Description of document:	Nuclear Regulatory Commission (NRC) Records Concerning Handling of "Orphan Source" Radioactive Materials and Devices, 1992-2011
Request date:	2013
Released date:	03-October-2014
Posted date:	02-March-2015
Source of document:	US Nuclear Regulatory Commission Mail Stop T-5 F09 Washington, DC 20555-0001 Fax: 301-415-5130 E-mail: FOIA.resource@nrc.gov

NRC FORM 464 Part I
(08-2013)

U.S. NUCLEAR REGULATORY COMMISSION

RESPONSE TO FREEDOM OF INFORMATION ACT (FOIA) / PRIVACY ACT (PA) REQUEST

FOIA/PA	RESPONSE NUMBER
2013-0068	3

RESPONSE TYPE: [ ] FINAL [✓] PARTIAL

REQUESTER

DATE: OCT 03 2014

PART I. -- INFORMATION RELEASED

- [ ] No additional agency records subject to the request have been located.
- [ ] Requested records are available through another public distribution program. See Comments section.
- [ ] GROUP: — Agency records subject to the request that are identified in the specified group are already available for public inspection and copying at the NRC Public Document Room.
- [✓] GROUP: E&F — Agency records subject to the request that are contained in the specified group are being made available for public inspection and copying at the NRC Public Document Room.
- [✓] GROUP: E&F — Agency records subject to the request are enclosed.
- [ ] Records subject to the request that contain information originated by or of interest to another Federal agency have been referred to that agency (see comments section) for a disclosure determination and direct response to you.
- [✓] We are continuing to process your request.
- [ ] See Comments.

PART I.A -- FEES

AMOUNT* $

* See comments for details

- [ ] You will be billed by NRC for the amount listed.
- [ ] You will receive a refund for the amount listed.
- [ ] None. Minimum fee threshold not met.
- [ ] Fees waived.

PART I.B -- INFORMATION NOT LOCATED OR WITHHELD FROM DISCLOSURE

- [ ] No agency records subject to the request have been located. For your information, Congress excluded three discrete categories of law enforcement and national security records from the requirements of the FOIA. See 5 U.S.C. § 552(c) (2006 & Supp. IV (2010). This response is limited to those records that are subject to the requirements of the FOIA. This is a standard notification that is given to all our requesters and should not be taken as an indication that excluded records do, or do not, exist.
- [✓] Certain information in the requested records is being withheld from disclosure pursuant to the exemptions described in and for the reasons stated in Part II.
- [✓] This determination may be appealed within 30 days by writing to the FOIA/PA Officer, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Clearly state on the envelope and in the letter that it is a "FOIA/PA Appeal."

PART I.C COMMENTS (Use attached Comments continuation page if required)

SIGNATURE - FREEDOM OF INFORMATION ACT AND PRIVACY ACT OFFICER

Stephanie Blaney, Acting FOIA Officer

NRC FORM 464 Part II
(08-2013)

U.S. NUCLEAR REGULATORY COMMISSION

RESPONSE TO FREEDOM OF INFORMATION ACT (FOIA) / PRIVACY ACT (PA) REQUEST

FOIA/PA 2013-0068

DATE OCT 0 3 2014

PART II.A -- APPLICABLE EXEMPTIONS

GROUP
F

Records subject to the request that are contained in the specified group are being withheld in their entirety or in part under the Exemption No.(s) of the PA and/or the FOIA as indicated below (5 U.S.C. 552a and/or 5 U.S.C. 552(b)).

☐ Exemption 1: The withheld information is properly classified pursuant to Executive Order 12958.

☐ Exemption 2: The withheld information relates solely to the internal personnel rules and practices of NRC.

☐ Exemption 3: The withheld information is specifically exempted from public disclosure by statute indicated.

- ☐ Sections 141-145 of the Atomic Energy Act, which prohibits the disclosure of Restricted Data or Formerly Restricted Data (42 U.S.C. 2161-2165).
- ☐ Section 147 of the Atomic Energy Act, which prohibits the disclosure of Unclassified Safeguards Information (42 U.S.C. 2167).
- ☐ 41 U.S.C., Section 4702(b), prohibits the disclosure of contractor proposals in the possession and control of an executive agency to any person under section 552 of Title 5, U.S.C. (the FOIA), except when incorporated into the contract between the agency and the submitter of the proposal.

☐ Exemption 4: The withheld information is a trade secret or commercial or financial information that is being withheld for the reason(s) indicated.

- ☐ The information is considered to be confidential business (proprietary) information.
- ☐ The information is considered to be proprietary because it concerns a licensee's or applicant's physical protection or material control and accounting program for special nuclear material pursuant to 10 CFR 2.390(d)(1).
- ☐ The information was submitted by a foreign source and received in confidence pursuant to 10 CFR 2.390(d)(2).
- ☐ Disclosure will harm an identifiable private or governmental interest.

☑ Exemption 5: The withheld information consists of interagency or intraagency records that are not available through discovery during litigation. Applicable privileges:

- ☑ Deliberative process: Disclosure of predecisional information would tend to inhibit the open and frank exchange of ideas essential to the deliberative process. Where records are withheld in their entirety, the facts are inextricably intertwined with the predecisional information. There also are no reasonably segregable factual portions because the release of the facts would permit an indirect inquiry into the predecisional process of the agency.
- ☐ Attorney work-product privilege. (Documents prepared by an attorney in contemplation of litigation)
- ☐ Attorney-client privilege. (Confidential communications between an attorney and his/her client)

☐ Exemption 6: The withheld information is exempted from public disclosure because its disclosure would result in a clearly unwarranted invasion of personal privacy.

☐ Exemption 7: The withheld information consists of records compiled for law enforcement purposes and is being withheld for the reason(s) indicated.

- ☐ (A) Disclosure could reasonably be expected to interfere with an enforcement proceeding (e.g., it would reveal the scope, direction, and focus of enforcement efforts, and thus could possibly allow recipients to take action to shield potential wrong doing or a violation of NRC requirements from investigators).
- ☐ (C) Disclosure could constitute an unwarranted invasion of personal privacy.
- ☐ (D) The information consists of names of individuals and other information the disclosure of which could reasonably be expected to reveal identities of confidential sources.
- ☐ (E) Disclosure would reveal techniques and procedures for law enforcement investigations or prosecutions, or guidelines that could reasonably be expected to risk circumvention of the law.
- ☐ (F) Disclosure could reasonably be expected to endanger the life or physical safety of an individual.

☐ OTHER (Specify)

PART II.B -- DENYING OFFICIALS

Pursuant to 10 CFR 9.25(g), 9.25(h), and/or 9.65(b) of the U.S. Nuclear Regulatory Commission regulations, it has been determined that the information withheld is exempt from production or disclosure, and that its production or disclosure is contrary to the public interest. The person responsible for the denial are those officials identified below as denying officials and the FOIA/PA Officer for any denials that may be appealed to the Executive Director for Operations (EDO).

DENYING OFFICIAL	TITLE/OFFICE	RECORDS DENIED	APPELLATE OFFICIAL EDO	SECY	IG
Dr. Brian W. Sheron	Director, Research	See Group F	☑	☐	☐
Sandy Joosten	Executive Assistant, Secy	See Group F	☐	☑	☐
			☐	☐	☐

Appeal must be made in writing within 30 days of receipt of this response. Appeals should be mailed to the FOIA/Privacy Act Officer, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, for action by the appropriate appellate official(s). You should clearly state on the envelope and letter that it is a "FOIA/PA Appeal."

NOTE: SENSITIVE INFORMATION -- LIMITED TO NRC UNLESS THE COMMISSION DETERMINES OTHERWISE

POLICY ISSUE
(Notation Vote)

February 3, 1999

SECY-99-038

FOR: The Commissioners

FROM: William D. Travers
Executive Director for Operations

SUBJECT: STAFF EFFORTS TO ADDRESS ORPHAN SOURCE ISSUES

PURPOSE:

To provide the Commission with information and options on orphan source issues in response to Item 8 of the Staff Requirements Memorandum (SRM) (Attachment 1) dated April 13, 1998, on SECY-97-273, "Improving the U.S. Nuclear Regulatory Commission's Control Over, and Licensees' Accountability for, Generally and Specifically Licensed Devices."

SUMMARY:

This paper describes the staff's efforts to address orphan source issues since April 1998, when the SRM on SECY-97-273 was issued. These efforts have included presentations and coordination with stakeholders on the orphan source problem; consultation with Federal agencies and States on jurisdictions and regulatory responsibilities for addressing the orphan source problem; continued close coordination with the Conference of Radiation Control Program Directors (CRCPD) through a committee addressing orphan source issues; and coordination with the U.S. Department of Energy (DOE), to finalize a Memorandum of Understanding (MOU) on management of sealed sources. This paper also presents options for establishing an orphan source contract, provides pros and cons for the different contract options, and gives an estimate of the cost of establishing such a contract.

CONTACT: Douglas A. Broaddus, NMSS/IMNS
(301) 415-5847

E-1

NOTE: SENSITIVE INFORMATION -- LIMITED TO THE NRC UNLESS THE COMMISSION DETERMINES OTHERWISE

BACKGROUND:

On December 31, 1996, the Commission issued an SRM on SECY-96-221, and the staff responded in SECY-97-273, "Staff Requirements -- SECY-96-221 -- 'Improving NRC's Control Over, and Licensees' Accountability for, Generally and Specifically Licensed Devices.'" On April 13, 1998, the Commission issued an SRM on SECY-97-273.

In the SRM on SECY-97-273, the Commission instructed the staff, in part, to continue efforts to further address orphan sources, using the guiding principle that non-licensees who find themselves to be in possession of radioactive sources that they did not seek to possess should not be expected or asked to assume responsibility and cost for exercising control or arranging for their disposal. The Commission directed the staff to continue efforts to address orphan sources; consult with other Federal agencies and the States to define jurisdictions and regulatory responsibilities for addressing the orphan source problem; continue to coordinate with CRCPD to ensure that a similar regulatory framework is applied to sources/devices containing Atomic Energy Act (AEA) material and sources/devices containing Naturally occurring or Accelerator-produce Radioactive Material (NARM); aggressively pursue finalizing the MOU with DOE; and consider the pros and cons of establishing a contract program for orphan sources, and provide an estimate of the costs of such a program. Each of these areas of the SRM is addressed, in sequence, in the following discussion. Other areas of the SRM, involving the U.S. Nuclear Regulatory Commission's (NRC) general license program, are the subject of separate staff actions and are not addressed here.

DISCUSSION:

Staff efforts to further address orphan sources

The staff is actively pursuing efforts to address the issue of orphan sources, consistent with Commission direction. These efforts have included: staff participation in five federal and state interagency meetings which included representatives of the metal recycling and manufacturing industries; staff presentations at a workshop and a seminar, concerning efforts to improve detection of radioactive materials in the metal recycling and manufacturing industries; interaction with DOE on a pilot program to recover and recycle certain Greater-Than-Class-C (GTCC) materials; responses to two requests from Agreement States for DOE emergency acceptance of GTCC orphan sources; and incident response efforts on a number of orphan source and contaminated metal incidents, including several incidents that involved other Federal agencies and States. Attachment 2 contains more specific information concerning these efforts. The staff plans to continue outreach efforts with industry and stakeholders.

Consult with Federal Agencies and States to define jurisdictions and regulatory responsibilities

The staff met with and/or discussed the roles, responsibilities, and jurisdictions of DOE; the U.S. Environmental Protection Agency (EPA); and the U.S. Federal Emergency Management Agency (FEMA), regarding orphan source issues, with representatives from each of these Federal agencies. The staff also addressed the same issues with State representatives through CRCPD. In addition, the staff researched and consulted available documentation, such as the Federal Radiological Emergency Response Plan (FRERP) and the National Contingency Plan (NCP), concerning each agency's role in responding to orphan source incidents. The discussion in this paper and the attachments have not been reviewed, approved, or sanctioned by the applicable agencies. Attachment 3 provides the NRC staff's characterization of the roles, responsibilities, and jurisdictions of Federal agencies and States for addressing orphan sources, based on available information and the views expressed by the different agency representatives.

The issues of regulatory responsibilities and jurisdictions of Federal agencies and States in addressing orphan source problems have been complex, and there is overlap between the cognizant organizations. Regulatory responsibilities and jurisdictions are particularly difficult to clarify, because of the many different types of sources and situations that may be associated with orphan source incidents. The numerous Federal, State, and local organizations having responsibilities in this area have a variety of capabilities, as well as differing perceptions of each organization's roles and responsibilities, even within their own organizations. All 50 States, and no less than 11 Federal agencies (primarily NRC, DOE, EPA, FEMA, the U.S. Department of Defense, and the U.S. Department of Transportation, and secondarily, the Federal Bureau of Investigations, the U.S. Customs Service, the Central Intelligence Agency, the National Security Agency, and the U.S. Department of State) have responsibility for or jurisdiction over addressing different aspects of the orphan source problem.

Development and implementation of the FRERP and coordination work over the past several years between CRCPD, Federal agencies, and States have helped to clarify roles, responsibilities, and jurisdictions on orphan source incidents, especially concerning the authorities governed by the NCP. Although these efforts have been ongoing for a number of years, significant improvement in this area has been seen over the last few years. To provide a more consistent national approach to orphan source incidents, further efforts are needed. Several mechanisms may be utilized to continue this work, including: working directly and separately with each agency, possibly resulting in additional MOU's, similar to the DOE MOU, concerning orphan sources; requesting the CRCPD E-34 Committee on Unwanted Radioactive Material (the E-34 Committee) to expand its charter to fully address this issue; initiating a working group of representatives of the applicable Federal agencies, and one or more State representatives, to provide a consensus position on this issue; as a member of the NCP National Response Team (NRT), request guidance and clarification on this matter from the NRT in accordance with the provisions of the NCP; request FEMA, through the Federal Radiological Preparedness Coordinating Committee (FRPCC), to develop a consensus position on this issue, and consider training programs and exercises conducted through the FRPCC Training Subcommittee; and supporting and participating in additional lost source exercises. Obtaining a national consensus position on roles, responsibilities, and jurisdictions will likely require a combination of these approaches. The staff plans to continue exploration of these mechanisms.

<u>Coordination with CRCPD</u>

In late Calendar Year (CY) 1997, EPA provided funding to the CRCPD for initiation of a committee -- the E-34 Committee -- whose charter is to prepare a national program for addressing and responding to unwanted radioactive material. The staff has coordinated with CRCPD, through the E-34 Committee, consistent with Commission direction to ensure that a similar regulatory framework is applied to both AEA and NARM sources/devices. The E-34 Committee includes advisory members from NRC, EPA, and DOE. The E-34 Committee's activities have included: defining the problem; determining the part of the problem that the E-34 Committee's program would address; identifying the essential elements of an orphan source program; surveying regulatory agencies, discussing the issue with stakeholders, and developing criteria for acceptance of radioactive materials into the program, to determine and bound the scope of the problem; requesting NRC assistance to use the Nuclear Material Event Database (NMED) for tracking orphan sources; and discussing the need for clarification of the roles and responsibilities of State and Federal agencies for addressing the orphan source issue, and coordinating these roles for a consistent approach.

The E-34 Committee plans to continue development of the program and initiate a pilot orphan source acceptance program in CY 1999. If the pilot program is successful, it may serve as a template for State and Federal agencies to respond to unwanted radioactive materials. Issues regarding EPA's funding of the program development, funding of the final E-34 orphan source acceptance program, cooperative agreements between States, application of a similar regulatory framework between AEA orphan sources and NARM orphan sources, and the use of NMED to track orphan sources, are discussed in more detail in Attachment 4. To date, the staff has found participation on the E-34 Committee to be a valuable mechanism for interacting with other organizations on the orphan source problem and for developing a potential solution to the orphan source problem.

Efforts to finalize the MOU with DOE

The Office of Nuclear Material Safety and Safeguards (NMSS) staff worked closely with the NRC's Office of the General Counsel (OGC) and DOE Office of Waste Management to redraft the MOU on management of sealed sources, in an attempt to address concerns expressed by DOE's OGC with the original 1995 draft MOU. In addition, NRC staff informed DOE about the Commission's direction in the SRM on SECY-97-273, to aggressively pursue finalization of the MOU. DOE Office of Waste Management staff agreed, in principle, to assist in this effort, and on December 18, 1998, DOE management signed the MOU and returned it to NRC in a letter of the same date. The signed MOU is being provided to the Commission, for approval, as Attachment 5. NMSS has coordinated with OGC on the final version of the MOU, and OGC has no legal objection to NMSS signing and issuing the MOU. Upon Commission approval, the staff is prepared to sign the MOU.

Options regarding an orphan source contract program

In considering the pros and cons of establishing an orphan source contract program that would enable licensees or DOE to take possession of, and arrange for proper transfer or disposal of, orphan sources, the staff evaluated: the required capabilities of such a contractor and the bounds of such a contract; whether NRC has the legal authority to issue such a contract; factors that would limit such a contract; contract alternatives; and the positive and negative attributes of such a contract. The steps the staff took to consider the pros and cons of establishing an orphan source contract, and an analysis of the legal and contractual complexities of such a program, are discussed in detail in Attachments 6, 7, and 8.

As shown in the analysis in Attachment 6, the staff identified four principal options for an orphan source contract:

1. NRC establishes an orphan source contract program, with a commercial firm or firms, for AEA material only.

2. NRC funds CRCPD to establish, implement, and manage a national orphan source program, once the E-34 Committee's pilot program is complete (~ mid CY 2000). NRC funding would be commensurate with the proportion of NRC licensees to all US licensees, and would be limited to only those efforts associated with AEA material.

3. NRC neither establishes nor funds an orphan source contract or program, but continues to work with the E-34 Committee, to develop a national orphan source program (the E-34 Committee's program would require funding from sources other than NRC).

4. A combination of Options 1 and 2. The combination would allow NRC to issue an orphan source contract while the E-34 Committee is continuing work on its national program, then end the contract and fund the E-34 Committee's program, once its development is complete.

The staff identified a number of pros and cons for each of the options (see Attachment 6). Based on the pros and cons and an analysis of the legal and contractual complexities of establishing an orphan source contract, the staff recommends that the Commission proceed with Option 2 (fund the E-34 Committee's program) as the preferred alternative. The staff expects that the E-34 Committee's program will contain the essential elements that NRC would require of an orphan source contract, or more, and funding the E-34 Committee's program presents several clear advantages over other options. For instance, the E-34 Committee's program would offer a seamless framework for both NARM and AEA orphan sources; minimize many legal uncertainties and potential conflicts of interest that an NRC contract would face; cover all States and jurisdictions; require fewer NRC full-time equivalent position resources; and promote inter-agency and Federal/State cooperation on the orphan source problem.

<u>Estimate the costs of an orphan source contract program</u>

The annual frequency of orphan source incidents, which is a dominant factor in the cost of an orphan source contract, is not known for a variety of reasons, as discussed in Attachment 9. Therefore, it is difficult to accurately estimate the costs of the orphan source contract options discussed in this paper. The staff has been able to provide a rough estimate for an orphan source contract, based on current information and discussions with waste brokers and waste handlers, with the assumption that the contract covers only AEA orphan source material in non-Agreement States. The staff's estimate of the annual cost of an orphan source program is only a rough approximation, and actual costs would be highly dependent on a number of variables. The staff's estimated costs for NRC funding the E-34 Committee's program implementation and continuation, with the assumptions that NRC's funding covers only AEA material and NRC shares the costs of the program proportionally with the Agreement States, results in an expectation of the same approximate costs. Estimates for the costs of funding the E-34

Committee's program should be better defined after the pilot program. The staff's estimate is that either option (an NRC contract program or NRC funding of the E-34 Committee's program) would cost approximately $450,000 per year. Actual costs would likely vary from year to year, possibly by as much as a couple hundred thousand dollars. More detail on these estimates, and the bases for the costs, are provided in Attachment 9.

RECOMMENDATIONS:

1. The Commission approve the staff's plans to sign the MOU with DOE on management of sealed sources.

2. The Commission proceed with Option 2 as the preferred alternative for an orphan source contract. If approved, the staff will provide the Commission with the status of the E-34 Committee's program development, and the E-34 Committee's cost estimates for the program, by mid-CY 2000. Funding for this option should not be required until the E-34 Committee's program is fully developed (FY 2001), and could be addressed during the current, ongoing-budget formulation cycle for the FY 2001 budget.

RESOURCES:

The resources in NMSS' budget are sufficient to support Recommendation 1. Although resources to implement Recommendation 2 have not been budgeted, if the Commission directs the staff to pursue any type of contract option that requires funding, NMSS will address the funding requirements in the next budget formulation cycle. Following initial implementation of a program, staff would use its experience to further refine cost estimates for future budget cycles.

COORDINATION:

OGC has reviewed this paper and has no legal objection. The Office of the Chief Financial Officer has reviewed this Commission paper for resource implications and has no objections.

William D. Travers
William D. Travers
Executive Director
for Operations

Attachments:
1. SRM on SECY-97-273, dtd 4/13/98
2. Staff Efforts to Further Address Orphan Sources
3. Jurisdictions and Regulatory Responsibilities
4. Coordination with CRCPD
5. Letter transmitting signed MOU with DOE.
6. Pros and Cons of a Contract Program
7. Sources Sought Synopsis
8. Request for Legal Advice on a Contract Program
9. Cost Estimates for Contract Options

Commissioners' completed vote sheets/comments should be provided directly to the Office of the Secretary by c.o.b. **Monday, February 22, 1999.**

Commission staff office comments, if any, should be submitted to the Commissioners NLT **February 12, 1999,** with an information copy to SECY. If the paper is of such a nature that it requires additional review and comment, the Commissioners and the Secretariat should be apprised of when comments may be expected.

DISTRIBUTION:
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ATTACHMENT 1

SRM ON SECY-97-273
DATED APRIL 13, 1998

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

OFFICE OF THE SECRETARY

April 13, 1998

Action: ~~Paperiello, NMSS/~~
Lieberman, OE/
Bangart, SP/
Funches, CFO

Cys: Callan
Thadani
Thompson
Norry
Blaha
Martin, AEOD
Knapp, RES
Lubinski, NMSS

MEMORANDUM TO: L. Joseph Callan
Executive Director for Operations

Jesse L. Funches
Chief Financial Officer

William M. Beecher, Director
Office of Public Affairs

FROM: Annette L. Vietti-Cook, Acting Secretary

SUBJECT: STAFF REQUIREMENTS - SECY-97-273 - STAFF REQUIREMENTS -- SECY-96-221 -- "IMPROVING NRC'S CONTROL OVER, AND LICENSEES' ACCOUNTABILITY FOR, GENERALLY AND SPECIFICALLY LICENSED DEVICES"

The Commission had disapproved the staff's recommendation and directs the staff take the following actions:

*8900090 and 9000192 (NMSS)

1. Terminate the rulemaking on 10 CFR Part 31.5* that was initiated in 1991 except those provisions that will enable NRC to request information from certain general licensees to provide the regulatory basis for initiation of a registration program in advance of the rulemaking described below. Those portions of the 1991 proposed rule should be renoticed for public comment.
(~~EDO~~) (NMSS) (SECY Suspense: ~~8/21/98~~) 8/14/98 9800070

2. Provide a set of milestones to the Commission for information for implementing the rulemaking described below. The milestones should be in lieu of the standard rulemaking plan required by Management Directive 6.3, but should meet the requirement for coordination with Agreement States.
(~~EDO~~) (NMSS) (SECY Suspense: ~~8/21/98~~) 8/14/98 9800071

SECY NOTE: SECY-97-273 WAS RELEASED TO THE PUBLIC ON DECEMBER 2, 1997. THIS SRM AND THE COMMISSION VOTING RECORD CONTAINING THE VOTE SHEETS OF ALL COMMISSIONERS WILL BE MADE PUBLICLY AVAILABLE 5 WORKING DAYS FROM THE DATE OF THIS SRM.

3. Draft a proposed rule to implement a registration and follow up program for the generally-licensed sources/devices identified by the NRC Agreement State Working Group, apply fees to these general licensees, and incorporate requirements for permanent labeling of sources/devices. The proposed rule should include the staff's preferred approach -- Attachment item 11, Option 3 -- to apply a registration fee, per licensee, at the time of initial registration and annual re-registration of sources/devices. The staff should explore the possibilities, advantages, and disadvantages of other fee approaches such as pro-rating the fees, e.g., per device (fixed or sliding scale) or per license and provide recommendations to the Commission. Determine the extent to which application of the small business rule will affect the fees.
(~~EDO~~/CFO) NMSS (SECY Suspense: ~~12/31/98~~ 12/24/98) 9800071

4. Use the results of the materials risk assessment study to restructure the current licensing and materials programs. Consider the findings when determining whether additional sources/devices should be subject to registration and follow up, and for performing the risk ranking necessary if a phase-in approach is used to reduce the initial resource surge associated with an increased regulatory program. Review the basis of the general licenses for adequacy with respect to consideration of the consequences of off-site accidents, such as loss of shielding or melting in metal making furnaces. The staff should provide the technical basis document for the risk assessment together with recommendations on how to proceed.
(~~EDO~~) (NMSS) (SECY Suspense: ~~12/31/98~~ 12/24/98) 9800090

5. Include provisions in the registration program for follow up of cases where there are no responses or where discrepancies are found between responses and NRC records. Explore with vendors their willingness to voluntarily assist the NRC (and Agreement States) in the follow up effort. Develop follow up procedures which integrate the following fundamental concepts:

   a. the extent of follow up should consider the risk to public health and safety that the source or device in question poses as well as the likelihood of finding the device;

   b. considering the associated level of risk, there should be a point at which the follow up of certain low risk sources and devices is terminated;

   c. all information about lost sources should be made public in a timely manner.

(~~EDO~~) (NMSS) (SECY Suspense: concurrent with effective date for final rule) 9800071

6. Implement an enforcement program that includes a short amnesty program for general licensees and increased civil penalties for both general and specific licensees for "lost" sources. The increased civil penalties should be significantly greater than the costs of proper disposal or transfer of a source or device. Work with Agreement States in

implementing enforcement programs such that their policies, practices, and procedures have the same impact as NRC's enforcement program.
~~(EDO)~~ (NMSS/OE/SP) (SECY Suspense: concurrent with effective date for final rule) 9800071

7. Provide an estimate of the resources needed to fully support this program. Preparation of this estimate should include:

   - o Estimating resource needs for the various phases of the registration program including, in particular, the substantial "spike" of resources needed to carry out the follow up program.

   - o Reviewing registration programs for general licensees that have been implemented by Agreement States for applicability of concepts, and exploring the possibility of utilizing other Federal agency registration programs and off-the-shelf commercial programs to minimize development and operating costs.

   - o Exploring the possibility of contracting with the States to carry out this part of the program under authority of Section 274i of the Atomic Energy Act, as amended.

   - o Identifying, through the Executive Council, resources to support the expanded program, and inform the Commission if other program areas need to be reduced. The Executive Council should consider program areas outside of NMSS. The Executive Council should also evaluate and inform the Commission of the impact of this change on the Strategic Plan, Strategic Goals, and specific programs.

~~(EDO)~~ (NMSS/CFO) (SECY Suspense: ~~12/31/98~~) 12/24/98 9800091

8. Continue efforts to further address the orphan sources. A guiding principle is that non-licensees who find themselves to be in possession of radioactive sources that they did not seek to possess should not be expected or asked to assume responsibility and cost for exercising control or arranging for their disposal. These efforts should include:

   - o Consulting with DOE, EPA, FEMA and the States to define jurisdictions and regulatory responsibilities for addressing the orphan source problem, and continued close coordination with the Conference of Radiation Control Program Directors to ensure that a similar regulatory framework is applied to source/devices containing Atomic Energy Act (AEA) material and sources/devices containing naturally-occurring or accelerator-produced radioactive material.

   - o The staff should aggressively pursue finalizing the MOU with DOE.

o Consider the pros and cons of establishing a contract program that would enable licensees or DOE to take possession of and arrange for proper transfer or disposal of orphan sources and provide an estimate of the costs of such a program.

(~~EDO~~) (NMSS) (SECY Suspense: ~~12/31/98~~) 9800092
12/24/98

o If NRC funding is necessary for an orphan source recovery program, the staff should provide recommendations for funding the program including, as directed by the Commission in its December 1996 SRM, "exploring with Congress the possibility of removing specific program costs from the NRC's user fee base (e.g., orphan source recovery fund)."
(CFO) (SECY Suspense: 12/31/98)

The Office of Public Affairs should issue a press release concerning the Commission's decision.
(OPA) (SECY Suspense: 4/15/98)

Chairman Jackson
Commissioner Dicus
Commissioner Diaz
Commissioner McGaffigan
OGC
CIO
CFO
OCA
OIG
Office Directors, Regions, ACRS, ACNW, ASLBP (via E-Mail)
PDR
DCS

CONTINUED STAFF EFFORTS TO FURTHER ADDRESS ORPHAN SOURCES

1. COMMISSION DIRECTION

In the Staff Requirements Memorandum (SRM) on SECY-97-273, the Commission instructed the staff to, "Continue efforts to further address the orphan sources. A guiding principle is that non-licensees who find themselves to be in possession of radioactive sources that they did not seek to possess should not be expected or asked to assume responsibility and cost for exercising control or arranging for their disposal."

2. DEFINITION OF ORPHAN SOURCE

Before describing the staff's efforts with "orphan sources," it is important to define the term. A key concept in addressing the orphan source issue is answering the question: "What is an orphan source?" The answer is non-trivial. The answer bounds the extent of the orphan source problem. For instance, if the orphan source definition is considered to include unsealed material of any form, then very large volumes of contaminated soil or building materials might be considered to fit into the definition. This would result in a broad interpretation of the extent of the orphan source problem, requiring massive funding to address the problem. Conversely, if the orphan source definition is limited to just sealed sources, then small areas of volumetrically contaminated metals might not be considered to fit into the definition. Small amounts of material contaminated by a leaking sealed source also might not be considered to fit into the definition, although the leaking sealed source itself might fit the definition. This would result in a narrow interpretation of the extent of the orphan source problem, leading to an underestimate of the funding needed to address the problem.

The term "orphan source" may be, and has been, used to describe a variety of types and forms of radioactive materials in a multitude of conditions, for which there is no viable responsible party to provide for an appropriate disposition of the material. However, the generally accepted definition of an orphan source is radioactive material in discrete form (i.e., contained within a small volume such as a sealed source, activated metal, or materials encapsulated in similar small containers), containing either material covered by the Atomic Energy Act of 1954, as amended, or naturally occurring or accelerator-produced radioactive material that is in any one or more of the following conditions:

- In an uncontrolled condition that requires removal to protect the public health and safety from a radiological threat;
- Controlled or uncontrolled, but for which a responsible party cannot be readily identified;
- Controlled, but for which the continued security of the material cannot be assured and, if in the possession of a licensee, the licensee has little or no options for, or is incapable of providing for, the disposition of the material;
- In the possession of a person, not licensed to possess the material, who did not seek to possess the material; or

- In the possession of a State radiological protection program (either Agreement State or non-Agreement State) for the sole purpose of mitigating a radiological threat because of one of the above conditions, and for which the State does not have a means to provide for the appropriate disposition of the material.

The staff applies this definition of "orphan sources" in addressing orphan source issues. Although imperfect, this definition contains the extent of the orphan source problem to realistic, manageable levels.

3. <u>CONTINUED STAFF EFFORTS TO FURTHER ADDRESS ORPHAN SOURCES</u>

In addition to the specific activities listed in the SRM on SECY-97-273, the staff has continued a number of efforts to further address the orphan source issue. These staff efforts have included the following:

A. Working with the U.S. Department of Energy (DOE) to identify and remove (or schedule for removal) 57 americium-241:beryllium (AmBe) orphan sources, located in both Agreement and non-Agreement States, that are Greater-Than-Class-C (GTCC), in accordance with the waste classification in 10 CFR Section 61.55. In a letter dated September 5, 1996, DOE indicated that it intended to implement a pilot program to recycle AmBe sources. In subsequent discussions, DOE staff requested that the U.S. Nuclear Regulatory Commission (NRC) and the States identify up to 40 potential candidates for the pilot program. Based on information provided by the NRC regional offices and the States, the staff identified and prioritized 57 sources. The staff requested that the sources be accepted into DOE's pilot program, in letters to DOE sent between August 1997 and September 1998. DOE accepted all but one of the NRC-identified candidates into the program and expanded the pilot by an additional 16 sources, to 56 total sources. (The one candidate source not accepted had other available disposition options.) To date, 15 of the 57 sources have been received by DOE, with the remaining to be scheduled in early Calendar Year 1999. The staff will continue working with DOE in an effort to establish routine acceptance of AmBe sources, as well as to expand DOE's recycling program to include other GTCC sealed sources, such as plutonium-238 (Pu^{238}).

B. Responding to two requests from Agreement States for DOE assistance in situations involving GTCC material that was causing, or had a potential to cause, a threat to the public health and safety. These requests concerned a 213.5-Gigabecquerel (5.77-curie) Pu^{238}:Be sealed source used in a "neutron howitzer," and a pacemaker containing a 0.08-gram Pu^{238} sealed source.

C. Working with industry (primarily the metal recycling and manufacturing industries) to address issues concerning the identification and proper disposition of orphan sources, including:

    - Participation in a meeting, in April 1998, between NRC; DOE; the U.S. Environmental Protection Agency (EPA); members of the Conference of Radiation Control Program Directors E-34 Committee on Unwanted Radioactive Material (the E-34 Committee); and representatives of the Institute of Scrap Recycling Industries (ISRI); the American Iron and Steel Institute (AISI); the

Steel Manufacturer's Association (SMA); and the Specialty Steel Industry of North America, to introduce these stakeholders to the E-34 Committee's initiative, and to provide the stakeholders with an opportunity to identify areas of concern that need to be addressed by the E-34 Committee.

- Participation in a meeting, in July 1998, between the DOE National Center of Excellence for Metals Recycle, ISRI, and AISI, where EPA and NRC discussed current activities, within their agencies, concerning the recycling of and clearance levels for metals and orphan sources.

- Participation in a "Workshop on the Detection of Radioisotopes in Steel Scrap," in June 1998, that focused on identifying means to better detect radioactive material in the steel manufacturing and scrap recycling process. The workshop was sponsored by DOE's Office of Industrial Technology, which requested NRC to make a presentation concerning NRC's current efforts to better ensure the control and accountability of material and to address the orphan source issue. Representatives of the steel industry, including ISRI, AISI, and SMA attended this workshop.

- Participation in a June 1998, ISRI seminar, on "Radioactivity in the Scrap Recycling Process," that addressed how radioactive material enters the scrap recycling process, means to prevent this from occurring, ways to detect radioactive material in the scrap recycling process, and how to handle found material. NRC was requested to make a presentation on assistance in the identification of radioactive materials in the scrap recycling process. This presentation included a discussion of identifying markings on sources and devices; typical shapes and sizes of various types of sources and devices; industries in which sources and devices are typically used; common isotopes and activities found in sources or devices; and points, during the life-cycle of a source or device, when the potential for identification could be increased. Workshop participants and attendees included a number of representatives of the steel recycling industry; other governmental agencies (EPA, DOE, and the States); health physics consultants; and radiation detection equipment manufacturers.

- Participation in a December 1998, meeting, with the U.S. Department of State (DOS), concerning the creation of an International Radioactive Source Management (IRSM) initiative. The DOS is leading the IRSM initiative in response to international requests for assistance in the areas of orphan source management, and clearance levels for metals. The IRSM initiative is intended, in part, to develop a program for the prevention, identification, tracking, response, and remediation of radioactive materials being illegally imported and exported to and from nation-states, including the United States. NRC presentations concentrated on past initiatives in this area and current activities, including rulemakings on control and accountability of generally licensed devices, and clearance levels for certain materials. NRC presenters also discussed the staff's work on orphan sources issues and recycling of contaminated materials. Other participants and attendees included EPA, DOE, the U.S. Department of Transportation, the U.S. Customs Service, ISRI, AISI, SMA, radiation detection equipment manufacturers, staff representatives from the House of Representatives and the Senate Sub-committee on Intelligence, and representatives of other government agencies.

D. Responding to a number of orphan source incidents, including incidents involving orphan sources that were melted at steel mills and uniformly distributed in steel products, and working with EPA, States, NRC's Office of International Programs, and the Federal Bureau of Investigation, to address policy issues concerning the licensing of products manufactured using the contaminated steel, attempting to recover stolen or lost radioactive material, and locating responsible parties

The staff recommends continuing outreach efforts with industry and stakeholders. These efforts will provide assistance to stakeholders in identifying orphan sources before they are shredded or melted; obtain information about the concerns and needs of the scrap recycling and metal manufacturing industries in the areas of orphan sources and clearance levels; identify and include other stakeholders; continue identifying other related orphan source areas that should to be addressed by NRC; and keep stakeholders informed of the status of NRC's other efforts in the orphan source area.

JURISDICTIONS AND REGULATORY RESPONSIBILITIES OF FEDERAL AGENCIES AND STATES IN ADDRESSING ORPHAN SOURCES

1. BACKGROUND

The issues of regulatory responsibilities and jurisdictions of the various Federal agencies and States in addressing orphan source issues have been complex, leading to overlap and potential gaps between the cognizant organizations. Roles, regulatory responsibilities, and jurisdictions of the organizations are particularly difficult to clarify, for a number of reasons. Orphan source incidents are inherently different, variable, and unplanned; a large number of Federal, State, and local agencies and organizations have responsibilities for different portions of orphan source incidents; and individual agencies may have different roles, or perceptions of roles, within their own staffs, at different locations.

The variability in orphan source incidents is tremendous. For instance, an incident may involve a foreign radioactive source imported into the United States, or a domestic orphan source. An incident could involve Naturally occurring or Accelerator-produce Radioactive Material (NARM), or material covered under the Atomic Energy Act of 1954, as amended (AEA). An incident could result from an accident or intentional misconduct, in which case law enforcement agencies could be involved. An incident could occur either in an Agreement State or a non-Agreement State. Responders may have the capability to immediately mitigate any public health hazards, or they may ask for State or Federal assistance. Responders may have the authority and facilities to take and store the orphan source, or they may not. An incident could lead to minimal hazards, or to widespread contamination. An incident could even potentially involve domestic or international terrorism, in which case the Nation's intelligence agencies could become involved. All 50 States, and no less than 11 Federal agencies (primarily the U.S. Nuclear Regulatory Commission (NRC), the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), the Federal Emergency Management Agency (FEMA), and the U.S. Department of Transportation, and secondarily the U.S. Department of Defense, the Federal Bureau of Investigation, the U.S. Customs Service, the Central Intelligence Agency, the National Security Agency, and the U.S. Department of State) have some responsibility or jurisdiction for addressing the orphan source issue.

2. THE STAFF'S APPROACH TO DEFINING JURISDICTIONS AND REGULATORY RESPONSIBILITIES

To define jurisdictions and regulatory responsibilities for addressing the orphan source problem, the staff first researched and reviewed available guidance documentation for the Federal agencies on orphan source and similar incidents, including the following documents:

- The Federal Radiological Emergency Response Plan (FRERP);
- The National Contingency Plan (NCP), formally known as the National Oil and Hazardous Substances Pollution Contingency Plan;
- The Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA);
- NRC's Response Coordination Manual 1996 (RCM-96, NUREG/BR-0230);
- The Atomic Energy Act of 1954, as amended;

- The Energy Reorganization Act of 1974, as amended;
- The Department of Energy Organization Act; DOE Orders and guidance documents;
- Title 10 U.S. Code of Federal Regulations (10 CFR) Part 835 (DOE's regulations concerning the management of sealed sources, amended December 4, 1998);
- The draft NRC/DOE Memorandum of Understanding (MOU) concerning the management of sealed sources; and
- Other statements of purpose and responsibility found in agency brochures and Internet web pages.

Of these documents, the most significant for the overall coordination of an orphan source incident response would be likely the FRERP, because this plan is specifically designed for radiological emergencies where there would be a coordinated response involving both State and Federal resources. This plan does not grant authorities, but only delineates the process and procedure for coordinating the Federal response to a radiological emergency. In addition, the most significant document regarding the authorities granted to Federal agencies for the response to a radiological release (such as an orphan source), whether the release constitutes an emergency or not, would be the NCP as this plan specifically indicates the actions that Federal agencies may take in situations involving the release of radioactive material that require a Federal response.

Based on the documents described above, past orphan source incidents, a Lost Source Exercise conducted in September and October of 1997, and the report summarizing this exercise, the staff compiled a listing of the various roles, responsibilities, and tasks that could be required for addressing orphan source issues. Examples of areas included in this listing include prevention of orphan sources, response to both lost and found sources, enforcement, remediation, and investigation into orphan source incidents. To address the issue of Federal responsibilities and jurisdictions, the staff discussed the listing with representatives of DOE, EPA, and FEMA. The staff held discussions with representatives of DOE's Office of Environmental Management and EPA's Office of Radiation and Indoor Air (ORIA) in September and October 1998, respectively, where NRC staff presented the listing to the other agencies, and asked each representative to identify which roles, responsibilities, and tasks fell within its agency's responsibility or jurisdiction. Each agency provided a response to the NRC staff's request. These issues were also discussed telephonically with a representative from FEMA's Emergency Services Branch (who also had experience and responsibility in FEMA's Radiological Emergency Preparedness group). To address the issue of State responsibilities, the staff provided the listing to State representatives of the Conference of Radiation Control Program Directors (CRCPD) E-34 Committee on Unwanted Radioactive Material (E-34 Committee) and discussed State responsibilities during a committee meeting on October 14-16, 1998. In addition, the staff requested each State representative to further review the listing and provide responses, if able to, for both AEA material and NARM. To date, the staff has not yet received the State responses. However, during the October meeting, it was suggested that this issue about jurisdictions and regulatory responsibilities could also be raised at the next full CRCPD meeting, which is planned for mid-1999.

3. <u>THE FRERP AND THE NCP</u>

The scope of the FRERP covers "...any peacetime radiological emergency that has actual, potential, or perceived radiological consequences in the United States, its Territories, possessions, or territorial waters and that could require a response by the Federal

Government." In addition, the plan describes how the Federal response to a radiological emergency will be organized, and the circumstances under which each agency would be the Lead Federal Agency (LFA). The FRERP does not allocate resources or provide additional authorities to Federal agencies, but it does provide for the coordination of Federal resources in response to a request from a State or local government or from owners or operators of radiological facilities or activities. The FRERP also provides for the efficient integration of Federal resources with State and local resources, and the resources of the owner or operator of the facility or activity, through the use of an LFA. The LFA is identified, in general terms, as the "...Federal Agency that owns, authorizes, regulates, or is otherwise deemed responsible for the facility or radiological activity causing the [radiological] emergency and has authority to conduct and manage Federal actions onsite."

The FRERP specifically indicates that it is intended, in part, to address the coordination of the Federal response to radiological emergencies at or involving NRC and Agreement State licensees. In addition, the FRERP indicates that it is also intended to address radiological emergencies involving abandoned radioactive materials, imported radioactively contaminated material (including contaminated scrap metal), and shipments of foreign-owned radioactive material that have actual, potential, or perceived radiological consequences in the United States, its Territories, possessions, or territorial waters. These situations encompass, either directly or indirectly, a large portion of orphan source incidents.

The scope of the NCP covers a variety of incidents involving the release of a hazardous material, including radioactive material. The NCP specifically indicates that it covers "...releases into the environment of hazardous substances, and pollutants or contaminants which may present an imminent and substantial danger to public health or welfare of the United States." The NCP is not limited to either NARM or AEA material, but would not cover any situations involving the release of radioactive materials for which there were other viable options. For example, the NCP states that "...release of source, byproduct, or special nuclear material from a nuclear incident, as those terms are defined in the atomic Energy Act of 1954, if such release is subject to requirements with respect to financial protection established by the Nuclear Regulatory Commission under section 170 of such Act, or, for the purposes of section 104 of CERCLA or any other response action, any release of source, byproduct, or special nuclear material from any processing site designated under section 102(a)(1) or 302(a) of the Uranium Mill Tailings Radiation Control Act of 1978(42 U.S.C. 7901 et seq.)" are excluded from the definition of a release as these materials have financial assurance provisions relating to their release.

Similar to the FRERP, the NCP describes aspects of the response to the release of a hazardous material that presents an imminent and substantial danger to the public health or welfare of the United States. This includes the use of Federal, State, and local resources and their respective authorities and responsibilities. In contrast to the FRERP, the NCP identifies the mechanisms available for lead agencies, response teams, and/or On-Scene Coordinators (OSC) to obtain and allocate resources to address a response. The NCP is also similar to the FRERP as it designates a lead agency depending on the circumstances of the release, but is different from the FRERP in that the lead agency is not necessarily the agency which regulates or has jurisdiction over the hazardous material involved in the release, and an OSC is appointed by the lead agency and is responsible for the overall coordination of the response. For additional guidance on releases involving radioactive material, the NCP refers to the procedures contained in the FRERP, but states that "... most radiological discharges and releases do not result in FRERP activation and should be handled in accordance with the NCP." This would be true for most orphan source incidents, but not necessarily for the same reason it is recognized in the NCP. Most orphan source incidents require a rapid initial response involving State and/or local emergency response personnel. As no Federal involvement typically occurs in this initial response, coordination of Federal resources and activities is not required. Following this initial response, the hazard or threat to the public and environment is typically temporarily mitigated. Although Federal involvement may occur following the initial response phase, the Federal response is typically not to the extent where the FRERP would need to be invoked for the coordination of Federal resources. However, in cases where the threat remained prevalent and a Federal response was required, the NCP would likely be the primary guiding document for the coordination of the Federal response.

Although the NCP addresses the availability of resources for response actions through available funding, it also states that response actions to a release "...shall be carried out under existing programs and authorities when available. Federal agencies are to make resources available, expend funds, or participate in response to discharges and releases under their existing authority." In addition, the NCP encourages industry groups, academic organizations, and other interested parties to commit resources for response operations and indicates that response operations shall not be carried out under the NCP in situations where a "state or political subdivision thereof" has the capability to carry out the various aspects of a response, including removal actions, except in certain special circumstances (e.g., where the release has the potential to affect Federal lands, releases affecting several states, etc.).

A particular area of jurisdictional complexity involves situations where an orphan source has been identified, but the immediate hazard to members of the public has been mitigated, either through the actions of State and/or local emergency response personnel, actions by personnel at the facility where the orphan source is located, or because the type, activity, or configuration of the radioactive material does not present an immediate hazard. Once the immediate hazard is mitigated, but often before the source itself is removed, many response organizations' jurisdictions or responsibilities cease, leaving the facility with unwanted radioactive material. In addition, if the situation is no longer considered a radiological emergency, the FRERP is no longer applicable. State and Federal agencies having regulatory responsibility, or standards for release, for radioactive material, have employed a number of approaches to these types of situations. Differences in the approaches used in the past have occurred, in part, because of the differences in the conditions and situations associated with each individual orphan source incident. Examples of the different approaches taken include: 1) cases where the facility in which the material was found was required to provide for its disposition or to obtain a license to possess and store the material; 2) incidents where EPA provided for the disposition of material in <u>some</u> situations involving sources or devices that were determined to be of unknown or foreign origin, but indicated that it would not provide for the disposition of such material in other similar incidents; 3) situations where DOE assistance was requested to, and did, retrieve and/or dispose of radioactive material that presented a potential hazard to members of the public; and 4) several incidents where State agencies removed radioactive materials and either placed the materials in storage, pending a disposition option, or provided for disposition of the material via an orphan source contractor or other similar mechanism.

Although each of these situations was unique -- as is the case with almost all orphan source incidents -- they demonstrate that historically, there has not been a single, consistent, national approach to responding to orphan source incidents, both at the State and Federal levels. Some agencies, such as FEMA and DOE, have clearly defined responsibilities, and other organizations' responsibilities are less clear. Considerable overlaps exist between regulatory jurisdictions in responding to orphan source issues. For instance, EPA is the LFA under the FRERP for responding to unidentified radioactive material in a public location, when assistance is requested by the State or local government. If the source is subsequently identified as NRC-licensed material, then NRC becomes the LFA, even if the material is in an Agreement State. The hand-off point between EPA and NRC, and the process for transfer of LFA responsibility, has never been clearly defined, so both agencies could reasonably believe that they have similar, overlapping responsibilities. If the response actions were in accordance with the NCP, the EPA would likely be the lead agency and would appoint an OSC for the coordination of the response activities. If the responsible party for the source was identified and determined to be an NRC licensee, the NRC would have certain regulatory responsibilities, including enforcement actions and working with the licensee to recover and properly dispose of the source, but the OSC may also have similar responsibilities including pursuing recovery of the costs associated with the response from the responsible party. It is unclear when OSC responsibilities would end and NRC (or other regulatory agency) responsibilities would begin. This issue was a subject of discussion during the 1997 Lost Source Exercise, but no definitive consensus was reached as to whether or when the handoff of LFA would occur. One option presented was that EPA would continue as the lead agency, with NRC assisting in its traditional regulatory role. Also, NRC has traditionally deferred to Agreement States to respond to orphan source issues within their own boundaries; however, NRC would have responsibility for the coordination of the Federal response to an incident if assistance was requested by the State, in accordance with the FRERP.

The FRERP and NCP are even less clear about responsibilities after the immediate public health and safety hazard has been mitigated or is determined to be non-existent (i.e., after the "emergency" is over). In several recent incidents, EPA (as the LFA for unidentified sources in public areas) determined that the low-level sources found in public locations did not present significant hazards, and EPA terminated its involvement in the incidents. Once EPA ceases involvement, it is entirely unclear whether NRC or the Agreement States have some responsibility to regulate the material, or investigate the source of the material, whether or not the NRC staff agrees with EPA's risk-informed decision. At present, for all reports that unidentified radioactive material is found in a public location (such as in a metal scrap yard, a municipal landfill, or a public street), EPA is initially the LFA.

Coordination work in this area over the past several years, especially following the creation of the FRERP, has helped to clarify the roles, responsibilities, and jurisdictions of the Federal agencies and the States, as well as provide a more consistent national approach in responding to orphan source incidents. This work has resulted in productive dialogue between NRC, EPA, DOE, the States, and stakeholders, all working toward a common approach. However, the accomplishments in this area have been made relatively recently, as the orphan source issue received greater attention at the national and international levels, and there is a need for continued improvement.

3. JURISDICTIONS AND REGULATORY RESPONSIBILITIES OF FEDERAL AGENCIES AND THE STATES

The following discussion provides detailed information on the identified and/or stated jurisdictions and regulatory responsibilities of EPA, DOE, FEMA, and the States regarding orphan sources issues:

EPA

The FRERP identifies EPA as the LFA for the response to a radiological emergency at a facility that is not licensed, owned, or operated by a Federal agency or an Agreement State. Included in this responsibility are radiological emergencies involving both AEA and non-AEA material. The EPA is additionally designated as the LFA for radiological emergencies involving radioactive material from a foreign or unknown source that has actual, potential, or perceived radiological consequences in the United States, its territories, possessions, or territorial waters. The FRERP indicates that "unknown sources of radioactive material" refers to those materials whose origin and/or radiological nature have not yet been established, and indicates that these include contaminated scrap metal and abandoned radioactive material.

The NCP also identifies responsibilities for a number of Federal agencies, including EPA. As stated in the report issued by EPA Region III on the Lost Source Exercise, CERCLA "...and the NCP provide EPA broad funding and response authority to protect public health and welfare and the environment." In addition, this report states, "The NCP provides authority for an EPA removal action (cleanup) to radioactive materials so long as the licensee does not fall under the financial assurance provisions of the Price-Anderson amendments Act (not a commercial nuclear power plant or DOE facility). While EPA is authorized to respond under the NCP to all releases not covered under Price-Anderson, EPA would not normally initiate a removal action using CERCLA funds unless other options to address the situation were exhausted or there was a request for assistance from another Federal agency." In this respect, the NCP does not distinguish between AEA material and NARM, and therefore, the identified authorities would not be limited to either of these types of material.

The EPA/ORIA's response, concerning jurisdictions and regulatory responsibilities in addressing the orphan source issue, conforms with the FRERP and the discussion in the Lost Source Exercise report. However, EPA/ORIA's response made the distinction that activities under CERCLA are limited to emergency situations, whereas the discussion in the Lost Source Exercise report made no such distinction, and the text in the FRERP states that EPA is the LFA in emergencies where the material "...has actual, potential, or perceived radiological consequences."

DOE

The jurisdictions and regulatory responsibilities of DOE for addressing the orphan source problem are relatively well-defined.

DOE's roles, responsibilities, and jurisdictions for the management of sealed sources are contained or described in a number of documents, including 10 CFR Parts 820 and 835; DOE Orders and Notices; DOE's Radiological Control Manual (RCM); and DOE's "Implementation Guide for Sealed Source Control and Accountability." These regulations, requirements, and guidance documents contain the essential elements of a sealed source management program including the receipt, possession, use, transfer, security, reporting of events, inventory, accountability, leak-testing, record-keeping, enforcement, and emergency procedures for sealed sources. Specifically, these documents describe DOE's procedures and responsibilities for the reporting of lost or stolen material, or material otherwise unaccounted for, and for responding to the identification of lost, stolen, or otherwise unaccounted for material.

The FRERP identifies DOE as the LFA for the response to a radiological emergency at a facility owned or operated by DOE, as well as emergencies involving the transportation of radioactive materials shipped by or for DOE. Although DOE receives significant authority from the AEA, DOE's responsibilities and authorities are not limited to material that is covered by the AEA. DOE also possesses and uses NARM sealed sources and is responsible for the accountability of NARM material. The FRERP also designates DOE as responsible for the initial coordination of offsite Federal radiological monitoring and assessment during the response to a radiological emergency. The DOE Radiological Assistance Program (RAP) was developed for just this type of assistance, and was established by DOE Order 5530.3. DOE RAP teams will respond to requests for assistance from States in radiological emergencies, regardless of whether the response is coordinated under the FRERP guidelines. If the Federal response were being coordinated under the FRERP, DOE would remain responsible for the activities of a RAP team, but coordination authority for these Federal response activities would reside with the LFA.

In general, DOE has responsibility for addressing all aspects of orphan source incidents occurring at DOE-owned and -operated sites, and at all DOE activities. In the case of an orphan source incident occurring outside a DOE site, DOE has indicated that its roles and responsibilities for addressing the orphan source problem are limited to orphan sources that can be identified as having originated from within DOE jurisdiction. This would include radioactive materials owned, possessed, and/or used by DOE, or a DOE prime contractor, in the conduct of DOE activities, which become orphan sources; and radioactive materials that were inadvertently released from a DOE site. DOE's responsibility would be limited in situations involving radioactive materials owned by DOE but possessed and/or used by an NRC or Agreement State licensee under a DOE loan/lease, or similar, agreement. In such situations, the agreement stipulates the responsibility of both DOE and the licensee for the possession, use, and ultimate disposition of the material. Typically, DOE remains responsible for taking possession of the radioactive material at the end of the agreement term, but would not be responsible for the packaging and transportation of the material to a DOE site (i.e., DOE would accept the material once it is shipped to a DOE facility). DOE would also not be responsible for the cleanup of radioactive materials that were covered by one of these agreements, if the licensee lost control of the material resulting in the release of radioactive material or spread of contamination, unless the agreement specifically identifies the responsibility as DOE's.

FEMA

FEMA has only limited regulatory responsibility or jurisdiction for addressing the orphan source problem. In addition, FEMA has very limited response personnel and equipment for responding to incidents involving radiation sources or material. If an orphan source incident were to escalate to a radiological emergency, FEMA could serve in its traditional role of coordinating Federal resources for disaster relief, if requested by the Governor of the State, or in response to a Presidential disaster declaration. This high threshold would probably require that the incident be very large-scale, before FEMA would become involved. If FEMA did become involved, FEMA's role and activities would include providing non-radiological assistance with finding medical, housing, and recovery resources for those injured or displaced by the incident; assisting in evacuation and/or relocation of individuals and animals; disseminating information and literature concerning the long-term effects to the surrounding areas, following the radiological emergency; and providing guidance to the public and non-radiological response personnel on ways to reduce their risks of injury from the radiological hazard. These activities may be performed through a number of methods, including public meetings, and radio and television broadcasts. However, FEMA typically would not become involved in orphan source incidents limited to a single location or to a small number of affected persons.

FEMA has certain roles and responsibilities, other than incident response, that may be applicable to the orphan source problem. FEMA routinely assists States and local governments and communities in the development of disaster contingency plans. These contingency plans may be site-specific or general in nature. These contingency plans may contain sections on responding to sealed sources or devices that present a radiological threat to members of the public, or the contingency plans may involve a site that possesses and uses sealed sources and/or devices. The Superfund Amendments and Reauthorization Act of 1986 (SARA) requires each community to establish a Local Emergency Planning Committee (LEPC) with responsibility for the development of such contingency plans. In addition, FEMA periodically provides training on the FRERP and other emergency and disaster response and planning, including contingency planning, for State and Federal participants. A number of the training programs apply to radiological emergencies, as well as other emergencies and disasters.

<u>States</u>

The FRERP discusses States' general responsibilities for responding to radiological emergencies. The FRERP notes that, other than in areas under Federal control, "...the State or local government has the responsibility for taking emergency actions, both onsite and offsite, with support provided, upon request, by Federal agencies,..." for minimizing the radiological hazard to the public. In addition, the FRERP states that "...the concept of operations [of the FRERP] recognizes the preeminent role of State and local governments for determining and implementing any measures to protect life, property, and the environment in areas not under the control of a Federal agency." To address the local government's role in emergencies, the SARA requires each community to establish an LEPC, with responsibility for developing contingency plans for emergencies and disasters. State and local governments bear the ultimate responsibility for taking the necessary steps to protect the public from hazards, including radiological hazards, in areas within their boundaries that are not under Federal control. If the State or local government is unable to adequately provide this protection during a radiological emergency, either because of the magnitude of the hazard or because of a lack of appropriate resources or equipment, Federal assistance may be requested in accordance with the FRERP provisions. The Federal assistance provided in response to such a request is only intended to supplement the capabilities of the State or local government, and is not intended to transfer the complete response to the radiological emergency to the applicable Federal agencies. Except in extremely rare cases, where the State or local government is found to be inadequately minimizing the hazard to the public, or where there are extremely large incidents (such as those involving several States), the entity that requested the assistance (e.g., State or local government, facility, etc.) remains responsible at all times for the response to the radiological emergency, and that entity makes the final determination as to when assistance is no longer needed. Requests for assistance in accordance with the FRERP may include radiological emergencies involving both AEA and NARM materials.

In addition to the general responsibilities of all States, Agreement States have the additional regulatory responsibilities acquired under the NRC/State agreement, pursuant to subsection 274b of the AEA. These include establishing and implementing regulations and requirements for the control and accountability of licensed radioactive materials; enforcement programs for persons who lose control and accountability of their licensed material; and incident reporting and response programs that include orphan source incidents. Although the regulation of AEA material is limited to NRC or the Agreement States, the regulation of NARM is reserved to the States (except for NARM owned or used by or on a Federal facility). Excepting certain requirements of the Occupational Safety and Health Administration, there are few national requirements for the regulation of NARM. Consequently, the regulation of NARM varies considerably from State to State. In an effort that provides increased inter-State consistency, the CRCPD has issued "Suggested State Regulations" that address NARM, and numerous States have adopted these regulations.

Beyond Federally legislated requirements for the regulation of radioactive materials, some States have been granted the authority, by their legislatures, to expend resources for certain additional activities, such as the removal and temporary storage or disposal of radioactive material that presents a threat to the public. Under this authority, some States have developed effective programs that allow the States to take possession of, transfer, store, and dispose of orphan sources.

4. MECHANISMS FOR IMPROVING COORDINATION:

A number mechanisms may be utilized to continue to address this issue, including:

- Working directly and separately with other applicable agencies to address specific issues relating to NRC's working relationship with each agency in the area of orphan sources. This could include negotiating additional MOU's, similar to the DOE MOU, with other applicable agencies, where deemed necessary to formalize and document inter-agency agreements and procedures;
- Request the E-34 Committee to expand its charter to fully address this issue, as it deems appropriate for its national orphan source program, and continue participation on the E-34 Committee to ensure NRC views are expressed and understood in this area;
- Initiating an inter-agency Working Group (WG) comprised of representatives from the applicable Federal agencies; one or more State representatives (e.g., CRCPD and the Organization of Agreement States representing both Agreement and non-Agreement States); and other key stakeholders, such as industry, to provide a consensus position on this issue. The WG would need a defined focus so as to not duplicate efforts by other groups and initiatives.
- The NCP provides provisions for situations when there is insufficient national guidance, or questions, concerning interpretation of the NCP. These provisions provide that the National Response Team (NRT) may be requested to provide guidance and clarification on such matters. As a member of the NRT, NRC may request the NRT consider this issue as a matter of interpretation of the NCP, and request guidance and clarification from the NRT as a whole. The NRT has the authority to take steps to address issues brought before it, including the creation of a committee to address the issue. This may

have a similar result as the creation of an inter-agency WP as it would likely require input from all applicable NRT member agencies as well as the States;

- Following the 1997 lost source exercise, a number of States and participating organizations indicated the need for, and their support for, additional similar exercises. Specifically, the State of North Carolina has offered to host a second lost source exercise, which is currently planned for May 1999, and similar tabletop exercises have been conducted in Regions II and III. Continued support of, and participation in, these exercises will help to enhance an understanding of, and further define, the roles, responsibilities, and jurisdictions of both the participating Federal agencies, as well as State, local, and applicable stakeholder participants with the response to the identification of an unknown radioactive source that presents a threat to the public health and safety and the environment. To this end, NRC staff have built on the success of the original lost source exercise to enhance communication and cooperation with EPA, the OSCs, and the NRT, in the areas of inter-agency roles, responsibilities, and jurisdictions during the response to the identification of an unknown radioactive source that presents a threat to the public health and safety and the environment.
- As discussed above, FEMA has a role in orphan sources in the area of contingency planning and training. FEMA currently provides training in the area of response to radiological incidents (although, generally concentrating on potential incidents occurring at Nuclear Power plants) through the Training Subcommittee of the Federal Radiological Preparedness Coordinating Committee (FRPCC). The FRPCC Training Subcommittee may be requested to consider the development of training programs and exercises in this area, which would first require that they identify and/or develop a consensus position on this issue. Alternately, the FRPCC Training Subcommittee may decide to initiate a training workshop intended to address issues needing clarification. This process has been utilized in the past by the FRPCC Training Subcommittee for addressing FRERP issues needing clarification; and

The staff continues to attempt to identify additional areas which could enhance obtaining a national consensus position on roles, responsibilities, and jurisdictions in the area of orphan sources. Satisfactory resolution of this issue will likely require a combination of the currently available mechanisms being utilized and one or more of the new initiatives discussed above.

COORDINATION WITH CRCPD AND FUNDING OF CRCPD'S E-34 COMMITTEE

The staff continues to coordinate closely with Conference of Radiation Control Program Directors (CRCPD), through an advisory role on CRCPD's E-34 Committee on Unwanted Radioactive Material (the E-34 committee). In this role, the staff has striven to ensure that a similar regulatory framework is applied to sources/devices containing Atomic Energy Act (AEA) material and Naturally occurring or Accelerator-produce Radioactive Material (NARM), under CRCPD's developing orphan source program.

Funding from the U.S. Environmental Protection Agency (EPA) for the E-34 Committee provides authorization only for development of a national orphan source program and conducting a pilot program. EPA's funding does not provide for the implementation and continuation of an orphan source program once one is developed. The staff expects that funding for implementing a national orphan source program would probably come from a cooperative effort by the States and applicable Federal agencies. To this extent, the E-34 Committee has discussed potential cooperative agreements between States to pool resources and capabilities for addressing unwanted radioactive materials. The E-34 Committee has also proposed discussing the orphan source program, and cooperative agreements between States, at the next full CRCPD meeting, in mid-calendar year 1999.

The E-34 Committee has determined that, for an orphan source program to be most effective, such a program requires both the States and applicable Federal agencies to agree and participate in all aspects of the program, on a national scale. To address this goal, the E-34 Committee plans to recommend to the States that they consider ways to promote national cooperation and participation in the program. In particular, the E-34 Committee will recommend that the States use the Nuclear Material Events Database (NMED), not only for materials events, in general, but also for tracking unwanted radioactive material. The E-34 Committee also plans to recommend that States enhance their regulatory programs in the area of control and accountability of radioactive materials, to reduce the potential for lost material. The E-34 Committee will make these recommendations for both Agreement and non-Agreement States.

The staff has also supported the E-34 Committee's efforts by recommending that the Commission grant CRCPD's request to use NMED as a national database for tracking orphan sources. Use of NMED to track orphan sources will provide wide access to orphan source information, including NMED information about orphan sources/devices containing NARM. The staff's coordination with CRCPD also included meeting with the CRCPD Board on October 16, 1998, to discuss CRCPD's plans regarding the E-34 Committee and the orphan source problem, and to discuss NRC's efforts and activities in the orphan source area. The staff plans to continue participating in an advisory role on the E-34 Committee, meeting with CRCPD when requested on orphan source issues, and emphasizing that a similar regulatory framework should be applied to orphan sources/devices containing AEA material and orphan sources/devices containing NARM.

ATTACHMENT 5

**LETTER FROM DOE,
TRANSMITTING SIGNED MOU,
DATED DECEMBER 18, 1998**

Department of Energy
Washington, DC 20585
December 18, 1998

Mr. Carl J. Paperiello, Director
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Dear Mr. Paperiello:

The purpose of this letter is to transmit the Memorandum of Understanding (MOU) between the Office of Waste Management and the Office of Nuclear Material Safety and Safeguards regarding the management of sealed sources. I have signed the enclosed MOU and am forwarding it to you for your signature.

Both of our staffs have put a great deal of time and effort into this document and I am happy to be able to bring this effort to closure. I look forward to continuing to work with you and your staff as well as your regional offices and the Agreement States to protect the public health and safety.

If there are any questions, please have your staff contact Robert Campbell at (301) 903-7127.

Sincerely,

Mark W. Frei

Mark W. Frei
Acting Deputy Assistant Secretary
for Waste Management
Environmental Management

Enclosure

MEMORANDUM OF UNDERSTANDING
BETWEEN THE
U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS
AND THE
U.S. DEPARTMENT OF ENERGY
OFFICE OF WASTE MANAGEMENT
CONCERNING MANAGEMENT OF SEALED SOURCES

I. INTRODUCTION

The Federal Radiological Emergency Response Plan (FRERP) provides guidance for the response of Federal agencies in peacetime radiological emergencies that have actual, potential, or perceived radiological consequences within the United States, its Territories, possessions, or territorial waters. Although the FRERP encompasses a broad range of radiological emergencies, it does not provide specific actions that each agency must take when a radiological emergency is identified. This Memorandum of Understanding (MOU) defines the roles and responsibilities between the U.S. Nuclear Regulatory Commission (NRC) and the Department of Energy (DOE) in situations where the NRC is responsible for the Federal response to a radiological emergency, but that does not require an immediate response (i.e., activation of the NRC Incident Response Plan as described in NRC Management Directive 8.2), and where the transfer of licensed source, special nuclear, or byproduct radioactive material - as defined under the Atomic Energy Act of 1954, as amended (the Act) - primarily in the form of sealed sources and devices as described in section IV. B., to the DOE is determined to be necessary to protect the public health and safety and the environment.

II. BACKGROUND

This MOU formally defines the activities carried out since 1992 under agreements reached via exchange of correspondence between NRC and DOE. The need for this agreement arose due to the fact that licensed radioactive material which exceeds the Class C limits defined in §61.55, Title 10 Code of Federal Regulations (CFR) is not acceptable for disposal at commercial disposal sites. The Low-Level Radioactive Waste Policy Amendments Act of 1985 (PL 99-240) made DOE responsible for the ultimate disposition of this material. Until such time as the DOE has in place a disposal or routine acceptance and storage capability for the various types of this material, this agreement is necessary to allow transfer of material which exceeds Class C limits from NRC and Agreement State licensees to the DOE in limited situations which pose an actual or potential threat to the public health and safety.

Under limited situations, described in more detail in Section IV. A. of this agreement, DOE will consider accepting material at the request of NRC which does not exceed Class C limits, but only under situations where there is an actual or potential threat to the public health and safety that cannot be mitigated by other reasonable means.

III. PURPOSE

This MOU applies to the recovery and disposition of byproduct, source, and special nuclear material in the possession of licensees and in the public domain by the DOE at the request of NRC. Although this MOU is intended to apply to these materials in the form of sealed sources, it is envisioned that under rare circumstances this MOU will apply to the recovery and disposition of radioactive materials in other forms, as described in section IV. B. In addition, this agreement applies only to material in the private sector, licensed by NRC or an Agreement State, which represents an actual or potential threat to the public health and safety.

The determination of an actual or potential threat to the public health and safety will be made by the NRC as described in this MOU, in consultation with and participation by DOE, and may be based on such factors as condition of the material, environmental conditions that may affect the containment of the material, or loss of adequate controls by the licensee because of financial, technical, or other reasons. This MOU represents the process by which NRC may request assistance of DOE to mitigate or eliminate an actual or potential threat to the public health and safety from sealed sources and devices, after all other reasonable alternatives have been unsuccessfully explored.

This MOU does not apply to situations where the DOE has in-place the required capabilities for routine acceptance, storage, and/or disposal of material which exceeds the limits of §61.55, 10 CFR as specified in P.L. 99-240. Any agreements required under those situations will be entered into separately or as a specific modification of this MOU. In addition, this MOU does not apply to situations which require activation of the NRC Incident Response Plan, nor does it apply to safeguards or reactor incidents.

IV. SCOPE

A. Types of radioactive materials

This agreement is limited to only those radioactive materials which are defined under the Atomic Energy Act of 1954, as amended, as source, special nuclear, or byproduct materials. This agreement does not have the authority to require the NRC or DOE to respond to non-emergency situations, pursuant to this MOU, involving radioactive materials or to respond to emergency situations which do not involve materials regulated by the NRC.

This agreement is primarily intended to provide, under emergency situations as described in this MOU, for the proper recovery and disposition by the DOE of radioactive materials that are regulated by NRC that exceed Class C waste limits defined in §61.55, 10 CFR. Radioactive materials which do not exceed Class C limits are also covered by this agreement in circumstances that represent an actual or potential threat to the public health and safety and for which there are no other reasonable alternatives to mitigate the threat. NRC and DOE will consider situations involving radioactive material which does not exceed Class C limits on a case-by-case basis as described in section IV. E., or other agreed upon procedures.

Routine acceptance of material that does not exceed Class C limits is not a part of this MOU and would fall under the authority of the States in accordance with the intent of PL 99-240. No activities contained in this MOU are intended to undermine the authorities and responsibilities of the States as defined in PL 99-240. Further, situations which would be considered an emergency solely due to the lack of access to a compact or regional disposal site are not part of this MOU. These situations are covered in the emergency access provisions of PL 99-240 and must be addressed in accordance with 10 CFR Part 62. The purpose of 10 CFR Part 62 is to mitigate any serious or immediate threat to the public health and safety due to denial of access to a low-level waste disposal facility.

B. Form of Radioactive Material

This agreement primarily addresses the radioactive materials defined in section IV. A. in the form of sealed sources or in devices containing sealed sources. In general, the material must also be a form that is readily transportable, does not require significant special handling or unique handling equipment or capabilities, and is confined to a single location. Material forms which are determined to be outside these conditions will be handled on a case-by-case basis in accordance with section IV. E., or other agreed upon procedures.

C. Quantity of Radioactive Material

It is envisioned that most cases covered under this MOU will involve only a small number of sealed sources or devices, usually less than ten, and only relatively small licensees. Quantities of radioactive material contained in individual sealed sources or devices should not exceed the maximum authorized on the sealed source or device vendor's license. Situations involving significantly greater numbers of sealed sources or devices or large scale licensees will be considered on a case-by-case basis by the NRC and DOE in accordance with section IV. E., or other agreed upon procedures. Radioactive materials shall not be combined or altered for the sole purpose of meeting the conditions of this MOU.

D. Nature of the Threat to the Public and Response Required

This agreement does not apply to emergency situations requiring an immediate response, to situations for which immediate health and safety concerns have not been mitigated or to situations for which the NRC would not be designated as the Lead Federal Agency (LFA) for the federal response to a radiological emergency. This MOU addresses situations which the NRC determines, in consultation with DOE, represent an actual or potential threat to the public health and safety. The level of response required under this MOU will be based on an assessment of the potential health and safety consequences of the situation (e.g., amount of material involved, potential for radiation exposure or releases of radioactive material, and potential impact on the environment).

The authorities and responsibilities of certain Federal agencies (including NRC and DOE) for responding to radiological emergencies are specified in the FRERP. Activities under this MOU must be consistent with the FRERP for responses to radiological emergencies and must not interfere with or take precedence over FRERP activities. In addition, actions necessary to mitigate an emergency requiring an immediate response, or to mitigate an immediate health and safety threat (radiological or otherwise) -- including temporary control over radioactive material -- must be taken prior to any DOE recovery or disposition activities.

Assistance by DOE to recover and manage the material may only be requested by NRC after all other reasonable alternatives to alleviate the situation are addressed. In addition, NRC shall identify the response requested of DOE. DOE shall determine the appropriate response to ensure the present or potential threat is mitigated or eliminated in such situations where existing controls may not be adequate to ensure long-term assurance of the public health and safety.

E. Exceptions to the primary intent of this MOU

The purpose of section IV, Scope, is to define the bounds of this agreement in specific terms. Paragraphs A-C of this section indicate that exceptions to the conditions of this agreement may be necessary. The reason for these exceptions is that it is recognized that situations involving actual or potential health and safety threats requiring DOE assistance will not be limited to only small quantities of sealed sources which exceed the Class C limits as defined in 10 CFR Part 61.55.

In situations where the materials involved do not meet the specific conditions described in paragraphs A-C above, but DOE assistance is determined by NRC to be necessary, then the NRC shall document the reason why it is appropriate to respond to the particular situation under the terms of this MOU, document why DOE assistance is necessary for the particular situation, and provide this information to DOE. The DOE shall review this information and document the response it intends to take based upon the information provided, and provide this information to the NRC. So as to not delay a response to a request for assistance, this exchange of information may take place electronically, so long as hardcopy follow-up is provided.

F. Other Limitations

This agreement, and subsequent DOE recovery and disposition actions, are generally limited to packaging, transport, and/or receipt of radioactive materials, and the associated requirements to conduct those activities.

This agreement is not intended to require or imply that DOE will provide decontamination or clean-up activities, except as a direct result of a DOE recovery operation, nor will DOE be expected to perform recovery or disposition actions for materials other than those specifically identified in this document.

This MOU does not apply to requests for radiological assistance from DOE Radiological Assistance Program teams.

V. AUTHORITY AND REGULATORY PROGRAMS

A. NRC

NRC is responsible for licensing and regulating nuclear facilities and material and for conducting research in support of the licensing and regulatory process, as mandated by the Atomic Energy Act of 1954, as amended; the Energy Reorganization Act of 1974, as amended; in accordance with the National Environmental Policy Act of 1969, as amended; and other applicable statutes. NRC responsibilities include protecting public health and safety, protecting the environment, and safeguarding nuclear materials in the interest of national security.

The Office of Nuclear Material Safety and Safeguards (NMSS) was established under Section 204 of the Energy Reorganization Act of 1974, as amended, and is charged with the responsibility of protecting the public health and safety through regulatory control of the safe use of byproduct, source, or special nuclear material, for medical, industrial, academic, and commercial uses. To accomplish this goal, NMSS uses licensing, inspection, enforcement, development and implementation of regulations, guidance and policy, safety reviews for products that use the material (including sealed sources and devices), and other means available according to 10 CFR.

B. Agreement States

Section 274 of the Atomic Energy Act of 1954, as amended, provides the NRC the authority to discontinue its regulatory authority over certain radioactive materials (including sealed sources and devises) within a State that has agreed to establish and maintain a regulatory program for the materials that is adequate to protect the public health and safety, and is compatible with NRC's program. States that have been found to meet these criteria and have entered into such agreements with NRC are called Agreement States. These Agreement States have independent authority to regulate the radioactive materials specified in the agreement within their boundaries, and are charged with protecting the public health and safety through the licensing, regulation, and enforcement of activities associated with the materials.

Under PL 99-240, each State is responsible for providing for the disposal of radioactive material which does not exceed a waste Classification of C that is generated within its boundaries. In addition, State and local governments have primary responsibility for determining and implementing appropriate measures to protect life, property, and the environment from radiological and other hazards.

C. DOE

DOE is responsible for conducting research and development, and other activities, to support the use of byproduct, source, and special nuclear materials for medical, biological, health, and other uses as mandated by the Atomic Energy Act of 1954, as amended; the Energy Reorganization Act of 1974, as amended; the Department of Energy Organization Act, as amended; and other applicable statutes.

DOE is responsible for the disposal of radioactive material which exceeds a waste Classification of C as defined in §61.55, 10 CFR as mandated by PL 99-240. DOE is required to assure the public health and safety as mandated by Section 102(13) of the Department of Energy Organization Act, as amended, and is responsible jointly with NRC for the development of contingency plans to recall or recapture radioactive materials under Section 204(b)(2)(B) of the Energy Reorganization Act of 1974, as amended. In addition, DOE is granted the authority to take, requisition, condemn, or otherwise acquire any special nuclear, source, or byproduct material as authorized by Sections 55, 66, and 81, respectively, of the Atomic Energy Act of 1954, as amended.

VI. AGENCY RESPONSIBILITIES AND AGREEMENTS

NRC and DOE staffs will closely coordinate actions in both the planning and execution phases to: (1) ensure a timely response where DOE assistance is necessary; (2) provide adequate protection of the health and safety of the public and occupational workers involved in responding to requests for assistance; and (3) ensure cost effective operations. Each agency will develop, in consultation with the other, appropriate procedures as necessary to implement this agreement. Each agency will designate the organization and key personnel responsible for the day-to-day coordination and management of activities covered by this MOU.

A. NRC Responsibilities

1. Upon discovery of a potential radioactive material incident concerning NRC or Agreement State licensed material in an uncontrolled condition that does not require activation of the NRC Incident Response Plan, the NRC regional and headquarters offices will follow the procedures contained in NRC Manual Chapter (MC) 1301, "Response to Radioactive Material Incidents that do not Require Activation of the NRC Incident Response Plan," or Policy and Guidance Directive (P&GD) 9-12, "Reviewing Efforts to Dispose of Licensed Material and Requesting DOE Assistance," as applicable.

a. Manual Chapter 1301 is applicable to this MOU in situations where licensed material is in an uncontrolled condition in an unrestricted area and a responsible party cannot be readily identified. Incidents applicable to MC 1301 may include locations which are unlicensed, as well as licensed locations where the licensee is not authorized to possess the radioactive material. When requesting assistance of DOE is considered for these type incidents, MC 1301 will be consulted for the procedures and guidance to follow for determining whether DOE assistance is appropriate and necessary. Once DOE assistance is determined to be appropriate and necessary, MC 1303, "Requesting Emergency Acceptance of Radioactive Material by DOE," will be consulted for the procedures for making the request.

b. P&GD 9-12 is applicable to this MOU in situations where an NRC or Agreement State licensee is unable to safely maintain control over its licensed material, or there is a high potential for the licensee to lose control of its licensed material. NRC and Agreement State license reviewers will use this document to determine if DOE assistance with the material is appropriate and necessary, and for making the request. This document contains, in part, guidance for determining the need for DOE assistance based on an evaluation of: (1) whether viable options are available for recovery and disposition of the radioactive material, (2) the licensee's ability to adequately maintain control over the material and available options for achieving this, and (3) whether the material is causing or has a high potential to cause a significant health and safety risk to members of the public.

2. Upon determining that DOE assistance is likely, NRC staff shall consult with DOE staff to: (1) provide appropriate information available on the incident (e.g., information listed in Enclosure 1 to P&GD 9-12 or MC 1303); (2) determine if any additional information is needed; and (3) identify any special conditions or requirements concerning the incident.

3. Upon determining that DOE assistance is appropriate and necessary, NRC staff shall formally request DOE assistance in accordance with MC 1303 or P&GD 9-12, as applicable. These documents specify the procedure for making an official request for DOE assistance, information that is to be provided to DOE (e.g., sealed source identification and condition information, licensee name, point of contact, applicable historical information, etc.), the DOE addressee for the request, and follow-up actions after the request is made. Prior to issuance of the formal request, NRC will notify the applicable DOE staff (via phone or electronic media) that the request is being made.

4. Prior and subsequent to requesting DOE assistance, NRC will determine the extent of assistance that other parties involved are responsible for, or are able to, provide for the recovery of the material to minimize the cost to the government. Examples include providing for the packaging and/or transport of the material.

5. Agreement States seeking DOE assistance applicable to this MOU shall make all requests through NRC, following the guidance in MC 1301, MC 1303, or P&GD 9-12. NRC staff will evaluate the Agreement State's request and determine if all applicable information has been provided and if requesting DOE assistance is appropriate and necessary. NRC will not forward the request to DOE until the request contains complete information and provides sufficient justification for requesting DOE assistance, and will work with the Agreement State to obtain this information. NRC will make all requests for DOE assistance. under this MOU on behalf of the Agreement States and shall serve as the single point-of-contact for evaluating the requests in accordance with this MOU.

6. NRC shall arrange for transfer of title of the recovered materials to DOE or to other parties who will take possession of the material, as designated by DOE.

7. Within its regulatory authority, NRC will ensure, and expedite where appropriate, license and/or certification reviews and amendments are performed as necessary to support safe and timely recovery of the materials and to minimize costs to the government incurred in recovery and shipment operations.

8. NRC shall coordinate the efforts of non-DOE involved parties in recovery operations, and participate, as appropriate and necessary, to ensure adequate protection of public/worker health and safety, and to ensure regulatory compliance, as applicable.

B. DOE Responsibilities

1. DOE staff will participate and consult with NRC in the determination process for requesting DOE assistance.

2. Upon receipt of a formal request for assistance, DOE will review the request against the requirements of this agreement, Departmental policies in effect at the time of the request, changes in legislative authority which may affect actions requested, and expected cost versus available funds to carry out the requested action. DOE will review each request to ensure all reasonable options for disposition have been exhausted prior to providing assistance. Upon completion of this review, DOE will notify NRC of the action it will take.

3. Upon acceptance of a request for assistance, DOE shall identify, package, transfer, receive, and/or store the radioactive material at a DOE or other appropriate facility; or contract with appropriately licensed firms for these services.

4. DOE will coordinate, through NRC, with the licensee and/or local authorities and other agencies, as appropriate, regarding the details of the recovery operations and provide information on progress and status.

5. DOE will take title of the radioactive material either at the material pickup location or at the designated receiving site, as determined on a case-by-case basis, or ensure title is transferred to appropriate parties contracted for services.

6. DOE may review procedures that NRC uses to determine: (1) that material is an imminent threat to the public health and safety; (2) that all available options for disposition of the material have been exhausted; and (3) that a request for DOE assistance with radioactive material is appropriate and in accordance with this MOU.

7. DOE will plan and budget, as appropriate, for its costs to provide for reasonably expected requests under this agreement.

8. DOE shall utilize its field elements, contractors, laboratories, and facilities, and private industry, as required, in recovery and disposition operations, for the safe, timely, and efficient conduct of these operations. The use of these facilities is limited to those sites with appropriate capabilities and compliance with applicable regulations, as well as necessary funding. If such a site or necessary funds are not available, DOE will consult with NRC and/or other Federal and State agencies to determine if managing the material may be accomplished by other means.

C. Coordination Officers

Each agency shall designate an individual(s) who will serve as the respective coordination officer(s), or point(s) of contact (POC). The POCs will coordinate and facilitate actions required by their respective agencies. Additionally, they will establish and maintain a call list (names, phone, and fax numbers) of responsible persons for day-to-day contact on any matter related to this MOU, and shall provide this call list to each other, as requested and appropriate.

VII. ELEMENTS OF COORDINATION

A. Information Exchange

Both agencies agree to exchange information with respect to relevant programs and lessons learned. The purpose of the exchanges is to provide expert technical assistance to both agencies and to assist either agency by reducing or eliminating duplication of effort. The sharing of information between DOE and NRC (and Agreement States as appropriate) will be exercised to the extent authorized by law (i.e. NRC and DOE directives, statutes, and regulations), and will be consistent with each agencies' missions.

Both agencies recognize the need to protect from public disclosure, data and information that are exchanged between them, which fall within the definition of trade secrets, and confidential commercial or financial information. Both agencies agree to exchange proprietary information in accordance with applicable regulations and their regulatory authority. If a request calls for a disclosure determination regarding proprietary information obtained from either agency, such as a Freedom of Information Act request or response to a Congressional inquiry -- or either agency must comply with various regulatory or public information responsibilities -- the agency responsible for the information will be promptly notified, by the other agency, of the need for disclosure of the information. The responsible agency will make any needed contact with the submitter of the protected information and will accept the responsibility for evaluating the submitter's comments, before rendering the disclosure determination.

B. Sharing Other Information

DOE and NRC will also offer each other the opportunity to comment on regulations, regulatory guides, or other communications that refer to activities, policies, or regulations of the other agency, that are relevant to this agreement. If practicable, the documents will be provided for comment prior to issuance.

Either agency may request additional information, when such is deemed necessary to complete its mission.

VIII. MEETINGS

A. Annual Inter-Agency Meeting

The following are the offices and officers responsible for this agreement:

1. For the U.S. Nuclear Regulatory Commission:

   Director, Office of Nuclear Material Safety and Safeguards
   U.S. Nuclear Regulatory Commission

Mail Stop T8-A23
Washington, D.C. 20555
Telephone: (301) 415-7800

2. For the U.S. Department of Energy:

Deputy Assistant Secretary for Waste Management
Environmental Management
U.S. Department of Energy
Mail Stop 5B-040/FORS
Washington, D.C. 20585
Telephone: (202) 586-0370

The DOE and NRC responsible officers, or their designated representatives, shall meet at least annually to evaluate the activities related to this MOU and make recommendations to agency heads on its effectiveness. DOE and NRC will host the meeting on alternating years.

B. Coordination Officers

Coordination officers, POCs, or their designated representatives, shall meet, on a semiannual basis, to discuss technical issues related to this MOU, review the status of actions underway or planned, discuss any problems or issues, and recommend necessary changes. DOE and NRC shall host the meeting on alternate dates.

IX. OTHER LAWS AND MATTERS

Nothing in this MOU shall be deemed to restrict, modify, or otherwise limit the application or enforcement of any laws of the United States with respect to matters specified herein, nor shall anything in the MOU be construed as modifying, restricting, or directing the existing authority of either agency.

Nothing in this MOU shall be deemed to establish any right nor provide a basis for any action, either legal or equitable, by any person or class or persons challenging a government action or a failure to act.

This MOU shall not be used to obligate or commit funds or as the basis for the transfer of funds.

X. EFFECTIVE DATE, MODIFICATION, AND TERMINATION OF MOU

This MOU may be further implemented by supplementary agreements in which authorized representatives of DOE and NRC may further amplify or otherwise modify the policy or provisions in the memorandum or any of its supplements, provided that any material modifications of the provisions or any of its supplements shall be subject to the approval of the authorized signatories of this memorandum or their designated representatives.

This MOU will take effect when it has been signed and dated by the authorized representatives of DOE and NRC. It may be modified by mutual written consent, or terminated by either agency upon 60 days advance written notice. The agencies agree to reevaluate this MOU at least every five years, at which time either agency has the option of renewing, modifying, or terminating this MOU.

Approved and accepted for the U.S. Nuclear Regulatory Commission

____
Carl J. Paperiello
Director
Office of Nuclear Material Safety
and Safeguards

____
Date

Approved and accepted for the U.S. Department of Energy

Mark W. Frei
____
Mark W. Frei
Acting Deputy Assistant Secretary for
Waste Management
Environmental Management

12/18/98
____
Date

PROS AND CONS OF A POTENTIAL ORPHAN SOURCE CONTRACT PROGRAM

To consider the pros and cons of establishing a contract program that would enable licensees or the U.S. Department of Energy (DOE) to take possession of, and arrange for proper disposition of orphan sources, it was necessary to: a) define the required capabilities of such a contractor and the bounds of such a contract; b) determine whether the U.S. Nuclear Regulatory Commission (NRC) has the legal authority to issue such a contract; c) determine any factors that would limit such a contract; d) identify alternative means to accomplish the objectives of such a contract; and e) identify the positive and negative effects and consequences of such a contract and the alternatives.

A. Contractor Capabilities and Contract Bounds

To define the required capabilities of such a contractor and the bounds of such a contract, it was necessary to understand the types of orphan sources typically encountered, ascertain ranges of geographic locations and potential environmental and/or other hazardous or difficult conditions that may be encountered, determine appropriate response options to orphan source incidents, and identify appropriate disposition options.

Conditions Under Which One May Encounter an Orphan Source

Orphan sources may be encountered in a wide range of geographical and environmental conditions and may be found at any type of location, including industrial complexes, private residences, roadsides, school grounds, and in old and dilapidated structures, as well as buildings containing radioactive contamination and/or other hazardous materials. Therefore, for the contract to be effective, a contractor would be required to respond under all these types of conditions, not be restricted to any geographical region, and have the capabilities for dealing with other potentially hazardous situations. However, because States have the responsibility for protecting the public from health and safety threats (as first responders), and because NRC, U.S. Environmental Protection Agency (EPA), or an Agreement State radiation protection program would also respond, in all situations, if requested, to the immediate radiological hazards, to mitigate the threat to the public health and safety, the staff expects that the contractor would not be asked to respond to an orphan source incident unless all immediate threats had been mitigated, and the incident was in the recovery, remediation, or investigation phase.

One option for addressing the variety of geographical and technical needs of the contract is to issue contracts to multiple contractors. When deciding which contractor to use for a given orphan source situation, the staff would consider each contractor's special expertise and ability to respond in a timely manner to the particular incident, to ensure the best contractor is selected for an efficient and appropriate response.

Determine Appropriate Response and Identify Appropriate Disposition Options

The determination of an appropriate response would be based on reports from first responders and/or NRC, DOE, EPA, or Agreement State response personnel at the location of the incident, considering the experience, knowledge, and capabilities of the contractor. Although orphan source incidents are inherently variable, most orphan source incidents do have some aspects that are similar, including:

- Identification of the radioactive material is difficult (i.e., determination of isotope, activity, sealed source model and serial number, device model and serial number, and integrity of the sealed source or device);

- First responders are unequipped to determine former owners or responsible parties; and

- Only limited radiological information is know about the radioactive material (e.g., radiation levels at specified distances, other hazards involved, shielding capability, potential for the spread of contamination, etc.). Once the incident moves into the investigative phase, identifying information concerning the orphan source becomes increasingly more important, especially for determining the appropriate response to recover the material, and for determining an appropriate disposition.

NRC typically becomes aware of a radiological incident involving an orphan source only after response activities are well underway or completed. NRC's response to orphan source incidents is, therefore, usually based on information obtained from the first responders or the State radiological control program personnel. NRC would then use this information to request a response from the orphan source contractor. The contractor would respond at the incident location and make a determination/verification of the source isotope, activity, and a preliminary identification of source and/or device model and serial number. In addition, the contractor would be expected to respond with other appropriate equipment and capabilities to recover the source, package it in an appropriate transport container, and deliver it for transport to another licensee or to [one of] its licensed facilities. This would require that the contractor have the appropriate license authorizations and capabilities for handling, packaging, transporting or delivering for transport, and temporarily storing, a wide variety of radioactive materials. In addition, the contractor would be expected to determine disposition options/alternatives based on the initial information received from the first responders or State radiation protection program personnel. These disposition options may be modified once the material is recovered and further identified.

Further identification efforts by the contractor would include a determination of source and/or device model and serial number, and manufacturer or primary distributor. This additional information could be used in an attempt by NRC or Agreement States to locate a responsible party, but it could also be used by the contractor to identify other disposition options, such as identifying parties interested in acquiring the source for use. The staff expects that in some cases, the expense that would be incurred to determine sufficient information to identify a responsible party or to determine additional disposition options would be greater (and in some cases much greater) than the costs to act on a particular disposition option initially identified by the contractor, or it may become clear that further identification efforts would have little or no chance for success. NRC would need to consider cases such as this carefully to avoid perceived impropriety. An impropriety could be perceived whether or not NRC pursued attempting to obtain additional information. For example: if NRC's contractor pursued efforts to further identify the source, it could be perceived as wasteful, if the efforts were not successful; if NRC decided to stop source identification efforts, because of resource or other considerations, the Agency could be perceived as not performing its regulatory duty to identify and take enforcement action against a responsible party.

Once the contractor's orphan source identification efforts of the orphan source is complete, the contractor could determine appropriate disposition options for the orphan source and present those options to NRC. The greater number or variety of options that the contractor is able to identify, the more cost-effective the contract will be. Therefore, this contract would require a contractor who is well-experienced in performing source recovery operations, as well as determining appropriate disposition options.

B. NRC Legal Authority to Issue an Orphan Source Contract

Previous informal discussions have indicated that NRC has the legislative authority to issue an orphan source contract, but that a number of legal issues (discussed below) would need to be addressed before issuance of such a contract. However, no documented, formal finding regarding the basis for NRC issuing an orphan source contract, and how, or to what extent, NRC's legislated roles and responsibilities or other legal issues would limit such a contract, could be identified.

Discussions with Office of the General Counsel (OGC) staff having responsibilities in the contractual and rulemaking areas were held to further investigate and clarify NRC's authority for establishing an orphan source contract, and any limitations on the contract caused by any legislation, contract law, or other legal or technical issues. These discussions reinforced that there were no legal or other limitations that could prevent NRC from establishing an orphan source contract (more specifically, a contract to take possession and dispose of radioactive materials that present a health and safety threat to members of the public). However, these discussions identified several specific limitations and conditions concerning what an orphan source contract could include and how it may be issued. Examples of these will be discussed in the next section.

C. Limitations of an Orphan Source Contract

As discussed above, through discussion with OGC, several specific limitations and conditions concerning what an orphan source contract could include and how it may be issued were identified. Examples of these include the following:

- Any contract issued to recover radioactive material for the purpose of protecting public health and safety could not include non-Atomic Energy Act (AEA) material [i.e., Naturally occurring or Accelerator-produce Radioactive Material (NARM)]. However, several potential scenarios are envisioned where NARM could be involved in an orphan source recovery and where it is possible that an NRC contractor may be asked to respond. Attachment 8 discusses several of these potential scenarios.

- As long as there are commercial contractors available that could potentially have the capabilities necessary for an orphan source contract, NRC would be required to solicit interest in the contract as a competitive bid and would be prohibited from seeking a contract with DOE or a DOE prime contractor, unless it was determined that none of the commercial contractors could be accepted, nor was interested in the contract.

- The AEA provides the basis for NRC to take ownership of radioactive material, as needed to carry out its mission (including protecting the public health and safety), but NRC does not currently have the capabilities in place to take possession of the quantities and wide variety of types of radioactive materials that have been encountered in past orphan source incidents. NRC has taken ownership of radioactive materials on several occasions, but, on most of these, NRC only took title to the material and subsequently transferred title to the material to DOE for ultimate disposition without ever taking possession of the material. NRC has also taken possession of radioactive materials where there has been an imminent threat to the public health and safety from the material and no other actions could be taken to mitigate the threat. This was especially true a number of years ago when NRC had radioactive material storage capabilities at several of the regional offices. These storage capabilities are no longer maintained by any of the regional offices. In cases where NRC took title to material, but not possession, the material remained secured onsite until it could be removed by an authorized person.

Additional potential legal issues were identified after these preliminary discussions and were provided, via memorandum, to OGC for further consideration (see Attachment 8). OGC subsequently provided verbal responses to these issues which further clarified that NRC has the authority to issue a contract that would take title to abandoned radioactive materials and arrange for its disposition. However, any such contract would be limited by NRC's authorities, under the AEA, in as much as the contract could only include radioactive materials covered by the AEA (source, byproduct, or special nuclear materials). In addition, OGC indicated that, though possibly limiting the scope and effectiveness of such a contract, none of the issues identified in Attachment 8 would likely prevent the issuance of an orphan source contract.

Other potential limitations identified while developing this response include the following:

- Discussions with several licensees that were identified as potentially having the capabilities necessary to perform this type contract indicated that the licensees would be prohibited from applying for the disposal permits on behalf of NRC in cases where it was determined that disposal was the best alternative for disposition of the material. The licensees could file the applications for NRC, but the applications would be required to be signed by authorized NRC representatives. OGC staff was questioned concerning this issue and indicated that likely anyone within the agency could be designated as an authorized representative for the purposes of approving and signing the disposal permit application. However, OGC continues to investigate whom this person would need to be designated by, and if there are any limitations or conditions as to who could be designated as the authorized representative.

- Any orphan source contract would need to be written so as to be flexible enough to allow for a wide variety of orphan source scenarios (e.g., all isotopes covered by the AEA, a large range of source activities, and the capability to respond to a large variety of locations and conditions). However, to enable interested solicitors to prepare comprehensive proposals and ones that would not reflect inflated costs because of uncertainties in contractor duties, the statement of work for the contract would need to be relatively specific as to the activities of the contractor. In 1997, DOE attempted to issue a contract that contained similar duties and responsibilities as were determined to be required of an orphan source contractor. DOE's experience with the responses received to the solicitation for bid was that the costs of such a contract would be exorbitantly expensive. DOE indicated that it attempted to write the solicitation for bid generally enough to cover a variety of situations, but the respondents indicated that the solicitation for bid was written too broadly and they had to assume worst case scenarios in their responses. DOE further discussed its needs for a contract with the respondents, to clarify the required capabilities. These discussions suggested that the costs of such a contract may be less than initially indicated. Ultimately, DOE did not issue the contract, but rather decided to use the existing capabilities of its national labs for the contract.

- It is expected, based on past experience, that a large portion of the activities that would be conducted by an orphan source contractor would be for the benefit of non-NRC licensees. To address fairness and equity concerns with the NRC licensees paying for an activity that does not benefit them, appropriation funding should be sought from the general fund.

- Radioactive material recovered by an NRC orphan source contractor could be traced to an Agreement State licensee. In this situation, it is expected that the applicable Agreement State would take appropriate actions against the licensee for the recovery of the material. However, if this were not the case (either because the Agreement State did not, or was not able to, take the appropriate actions), NRC's ability to require the responsible party to recover, or accept back, the material, could be very limited.

- Discussions with waste handlers and brokers and review of capability statements received indicate that there are commercial companies that would likely have some or all the appropriate capabilities to act as orphan source contractors. Several of the companies indicated that they had performed orphan source recoveries in the past and some were currently orphan source contractors for Agreement States. If NRC were to establish an orphan source contract program, it is unlikely that the contractor or DOE would be able or willing to take title to any recovered radioactive material, except for extremely limited periods.

D. Alternatives to NRC Issuance of a Contract

A number of viable alternative means to accomplish the objectives of such a contract were identified. It is clear that for an orphan source contract program to be most effective, useful, beneficial -- and conform to the guiding principle that non-licensees that find themselves in possession of radioactive sources which they did not seek to possess should not be expected nor asked to assume responsibility and cost for exercising control or arranging for their disposal -- it would need to cover the widest range of situations and radioactive materials. However, the greater the scope of the contract, the greater its potential cost. Dispersed radioactive materials were not considered to be within the scope of this evaluation because of the uncertainty in a required response and the high potential costs associated with their recovery. In addition, it was initially assumed that an NRC orphan source contract would not cover licensees who have a high potential to lose control over their material, as they would not fit within the guiding principle of persons that "...did not wish to receive the materials" (even though this situation is generally considered within the definition of an orphan source). However, to prevent persons who did not wish to receive the materials from inadvertently receiving them from this category of licensee, it may become necessary to remove the material from these licensees before they lose complete control over the material. These cases would need to be handled on a case-by-case basis to ensure all alternatives to NRC's contractor taking the material have been explored and discounted before use of the contractor for recovery of the material.

Based on discussions with NRC legal staff, it was determined that any NRC contract would be limited to AEA material only. Since AEA materials make up less than 50 percent of all orphan source incidents, this would severely limit the effectiveness and benefit of an orphan source contract program. For such a contract to be most effective and to provide the greatest coverage for all types of radioactive materials, a separate program to address all other radioactive material orphan sources would need to be in place and coordinated with the NRC orphan source contract program. This would rely on each State, or a combination of States, to establish and implement orphan source programs to cover NARM orphan sources discovered within their boundaries. In situations where a device contained both AEA material and NARM, or these materials were commingled at a single site, both the NRC orphan source contractor and the applicable State contractor for NARM would need to be coordinated to effectively mitigate the potential hazard at the site.

The Conference of Radiation Control Program Directors (CRCPD) E-34 Committee on Unwanted Radioactive Materials (the E-34 Committee) has been tasked to develop an orphan source program that would cover not only discrete sources, but also would cover both AEA material and NARM orphan sources. Dispersed radioactive materials are not within the charter of the E-34 Committee, but represent a similar problem that also needs to be addressed. The E-34 Committee plans to recommend to the CRCPD that dispersed radioactive materials also be addressed, to determine an appropriate approach for dealing with radioactive materials, in this form, that are possessed by persons that did not seek to possess them.

The E-34 Committee has used the general definition of an orphan source for its program, which includes licensees who have a high potential for losing control over their radioactive materials. In addition, the E-34 Committee is using CRCPD's resources to develop an assistance referral program for determining an appropriate disposition of unwanted radioactive materials and for potentially locating alternative disposition options other than disposal. This has included creation of a video intended to familiarize viewers of the issues concerning lost and/or unsecured radioactive material and how to respond to the identification of such material, an Internet web site containing useful and helpful information on dealing with "unwanted radioactive material" and means to obtain assistance (www.CRCPD.ORG, under hot-key "What's New"), and includes plans for a toll free phone number for providing additional, one-on-one, assistance with unwanted radioactive material.

The E-34 Committee expects to finalize its program and initiate a pilot to test the effectiveness of the program in calendar year (CY) 1999. It is expected that the pilot program will contain all the essential aspects that an NRC contract program would require, and possibly more. However, it is uncertain how the program would be implemented following the pilot, or if CRCPD would continue to participate in the program. It is uncertain how long the pilot program will last, how extensive it will be, and what, if any, changes in the E-34 Committee's program will be required, based on the results of the pilot. The E-34 Committee's program will require funding for its implementation and continued operation, and it is envisioned that this funding would come from a cooperative effort of the States and applicable Federal agencies (i.e., NRC, DOE, EPA, and potentially others).

Based on the above considerations, four basic options were identified for NRC issuance of an orphan source contract program:

1. NRC establishes an orphan source contract program, with a commercial firm or firms, for AEA material only.

2. NRC funds CRCPD to establish, implement, and manage a national orphan source program, once the E-34 Committee's pilot program is complete (~ mid CY 2000). NRC funding would be commensurate with the proportion of NRC licensees to all US licensees, and would be limited to only those efforts associated with AEA material.

3. NRC neither establishes nor funds an orphan source contract or program, but continues to work with the E-34 Committee, to develop a national orphan source program (the E-34 Committee's program would require funding from sources other than NRC).

4. A combination of Options 1 and 2. The combination would allow NRC to issue an orphan source contract while the E-34 Committee is continuing work on its national program, then end the contract and fund the E-34 Committee's program, once its development is complete.

E. Positive and Negative Effects and Consequences of a Contract, and Alternatives

A number of pros and cons have been identified for each of the options listed above and are discussed in detail below.

Option 1

Pros

- NRC would have full control and accountability over the contract and would be able to decide which orphan sources would be considered for dispositioning and for determining which disposition option is most appropriate. If it was determined that the contract was not sufficiently flexible or did not meet all of NRC's needs, NRC would have the ability to modify the contract to provide for its needs. Since NRC would have complete control over the contract, it could ensure that the guiding principle, "Non-licensees that find themselves in possession of radioactive sources which they did not seek to possess should not be expected nor asked to assume responsibility and cost for exercising control or arranging for their disposal," would be followed.

- It is possible that the program being developed by the E-34 Committee may not be finalized until calendar year 2000, or later. It is likely that NRC could issue an orphan source contract well before full implementation of the CRCPD program.

- An NRC orphan source contract could be issued that would cover all 50 States, or be limited only to NRC jurisdiction. By covering all 50 States, NRC could use the contract on an as-requested basis to provide orphan source recovery capabilities that some Agreement States currently do not possess, but this would further increase the potential for NRC expending funds that would be for the benefit of non-NRC licensees (e.g., Agreement State licensees). Limiting the contract to only NRC jurisdiction would minimize the overall cost of the contract and would decrease, but not alleviate, the potential for expending NRC funds that benefit non-NRC licensees.

- NRC could require the contractor to have the ability to analyze each orphan source for identifying markings such that NRC could attempt to identify the responsible party. NRC could also direct the contractor to retain possession of the material until its investigation of the responsible party was complete.

Cons

- Any NRC contractor recovery activities involving AEA materials and NARM, where disposition of the NARM could not be coordinated with a State agency's orphan source program, would be perceived as only doing half the job, since the NARM could not be removed by the NRC contractor and would remain at the facility. This could reduce stakeholder confidence in the usefulness of the contract, especially if this scenario occurred on multiple occasions.

- Since the NRC contract would be limited to AEA material, in all cases, before the contractor could respond, some entity would have to identify whether the material were AEA or NARM. If the isotope could not be initially identified, the contractor might or might not be allowed to respond, depending on the situation. The contractor might be allowed to respond if the situation were such that the contractor needed to respond to mitigate a threat to the public or the environment. However, as previously indicated, it would be expected that all immediate threats to the public and the environment would be mitigated before the contractor arrived onsite. Accordingly, the situations where the contractor would need to respond to mitigate a threat would be rare. However, it is more likely that the contractor would need to respond to situations where the material is not yet identified, but presents no immediate threat. Since it would not be known whether the material were AEA or NARM, and since no immediate threat would exist, the contractor might be prohibited from responding. OGC is considering this issue. If it is determined that the contractor could respond, it would have to identify the material onsite. If the contractor identified the material onsite as NARM, it would be prohibited from proceeding with the source recovery and would be required to leave the material at the site. This would be further compounded in situations where AEA material and NARM were commingled in a device or container since the contractor would be allowed to remove and recover the AEA material, but not the NARM. The inability to respond, in cases involving NARM or where the material has not been identified, could seriously reduce stakeholder confidence in the effectiveness of the contract.

- NRC's establishing a contract for AEA material orphan sources would be a disincentive to other agencies and stakeholders for establishing similar orphan source contract programs for AEA material. A number of States currently have orphan source programs in place or have authority to establish such a program. Those States would have little incentive for continuing or initiating orphan source programs for AEA material if NRC had such a contract program in place. If NRC's contract were limited to non-Agreement States, then the contract would be a disincentive only to the non-Agreement States. In addition, an NRC contract could be a disincentive to State and local governments to provide resources and contingency plans for responding to orphan source incidents.

- Addressing the potential organizational conflicts-of-interest could limit the field of potential candidates for the contract or could limit the type and location of work a particular contractor could perform. All potential contractors would be required to address potential conflicts of interest. Attachment 8 lists a number of potential conflicts-of-interest for which legal advice was sought. Based on discussions with OGC, each of these conflicts of interest would likely be able to be addressed in some way, but the result may be a limitation placed in the contract.

- An inability to take advantage of the disposition option of transferring the material to another authorized recipient would limit the effectiveness of the contract and would likely drive up the costs. Several of the Agreement States that have orphan source programs use an auction process to disposition orphan sources (e.g., sealed bids, etc.). In many cases, a licensee authorized to receive the material is willing to pay for the orphan source. The licensee obtains the material for a low price and the State not only does not have to pay for the disposal of the source, but is also able to recoup some of its costs in the process. Discussions with OGC indicate that requesting the contractor to auction any recovered orphan sources would present a number of procurement and budget issues that would essentially make this option impractical (e.g., monies received may be required to be returned to the U.S. Treasury and would not be available to offset the costs of the contractor's fees; it is uncertain whether the contractor could be granted authority to sell Federal government property in this manner, etc.). In addition, there would be no incentive for the contractor to explore this disposition option as the contractor would essentially receive the same fee no matter which disposition option was employed. It is possible that the contractor could be authorized to transfer the orphan source to an authorized recipient without a fee, but there are certain procurement and legal issues associated with this option as well. An auditor could view employing this option as improper, since sufficient compensation was not received for government property. Also, this could present a fairness issue, regarding persons who may be seeking to procure radioactive materials, especially if two parties were interested in obtaining the same orphan source. There would be no criteria for determining who would receive the orphan source.

- Several of the waste brokers and handlers with whom the contract option was discussed indicated that they had certain geographic regions in which they worked. Primarily these regions corresponded to the surrounding area. In some cases, the geographic regions were broad, such as the East Coast, and were less limiting. At lease some of the waste brokers and handlers indicated that they were able to work in all of North America. To ensure complete coverage of the U.S. as well as to ensure appropriate capabilities throughout the U.S., it may be necessary to issue the contract to multiple contractors in different geographic regions.

- In cases where the material is located at a facility not licensed nor owned by a Federal agency, or of unknown or foreign origin, NRC contractor activities may be contrary to Federal Radiological Emergency Response Plan (FRERP) guidelines for the Federal response to a radiological emergency. The FRERP identifies EPA as the Lead Federal Agency (LFA) in radiological emergencies of this type. During the response to a radiological emergency, any State requests for assistance would be coordinated through the LFA. If the State requested assistance with the orphan source directly from NRC, in this capacity, NRC may be required to ensure that the request be coordinated through EPA as long as EPA remained the LFA. Once the Federal response to a radiological emergency was complete, this would no longer be an issue. This issue may be negated if NRC and the State had a preexisting agreement, as FRERP allows preexisting agreements to take precedence over FRERP coordination requirements.

- Determining what is covered by the contract and ensuring consistency in this area may be difficult when it comes to borderline discrete/diffuse material.

- If diffuse material were covered under the contract, this would drive the costs up significantly, but not covering diffuse material would not be completely consistent with the guiding principle that non-licensees that find themselves to be in possession of radioactive sources which they did not seek to possess should not be expected nor asked to assume responsibility and cost for exercising control over nor arranging for their disposal

- Any amount appropriated from the general fund for the orphan source contract program would be fixed, however the costs for the program during a fiscal year may exceed the general fund appropriated amount because of the variability of orphan source incidents. Obtaining additional funds if this occurred could be very difficult.

Option 2

Pros

- Would allow for a seamless response to both NARM and AEA material, thereby increasing stakeholders confidence level in the effectiveness and value of the contract.

- The legal uncertainties of NRC's establishing a contract, such as potential organizational conflicts of interest and dispositioning material through its sale to an authorized recipient, would be reduced or alleviated.

- Would likely increase consistency with respect to the response to orphan source incidents as it would be a national program covering all States and jurisdictions. States and Federal agencies already providing funding for orphan source programs would have the option of providing funding for, and using, the CRCPD program instead.

- Would likely be better received and supported by the States and other Federal agencies because of the inter-agency cooperation used in its development.

- CRCPD would not be limited to only certain contractors and options for disposition. CRCPD would be able to select a contractor or disposition option based on a particular situation and required capabilities.

- CRCPD has a large network of contacts and is already well-recognized as a source for assistance with determining disposition options for radioactive materials.

- The program is intended to receive funding from a variety of sources sufficient to cover the entire United States. The program is not intended to be limited to only one funding source, such as NRC, and may even receive funding from applicable stakeholders.

- Because the program would be a national program, information concerning lost and found material may be more readily available to all applicable regulatory authorities. This could assist in the identification of a responsible party. (Currently, NRC is only able to search NRC databases. The E-34 Committee's program may also allow for the use of databases in the States for searching capabilities, and vice-versa.)

Cons

- Any NRC funds provided for the program would be limited to only AEA material. Additional funding from other sources would be required to cover NARM.

- It is uncertain when the program will be fully in place. Completion of the program will be based on when the pilot program commences, how extensive the pilot program will be, when the pilot program will finish, and what changes to the program will be required following the pilot. It is not expected that the pilot will commence until mid- to late- CY 1999 and may not end until early- to mid- CY 2000. After completion of the pilot of the E-34 Committee's program and its development, the program would need to be agreed on, and implemented by, all applicable States and Federal agencies for it to be effective. This may be a long and arduous process, and there is no current projected date for full implementation of the program.

- It is uncertain whether CRCPD would continue to run the program. If not, it is uncertain if any other organization would run the program and who this would be. NRC may be unable to provide funding to whatever entity ran the program because of legal or technical problems or conflicts.

- The actual content and effectiveness of the CRCPD program will be unknown until it is completed and tested.

- It is uncertain if this program would meet NRC's needs for an orphan source program. The extent to which NRC could direct the implementation of the program could be limited.

- The organization responsible for administering the program may determine that the level of accountability to ensure that NRC funds are only used for AEA material, is prohibitive.

- Full funding of the program would rely on sources other than NRC, such as the States, EPA, or DOE. If this funding were not provided, the CRCPD program would have essentially similar limitations as the option of NRC issuing a contract.

- NRC may have limited control over the extent to which the material would be analyzed before its disposition, in an attempt to obtain information sufficient to track the responsible party. NRC may not be able to have the material held until its investigation of the responsible party were complete.

- This may be considered a disincentive for States providing funding for similar contracts within their jurisdictions. If Federal agencies provided funding for the program, it may be expected that the Federal agencies will provide funding for the entire program.

- This may be considered a disincentive for States to provide resources and contingency plans for responding to orphan source incidents in accordance with State responsibilities.

- This may be considered a disincentive, for some stakeholders that currently provide for the disposition of orphan source materials, to continue their own orphan source programs.

Option 3

In general, this option would have the same pros and cons as Option 2, with respect to the program developed by the E-34 Committee. Therefore, the following pro and cons relate only to the portion of this option relating to NRC not providing any funding to CRCPD for an orphan source program.

Pro

- There would be no legislative authority, conflict-of-interest, nor funding issues.

Cons

- NRC could be viewed as not supportive of a program, intended to mitigate a problem that is perceived by many as being caused by NRC (because of its perceived inadequate oversight of certain NRC licensees).

- NRC would have no control over the implementation of the program.

- Without NRC funding support, funding for the E-34 Committee program may not be sufficient to ensure its continuation or success.

- NRC would be required to either accept the E-34 Committee's program or consider other options after it is developed. NRC could be perceived negatively by the stakeholders if NRC did not accept the E-34 Committee's program, but instead pursued other options.

Option 4

The pros and cons for this option would essentially be the same as discussed in Options 1 and 2 above. However, this option presents several additional potential advantages and drawbacks:

Pros

- NRC would have in place an orphan source contract program that could provide for a response to a limited number of incidents, rather than having no such capabilities.

- NRC would have the option of continuing with its orphan source contract program if the E-34 Committee's program does not provide for NRC's desired benefits.

- This option would have a more definitive schedule for implementation, which would be under NRC's control, unlike the schedule for development of the E-34 Committee's program.

- This option could be viewed positively by the States and other applicable Federal agencies as a proactive step by NRC to "fill in the gap" until such time as the E-34 Committee completes its program.

Cons

- This option may be viewed negatively by the States and other Federal agencies as circumventing the efforts of the E-34 Committee.

- This option could be a disincentive to the E-34 Committee for continuing with its efforts on development of an orphan source program. It is more likely that this option would be an incentive to the E-34 Committee for developing a program that covered only those radioactive materials not covered by NRC's orphan source contract program.

- This option would have the highest resource implications on the NRC (full-time equivalent and funding requirements).

- This option would only be effective if funding for NRC's orphan source contract program could be obtained rapidly. If funding were not obtained until fiscal year 2000 or 2001, issuance of the contract could occur coincidently with, or even subsequently to, completion of the E-34 Committee's program. In addition, if the E-34 Committee's program does not sufficiently provide for NRC's needs, funding may be required on an ongoing basis for continuation of the contract after the E-34 Committee's program is developed.

- The effectiveness of this option would depend greatly on how the potential legal issues addressed above could be resolved and what, if any, limitations would be required for the contract.

ATTACHMENT 7

SOURCES SOUGHT SYNOPSIS FOR THE ORPHAN SOURCE RECOVERY PLAN

(Published in the Commerce Business Daily September 29, 1998)

September 25, 1998

MEMORANDUM TO: Mary Mace, Chief
Contract Management Branch 1
Division of Contracts
and Property Management
Office of Administration

FROM: Gary S. Janosko, Chief Original signed by:
Resource Management Branch
Program Management, Policy
Development and Analysis Staff
Office of Nuclear Material Safety
and Safeguards

SUBJECT: SOURCES SOUGHT SYNOPSIS

The Division of Industrial and Medical Nuclear Safety (IMNS), Office of Nuclear Material Safety and Safeguards, has prepared the attached sources sought request for the project entitled, "Orphan Source Recovery Program." This synopsis is not a request for proposals.

IMNS has requested that the synopsis be sent out for the minimum period of time required.

Attachment: Sources Sought Synopsis

CONTACT: Carolyn Boyle, NMSS/PMDA
301-415-7818

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SOURCES SOUGHT SYNOPSIS FOR THE ORPHAN SOURCE RECOVERY PROGRAM

The Office of Nuclear Material Safety and Safeguards (NMSS) is seeking a contractor to provide an ongoing, readily available capability for the recovery and transfer or disposal of discrete "orphaned" radioactive material -- referred to as an orphan source -- that may be causing a health and safety risk to members of the public. Examples of orphan sources include licensed and/or unlicensed radioactive material in any of the following conditions:

- In an uncontrolled condition which requires removal to protect the public health and safety from a radiological threat;
- Controlled or uncontrolled, but for which a responsible party cannot readily be identified;
- Controlled, but for which the continued security of the material cannot be assured; or
- In the possession of an unlicensed person who did not seek to possess the material.

This recovery may require the contractor to travel to the location of the material and recover, package, and deliver (or arrange for this service) the material for transport to an authorized licensee or licensed near-surface disposal facility. The contractor may also be requested to identify potential recipients (other authorized licensees or acceptable disposal sites) or attempt to identify the sealed source and/or device (by isotope, activity, model number, serial number, manufacturer, or other identifying marks on the sealed source or device) in which the material is contained. In addition, the contractor would be expected to be available to respond to an identification of an orphan source in as little as 24 - 48 hours, depending upon the health and safety threat posed by the material.

Types of radioactive material that may need to be recovered:

- Byproduct material (possibly also plutonium and depleted uranium shielding), as defined in the Atomic Energy Act of 1954, as amended, with a waste classification of C or less, as defined in §61.55 of 10 CFR Part 61;
- The above radioactive material contained in sealed sources, either unshielded or contained in devices, and in various conditions (possibly even damaged). In some cases, the sealed source may be leaking and/or breached;
- Unsealed radioactive material in a discrete condition (contained within a small area, such as activated metals or a sealed source that has been breached, but is contained); and
- Radioactive material which cannot initially be well-defined, such as unidentified isotope, activity, form, or condition.

Capabilities that would be required:

- "On-demand" responses to identification of an orphan source that would require recovery and transfer or disposal;

- Appropriate license(s) and/or authorization(s) that would allow recovery of a broad range of the radioactive materials, as outlined above, possessed by authorized and unauthorized persons;

- Ability to package and transport radioactive material, including:

    - knowledge and understanding of DOT and NRC packaging and transport regulations and requirements;

    - ability to prepare and transport Type A and Type B shipments, and determine which type shipment would be appropriate or required;

    - access to both Type A and B shipping containers; and

    - a quality assurance program approved in accordance with 10 CFR Part 71, Subpart H, and applicable Agreement State equivalents (i.e., authorization to package and transport Type B shipments from within NRC jurisdiction and from any Agreement State).

- Knowledge of the requirements for, and ability to prepare, radioactive material for disposal in a licensed near-surface land disposal facility (low-level waste disposal site);

- Ability to respond to locations within all 50 states and territories of the United States;

- Ability to separate, if needed, sealed sources from the devices in which they may be installed for disposal purposes; and

- Decontamination and clean-up ability would only be required for activities directly associated with a recovery operation.

Other factors that may or may not be required, but which would be helpful:

- Familiarity with sealed sources, and the devices in which they may be installed, for identification purposes and an ability to perform an analysis of the sealed source and/or device for the following:

    - isotope(s) identification;

    - activity determination;

- determination of identifying markings (such as model number, serial number, manufacturer's logo or trademark, etc.) on the sealed source and/or device. This may require varying degrees of cleaning of the sealed source or device and magnification of identifying markings, such as micro-engraving (no greater than 50X magnification, typically 10X); and

- rough dimensions (typically to within 10% accuracy; sealed sources may be as small as 1.0 x 1.0 mm (0.039" x 0.039").

- Ability to photograph (under magnification, if necessary) sealed source or device identifying markings for transmittal to NRC for identification purposes; and

- Means to identify interested parties who may want or be authorized to accept the radioactive material for reuse (i.e., determine potential alternatives to disposal). Examples include other licensed users, radioactive material sealed source and device manufacturers, waste brokers, and sealed source and device service companies.

Interested firms should submit written capability statements. The capability statements shall address the capability to conduct recovery and transfer or disposal activities discussed above. It is not a requirement for interested firms to show capabilities in the "other factors" areas discussed above, but capabilities in all areas are preferred.

ATTACHMENT 8

MEMORANDUM TO THE OFFICE OF THE GENERAL COUNSEL, REQUESTING LEGAL ADVICE ON AN ORPHAN SOURCE CONTRACT

November 9, 1998

MEMORANDUM TO: Stuart A. Treby, Assistant General Counsel for Rulemaking and Fuel Cycle, OGC

FROM: Donald A. Cool, Director (orig. signed by) FCombs, for
Division of Industrial and Medical Nuclear Safety, NMSS

SUBJECT: LEGAL QUESTIONS AND ISSUES ASSOCIATED WITH NRC ESTABLISHING A CONTRACT FOR ORPHAN SOURCES

In the Staff Requirements Memorandum (SRM) dated April 13, 1998, (Attachment 1) the Commission directed the staff, in part, to consider the pros and cons of establishing a contract program that would enable licensees or the U.S. Department of Energy (DOE) to take possession of and arrange for proper transfer or disposal of orphan sources. In considering the pros and cons of such a contract program, we have identified a number of potential legal issues on which we are requesting the Office of the General Counsel's (OGC's) advice. To assist you in your analysis of the issues involved, Attachment 2 contains background information on the orphan source problem, including the generally-accepted definition of an orphan source. Attachment 3 contains the specific questions and legal issues we have been able to identify Attachments 4 and 5 contain copies of letters referenced in Attachment 3. In considering the questions and legal issues raised in the Attachments, please provide information on any additional issues that would limit NRC's ability to pursue an orphan source contract, as well as any alternatives that you may suggest for dealing with a particular limitation. We have attempted to identify all possible legal issues that could be problematic for this type contract, but if you envision others, please let us know.

Our response to the SRM is due to the Commission on December 31, 1998, and we plan to draft a Commission Paper on orphan source issues much earlier than that, to meet the due date. Please provide your response to these issues by November 20, 1998, with a copy to the contact below. Given our tight deadline to respond to the Commission, it may be easier for you to have the contact person or persons within OGC for each of the numbered issues listed in Attachment 3 meet with the contact listed below to discuss the issues, rather than preparing a detailed response to each of the issues. We are available to meet at your convenience.

Attachments: As stated

CONTACT: Scott Moore, NMSS/IMNS
(301) 415-7875
e-mail @ SWM

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DATE	11/4 /98		11/4 /98		11/5 /98		11/ /98			

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OFFICE OF THE SECRETARY

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C.

April 13, 1998

Action: [illegible]
[illegible]
[illegible]
Funches, [illegible]

Cys: Callan
Thadani
Thompson
Norry
Blaha
Martin, AEOD
Knapp, RES
Lubinski, NMSS

MEMORANDUM TO: L. Joseph Callan
Executive Director for Operations

Jesse L. Funches
Chief Financial Officer

William M. Beecher, Director
Office of Public Affairs

FROM: Annette L. Vietti-Cook, Acting Secretary

SUBJECT: STAFF REQUIREMENTS - SECY-97-273 - STAFF REQUIREMENTS -- SECY-96-221 -- "IMPROVING NRC'S CONTROL OVER, AND LICENSEES' ACCOUNTABILITY FOR, GENERALLY AND SPECIFICALLY LICENSED DEVICES"

The Commission had disapproved the staff's recommendation and directs the staff take the following actions:

*8900090 and 9000192 (NMSS)

1. Terminate the rulemaking on 10 CFR Part 31.5* that was initiated in 1991 except those provisions that will enable NRC to request information from certain general licensees to provide the regulatory basis for initiation of a registration program in advance of the rulemaking described below. Those portions of the 1991 proposed rule should be renoticed for public comment.

   ~~(EDO)~~ (NMSS) (SECY Suspense: ~~8/21/98~~) 8/14/98 9800070

2. Provide a set of milestones to the Commission for information for implementing the rulemaking described below. The milestones should be in lieu of the standard rulemaking plan required by Management Directive 6.3, but should meet the requirement for coordination with Agreement States.

   (~~EDO~~) (NMSS) (SECY Suspense: ~~8/21/98~~) 8/14/98 9800071

SECY NOTE: SECY-97-273 WAS RELEASED TO THE PUBLIC ON DECEMBER 2, 1997. THIS SRM AND THE COMMISSION VOTING RECORD CONTAINING THE VOTE SHEETS OF ALL COMMISSIONERS WILL BE MADE PUBLICLY AVAILABLE 5 WORKING DAYS FROM THE DATE OF THIS SRM.

Attachment 1

BACKGROUND INFORMATION AND GENERALLY-ACCEPTED DEFINITIONS AND CONVENTIONS USED IN ADDRESSING ORPHAN SOURCES.

The Commission has directed the staff to consider the pros and cons of establishing a contract program that would enable licensees or DOE to take possession of and arrange for proper transfer or disposal of orphan sources and provide an estimate of the costs of such a program. The Commission further directed the staff to use as a guiding principle that non-licensees who find themselves to be in possession of radioactive sources that they did not seek to possess should not be expected or asked to assume responsibility and cost for exercising control or arranging for their disposal. NMSS plans to address the orphan source issues in a Commission Paper that responds to the Commission's April 13, 1998, SRM. In that paper, we will need to address the contractual issues that the Commission raised. Our due date for the SRM response is December 31, 1998.

The general term "orphan source" has been used within the regulatory community for a variety of types and forms of radioactive material for which there is no viable responsible party to provide for an appropriate disposition of the material. Generally-accepted guidelines for what constitutes an orphan source include discrete radioactive material [both material covered by the Atomic Energy Act of 1954, as amended, (AEA) and naturally occurring or accelerator produced radioactive material (NARM)] that is in any one or more of the following conditions:

- in an uncontrolled condition which requires removal to protect the public health and safety from a radiological threat, or
- controlled or uncontrolled, but for which a responsible party cannot readily be identified, or
- controlled, but for which the continued security of the material cannot be assured and, if in the possession of a licensee, the licensee has little or no options for, or is incapable of providing for, the disposition of the material, or
- in the possession of a person who is not licensed to possess the material and did not seek to possess the material, or
- in the possession of a State radiological protection division (either Agreement States or non-Agreement States) for the sole purpose of mitigating a radiological threat due to one of the above conditions, and for which the State does not have a means to provide for the disposition of the material.

To put these guidelines in context, a few examples of orphan sources include:

- An abandoned sealed source found in a public area, but which has not been removed from the public area or adequately secured, such that the material continues to pose a radiological health and safety risk to members of the public. In addition, if the source contains no identifying markings or if the material is in unsealed form (not encapsulated), identifying a responsible party would be nearly impossible.

- A gauging device containing a sealed source in the possession of a scrap recycler who is not licensed to posses the material, minimize -- but not completely remove -- the potential health and safety risk to members of the public (including employees of the recycling company). Unless identifying markings on the gauge are visible and apparent, or the recycler has records indicating where the gauge originated, identifying the responsible party may be difficult, and in some cases, virtually impossible without expending extensive resources (both on the part of the recycling company as well as the NRC or an Agreement State). Note that in this example, the gauging device is considered to be an orphan source as long as it remains intact. But, if the gauging device was shredded by the recycler, resulting in widespread (dispersed) contamination of the facility and equipment, the resulting contaminated material would not be considered orphan sources (see below).

- A well logging sealed source in the possession of a State radiological regulatory program that was confiscated in order to protect public health and safety because the State had little confidence the licensee could maintain security over the source.

- A licensee that is having financial difficulties and wishes to terminate its license, but the licensee still possess an old licensed device which is no longer in use and has little market value. Although the licensee may be diligently attempting to maintain control over its licensed material, in this situation the licensee may become financially unable to continue to maintain staff or facilities adequate to maintain security over the material. Although disposition options may be available for the licensee's material, due to its situation, the licensee could be incapable of providing for the disposition of the material.

The term orphan source does not generally include dispersed radioactive material, material evenly concentrated in metals or other materials, and surface contamination in a facility. However, the guidelines for classification as an orphan source are flexible, and whether a particular situation is determined to contain an orphan source or not will be, and has been, handled on a case-by-case basis. If the material is considered to be "discrete," then it may be considered to be an orphan source even if it is slightly dispersed, evenly concentrated in another material, or associated with limited surface contamination.

The subject of orphan sources nearly always includes a discussion of "responsible parties." For clarity purposes, a responsible party refers to the entity (person or company) whose responsibility it was to ensure for the proper control over or disposition of the material, but who did not reasonably provide it. The entity may or may not be a current or former NRC or Agreement State licensee, or the entity may be a foreign. The "responsible party" is not always the legally liable party. Several examples of entities who would and would not be considered responsible parties include:

- A licensee contracts with a waste broker to properly package the material and deliver it to an authorized disposal site, but the waste broker looses control over the material after it leaves the licensee's facility. In this case, it would seem that the waste broker was the responsible party, but the licensee is not.

- A scrap recycler purchases a load of scrap steel piping from a licensed facility that decommissioned a process line. The licensee neglects to remove one of its nuclear gauges, containing licensable amounts of cobalt-60, from one of the pipes. The scrap recycler does not detect the material as it enters its facility and accepts the load of scrap for processing. At some point in the recycling process, the radioactive material is detected and identified, and is traced to the licensee through the source or device model number and serial number. In this case, the recycler would not be the responsible party and the licensee who improperly transferred the gauge would be the responsible party.

Discussions with waste handlers and brokers, and past history in dealing with orphan sources indicate that the process of responding to an orphan source includes:

- proper recovery of the material;

- performing a characterization of the material (including determining the isotope and activity, and identifying any markings that could be used to trace the material to the responsible party or classify it for disposal);

- providing for the proper security of the material. Temporary storage of the material (either at the contractor's facility or other appropriate location) may be necessary while disposition alternatives are being considered, while the identity of the responsible party is investigated, or while attempts are made to require the responsible party to take back the material or properly dispose of it; and

- Selecting an appropriate disposition option and carrying it out, whether that disposition option is disposal, recycle, resale, or transfer back to the responsible party.

NMSS IDENTIFIED LEGAL ISSUES AND QUESTIONS CONCERNING ESTABLISHING AN ORPHAN SOURCE CONTRACT

In considering the pros and cons of establishing a contract for the purpose of addressing orphan sources, we have discussed potential orphan source recovery/contract issues with a number of radioactive materials waste handlers and brokers. In all cases, representatives of the waste handlers and brokers indicated certain functions -- discussed below -- that they would be unable to perform, and that either the NRC or some other party (such as a State agency) would need to perform. Issues concerning these functions, and other issues that have been identified, bring into question whether NRC could create such a contract or, once created, whether the contract could be effective given the potential limitations of these issues. We request that the Office of the General Counsel (OGC) provide legal guidance on the specific issues outlined below:

1) Does NRC have the legislative authority to establish a contract to carry-out the process of responding to an orphan source?

Previous informal discussions with OGC have indicated that NRC does have this legislative authority, as long as the contract is used to mitigate a health and safety threat from the orphan source. If NRC does have the legislative authority to establish and implement a contract of this type, could the contractor's activities include the recovery and disposition of material in cases where the immediate health and safety threat had been mitigated [e.g., by the State or a Department of Energy (DOE) Radiological Assistance Program team], but the material remains in a controlled condition with a party that did not wish to possess it (e.g., secured at a scrap recycler's facility, a State radiation regulatory office, or a licensee who temporarily took possession of the material at the request of the NRC or a State to help mitigate the threat)? In these examples, the radiological threat is minimized because the party possessing the material took a responsible action to mitigate the threat, even though they were not the responsible party for the material.

2) If it is determined that NRC has the legislative authority to establish a contract to address orphan sources, it would seem that there may be the potential for numerous conflict of interest issues associated with this type contract. Please address the following conflict of interest issues, and the implications/limitations on the contract that any conflict of interest would have:

- Would it be a conflict of interest that NRC could only contract with an organization that has an NRC- or Agreement State-license for possession, storage, transfer, and disposal of radioactive material?

  All potential contractors would be required to have a valid license (or subcontract with a licensee), in order to conduct the activities described in the process of responding to an orphan source. Can NRC enter in a contract with an organization who would be required to have, and maintain, a license from NRC or an Agreement State that authorized the activities specifically required in the contract (i.e., could NRC enter in an orphan source contract with someone

NRC licensed to perform the activities specified in the orphan source contract)? Does it matter, in the conflict of interest considerations, that any potential contractors would have equal conflicts ---- that is, that all potential contractors would have to obtain and maintain an NRC or Agreement State license for these activities? Does it matter, in the conflict of interest considerations, whether the licensee is an NRC licensee vs. an Agreement State licensee (i.e., would an Agreement State licensee have a lessor conflict)? Would a DOE laboratory have the same conflict of interest issues, or would a DOE laboratory be a preferable contractor, from a conflict of interest perspective?

- Would it be a conflict of interest if NRC were the licensing authority over the contractor(s), and processed an application for amendment to the contractor's license in order to provide the contractor with a specific authorization determined to be necessary to handle a unique situation with an orphan source response for which NRC directed it to respond under NRC's contract?

  If unique situations occurred that were unanticipated such that the contractor(s) did not have the appropriate license authorizations to recover and properly disposition an "orphan source," a contractor would need to obtain a license amendment to obtain the appropriate authorization(s) prior to responding for NRC. It is very possible that the contractor could be licensed by the NRC, and would need to submit its license amendment application to NRC. For instance, NRC may need the contractor to recover, analyze, and appropriately disposition a rare nuclide that is not authorized in the contractor's license. The contractor would need to apply for an amendment, possibly to NRC, to receive the particular nuclide before taking action under the contract. Would it be a conflict of interest for NRC to accept, process, and act on the contractor's license amendment application? If this is a conflict of interest, how would this limit the activities of the license reviewer, the contract project manager (PM) or technical monitor (TM), and their supervisors? For example: could the license reviewer contact the PM or TM concerning the amendment request (e.g., for clarifications or confirmations); could the TM, PM, or their management, request expedited review of the request based on health and safety concerns; could the TM or PM provide any technical assistance to the license reviewer? If OGC determines that this process does present a conflict of interest, can OGC recommend an alternative process to remove or minimize the conflict of interest?

- Would it be a conflict of interest if, because of the use of this contract, it is perceived that NRC is not performing its legislated duty of providing for the protection of the public health and safety through the established processes of regulation, licensing, inspection, and enforcement?

  NRC's enforcement process provides a number of tools at its disposal (CAL's, Orders, etc.) for requiring licensees who loose control over their material to attempt to locate it and/or to recover it and regain its control. If an orphan source is found and NRC's contractor recovered it and identified its model number and serial number, we would expect that either NRC, the Agreement State, or the contractor would make an attempt to track down the responsible party. If a responsible party is not found, but it is apparent that the material likely was at one time licensed by NRC or an Agreement State, it could present the perception, or be an actuality, that NRC is paying for the disposal of material for one of NRC's licensees. In addition, the contractor and NRC staff may feel that they have exhausted all likely avenues for identifying the responsible party, but it may be perceived by members of the public or other licensees that these efforts were not sufficient. Finally, in some cases, it may at some point become a greater expense (to NRC) to track down the responsible party than to just have the contractor recover and provide a proper disposition of the material, or it may be initially apparent that tracking down the responsible party would be a futile or highly costly endeavor. In these cases, are the potential conflict of interest issues resolvable, including perceived conflicts? If they cannot be resolved, does that bar establishment of such a contract?

- If the contractor is requested to respond to an orphan source at a facility where there is also other radioactive material that does not meet the definition of an orphan source containing AEA materia , but the facility desires that the additional material be dispositioned as well; would it be a conflict of interest (for either the NRC, the contractor, or the facility) if the facility contracts with the NRC orphan source contractor to perform these other disposal, decommissioning, or decontamination activities?

  A contractor who would have the appropriate capabilities to perform the orphan source disposition process would likely have decommissioning and decontamination capabilities as well, and have ongoing work in these areas. The contractor may also have contract arrangements directly with facilities to remove and dispose of an orphan source independent of NRC's contract activities (such as NORM or NARM sources). In order for this contract to be effective, it may require contractors in different locations throughout the country and it may be necessary to have contractors with differing specialized capabilities in order to handle unusual situations that may occur. Both of these conditions increase the potential for the contractor(s) to be involved in identical or related work at facilities that NRC would direct the contractor to respond to an orphan source. This is especially true at facilities, such as scrap recyclers, that may encounter various types of radioactive materials, including orphan sources containing AEA and non-AEA material, on a regular basis.

3) Could NRC be considered as the generator of the orphan source material such that NRC would be listed on the disposal permit as the generator?

Radioactive waste shipments to a licensed disposal site require application for and issuance of a disposal permit before the material will be accepted for disposal. The permit requires that the generator of the material be listed, and the application for the permit be signed by the generator. In the case where material is found in the public domain, or a responsible party is not identified, there would not be an identifiable generator to list on the permit. In all cases, the waste handlers and brokers have indicated to us in conversations that they would be unable to be listed as the generator on the permit. In the case where material is found on private property, the owner of the property may be listed as the generator, but past experience has shown that these persons are reluctant to do so. If another party could not be found that could, or would agree to be listed as the generator of the material, NRC may need to be listed as the generator. In a letter dated April 16, 1993, from Stephen H. Lewis to Robert S. Faron, the issue of whether NRC could take title to, and transfer title of, an "orphan source" (in this case it was described as abandoned radioactive material) to DOE for the purposes of a DOE contractor removing the material and dispositioning the material in accordance with the contract, was discussed. The radioactive material involved in this case was considered to meet the definition of an orphan source; control of the material was uncertain and the material presented a potential health and safety threat (see letter to DOE, dated December 7, 1992, requesting assistance with the disposition of the material). Based on the interpretation discussed in the April 13, 1993, letter, it would seem that if NRC is able to take title to material, NRC could also be considered as the generator of the material for disposal purposes.

4) If NRC could be considered as the generator of the orphan source material for disposal purposes, would there be any restrict ons as to whom within NRC could be authorized to sign the permit application, and if so, what are the restrictions?

Applications for a disposal permit require that an authorized representative of the generator sign the permit application. Who could be considered an authorized representative of the NRC -- as the generator of the material -- would be an important issue as it may determine if an orphan source recovery process would be efficient. It would seem that essentially, the person signing the disposal permit application would be authorizing transfer of NRC owned material to the licensed disposal facility.

5) Could the contractor respond to orphan sources containing non-AEA radioactive materials under any situations?

The orphan source issue is not limited to AEA material, and involves NARM in a large majority of situations. In addition, the response to an orphan source may include commingled material, such that it could not be separated into AEA and non-AEA material, or may contain separate discrete AEA and non-AEA material sealed sources that are contained in the same device or other container, but could be separated by removal from the device or container. Informal discussions with OGC indicate that a orphan source contract could not include NARM material since the regulation and oversight of NARM material is not covered under NRC's statutory authority.

In situations where AEA material and NARM are commingled or contained in separate discrete sources in the same device or container, could NRC's contractor recover and properly disposition all the material or would the contractor be limited to only dealing with the AEA material? If the contractor was limited to only dealing with the AEA material, could the contract authorize the contractor to separate the material and properly disposition only the AEA material, or would the separation need to be completed before the contractor could respond? If the material was commingled such that it could not, in all practicality, be separated into its AEA material and NARM components, could the contractor be allowed to dispose of all the material, or would this prohibit the contractor from responding? NRC practice has been that when material is commingled, NRC continues to have certain regulatory authority over the material. In addition, certain isotopes, such as Cadmium-109, may be either AEA material or NARM, depending on whether they were produced in a reactor or in an accelerator. For orphan sources containing these types of isotopes, if the material's origin could not be traced to its method of production, could the contractor be authorized to recover and properly disposition the material, or would it have to be assumed that the material was NARM and not be covered by the contract?

6) Would the sale of an orphan source to an authorized recipient through the contractor be a disposition option available to the NRC, and if so, what are the options available to NRC concerning the disposition of the proceeds from the sale of such material?

Several State programs have "orphan source" contracts in place where they have a contractor recover and package the material, but the State takes possession of the material, pending an ultimate disposition. In many cases, the State solicits bids for the material as an alternative to its disposal. Discussions with waste brokers and handlers indicate that the option of selling the material to another licensee is, in many cases, the best disposition alternative due to high disposal costs or the lack of other disposition options. It is envisioned that NRC would employ this alternative, if available, but that the transaction would be handled through the orphan source contractor temporarily storing the material and attempting to find other interested parties willing to purchase it. If an interested party was found and purchased the material, would NRC be required to recover, or be barred from recovering, these funds, or could the contract be written such that these funds would go to the contractor or towards defraying the costs of the contractor's orphan source recovery activities? Or is this whole avenue of disposition (i.e., re-sale of orphan sources with the proceeds either going to the contractor, to the contractor to defray contract activities, or to NRC) prohibited under a potential contract?

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

APR 16 1993

Docket No. 030-00320
License No. 24-05592-01
Docket No. 999-90003
Non-Licensee
EA 92-172

Robert S. Faron, Esq.
Deputy Assistant General Counsel for Environment
United States Department of Energy
GC-11, 1000 Independence Avenue, S.W.
Washington, DC 20585

Dear Mr. Faron:

SUBJECT: ST. JOSEPH RADIOLOGY ASSOCIATES, INC. AND JOSEPH L. FISHER, M.D.; ABANDONMENT OF LICENSED MATERIALS

This letter relates to discussions between NRC and DOE regarding the retrieval of an abandoned cobalt-60 source and the head, if the shield contains depleted uranium, in a teletherapy unit on the premises of Joseph L. Fisher, M.D. at 702 Jules Street, St. Joseph, Missouri. DOE agreed to assist the NRC in effectuating the retrieval of these materials and, to that end, entered into a contract with Neutron Products, under which Neutron Products would remove the cobalt source and the head from Dr. Fisher's premises. Neutron Products, a licensee of an Agreement State (Maryland), is authorized to possess these types of materials and to retrieve these materials, provided it files a Form 241 with the NRC.

In the course of our discussions, you advised us of a request by Neutron Products that it receive clear title to the radioactive materials in question. As reflected in the enclosed letter (Enclosure 1) from James Lieberman, Director of the NRC's Office of Enforcement, to Dr. Fisher, and the Declaration of Transfer of Clear Title to U.S. Department of Energy, executed by Dr. Fisher on April 6, 1993 (Enclosure 2), the Licensee for these materials, St. Joseph Radiology Associates, Inc., is defunct and has abandoned the cobalt unit, which includes the materials identified above. Further, Dr. Fisher disclaims any "vested interest" in the teletherapy unit. Based upon discussions among NRC, DOE and Neutron Products, the NRC understands that the above documents satisfy the concerns of Neutron Products and of DOE regarding assuring that Neutron Products can acquire clear title to these materials.

In a previous conversation in which you and I participated, I informed you that the NRC had earlier determined that it has the authority to acquire title to abandoned radioactive material and to thereafter convey such title to DOE for purposes of having a DOE contractor retrieve such material and take such steps regarding the disposition of that material as the contract may permit and are in

Attachment 4

accordance with applicable statutes and regulations. The statutory basis for that authority is section 161g of the Atomic Energy Act (42 U.S.C. 2201g), which provides in pertinent part, that:

> In the performance of its functions, the Commission is authorized to--
>
> > acquire...personal property...as agent of and on behalf of the United States...and to sell, lease, grant, and dispose of such personal property as provided in this Act.

Senate Report 93-980, regarding S.2744 (the Energy Reorganization Act), dated June 27, 1974, provides (at p. 84) that the authority conferred under section 161g was conveyed to both the NRC and DOE.

If you have any further questions regarding this matter, do not hesitate to contact either Mr. Lieberman or me.

Sincerely,

Stephen H. Lewis

Stephen H. Lewis
Senior Supervisory
Enforcement Attorney

Enclosures (2): As stated

cc with enclosures: Francis Kreysa, Esq.
Neutron Products

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

DEC 07 1992

U.S. Department of Energy
ATTN: Ms. Jill E. Lytle
Deputy Assistant Secretary
for Waste Management
Environmental Restoration
and Waste Management
Washington, D.C. 20585

Dear Ms. Lytle:

We are requesting the assistance of the Department of Energy (DOE) to store or dispose of a teletherapy sealed source containing approximately 600 curies of cobalt-60. This source is currently in the possession of Dr. Joseph L. Fisher who does not have a current license to possess byproduct material and has not filed an application for a license for this material. The source and associated teletherapy unit were previously covered under a license held by St. Josepn Radiology Associates, Inc., of which Dr. Fisher was a partial owner and which no longer exists as a legal entity. On October 16, 1992, the enclosed Nuclear Regulatory Commission Order (Effective Immediately) was issued to Dr. Fisher which required him to transfer the byproduct material to an authorized recipient within 45 days from the date of the Order. Dr. Fisher claims to be experiencing financial difficulties and has stated that he does not have sufficient funds to dispose of the source and as of the date of this letter has not transferred the byproduct material to an authorized recipient. Additionally, Dr. Fisher has claimed that he does not actually possess the byproduct material and denies responsibility for the byproduct material. Also enclosed for your information is a copy of the Atomic Safety and Licensing Board's denial of Dr. Fisher's October 22, 1992, request to set aside the immediate effectiveness of the Order.

Since control of the sources cannot be ensured, they must be removed from Dr. Fisher's possession as soon as possible to protect public health and safety. Attempts to find another licensee willing to take possession of the material have been unsuccessful. Additionally, our Regional Office does not have facilities to accommodate the sources. We believe that the situation with Dr. Fisher (St. Joseph Radiology Associates, Inc., and Fisher Radiological Clinic) meets the conditions specified by Mr. Leo P. Duffy in his letter of April 7, 1991, for emergency storage by DOE.

The exact location of the source can be obtained from Mr. Charles Norelius of our Region III Office. His phone number is (708) 790-5510. I am enclosing some additional information about the source and teletherapy unit for your information.

Attachment 5

Your attention to this matter is greatly appreciated. If I can be of any assistance, please call me at (301) 504-3426.

Sincerely,

Richard E. Cunningham, Director
Division of Industrial and
Medical Nuclear Safety
Office of Nuclear Material Safety
and Safeguards

Enclosures: As stated

COST ESTIMATES FOR CONTRACT OPTIONS

The annual frequency of orphan source incidents is the most important factor in estimating the cost of any orphan source contract option, including options involving responses to only a portion of the orphan source incidents, or options involving U.S. Nuclear Regulatory Commission (NRC) funding of the Conference of Radiation Control Program Directors (CRCPD) Committee on Unwanted Radioactive Material's (E-34 Committee's) program. Unfortunately, the annual frequency of orphan source incidents is not known. The reasons that the regulatory community does not know the number of orphan source incidents occurring each year include: 1) some orphan source incidents are resolved but are never reported by the facility that receives the orphan source; 2) not all State and Federal agencies' reports of orphan source incidents are easily accessible or searchable, due in part to some organizations maintaining only written incident records; 3) orphan source incidents are not reported to a single national database; 4) reports listed in available databases may not be characterized for easy identification as orphan source incidents; and 5) there is not a common understanding in the regulatory community on what constitutes an "orphan source." A centralized and standardized national database of orphan sources, such as has been proposed by CRCPD for the Nuclear Material Events Database (NMED), would help to more accurately track orphan sources.

For planning purposes, the staff can provide a rough estimate of the cost of an orphan source contract program that would enable a contractor to take possession of, and arrange for, proper transfer or disposal of orphan sources. The staff's estimate is only a gross approximation, that is probably accurate to within a couple hundred thousand dollars. If the Commission directs the staff to proceed with an orphan source contract program, the staff will attempt to refine the estimate further (e.g., through more detailed discussions with waste handlers and brokers and with State radiation control program offices having experience with orphan source contractors, and based on the E-34 Committee's experience in developing the pilot program). Information necessary to further refine the estimate is not easily available, as discussed above. Developing a more accurate estimate would require additional effort; and will depend, in part, on State radiation control programs providing the necessary orphan source information to NRC. The staff believes that spending further resources to refine the estimate, before the Commission directed the staff to proceed further with a contract option, would not be consistent with the Commission's direction.

Based on the staff's limited experience in dealing with orphan source contractors, and information gained from currently available data, the staff estimates that the annual costs of an orphan source contract program would be approximately:

30 orphan sources/year x $15,000 per orphan source = $450,000/year

In arriving at this cost estimate, the staff made numerous assumptions regarding the number of orphan sources that would be addressed annually under the contract, the types of orphan sources involved, the average cost per orphan source response action, the contractors' costs of maintaining adequate response capabilities for different types of response actions and in different geographic areas, and the source disposition options available to the contractor.

Without firm data on the annual frequency of orphan source incidents, the staff relied on currently available data, such as NMED, State databases of scrap metal incidents in the U.S., and past orphan source incidents involving a request for Federal assistance. Based on this data, the staff expects that an NRC orphan source contractor could be requested to respond to 20 to 30 orphan source incidents per year (assuming only Atomic Energy Act (AEA) material in non-Agreement states). However, the actual number of incidents will vary from year to year. The number of incidents that would occur in the first-year would likely be in the higher range, because some existing orphan sources await disposition. In addition, the number of orphan source cases involving requests for NRC-contractor assistance could increase once the availability of NRC's contract becomes well known (i.e., States and non-licensees could request NRC assistance for orphan source cases that they are now resolving on their own).

Based on discussions with waste brokers and waste handlers that have performed orphan source recoveries in the past, the costs for such recoveries have ranged between $3000 and $20,000 per source, depending on the location and resources needed to respond. Staff used a value of $15,000 per source, to account for the increased costs of maintaining response capabilities for broad geographic areas and for rapid response, higher handling costs associated with sources that may be damaged or difficult to recover, and higher costs caused by the limitations on disposition options. For instance, a hypothetical orphan source recovery case may involve paying for the contractor to fly, on short notice, personnel and equipment to the incident location; conduct surveys and an analysis of the source; safely package the source; arrange for transport to a disposal location or waste processor; arrange for, and dispose of, the source at a licensed burial site; obtain the appropriate applications and authorizations from NRC; and document the whole process. The costs could quickly increase into the thousands of dollars, even for the most basic of sources or incidents. Again, the accuracy of this estimate is completely dependent on the number of orphan source incidents that occur each year, disposition options available and their associated costs, the type and condition of each orphan source involved in an incident, and the time allowed for the contractor to prepare and respond to each incident.

If the contract covered less than the total number of orphan source incidents that occurred in a single year, or if orphan source recoveries were deferred from one year to the next, the contract costs would drop. Similarly, if the contractor was permitted disposition options other than disposal at a low-level waste facility (e.g., transfer to an authorized recipient), then contract costs may also drop. Obviously, if the number of orphan source incidents rose, then the contract costs would also rise. The staff expects that, as existence of an NRC orphan source recovery contract program becomes more widely known, and services are more widely requested, the contract costs would increase. Additionally, if non-Agreement States who currently have orphan source recovery programs discontinue their programs, in favor of relying on NRC's orphan source contract, then the adverse impact would push up costs of NRC's program. As increased or decreased cost trends are identified, the staff would revise the funding requirements for an orphan source contract program.

The E-34 Committee has not developed an estimate of the level of funding necessary for implementation and continued operation of the E-34 Committee's program. However, assumptions similar to those made about an NRC contract can be made about the E-34 Committee's program. The E-34 Committee's program would likely not have the same limitations as an NRC contractor would have, which could reduce the average cost per orphan source response. In addition, a national orphan source recovery program, versus independent programs conducted by NRC and each Agreement State, may lead to program efficiencies that could result in lower costs. However, the additional administrative burden of ensuring that NRC funds be applied only to AEA material would increase overhead costs for the program, possibly negating any savings from the E-34 Committee's program option.

To estimate an appropriate NRC share of this national program, the staff used the assumption that NRC would be responsible for only the portion of the program costs applicable to incidents that occur in NRC jurisdiction (i.e., non-Agreement States and Federal facilities) and involve AEA material (i.e., the same subset of incidents that an NRC contractor would be expected to respond to). Because the number of orphan source cases covered by NRC's contract would be roughly the same, under either NRC's own program or the E-34 Committee's program, then NRC's funding of the E-34 Committee program would be expected to be the same as the estimate for an NRC contract program: approximately $450,000 per year. Accordingly, the E-34 Committee's program would require additional funding from the Agreement States to cover that portion of the program that would be applicable to orphan source incidents involving AEA material occurring in Agreement State jurisdictions.

In reality, it is unlikely that all Agreement States would participate, or Agreement States would urge NRC to accept more of the funding burden, which would drive up NRC's costs. Also, NRC is limited to funding only AEA material disposition costs, whereas the States would need to fund all naturally occurring or accelerator-produce radioactive material orphan source recoveries. Nevertheless, funding CRCPD to implement the E-34 Committee's national orphan source program offers certain advantages over the other contract options.

(4)

POLICY ISSUE
(Information)

~~NOTE: SENSITIVE INFORMATION -- LIMITED TO NRC UNLESS THE COMMISSION DETERMINES OTHERWISE~~

January 17, 2002 SECY-02-0013

FOR: The Commissioners

FROM: William D. Travers
Executive Director for Operations

SUBJECT: ISSUES CONCERNING SELF-LUMINOUS TRITIUM CONSUMER PRODUCTS

PURPOSE:

This paper informs the Commission of staff plans to address issues related to distribution of self-luminous tritium consumer products.

BACKGROUND:

In SECY-01-0020, dated February 2, 2001, the staff discussed the U.S. Nuclear Regulatory Commission (NRC) policy on self-luminous tritium consumer products, in the context of a review of a license application requesting authorization to distribute flashlights with self-luminous tritium markers. In the Staff Requirements Memorandum (SRM) dated February 21, 2001, the Commission approved the staff's position that the tritium marker would not be considered a frivolous use. As discussed in SECY-01-0020, the staff requested comments from the Agreement States on this specific application of a self-luminous tritium product. Some of the State comments raised broader concerns about existing consumer products, as well as potential proliferation of new products. The staff is proceeding to complete the review of the license application.

CONTACT: Anthony Kirkwood, NMSS/IMNS
(301) 415-6140

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In addition, the staff has received numerous reports and allegations of unauthorized distribution and sales of self-luminous tritium products, some of which occurred in Agreement States. At the Commission meeting with the Organization of Agreement States (OAS) and the Conference of Radiation Control Program Directors (CRCPD) on August 15, 2001, the State of California representative expressed concern about unauthorized Internet sales of radioactive material, which also highlighted inconsistencies between the U.S. and other countries with respect to regulation of tritium consumer products. In light of such reports and allegations and Agreement State concerns, the staff has broadened its review of issues related to the regulation of
self-luminous tritium consumer products.

DISCUSSION:

1. Unauthorized Distribution of Self-luminous Tritium Consumer Products

The staff has received numerous reports and allegations of unauthorized sales of self-luminous tritium consumer products on the Internet. The staff determined that the majority of the products, "Glowrings," were from the United Kingdom (UK), where domestic distribution is apparently authorized. The "Glowring" key ring contains approximately 17 gigabecquerels (GBq) [460 millicuries (mCi)] of tritium. After consultation with the Office of International Programs, the staff initiated informal telephone contacts with UK regulatory staff and the foreign manufacturer of the "Glowrings" to determine how these items were being distributed. After learning that U.S. regulations do not permit distribution of radioactive consumer products for frivolous purposes, the UK distributor stated that it will no longer ship the key rings to the U.S. In addition, the NRC and Agreement State staff contacted the U.S. Internet sellers by telephone, informed them that their activity was illegal, requested that they stop the sale of these items, and confirmed these discussions with formal letters. The staff does not plan any further enforcement action unless distribution by the sellers continues.

In response to these incidents of unauthorized distribution of self-luminous tritium consumer products through sales over the Internet, the NRC staff, California, and Illinois have contacted Ebay, a major California Internet auction site, and asked Ebay to stop the sale of illegal radioactive material on its site. The State of California sent an October 1, 2001, Cease and Desist Order (Attachment) to Ebay directing them to stop facilitating the unauthorized distribution of radioactive material. In response to these contacts, Ebay is placing restrictions on its site which are designed to prevent unauthorized distribution of illegal radioactive material.

With respect to unauthorized distribution of tritium consumer products, the staff's response has taken into consideration the low health risk posed by these products, as well as the importance of maintaining both public confidence and the integrity of NRC regulatory requirements. The staff has considered broad-based, resource intensive responses such as a moratorium or recall of tritium consumer products; a surveillance program to intercept illegal receipt and distribution of these types of products; and discussions with other countries to standardize regulations. However, because the health risk to the public from the types of consumer products that are similar in nature to the "Glowring" key chains is very low, we believe it is inappropriate to expend resources in this manner. Instead, the staff will continue to respond to allegations or other specific reports of unauthorized distribution and sale of radioactive material on a case-by-case basis, coordinating with the states as appropriate. We will modify this approach should we become aware of new information that warrants a broader approach and coordinate with the states as appropriate.

2. Concerns Related to Authorized Distribution of Tritium Consumer Products

SECY-01-0020 discussed an application for an exempt distribution license for tritium markers in flashlights. The proposed flashlight markers contain a total of approximately 1.6 GBq (42 mCi) of tritium in two sources. The staff concluded that the flashlights with the tritium markers were not contrary to 10 CFR 30.19(c)(i.e., were not a frivolous use of a self-luminous product). In the Staff Requirements Memorandum dated February 21, 2001, the Commission agreed with this conclusion.

As indicated in SECY-01-0020, the staff solicited comments from the Agreement States on this particular application. We received comments from five states. Only one State thought the use of tritium markers in flashlights was frivolous, since certain designs of flashlights, such as light phosphorescent types, can be located in the dark without the use of radioactive material. The staff's information on the type of flashlights mentioned by the State, as well as those that have battery-operated locator lights, indicated that these types of flashlight markers would only illuminate for a short duration, whereas self luminous tritium markers would illuminate for years. The staff maintains its position that the proposed use of this particular consumer product is not frivolous and is currently completing its review of the license application on that basis.

Several of the States responding to our request for comments expressed broader concerns about tritium consumer products. The States noted that breakage and subsequent contamination from such consumer products may cause an increase in public concern, and require a resource-intensive response from radiation safety officials, despite the low health risk to the public. Because of this, some States are concerned generally about increased proliferation of consumer products containing radioactive material, although most did not have specific concerns with this particular application. In SECY-01-0020, the staff also identified this issue, and stated that we would carefully consider the safety issues of radiological risk and proliferation.

In light of State and NRC staff concerns with increased proliferation and illegal distribution of self-luminous tritium consumer products, the staff plans to review self-luminous product applications for exempt distribution with added emphasis on 10 CFR 32.22(b), which states, ". . . the Commission may deny an application for a specific license if the end uses of the product cannot be reasonably foreseen." For example, the staff has reviewed exempt "personal markers." When originally authorized, these "personal markers" contained 4.4 GBq (120 mCi) of tritium and were described as being used for friend/foe determination in military or police night operations. The one exempt distribution license issued for this product in 1997 was terminated this year at the request of the U.S. licensed distributor. The foreign manufacturer of this product recently requested its own exempt distribution license in order to resume distribution and sales, but because of the above considerations, the staff reassessed its previous licensing position on "personal markers."

This was because their design consists simply of a self-luminous tritium source fastened to a small plastic holder and could, after initial licensed distribution, conceivably be used in a fashion not originally reviewed and authorized by NRC. For example, a toy manufacturer could buy "personal markers," and distribute them as a novelty. For these reasons, the staff does not plan to license the exempt distribution of "personal markers" again.

3. Considerations Related to Terrorist Threats

   The staff has considered the distribution of self-luminous tritium consumer products in light of the current terrorist threat environment. Tritium is a low-hazard radionuclide, and the tritium products contain low quantities, 1-100 GBq (2.7-270 mCi). Because of the very low health risk, the staff does not believe that additional restrictions on tritium consumer products are warranted based on the current threat environment.

This paper contains sensitive information regarding allegation and enforcement, and should not be released to the public.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection.

/RA/

William D. Travers
Executive Director
for Operations

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/RA/
William D. Travers
Executive Director
for Operations

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*: See previous concurrence
**: No legal objection via E-mail

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POLICY ISSUE
INFORMATION

July 22, 2005 SECY-05-0129

FOR: The Commissioners

FROM: Luis A. Reyes
Executive Director for Operations

SUBJECT: STAFF PLANS TO ADDRESS AN ANTICIPATED SHORTAGE OF SPACE IN THE WHITE FLINT COMPLEX

PURPOSE:

To inform the Commission of the staff's plans to address an anticipated shortage of office space in the White Flint Complex (WFC).

BACKGROUND:

In April 2003, the Office of Administration (ADM) developed a space optimization plan for TWFN in anticipation of staff increases projected for FY 2004 through FY 2006. The plan involved the re-configuration of staff offices and support space on seven of the nine office floors in TWFN. The initial plan provided for construction of an additional 160 staff workstations in TWFN to accommodate growth in NSIR and NMSS. As of July 1, 2005, ADM had completed approximately 115 of the planned 160 additional workstations. The remaining 45 workstations will be completed by the end of FY 2005. Attachment 1 provides a list of the staff's space optimization efforts.

Despite these space optimization efforts, the amount of vacant, occupiable space in the WFC fell to a low of 4 percent during the summer of 2004 as a result of Agency growth and the arrival of approximately 60 summer hires. This shortage of space created operational inefficiencies as new employees had to be assigned workstations that were not contiguous to their work groups. The summer space "crunch" dissipated as students went back to school and additional workstations became available as a result of the ongoing space optimization effort in TWFN. However, office FTE projections indicated that this relief would be temporary and that the shortage of space would worsen at Headquarters (HQ) through FY 2006 and FY 2007.

CONTACT: Kathryn O. Greene, ADM/DFS
(301) 415-6222

OFFICIAL USE ONLY
May be exempt from public release under the Freedom of Information Act (5 U.S.C. 552)

Exemption number 4
Nuclear Regulatory Commission review required before release.
Kathryn Greene/ ADM
Name and organization of person making determination.

Date of Determination June 30, 2005

E/3

During the same time period, staff also explored the potential benefits of telecommuting as another opportunity to achieve more efficient use of office space and as a potential long-term solution to Agency space shortage concerns. On July 9, 2004, the staff met with representatives from agencies that have successfully implemented telecommuting (General Services Administration, Patent and Trademark Office, Equal Employment Opportunity Commission, and Department of the Treasury) to discuss their experiences, lessons-learned, and recommended best practices for telecommuting programs. A working group has been formed to examine the array of telecommuting options (desk sharing, office sharing, hoteling, etc.), and will begin a pilot effort to implement some of those options.

ADM tracks space use in the WFC using a database of digitized drawings of every workstation coupled with an integrated descriptive database of information on occupancy and use of the space. This Space Planning System (SPS) is used to generate reports showing Office occupancy rates, location of vacant offices, and various statistical analyses of office and special space use by building, floor and office. The SPS is also used extensively for planning large and small changes to office and special space configurations.

In the summer of 2004, the staff acquired the services of an independent contractor to assess the adequacy of NRC's SPS and overall space utilization at the WFC. The contractor noted that NRC's vacancy rate for HQ should be at least 10 percent and preferably as high as 15 percent to allow for a sufficient amount of swing space. The report concluded that maintaining this level of vacancy would increase the efficiency of Agency operations by allowing contiguous assignment of space and providing enough space to accommodate reorganizations, summer hires, rotational assignments and special projects.

Although comparison among organizations is difficult because space measurement is inconsistent among the organizations surveyed[1], the contractor also compared NRC's space with existing data on several NIH facilities in the Maryland suburbs. The data showed that NRC had the lowest average office size per person (96 sq. ft. vs. 107, 101, and 108), the lowest amount of circulation space per person (51 sq. ft. vs. 58, 56, and 57), and the highest amount of special space[2] per person (50 sq. ft. vs. 28, 28, and 26). Since the assessment was completed, the amount of special space per person has been reduced somewhat as a result of converting Library and File Center space into workstations, and further reductions in the amount of special space are being planned.

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[1] U.S. General Services Administration, Office of Governmentwide Policy, Office of Real Property, *Real Property Performance Results*, December 2002.

[2] Special space includes space such as the auditorium, cafeteria, library, fitness center, conference rooms, health center, day care center, copy rooms, file rooms, credit union, exhibit area, and computer center.

DISCUSSION:

By the end of FY 2005, ADM's program to build new workstations will be completed and will bring the total number of workstations in the WFC to approximately 2,630. This number of workstations will accommodate the 2,289 FTE (FY 2005 FTE level) plus approximately 140 workstations needed for essential contractor support. It will also provide sufficient "swing space" (vacant offices) to support reorganizations, rotations, summer hires, and task force activities. This space optimization initiative will exhaust most of the opportunities for creating additional offices in the WFC without significantly impacting space used for other activities. Constructing a significant number of additional workstations within the WFC would require downsizing offices from the existing standards and further reducing special space including conference rooms. Such an effort would be disruptive and expensive, especially in view of the lack of sufficient "swing space" in either building to house displaced staff during the workstation reconfiguration and downsizing. Attachment 2 contains a list of special space in the WFC, along with the potential impact of relocating the activity offsite.

The staff estimates the maximum occupancy for the WFC to be approximately 2,350 FTE, allowing for a 5.5 percent vacancy rate and retaining the current level of onsite contractor staff. Although this vacancy rate is significantly lower than the desired level of "swing space" (10 percent) and will create some operational inefficiencies, the staff believes it is manageable. The Chairman's proposed FY 2007 budget includes a projected increase of 196 HQ FTE above the FY 2005 HQ FTE ceiling. Therefore, the FY 2007 HQ FTE level will be 135 FTE above the maximum occupancy level.

Options Considered to Address Space Shortage in the WFC

The staff considered a variety of options to address both the short- and long-term office space shortages in the WFC. These are discussed below:

Make More Effective Use of Special Space

There are some opportunities in the WFC to make more effective use of special space, including the Professional Development Center (PDC), the Library, the Supply Store and conference rooms. The utilization of these spaces would avoid a large scale move of program staff that would interfere with accomplishing agency work and would create several vacant and contiguous spaces that could be re-configured with minimal disruption to staff.

The PDC occupies approximately 10,100 square feet of space on the third floor of TWFN. Moving the PDC to an offsite location would permit the construction of approximately 90 workstations on the 3rd floor of TWFN.

The size of the Library was reduced in FY 2005 by about 1,000 square feet to accommodate additional workstations as part of the ongoing WFC space optimization plan. The Library currently occupies approximately 5,700 square feet on the second floor of TWFN. Although further reducing the size of the Library would permit the construction of additional workstations, and may be considered in the future, no further changes to the Library are recommended at this time.

ADM plans to implement efficiencies in the supply activity, which will reduce the size of the Supply Store, making it possible to relocate the store without reducing services. Relocating the Supply Store from its present location would provide an optimum location for the approximately 30 document processing contractors currently on the 6th floor of OWFN, freeing up needed space for expansion of the Office of Nuclear Reactor Regulation and enhancing operational efficiency for the Document Processing Center (DPC).

During FY 2006, the staff also plans to remove temporary workstations from conference rooms and recover several of these rooms for general meeting room use. The staff is also exploring the use of adjacent offsite conference room space for conducting meetings.

Rent Additional Offsite Space to House NRC Staff

ADM queried the GSA on the availability of nearby office space comparable in quality to space in the WFC. GSA identified several locations within a half-mile radius that may meet NRC criteria for offsite office space where the NRC could create 150 additional workstations. GSA also identified space located 1.5 miles north of the WFC on Rockville Pike that is being vacated by the Food and Drug Administration and will be under lease by GSA through February 2009. Relocating there would provide the benefits of reduced cost of a long-term lease, along with the flexibility of consolidating NRC assets located outside the WFC complex in the FY 2008 or FY 2009 time frame to a more optimum location.

Move Onsite Contractors Out of the Complex

There are about 170 contractors occupying the equivalent of approximately 140 workstations in office space in the WFC, mostly supporting computer operations. Moving many of these contractors would not be feasible for operational reasons because it would substantially affect their ability to deliver needed services. For example, the efficiency of the DPC contractor operations is highly dependent on its location and accessibility to mail and office staff.

Plans to Provide Adequate Office Space Through FY 2007

Based on the Chairman's proposed FY 2007 Budget and the potential for additional funding to support security and new reactor licensing in FY 2006, the staff developed two scenarios. Scenario A assumes HQ FTE remain at the level contained in the Chairman's FY 2007 Budget. Scenario B assumes that NRC receives additional funding and HQ FTE to support security and new reactor licensing activities in FY 2006.

Scenario A

	FY 2005	FY 2006	FY 2007
HQ FTE	2,289	2,327	2,485
HQ FTE Growth		38	158

The staff intends to take the following steps with funds available in FY 2006 and FY 2007 to ensure that there is an adequate amount of office space for NRC employees in the WFC through FY 2007. The proposed items specified below along with the modifications to be accomplished by the end of FY 2005 will achieve a vacancy level of approximately 5.5 percent through FY 2007, assuming that NRC headquarters adds approximately 135 FTE above the maximum occupancy level of 2,350.

1. Move the PDC from TWFN 3rd floor to GSA space 1.5 miles north on Rockville Pike (3,500 feet from Twinbrook metro station) or another suitable site in the Rockville area by June 2006. Construct approximately 90 workstations on the TWFN 3rd floor. In order to occupy new workstations on the TWFN 3rd floor during the first quarter of FY 2007, NRC would have to submit space requirements to GSA no later than August 2005.

2. Continue to more efficiently use space within the WFC by building additional workstations in other available space. We estimate that about 20 additional workstations can be added without changing the office space standards or having a significant impact on amenities for staff. The staff will also continue to monitor use of office space for contractors to ensure use is reasonable, necessary and cost effective.

3. Relocate the DPC contractors from the OWFN 6th floor to the current Supply Store location. This will free up 30 workstations on OWFN 6th floor in FY 2007. ADM is exploring options for reducing Supply Store space through the use of automation. Based on the results of that analysis, ADM will identify a suitable location for the Supply Store on the P-1, lobby level, or second floor of OWFN.

Scenario B

	FY 2005	FY 2006	FY 2007
HQ FTE	2,289	2,406	2,485
Additional HQ Growth		117	79

The anticipated receipt of additional resources for new reactor licensing and security related work would result in approximately 117 additional HQ FTE in FY 2006. The staff anticipates an additional 20 onsite contractors in FY 2006 above the current occupancy level, based on office projections at this time. If the additional resources are approved by Congress, the actions outlined above would need to be accelerated to accommodate this growth in FY 2006.

RESOURCES:

Table I contains the resources needed for Items 1 - 3 above.

Table I

	FY 2005	FY 2006		FY 2007	
Item	**Action**	**Cost**	**Action**	**Cost**	**Action**
1. Move PDC offsite and construct 90 workstations (WS) on T-3	Submit offsite space requirement of approx. 10, 000 s.f. to GSA in August 2005	\$ 675K - ADM[3] \$ 420K - OIS \$1,095K	Move PDC offsite in June 2006 and begin construction on T-3	\$ 850K - ADM \$ 407K - OIS \$1,257K	Move staff into 90 WS on T-3 in December 2006
2. Construct an additional 20 WS throughout WFC		\$ 50K - ADM \$ 58K - OIS \$108K	Construct 10 additional WS in January 2006	\$ 50K - ADM \$100K[4] - OIS \$150K	Construct 10 additional WS in January 2007
3. Relocate DPC to P1 and relocate and reduce size of the Supply Store			Identify new location for Supply Store in September 2006	\$350K - ADM \$153K - OIS \$503K	Relocate Supply Store in January 2007. Relocate DPC to P-1 in April 2007.
Total		\$ 725K - ADM \$ 478K - OIS \$1,203K		\$1,250K - ADM \$ 660K - OIS \$1,910K	

Total resources for Items 1, 2 and 3 for FY 2006 are \$725,000 for ADM and are included within ADM's FY 2006 budget. OIS' FY 2006 budget does not include the \$478,000 required to complete these plans. However, there are sufficient resources in the additional FY 2006 funding currently being considered by Congress to cover this need.

[3] Assumes 4 months rent in FY 2006.

[4] Cost based on 20 new workstations being supported under seat management.

In FY 2007, the total resources for Items 1, 2 and 3 are $1,250,000 and 2 FTE for ADM and $660,000 and 6 FTE for OIS. Both the ADM and OIS FY 2007 budgets contain the necessary resources to implement this plan. The FY 2007 budget includes $4.5M for space and infrastructure to address uncertainties in the new reactor applications and associated growth in FY 2008 and beyond. Given those uncertainties, the CFO and I recommend no changes to our FY 2007 space planning budget at this time.

COORDINATION:

The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections. The Office of the General Counsel has reviewed this paper and has no legal objection.

/RA/

Luis A. Reyes
Executive Director
for Operations

Attachments:
1. WFC Space Optimization Plan
2. WFC Special Space

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The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections. The Office of the General Counsel has reviewed this paper and has no legal objection.

/RA/

Luis A. Reyes
Executive Director
for Operations

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1. WFC Space Optimization Plan
2. WFC Special Space

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Summary

White Flint Complex Space Optimization Initiatives

December 2003 - Converted 4,000 square feet of file room space to construct 42 workstations.

June 2003 - Moved the Document Processing Contractor off the 4th floor and reconfigured this floor to accommodate NSIR and reconfigure workstations.

May 2004 - Substantially reconfigured the 8th floor to add 25 workstations. This included the removal of a small SCIF on this floor.

May 2004 - Constructed 42 workstations in 7 conference rooms to mitigate the effect of bringing on board summer hires. As of early June 2005, 38 of these workstations were occupied to support the persons displaced by construction in TWFN.

August - September 2004 - An assessment and analysis of the adequacy of the NRC Space Planning System and space utilization at NRC Headquarters was performed by our contractor, McManis & Monsalve Associates. This assessment showed we have a good infrastructure to monitor space usage, verified that we are using space effectively, and concluded that our occupancy levels were higher than preferred.

September 2004 - Substantially reconfigured the 9th floor to move the CFO Office Director and Staff from OWFN.

March 2005 - Expanded the computer center on the 5th floor by 4,000 square feet and moved in 35 OIS contractors, consolidating the Network Operations Center, the help desk, and the Computer Test Facility.

April - June 2005 - Demolished the Computer Test Facility (2,000 sq. ft.) and several other spaces on the 2nd floor of TWFN (including removing 1,000 sq. ft. of library space) to construct 35 additional workstations.

August 2005 - Developed plan to reconfigure several areas on the 6th floor to add 10 workstations. (ongoing)

Special Space in the White Flint Complex

Area	Square Footage	Impact on NRC Staff of Relocating Space Off Site
Professional Development Center	10,100	Inconvenient to staff. Additional cost to provide shuttle service.
Supply Store	3,900	Delays in receiving required supply items.
Health Center	2,700	Potential impact on timely response to employee health and safety issues. Major component of mandatory employee wellness program. Reduces recruitment incentives. May contribute to higher employee absences.
Library	5,700	Already reduced by 1,000 s. f. in FY 2005.
Computer Center	5,300	Already reduced by 900 s. f. to consolidate OIS functions and gain 34 workstations in FY 2005.
Exhibit Area	2,900	Not conducive for office space due to high ceiling and cost to convert a unique area.
Cafeteria	5,000	Reduces recruitment incentives. Negative impact on employee moral.

OFFICIAL USE ONLY
May be exempt from public release under the Freedom of Information Act (5 U.S.C. 552)

Exemption number 4
Nuclear Regulatory Commission review required before release.
Kathryn Greene, ADM
Name and organization of person making determination.

Date of Determination June 30, 2005

Attachment 2

Area	Square Footage	Impact on NRC Staff of Relocating Space Off Site
Fitness Center	5,500	Reduces recruitment incentives. Not conducive for office space due to high ceiling and cost to convert a unique area. Negative impact on employee moral.
File Room	3,800	Already reduced by 4,000 s. f. to consolidate OIS functions and gain 45 workstations.
Day Care Center	9,600	Reduces recruitment incentives. Not conducive for office space due to cost to convert a unique area. Negative impact on employee morale.

13

POLICY ISSUE
NOTATION VOTE

July 29, 2005 SECY-05-0137

FOR: The Commissioners

FROM: Luis A. Reyes
Executive Director for Operations

SUBJECT: PROPOSED REVISED ABNORMAL OCCURRENCE CRITERIA

PURPOSE:

To obtain Commission approval of the draft revised abnormal occurrence (AO) criteria for the staff of the U.S. Nuclear Regulatory Commission (NRC) and Agreement States to use in identifying potential abnormal occurrences.

BACKGROUND:

In a Commission paper (SECY-04-0046), entitled "Fiscal Year [FY] 2003 Report to Congress on Abnormal Occurrences," dated March 18, 2004, the staff forwarded a draft of the AO report for 2003 (NUREG-0090, Volume 26) for Commission review and approval. In that Commission paper, the staff stated its intent to consider additional changes to the AO criteria in the future.

The staff of the Office of Regulatory Research (RES) subsequently established a working group in May 2004 to facilitate review of the existing criteria and determine whether any changes were warranted. That working group included representatives of RES and the NRC's Offices of Nuclear Reactor Regulation (NRR), Nuclear Material Safety and Safeguards (NMSS), Nuclear Security and Incident Response (NSIR), and State and Tribal Programs (STP), as well as the NRC's four regional offices. Working together, these representatives evaluated and revised the AO criteria to ensure that each criterion is consistent with the NRC's Strategic Plan for FY2004-2009, the Performance Measures and Metrics for FY2005-2006, and the NRC's recent rulemaking on Title 10 CFR Part 35, "Medical Use of Byproduct Material."

CONTACT: Stephanie P. Bush-Goddard, RES
(301) 415-6293

E-4

DISCUSSION:

Section 208 of the Energy Reorganization Act of 1974 (Public Law 93-438) defines an AO as an unscheduled incident or event that the NRC deems significant from the standpoint of public health or safety. This definition establishes the agency's statutory requirement for identifying and classifying events. The criteria established fall into the following categories:

I. For All Licensees
II. For Commercial Nuclear Power Plant Licensees
III. For Fuel Cycle Facilities
IV. For Medical Licensees
V. Other Events of Interest

As a result of its review, the staff proposes a change to the existing criteria to better align the AO criteria with the NRC Strategic Plan and Performance Measures. In proposing these changes, the staff has developed a proposed new structure for the criteria as follows:

I. For All Licensees
II. For Commercial Nuclear Power Plant Licensees
III. For All Transportation Events and Events at Facilities Other than Nuclear Power Plants
IV. Other Events of Interest

Re-structuring the categories better supports the changes made in the individual criteria and minimizes duplication that would be required if the existing categories were used. The proposed AO criteria are listed in Attachment 1 and the existing AO criteria are provided in Attachment 2. The remainder of this section identifies and discusses the specific changes to the AO criteria.

SECTION I, "FOR ALL LICENSEES"

Criterion B in Section I is entitled, "Discharge or Dispersal of Radioactive Material from Its Intended Place of Confinement at Fixed Facilities." This criterion is intended to capture significant events associated with the discharge or dispersal of radioactive material from license facilities. The staff proposes the following changes to the current criterion.

The first proposed change to Criterion 1.B.1 is to add the phase, "This does not include transportation events," to the end of the criterion. The staff proposes this change to clarify that the activity concentrations provided in Table 2 of Appendix B to 10 CFR Part 20 pertain to effluent releases at fixed facilities but not to transportation events. The second proposed change is to delete the current section, Criterion I.B.2., in its entirety to prevent confusion with the reporting thresholds for transportation-related events. The staff believes the existing criteria (Attachment 2) are sufficient to cover transportation events.

Criterion C in Section I is entitled, "Theft, Diversion, or Loss of Licensed Material, or Sabotage or Security Breach." This criterion is intended to capture significant security events. The staff proposes two changes to this criterion.

The first proposed change to Criterion I.C.1. resulted from a staff requirements memorandum (SRM), entitled "Discussion of Intergovernmental Issues," dated August 21, 2003. In that SRM, the Commission directed the staff to move forward with tracking radioactive sources that if abandoned, unsecured, unrecovered, or stolen could be used for malicious purposes to cause harmful health effects. The International Atomic Energy Agency (IAEA) described these high-risk sources and their activity thresholds in its draft TECDOC-1344, entitled "Categorization of Radioactive Sources." That document provides the supporting technical basis for the IAEA's Code of Conduct on the Safety and Security of Radioactive Sources, as listed in Categories 1 and 2 of Table 1 to the Code. The Commission has since codified these requirements in Appendix P to 10 CFR Part 110, "High-Risk Radioactive Material, Category 2," and plans to issue a Regulatory Information Summary, "RIS-2005-XX, Clarification of the Reporting Requirements in 10 CFR 20.2201," to clarify the reporting requirements for recovery of sources in accordance with the 10 CFR Part 20, "Standards for Protection Against Radiation." Consistent with the Commission's direction, the proposed change to the security AO criterion would require the NRC to report to Congress any events involving unrecovered losses or thefts of risk-significant sources if the quantities exceed the thresholds specified in Appendix P to 10 CFR Part 110, "High-Risk Radioactive Material, Category 2." Lost sources would be considered as "unrecovered losses" until they decay to below Category 2 thresholds or until they are recovered, whichever occurs first. In FY 2006, the Commission plans to complete the National Source Tracking System rulemaking and these AO criteria may be revisited at that time.

The second proposed change to Criterion I.C. is to add new language (as Criterion I.C.5) that would require the NRC to report to Congress any significant events involving unauthorized disclosures of classified and/or safeguards information that caused harm to national security. Currently, AO criteria do not speak to unauthorized disclosures of classified and/or safeguards information that could assist potential terrorists. The proposed wording would apply to any person, including NRC employees, whether or not affiliated with an NRC licensee, who discloses safeguards information or material, and/or classified information or material.

Criterion D in Section I is currently entitled, "Other Events (i.e., Those Concerning Design, Analysis, Construction, Testing, Operation, Use, or Disposal of Licensed Facilities or Regulated Materials)." This criterion was intended to capture other events not specifically identified in Criterion's A, B and C of Section I, "For All Licensees."

As the revised criteria for nuclear power plants are very similar to the events described under this existing criterion, the staff proposes to move this criterion from Section I, "For All Licensees," to a new section identified as, Section III, "For Facilities Other Than Nuclear Power Plants," under Subcriterion A, "For All Licensees Other Than Nuclear Power Plants."

The staff proposes a new Criterion D, in Section I, entitled, "Initiation of High-Level NRC Team Inspections," to capture significant operational events not covered under other criteria. This would ensure a more effective means to identify a "significant" incident while connecting the criteria to NRC actions such as Accident Review Groups and Incident Investigation Teams. The staff believes these proposed changes will yield consistent, more predictable, and less subjective results than the current criteria.

SECTION II, "FOR COMMERCIAL NUCLEAR POWER PLANT LICENSEES"

This section, entitled, "For Commercial Nuclear Power Plant Licensees," specifies criteria that are intended to capture significant safety events at commercial nuclear power plant facilities. The staff proposes to delete the current criteria in this section and replace them with new criteria that are based on the number and significance of NRC inspection findings and licensee performance indicators.

The proposed changes are consistent with those used for reporting to Congress in NRC's annual Performance Budget (NUREG-1100), and Performance and Accountability Report (NUREG-1542). Furthermore, the proposed changes integrate the various strategic planning, budgeting, and reporting processes; risk-inform the existing deterministic criteria; and ensure agency follow-up of issues reported to Congress.

Specifically, the proposed Criterion II.A includes any events or conditions evaluated by the NRC's Accident Sequence Precursor (ASP) program to have a conditional core damage probability (CCDP) given an occurrence of an initiating event or an increase in the core damage probability (CDP) due to a degraded condition of plant equipment of greater than 1×10^{-3}. Such events have a probability of greater than 1 in 1000 (10^{-3}) of leading to a reactor accident involving core damage. An identical condition affecting more than one plant is counted as a single ASP-event if a single accident initiator would have resulted in a single reactor accident. Additionally, Criterion II.A also includes any conditions evaluated by the NRC's Reactor Oversight Process (ROP) to be Red, as described in NRC Management Directive 8.13, "Reactor Oversight Process." This includes any Red findings or Red performance indicators.

In addition, the proposed Criterion II.B includes any plants that are determined to have overall unacceptable performance, or that are in a shutdown condition as a result of significant performance problems and/or operational events, as described in NRC-Inspection Manual Chapter 0350, "Oversight of Operating Reactor Facilities in a Shutdown-Condition with Performance Problems."

SECTION III, "FOR FACILITIES OTHER THAN NUCLEAR POWER PLANTS"

Section III entitled, "For Facilities Other Than Nuclear Power Plants," is intended to capture significant safety and security events at all facilities other than nuclear power plants, including fuel cycle and medical facilities.

Criterion A in Section III is unchanged from the existing criterion, but was moved from the current Section I, D, as previously discussed.

Criterion B in Section III is intended to capture significant safety and security events at fuel cycle facilities. The proposed changes are intended to risk-inform the existing criterion to be commensurate with hazard, likelihood, and consequences. As such, the proposed criterion envelops NRC's regulated radiological and chemical hazards, is consistent with licensing and the certification bases, and aligns them with regulatory reporting requirements.

Criterion C in Section III is intended to capture significant safety events involving medical licensees. Changes proposed here are discussed below.

The first proposed change involves adding language to increase the dose threshold for gonads from 1 Gy (100 rads) to 2.5 Gy (250 rads). This is consistent with the recommendations of the International Commission on Radiological Protection (ICRP), as stated in Publication 60, "1990 Recommendations of the ICRP," that a dose range of 2.5 Gy (250 rads) to 6 Gy (600 rads) to the ovaries causes permanent sterility. By corollary, the dose range to the testes causing permanent sterility is 3.5 to 6.0 Gy (350 rads to 600 rads). This proposed change would ensure that the NRC would report to Congress only significant events with permanent adverse health effects.

The second proposed changed is to add the phrase "or tissue" to capture events involving structures that may not be considered organs (e.g., blood vessels). Doses used for therapeutic purposes in treating disease customarily approach or exceed the tolerance of normal tissue and are intended to kill cells. With this in mind, the staff proposes to modify the medical criterion to acknowledge the introduction of evolving therapeutic treatment procedures that deliver high radiation doses to localized portions of an organ or tissue with potential for significant injury to the patient.

The third change would capture events in which the administered dosage is at least 50 percent greater than prescribed, regardless of whether a written directive was required. The staff believes it is important to capture all patient administrations of byproduct materials that significantly exceeded the intended dose. Furthermore, the staff believes this change to the AO criteria can be made within the existing regulatory framework (i.e., without the need to amend the medical event criteria in 10 CFR Part 35.)

The fourth change is to add the term "unsealed byproduct material" to align the AO criteria with the language in 10 CFR Part 35, "Medical Use of Byproduct Material."

Finally, the fifth proposed change would capture events in which a significant administration of byproduct material was delivered to the wrong individual or human research subject. The staff believes it is important to capture these types of events for inherent safety reasons, and also to align the AO criteria with the medical event criteria in 10 CFR Part 35.

SECTION IV, "OTHER EVENTS OF INTEREST"

The staff proposes to amend the current Section V, entitled, "Other Events of Interest." This section (now Section IV) discusses events that do not meet the AO criteria but have been perceived by Congress or the public to be of high health and safety significance, have received media coverage, or have caused the NRC to increase its attention to or oversight of a program area, including a group of similar events that have resulted in licensed materials entering the public domain in a uncontrolled manner. The proposed change is to include examples of events that could be included in this area to facilitate identification of appropriate items to include.

COORDINATION:

The Office of the General Counsel has reviewed the proposed changes and has no legal objections.

RECOMMENDATION:

The staff recommends that the Commission authorize publication of the proposed Policy Statement for public comment. This proposed Policy Statement revises the AO criteria that the NRC would use to determine abnormal occurrences. A Federal Register Notice soliciting comment on the proposed criteria is provided as Attachment 3.

/RA/

Luis A. Reyes
Executive Director
For Operations

Attachments:
1. Draft Abnormal Occurrence Criteria and Guidelines for Other Events of Interest
2. Current Abnormal Occurrence Criteria and Guidelines for Other Events of Interest
3. Abnormal Occurrence Reports: Implementation of Section 208 of the Energy Reorganization Act of 1974; Revised Policy Statement

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Luis A. Reyes
Executive Director
For Operations

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DRAFT ABNORMAL OCCURRENCE CRITERIA AND GUIDELINES FOR OTHER EVENTS OF INTEREST

Criteria by types of events used to determine which events will be considered for reporting as AOs are as follows:

I. For All Licensees.

A. Human Exposure to Radiation from Licensed Material

1. Any unintended radiation exposure to an adult (any individual 18 years of age or older) resulting in an annual total effective dose equivalent (TEDE) of 250 mSv (25 rem) or more; or an annual sum of the deep dose equivalent (external dose) and committed dose equivalent (intake of radioactive material) to any individual organ other than the lens of the eye, bone marrow, and the gonads, of 2,500 mSv (250 rem) or more; or an annual dose equivalent to the lens of the eye, of 1 Sv (100 rem) or more; or an annual sum of the deep dose equivalent and committed dose equivalent to the bone marrow, and the gonads, of 1 Sv (100 rem) or more; or an annual shallow-dose equivalent to the skin or extremities of 2,500 mSv (250 rem) or more.

2. Any unintended radiation exposure to any minor (an individual less than 18 years of age) resulting in an annual TEDE of 50 mSv (5 rem) or more, or to an embryo/fetus resulting in a dose equivalent of 50 mSv (5 rem) or more.

3. Any radiation exposure that has resulted in unintended permanent functional damage to an organ or a physiological system as determined by a physician.

B. Discharge or dispersal of radioactive material from its intended place of confinement which results in the release of radioactive material to an unrestricted area in concentrations which, if averaged over a period of 24 hours, exceeds 5,000 times the values specified in Table 2 of Appendix B to 10 CFR Part 20, unless the licensee has demonstrated compliance with § 20.1301 using § 20.1302 (b) (1) or § 20.1302 (b) (2) (ii). This does not include transportation events.

C. Theft, Diversion, or Loss of Licensed Material, or Sabotage or Security Breach[1]

1. Any unrecovered lost, stolen, or abandoned sources that the Commission has determined to be risk significant (exceeds the values listed in Appendix P to Part 110, "High Risk Radioactive Material, Category 2"). Excluded from

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1 Information pertaining to certain incidents may be either classified information or material or safeguards information or material under consideration for classification because of national security implications. Classified information will be withheld when formally reporting these incidents in accordance with Section 208 of the ERA of 1974, as amended. Any classified or safeguards information details regarding these incidents would be available to the Congress, upon request, under appropriate security arrangements.

reporting under this criterion are those events involving sources that are lost, stolen, or abandoned under the following conditions: sources abandoned in accordance with the requirements of 10 CFR 39.77(c); sealed sources contained in labeled, rugged source housings; recovered sources with sufficient indication that doses in excess of the reporting thresholds specified in AO criteria I.A.1 and I.A.2 did not occur during the time the source was missing; and unrecoverable sources (sources that have been lost and a reasonable attempt at recovery has been made without success) lost under such conditions that doses in excess of the reporting thresholds specified in AO criteria I.A.1 and I.A.2 were not known to have occurred and the agency has determined that the risk of theft or diversion is acceptable.

2. A substantiated case of actual or attempted theft or diversion of licensed material or sabotage of a facility.

3. Any substantiated loss of special nuclear material or any substantiated inventory discrepancy that is judged to be significant relative to normally expected performance, and that is judged to be caused by theft or diversion or by substantial breakdown of the accountability system.

4. Any substantial breakdown of physical security or material control (i.e., access control containment or accountability systems) that significantly weakened the protection against theft, diversion, or sabotage.

5. Any significant unauthorized disclosures (loss or theft) of classified[2] and/or safeguards information.

D. Initiation of High Level NRC Team Inspections.[3]

II. For Commercial Nuclear Power Plant Licensees

A. Any reactor events or degraded plant conditions that are determined to be of high safety significance.[4]

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2 Due to increased terrorist activities worldwide, the AO report would not disclose specific classified information or material or safeguards information or material and details considered useful to potential terrorists. Classified information or material or safeguards information or material is defined as information that would harm national security if disclosed in an unauthorized manner.

3 Initiation of any Incident Investigation Teams, as described in NRC Management Directive (MD) 8.3, "NRC Incident Investigation Program," or initiation of any Accident Review Groups, as described in MD 8.9, "Accident Investigation."

4 Any conditions evaluated by the NRC's Reactor Oversight Process (ROP) to be Red, as described in NRC Management Directive 8.13, "Reactor Oversight Process." In general, Red inspection findings are included in the fiscal year in which the final significance determination was made, and Red performance indicators are included in the fiscal year in which the NRC's external web page for the ROP was updated to show the Red indicator. Additionally, Criterion II.A also includes any events or conditions evaluated by the NRC's Accident Sequence Precursor (ASP) program to have a conditional core damage probability (CCDP) or change in the core damage probability (CDP) of greater than $1x10^{-3}$. An identical condition affecting more than one plant is counted as a single ASP-event if a single indicator would have resulted in a single reactor accident.

B. Any operating reactor plants that are determined to have overall unacceptable performance, or that are in a shutdown condition as a result of significant performance problems and/or operational event(s).[5]

III. For All Transportation Events and Events at Facilities Other than Nuclear Power Plants

A. Events Concerning Design, Analysis, Construction, Testing, Operation, Transport, Use, or Disposal of Licensed Facilities or Regulated Materials

1. An accidental criticality [10 CFR 70.52(a)].

2. A major deficiency in design, construction, control, or operation having significant safety implications requiring immediate remedial action.

3. A serious safety-significant deficiency in management or procedural controls.

4. Series of events (where individual events are not of major importance), recurring incidents, and incidents with implications for similar facilities (generic incidents) that create a major safety concern.

B. For Fuel Cycle Facilities

1. Absence/failure of all safety-related or security-related controls (engineered and human) for an NRC regulated lethal hazard (radiological or chemical) while the lethal hazard is present.

2. An NRC ordered safety-related or security-related immediate remedial action.

C. For Medical Licensees

A medical event that:

1. Results in a dose that is

a. equal to or greater than 1Gy (100 rad) to a major portion of the bone marrow, or to the lens of the eye; or 2.5 Gy (250 rad) to the gonads; or
b. equal to or greater than 10 Gy (1,000 rad) to any other organ or tissue; and

2. Represents either

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5 Any plants assessed by the ROP to be in the unacceptable performance column, as described in NRC Inspection Manual Chapter 0305, "Operating Reactor Assessment Program." This assessment of safety performance is based on the number and significance of NRC inspection findings and licensee performance indicators.

a. a dose or dosage that is at least 50 percent greater than that prescribed, or

b. a prescribed dose or dosage that

   (i) is the wrong radiopharmaceutical or unsealed byproduct material; or

   (ii) is delivered by the wrong route of administration; or

   (iii) is delivered to the wrong treatment site; or

   (iv) is delivered by the wrong treatment mode; or

   (v) is from a leaking source or sources; or

   (vi) is delivered to the wrong individual or human research subject.

IV. Other Events of Interest

The Commission may determine that events other than AOs maybe of interest to Congress and the public and should be included in an appendix to the AO report as "Other Events of Interest." Guidelines for events to be included in the AO report for this purpose may include, but not necessarily be limited to, events that do not meet the AO criteria but that have been perceived by Congress or the public to be of high health and safety significance, have received significant media coverage, or have caused the NRC to increase its attention to or oversight of a program area, or a group of similar events that have resulted in licensed materials entering the public domain in an uncontrolled manner. Examples include 1.) any significant adverse trends in industry safety performance, 2.) the initiation of an Augmented Inspection Team per MD 8.3., or 3.) any plant that enters the Multiple/Repetitive Degraded Cornerstone Column of the ROP Action Matrix.

CURRENT ABNORMAL OCCURRENCE CRITERIA AND GUIDELINES FOR OTHER EVENTS OF INTEREST

An accident or event will be considered an abnormal occurrence (AO) if it involves a major reduction in the degree of protection of public health or safety. This type of incident or event would have a moderate or more severe impact on public health or safety and could include, but need not be limited to, the following:

(1) Moderate exposure to, or release of, radioactive material licensed by or otherwise regulated by the Commission;

(2) Major degradation of essential safety-related equipment; or

(3) Major deficiencies in design, construction, use of, or management controls for facilities or radioactive material licensed by or otherwise regulated by the Commission.

The following criteria for determining an AO and the guidelines for "Other Events of Interest" were stated in an NRC policy statement published in the *Federal Register* on December 19, 1996 (61 FR 67072). The policy statement was revised to include criteria for gaseous diffusion plants and was published in the *Federal Register* on April 17, 1997 (62 FR 18820).

Note that in addition to the criteria for fuel cycle facilities (Section III of the AO criteria) that are applicable to licensees and certificate holders, such as the gaseous diffusion plants, other criteria that reference "licensees," "licensed facility," or "licensed material" also may be applied to events at facilities of certificate holders.

The guidelines for including events in Appendix C "Other Events of Interest" of this report were provided by the Commission in the Staff Requirements Memorandum on SECY-98-175, dated September 4, 1998, and are listed at the end of this Appendix.

<u>Abnormal Occurrence Criteria</u>

Criteria by types of events used to determine which events will be considered for reporting as AOs are as follows:

I. For All Licensees

A. Human Exposure to Radiation from Licensed Material

1. Any unintended radiation exposure[1] to an adult (any individual 18 years of

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1 An unintended radiation exposure for the purpose of reporting as an AO includes any occupational exposure, exposure to the general public, or exposure as a result of a medical event involving the wrong patient that exceeds the reporting values established in the regulation. All other reporting medical events will be considered for reporting as an AO under the criteria "For Medical Licensees."

In addition, unintended radiation exposures includes any exposure to a nursing infant, fetus, or embryo as a result of an exposure (other than an occupational exposure to an undeclared pregnant woman) to a nursing mother or pregnant woman.

age or older) resulting in an annual total effective dose equivalent (TEDE) of 250 mSv (25 rem) or more; or an annual sum of the deep dose equivalent (external dose) and committed dose equivalent (intake of radioactive material) to any individual organ other than the lens of the eye, bone marrow, and the gonads, of 2,500 mSv (250 rem) or more; or an annual dose equivalent to the lens of the eye, of 1 Sv (100 rem) or more; or an annual sum of the deep dose equivalent and committed dose equivalent to the bone marrow, and the gonads, of 1 Sv (100 rem) or more; or an annual shallow-dose equivalent to the skin or extremities of 2,500 mSv (250 rem) or more.

2. Any unintended radiation exposure to any minor (an individual less than 18 years of age) resulting in an annual TEDE of 50 mSv (5 rem) or more, or to an embryo/fetus resulting in a dose equivalent of 50 mSv (5 rem) or more.

3. Any radiation exposure that has resulted in unintended permanent functional damage to an organ or a physiological system as determined by a physician.

B. Discharge or Dispersal of Radioactive Material from its Intended Place of Confinement

1. The release of radioactive material to an unrestricted area in concentrations which, if averaged over a period of 24 hours, exceeds 5,000 times the values specified in Table 2 of Appendix B to 10 CFR Part 20, unless the licensee has demonstrated compliance with § 20.1301 using § 20.1302 (b) (1) or § 20.1302 (b) (2) (ii).

2. Radiation levels in excess of the design values for a package, or the loss of confinement of radioactive material resulting in one or more of the following: (a) a radiation dose rate of 10 mSv (1 rem) per hour or more at 1 meter (3.28 feet) from the accessible external surface of a package containing radioactive material; (b) a radiation dose rate of 50 mSv (5 rem) per hour or more on the accessible external surface of a package containing radioactive material and that meet the requirements for "exclusive use" as defined in 10 CFR 71.47; or (c) release of radioactive material from a package in amounts greater than the regulatory limits in 10 CFR 71.51(a)(2).

C. Theft, Diversion, or Loss of Licensed Material, or Sabotage or Security Breach[2]

1. Any lost, stolen, or abandoned sources that exceed 0.01 times the A_1 values, as listed in 10 CFR Part 71, Appendix A, Table A-1, for special

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2 Information pertaining to certain incidents may be either classified or under consideration for classification because of national security implications. Classified information will be withheld when formally reporting these incidents in accordance with Section 208 of the ERA of 1974, as amended. Any classified details regarding these incidents would be available to the Congress, upon request, under appropriate security arrangements.

form (sealed/nondispersible) sources, or the smaller of the A_2 or 0.01 times the A_1 values, as listed in Table A-1, for normal form (unsealed/dispersible) sources or for sources for which the form is not known. Excluded from reporting under this criterion are those events involving sources that are lost, stolen, or abandoned under the following conditions: sources abandoned in accordance with the requirements of 10 CFR 39.77(c); sealed sources contained in labeled, rugged source housings; recovered sources with sufficient indication that doses in excess of the reporting thresholds specified in AO criteria I.A.1 and I.A.2 did not occur during the time the source was missing; and unrecoverable sources lost under such conditions that doses in excess of the reporting thresholds specified in AO criteria I.A.1 and I.A.2 were not known to have occurred.

2. A substantiated case of actual or attempted theft or diversion of licensed material or sabotage of a facility.

3. Any substantiated loss of special nuclear material or any substantiated inventory discrepancy that is judged to be significant relative to normally expected performance, and that is judged to be caused by theft or diversion or by substantial breakdown of the accountability system.

4. Any substantial breakdown of physical security or material control (i.e., access control containment or accountability systems) that significantly weakened the protection against theft, diversion, or sabotage.

D. Other Events (i.e., Those Concerning Design, Analysis, Construction, Testing, Operation, Use, or Disposal of Licensed Facilities or Regulated Materials)

1. An accidental criticality [10 CFR 70.52(a)].

2. A major deficiency in design, construction, control, or operation having significant safety implications requiring immediate remedial action.

3. A serious deficiency in management or procedural controls in major areas.

4. Series of events (where individual events are not of major importance), recurring incidents, and incidents with implications for similar facilities (generic incidents) that create a major safety concern.

II. For Commercial Nuclear Power Plant Licensees

A. Malfunction of Facility, Structures, or Equipment

1. Exceeding a safety limit of license technical specification (TS) [10 CFR 50.36(c)].

2. Serious degradation of fuel integrity, primary coolant pressure boundary, or primary containment boundary.

3. Loss of plant capability to perform essential safety functions so that a release of radioactive materials, which could result in exceeding the dose limits of 10 CFR Part 100 or 5 times the dose limits of 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 19, could occur from a postulated transient or accident (e.g., loss of emergency core cooling system, loss of control rod system).

B. Design or Safety Analysis Deficiency, Personnel Error, or Procedural or Administrative Inadequacy

1. Discovery of a major condition not specifically considered in the safety analysis report (SAR) or TS that requires immediate remedial action.

2. Personnel error or procedural deficiencies that result in loss of plant capability to perform essential safety functions so that a release of radioactive materials, which could result in exceeding the dose limits of 10 CFR Part 100 or 5 times the dose limits of 10 CFR Part 50, Appendix A, GDC 19, could occur from a postulated transient or accident (e.g., loss of emergency core cooling system, loss of control rod system).

III. For Fuel Cycle Facilities

1. A shutdown of the plant or portion of the plant resulting from a significant event and/or violation of a law, regulation, or a license/certificate condition.

2. A major condition or significant event not considered in the license/certificate that requires immediate remedial action.

3. A major condition or significant event that seriously compromises the ability of a safety system to perform its designated function that requires immediate remedial action to prevent a criticality, radiological, or chemical process hazard.

IV. For Medical Licensees

A medical event that:

A. Results in a dose that is (1) equal to or greater than 1Gy (100 rad) to a major portion of the bone marrow, to the lens of the eye, or to the gonads, *or* (2) equal to or greater than 10 Gy (1,000 rad) to any other organ; and

B. Represents either (1) a dose or dosage that is at least 50 percent greater than that prescribed in a written directive or (2) a prescribed dose or dosage that (i) is the wrong radiopharmaceutical,[3] or (ii) is delivered by the wrong route of administration, or (iii) is delivered to the wrong treatment site, or (iv) is delivered by the wrong treatment mode, or (v) is from a leaking source or sources.

Guidelines for "Other Events of Interest"

The Commission may determine that events other than AOs may be of interest to Congress and the public and should be included in an appendix to the AO report as "Other Events of Interest." Guidelines for events to be included in the AO report for this purpose may include, but not necessarily be limited to, events that do not meet the AO criteria but that have been perceived by Congress or the public to be of high health and safety significance, have received significant media coverage, or have caused the NRC to increase its attention to or oversight of a program area, or a group of similar events that have resulted in licensed materials entering the public domain in an uncontrolled manner.

3 "The wrong radiopharmaceutical" as used in the AO criterion for a medical event refers to any radiopharmaceutical other than the one listed in the written directive or in the clinical procedures manual.

U.S. NUCLEAR REGULATORY COMMISSION

ABNORMAL OCCURRENCE REPORTS: IMPLEMENTATION OF SECTION 208 OF THE ENERGY REORGANIZATION ACT OF 1974; REVISED POLICY STATEMENT

AGENCY: U.S. Nuclear Regulatory Commission.

ACTION: Issuance of Revised Policy Statement on Abnormal Occurrence Criteria and Solicitation of Comments.

SUMMARY: Section 208 of the Energy Reorganization Act of 1974 (Public Law 93-438) defines an abnormal occurrence (AO) as an unscheduled incident or event which the U.S. Nuclear Regulatory Commission (NRC) determines to be significant from the standpoint of public health or safety. This policy statement presents the revised AO criteria the NRC will use in submitting its annual report to Congress and the public. The AO criteria have been amended to ensure that each criterion is consistent with the NRC's Strategic Plan for Fiscal Year (FY) 2004–2009; the FY 2005–2006 Performance Measures and Metrics; and NRC rulemaking on Title 10, Part 35, of the Code of Federal Regulations (10 CFR Part 35), "Medical Use of Byproduct Material." Some sections of the AO criteria also have a revised structure and new titles. Restructuring the categories better supports the changes made in the individual criteria and minimizes duplication that would be required if the existing categories were used.

DATES: Submit comments by (insert date 90 days after publication in the Federal Register). Comments received after the above date will be considered if it is practicable to do so, but assurance of consideration cannot be given to comments received after that date.

ADDRESSES: You may submit comments by any one of the following methods. Comments submitted in writing or electronic form will be made available for public inspection. Mail comments to: Secretary, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, ATTN: Rulemakings and Adjudications Staff. E-mail comments to: SECY@nrc.gov. If you do not receive a reply e-mail confirming that we have received your comments, contact us directly at (301) 415-1966. Hand deliver comments to: 11555 Rockville Pike, Rockville, Maryland 20852, between 7:30 a.m. and 4:15 p.m. on Federal workdays (telephone (301) 415-1966). Fax comments to: Secretary, U.S. Nuclear Regulatory Commission at (301) 415-1101.

Publicly available documents may be viewed electronically on the public computers located at the NRC's Public Document Room (PDR), One White Flint North, 11555 Rockville Pike, Room O1-F21, Rockville, Maryland. The PDR reproduction contractor will copy documents for a fee. The public can gain entry into the NRC's Agencywide Document Access and Management System (ADAMS) through the agency's public Web site at www.nrc.gov. This Web site provides text and image files of the NRC's public documents. If you do not have access to ADAMS or if there are problems in accessing the documents located in ADAMS, contact the NRC Public Document Room (PDR) Reference Staff at 1-800-397-4209, 301-415-4737 or by email to pdr@nrc.gov.

FOR FURTHER INFORMATION CONTACT: Sheryl Burrows, telephone: (301) 415-6086; e-mail: SAB2@nrc.gov; USNRC, Office of Nuclear Regulatory Research, Mail Stop T9-F31, Washington, DC 20555-0001.

A copy of the final supporting statement may be viewed free of charge at the NRC Public Document Room, One White Flint North, 11555 Rockville Pike, Room O-1 F21, Rockville, Maryland.

SUPPLEMENTARY INFORMATION:

I. Background

Section 208 of the Energy Reorganization Act of 1974 (Public Law 93-438) defines an abnormal occurrence (AO) as an unscheduled incident or event which the U.S. Nuclear Regulatory Commission (NRC) determines to be significant from the standpoint of public health or safety. The Federal Reports Elimination and Sunset Act of 1995 (Public Law 104-66) requires that AOs be reported to Congress annually. As required by Section 208, the discussion for each event includes the date and place, the nature and probable consequences, the cause or causes, and the action taken to prevent recurrence. The Commission also shall provide wide dissemination to the public of the information within 15 days of publishing the AO report to Congress.

Abnormal Occurrence Reporting

The AO statement of policy has been developed to comply with the legislative intent of Section 208 of the Energy Reorganization Act of 1974, as amended. It keeps Congress and the public informed of unscheduled incidents or events which the Commission considers significant from the standpoint of public health and safety. The policy reflects a range of health and safety concerns and is applicable to incidents and events involving a single individual, as well as those having overall impact on the general public. The Commission has established reporting thresholds at a level that will ensure that all events that should be considered for reporting to Congress will be identified. At the same time, the thresholds are generally above the normal level of reporting to NRC to exclude those events that involve some variance from regulatory limits, but are not significant from the standpoint of public health and safety.

Licensee Reports

This general statement of policy will not change the reporting requirements imposed on NRC licensees by Commission regulations, license conditions, or technical specifications (TS). NRC licensees will continue to submit required reports on a wide spectrum of events, including events such as instrument malfunctions and deviations from normal operating procedures that are not significant from the standpoint of the public health and safety, but do provide data useful to the Commission in monitoring operating trends of licensed facilities and in comparing the actual performance of these facilities with the potential performance for which the facilities were designed and/or licensed.

II. The Commission Policy: General Statement of Policy on Implementation of Section 208 of the Energy Reorganization Act of 1974, as Amended.

Applicability

Implementation of Section 208 of the Energy Reorganization Act of 1974, as amended, Abnormal Occurrence Reports, involves the conduct of Commission business and does not impose requirements on licensees or certified facilities. Reports will cover certain unscheduled incidents or events related to the manufacture, construction, or operation of a facility or conduct of an activity subject to the requirements of Parts 20, 30 through 36, 39, 40, 50, 61, 70, 71, 72 or 76 of Chapter I, Title 10, Code of Federal Regulations (10 CFR).

Through an exchange of information, Agreement States provide information to the NRC on incidents and events involving applicable nuclear materials that have occurred in their States. Those events reported by Agreements States that reach the threshold for reporting as an AO are also published in the "Report to Congress on Abnormal Occurrences."

Abnormal Occurrence General Statement of Policy

The Commission will apply the following policy in determining whether an incident or event at a facility or involving an activity that is licensed or otherwise regulated by the Commission is an AO.

An incident or event will be considered an abnormal occurrence (AO) if it involves a major reduction in the degree of protection of public health or safety. This type of incident or event would have a moderate or more severe impact on public health or safety and could include, but need not be limited to, the following:

(1) Moderate exposure to, or release of, radioactive material licensed by or otherwise regulated by the Commission;

(2) Major degradation of essential safety-related equipment; or

(3) Major deficiencies in design, construction, use of, or management controls for facilities or radioactive material.

Criteria by type of event used to determine which incident or events will be considered for reporting as AOs are set forth in Appendix A of this policy statement.

Commission Dissemination of AO Information

(1) The Commission will provide wide dissemination of information to the pubic.

(2) Each year, the Commission will submit a report to Congress listing for that period any AOs at or associated with any facility or activity which is licensed or otherwise regulated pursuant to the Atomic Energy Act of 1954, as amended, or the Energy Reorganization Act of 1974, as amended. This report will contain the date, place, nature, and probable consequences of each AO, the cause or causes of each AO and any action taken to prevent recurrence.

Appendix A: Abnormal Occurrence Criteria

Criteria by types of events used to determine which events will be considered for reporting as AOs are as follows:

I. For All Licensees

A. Human Exposure to Radiation from Licensed Material

1. Any unintended radiation exposure to an adult (any individual 18 years of age or older) resulting in an annual total effective dose equivalent (TEDE) of 250 mSv (25 rem) or more; or an annual sum of the deep dose equivalent (external dose) and committed dose equivalent (intake of radioactive material) to any individual organ other than the lens of the eye, bone marrow, and the gonads, of 2,500 mSv (250 rem) or more; or an annual dose equivalent to the lens of the eye, of 1 Sv (100 rem) or more; or an annual sum of the deep dose equivalent and committed dose equivalent to the bone marrow, and the gonads, of 1 Sv (100 rem) or more; or an annual shallow-dose equivalent to the skin or extremities of 2,500 mSv (250 rem) or more.

2. Any unintended radiation exposure to any minor (an individual less than 18 years of age) resulting in an annual TEDE of 50 mSv (5 rem) or more, or to an embryo/fetus resulting in a dose equivalent of 50 mSv (5 rem) or more.

3. Any radiation exposure that has resulted in unintended permanent functional damage to an organ or a physiological system as determined by a physician.

B. Discharge or dispersal of radioactive material from its intended place of confinement which results in the release of radioactive material to an unrestricted area in concentrations which, if averaged over a period of 24 hours, exceeds 5,000 times the values specified in Table 2 of Appendix B to 10 CFR Part 20, unless the licensee has demonstrated compliance with § 20.1301 using § 20.1302(b) (1) or § 20.1302(b) (2) (ii). This does not include transportation events.

C. Theft, Diversion, or Loss of Licensed Material, or Sabotage or Security Breach[1]

1. Any unrecovered lost, stolen, or abandoned sources that the Commission has determined to be risk significant (exceeds the values listed in Appendix P to Part 110, "High Risk Radioactive Material, Category 2"). Excluded from reporting under this criterion are those events involving sources that are lost, stolen, or abandoned under the following conditions: sources abandoned in accordance with the requirements of 10 CFR 39.77(c); sealed sources contained in labeled, rugged source housings; recovered sources with sufficient indication that doses in excess of the reporting thresholds specified in AO criteria I.A.1 and I.A.2 did not occur during the time the source was missing; and unrecoverable sources (sources that have been lost and a reasonable attempt at recovery has been made without success) lost under such conditions that doses in excess of the reporting thresholds specified in AO criteria I.A.1 and I.A.2 were not known to have occurred and the agency has determined that the risk of theft or diversion is acceptable.

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1 Information pertaining to certain incidents may be either classified or under consideration for classification because of national security implications. Classified information will be withheld when formally reporting these incidents in accordance with Section 208 of the ERA of 1974, as amended. Any classified details regarding these incidents would be available to the Congress, upon request, under appropriate security arrangements.

2. A substantiated case of actual or attempted theft or diversion of licensed material or sabotage of a facility.

3. Any substantiated loss of special nuclear material or any substantiated inventory discrepancy that is judged to be significant relative to normally expected performance, and that is judged to be caused by theft or diversion or by substantial breakdown of the accountability system.

4. Any substantial breakdown of physical security or material control (i.e., access control containment or accountability systems) that significantly weakened the protection against theft, diversion, or sabotage.

5. Any significant unauthorized disclosures (loss or theft) of classified[2] and/or safeguards information.

D. Initiation of High-Level NRC Team Inspections.[3]

II. For Commercial Nuclear Power Plant Licensees

A. Any reactor events or conditions that are determined to be of high safety significance.[4]

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2 Due to increased terrorist activities worldwide, the AO report would not disclose specific classified information and details considered useful to potential terrorist. Classified information is defined as information that would harm national security if disclosed in an unauthorized manner.

3 Initiation of any Incident Investigation Teams, as described in NRC Management Directive (MD) 8.3, "NRC Incident Investigation Program," or initiation of any Accident Review Groups, as described in MD 8.9, "Accident Investigation."

4 Any conditions evaluated by the NRC's Reactor Oversight Process (ROP) to be Red, ad described in NRC Management Directive 8.13, "Reactor Oversight Process." In general, Red inspection findings are included in the fiscal year in which the final significance determination was made, and Red performance indicators are included in the fiscal year in which the NRC's external web page for the ROP was updated to show the Red indicator. Additionally, Criterion II.A also includes any events or conditions evaluated by the NRC's Accident Sequence Precursor (ASP) program to have a conditional core damage probability (CCDP) or change in the core damage probability (CDP) of greater than $1x10^{-3}$. An identical condition affecting more than one plant is counted as a single ASP-event if a single indicator would have resulted in a single reactor accident.

B. Any operating reactor plants that are determined to have overall unacceptable performance, or that are in a shutdown condition as a result of significant performance problems and/or operational event(s).[5]

III. For All Transportation Events and Events at Facilities Other than Nuclear Power Plants

A. Events Concerning Design, Analysis, Construction, Testing, Operation, Transport, Use, or Disposal of Licensed Facilities or Regulated Materials

1. An accidental criticality [10 CFR 70.52(a)].
2. A major deficiency in design, construction, control, or operation having significant safety implications requiring immediate remedial action.
3. A serious safety-significant deficiency in management or procedural controls.
4. Series of events (where individual events are not of major importance), recurring incidents, and incidents with implications for similar facilities (generic incidents) that create a major safety concern.

B. For Fuel Cycle Facilities

1. Absence/failure of all safety-related or security-related controls (engineered and human) for an NRC-regulated lethal hazard (radiological or chemical) while the lethal hazard is present.
2. An NRC ordered safety-related or security-related immediate remedial action.

C. For Medical Licensees

A medical event that:

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5 Any plants assessed by the ROP to be in the unacceptable performance column, as described in NRC Inspection Manual Chapter 0305, "Operating Reactor Assessment Program." This assessment of safety performance is based on the number and significance of NRC inspection findings and licensee performance indicators.

1. Results in a dose that is
   a. equal to or greater than 1Gy (100 rad) to a major portion of the bone marrow, or to the lens of the eye; or 2.5 Gy (250 rad) to the gonads; or
   b. equal to or greater than 10 Gy (1,000 rad) to any other organ or tissue; and
2. Represents either
   a. a dose or dosage that is at least 50 percent greater than that prescribed, or
   b. a prescribed dose or dosage that
      (i) is the wrong radiopharmaceutical or unsealed byproduct material; or
      (ii) is delivered by the wrong route of administration; or
      (iii) is delivered to the wrong treatment site; or
      (iv) is delivered by the wrong treatment mode; or
      (v) is from a leaking source or sources; or
      (vi) is delivered to the wrong individual or human research subject.

IV. Other Events of Interest

The Commission may determine that events other than AOs maybe of interest to Congress and the public and should be included in an appendix to the AO report as "Other Events of Interest." Guidelines for events to be included in the AO report for this purpose may include, but not necessarily be limited to, events that do not meet the AO criteria but that have been perceived by Congress or the public to be of high health and safety significance, have received significant media coverage, or have caused the NRC to increase its attention to or oversight of a program area, or a group of similar events that have resulted in licensed materials entering the public domain in an uncontrolled manner. Examples include (1) any significant adverse trends in industry safety performance, (2) the initiation of an Augmented Inspection Team per MD 8.3, or (3) any plant that enters the Multiple/Repetitive Degraded Cornerstone Column of the ROP Action Matrix.

[5 U.S.C. 552(a)]

Dated at Rockville, Maryland, this _______ day of __________________, 2005.

For the U.S. Nuclear Regulatory Commission,

____

Annette L. Vietti-Cook,
Secretary of the Commission

POLICY ISSUE
(Notation Vote)

June 18, 2010 SECY-10-0080

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: ECONOMIC CONSEQUENCE MODELING FOR POSTULATED RADIOLOGICAL EVENTS

PURPOSE:

The purpose of this paper is to inform the Commission of the process by which Federal Protective Action Guides (PAGs) have been incorporated into an economic consequence assessment model for potential radiological events and seek the Commission's agreement with the staff's recommendation to continue supporting the Federal interagency processes for the inclusion of the DHS PAGs into economic consequence assessments.

BACKGROUND:

In the Staff Requirements Memorandum (SRM) for SECY-09-0051, dated June 23, 2009, the Commission directed the staff to produce a policy paper discussing how guidance from the U.S. Environmental Protections Agency's (EPA's) Manual of PAGs could be incorporated into an improved economic consequence model.

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The EPA published a draft of its updated PAGs Manual in January 2009, for review and comment. The draft fully incorporated the Department of Homeland Security (DHS) document, "Planning Guidance for Protection and Recovery following Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents (DHS PAGs)," issued in 2008. The DHS planning guidance focused on optimization as the basis for economic consequence considerations and not on pre-established dose limits. The term "optimization" refers to a flexible, multi-attribute decision-making process that seeks to weigh many factors.

Optimization analyses are interrelated, quantitative, and qualitative assessments that are independently applied at each stage of a decision-making process for an event. Optimization includes economic (i.e., cleanup costs, waste disposal costs, economic impact on places of historical significance, economic impact on businesses, and medical costs) effects, psycho-social effects, human health risk, ecological risk, and technical feasibility factors. The development of this PAG guidance was directed by the White House, Office of Science and Technology Policy, through the National Science and Technology Council, Committee on Homeland and National Security, Subcommittee on Standards (SoS). In 2003, the SoS convened a senior level Federal working group, chaired by DHS, to develop this guidance. The Nuclear Regulatory Commission (NRC) staff was part of this senior level working group.

The EPA withdrew the draft PAGs Manual from review in early 2009, and according to the agency's website, "...The new team at EPA wishes to review the PAGs revisions before proceeding with a notice of availability and public comment." No additional information has been available from EPA regarding the agency's plans for the PAGs revision. However, interagency planning and continued refinement of the optimization methodology has continued to progress. The PAGs from the EPA manual that are relevant to the discussion of economic consequence models are the DHS PAGs which were, as noted above, incorporated in full into the EPA PAGs. Therefore for the purposes of this paper, the staff will refer to the DHS PAGs rather than the EPA PAGs.

DISCUSSION:

Consequence analyses for potential radiological events are of interest to the NRC as well as to the Federal government at large. The optimization methodology, as outlined in the DHS PAGs, has been implemented in the evaluation of economic consequences for the purposes of threat analysis, risk reduction, and radiological exercises. Examples include analysis initiatives by the Department of Energy (DOE) and DHS, and exercises conducted as part of the National Exercise Program.

The optimization process for consideration of economic consequences was used by the DOE, National Nuclear Security Administration (DOE/NNSA) Global Threat Reduction Initiative in the development of a classified report that examined the magnitude of the economic impact of an RDD in a major urban center. The classified report was developed in cooperation with several Federal agencies, including the NRC. DOE/NNSA compared a particular area before the detonation of an RDD to the same area after the event using a methodology designed to estimate the nature and extent of the physical damages to the affected area. This included: a determination of the size and geographic location of the area exposed to radioactive contamination; an estimate of both the cost and time needed to decontaminate the area based upon various doses (considering optimization as a process); an estimate of how other critical infrastructures are affected by the blast (either through damage to the buildings or through decreased workforce participation and lost revenues); and an estimate of the health impacts of the blast and resulting contamination. This was a multi-step, months-long process that involved expert elicitation and judgment, as well as the use of multiple computer codes. This methodology was created to develop realistic order of magnitude estimates of potential economic impacts that encompass many categories, including losses in gross domestic products, decontamination, demolition, and disposal of radioactively contaminated structures, new construction of structures deemed too expensive to decontaminate, health care costs, residential and business relocation costs, and perception-based impacts. This process, as agreed upon by the Federal partners, is the procedure by which the DHS PAGs would be incorporated into an economic consequence model.

In addition to the optimization processes described above, DHS conducts an Integrated Chemical, Biological, Radiological, and Nuclear (CBRN) Terrorism Risk Assessment (ITRA) as directed under Homeland Security Presidential Directive (HSPD) -18, "Medical Countermeasures against Weapons of Mass Destruction," to provide a risk-informed decision support tool to agencies across the Federal government responsible for reducing and mitigating the CBRN terrorism risk. Biennial completion of the ITRA, as required by HSPD-18, is achieved through interagency coordination with Federal partners. The resultant assessments are intended to support those same Federal partner agencies and their component organizations by providing a detailed assessment of the agents/materials and scenarios contributing to risk. In addition, tailored assessments are conducted within the ITRA at the request of Federal partners to evaluate the risk reduction potential associated with proposed Federal strategies and programs designed to reduce and/or mitigate CBRN terrorism risk.

The 2011 ITRA plans to address economic consequences by applying a modeling structure that ensures consistent estimates of terrorism economic risk across CBRN threats. This approach ensures that the assessment can be used as a comprehensive planning tool by other Federal agencies. Thus, there is a strong case for individual agencies not to invest significant resources in research that is similar or duplicative. In addition to the ITRA, DHS performs individual Radiological and Nuclear Terrorism Risk Assessment (RNTRA) threats. Each of these assessments is also performed biennially by DHS per HSPD-22, "Domestic Chemical Defense," HSPD-10, "Biodefense for the 21st Century," and HSPD-18, respectively. One of the ongoing goals of the ITRA, as well as the RNTRA economic model, is to produce economic consequence metrics that can inform the risk mitigation decisions made by DHS and other Federal agencies.

SRM-SECY-09-0051 also directed the staff to: continue to participate in multi-agency organizations such as the Federal Radiological Preparedness Coordinating Committee (FRPCC) and to continue to coordinate with NRC's Federal partners such as DHS, EPA, and the Radiation Source Protection and Security Task Force[1]; encourage broader acceptance of the methodology and the modeling through additional studies as suggested by the NNSA report and use the methodology and modeling tools as part of a future RDD exercise to test its utility for decision making.

The NRC has been, and continues to be, an active participant in the multi-agency working groups such as the FRPCC and the Radiation Source Protection and Security Task Force, as well as a participant in the national level exercise program. The NRC responds to radiological events in accordance with its responsibilities under the National Response Framework[2]. In June 2009, the NRC participated in the EMPIRE 09 exercise, which explored the impact of an RDD on Albany, New York. State and local officials, in consultation with Federal experts, worked through the optimization process as outlined by the DHS PAGs using their local knowledge and local priorities to achieve an effective plan for evacuation and relocation of the impacted populations. More recently, in April 2010, the NRC participated in Liberty RadEx, an EPA-led exercise that explored long-term recovery issues related to a large RDD explosion in an urban area (Philadelphia). This exercise was unique in that it focused only on long-term issues, as the start time of the exercise was 45 days into the event. Commonwealth of Pennsylvania officials used the DHS PAGS and its optimization process as a basis to request that acceptable and practical limits for relocation and return be determined, and that these limits include associated economic impacts as economic considerations will help define what is possible or practical.

The NRC has been an active partner within the Federal interagency working groups to develop economic consequence assessment models for radiological events. These efforts have proven to be an effective use of resources to ensure a consistent approach within the Federal government to assess economic risks from potential radiological events.

[1] In 2005, the Energy Policy Act of 2005 (Public Law 109-58) [EPAct 2005], established an interagency task force on radiation source protection and security under the lead of the U.S. Nuclear Regulatory Commission (NRC) to evaluate and provide recommendations to the President and Congress relating to the security of radiation sources in the United States from potential terrorist threats, including acts of sabotage, theft, or use of a radiation source in an RDD or radiation emission device (RED). This task force, in response to an additional request from DHS for further analysis of RDD consequences, formed a multi-agency Radiation Sources Subgroup to evaluate, among other things, consequences other than the deterministic health effects that form the basis of the established International Atomic Energy Agency (IAEA) categorization (e.g., economic, physical, psychological, and social disruption consequences).

[2] Due to the several categories of potential radiological incidents and impacted entities, the NRF identifies different Federal agencies as "coordinating agencies" and "cooperating agencies" and associated strategic concepts of operations based on the authorities, responsibilities, and capabilities of those departments or agencies. The NRC is the coordinating agency for incidents involving materials or facilities licensed by the NRC or Agreement States. During events that do not involve NRC or Agreement State licensed materials, the NRC supports other Federal agencies in its role as a cooperating agency. DHS is the coordinating agency for all deliberate attacks involving nuclear/radiological facilities or materials, including RDDs and INDs.

RECOMMENDATION:

The staff recommends that the policy of the NRC should be to continue supporting the Federal interagency processes for the inclusion of the DHS PAGs (and when they are issued, the EPA PAGs as appropriate) into economic consequence assessments.

RESOURCES:

There are no resource implications for the NRC. Activities in this area have been and will continue to use selected members of the agency's Senior Level Service staff.

COORDINATION:

The Office of the General Counsel reviewed this package and has no legal objection.

/RA Martin Virgilio for/

R. W. Borchardt
Executive Director
for Operations

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/RA Martin Virgilio for/

R. W. Borchardt
Executive Director
for Operations

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POLICY ISSUE
INFORMATION

November 5, 2010 SECY-10-0146

FOR: The Commissioners

FROM: Charles L. Miller, Director
Office of Federal and State Materials
and Environmental Management Programs

SUBJECT: STATUS OF INTERAGENCY RESEARCH TO IDENTIFY A LEAD AGENCY TO CHAMPION DEVELOPMENT OF ALTERNATE CHEMICAL FORMS OF CESIUM-137

PURPOSE:

The purpose of this paper is to respond in part to the Staff Requirements Memorandum (SRM) to SECY-08-0184, "Strategy for the Security and Use of Cesium-137 Chloride (CsCl) Sources." The SRM directed the staff to identify a lead Federal government agency to champion a national approach for development of alternate chemical forms of cesium-137 (Cs-137) to diminish the utility of such sources in a radiological dispersal device (RDD). This paper does not address any new commitments or resource implications.

SUMMARY:

On April 15, 2009, the Commission issued the SRM to SECY-08-0184, which directed the staff, in part, to engage its Federal partners to identify a lead agency or agencies to conduct research into the development of, and/or provide incentives for, alternate forms of Cs-137 that would diminish the utility of such sources in an RDD. Both domestic and international production facilities were envisioned to be involved in this research and development work and the results were to be shared with our international partners.

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The staff worked with Federal partners, industry, various domestic and international stakeholders, and the Radiation Source Protection and Security Task Force to find solutions and provide recommendations to the Commission on the path forward. The staff was not able to identify a Federal agency willing to take the lead or fund research for alternate chemical forms for Cs-137 sources. In addition, the staff has concluded, based on classified risk analyses, that development of alternate forms of Cs-137 would not significantly reduce dispersibility and clean-up costs associated with the malevolent use of such sources. Therefore, for the reasons set forth below, the staff is not recommending further Federal efforts to identify a lead agency or agencies to conduct research to facilitate development of alternative chemical forms for cesium-137.

BACKGROUND:

At the present time, CsCl sources with activity levels in International Atomic Energy Agency (IAEA) Categories 1 and 2 (i.e., above 27 Ci) are widely used in self-shielded irradiators in three major modes of application: blood irradiation, bio-medical research, and calibration. CsCl is used because of its unique properties of Cs-137, including its desirable single (662 keV) energy spectrum, long half-life (30.17 years), low cost, and moderate shielding requirements relative to other nuclides. In the irradiators, the CsCl in a compressed powder form is doubly-encapsulated in a stainless steel capsule. This physical form is used because of its high specific activity (gamma emission per unit volume) and manufacturability; but because of this chemical composition, it is highly soluble in water and can be dispersible in aerosol form, which may present potential security concerns if used malevolently.

The staff conducted a number of initiatives regarding the technological issues of Cs-137 as well as maintaining continual interactions with other Federal agencies as described below.

The staff's initial effort to address the issue of alternative chemical forms of Cs-137 involved a pilot study (ML090060079), conducted under contract with Brookhaven National Laboratory (BNL), aimed to identify Cs-137 compounds that possess a high concentration of Cs-137, low solubility and high thermal, radiation and mechanical resistance. The information in the study was based primarily on research conducted by PA Mayak and the Research and Production Association "V.G. Khlopin Radium Institute," in Russia, under subcontract with BNL. The results delineated that alternative forms, such as glass and ceramic, have only been used in lower activity Cs-137 sources (<10 Ci) in medical and well-logging applications. The study concluded that the most promising alternative forms were phosphate ceramics and cesium alumophosphate glass, but technology and fabrication facilities were not available to scale up the activity level for these materials to levels necessary for irradiator sources (i.e., 400-2000 Ci). As a result, the study concluded that significant further research and development were needed to ascertain if there could be a capability developed for the manufacture of such high activity sources. However, the development of new forms of cesium is outside the scope of the U.S. Nuclear Regulatory Commission (NRC) mission, and no further research has been conducted by the (NRC).

The staff prepared a Commission Memorandum (ML093160735), dated December 23, 2009, which summarized the status of interagency activities on CsCl research at that time. In that paper, the staff discussed the results of a classified study[1] performed by Sandia National Laboratory (SNL) for the U.S. Department of Energy's National Nuclear Security Administration (NNSA), and recommendations provided by the White House's Office of Science and Technology Policy (OSTP) staff.

In response to the direction in SRM COMSECY-09-0029 (ML101440306), the staff published a notice in the *Federal Register* (75 FR 37483) on June 29, 2010, issuing the NRC "Draft Policy Statement on the Protection of Cesium-137 Chloride Sources" for public comment. This Notice also announced a public meeting in November 2010 to solicit public input on major issues associated with the draft policy statement regarding the current use of certain forms of Cs-137 sources used by NRC – and Agreement State – licensees. A second notice was published on September 29, 2010, in the *Federal Register* (75 FR 60149) providing the meeting agenda and an Issues Paper which listed the discussion points for each session of the meeting. The public meeting will be held on November 8 - 9, 2010. The staff is currently considering the comments received on the draft policy statement and is scheduled to submit to the Commission, in April 2011, a final Policy Statement that will include a discussion of the comments received.

On August 11, 2010, the NRC provided the President and Congress with a report (ML102230141) documenting the efforts of the interagency Radioactive Source Protection and Security Task Force (Task Force). The Task Force, established by the Energy Policy Act of 2005 (Public Law 109-58), includes 12 Federal agencies and named the NRC Chairman (or designee) as its chair. The Task Force was charged with evaluating and providing recommendations, every four years, to the President and Congress relating to the security of radiation sources in the U.S. from potential terrorist threats, including acts of sabotage, theft, or use of a radiological source in a radiological dispersal device. The first Task Force report was submitted in August 2006. The second report issued in August 2010, referenced above, included 11 recommendations to improve source security in the U.S. Two of the recommendations are associated with research related to CsCl sources (i.e., 2010 Recommendations 10 and 11). The recommendations did not propose direct or immediate research; rather they indicated that it is prudent for industry to develop viable alternative technologies and sources. Furthermore, the report recommended making replacement of these sources contingent upon the availability of a disposal pathway for sources currently in use and the viability of alternative technologies.

The staff maintained continual interaction, through regularly scheduled periodic meetings ("Trilateral Meetings"), with the Federal agencies who conduct research related to the use of radioactive materials, i.e., the NNSA, and the Department of Homeland Security's Domestic Nuclear Detection Office (DNDO). These agencies have stated that they do not plan to pursue research for the development of alternate forms of Cs-137. Currently, the budgets of these agencies do not include funds for research on CsCl issues. These agencies have indicated that they do not intend to request funding for such research in their upcoming budget cycles.

[1] *Radioactive Sources Relative Risk Reduction Study (U),* Phase 1 Results, Sandia National Laboratory, September 16, 2009.

In addition, the staff also discussed the possibility of initiating research on the development of alternate forms for Cs-137 sources with the White House's OSTP. At that time, OSTP staff stated that given the results of the 2009 SNL *Radioactive Sources Relative Risk Reduction Study (U),* they would recommend continuing with: (1) the existing source security requirements for Cs-137 (and roll-up of these requirements into a new 10 CFR Part 37); (2) working with NNSA, Agreement States and licensees on NNSA's voluntary supplemental irradiator security upgrades; and (3) monitoring the threat environment and requiring additional security measures, if needed, instead of conducting additional research because alternative forms of Cs-137 would not provide enough risk reduction to warrant the high cost of initial research (~ $5-7 million per year for the first five years at PA Mayak).

The staff has also maintained a continual dialog with representatives of the Cs-137 source supply industry. One source manufacturer indicated that their voluntary research program demonstrated with developmental sources that scaling up alternative chemical forms of Cs-137 sources to larger activity [Vendor Proprietary Information: up to 1,000 Ci levels], suitable for use is attainable (e.g., 5-10 years). However, private industry also indicated that, without market demand (including international markets as well), the finalization of the development of the manufacturing technology for this type of source is not financially viable at the present time.

DISCUSSION:

As stated in the Draft Policy Statement, it is outside the scope of the NRC's mission to conduct developmental research on alternative forms of Cs-137. In response to the Commission direction in the SRM to find a lead agency to conduct the research, the staff has identified one Federal agency, NNSA, which has the mission and the qualified staff to lead research for alternative chemical forms of Cs-137. However, when asked, NNSA stated that they do not have an interest in and do not have budgets for such an initiative. The focus of current NNSA research is aimed at developing alternate, non-radioactive technologies to substitute certain applications of radioactive sources, such as in well-logging and in nondestructive testing (i.e., radiography). The mission of DNDO is to protect against terrorist attacks using nuclear and radiological devices or materials through coordinated detection, analysis, and reporting on the unauthorized importation, possession, storage, transportation, development, or use of such devices or materials. Thus, conducting research for alternate forms of Cs-137 is outside the scope of DNDO's mission.

The staff also has determined that it would not be cost effective to engage in this research effort. Systematic risk and threat studies conducted both by the NRC and other Federal agencies indicate that there continues to be no specific, credible threat directed towards U.S. nuclear facilities or licensed radioactive material, including CsCl sources. The security measures in place in the U.S. are adequate for the current threat environment. The NRC, in cooperation with other Federal and law enforcement agencies, has processes to monitor changes in the threat environment and could issue further security requirements in the event that the threat environment necessitates regulatory action. Lastly, classified risk analyses indicate that, given the uncertainties in the analyses and estimates for clean-up levels, the use of Cs-137 in an alternate chemical form would not provide significant risk reduction with respect to costs for clean-up of contamination from a malicious or malevolent event.

Therefore, the reduced dispersibility of alternative chemical forms of Cs-137 would not significantly reduce explosive dispersion and cleanup costs.

In summary, the staff was not able to identify a Federal agency to promote or to lead research for alternate chemical forms in Cs-137 development. In addition, the staff has concluded, based on classified risk analyses, that development of alternate forms of Cs-137 would not significantly reduce dispersibility and clean-up costs. Consequently, there does not appear to be sufficient benefit to outweigh the cost to pursue research efforts at the Federal level for the development of alternate chemical forms of Cs-137 sources. Given the current threat environment, security measures in place in the U.S., coupled with the recent NNSA voluntary supplemental irradiator security upgrades, provide an adequate level of protection for the public's health and safety.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection.

***/RA by* Cynthia A. Carpenter Acting For/**

Charles L. Miller, Director
Office of Federal and State Materials
and Environmental Management Programs

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COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection.

Cynthia A. Carpenter for
Charles L. Miller, Director **/RA/**
Office of Federal and State Materials
and Environmental Management Programs

ML103050379 WITS 200900093/EDATS: SECY-2010-0529

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OFC	NSIR	OGC	FSME/ TechEd	FSME	
NAME	JWiggins/NSIR	EBowdenBerry	CPoland	**(CCarpenter for)** CMiller	
DATE	10/25/10	10/29/10	11/02/10	11/05/10	

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POLICY ISSUE
(Information)

February 10, 2011 SECY-11-0020

FOR: The Commissioners

THRU: E. Roy Hawkens
Chief Administrative Judge

FROM: Daniel J. Graser
Licensing Support Network Administrator

SUBJECT: LICENSING SUPPORT NETWORK PROGRAM ADMINISTRATION - ANNUAL REPORT

PURPOSE:

This is to inform the Commission, in accordance with 10 C.F.R. § 2.1011(c)(5), of the status of the Licensing Support Network (LSN) and the activities of the LSN Administrator (LSNA) for the year ending December 31, 2010.

BACKGROUND:

The Commission's Staff Requirements Memorandum (SRM) dated January 31, 1992, directed the submission of a semiannual report on the activities of the LSNA (formerly the Licensing Support System (LSS) Administrator). Per notification from Ken Hart on March 27, 2009, the Commission revised the frequency of this report by changing it to an annual report. The scope of this report now includes LSN program activities from January 1, 2010, through December 31, 2010.

CONTACT: Daniel J. Graser, LSNA/ASLBP
301-415-7401

DISCUSSION:

I. Activities

A. Licensing Support Network Administrator (LSNA) and Staff

LSN staffing consists of the LSN Administrator (.5 FTE) and the LSN Project Manager (1.0 FTE), augmented by information technology (IT) security and local participant training support from the Las Vegas Facility Manager (.5 FTE), as needed.

B. Federal Advisory Committee Act (FACA)-Related Activities

Dr. Andrew Bates of the Office of the Secretary (SECY) continues to serve as the LSN Advisory Review Panel (LSNARP) Chair. The agency announced renewal of the charter for the LSNARP through December 3, 2012, in the Federal Register (75 Fed. Reg. 76,757) of December 9, 2010.

C. LSN Advisory Review Panel (LSNARP) Activities

No LSNARP meetings occurred during the reporting period.

D. LSN Administrator Guidelines

No new LSNA Guidelines were promulgated and no existing LSNA Guidelines were revised during the reporting period. The technical bases for LSN operations, including participant organization technologies, remain stable.

E. Interactions with Other NRC Offices and Entities

The LSNA met with the Records Officer of the Department of Energy (DOE) and representatives of the Office of Information Services, Information and Records Services Division (OIS/IRSD) and the National Archives and Records Administration (NARA) to clarify the status of collections of material associated with the HLW proceeding. As of the end of September, comments were provided to OIS/IRSD regarding revisions to the initial sections of the draft records retention schedule describing adjudicatory hearing support systems to have those sections more accurately reflect the business uses of the LSN (and digital recordings of hearings used by the Digital Data Management System (DDMS) application). Those comments are under consideration by OIS/IRSD for incorporation into the proposed records retention schedule that ultimately will require NARA approval.

1. The Commission

The previous LSNA semiannual report (SECY-10-0010) was submitted to the Commission on January 29, 2010.

On June 29, 2010, the LSNA responded to a question from Commissioner Magwood's office regarding the then-proposed FY 2012 budget for the LSN and what it would mean for knowledge retention. The LSNA explained that because the LSN contains no "content" other than indexes, funding under the FY 2012 budget would be for purely technical operations, with any knowledge retention activities falling into the hands of the parties. The NRC's HLW document collection, which resides within the Agencywide Document Access Management System (ADAMS), is one such participant collection.

2. Office of Nuclear Material Safety and Safeguards (NMSS)

Interactions with the Office of Nuclear Material Safety and Safeguards (NMSS) regarding LSN technical coordination were routine. Beginning in April 2010, OIS, in conjunction with NMSS, tested and then implemented the upgraded NRC LSN document repository web site. Later in the summer, LSN program staff worked with OIS to support NMSS in upgrading the File Transfer Protocol (FTP) software (WS_FTP) used to effect the indexing of NRC staff documents submitted to the LSN.

3. Office of Administration/Division of Contracts (ADM/DC)

A new LSN operations and maintenance (O&M) contract was awarded in February 2010. The period of performance for the newly awarded contract is February 25, 2010, through February 24, 2011, but includes four 1-year options.

F. Interactions with the DOE Office of Civilian Radioactive Waste Management on Its Efforts and Readiness to Meet LSN Commitments

In March 2010, DOE notified the LSNA of its intent to shut down the continuity of operations servers formerly maintained at its contractors' Hillshire facility in Las Vegas. Its so-called "V-Cops" facility allowed DOE to switch from the Hillshire servers to servers in Ballston, Virginia, nearly instantaneously if something happened in Las Vegas. The LSNA advised that providing backup capability, in addition to being consensus guidance generated by the LSNARP technical working group is, from a technical perspective, a best-practice in operating a major information technology (IT) system. DOE was encouraged to continue to adhere to good IT practice, the consensus direction of the FACA-chartered LSNARP, and its commitment to maintain the LSN collection.

DOE subsequently closed its "V-Cops" facility, although DOE asserts that it still has back-up capability that may take a little longer to retrieve files if there is a problem with the main servers.

G. Interactions with Other Participants in Conjunction with Their Efforts to be Ready to Meet LSN Commitments

In the same time frame that DOE filed a March 3, 2010 motion to withdraw its pending license application for a permanent geologic repository at Yucca Mountain, Nevada, the State of South Carolina, the State of Washington, and Aiken County, South Carolina, filed petitions to intervene in the HLW proceeding. Thereafter, on March 15, the National Association of Regulatory Utility Commissioners and the Prairie Island Indian Community filed petitions to intervene. As a consequence, these five petitioners were added as new LSN participants.

By the end of May 2010, the LSN staff and contractors had completed integration efforts with the Prairie Island Indian Nation, making it the last of the five petitioners to successfully establish LSN document collection servers in preparation for the oral argument sessions on the DOE motion to withdraw subsequently held in Las Vegas on June 3-4, 2010.

H. LSN Project Plan Implementation

1. Ongoing Upgrades and Expansion to the LSN

Consistent with the program plan, a number of technical activities were successfully completed during this reporting period.

On March 24, 2010, the LSNA and the LSN project manager, Matt Schmit, performed a contract deliverable walkthrough of a new computer room at AT&T's Tyson's Corner offices that now houses the LSN test and development suite. This effort marked the completion of the first phase of LSN modernization. Subsequently, we began the technology refresh activity for the production system. LSN contractor staff previously had acquired the hardware power cords, fiber cables, upgraded firewall/Intrusion Detection System (IDS) and switches, and other components necessary to implement this technology refresh of the LSN production configuration, which is housed at the AT&T facility in Ashburn, Virginia.

The technology refresh, which is comprised of 19 new production servers, should be completed by early February 2011.

2. Administration of the LSN

During the course of the year, a number of routine administrative tasks were completed. The LSN Control Phase Status Update was presented to the Information Technology Business Council (ITBC) on June 29, 2010. No action items resulted, although there were a number of questions about contingency plans should the HLW proceedings terminate. A comprehensive hardware inventory of all LSN computer resources was performed in July 2010. In August 2010, the LSNNET.GOV domain name was renewed with the General Services Administration (GSA).

LSN staff project management performance continues to achieve planned system milestones for user access, participant support, and document loading timeliness.

Entering this reporting period, the LSN was comprised of twenty-one participant organizations' document collections and contained 3,685,786 documents.

During the year, five additional participant collections were connected and another 6,028 (net) documents were added.

System availability, against scheduled availability, was 100 per cent throughout the course of the year and there were no unscheduled outages.

The following table presents cumulative performance metrics for the LSN during the reporting period:

	As of January 1, 2010	As of December 31, 2010	Change +
Total Number of Participants	21	26	5
Total Number of Documents	**3685786**	**3691814**	**6028**
City of Las Vegas	1	1	0
Churchill County	46	58	12
Clark County	86	90	4
Eureka County	58	60	2
Lander County	71	72	1
Lincoln County	61	61	0
Mineral County	51	52	1
Nye County	2267	2308	41
White Pine County	98	98	0
Esmeralda County	32	36	4
Inyo County, California	389	425	36
State of Nevada	5446	5450	4
Department of Energy I	1321931	1327013	5082
Department of Energy II	2324130	2324125*	(5)
Nuclear Energy Institute	795	797	2
Nuclear Regulatory Commission	29599	30413	814
California Energy Commission	611	611	0
City of Caliente	23	23	0
Joint Timbisha Shoshone**	11	11	0
Timbisha Shoshone Indian Tribe	43	43	0
Timbisha Shoshone Yucca Oversight Program	34	34	0
Native Community Action Council	3	3	0
Aiken County, SC	0	11	11

	As of January 1, 2010	As of December 31, 2010	Change +
National Association of Regulatory Utility Commissioners	0	1	1
State of South Carolina	0	5	5
State of Washington	0	10	10
Prairie Island Indian Community	0	3	3

* Five documents were removed from the DOE II web site. The documents did not make it into the search system as they contained invalid characters and subsequently were removed by DOE as it determined the documents did not constitute LSN "documentary material."

** The Timbisha Shoshone Indian Tribe and Timbisha Shoshone Yucca Oversight Program agreed in May 2009 to litigate as a single tribal entity.

3. Security Profile of the LSN

The LSN was successful in obtaining its security recertification and an Authority to Operate (ATO) was issued on October 12, 2010. The system, which was accredited without any significant security restrictions or limitations, has an ATO that is valid for three years, i.e., through October 2013. Pursuant to a condition of the re-certification of the system, priority users accounts were reviewed in November 2010 and, acting on a request from the LSNA, unused accounts were purged by all participant organizations except DOE, which finally responded in January 2011 (after the period covered in this report).

On November 3, 2010, ASLBP submitted a plan responding to another of the system-specific conditions of the renewed ATO that required the completion of a web application security assessment.

No system downtime was experienced during the reporting period because of hacker attacks directed against the LSN.

Routine IT security activities were performed during this reporting period and all milestone dates for products and deliverables were met. LSN staff completed the annual Security Controls and Contingency Plan Tests as required for compliance with the Federal Information Security Management Act (FISMA).

LSN staff including the Information System Security Officer (ISSO) had a 100 per cent completion rate for the required IT security training modules corresponding to staff roles and responsibilities.

II. Issues

Budget Issues

As of this time, FY 2011 budget resources are being used to sustain operations for the ongoing HLW adjudication, which continues in light of the June 29, 2010 decision by Construction Authorization Board (CAB)-4 rejecting DOE's motion to withdraw its application. That decision remains pending before the Commission as it deliberates whether to grant review and, if review is granted, whether to affirm or reverse.

In the meantime, the December 20, 2010 Administration budget pass-back from the Office of Management and Budget eliminates all funding for the LSN effective October 1, 2011. Assuming the Administration's approach to funding is accepted by the Congress, the LSN faces a shutdown that must be completed as of October 1, 2011.

Because the LSN is essential to the agency's ability to comply with the adjudicative milestones in the Nuclear Waste Policy Act, the LSNA has long understood that this vital IT infrastructure would be maintained until the Commission directed the ASLBP to initiate shutdown procedures. In light of this situation, as well as the consequences of shutting down the LSN (addressed below), the ASLBP plans to send a memorandum to the Commission in February that discusses this matter more fully and includes key action points for an orderly shutdown.

Issues Associated with Restoration of the LSN

If subsequent events result in resumption of active HLW adjudication, the lack of funding and FTE allocation in FY 2012 and beyond for the LSN places the agency's ability to conduct a timely adjudication on the DOE application at significant risk.

The LSNA's assessment is that if the LSN system is discontinued, staff recruitment, budget cycle, procurement, and IT security certification timelines make it likely that it will take 2 to 3 years to resurrect the NRC-managed aspects of the system should it be needed in the future.

III. Future LSN-Related Activities

Absent congressional funding, the LSN will be shut down effective October 1, 2011.

LSN staff will work with the LSNARP Chairman to schedule a meeting with parties to the HLW proceeding to coordinate the timing of the LSN website shutdown and what actions the parties will need to take should they decide to continue their document collection availability independent of the LSN system.

COORDINATION:

The Office of the General Counsel has no legal objection.

This paper contains pre-decisional budget information as well as planning information relating to an adjudicatory matter currently before the Commission and should be withheld from public disclosure.

/RA/

Daniel J. Graser
Licensing Support Network Administrator
Atomic Safety and Licensing
Board Panel

Distribution:
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OCA

COORDINATION:

The Office of the General Counsel has no legal objection.

This paper contains pre-decisional budget information as well as planning information relating to an adjudicatory matter currently before the Commission and should be withheld from public disclosure.

/RA/

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ADAMS: ML 110330107 * See Previous Concurrence

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POLICY ISSUE
NOTATION VOTE

June 18, 2010 SECY-10-0079

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: UNITED STATES OF AMERICA NATIONAL REPORT FOR THE FIFTH CONVENTION ON NUCLEAR SAFETY

PURPOSE:

The purpose of this paper is to provide the draft United States (U.S.) national report for the fifth Convention on Nuclear Safety (CNS) for Commission approval. This paper does not address any new commitments.

BACKGROUND:

The CNS commits contracting parties to a high level of safety in nuclear power plants by setting international benchmarks. The articles of the Convention cover the legislative framework; the regulatory framework; the regulatory body; and the technical safety guides related to nuclear power plant siting, design, construction, operation, financial and human resources, assessment and verification of safety, quality assurance, and emergency preparedness. While recognizing the sovereignty of national decisions on nuclear safety, the CNS obligates the contracting parties to submit, for peer review, triennial national reports detailing implementation of these articles. The impetus for negotiating the CNS was the need for countries to openly and regularly exchange safety information in the wake of the Three Mile Island and Chernobyl accidents.

CONTACT: Veronica M. Rodriguez, NRR/DPR
301-415-3703

F-1

The review meetings have provided a forum for this exchange, keeping the focus on national responsibility for the safe operation of nuclear programs. The fifth CNS review meeting is scheduled to take place in Vienna, Austria, from April 4–16, 2011. As required by the International Atomic Energy Agency (IAEA), the U.S. must submit its national report to the CNS Secretariat by September 1, 2010.

DISCUSSION:

Before the CNS peer review meeting, contracting parties must issue a national report describing how they meet the objectives of the CNS. Contracting parties may review and submit questions on any or all of the reports submitted to the CNS Secretariat.

Late ratification of the convention by the U.S. Senate permitted U.S. representatives to participate only as observers in the first CNS review meeting. The U.S. fully participated in the subsequent review meetings held in April 2002, April 2005, and April 2008. Contracting parties must submit their national reports for the fifth CNS review meeting, to be held in April 2011, to the CNS Secretariat by September 1, 2010.

The U.S. Department of State (DOS) has delegated the lead responsibility for implementing the CNS to the U.S. Nuclear Regulatory Commission (NRC). The Office of Nuclear Reactor Regulation (NRR) has prepared the U.S. national report for the fifth CNS in coordination with 20 NRC offices, including the Office of International Programs (OIP), as well as the Institute for Nuclear Power Operations (INPO), DOS, and the U.S. Department of Energy.

The enclosed U.S. national report is a stand-alone document which updates and supplements the information discussed in NUREG-1650, Revision 2, "The United States of America Fourth National Report for the Convention on Nuclear Safety," issued September 2007 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML072890280).

The issuance of this report is consistent with the staff's goals and objectives discussed in SECY-10-0027, "U.S. Nuclear Regulatory Commission Goals and Objectives for Participating in the Convention on Nuclear Safety Fifth Peer Review Meeting," dated March 11, 2010 (ADAMS Accession No. ML100541296).

Note that further changes to the U.S. national report may be necessary after Commission review and approval to ensure that it includes the most updated information in areas such as the current safety and regulatory issues section. The staff will consult with the Commission regarding substantive changes, if any, to the U.S. national report.

The staff would like to note that the composition of the U.S. delegation to the fifth CNS review meeting will be determined based on the interactions during the review, comment, and question period following the submission of the U.S. national report. Typically, the NRC Chairman or a Commissioner leads the delegation, while a senior NRC manager is designated to present the main body of the U.S. national report at the review meeting. The NRC's Nuclear Safety Attaché in Vienna, various NRC staff members, representatives from DOS, and U.S. nuclear industry representatives provided by INPO will also join the delegation. INPO, as the author of Part 3 of the U.S. national report, will be a full member of the U.S. delegation and will participate in monitoring the country groups and asking questions at the presentations. The staff anticipates that the U.S. delegation will contain a sufficient number of personnel to (1) meet the commitments of the CNS with regard to representing the U.S. and presenting its national report, (2) attend each of the anticipated six country group sessions, and (3) support the meeting Vice President and Vice Chair positions obtained by the NRC during the organizational meeting in September 2009. In accordance with lessons learned from previous review meetings, the staff intends to develop a diverse work team with a mix of experienced individuals (i.e., those who attended previous review meetings) and staff who will participate for the first time to build a broad base of experienced personnel to participate in future review meetings.

The staff will continue to provide periodic updates to the Commission on the status of the preparatory activities for the U.S. participation in the upcoming review meeting in April 2011 and will seek Commission guidance as appropriate.

<u>RESOURCES</u>:

Consistent with the resources approved in SECY-10-0027, the fiscal year (FY) 2010 budget and FY 2011 budget request include the staff resources necessary to support and participate in the CNS fifth review meeting as follows:

(b)(5)

<u>RECOMMENDATION</u>:

The staff recommends that the Commission approve the enclosed U.S. national report for the fifth CNS. The staff requests that the Commission respond by July 30, 2010, so that the document can be finalized and issued by September 1, 2010, as requested by IAEA.

EXECUTIVE SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) has prepared Revision 3 to NUREG-1650, "United States of America Fifth National Report for the Convention on Nuclear Safety" for submission for peer review at the fifth review meeting of the Convention on Nuclear Safety, to be convened at the International Atomic Energy Agency in Vienna, Austria, in April 2011. The NRC issued the fourth report in September 2007. This revised report addresses the safety of land-based commercial nuclear power plants in the U.S. It demonstrates how the U.S. Government achieves and maintains a high level of nuclear safety worldwide by enhancing national measures and international cooperation and by meeting the obligations of all the articles established by the Convention. These articles address the safety of existing nuclear installations, the legislative and regulatory framework, the regulatory body, responsibility of the licensee, the priority given to safety, financial and human resources, human factors, quality assurance, assessment and verification of safety, radiation protection, emergency preparedness, siting, design and construction, and operation.

This report addresses the issues identified through the peer review conducted during the fourth review meeting in April 2008 and discusses challenges and issues that have arisen since that time. The fourth review meeting identified the following NRC challenges:

(1) hiring and developing a qualified workforce
(2) handling unexpected material degradation problems associated with operation and power up-rates
(3) maintaining a positive and adequate safety culture
(4) licensing new plants with new and different technologies

The NRC highlighted the following planned initiatives at the fourth review meeting:

(1) conduct follow-up activities related to the Integrated Regulatory Review Service (IRRS) self-assessment and prepare for the IRRS mission in 2010
(2) continue hiring and training initiatives
(3) continue the INPO 2-year evaluation program and the program to assist plants requiring additional support
(4) use the operating experience program to share experience and establish any underlying causes of unexpected material degradation
(5) complete the initiatives to establish the necessary framework to support the use of digital technology by drawing on the operating experience of others

This report also discussed the status of safety issues raised in the fourth U.S. National Report, including reactor materials degradation, unanticipated equipment problems from power uprates, and pressurized-water reactor (PWR) emergency core cooling system (ECCS) sump blockage resulting from post-loss-of-coolant accident (LOCA) chemical formation, as well as those that have arisen since 2007.

The Institute of Nuclear Power Operations (INPO) has also provided input to this report. The prime responsibility for the safety of a nuclear installation rests with the license holder; therefore, Part 3 explains how the nuclear industry maintains and improves nuclear safety.

INTRODUCTION

This section describes the purpose and structure of the "United States of America Fifth National Report for the Convention on Nuclear Safety," the national policy of the U.S. toward nuclear activities, the main national nuclear programs, and current nuclear issues. It also highlights major regulatory accomplishments since submission of the previous (fourth) U.S. National Report in 2007 (see NUREG-1650, Revision 2, "The United States of America Fourth National Report for the Convention on Nuclear Safety," dated September 2007).

Purpose and Structure of This Report

The United States of America is submitting this updated report for peer review to the fifth review meeting of the Contracting Parties to the Convention on Nuclear Safety (hereafter referred to as the Convention or CNS). The scope of this report considers only the safety of land-based commercial nuclear power plants, consistent with the definition of nuclear installations provided in Article 2 and the scope of Article 3 of the Convention.

This report demonstrates how the U.S. Government meets the following objectives described in Article 1 of the Convention:

(i) to achieve and maintain a high level of nuclear safety worldwide through the enhancement of national measures and international cooperation including, where appropriate, safety-related technical cooperation

(ii) to establish and maintain effective defenses in nuclear installations against potential radiological hazards in order to protect individuals, society, and the environment from harmful effects of ionizing radiation from such installations

(iii) to prevent accidents with radiological consequences and to mitigate such consequences should they occur

Technical and regulatory experts from the U.S. Nuclear Regulatory Commission (hereafter referred to as the NRC, Commission,[1] agency, or staff) updated the fifth U.S. National Report, principally using agency information that is publicly available. This updated report follows the format of the forth U.S. National Report, and is designed to be a stand-alone document. Hence, this report duplicates some of the information presented in the 2007 (fourth) report. To facilitate peer review, Part 1 of this report includes a summary of the main changes to the report (Table 1). This table is followed by a discussion of (1) the U.S policy towards nuclear activities, (2) national nuclear programs, (3) conclusions from the fourth review meeting, (4) current safety and regulatory issues, (5) an update on safety and regulatory issues discussed in the fourth U.S. National Report, (6) major regulatory accomplishments, and (7) the NRC's main challenges.

Part 2 discusses the Convention's Articles 6 through 19. Chapters are numbered according to the article of the Convention under consideration. Each chapter begins with the text of the article, followed by an overview of the material covered and a discussion of how the U.S. meets the obligations described in the article. Articles 6 through 9 summarize the existing nuclear installations and the legislative and regulatory system governing their safety and discuss the

[1] "Commission" may also refer to the Chairman and Commissioners who head the NRC.

adequacy and effectiveness of that system. Articles 10 through 16 address general safety considerations and summarize major safety-related features. Articles 17 through 19 address the safety of installations.

Similar to the 2007 report, Part 3 of this document includes a contribution by INPO describing work done by the U.S. nuclear industry to ensure safety. INPO is a nongovernmental corporation founded in 1979 by the U.S. nuclear industry to collectively promote the highest levels of safety and reliability at U.S. nuclear plants. The prime responsibility for the safety of a nuclear installation rests with the license holder; therefore, Part 3 explains how the nuclear industry maintains and improves nuclear safety.

The report concludes with a series of appendices that discuss the NRC's main challenges as described in the NRC Strategic Plan and the Inspector General's report, followed by appendices of references, abbreviations, and acknowledgments. Annex 1 of the report lists nuclear plants in the U.S.

This report does not explicitly discuss Articles 1 through 5 because the general text of the report, and indeed the very existence of the report, fulfills the requirements of these articles. In accordance with Article 1, the report illustrates how the U.S. Government meets the objectives of the Convention. The report discusses the safety of nuclear installations according to the definition in Article 2 and the scope of Article 3. It addresses implementing measures (such as national laws, legislation, regulations, and administrative means) according to Article 4. Submission of this report fulfills the obligation under Article 5 on reporting. In addition, the information in this report is available in more detail on the NRC's public Web site.

Summary of Changes to the Fifth U.S. National Report

To facilitate peer review of this report, Table 1 summarizes the changes to the fifth U.S. National Report. A revision bar along the left margin of the page identifies changes from the fourth report.

Table 1 Summary of Changes to the Fifth U.S. National Report

Report Section	Change
Abstract	Updated to add discussion about the 4th CNS
Executive Summary	Updated to add discussion about the 4th CNS
PART 1	
Introduction	Updated to add discussion about the 4th CNS
Purpose and Structure of This Report	Updated to add discussion about the 4th CNS
Summary of Changes to the Fifth U.S. National Report	Updated table
The U.S. National Policy toward Nuclear Activities	Editorial changes only
National Nuclear Programs	Reordering and editorial changes only
Reactor Oversight Process	Updated to add discussion about the 2008 self-assessment

Report Section	Change
License Renewal	Updated to add discussion about units entering the 41st year of operation
Power Uprate Program	Editorial changes only
New Reactor Licensing	Updated to add discussion about applications received to date
Conclusions from the Fourth Review Meeting	Completely updated to add discussion about the 4th CNS
Items Resulting from Country Group Session	Completely updated to add discussion about the 4th CNS
Survey of Current Regulatory and Safety Issues	Completely updated to add discussion about seven current regulatory and safety issues
Reactor Materials Degradation Issues	New section
Cyber Security	New section
Digital Upgrades to Instrumentation and Control	New section
Moisture Effects on Underground Cables	New section
Containment Pressure Credit for Emergency Core Cooling System Pump Net Positive Suction Head	New section
Gas Voiding Issues in Light-Water Reactor Safety Systems	New section
Enhancements to Emergency Preparedness Regulations	New section
Status of Safety and Regulatory Issues Discussed in the Fourth U.S. National Report	Completely updated to add discussion about status of these issues discussed in the 4th National Report
Reactor Materials Degradation Issues	Completely updated section to add current status
Unanticipated Issues Associated with Power Uprates	Completely updated section to add current status
PWR Post-Loss of Coolant Accident Chemical Formation and PWR Sump Strainer Performance	Completely updated section to add current status
Other Major Regulatory Accomplishments	Added discussion about nine major regulatory accomplishments
Issuance of Early Site Permits and Limited Work Authorizations	Updated to add discussion about two early site permits and one limited work authorization issued
Reactor Pressure Vessel Pressurized Thermal Shock	New section
Power Reactor Security	New section

Report Section	Change
Aircraft Impact Assessment	New section
Fatigue Management	New section
Risk-Informed Fire Protection Infrastructure	New section
Probabilistic Risk Assessment Standard for the Analysis of External Events	New section
Regulatory Effectiveness	New section
Safety Culture Initiatives	New section
The NRC's Main Challenges	Updated to add discussion presented in the 2008-2013 NRC Strategic Plan
NRC Major Management Challenges	Updated to add discussion about the 2009 Inspector General's assessment
PART 2	
ARTICLE 6. EXISTING NUCLEAR INSTALLATIONS	Editorial changes only
6.1 Introduction	Updated to add safety strategic outcomes in fiscal years 2008-2009
6.2 Nuclear Installations in the United States	Updated to included 2009 reference
6.3 Regulatory Processes and Programs	Editorial changes only
6.3.1 Reactor Licensing	Updated to add discussion about applications received to date
6.3.2 Reactor Oversight Process	Updated to add discussion about the 2008 self-assessment
6.3.3 Industry Trends Program	Updated to add discussion about the baseline risk index for initiating events
6.3.4 Accident Sequence Precursor Program	Updated to include a discussion about the accident sequence precursor program status report issued in 2009
6.3.5 Operating Experience Program	Editorial changes only
6.3.6 Generic Issues Program	Updated to add discussion about changes to the program made in 2008
6.3.7 Rulemaking	Updated to add discussion about public access to rulemaking documents
6.3.8 Fire Regulation Program	Updated to add discussion about risk-informed, performance-based fire protection rule and the research program
6.3.9 Decommissioning	Updated to reference relevant regulations and guidance documents
6.3.10 Reactor Safety Research Program	Editorial changes only
6.3.11 Special Programs for Public Participation	Updated to add a discussion about the Federal Docket Management System

Report Section	Change
ARTICLE 7. LEGISLATIVE AND REGULATORY FRAMEWORK	Editorial changes only
7.1 Legislative and Regulatory Framework	Updated to add a list of ratified international conventions that impact nuclear safety
7.2 Provisions of the Legislative and Regulatory Framework	Editorial changes only
7.2.1 National Safety Requirements and Regulations	Updated to add discussion about regulations, executive orders and directives that impact nuclear safety
7.2.2 Licensing of Nuclear Installations	Updated to add discussion about the Atomic Energy Act, license renewal, and hearings
7.2.3 Inspection and Assessment	Updated to add discussion about resident inspectors
7.2.4 Enforcement	Updated monetary civil penalties limits and enforcement measures
ARTICLE 8. REGULATORY BODY	Editorial changes only
8.1 The Regulatory Body	Editorial changes only
8.1.1 Mandate	Editorial changes only
8.1.2 Authority and Responsibilities	Reorganized subsections
8.1.2.1 Scope of Authority	Editorial changes only
8.1.2.2 The NRC as an Independent Regulatory Agency	Updated to expand discussion
8.1.3 Structure of the Regulatory Body	Editorial changes only
8.1.3.1 The Commission	Editorial changes only
8.1.3.2 Component Offices of the Commission	Editorial changes only
8.1.3.3 Offices of the Executive Director for Operations	Noted organizational changes
8.1.3.4 Advisory Committees	Noted organizational changes
8.1.3.5 Atomic Safety and Licensing Board Panel	New section
8.1.4 International Responsibilities and Activities	Updated to expand discussion about treaties, export-import, assistance program, and international organizations
8.1.5 Financial and Human Resources	Editorial changes only
8.1.5.1 Financial Resources	Updated to add funds for fiscal years 2008-2010
8.1.5.2 Human Resources	Updated to expand discussion about recruitment, knowledge management and retaining staff

Report Section	Change
8.1.6 Position of the NRC in the Governmental Structure	Editorial changes only
8.1.6.1 Executive Branch	Editorial changes only
8.1.6.2 The States (i.e., of the United States)	Editorial changes only
8.1.6.3 Congress	Editorial changes only
8.1.7 Report of the Integrated Regulatory Review Service Self-Assessment Team	Updated to add discussion about complementary self-assessment performed in 2009 and 2010
8.2 Separation of Functions of the Regulatory Body from Those of Bodies Promoting Nuclear Energy	Editorial changes only
ARTICLE 9. RESPONSIBILITY OF THE LICENSE HOLDER	Editorial changes only
9.1 Introduction	Editorial changes only
9.2 The Licensee's Prime Responsibility for Safety	Editorial changes only
9.3 NRC Enforcement Program	Updated to reference revised guidance documents and discuss enforcement actions in 2008 and 2009
ARTICLE 10. PRIORITY TO SAFETY	Editorial changes only
10.1 Background	Updated to reference risk-informed, performance-based fire protection regulation
10.2 Probabilistic Risk Assessment Policy	Shortened
10.3 Applications of Probabilistic Risk Assessment	Updated discuss the use of RG 1.200
10.3.1 Risk-Informed Special Treatment	Revised title and updated to discuss the 50.69 final rule and RG 1.201, Revision 1
10.3.2 Risk Informed Inservice Inspection	Updated to add discussion about Code Case N-716
10.3.3 Risk-Informed Technical Specification Changes	Updated to expand discussion about accomplishments in the PRA area
10.3.4 Development of Standards	Updated to add discussion about a joint ASME/ANS PRA quality standard issued in 2009
10.4 Safety Culture	Editorial changes only
10.4.1 NRC Monitoring of Licensee Safety Culture	Editorial changes only
10.4.1.1 Background	Corrected section number
10.4.1.2 Enhanced Reactor Oversight Process	Corrected section number and updated to add discussion about the 2008 self-assessment

Report Section	Change
10.4.2 The NRC Safety Culture	Expanded discussion and added details about the Inspector General's 2009 survey.
10.5 Managing the Safety and Security Interface	New section
ARTICLE 11. FINANCIAL AND HUMAN RESOURCES	Editorial changes only
11.1 Financial Resources	Editorial changes only
11.1.1 Financial Qualifications Program for Construction and Operations	Editorial changes only
11.1.1.1 Construction Permit Reviews	Editorial changes only
11.1.1.2 Operating License Reviews	Editorial changes only
11.1.1.3 Combined License Application Reviews	Editorial changes only
11.1.1.4 Postoperating License Nontransfer Reviews	Editorial changes only
11.1.1.5 Reviews of License Transfers	Updated to add complete reference to NUREG-1577, Revision 1
11.1.2 Financial Qualifications Program for Decommissioning	Updated to add reference to 10 CFR 50.75
11.1.3 Financial Protection Program for Liability Claims Arising from Accidents	Updated Price-Anderson Act information
11.1.4 Insurance Program for Onsite Property Damages Arising from Accidents	Editorial changes only
11.2 Regulatory Requirements for Qualifying, Training, and Retraining Personnel	Editorial changes only
11.2.1 Governing Documents and Process	Editorial changes only
11.2.2 Experience	Shortened and updated numbers for human performance issues.
ARTICLE 12. HUMAN FACTORS	Editorial changes only
12.1 Goals and Mission of the Program	Editorial changes only
12.2 Program Elements	Updated to discuss the human event repository and analysis system
12.3 Significant Regulatory Activities	Editorial changes only
12.3.1 Human Factors Engineering Issues	Updated to reference NUREG-1852 and discuss the interim staff review guidance regarding computer-based procedures and plant digital upgrades
12.3.2 Emergency Operating Procedures and Plant Procedures	Updated experience subsection
12.3.3 Shift Staffing	Updated experience subsection

Report Section	Change
12.3.4 Fitness for Duty	Updated to add discussion about the fatigue management rulemaking and the Enforcement Guidance Memorandum
12.3.5 Human Factors Information System	Editorial changes only
12.3.6 Support to Event Investigations and For-Cause Inspections and Training	Updated to add discussion about safety culture inspections performed in 2007
ARTICLE 13. QUALITY ASSURANCE	Editorial changes only
13.1 Background	Editorial changes only
13.2 Regulatory Policy and Requirements	Section reworded
13.2.1 Appendix A to 10 CFR Part 50	Editorial changes only
13.2.2 Appendix B to 10 CFR Part 50	Editorial changes only
13.2.3 Approaches for Adopting More Widely Accepted International Quality Standards	Editorial changes only
13.3 Quality Assurance Regulatory Guidance	Updated slightly
13.3.1 Guidance for Staff Reviews for Licensing	Section renumbered and updated slightly.
13.3.2 Guidance for Design and Construction Activities	Section renumbered and updated slightly.
13.3.3 Guidance for Operational Activities	Section renumbered and updated slightly.
13.4 Quality Assurance Programs	Shortened and updated to discuss 10 CFR 52.103(g)
13.5 Quality Assurance Audits Performed by Licensees	New section
13.5.1 Audits of Vendors and Suppliers	New section
ARTICLE 14. ASSESSMENT AND VERIFICATION OF SAFETY	Editorial changes only
14.1 Ensuring Safety Assessments throughout Plant Life	Editorial changes only
14.1.1 Maintaining the Licensing Basis	Editorial changes only
14.1.1.1 Governing Documents and Process	Editorial changes only
14.1.1.2 Regulatory Framework for the Restart of Browns Ferry Unit 1	Editorial changes only
14.1.2 License Renewal	Editorial changes only
14.1.2.1 Governing Documents and Process	Updated to add discussion about revised guidance documents and rulemaking activities
14.1.2.2 Experience	Updated to add discussion about renewed license to date
14.1.2.3 Operating Beyond 60 Years	New section

Report Section	Change
14.1.3 The United States and Periodic Safety Reviews	Updated to expand discussion
14.1.3.1 The NRC's Robust and Ongoing Regulatory Process and the Current Licensing Basis	Editorial changes only
14.1.3.2 The Backfitting Process: Timely Imposition of New Requirements	Editorial changes only
14.1.3.3 The NRC=s Extensive Experience with Broad-Based Evaluations	Updated to expand discussion about the Maintenance Rule
14.1.3.4 License Renewal Confirms Safety of Plants	Updated to expand discussion about the Reactor Oversight Process and license renewal
14.1.3.5 Risk-Informed Regulation and the Reactor Oversight Process	Updated to expand discussion about the Reactor Oversight Process
14.1.3.6 Licensee Responsibilities for Safety: Regulations and Initiatives Beyond Regulations	Editorial changes only
14.1.3.7 Summary	Editorial changes only and removed figure.
14.2 Verification by Analysis, Surveillance, Testing, and Inspection	Updated to add discussion about performance measure and aging management
ARTICLE 15. RADIATION PROTECTION	Editorial changes only
15.1 Authorities and Principles	Editorial changes and updated to add discussion about new ICRP recommendations
15.2 Regulatory Framework	Editorial changes only
15.3 Regulations	Updated to add discussion about interaction with stakeholders and the evaluation of international standards
15.4 Radiation Protection Activities	Editorial changes only
15.4.1 Control of Radiation Exposure of Occupational Workers	Updated collective doses
15.4.2 Control of Radiation Exposure of Members of the Public	Updated to add background information about 10 CFR 20.1301 and 10 CFR 20.1302 and the revision of RGs 1.21 and 4.1
ARTICLE 16. EMERGENCY PREPAREDNESS	Editorial changes only
16.1 Background	Editorial changes only
16.2 Offsite Emergency Planning and Preparedness	Editorial changes only
16.3 Emergency Classification System and Emergency Action Levels	Editorial changes only

Report Section	Change
16.4 Recommendations for Protective Action in Severe Accidents	Updated number of States receiving potassium iodide and added reference to the draft revision to NUREG-0654/FEMA-REP-1, Supplement 3.
16.5 Inspection Practices - Reactor Oversight Process for Emergency Preparedness	Editorial changes only
16.6 Responding to an Emergency	Updated to add discussion about the National Response Framework issued in 2008
16.6.1 Federal Response	Updated to add discussion about updates to governing documents
16.6.2 Licensee, State, and Local Response	Editorial changes only
16.6.3 The NRC's Response	Updated to expand discussion about response centers
16.6.4 Aspects of Security that Support Response	Editorial changes and updated to add reference to rulemaking discussions
16.7 International Arrangements	Updated to add renewal dates of bilateral agreements
ARTICLE 17. SITING	Editorial changes only
17.1 Background	Updated to add discussion about applications received to date
17.2 Safety Elements of Siting	Editorial changes only
17.2.1 Background	Editorial changes only
17.2.2 Assessments of Seismic and Geological Aspects of Siting	Updated to add discussion about seismic designs in new reactors
17.2.3 Assessments of Radiological Consequences	Editorial changes only
17.3 Environmental Protection Elements of Siting	Editorial changes only
17.3.1 Governing Documents and Process	Updated to add discussion about changes in review practices made in 2007 and 2010 and added discussion about the memorandum of understanding between the NRC and the U.S. Army Corps of Engineers.
17.3.2 Other Considerations for Siting Reviews	Editorial changes only
17.4 Consultation with other Contracting Parties to be Affected by the Installation	New section
ARTICLE 18. DESIGN AND CONSTRUCTION	Editorial changes only
18.1 Defense-in-Depth Philosophy	Editorial changes only

Report Section	Change
18.1.1 Governing Documents and Process	Editorial changes only
18.1.2 Experience	Editorial changes only
18.1.2.1 Regulatory Framework for the Reactivation of Watts Bar Unit 2	Updated status of the reactivation
18.1.2.2 Design Certifications	Updated to add discussion about applications received to date
18.2 Technologies Proven by Experience or Qualified by Testing or Analysis	Editorial changes only
18.3 Design for Reliable, Stable, and Easily Manageable Operation	Editorial changes only
18.3.1 Governing Documents and Process	Updated references
18.3.2 Experience	Editorial changes only
18.3.2.1 Human Factors Engineering	New section
18.3.2.2 Digital Instrumentation and Controls	Renumbered section and updated.
18.3.2.3 Cyber Security	Renumbered section and updated to add discussion about new regulations and guidance documents.
18.4 New Reactor Construction Experience Program	New section
ARTICLE 19. OPERATION	Editorial changes only
19.1 Initial Authorization to Operate	Shorten and reorganized; updated to include discussion of applications received to date.
19.2 Definition and Revision of Operational Limits and Conditions	Editorial changes only
19.3 Approved Procedures	Added references
19.4 Procedures for Responding to Anticipated Operational Occurrences and Accidents	Editorial changes only
19.5 Availability of Engineering and Technical Support	Editorial changes only
19.6 Incident Reporting	Updated to add discussion about abnormal occurrence report to Congress, the International Nuclear and Radiological Event Scale and the nuclear events Web-based system
19.7 Programs To Collect and Analyze Operating Experience	Updated to expand discussion about the phases of the Operating Experience Program and international operating experience
19.8 Radioactive Waste	Updated to add the status of the high-level waste repository in Nevada
PART 3	

Report Section	Change
Convention on Nuclear Safety Report: The Role of the Institute of Nuclear Power Operations in Supporting the U.S. Commercial Nuclear Power Industry's Focus on Nuclear Safety	Updated
APPENDIX A NRC STRATEGIC PLAN 2008-2013	Updated to add new Strategic Plan
APPENDIX B NRC MAJOR MANAGEMENT CHALLENGES FOR THE FUTURE	Updated to add the 2009 report from the Inspector General
APPENDIX C REFERENCES	Updated
APPENDIX D ABBREVIATIONS	Updated
APPENDIX E ACKNOWLEDGMENTS	Updated
ANNEX 1 U.S. COMMERCIAL NUCLEAR POWER REACTORS	Updated
ANNEX 2 U.S. NUCLEAR ELECTRIC INDUSTRY PERFORMANCE INDICATOR GRAPHS	New section. Graphs moved from Part 3 to Annex 2 to maintain consistency in the report.

The U.S. National Policy toward Nuclear Activities

The Energy Reorganization Act of 1974 created the NRC as an independent agency of the Federal Government. The agency's mission is to license and regulate the Nation's civilian use of byproduct, source, and special nuclear materials to ensure adequate protection of public health and safety, promote the common defense and security, and protect the environment. The agency also has a role in combating the proliferation of nuclear materials worldwide. The NRC's safety and security responsibilities stem from the Atomic Energy Act of 1954, as amended. The agency accomplishes its mission by licensing and overseeing nuclear reactor operations and other activities that apply to the possession of nuclear materials and wastes, ensuring that nuclear materials and facilities are safeguarded from theft and radiological sabotage, issuing rules and standards, inspecting nuclear facilities, and enforcing regulations.

The NRC views nuclear regulation as the public's business and, as such, it must be transacted openly and candidly to maintain the public's confidence. The agency's goal to ensure openness explicitly recognizes that the public must be informed about, and have a reasonable opportunity to participate meaningfully, in the regulatory process. Except for certain proprietary business material, facility safeguards information, sensitive pre-decisional information, and information supplied by foreign countries that is deemed to be sensitive, the NRC makes the documentation that it uses in its decision-making process available in the agency's Public Document Room in Rockville, MD, and on the agency's public Web site at http://www.nrc.gov. As a result, a significant amount of information about nuclear activities and the national policy regarding them is available to everyone.

The NRC's interpretation of regulations continues to evolve from a prescriptive, deterministic approach toward a more risk-informed and performance-based regulatory approach. Improved probabilistic risk assessment (PRA) techniques, combined with more than four decades of accumulated experience with operating nuclear power reactors, led the Commission to revise or eliminate certain requirements. The Commission is also prepared to strengthen the regulatory system when risk considerations reveal the need.

National Nuclear Programs

The NRC has a number of programs and processes to protect public health and safety and the environment and to meet the obligations of the Convention. Key programs and processes include: (1) reactor oversight, (2) license renewal, (3) power uprates, and (4) new reactor licensing.

Reactor Oversight Process

The NRC's Reactor Oversight Process is now nearly 9 years old. In its annual self-assessment for calendar year 2008, the NRC staff concluded that the Reactor Oversight Process provided effective safety oversight as demonstrated by meeting the program goals and achieving its intended outcomes. The self-assessment showed that the Reactor Oversight Process was objective, risk-informed, understandable, and predictable. It also showed that the Reactor Oversight Process ensures openness and effectiveness in support of the agency's mission and its strategic goals of safety and security. The NRC appropriately monitored operating nuclear power plant activities and focused agency resources on performance issues. Plants continued to receive a level of oversight commensurate with their performance. The staff continued to emphasize stakeholder involvement and improve various aspects of the Reactor Oversight Process as a result of feedback and lessons learned.

Article 6 of this report discusses the Reactor Oversight Process in detail.

License Renewal

The NRC's review of license renewal applications focuses on maintaining plant safety and particularly considers the effects of aging on important structures, systems, and components. The review of a renewal application proceeds along two paths—one to review safety issues and the other to assess potential environmental impacts. Applicants must demonstrate that they have identified and can manage the effects of aging and can continue to maintain an acceptable level of safety throughout the period of extended operation. Applicants must also address the environmental impacts from extended operation. With the improved economic conditions for operating nuclear power plants, the Commission has seen sustained, strong interest in license renewal, which allows plants to operate up to 20 years beyond their current operating licenses. The Atomic Energy Act established the original 40-year term, which was not based on technical limitations.

The decision to seek license renewal is voluntary and rests entirely with nuclear power plant owners. The decision is typically based on the plant's economic viability and whether it can continue to meet the Commission's requirements. Currently, more than half of the plants in the United States have had their operating licenses renewed. Based on statements from industry representatives, the Commission expects nearly all sites to apply for license renewal. In 2009, four units entered their 41st year of operation. These were Oyster Creek (April), Nine Mile Point Unit 1 (August), Ginna (September), and Dresden Unit 2 (December). In 2010, three additional units enter the period of extended operation. These units are H. B. Robinson Unit 2 (July), Monticello Unit 1 (September), and Point Beach Unit 1 (October.)

Article 14 of this report discusses the license renewal process in detail.

Power Uprate Program

Under its licensing program, the NRC carefully reviews requests to raise the maximum thermal power level at which a plant may be operated. In reviewing these power uprate requests, NRC's review focuses on safety. The agency closely monitors operating experience to identify safety issues that may affect the implementation of power uprates.

Power uprates can be classified as: (1) measurement uncertainty recapture power uprates, (2) stretch power uprates, and (3) extended power uprates (EPUs). Measurement uncertainty recapture power uprates are less than a two-percent increase and are achieved by implementing enhanced techniques for calculating reactor power. Stretch power uprates are typically increases of up to seven percent and are generally within the original design capacity of the plant. Stretch power uprates usually involve changes to instrumentation setpoints and do not generally involve major plant modifications. EPUs are usually greater than stretch power uprates and require significant modifications to major balance-of-plant equipment. The NRC has approved EPUs of up to 20 percent.

New Reactor Licensing

The NRC staff is engaged in numerous ongoing interactions with vendors and utilities regarding prospective new reactor applications and licensing activities. Based on these interactions, the NRC staff has received a significant number of new reactor combined license applications since 2007. As of March 1, 2010, the NRC has received 18 combined license applications for 28 new light-water reactor units. Of these 18 applications, five applicants have requested that the NRC suspend its review of their applications given changing business strategies. The NRC is now actively reviewing 13 combined license applications. All combined license applicants are using the licensing process specified in the recently revised Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," which is designed to be more stable and predictable than the process specified in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." This licensing process resolves all safety and environmental issues, as well as emergency preparedness and security issues, before a new nuclear power plant is constructed.

The NRC staff has issued design certifications for four reactor designs that can be referenced in an application for a nuclear power plant: (1) General Electric (GE) Nuclear Energy's Advanced Boiling Water Reactor (ABWR), (2) Westinghouse Electric Company, LLC's (Westinghouse's) System 80+, (3) Westinghouse's Advanced Passive (AP) 600 design, and (4) Westinghouse's AP1000.

The NRC staff is currently performing the following design certification reviews: (1) GE-Hitachi Nuclear Energy's Economic Simplified Boiling Water Reactor (ESBWR), (2) Westinghouse's AP1000 design amendment, (3) AREVA Nuclear Power's U.S. Evolutionary Power Reactor (US EPR), (4) Mitsubishi Heavy Industries, Ltd.'s U.S. Advanced Pressurized Water Reactor (US APWR), and (5) South Texas Project Nuclear Operating Company's ABWR application to address the aircraft impact rule.

By certifying nuclear reactor designs, the NRC resolves safety issues in a design certification rulemaking. When an applicant submits an application for construction of a new nuclear power plant using one of the certified designs, the license application review can proceed more efficiently in a manner that ensures safety while minimizing unnecessary regulatory burden and delays.

To date, the NRC has issued four early site permits: (1) System Energy Resources, Inc., for the Grand Gulf site in Mississippi; (2) Exelon Generation Company, LLC, for the Clinton site in Illinois; (3) Dominion Nuclear North Anna, LLC, for the North Anna site in Virginia; and (4) Southern Nuclear Operating Company for the Vogtle Electric Generating Plant early site permit and limited work authorization in Georgia. These are the first early site permits issued by the NRC and the first time this portion of the 10 CFR Part 52 licensing process has been implemented. According to this process, environmental issues that have been resolved in the early site permit proceedings cannot be re-opened during a combined license proceeding.

By letter dated July 1, 2009, Exelon notified the NRC staff that Exelon had decided to pursue an early site permit rather than a combined license for the Victoria station in Texas. By letter dated October 13, 2009, Exelon notified the NRC staff that it plans to submit its early site permit application in late March 2010. The application will use the plant parameter envelope approach for two units, will include a complete emergency plan, and will not request a limited work authorization.

By letter dated December 2, 2008, Public Service Enterprise Group updated the NRC staff on its intention to submit an application for an early site permit during the second quarter of calendar year 2010. Public Service Enterprise Group plans to use a plant parameter envelope methodology in the early site permit application since it has not yet selected a reactor technology. The NRC staff has been providing support for these pre-application activities.

In 2006, to better prepare the agency for the anticipated new reactor licensing and construction inspection work, while ensuring that the agency maintains its focus on the safety and security of currently operating reactors, the NRC established the Office of New Reactors. The agency also established a dedicated construction inspection organization in its Region II office in Atlanta, Georgia, that will carry out all construction inspection activities across the U.S., including both the day-to-day onsite inspections and the specialized inspections needed to support NRC oversight of the construction of new nuclear power plants.

One partially built plant, Watts Bar Nuclear Plant Unit 2, had stopped construction activities in the mid-1980s. Watts Bar Unit 2 is a Westinghouse designed PWR located in southeastern Tennessee and owned by the Tennessee Valley Authority (TVA), which has resumed construction activities and is currently pursuing an operating license approval under 10 CFR Part 50.

In addition to working on domestic issues for new reactor construction, the NRC has been a leader in cooperating with other national nuclear regulatory authorities to address advanced reactor oversight. The NRC is participating in an international effort, the Multinational Design Evaluation Program, to more efficiently review new reactor designs. The goal of this program is to make all new reactor reviews more safety-focused. NRC representatives are communicating closely with representatives from the Finnish and French regulatory authorities concerning the European power reactor designs that are under construction in Finland and slated to be licensed in France and the United States. The NRC is also participating in a longer-term multinational effort to establish reference regulatory practices and regulations for the review of current and future reactor designs.

Articles 17 and 18 of this report discusses the new reactor licensing in more detail.

Conclusions from the Fourth Review Meeting

This section presents the conclusions from the review of the 2007 U.S. National Report at the fourth review meeting in April 2008.

Delegates from other countries noted that the U.S. delivered a highly informative presentation at the country group meeting. They commended the U.S. for including a contribution from INPO in the report that explains how the nuclear industry maintains and improves nuclear safety.

Items Resulting from Country Group Session

Review of the questions raised by other contracting parties on the U.S. National Report identified the following areas of interest:

- safety trends
- generic issues
- long-term operation
- new and advance reactors
- knowledge management
- regulatory openness

The NRC's presentation during the 2008 review meeting focused on these topics. INPO also discussed its role in maintaining and improving nuclear safety.

Country Group 1 participants concluded that the U.S. implemented the following good practices:

- the National Report content and structure
- involving the industry in the development of the National Report and the review meeting presentation
- making extensive use of the NRC public Web site to increase public awareness
- establishing the Office of New Reactors and hiring staff in advance of new reactor construction
- developing the new reactors licensing structure
- performing a self-assessment in preparation for the 2010 Integrated Regulatory Review Service (IRRS) mission

Country Group 1 identified the following challenges for the U.S.:

- hiring and developing a qualified workforce
- handling unexpected material degradation problems associated with plant operation and power up-rates
- maintaining a positive and adequate safety culture
- licensing new plants with new and different technologies

Country Group 1 highlighted the following planned U.S. initiatives:

- conduct follow-up activities related to the IRRS self assessment and prepare for the IRRS mission in 2010
- continue hiring and training initiatives
- continue the INPO 2-year evaluation program and the program to assist plants requiring additional support
- use the operating experience program to share experience and establish any underlying causes of unexpected material degradation
- complete the initiatives to establish the necessary framework to support the use of digital technology drawing on the operating experience of others.

The current U.S. National Report addresses many of these issues under the relevant articles.

Survey of Current Safety and Regulatory Issues

The NRC and its licensees are currently facing the following regulatory and safety issues:

- reactor materials degradation
- cyber security
- digital upgrades to instrumentation and control
- moisture effects on underground cables
- containment pressure credit for emergency core cooling system pump net positive suction head
- gas voiding impacts on emergency core cooling system operability
- proposed changes to emergency preparedness regulations

Reactor Materials Degradation Issues

Cases involving materials degradation include the degradation of buried piping systems and the degradation of neutron-absorber materials in spent fuel pools.

Degradation of Buried Piping Systems

Over the past several years, instances of buried piping leaks have occurred in safety-related and nonsafety-related piping at nuclear power plants. Most of the leaks have occurred in nonsafety-related piping. Some of these leaks have caused inadvertent releases of low-level radioactive material and diesel fuel oil. This has resulted in ground water contamination at several plants. The pipe degradation leading to these leaks has not affected the operability of safety systems, and the type and amount of radioactive material or chemicals released to the environment have been a small fraction of the regulatory limits. Consequently, these pipe leaks have been of low significance with respect to public health and safety. The staff documented its evaluation of buried piping degradation issues in SECY-09-0174, "Staff Progress in Evaluation of Buried Piping at Nuclear Reactor Facilities," dated December 2, 2009.

Based on the staff's review, including the review of operating experience related to buried piping degradation, current regulations and American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code requirements are effective in ensuring that the structural integrity and functionality of buried, safety-related piping are maintained. Current regulations are also effective in ensuring that unintended releases of hazardous material to the environment from leaks in both safety-related and nonsafety-related buried piping remain below regulatory limits.

The U.S. nuclear industry has recently developed the Buried Piping Integrity Initiative. The staff plans to meet with the industry to further understand this initiative, evaluate its effectiveness, and monitor industry implementation. The staff will evaluate the need to revise NRC inspection procedures to assess licensee implementation of this new initiative. The staff will also continue to actively participate in codes and standards activities, revise license renewal guidance, monitor operating experience, and assess the need for any further regulatory actions or communications. In addition, the staff continues to evaluate the NRC's regulatory framework associated with groundwater protection.

Degradation of Neutron-Absorber Materials in Spent Fuel Pools

One of the NRC's strategic outcomes for its safety goal is that there are "no inadvertent criticality events." To achieve this goal, as it relates to the storage and handling of reactor fuel, the NRC has promulgated regulations focused on maintaining spent fuel pools subcritical under normal and accident conditions. These regulations appear in 10 CFR 50.68, "Criticality Accident Requirements," and General Design Criterion 62, "Prevention of Criticality in Fuel Storage and Handling," in 10 CFR Part 50, Appendix A. To satisfy these regulations, most licensees have installed fixed neutron absorbers within the spent fuel pool storage racks. Degradation or deformation of the credited neutron absorbing materials could reduce the material's ability to perform its safety function and potentially violate the NRC's subcriticality regulations.

There are many different types of neutron absorbing materials. Within U.S. spent fuel pools the most common types are Boraflex, carborundum, boral, and Metamic. Boraflex was the first neutron-absorbing material to exhibit significant degradation. The NRC documented this issue in Information Notice (IN) 87-43, "Gaps in Neutron-Absorbing Material in High- Density Spent Fuel Storage Racks," dated September 8, 1987; IN 93-70, "Degradation of Boraflex Neutron Absorber Coupons," dated September 10, 1993; and IN 95-38, "Degradation of Boraflex Neutron Absorber in Spent Fuel Pool Storage Racks," dated September 8, 1995; and in Generic Letter (GL) 96-04, "Boraflex Degradation in Spent Fuel Pool Storage Racks," dated June 26, 1996. Ultimately, this issue was resolved through either revised plant-specific criticality analyses that reduced or eliminated credit for Boraflex or by the replacement of Boraflex with other neutron-absorbing materials.

Recent operating experience has identified several instances of degradation, deformation, or both of carborundum and boral neutron-absorbing materials in the spent fuel pools of operating reactors. One example of neutron-absorbing material degradation occurred in the Palisades Power Plant. On July 15, 2008, in support of its license renewal activities, the licensee performed "blackness testing" of the spent fuel pool racks to verify its carborundum was performing in accordance with the assumptions in its criticality analysis of record. Based on this testing, the licensee could not confirm that the spent fuel pool met the subcriticality requirements in 10 CFR 50.68 or its technical specifications. Since the licensee did not have an established monitoring program for the carborundum, the onset of the degradation and the degradation rate cannot be established. In response to the recent operating experience on this issue, the NRC issued IN 09-26, "Degradation of Neutron-Absorbing Materials in the Spent Fuel Pool," dated October 23, 2009, and Draft License Renewal Interim Staff Guidance (ISG) 2009-01, "Staff Guidance Regarding Plant-Specific Aging Management Review and Aging Management Program for Neutron-Absorbing Material in Spent Fuel Pools," dated November 23, 2009. The NRC is currently working to finalize the ISG and exploring what additional actions need to be taken.

The NRC has begun to evaluate the regulatory changes that may be necessary to ensure that its licensees can identify and mitigate neutron-absorber degradation before it challenges subcriticality safety margins. The Palisades operating experience has highlighted the importance of an effective surveillance program for the early identification of neutron-absorber degradation. Such a program could consist of various testing and identification methods, including but not necessarily limited to coupon sampling, in-situ testing, and validated and verified predictive analytical computer codes.

Cyber Security

Information security programs continue to be a critical consideration for any organization that depends on information systems and computer networks to carry out mission or business objectives. The energy sector and the necessary regulatory activities within that sector to provide safe power generation are not immune to increasing threats to their information management and computer enabled control systems. These threat vectors include: cyber criminals, unauthorized access, insider misuse, denial of service attacks, natural disasters, and other disruptions.

Over the last few years, power generators have markedly increased their use of digital control systems to regulate, monitor, and operate power production facilities. This increase in the use of digital control systems has been more than matched by the recent increase in security incidents reported both domestically and internationally, the ease with which computer hacking tools are available, and the steady advancement in the sophistication and effectiveness of attack technology. These risks and risk vectors have all contributed to the urgency of power generators and regulators to ensure that this infrastructure is supported and protected by strong, effective, and measurable information systems security programs.

In March 2009, the NRC issued a new rule on cyber security, 10 CFR 73.54, "Protection of Digital Computer and Communication Systems and Networks." This rule requires operating power reactor licensees and combined operating license applicants to provide assurance that nuclear power plants' safety, safety-related, security, and emergency preparedness functions are protected from cyber attacks up to and including the design-basis threat. This new regulation required licensees and combined operating license applicants to submit a cyber security plan, including an implementation schedule, to the NRC for review and approval.

In addition, the NRC has taken steps to address these issues within the agency by establishing the Computer Security Office.

Section 18.3.2.3 of this report discusses cyber security in more detail.

Digital Upgrades to Instrumentation and Control

The use of digital instrumentation and control raises issues that were not relevant to analog systems. Examples of such issues include the following:

- A common-cause failure attributable to software errors was not possible with analog systems. This potential weakness may require the consideration of diversity and defense-in-depth in the application of digital instrumentation and control systems.

- Interchannel communication, communication between nonsafety and safety systems, and system security and reliability must be reviewed closely to ensure that public safety is preserved.

- Highly integrated control room designs with safety and nonsafety displays and controls will be the norm for new reactor designs.

- Human factors design and quality assurance during all phases of software development, control, and validation and verification are critical.

The NRC's Digital Instrumentation and Control Steering Committee initiated task working groups to develop ISG documents for all high-priority technical issues associated with licensing digital instrumentation and control for nuclear power reactors. The working groups developed the ISG documents with significant input from external stakeholders through a series of public meetings and posted draft versions on the NRC Web site for public comment. The working groups addressed the following technical issues: (1) cyber security, (2) diversity and defense-in-depth, (3) review of new reactor digital instrumentation and control PRA, (4) highly-integrated control room-communications, and (5) highly-integrated control room human factors. The NRC staff is using the guidance documents to conduct ongoing reviews. Early feedback from licensees and NRC staff who have used the ISG documents has been positive. The staff used the ISGs in reviewing digital upgrades for the Wolf Creek and Oconee plants and in reviewing a number of design certification and combined license for new plants. The NRC staff plans to use the ISGs to update regulatory documents such as standard review plans (SRPs), regulatory guides (RGs), and NUREGs.

The working groups are still developing guidance on the licensing process for operating power reactors and fuel cycle facilities. For the licensing process, the working group is providing additional guidance on the scope and conduct of the review of digital retrofits to operating plant safety systems. The staff is incorporating lessons learned from ongoing reviews and has published a draft ISG for comment. For fuel cycle facilities, the working group is addressing many of the same technical and licensing questions but with consideration of the significant differences in licensing requirements for power plants and fuel cycle facilities, and the consequences of digital system failures.

The NRC is actively involved with the Multinational Design Evaluation Program which is an international assembly of nuclear regulators addressing common issues with the licensing of new reactors. The NRC chairs the digital instrumentation and control issue-specific group, which is looking at ways to harmonize requirements, standards, and guidance for instrumentation and control. The NRC is also working with the EPR digital instrumentation and control task group, which is a collaboration of regulators that are reviewing the EPR instrumentation and control design. The Multinational Design Evaluation Program allows the NRC to share digital instrumentation and control information to support regulatory infrastructure improvements and licensing decisions.

Article 18 of this report discusses the digital instrumentation and control in more detail.

Moisture Effects on Underground Cables

The NRC began a detailed review of underground electrical power cables after an increasing trend in moisture-induced cable failures was identified. The failed cables had been exposed to condensation, wetting, submergence, and other environmental stresses that resulted in insulation degradation. Since most of the cables exposed to this environment were not designed for continuous wetting or submergence, there is an increasing possibility of multiple failures, which in turn could initiate a plant shutdown and/or disable accident mitigation systems.

On February 7, 2007, the NRC issued GL 2007-01, "Inaccessible or Underground Power Cable Failures That Disable Accident Mitigation Systems or Cause Plant Transients," to inform licensees that the failure of certain power cables can affect the functionality of multiple accident mitigation systems or cause plant transients. The NRC asked the licensees to provide information on inaccessible or underground power cable failures for all cables that are within the scope of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants" (the Maintenance Rule).

Based on the review of licensee's responses to GL 2007-01, the NRC staff identified 269 cable failures at U.S. nuclear power plants. Licensees applying for a 20-year license renewal have agreed to implement a cable testing program during the period of extended operation for a limited number of cables that are within the scope of licensee renewal, but only a few plants have established a cable testing program for the current operating period. The data obtained from the responses to GL 2007-01 show an increasing trend in cable failures within the plants' current 40-year licensing period of operation. The predominant factor contributing to cable failures at nuclear power plants appears to be the presence of water or moisture resulting in intrusion, because of the submergence of underground cables in water. If cables have been exposed to conditions for which they are not designed, licensees need to demonstrate, through adequate testing, that there is reasonable assurance that the cables can perform their intended design function. Licensees should also minimize the amount of moisture in underground cable raceways, conduits, and cable vaults.

NRC regulations in 10 CFR Part 50 require licensees to assess the condition of systems and components in a manner sufficient to provide reasonable assurance that they are capable of fulfilling their intended functions, and that a test program to ensure that components will perform satisfactorily in service is identified and performed. Licensees should have a program for using available diagnostic cable testing methods to assess cable condition to ensure the insulation is not degraded over the life of the plant.

In January 2010, the NRC issued NUREG/CR-7000, "Essential Elements of an Electric Cable Condition Monitoring Program," to inform licensees of the types of cable testing methods that are currently available to detect cable insulation degradation. In addition, the Electric Power Research Institute (EPRI) has also developed a model cable monitoring program to provide licensees with information on creating such a program. The NRC staff is planning to issue a draft RG for public comment, by the middle of 2010. The staff will continue to consider public comments in addition to EPRI's proposed cable monitoring program when finalizing the RG.

Containment Pressure Credit for Emergency Core Cooling System Pump Net Positive Suction Head

NRC RG 1.1, "Net Positive Suction Head for Emergency Core Cooling and Containment Heat Removal System Pumps," dated November 2, 1970, states that the pressure in containment before the postulated accident should be used when determining the available net positive suction head of emergency core cooling system and containment heat removal system pumps. Before the NRC issued this guidance document, some reactors were designed and licensed using the calculated containment accident pressure.

The agency modified this guidance in RG 1.82, Revision 3, "Water Sources for Long-Term

Recirculation Cooling Following a Loss of Coolant Accident," dated November 2003, which permitted certain operating reactors to use containment accident pressure when modification of the reactor design was impractical. The modification to the guidance of RG 1.1 recognized the fact that in certain cases it was not practical to avoid using containment accident pressure. Such cases included sub-atmospheric containments, application of a larger debris source term following a loss-of-coolant accident, and an increase in licensed thermal power (or power uprates).

As a result of discussions with the NRC Advisory Committee on Reactor Safeguards, the staff is re-examining this issue with the goal of evaluating containment integrity probabilistically and studying all related pump phenomena and quantifying margins both in terms of pump cavitation limits and containment accident response. Some of the subjects examined include the effect of containment integrity testing frequency on failure probabilities, the uncertainty in required net positive suction head, cavitation erosion as a function of pump flow rate, and the mechanical performance of centrifugal pumps with various degrees of cavitation. The staff is also evaluating whether this issue raises a policy question regarding the use of probabilistic risk assessment in deterministic regulatory decisionmaking and defense-in-depth. The staff will publish the results of this work in appropriate regulatory documents.

Gas Voiding Issues in Light-Water Reactor Safety Systems

The accumulation of gas in systems that are important to safety has been a continuing, often unrecognized, problem since the first light-water nuclear power plants were placed into operation. Early manifestations of the issue included pipe hanger damage as a result of water hammer in residual heat removal systems when the systems were started and the loss of residual heat removal when the pumps became gas-bound. This led to a recognition of potential problems with the emergency core cooling systems since much of the residual heat removal system also serves as the low-pressure – high flow rate portion of the emergency core cooling system, and similar problems could occur in the low-pressure and high-pressure emergency core cooling systems if they were placed in operation in response to a loss-of-coolant accident. Consequently, numerous publications were issued to address the issue, technical specifications were developed to require pump discharge piping to be full of water to address the water hammer issue, and steps were taken to prevent gas ingestion into pumps. Before 2008, the actions were not fully successful because of a failure to understand the root causes of gas accumulation and to comprehensively address the potentially affected systems and the phenomena associated with gas accumulation and movement before, during, and after system startup.

The root causes of gas accumulation include: (1) poor designs that allow gas introduction and accumulation, (2) licensees failing to properly fill and vent the system following drain-down or maintenance, (3) ineffective gas accumulation controls during operation, (4) inappropriate technical specifications regarding the scope and frequency of inspections for gas accumulation, and (5) unanticipated problems with keep-full systems.

GL 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal and Containment Spray Systems," dated January 11, 2008, addressed the issue for several important safety systems via in-depth coverage of the phenomena and the operating processes necessary to prevent event occurrence as a result of gas. The U.S. nuclear industry provided a detailed response to GL 2008-01 that included: (1) transient suction pipe testing, (2) development of analysis methodologies, (3) system walkdowns, including precision measurement of piping configurations, (4) void measurements using ultra-sonics, rewritten and new procedures, (5) extensive operator training, and (6) hardware changes such as the addition of vent valves and tanks to remove gas from piping before it becomes a concern. These follow-up actions have resulted in an enhanced understanding of the issues and implementation of measures to minimize future problems. As a result, there is an increased confidence that the systems will perform their safety-related functions when required to do so. Further improvements are underway.

The NRC is following up on the industry activities by reviewing licensee responses to GL 2008-01 and by performing inspections at the 104 nuclear power plants that are licensed in the U.S. The scope of these activities is illustrated by the generic review instructions the NRC uses in providing inspection suggestions to its inspectors in accordance with Temporary Instruction 2515/177, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems (NRC Generic Letter 2008-01)," dated June 9, 2009. The scope of industry participation is evident in the four well-attended workshops sponsored by the Nuclear Energy Institute (NEI) and in the release of NEI guidance document NEI 09-10, Revision 0, "Guidelines for Effective Prevention and Management of System Gas Accumulation," dated October 2009.

Enhancements to Emergency Preparedness Regulations

The basis of radiological emergency preparedness and response is to protect public health and safety by avoiding public radiological exposure as a result of a release from a nuclear power plant. Since the Three Mile Island accident in 1979, the premise underlying emergency preparedness regulations has been that conditions and events driving an accident are typically related to equipment malfunction, component failure, or operator error. Following the terrorist events of September 11, 2001, the NRC determined that it was necessary to require certain modifications to emergency preparedness programs for operating power reactor licensees to ensure continued adequate protection of public health and safety. The agency issued these modifications to the licensees via several orders.

The NRC evaluated the emergency preparedness planning basis for nuclear power reactors given the changed threat environment. The NRC staff informed the Commission that the emergency preparedness planning basis remained valid, including scope and timing issues. The NRC staff also noted several emergency preparedness issues that required further action to better respond to the post-September 11, 2001, threat environment. As a result, the Commission directed the staff to conduct a comprehensive review of emergency preparedness regulations and guidance. The NRC staff provided the results of its review to the Commission and recommended rulemaking for enhancements to the emergency preparedness program. The Commission approved the staff's recommendation, and the rulemaking includes changes in the following areas:

- on-shift staff responsibilities
- emergency action levels for hostile action events
- emergency response organization augmentation and alternate facilities
- licensee coordination with offsite response organizations during hostile action events
- protection for onsite personnel
- challenging drills and exercises
- backup means for alert and notification systems
- emergency declaration timeliness
- emergency operations facility – performance-based approach

- evacuation time estimate updating
- amended emergency plan change process

In an effort to conduct rulemaking that is transparent and open to stakeholder participation, the NRC, in conjunction with the Federal Emergency Management Agency (FEMA), engaged stakeholders through various means during the development of this rule. The NRC and FEMA held several public meetings to discuss the proposed changes. These meetings included participants from the nuclear industry, non-governmental organizations, State and local agencies, and other interested stakeholders. The NRC also requested public comments and considered these comments in the development of the rule. The NRC and FEMA are also updating their emergency preparedness guidance documents to reflect the changes in the NRC regulations.

The new requirements should enhance the licensees' ability to prepare and implement certain emergency preparedness and protective measures in the event of a radiological emergency. These changes will also address, in part, security issues identified after the 2001 terrorist events; clarify regulations to achieve consistent emergency plan implementation among licensees; and modify certain emergency preparedness requirements to be more effective and efficient.

Status of Safety and Regulatory Issues Discussed in the Fourth U.S. National Report

Reactor Materials Degradation Issues

The reactor materials degradation issues outlined in 2007 focused on environmentally-assisted cracking of dissimilar metal welds in both PWRs and boiling water reactors (BWRs). The Wolf Creek pressurizer dissimilar metal butt weld cracking issue and the Duane Arnold jet pump riser safe end cracking event were discussed.

Wolf Creek Pressurizer Dissimilar Metal Butt Weld Cracking Issue. The discovery, in October 2006, of five circumferential indications in three dissimilar metal welds on the pressurizer at the Wolf Creek Generating Station raised safety concerns based on the size and location of the indications. This condition calls into question the degree of safety margin present in past structural integrity evaluations for dissimilar metal welds susceptible to primary water stress-corrosion cracking because of the circumferential nature of the indications and because multiple stress-corrosion cracking flaws may grow independently and ultimately grow together, significantly reducing the time from flaw initiation to leakage or rupture. To address the concern in the pressurizer surge, spray, safety, and relief nozzle welds, the NRC issued confirmatory action letters to the licensees of 40 PWR plants requesting specific inspection and leak detection enhancements. All 40 plants have completed the initial inspections, and 36 have mitigated the welds. The remaining four plants must re-inspect the remaining unmitigated welds every 4 years.

On October 22, 2008, the NRC issued Regulatory Issue Summary (RIS) 2008-25, "Regulatory Approach for Primary Water Stress Corrosion Cracking of Dissimilar Metal Butt Welds in Pressurized Water Reactor Primary Coolant System Piping." This RIS documents the current NRC regulatory approach for ensuring the integrity of primary coolant system dissimilar metal butt welds containing Alloy 182/82 in PWRs. The NRC has reviewed the industry's near-term inspection plans by monitoring the implementation of the industry's MRP-139 report, "Materials Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guideline." The NRC is working to establish industry inspection plans for the long term. It participated with

ASME to develop ASME Code Case N-770, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities," Dated January 26, 2009. Final incorporation of ASME Code Case N-770, with certain NRC conditions, into the *Code of Federal Regulations* is ongoing through a current rulemaking activity.

Duane Arnold Jet Pump Riser Safe End Cracking Event. Since preparation of the fourth U.S. National Report, the Boiling Water Reactor Vessels and Internals Project (BWRVIP), an industry group that provides guidance on the management of BWR materials degradation issues, evaluated the significance of the February 2007 Duane Arnold Inconel 82/182 weld cracking event to the U.S. nuclear industry. BWRVIP had previously issued guidance on the inspection of BWR welds susceptible to intergranular stress-corrosion cracking in technical report BWRVIP-75-A, "BWR Vessel and Internals Project, Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules," dated October 2005. BWRVIP issued supplementary guidance to U.S. BWR licensees by letters dated January 23, February 28, May 24, and December 4, 2007, which requested: (1) a review of prior in-service inspection data for welds similar to those that were discovered to be cracked at Duane Arnold to verify that other indications of cracking had not been missed, and (2) expedited inspection of any welds similar to those found cracked at Duane Arnold that had not been recently examined by current, qualified inspection techniques. U.S. BWR licensees are in the process of implementing this guidance and have discovered a limited number of other indications, none of which have been of immediate safety significance. Furthermore, the BWRVIP has summarized the guidance information provided to its members in proprietary technical report BWRVIP-222, "Accelerated Inspection Program for BWRVIP-75-A Category C Dissimilar Metal Welds Containing Alloy 182," dated July 2009. With the issuance of this updated guidance, the staff considers this particular operating event to have been adequately addressed.

Unanticipated Issues Associated with Power Uprates

Potential Adverse Flow Effects. At power uprate conditions, nuclear power plants can experience significant increases in steam flow velocities. Plant experience has shown that as the higher main steamline flow passes over branch lines, it can create an acoustic resonance in the steamlines that can vary greatly from one plant to another, depending on the routing of the main steamlines and the steam dryer vintage and geometry. The acoustic resonance can create pressure waves that strike the steam dryer in BWRs with significant force. This flow could cause the stress in the steam dryer to exceed the material fatigue limits, which may result in steam dryer cracking. The acoustic resonance can also cause excessive vibration that may damage steamline and feedwater line components. For example, in 2002 and 2003, the steam dryers at Quad Cities Units 1 and 2 developed cracks and, in some cases, fractured metal parts from the steam dryer fell into the reactor pressure vessel and entered the steamlines leading to the turbine generator during EPU operation. In addition, feedwater sampling probes at Dresden Units 2 and 3 broke loose within a relatively short period of time under the higher feedwater flow conditions.

The NRC is applying lessons learned from operating experience, as well as knowledge gained from previous reviews of analyses of potential adverse flow effects, in reviewing power uprate requests for operating nuclear power plants and design certification requests for new nuclear power plants. As part of this effort, the NRC has updated relevant sections of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," and RG 1.20, Revision 3, "Comprehensive Vibration Assessment Program for

Reactor Internals during Preoperational and Initial Startup Testing," dated March 2007, to further guide NRC reviewers and the nuclear industry regarding evaluation of potential adverse flow effects.

To address the issue, BWR EPU applicants have provided complex steam dryer analyses to demonstrate the structural integrity of the steam dryers at uprated power levels. However, it has been challenging for licensees to provide acceptable steam dryer analyses, and this has significantly contributed to delays in the EPU reviews for several BWR plants. Reasons for these delays include: (1) licensees introducing new refinements to analytical methods not used in previous EPU applications, (2) the NRC identifying new issues with licensees' acoustic circuit models, (3) licensees needing to make steam dryer modifications to address analyses issues, and (4) lack of adequate plant measurement data needed for the steam dryer analyses.

To further address this issue, the industry submitted two independent topical reports to the NRC for review and approval. These reports present two independent integrated evaluation approaches and acceptance criteria for steam dryers. GE Hitachi Nuclear Energy submitted NEDC-33436P, "GEH Boiling Water Reactor Steam Dryer - Plant Based Load Evaluation," on November 7, 2008. (NEDC-33436P gives direction to refer to GE Hitachi topical report NEDC-33408P, "ESBWR Steam Dryer - Plant Based Load Evaluation Methodology," dated February 2008, which was submitted to the NRC for review and approval of similar methodology for the ESBWR.) EPRI (BWRVIP) submitted BWRVIP-194, "Methodologies for Demonstrating Steam Dryer Integrity for Power Uprate," on December 18, 2008. The NRC has begun its review of these topical reports; however, the NRC has identified the need for complementary or related topical reports, as well as additional information, to continue its review. If the NRC ultimately approves these topical reports, licensees referencing them will only need to provide the plant-specific items for review. This process should improve the review timeliness of future requests that involve evaluation of potential adverse flow effects.

PWR Post-Loss-of-Coolant-Accident Chemical Formation and PWR Sump Strainer Performance

The fourth U.S. National Report identified post-loss-of-coolant-accident chemical formation related to PWR containment sump performance as an issue. This issue remains of concern, though substantial progress has been made in resolving it. This update addresses chemical effects, but also the larger issue of sump performance, some aspects of which are not fully resolved. The NRC expects licensees to commit to specific and acceptable methods for evaluating strainer performance, as well as to make any needed plant modifications to address the results of the strainer performance evaluations. Although the NRC had planned to complete all activities related to sump strainer performance by the end of 2010, the resolution of several technical issues has been particularly challenging. Examples of the more complex issues include effects of chemical precipitate, debris generation zone of influence, and potential reactor core interactions with debris that passes through the sump strainer.

To address concerns about the potential for chemical precipitates and corrosion products to significantly block a fiber bed and increase the head loss across an emergency core cooling system sump screen, the NRC has sponsored research, issued INs, observed testing, issued review guidance, and performed detailed reviews of plant-specific evaluations. NUREG/CR-6914, Volumes 1–6, "Integrated Chemical Effects Test Project," dated December 2006, provides results from a joint NRC/U.S. nuclear industry integrated chemical effects testing program. This test program identified chemical precipitation products, and follow-up testing and analyses were performed to address the effect of chemical precipitate on head loss. Subsequent vertical loop head loss test results appear in NUREG/CR-6913, "Chemical Effects Head Loss Research in Support of Generic Safety Issue 191," dated December 2006. On the basis of these tests performed at Argonne National Laboratory, the NRC issued IN 2005-26, "Results of Chemical Effects Head Loss Tests in a Simulated PWR Sump Pool Environment," dated September 16, 2005, and IN 2005-26, Supplement 1, "Additional Results of Chemical Effects Tests in a Simulated PWR Sump Pool Environment," dated January 20, 2006.

Since the test results contained in these NUREGs demonstrated that chemical effects can be significant, the U.S. nuclear industry performed additional testing to evaluate potential chemical effects. The NRC issued a safety evaluation report on the PWR Owners Group (Westinghouse) topical report that supports the evaluation and testing of chemical effects, WCAP-16530-NP-A, "Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids to Support GSI-191," dated March 2008. Licensees have also performed integrated head-loss testing that included chemical effects, and the NRC has visited all vendor sites that performed testing to observe tests and provide comments. The NRC issued staff review guidance for plant-specific evaluations of chemical effects, entitled "NRC Staff Review Guidance Regarding Generic Letter 2004-02 Closure in the Area of Plant-Specific Chemical Effect Evaluations," dated March 2008. The NRC staff is currently reviewing licensee plant-specific chemical effects evaluations, and many licensees have demonstrated an adequate evaluation of plant-specific post-loss-of-coolant-accident chemical effects.

In order to reduce the amount of debris expected to impact the sump strainer, some licensees sponsored jet impingement testing intended to show a reduced zone of influence for certain insulation and coating types. The zone of influence determines the amount of debris generated by the postulated break and, therefore, is a significant parameter in the evaluation of the sump screen performance. The NRC has not accepted the industry testing because of a number of concerns regarding it. In addition, on December 11, 2009, as a result of NRC staff questions, the test vendor identified a potential issue with the testing that may have resulted in non-conservative zones of influences in the test reports. The NRC plans to ask licensees to demonstrate adequate strainer performance without referencing these reports, with the exception of epoxy coatings reports that can still be referenced. The inability to take credit for the reduced zones of influence could lead to additional testing or plant modifications or both in order for affected plants to fully address the sump performance issue.

The NRC staff is currently reviewing an industry topical report by Westinghouse addressing downstream effects in the reactor vessel, WCAP-16793-NP, "Evaluation of Long Term Cooling Considering Particulate, Fibrous and Chemical Debris in the Recirculating Fluid," dated April 2009. This document is intended to provide an acceptance criterion for licensees to use to demonstrate that debris passing through the sump strainers will not cause unacceptable impacts in the reactor core. The NRC expects to issue a safety evaluation regarding this report in 2010. However, some questions regarding the subject matter of the report have not been fully addressed, and the industry plans additional testing to support the report.

Other Major Regulatory Accomplishments

Since its previous U.S. National Report in 2007, the NRC has issued two early site permits and one limited work authorization. The NRC also amended its regulations concerning pressurized thermal shock, power reactor security, aircraft impact assessment, and fatigue management. The agency has also had major accomplishments in the areas of fire protection, analysis of external events, safety culture, and regulatory effectiveness.

Issuance of Early Site Permits and Limited Work Authorizations

On November 27, 2007, and August 26, 2009, the NRC issued two early site permits -- one to Dominion Nuclear North Anna, LLC, for the North Anna site in Virginia, and another to Southern Nuclear Operating Company for the Vogtle Electric Generating Plant early site permit and a limited work authorization in Georgia. The main advantage of the early site permit process is the removal of environmental contentions later in the licensing process. Successful completion of the early site permit process resolves many site-related safety and environmental issues and determines that the sites are suitable for possible future construction and operation of a nuclear power plant. The permits are valid for up to 20 years. An early site permit may be referenced in an application to the NRC for a combined license to build one or more nuclear plants on the permitted site.

Reactor Pressure Vessel Pressurized Thermal Shock

On January 4, 2010, the NRC promulgated a new regulation in 10 CFR 50.61a, "Alternate Fracture Toughness Requirements for Protection against Pressurized Thermal Shock Events." This new regulation provides an alternative set of requirements that U.S. PWR licensees may choose to implement (provided they meet certain criteria established with the regulation) to demonstrate that their facility's reactor pressure vessel will be adequately protected from failure because of a pressurized thermal shock event through the end of the facility's operating license. The NRC developed the technical basis for 10 CFR 50.61a based on a state-of-the-art probabilistic fracture mechanics methodology that accounted for, among other factors, (1) reactor pressure vessel material, (2) mechanical and chemical properties and their variability, (3) reactor pressure vessel material flaw distributions, (4) radiation damage modeling, (5) calculation of neutron fluence, (6) thermal-hydraulic modeling of pressurized thermal shock events, and (7) PRA modeling of the likelihood of a pressurized thermal shock event. It is anticipated that this new regulation may obviate the need for detailed plant-specific analyses by those licensees who would otherwise have difficulty demonstrating compliance with the NRC's original pressurized thermal shock regulation described in 10 CFR 50.61, "Fracture Toughness Requirements for Protection against Pressurized Thermal Shock Events," through the end of their facility's operating license.

Power Reactor Security

On March 27, 2009, the NRC amended its power reactor security regulations. The rulemaking: (1) makes generically applicable many of the security requirements imposed by Commission orders issued after the terrorist attacks of September 11, 2001, (2) adds several new requirements that resulted from insights gained while implementing the security orders, reviewing site security plans, and implementing the enhanced baseline inspection program and force-on-force exercises, (3) updates the regulatory framework in preparation for receiving license applications for new reactors, and (4) imposes requirements to assess and manage site activities that can adversely affect safety and security. Additionally, the NRC resolved three petitions for rulemaking as part of the effort to develop the security requirements.

This final rulemaking amended the following existing requirements within 10 CFR Part 73, "Physical Protection of Plants and Materials":

- 10 CFR 73.55, "Requirements for Physical Protection of Licensed Activities in

Nuclear Power Reactors against Radiological Sabotage"

- 10 CFR 73.56, "Personnel Access Authorization Requirements for Nuclear Power Plants"
- 10 CFR Part 73, Appendix B, "Nuclear Power Reactor Training and Qualification Plan for Personnel Performing Security Program Duties"
- 10 CFR Part 73, Appendix C, "Licensee Safeguards Contingency Plans"

The amendments added two new sections to 10 CFR Part 73 and a new paragraph to 10 CFR Part 50:

- 10 CFR 73.54, "Cyber Security Requirements"
- 10 CFR 73.58, "Safety/Security Interface Requirements for Nuclear Power Reactors"
- 10 CFR 50.54(hh), "Mitigative Strategies and Response Procedures for Potential or Actual Aircraft Attacks"

There was extensive public and stakeholder participation during the development of the new requirements. The NRC extended the normal proposed rule comment period twice, offered a supplemental proposed rule comment period (related to the changes made to 10 CFR 50.54(hh)), and held meetings during the public comment period to support more informed external stakeholder feedback. The new power reactor security regulations became effective on March 31, 2010. However, due to the nuclear power plant physical changes required by the new regulations, some licensees have requested and received exemptions for the compliance date of certain elements of the rule.

Aircraft Impact Assessment

Since September 11, 2001, the issue of an airborne attack on U.S. infrastructure, including both operating and potential new nuclear power plants, has been widely discussed. The NRC has comprehensively studied the effect of an airborne attack on nuclear power plants and has undertaken a series of regulatory actions to enhance the security of nuclear power plants. Studies confirm the low likelihood that an airplane attack on a nuclear power plant would affect public health and safety, in part because of the inherent robustness of the structures. One study identified new methods plants could use to minimize damage and risk to the public in the event of any kind of large fire or explosion. Nuclear power plants subsequently implemented many of these methods, and the NRC has adopted new regulations to require both existing and new nuclear power plants to address strategies for coping with large fires or explosions from any cause, including the impact of a large, commercial aircraft.

The NRC also adopted an additional regulation for the consideration of aircraft impacts for new nuclear power reactors. This rule requires applicants for new nuclear power reactors to perform a design-specific assessment of the effects of the impact of a large, commercial aircraft, using realistic analyses. Based on the results of this assessment, applicants must identify and incorporate design features to show that the facility can withstand the effects of the aircraft impact. Applicants for all of the designs currently under NRC review have completed their aircraft impact assessments and submitted the resulting design information.

The NRC has also worked with the nuclear power industry to develop guidance for the performance of the required aircraft impact assessment. In 2010, a RG will endorse this guidance, NEI 07-13, Revision 7, "Methodology for Performing Aircraft Impact Assessments for New Plant Designs," dated May 2009. The NRC staff will inspect the aircraft impact assessments performed by applicants for the designs currently under review.

Fatigue Management

On March 31, 2008, the NRC amended 10 CFR Part 26, "Fitness for Duty Programs," to establish enforceable requirements for the management of worker fatigue. Subpart I, of 10 CFR Part 26, "Managing Fatigue," includes new regulations that establish an integrated approach to fatigue management consisting of prevention, detection, and mitigation as the fundamental components. The rule required licensees to implement its requirements by October 1, 2009, which provided 18 months to hire and train individuals as needed to ensure proper implementation of the requirements. Subpart I strengthens the effectiveness of fitness for duty programs by ensuring that worker fatigue does not adversely affect public health and safety. In addition to the rulemaking and its associated analyses, the Commission also issued RG 5.73, "Fatigue Management for Nuclear Power Plant Personnel," in March 2009 to implement the rule.

Risk-Informed Fire Protection Infrastructure

In 2004, the NRC staff promulgated a rule, 10 CFR 50.48(c), which allows an operating nuclear power plant licensee to voluntarily adopt a risk-informed, performance-based fire protection program. The fire protection regulations now allow licensees to demonstrate compliance in one of two ways -- licensees may either maintain their currently approved fire protection program or transition to the risk-informed, performance-based fire protection program. The risk-informed, performance-based fire protection rule incorporates by reference the National Fire Protection Association standard 805 (NFPA 805), "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition," with several clarifications and exceptions. Licensees transitioning to 10 CFR 50.48(c) can use consensus standards on PRA quality (i.e., ASME/American Nuclear Society (ANS)-RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessments for Nuclear Power Plant Applications," dated February 2009) and associated peer reviews, as endorsed in the latest revision of RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," published by the NRC, to help ensure the technical adequacy of their PRAs for this transition. The NRC has also sponsored research on fire protection and fire PRA issues for a number of years. One key product of this research is a joint NRC-EPRI document, NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," dated September 2005.

Two nuclear stations, Oconee and Shearon Harris, volunteered to be pilot plants for the transition to a risk-informed, performance-based fire protection program, and the NRC is reviewing the pilot plants' license amendment requests. The NRC published RG 1.205, Revision 1, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," in December 2009, which captures the lessons learned from the pilot plant programs. The NRC also issued NUREG-0800, Section 9.5.1.2, "Risk-Informed, Performance-Based Fire Protection Program," in December 2009. The risk-informed, performance-based approach will provide greater regulatory consistency and clarity, and provide more flexibility for licensees to address very low-risk issues without needing prior NRC staff approval. Transitioning to this new approach includes a reassessment of the current plant fire protection program. This could lead to the identification of previously unrecognized fire safety issues. Subsequent resolution of these issues will result in safer plants. To date, 51 operating reactor units, including the two pilot plants (four units), have committed to transitioning to the new rule.

Probabilistic Risk Assessment Standard for the Analysis of External Events

The NRC used a phased approach to PRA quality so that progress could be made in risk-informed activities while the necessary infrastructure (e.g., development of PRA quality standards and related industry peer review guidance) was being built. In the initial phases, the standard for external events PRA quality was still under development, and in general, external event contributors to risk were addressed in an ad hoc fashion, including through limited or simplified quantitative analyses, qualitative arguments, and reliance on compensatory measures.

The initial consensus PRA standard for the analysis of external events for at-power operations was published in February 2009 as part of ASME/ANS RA-Sa-2009. This standard includes internal fires, seismic events, external floods, high winds, and other external events. In March 2009, the NRC published RG 1.200, Revision 2, which includes the NRC's endorsement (with objections and clarifications) of the PRA standard ASME/ANS RA-Sa-2009 including external events at power. The NRC allowed a 1-year implementation period for limited-scope applications (e.g., single component technical specification changes) to enable licensees to develop or revise their PRAs, perform self-assessments and any necessary peer reviews, and address any findings of these reviews and previous reviews. Starting in April 2010, nuclear power plant licensees who submit risk-informed licensing applications are expected to meet the guidelines in RG 1.200, Revision 2, including the external events PRA quality standard.

Future revisions to the PRA standard are expected to refine the quality expectations for internal and external event PRAs at power, as well as to incorporate additional peer review guidance and PRA standards for operations during low-power and shutdown modes. The NRC will endorse the revisions to the standard (with objections and clarifications, as appropriate) in future revisions of RG 1.200 and will typically include a 1-year implementation period for limited-scope applications.

Regulatory Effectiveness

The NRC went through a period of expansion in which it worked aggressively to hire the highly skilled staff needed to regulate the existing fleet of operating nuclear reactors and to meet the demands for new reactor and materials license application reviews. The agency has grown from a staff of 3,110 employees in 2004 to more than 4,000 employees today. Although this hiring rate has decreased, the NRC is now working to meet the challenge of training and integrating a new and increasingly younger workforce, providing staff with the necessary infrastructure to successfully carry out the organization's mission.

Staffing. The NRC recognizes that the agency must remain the employer of choice if it is to continue to be effective in accomplishing its mission. The NRC has developed a talent acquisition plan, which includes the following elements:

- Branding – Employer branding implies name recognition and identification with a mission. The NRC is engaged in this long-term process even when not actively recruiting.
- Academic Linkages – This element includes targeted recruiting and connecting with universities. In addition to participation in career fairs, the agency has University Champions who facilitate relationships between the NRC and individual universities to aid in recruiting, and it engages faculty and administration in the agency's work

through grants and scholarships.

- Mission Driven – NRC staff members want to know how their work relates to the agency mission and how they are making a difference. This is, perhaps, the NRC's most important recruitment and retention tool.

Responses to employee viewpoint surveys show that NRC efforts to hire and retain a highly motivated workforce are working. In 2007 and 2009, the NRC was ranked as the best place to work in the Federal Government. The results of the 2009 survey reflect that employees feel strongly engaged, understand how their work contributes to the agency's mission, and view their work as meaningful and important. Survey results also indicate that employees agree that they have the training, development, information, and skills needed to perform their work.

Training. Nearly half of all NRC staff members have been with the agency for less than 4-years. Rapidly training and integrating this large number of new employees into the agency is a significant challenge. The NRC uses an integrated approach to learning to provide new employees with consistent information from branch to branch and division to division.

For example, the agency has adopted an enterprise-wide leadership development program for all workforce segments, from entry-level through the Senior Executive Service. The program focuses on development of 28 defined Federal Government-wide leadership competencies. To assist new employees, the NRC is implementing a virtual orientation center. This advanced training tool allows new hires to enter a computer-generated or virtual world where they can obtain information about the NRC organization, mission, and employee benefits before starting their first day of work.

Additionally, the NRC offers position-specific training to accompany this generic orientation. The main NRC offices, such as the Office of Nuclear Reactor Regulation, have developed a qualification program that consists of three parts: general requirements, position-specific requirements, and oral qualification boards. The NRC is continuing to develop its qualification plans and other position-specific training, such as for project engineers and project managers. It is also identifying course needs at its Technical Training Center and Professional Development Center.

Knowledge Management. The NRC has incorporated knowledge management into its strategic workforce planning. The goal is to identify short- and long-term critical skill gaps to enable the agency to anticipate change. To this end, the NRC attempts to spot workforce trends and projections and to close anticipated skill gaps through both training and development and knowledge management.

The NRC uses an agency-wide knowledge management plan that serves as a framework to integrate new and existing approaches that generate, capture, and transfer knowledge and information relevant to the NRC's mission. The following are some of the near-term and long-term strategies for this plan:

- capture relevant critical knowledge from departing personnel
- recapture departed knowledge where possible
- communicate leadership's expectation for a knowledge-sharing culture
- formalize knowledge management values and principles
- incorporate knowledge management within process workflows

Some of the knowledge management and transfer activities used to accomplish these goals include the following:

- Branch Chief and Team Leader Seminars - As a community of practice, the branch chiefs and team leaders meet monthly and hear presentations by agency experts on topics such as performance management, budget, and communications.

- Video Interviews – The NRC conducted a pilot project to capture knowledge from retiring senior staff using video interviews. The interviews included questions about licensing issues, recruiting and mentoring new hires, leadership, operations center experience, and reactor licensing performance metrics.

- Web Sites – The NRC has developed the NRC Knowledge Center Web page that links a number of communities and topics. This page is supplemented by office-specific knowledge management programs.

Finally, the NRC makes prudent, targeted use of retention incentives and pension offset waivers (rehiring annuitants without reduction of salary or pension) in order to retain highly qualified employees and as a knowledge management tool. Such incentives are particularly useful for unusual occupations or highly specialized disciplines for which candidates may be scarce.

Section 8.1.5.2 of this report discusses the human resources in more detail.

Safety Culture Initiatives

Based on lessons learned from the Davis-Besse reactor pressure vessel head degradation event and other considerations, the NRC enhanced the Reactor Oversight Process to more fully address safety culture and identify safety culture problems earlier so that corrective steps can be taken to address the problems and prevent further plant performance degradation.

In July 2006, the NRC implemented revisions to the Reactor Oversight Process inspection and assessment processes related to safety culture. In 2008, the NRC conducted a self-assessment to review the changes to the Reactor Oversight Process over the initial 18-month implementation period. Lessons learned from the initial 18-month implementation period and from the Palo Verde supplemental inspection resulted in changes to inspection procedures and program guidance.

In November 2009, the agency published a draft Safety Culture Policy Statement in the *Federal Register* that set forth the expectation that all licensees and certificate holders establish and maintain a positive safety culture. Similarly, given the NRC's safety and security mission, the NRC recognizes the importance of maintaining its own strong safety culture and the need to continuously seek to improve its internal organizational effectiveness.

The agency is implementing several initiatives to improve safety culture. Also, the agency uses the periodic Safety Culture and Climate Survey by the Office of the Inspector General as a means to assess the effectiveness of these new and existing safety culture efforts. The latest survey took place in 2009, and the NRC is addressing the survey responses to maintain areas identified as strengths and to improve areas identified as challenges.

Section 10.4 of this report discusses safety culture in more detail.

The NRC's Main Challenges

The NRC identified major challenges for the future in its Strategic Plan for 2008-2013, dated February 2008. Challenges, summarized below and detailed in Appendix A to this report, arise from the changing regulatory environment and external factors.

- The NRC expects to receive additional applications from entities that want to build and operate new nuclear power plants.
- Increasing quantities of spent nuclear fuel will be held in interim storage at reactor sites or transported to centralized interim storage sites awaiting permanent disposal.
- The NRC will continue to coordinate with a wide array of Federal, State, local, and Tribal authorities on issues related to license renewal, new reactor licensing, homeland security, emergency planning, and environmental protection.

The NRC recognizes that these changes will create an even greater need for effective and open communication with public stakeholders about a variety of issues. These include the safety and security of existing and proposed nuclear power plants and other licensed facilities and materials, emergency preparedness, and the impact on public health and safety and the environment from medical, academic, and industrial uses of licensed materials.

The following key external factors could cause challenges:

- receipt of new reactor license applications
- a significant operating incident (domestic or international)
- a significant terrorist incident
- timing of the U.S. Department of Energy (DOE) application for the high-level waste repository at Yucca Mountain and related activities[2]
- legislative initiatives

NRC Major Management Challenges

By law, the Inspector General of each Federal agency (as discussed in Article 8) identifies the agency's most serious management and performance challenges facing the agency and assesses progress in addressing them. The NRCs Inspector General's annual assessment of the major management challenges confronting the agency appear on the NRC's public Web site. The 2009 described the following main challenges, given in more detail in Appendix B to this report.

- protection of nuclear material used for civilian purposes
- managing information to balance security with openness and accountability
- ability to modify regulatory processes to meet a changing environment to include the licensing of new nuclear facilities.
- oversight of radiological waste
- implementation of information technology and information security measures
- administration of all aspects of financial management
- managing human capital

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2 In March 2010, DOE filed a motion to withdraw its application from NRC review. Section 19.8 of this report discusses radioactive waste in more detail.

ARTICLE 6. EXISTING NUCLEAR INSTALLATIONS

Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shutdown may take into account the whole energy context and possible alternatives, as well as the social, environmental, and economic impact.

This section explains how the United States ensures the safety of nuclear installations in accordance with the obligations in Article 6. It covers the reactor licensing and major oversight processes in the United States. This section also discusses programs for rulemaking, fire protection regulation, decommissioning, research, and programs for public participation. The U.S. Nuclear Regulatory Commission (hereafter referred to as the NRC, Commission, agency, or staff) posts the major results of assessments on the agency's public Web site at http://www.nrc.gov. This update includes expectations about early site permits and design certification applications, current experience, and revised details about programs.

6.1 Introduction

The mission of the NRC is to license and regulate the Nation's civilian use of byproduct, source, and special nuclear materials in order to protect public health and safety, promote the common defense and security, and protect the environment. The NRC's primary goal is safety. The agency achieves this goal by ensuring that licensee performance is at or above acceptable safety levels. The NRC's licensees are responsible for designing, constructing, and operating nuclear facilities safely, while the NRC is responsible for the regulatory oversight of the licensees. Six strategic outcomes for this goal are specified:

(1) No nuclear reactor accidents.
(2) No inadvertent criticality events.
(3) No acute radiation exposures resulting in fatalities.
(4) No releases of radioactive materials that result in significant radiation exposures.
(5) No releases of radioactive materials that cause significant adverse environmental impacts.
(6) No instances where licensed radioactive materials are used domestically in a manner hostile to the United States

The NRC met all of its safety strategic outcomes in fiscal years (FYs) 2008 and 2009.

The NRC also uses performance measures to determine whether the agency has met its safety goal. The NRC met its performance measures in FYs 2008 and 2009. Currently the NRC uses six performance measures.

The first measure analyzes nuclear power plant performance based on a large number of performance indicators and inspection findings.

The second measure tracks significant precursor events at nuclear power plants determined by the likelihood of an event adversely impacting safety.

The third performance measure indicates whether the NRC identifies significant issues in a nuclear power plant during inspections conducted under the Reactor Oversight Process.

The fourth measure tracks the trends of several key indicators of nuclear power plant safety. This measure is the broadest measure of the safety of nuclear power plants, incorporating the performance results from all plants to determine industry average results.

These four measures indicated that the nuclear power plants were safely operated, and that the events that did occur were of relatively minor significance.

The other two measures address harmful radiation exposures to the public and occupational workers and radiation exposures that harm the environment. Neither of these measures exceeded their targets in FY 2009.

6.2 Nuclear Installations in the United States

Annex 1 to Part 2 of this report lists all 104 nuclear installations in the U.S., as discussed in NUREG-1350, Volume 21, "NRC Information Digest 2009-2010," dated August 2009, available on the agency's Web site.

6.3 Regulatory Processes and Programs

6.3.1 Reactor Licensing

To construct and operate a nuclear reactor, an entity must submit an application to the NRC for a safety and environmental review. The public has opportunities to participate through a hearing process. The NRC licensed all current operating nuclear plants under the detailed two-step process specified in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," first issuing a construction permit and then an operating license. Since 1976, the NRC has not received applications to construct a new reactor under 10 CFR Part 50. A new single-step process specified in 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," provides direction for issuing a combined license for construction and operation of a new reactor. The NRC has received 18 combined license applications for 28 reactors. In addition, largely because of the favorable incentives created by the U.S. Congress in the Energy Policy Act of 2005, the industry has submitted applications for three additional design certifications, one design certification amendment, and one design certification request to amend the rule for aircraft impact. To date, the NRC has issued four early site permits and one limited work authorization in August 2009. To date, the agency has not issued any combined licenses. Article 18 provides more detail about the 10 CFR Part 52 regulations.

The NRC's reactor licensing process provides for the review and approval of changes after initial licensing. The process allows amendments to the operating license to support plant changes, license renewal, changes of ownership and license transfer, exemptions and relief from NRC regulations, and increases in the reactor power level (i.e., power uprates). This reports provides additional discussion of the process in the introduction and other articles (i.e., Articles 14, 17 and 18).

6.3.2 Reactor Oversight Process

Through its Reactor Oversight Process, the NRC continuously oversees nuclear power plants to verify that they are being operated in accordance with the agency's rules and regulations. The NRC has full authority to take whatever action is necessary to protect public health and safety, and may demand immediate licensee actions, up to and including a plant shutdown.

The Reactor Oversight Process uses both inspection findings and performance indicators to assess the performance of each plant within a regulatory framework of seven cornerstones of safety. Toward that end, the NRC performs a program of baseline inspections at each plant and may perform supplemental inspections and take additional actions to ensure that the plants address significant issues. The NRC communicates the results of its oversight process by posting plant-specific inspection findings and performance indicator information on the agency's public Web site. The NRC also conducts public meetings with licensees to discuss the results of its assessments of licensee performance.

The NRC assesses the Reactor Oversight Process annually and evaluates its overall effectiveness through the agency's success in meeting its pre-established goals (i.e., performance metrics) and intended outcomes. The NRC issued its latest report on the subject, SECY-09-0054, "Reactor Oversight Process Self-Assessment for Calendar Year 2008," on April 6, 2009.

The results of the calendar year 2008 self-assessment indicated that the Reactor Oversight Process met its program goals and achieved its intended outcomes. The staff found the Reactor Oversight Process to be objective, risk informed, understandable, and predictable, and it met the agency's strategic goals of ensuring safety and security. The NRC staff maintained its focus on stakeholder involvement and continued to improve various aspects of the Reactor Oversight Process. The staff implemented several Reactor Oversight Process improvements in calendar year 2008 to address issues raised by the Commission, recommended by independent reviews, and obtained from internal and external stakeholder feedback.

The staff continued to improve the performance indicator program to ensure that the performance indicators provided meaningful inputs to the Reactor Oversight Process. The inspection program independently verified that plants were operated safely and securely, appropriately identified performance issues, and ensured the adequacy of licensee corrective actions to address the noted performance issues. The significance determination process remained an effective tool for determining the safety and security significance of identified performance issues, and the staff met the timeliness goal in calendar year 2008. The staff revised the assessment program to incorporate lessons learned from implementing the safety culture enhancements and continued to ensure that the staff and licensees acted as necessary to address identified performance issues. The staff will continue to actively solicit input from the NRC's internal and external stakeholders and further improve the Reactor Oversight Process based on stakeholder feedback and lessons learned.

Based on its calendar year 2008 self-assessment, the NRC focused on the following significant actions or activities in 2009 to improve the efficiency and effectiveness of the Reactor Oversight Process:

- Continue to implement improvement initiatives based on its mitigating system performance index lessons learned review and provide training on the safety system functional failure performance indicator to the inspection staff.

- Revise program guidance to better integrate operating experience into the Reactor Oversight Process inspection and assessment processes.

- Provide recommendations to the Commission detailing potential improvements to the attraction and retention practices for resident and senior resident inspectors.

- Develop and implement additional significance determination process training to ensure the inspectors remain efficient and effective in determining the safety and security significance of identified performance issues.

- Begin developing models for low-power and shutdown situations for use in the significance determination process.

- Revise program guidance to better integrate traditional enforcement outcomes into the assessment process.

- Revise program guidance, as necessary, to better align with the Commission's Safety Culture Policy Statement once it has been finalized.

- Explore ways to use cross-regional experience to further improve the implementation of the substantive cross-cutting issue guidance.

6.3.3 Industry Trends Program

The NRC staff implemented the Industry Trends Program in 2001. The agency continues to develop the program as a means to confirm that the nuclear power industry is maintaining the safety of operating power plants and to increase public confidence in the effectiveness of the NRC's processes. The agency uses industry-level indicators to identify adverse trends in performance. After assessing industry trends for safety significance, the NRC responds as necessary to any identified safety issues, including adjusting the inspection and licensing programs if necessary. One important output of the Industry Trends Program is the annual agency performance measures reported to Congress on the number of statistically significant adverse industry trends. The NRC Performance and Accountability Report includes this outcome measure.

In addition to long-term trending of the data to identify statistically significant adverse trends, the NRC staff uses a statistical approach based on prediction limits to identify potential short-term, year-to-year emergent issues before they become long-term trends. Short-term fiscal year (FY) 2009 data did not identify any issues that warranted additional analysis or significant adjustments to the nuclear reactor safety inspection or licensing programs.

The Reactor Oversight Process uses both plant-level performance indicators and inspections to provide plant-specific oversight of safety performance, whereas the Industry Trends Program provides a means to assess overall industry performance using industry-level indicators. The NRC evaluates issues that are identified through either program using information from agency databases and addresses those determined to have generic safety significance, including generic safety inspections under the Reactor Oversight Process, the generic communications process, and the generic safety issue process.

Based on the information currently available from the industry-level indicators and the Accident Sequence Precursor Program (discussed in Section 6.3.4), no statistically significant adverse industry trends have been identified through FY 2009.

The staff has recently implemented the Baseline Risk Index for Initiating Events (BRIIE), a new indicator that monitors nine risk-significant initiating events for boiling-water reactors (BWRs) and 10 events for pressurized-water reactors (PWRs) (the additional event category is steam generator tube rupture).

The BRIIE concept provides a two-level approach to industry performance monitoring: (1) it tracks several types of events that could potentially start ("initiate") a challenge to a plant's safety systems; (2) it assigns a value to each initiating event according to its relative importance to the plant's overall risk of damage to the reactor core, then calculates an overall indicator of industry safety performance.

The first level (referred to as Tier 1 performance monitoring) tracks and counts the number of times the initiating events that have an impact on plant safety occur in nuclear power plants during the year. The number of times that each event occurs is compared with a predetermined number of occurrences for that event. If the predetermined number is exceeded, one can infer possible degradation of industry safety performance. This annual tracking allows the NRC to intervene and engage the nuclear industry before any long-term adverse trends in performance emerge.

The second level (referred to as Tier 2 performance monitoring) addresses the risk to plant safety and core damage that each of the initiating events contributes. Each of the events is assigned an importance value, a ranking according to its relative contribution to overall risk to plant safety. The greater the contribution of the event to overall risk, the higher the importance value that is assigned to the event. Using statistical methods, the importance values are combined with the number of times the events occur during the year to calculate a number that indicates how much the overall industry risk of damage to the reactor core has changed from a baseline value. The NRC Performance and Accountability Report notes if this combined industry value reaches or exceeds a threshold value of 1×10^{-5} per reactor critical year, along with actions that have already been taken or are planned in response.

None of the initiating events tracked in Tier 1 exceeded its prediction limit in FY 2009. The BRIIE Tier 2 combined industry value in FY 2009 (i.e., -2.36×10^{-6} per reactor critical year) indicates better than baseline industry performance and is well below the established reporting threshold of 1×10^{-5} per reactor critical year.

SECY-10-0028, "FY 2009 Results of the Industry Trends Program for Operating Power Reactors and Status of Ongoing Development," dated March 16, 2010, provided more details.

6.3.4 Accident Sequence Precursor Program

The Accident Sequence Precursor Program systematically evaluates U.S. nuclear power plant operating experience to identify, document, and rank the operating events that are most likely to lead to inadequate core cooling and severe core damage (i.e., precursors).

To identify potential precursors, the NRC reviews plant events from licensee event reports and inspection reports. The staff then analyzes any identified potential precursors by calculating the probability of an event leading to a core damage state. A plant event can be one of two types, either (1) an occurrence of an initiating event, such as a reactor shutdown or a loss of offsite power, with or without any subsequent equipment unavailability or degradation, or (2) a degraded plant condition, depicted by the unavailability or degradation of equipment without the occurrence of an initiating event.

The Accident Sequence Precursor Program considers an event with a conditional core damage probability or an increase in core damage probability greater than or equal to 1×10^{-6} to be a precursor. The Accident Sequence Precursor Program defines a *significant* precursor as an event with a conditional core damage probability or an increase in core damage probability greater than or equal to 1×10^{-3}.

The Accident Sequence Precursor Program has the following objectives:

- Provide a comprehensive, risk-based view of nuclear power plant operating experience and a measure for trending nuclear power plant core damage risk.
- Provide a partial check on dominant core damage scenarios predicted by probabilistic risk assessments (PRAs).
- Provide feedback for regulatory activities.

The NRC also uses the Accident Sequence Precursor Program to monitor performance against the safety goal established in the agency's Strategic Plan. Specifically, the program provides input to the following performance measures:

- Zero events per year identified as a *significant* precursor of a nuclear reactor accident.
- No more than one significant adverse trend in industry safety performance (determination principally made from the Industry Trends Program but partially supported by Accident Sequence Precursor results).

The staff completed precursor trend analyses as part of the annual Accident Sequence Precursor Program status report provided to the Commission in SECY-09-0143, "Status of the Accident Sequence Precursor Program and the Standardized Plant Analysis Risk Models;" dated September 29, 2009. The report provided insights such as the following:

- No *significant* precursors were identified in FY 2009. The last *significant* precursor was identified in FY 2002 (i.e., multiple degraded conditions at Davis-Besse).
- A statistically significant decreasing trend was detected in the occurrence rate of all precursors during the FY 2001–2008 period.
- During the same period, statistically significant decreasing trends were detected for three groups of precursors: (1) precursors with a conditional core damage probability or an increase in core damage probability greater than or equal to 10^{-4}, (2) precursors involving degraded conditions, and (3) precursors that occurred at PWRs.

6.3.5 Operating Experience Program

The NRC launched the revised Operating Experience Program in January 2005, recognizing that the effective use of operating experience is important for the agency's safety mission. Under the current NRC Strategic Plan, the agency is committed to "evaluate domestic and international operating events and trends for risk significance and generic applicability in order to improve NRC programs" as part of its effort to achieve the goal of safety. As a result, the NRC's emphasis on the effective use of operating experience remains strong.

The fundamental aim of the Operating Experience Program is to collect, evaluate, communicate, and apply operating experience information to achieve the NRC's principal safety mission of protecting people and the environment. Operating experience is reported to the NRC identified in licensee event notifications and in many other reports that are submitted under licensee reporting requirements, and described in reports of operating experience at foreign facilities. Sources of foreign operating experience include International Nuclear Event Scale events and Incident Reporting System reports. NRC staff systematically screens nuclear reactor-related operating experience for safety significance and generic implications. The NRC staff also determines the need for further action and application of lessons learned related to plant operating experience.

To support its safety mission, the NRC increased resources dedicated to the review of operating experience and instituted a clearinghouse. The clearinghouse collects, stores, screens, and communicates operating experience; conducts and coordinates the evaluation of operating experience; tracks the application of operating experience lessons learned; and coordinates NRC operating experience activities with other organizations performing related functions.

Upon launching the program, the NRC developed an internal Web site to provide a centralized source for accessing reactor operating experience information. This Web site is a gateway to the agency's operating experience document collections, contacts, search tools, sources, and reference material. In addition, the NRC created an operating experience community forum to quickly disseminate operating experience to the appropriate technical staff. The agency's public Web site contains all of the NRC's event-related reports.

Section 19.7 of this report provides more information about this program.

6.3.6 Generic Issues Program

The U.S. Congress mandated the NRC's agencywide Generic Issues Program to address issues that have significant generic implications related to safety or security that cannot be more appropriately addressed by other regulatory programs or processes. Sources of candidate generic issues include safety evaluations, operational events, and suggestions from NRC staff members, outside organizations, or members of the general public. Other existing programs generally address emergent issues that demand immediate attention (e.g., issues that may require plant shutdown) so that quick decisions can be made. The NRC maintains a complete list of all generic issues in NUREG-0933, "Resolution of Generic Safety Issues," published most recently in August 2008.

In order to efficiently use program resources and promote timeliness, the following seven criteria describe those issues that are appropriate for processing through the program:

(1) affects public health and safety, security, or the environment (this includes a risk threshold)
(2) applies to two or more facilities
(3) cannot be readily addressed through other regulatory processes or voluntary industry initiatives

(4) can be resolved by new or revised regulation, policy, or guidance
(5) risk or safety significance can be adequately determined or estimated
(6) well defined and discrete
(7) may involve review, analysis, or action by the licensee

Recent major program changes are intended to: (1) ensure timeliness of issue resolution, (2) clarify roles and responsibilities of the participating offices, (3) increase participation of the nuclear industry stakeholders and other stakeholders, as appropriate, and (4) establish clear interfaces between the Generic Issues Program and other NRC processes and activities that are used to address generic issues outside the Generic Issues Program.

6.3.7 Rulemaking

The NRC's regulations, also called rules, impose requirements that licensees must meet to obtain or retain a license or certificate to use nuclear materials or to operate a nuclear facility. The technical staff usually proposes a rule or a change to a rule because of a perceived need to protect public health and safety. However, any member of the public may petition the NRC to develop, change, or rescind a rule. The impetus for a proposed rule could be a requirement issued by the Commission, a petition for rulemaking submitted by a member of the public, or research results that indicate a need for a rule change. The NRC publishes the proposed rule in the *Federal Register* for public comment. Once the public comment period has closed, the staff analyzes the comments, makes any needed changes, and forwards the final rule for approval, signature, and publication in the *Federal Register*.

The NRC uses http://www.regulations.gov to provide an easy means for members of the public to access and comment on NRC rulemaking actions. Accessible through the Internet, Regulations.gov contains proposed rulemakings that have been published in the *Federal Register*, petitions for rulemaking, and other types of documents related to rulemaking proceedings.

The NRC Commissioners must approve each final rule that involves significant matters of policy. Once approved, the final rule is published in the *Federal Register* and will become effective 30 days or after from the date of publication. The section of this report on major regulatory accomplishments summarizes the significant nuclear reactor-related rules issued since the previous U.S. National Report.

6.3.8 Fire Regulation Program

The NRC has three main foci in fire protection regulation: (1) implementation of the new risk-informed, performance-based fire protection licensing basis (10 CFR 50.48(c)); (2) resolution of the fire-induced multiple spurious operation/circuit analysis issue; and (3) resolution of licensees' non-conforming post-fire operator manual actions. To support the implementation of 10 CFR 50.48(c), the NRC issued Regulatory Guide (RG) 1.205 "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," in May 2006, and RG 1.205, Revision 1, in December 2009. As of March 2010, approximately 50 reactor units are committed to transitioning to 10 CFR 50.48(c). Two nuclear stations, Oconee and Shearon Harris, volunteered as pilot plants for the transition, and the NRC is reviewing their license amendment requests. The NRC is also developing guidance to conduct triennial fire inspections of plants after they complete their transitions to the 10 CFR 50.48(c) licensing bases. The Survey of Current Regulatory and Safety Issues section of this report provides further information on the NRC's risk-informed fire protection infrastructure.

For plants that are not transitioning to the risk-informed, performance-based fire protection rule, the NRC published RG1.189, Revision 2, "Fire Protection for Nuclear Power Plants," in November 2009. Revision 2 of RG 1.189 offers clear guidance on acceptable means for addressing multiple spurious operations, as well as general fire protection guidance. Where appropriate, it endorses approaches that industry is developing to assist licensees in their efforts to meet regulatory requirements as, provided in Nuclear Energy Institute (NEI) guidance document NEI 00-01, Revision 2, "Guidance for Post-Fire Safe-Shutdown Circuit Analysis," dated May 2009.

The NRC continues to engage with stakeholders to develop an acceptable method to resolve the issue of circuit analysis actuations. Enforcement Guidance Memorandum (EGM)-09-002, "Enforcement Discretion for Fire Induced Circuit Faults," dated May 2009, gives licensees until May 2010 to identify non-compliances, implement compensatory measures, and enter non-compliances into their corrective action program while under enforcement discretion. Licensees have until November 2012 to implement the resolutions.

On the topic of operator manual actions, the NRC issued Regulatory Issue Summary (RIS) 2006-10, "Regulatory Expectations with Appendix R Paragraph III.G.2 Operator Manual Actions," dated June 30, 2006, and developed NUREG-1852, "Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire," issued October 2007, as a follow-on to the withdrawn proposal to amend 10 CFR 50, Appendix R, Section III.G.2, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," via a rulemaking that would have codified the use of operator manual actions meeting specified criteria. Via EGM 2007-004, "Enforcement Discretion for Post-Fire Manual Actions Used as Compensatory Measures for Fire Induced Circuit Failures," the NRC granted enforcement discretion to licensees to resolve issues involving postfire operator manual actions by March 2009. Those licensees seeking exemptions to the regulations or changes to their approved fire protection program for the use of operator manual actions have submitted their requests. Currently, the NRC staff is reviewing 11 such requests.

The NRC has an active fire research program that develops the technical bases for ongoing and future regulatory activities in fire protection and fire risk analysis. The NRC's current research program includes the following activities:

- developing and improving fire risk analysis methods and tools
- applying these methods and tools to develop risk insights
- collecting, generating and analyzing fire related data
- verifying, validating and improving fire models for regulatory use
- performing specialized fire testing on electrical cables for both hot shorts and fire properties
- evaluating shipping casks for beyond design basis fire conditions
- evaluating methods to predict operator performance during fire conditions
- providing specialized training on the fire PRA and human reliability analysis methods and performing fire modeling
- knowledge management

The fire research program supports the agency's strategic goals of safety and effectiveness and partners with other organizations with similar missions such as the National Institute of Standards and Technology and the Electric Power Research Institute (EPRI), the University of

Maryland, and international groups such as the Organisation for Economic Co-operation and Development Committee on the Safety of Nuclear Installations.

6.3.9 Decommissioning

The decommissioning process consists of a series of integrated activities, beginning with the nuclear facility transitioning from "active" to "decommissioning" status and concluding with termination of the license, and release of the site. The NRC has adopted extensive regulations to ensure that decommissioning is accomplished safely and that residual radioactivity is reduced to a level that permits release of the property for unrestricted use (10 CFR 20 Subpart E, "Radiological Criteria for License Determination"). The NRC reviews and approves license termination plans, conducts inspections, processes license amendments, and monitors the status of activities to ensure that radioactive contamination is reduced or stabilized. In addition, the decommissioning process includes several opportunities for public involvement.

The design criteria for new facility construction at 10 CFR 20.1406, "Minimization of Contamination," require applicants to describe how facility design and procedures will facilitate eventual decommissioning and minimize, to the extent practicable, the generation of radioactive waste. Furthermore, the safety standards on decommissioning promulgated by the International Atomic Energy Agency (IAEA) include considerations, which the United States supports, for future decommissioning provisions in the conceptual design of nuclear facilities.

NRC regulations and guidance (e.g., NUREG-1577, Revision 1, "Standard Review Plan on Power Reactor Licensee Financial Qualifications and Decommissioning Funding Assurance," dated February 1999) describe requirements and processes to review power reactor licensee financial qualifications and methods of providing decommissioning funding assurance.

Spent fuel can remain stored in the spent fuel pools or in dry cask storage facilities until a geologic repository is built and operating. The NRC regulations in 10 CFR Part 50 and 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, Reactor-Related Greater Than Class C Waste," contain licensing requirements to maintain spent fuel integrity. The Commission, in issuing its Waste Confidence Decision in 1990, found that spent fuel can be stored safely in spent fuel pools or in onsite independent spent fuel storage installations without significant environmental impacts for at least 30 years beyond the plant's licensed life (which may include the term of a renewed license).

6.3.10 Reactor Safety Research Program

The NRC conducts reactor safety research to support its mission of ensuring that its licensees safely design, construct, and operate nuclear reactor facilities. The agency carries out this research program to (1) identify, evaluate, and resolve safety issues, (2) ensure that an independent technical basis exists to review licensee submittals, (3) evaluate operating experience and results of risk assessments for safety implications, and (4) support the development and use of risk-informed regulatory approaches. In conducting the Reactor Safety Research Program, the NRC anticipates challenges posed by the introduction of new technologies. The NRC continues to seek out opportunities to leverage its resources through both domestic and international cooperative programs and to provide enhanced opportunities for stakeholder involvement and feedback on its research program.

The NRC conducts pre-application reviews for advanced non-light-water reactor designs under the Reactor Safety Research Program. In the pre-application phase, the NRC interacts with prospective design certification applicants to address topics that would benefit both the applicant and the staff in preparing for a design certification application. The Commission's Policy Statement on Advanced Reactors (SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor Designs," dated April 2, 1993) encourages early interactions on such advanced designs so as to facilitate the resolution of safety issues early in the design process. In addition, the agency will conduct research to address technical issues that it anticipates will arise during its review of advanced reactor designs.

6.3.11 Special Programs for Public Participation

The NRC views nuclear regulation as the public's business and, as such, believes it should be transacted as openly and candidly as possible to maintain and enhance the public's confidence. Ensuring appropriate openness explicitly recognizes that the public must be informed about, and have a reasonable opportunity to participate meaningfully in, the NRC's regulatory processes.

The NRC extends opportunities to participate in the agency's regulatory process to a diverse body of stakeholders, including the general public; Congress; other Federal, State, and local governments; Indian Tribes; industry; technical societies; the international community; and citizen groups. Numerous NRC programs and processes provide the public with accessibility to NRC staff and resources; seek to make communication with stakeholders more clear, accurate, reliable, objective, and timely; and help to ensure that the reporting of nuclear power plants performance is open and objective. The agency has developed Web sites to disseminate timely, accurate information regarding issues of interest to the public or events at nuclear facilities. The NRC elicits public involvement early in the regulatory process so as to address any safety concerns in a timely manner. In addition to the formal petition and hearing processes integrated into the licensing program, the agency also uses feedback forms at public meetings to obtain public input. Section 7.2.2 of this report provides more information about the NRC's hearing process.

The NRC manages its rulemaking dockets using the Federal Docket Management System, a tool that provides a single point of access at http://www.regulations.gov across the Federal Government. The public can now access more than 7,400 NRC documents related to almost 300 rulemaking actions conducted by the NRC from January 1999 through March 2008. As agency viewers of the Federal Docket Management System, NRC employees are able to access these documents, including public comments, petitions for rulemaking, *Federal Register* notices, and their supporting materials.

Fostering an environment in which safety issues can be openly identified without fear of retribution is of paramount interest to the NRC. The agency has established tools for the public, industry, and NRC employees to use to raise safety concerns, including the petition process under 10 CFR 2.206, "Requests for Actions under This Subpart," the safety-conscious work environment policy, and the allegation program.

The NRC petition process regulations in 10 CFR 2.206 allow any member of the public to raise potential health and safety concerns and ask the agency to take specific enforcement actions against a licensee. If warranted, the NRC can modify, suspend, or revoke a license, or take other appropriate enforcement action, to resolve a problem identified in the petition. Recent changes made to the petition process emphasize a timely response to the petitioner and encourage increased, direct involvement of the petitioner (in addition to involvement of the licensee) by allowing the petitioner to personally address the petition review board and comment on the agency's decision.

Any member of the public may petition the NRC to develop, change, or rescind a rule under 10 CFR 2.802, "Petition for Rulemaking." Upon receiving the petition, the NRC publishes it in the *Federal Register* for public comment. The NRC staff will evaluate the petition and any comments received and may either grant or deny the petition or, in some instances, partially consider or deny the petition. In considering the petition, the NRC will publish a proposed rule that would address the concern included in the petition. This action would be followed by a period for public comments and the publication of a final rule. In denying a petition, the NRC publishes a notice of denial in the *Federal Register*. This notice of denial will address any public comments received and the reason for denying the petition.

The NRC encourages workers in the nuclear industry to take their concerns directly to their employers and is particularly vigilant about a fostering safety-conscious work environment that encourages such reporting. The NRC expects licensees and other employers subject to NRC authority to establish and maintain a work environment where employees do not fear retribution by a licensee for raising concerns about safety or regulatory issues. Additionally, workers and members of the public may bring their concerns relating to safety or regulatory issues directly to the NRC. The agency established a toll-free safety hotline for reporting such concerns, and NRC management, staff, and inspectors, including the resident inspectors at plant sites, are trained and available to receive such concerns.

Historically, industry workers or members of the public report approximately 600 potential allegations directly to the NRC allegation program each year. The NRC developed the allegation program to establish a formal process for evaluating and responding to each issue. The primary purpose of the program is to provide an alternative method for individuals to raise safety or regulatory issues and to have them addressed. About 60 percent of the issues that are reported to the NRC are from licensee employees, employees of contractors to licensees, or former employees of licensees or contractors. Given sufficient information, the staff will evaluate each issue to determine whether it can verify the issue and, if so, the effect of the issue on plant safety. The evaluation either involves an engineering review, inspection, or investigation by NRC staff or an evaluation by the licensee that is independently assessed by the NRC staff. Historically, the NRC has been able to substantiate 30 percent of the allegations received. If the evaluation reveals a violation of regulatory requirements, the agency takes appropriate enforcement action. Additionally, the NRC informs in writing the individual who raised the issue of the results of its evaluation, except in limited instances when sensitive security-related matters are discussed.

ARTICLE 7. LEGISLATIVE AND REGULATORY FRAMEWORK

1. **Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.**

2. **The legislative and regulatory framework shall provide for:**

   (i) **the establishment of applicable national safety requirements and regulations**

   (ii) **a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a license**

   (iii) **a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licenses**

   (iv) **the enforcement of applicable regulations and of the terms of licenses, including suspension, modification, or revocation**

This section explains the legislative and regulatory framework governing the U.S. nuclear industry. It discusses the provisions of that framework for establishing national safety requirements and regulations and systems for licensing, inspection, and enforcement.

7.1 Legislative and Regulatory Framework

The Atomic Energy Act of 1954, passed by Congress and signed by the President, established the Atomic Energy Commission and the legal framework for all subsequent regulation of nuclear installations. However, as is generally the case with most laws, this act provided general principles and concepts and left the regulatory body (i.e., the NRC) to address the details through specific regulations. The Energy Reorganization Act of 1974, likewise passed by Congress and signed by the President, abolished the Atomic Energy Commission and created the NRC to regulate commercial nuclear activities and the U.S. Energy Research and Development Administration (ERDA) to continue government-sponsored nuclear activities. ERDA was subsequently incorporated into the U.S. Department of Energy (DOE). The Administrative Procedure Act provides the general rules and procedures through which the Atomic Energy Act is implemented.

The United States has also ratified various international conventions that impact nuclear safety:

- The Nuclear Non-Proliferation Treaty, ratified in 1970, governs the NRC's export licensing activities.
- The U.S.-IAEA Safeguards Agreement, ratified in 1980, requires eligible facilities in the United States to report material accounting data on declared nuclear material. The Agreement further requires eligible facilities to submit to IAEA inspections. The Additional Protocol to the US-IAEA Safeguards Agreement, ratified in 2004, strengthened IAEA reporting and access rights for eligible facilities.
- The Convention on the Physical Protection of Nuclear Material, ratified in 1982, requires NRC licensees to take steps to protect nuclear material during international transport.

- The Convention on Early Notification of a Nuclear Accident, ratified in 1988, requires the NRC to help the U.S. Department of State report significant accidents to IAEA and any State affected by a transboundary radioactive release.
- The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, ratified in 1988, requires the NRC to help the U.S. Department of State respond to requests for assistance in the event of a foreign nuclear accident or emergency.
- The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management ("Joint Convention"), ratified in 2003, requires the United States to take steps to ensure that individuals and the environment are protected against radiological hazards at all stages of radioactive waste and spent fuel management. The Joint Convention further calls for periodic review meetings of all the Contracting Parties. Before the review meeting, each Contracting Party must submit a national report that addresses measures taken to implement the obligations under the Joint Convention.
- The Convention on Supplementary Compensation for Nuclear Damage, ratified in 2008, requires the United States to ensure that adequate compensation exists in the event that "nuclear damage" results from a nuclear incident.
- The Convention on Nuclear Safety, ratified in 1999, requires the United States to submit periodic National Reports that detail the United States' commitment to nuclear safety.

7.2 Provisions of the Legislative and Regulatory Framework

7.2.1 National Safety Requirements and Regulations

In addition to the Atomic Energy Act, several statutes (listed in previous U.S. National Reports) have substantial bearing on the practices and procedures of the Commission. Furthermore, various U.S. Presidents have issued Executive orders and directives that impact nuclear safety. For example, President Reagan issued Executive Order 12656 "Assignment of Emergency Preparedness Responsibilities," on November 18, 1988. This Executive order assigned certain emergency preparedness responsibilities to the NRC in case of a national emergency. Likewise, in the wake of the Three Mile Island accident, President Carter directed the Federal Emergency Management Agency (FEMA) to lead up all off-site emergency activities and review emergency plans in States with operating reactors. As a final example, the NRC has voluntarily complied with President Clinton's Executive Order 12898, "Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations," dated February 11, 1994, which required agencies to consider whether its programs or policies have a disproportionately adverse health or environmental effect on minority populations.

The NRC has implemented these statutes and Executive orders through regulation. Specifically, Title 10 of the *Code of Federal Regulations*, "Energy," governs the licensing of nuclear installations. The NRC established these regulations through "notice-and-comment" rulemaking procedures under the Administrative Procedure Act. In short, these procedures include: (1) establishing a technical or legal basis, or both, for the proposed rule, (2) inviting interested parties to comment on the proposed rule, and (3) considering comments and issuing a final rule. Once these final rules are in place, they are binding on operators of nuclear installations and can be revised only through a new notice-and-comment rulemaking. This ensures that interested parties remain both informed of, and involved with, any changes to the NRC's regulatory scheme.

7.2.2 Licensing of Nuclear Installations

The NRC must license all commercial nuclear installations in the United States (some Government facilities that are operated by or for DOE are not subject to NRC licensing under the Atomic Energy Act and the Energy Reorganization Act except where specifically provided by law). The Atomic Energy Act, Chapter 10, Section 101, prohibits operation of a nuclear installation without a valid license. Sections 101 and 103 further provide that only the NRC is authorized to issue a license for nuclear reactor facilities. Section 103 also states that such licenses are subject to conditions that the NRC may establish by rule or regulation to carry out the purposes and provisions of the Atomic Energy Act.

The Atomic Energy Act, Section 189a, provides interested parties with hearing rights in proceedings for the granting, suspending, revoking, or amending of a license or construction permit. Hearings, which are used in licensing proceedings for production and utilization facilities (e.g., nuclear power plants), are held under procedural rules stated in 10 CFR Part 2, "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," and, in particular, Subpart C, "Rules of General Applicability." The NRC staff participates as a party in most formal hearings and may also participate as a party in less formal hearings. Hearings are usually held before a three-member Atomic Safety and Licensing Board, which is generally composed of one lawyer and two technical members.

Article 18 of this report describes the licensing process in greater detail. Two alternative approaches to licensing exist. The traditional approach, under 10 CFR Part 50, requires two steps. In the first step, the NRC reviews a preliminary application and decides whether to grant a construction permit. In the second step, the agency reviews the final application and decides whether to grant an operating license. The NRC licensed all current operating plants in the United States according to this process.

In 1989, the Commission established an alternative licensing system, published in 10 CFR Part 52, which provides for certified standard designs and combined licenses that resolve design issues before construction, and early site permits that resolve most siting issues years before construction. The basic concept underlying 10 CFR Part 52 is that the NRC can approve nuclear reactor designs through generic rulemaking. Once the designs are approved, an applicant can reference them in applications for permission to build and operate nuclear power plants without needing to relitigate, in individual hearings, the issues resolved in the rulemaking. Moreover, the NRC will determine and approve before construction the criteria for evaluating whether the plant had been built as specified. Thus, the plant could begin operation without a second hearing, provided that it satisfied the acceptance criteria. To the extent possible, issues would be litigated before construction, not once construction is nearly complete, when the consequences of delay are much greater. In adopting 10 CFR Part 52, the Commission used the latitude allowed by law to streamline licensing.

Recently, the NRC amended 10 CFR Part 52 to improve the effectiveness of its processes for licensing future nuclear power plants. The amendments clarify the overall regulatory relationship between 10 CFR Part 50 and 10 CFR Part 52, reorganize 10 CFR Part 52, and reconcile differences in wording in other parts of the regulations to provide consistent terminology throughout all of the regulations affecting 10 CFR Part 52. The amendments also added new sections on written communications, employee protection, completeness and accuracy of information, exemptions, combining licenses, and jurisdictional limits.

Once licensed, a nuclear power plant can renew its operating license for up to an additional 20 years. The NRC provides the licensing system for license renewal under 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," and interested parties have hearing rights under 10 CFR Part 2 in renewal proceedings.

7.2.3 Inspection and Assessment

Under the Atomic Energy Act, the NRC has the authority to inspect nuclear power plants in its role of protecting public health and safety and the common defense and security. The NRC staff inspects power reactors under construction, in test conditions, and in operation to ascertain compliance with regulations and license conditions. Through its inspection program, the NRC assesses whether activities are properly conducted and equipment is properly maintained to ensure safe operations. The agency integrates inspection results into its overall evaluation of licensee performance, as discussed in Article 6 of this report. If a safety problem exists, or there is a failure to comply with requirements, the licensee must take prompt corrective action. If necessary, the NRC may take enforcement action.

A primary feature of the NRC's inspection program is the assignment of resident inspectors to nuclear power plants. At least two inspectors are assigned to each nuclear power site, and these inspectors continuously monitor licensee activities in accordance with the NRC's baseline inspection program. To supplement these continuous inspections, regional inspection specialists conduct periodic inspections of each plant in his or her region. If needed, regional inspectors perform special investigations of plants that exceed established thresholds during routine inspections and thus require heightened scrutiny. All inspection findings are recorded, and the NRC typically issues inspection reports for a specific power plant each quarter.

7.2.4 Enforcement

The NRC draws its jurisdiction for enforcement from the Atomic Energy Act and the Energy Reorganization Act.

The Atomic Energy Act, Section 161, authorizes the NRC to conduct inspections and investigations and to issue orders as may be necessary or desirable to promote the common defense and security, protect health, or minimize danger to life or property. Section 186 authorizes the NRC to revoke licenses under certain circumstances (e.g., for material false statements, for a change in conditions that would have warranted NRC refusal to grant a license on an original application, for a licensee's failure to build or operate a facility in accordance with the terms of the permit or license, and for violation of an NRC regulation). Section 234 authorizes the NRC to impose monetary civil penalties not to exceed $100,000 per violation per day; however, that amount is adjusted every 4 years by the Federal Civil Penalties Inflation Adjustment Act of 1990, as amended by the Debt Collection Improvement Act of 1996, and is currently $140,000. In addition to the provisions mentioned in Section 234, Sections 84 and 147 authorize the imposition of civil penalties for violations of regulations implementing those provisions. Section 232 authorizes the NRC to seek injunctive or other equitable relief for violation of regulatory requirements.

The Atomic Energy Act, Chapter 18, provides for varying levels of criminal penalties (i.e., monetary fines and imprisonment) for willful violations of the act or the regulations or orders issued under Sections 65, 161b, 161i, or 161o of the act. Section 223 allows the NRC to impose criminal penalties on certain individuals who are employed by firms constructing or supplying basic components of any utilization facility if the individual knowingly and willfully violates NRC requirements in a manner that could significantly impair a basic component. Section 235 allows the NRC to impose criminal penalties on persons who interfere with nuclear inspectors. Section 236 allows the NRC to impose criminal penalties on persons who attempt to or cause sabotage at a nuclear facility or to nuclear fuel. The agency refers alleged or suspected instances of criminal violations of the Atomic Energy Act to the U.S. Department of Justice for appropriate action.

The Energy Reorganization Act, Section 206, authorizes the NRC to impose civil penalties on licensees for knowing and conscious failures to provide the agency with certain safety information.

Subpart B, "Procedure for Imposing Requirements by Order, or for Modification, Suspension, or Revocation of a License, or for Imposing Civil Penalties," of 10 CFR Part 2 specifies the procedures that the NRC uses in exercising its enforcement authority. The scope of Subpart B includes the following procedures:

- 10 CFR 2.201, "Notice of Violation," outlines the procedure for issuing notices of violations.

- 10 CFR 2.202, "Orders," explains the procedure for issuing orders. In accordance with this section, the NRC may decide to issue an order to institute a proceeding to modify, suspend, or revoke a license or to take other action against a licensee or other person subject to the NRC's jurisdiction. The licensee or any other person adversely affected by the order may request a hearing. The NRC is authorized to make orders immediately effective if required to protect public health, safety, or interest, or if the violation is willful.

- 10 CFR 2.204, "Demand for Information," specifies the procedure for issuing a demand for information to a licensee or other person subject to the Commission's jurisdiction to determine whether an order should be issued or other enforcement action should be taken. The demand does not provide hearing rights because the agency is only seeking information. A licensee must answer a demand for information. An unlicensed person may answer a demand either by providing the requested information or by explaining why the demand should not have been issued.

- 10 CFR 2.205, "Civil Penalties," describes the procedure for assessing civil penalties. The NRC initiates the civil penalty process by issuing a notice of violation and proposed imposition of a civil penalty. The agency provides the person charged with an opportunity to contest in writing the proposed imposition of a civil penalty. After evaluating the response, the NRC may mitigate, remit, or impose the civil penalty. If the agency imposes a civil penalty, it provides an opportunity for a hearing. If a civil penalty is not paid following a hearing, or if a hearing is not requested, the agency may refer the matter to the U.S. Department of Justice to institute a civil action in Federal district court to collect the penalty.

The NRC has had positive experience with legal actions and enforcement measures. As noted in Section 9.3 of this report, the NRC has recently undertaken many successful enforcement actions against licensees. These actions are rarely challenged before an Atomic Safety and Licensing Board, and the appellate courts rarely overturn the NRC's decision.

ARTICLE 8. REGULATORY BODY

1. **Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence, and financial and human resources to fulfill its assigned responsibilities.**

2. **Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.**

This section explains the establishment of the U.S. regulatory body (i.e., the NRC). It also explains how the functions of the NRC are separate from those of bodies responsible for promoting research, development and advancement of nuclear energy (e.g., DOE).

8.1 The Regulatory Body

This section explains the NRC's mandate, authority and responsibilities, structure, international responsibilities and activities, financial and human resources, position in the governmental structure, and report of the Integrated Regulatory Review Service (IRRS) self-assessment team.

8.1.1 Mandate

As discussed in Article 7, Congress created the NRC as an independent regulatory agency in January 1975, with the passage of the Energy Reorganization Act. In giving the NRC an exclusively regulatory mandate, the statute reflected (in part) a congressional judgment that the expanding commercial nuclear power industry (which was expected to continue to grow) warranted the full-time attention of an exclusively regulatory agency. In creating the NRC, Congress also addressed a developing public concern that regulatory responsibilities were overshadowed by the promotion of nuclear power at the Atomic Energy Commission.

8.1.2 Authority and Responsibilities

8.1.2.1 Scope of Authority

The NRC's mission is to ensure that the civilian uses of nuclear energy and materials in the United States are conducted with proper regard for public health and safety, national security, and environmental concerns. The Atomic Energy Act provides the charter for these regulatory responsibilities through which the U.S. Congress created a national policy of developing the peaceful uses of atomic energy. The U.S. Congress has amended the statute over the years to address developing technology and changing perceptions of regulatory needs. For example, the National Environmental Policy Act of 1969, as amended, imposed broad new responsibilities on Federal agencies. Other more specialized statutes prescribe the NRC's duties with regard to high-level radioactive waste, low-level radioactive waste, mill tailings, environmental reviews, nonproliferation, antiterrorism, and import and export of nuclear materials and equipment.

The NRC's licensing authority extends to other Government organizations (such as the Tennessee Valley Authority (TVA), which operates nuclear power plants) and the military's use of radiopharmaceuticals in its hospitals. The NRC's responsibilities include ensuring both safety and the security of commercial nuclear facilities and materials against radiological sabotage and thefts.

In addition, the NRC is authorized to relinquish its authority, in certain cases, to States (i.e., of the United States) that enter into agreements with the NRC. Such States are known as Agreement States.

Section 8.2 of this report provides specific information about the scope of the agency's authority over DOE nuclear installations.

8.1.2.2 The NRC as an Independent Regulatory Agency

The Commission's status as an independent regulatory agency within the executive branch of the Federal Government means that the President cannot ordinarily direct its regulatory decisions. There are two statutory sources of the Commission's independence from presidential direction. First, the President can remove an NRC Commissioner only for cause – namely, "inefficiency, neglect of duty, or malfeasance in office." The President can, however, designate one member of the Commission to serve as Chairman. Second, the Commission has the statutory right to defend itself whenever its safety findings are challenged in U.S. appellate courts. There is an ongoing debate, however, whether independent regulatory agencies – such as the NRC – have to submit proposed regulations to the U.S. Office of Management and Budget (OMB), in the Executive Office of the President, for regulatory review (by law, OMB already reviews the proposed NRC budget). To date, no such requirement exists. However, even if the Commission had to submit proposed rules to OMB, under current law the Commission would still likely make the ultimate decision whether to issue a rule, and the technical nature of nuclear safety would, in all likelihood, compel OMB to deference to the Commission's safety judgments.

Congress cannot override the Commission's decisions, except by duly enacted legislation. The courts are likewise limited in reviewing the NRC's factual safety findings. Although a Federal appellate court can overturn a Commission decision for violations of law, safety findings will generally be overturned only if they are arbitrary. This provides the Commission with some degree of independence from a court's second-guessing the NRC's technical factual findings.

The independence of the NRC's decisionmaking process implies a responsibility on the part of the Commissioners and their personal staffs to keep the process free from improper outside influence. This is especially important in the case of adjudications. When the Commissioners take part in adjudications, they ordinarily act in the role of appellate judges (reviewing the decisions of lower judges) and, in general, are bound by the same kinds of strictures that apply to judges in Federal courts.

8.1.3 Structure of the Regulatory Body

This section explains the structure of the NRC. It covers the Commission, component offices and their responsibilities, and advisory committees and their functions. It also explains recent changes in NRC organization.

8.1.3.1 The Commission

The NRC is headed by a five-member Commission. The President designates one member to serve as Chairman and official spokesperson. The Commission as a whole formulates policies and regulations governing nuclear reactor and materials safety, issues orders to licensees, and adjudicates legal matters brought before it. The Executive Director for Operations carries out the policies and decisions of the Commission and directs the activities of the program offices.

8.1.3.2 Component Offices of the Commission

The following offices report directly to the Chairman or the Commission:

- Office of the Executive Director for Operations. The Executive Director for Operations is the chief operational and administrative officer of the Commission and is authorized and directed to discharge such licensing, regulatory, and administrative functions and to take such actions as necessary for day-to-day agency operations. The Executive Director for Operations supervises and coordinates the policy development and operational activities of the NRC program and regional offices and implements Commission policy directives pertaining to these offices.

- Office of the Chief Financial Officer. The Office of the Chief Financial Officer is responsible for the NRC's planning, budgeting, and performance management process and for all NRC financial management activities.

- Office of the General Counsel. The Office of the General Counsel directs matters of law and legal policy, providing opinions, advice, and assistance to the agency on all of its activities.

- Office of the Inspector General. The Inspector General provides leadership and policy direction in conducting audits and investigations to promote economy, efficiency, and effectiveness within the NRC and to prevent and detect fraud, waste, abuse, and mismanagement in agency programs and operations.

- Office of International Programs. The Office of International Programs coordinates the NRC's international activities and provides assistance and recommendations to the Chairman, the Commission, and the NRC staff. It plans, develops, and implements programs to carry out policies in the international arena, including export and import licensing responsibilities. It establishes and maintains working relationships with individual countries and international nuclear organizations, as well as other involved U.S. Government agencies.

- Office of Public Affairs. The Office of Public Affairs directs the agency's public affairs program, advising agency officials and developing key strategies that help increase public confidence in NRC policies and activities.

- Office of Congressional Affairs. The Office of Congressional Affairs is the primary point of contact for all communications between the NRC and Congress. This office provides advice and assistance to the Chairman, Commission, and NRC staff on congressional matters; monitors legislative proposals, bills, and hearings; informs the NRC of the views of Congress on NRC policies, plans, and activities; provides timely responses to congressional requests for information; and provides the information necessary to keep appropriate Members of Congress and congressional staff fully and currently informed of NRC actions.

- The Office of Commission Appellate Adjudication. The Office of Commission Appellate Adjudication provides the Commission with an analysis of any adjudicatory matter requiring a Commission decision and drafts necessary decisions pursuant to the Commission's guidance after a presentation of options.

- Office of the Secretary of the Commission. The Office of the Secretary of the Commission provides executive management services to support the Commission and to carry out Commission decisions. It assists with the planning, scheduling, and conduct of Commission business; maintains historical paper files of official Commission records; administers the NRC Historical Program; and maintains the Commission's official adjudicatory and rulemaking dockets.

8.1.3.3 Offices of the Executive Director for Operations

The offices reporting to the Executive Director for Operations ensure that the commercial use of nuclear materials in the United States is safely conducted. Since issuance of the previous U.S. National Report, the NRC established a new office, the Computer Security Office, which was effective in November 2007. The following briefly describes this and other NRC offices:

- Office of Nuclear Reactor Regulation. The Office of Nuclear Reactor Regulation is responsible for accomplishing key components of the NRC's nuclear reactor safety mission to protect public health and safety and the environment. To do so, the office conducts a broad range of regulatory activities in the four primary program areas of rulemaking, licensing, oversight, and incident response for commercial nuclear power reactors and test and research reactors.

- Office of New Reactors. The Office of New Reactors is responsible for accomplishing key components of the NRC's nuclear reactor safety mission for new reactor facilities licensed in accordance with 10 CFR Part 52. As such, the office conducts regulatory activities in the primary program areas of siting, licensing, and oversight for new commercial nuclear power reactors.

- Office of Nuclear Material Safety and Safeguards. The Office of Nuclear Material Safety and Safeguards is responsible for regulating activities that provide for the safe and secure production of nuclear fuel used in commercial nuclear reactors; the safe storage, transportation, and disposal of high-level radioactive waste and spent nuclear fuel; and the transportation of radioactive materials regulated under the Atomic Energy Act.

- Office of Nuclear Security and Incident Response. The Office of Nuclear Security and Incident Response develops overall agency policy and provides management direction for evaluating and assessing technical issues involving security and emergency preparedness at nuclear facilities.

- Office of Nuclear Regulatory Research. The Office of Nuclear Regulatory Research plans, recommends, and conducts research programs and technical safety reviews that support the resolution of ongoing and future safety issues identified as regulatory needs by offices with regulatory functions or through its own long-term research review program.

- Office of Enforcement. The Office of Enforcement oversees, manages, and directs the development and implementation of policies and programs for enforcing NRC requirements. It oversees the agency's allegations management program and the allegations review process. The office is responsible for external safety culture policy matters, the agency's Alternative Dispute Resolution Program, the agency's internal Differing Professional Opinions Program, and its internal non-concurrence process.

- Office of Investigations. The Office of Investigations develops policy, procedures, and quality control standards for investigations of licensees and applicants, as well as their contractors or vendors. This office conducts investigations of allegations of wrongdoing by non-NRC employees and contractors. The Office of Investigations is independent and may self-initiate investigations when a person or entity under its jurisdiction is suspected to have committed a matter of wrongdoing. This office plans, conducts, and makes referrals of substantiated criminal cases to the U.S. Department of Justice. This office conducts liaison with Federal, State, and local law enforcement and provides investigative assistance to NRC staff on regulatory matters. Additionally, it keeps the Commission and NRC offices apprised of regulatory matters under investigation as they affect public health and safety, the common defense and security, and the environment.

- Office of Federal and State Materials and Environmental Management Programs. The Office of Federal and State Materials and Environmental Management Programs is responsible for the safe and secure use of source, byproduct, and special nuclear materials in industrial, medical, academic, and commercial activities, and at decommissioning, uranium recovery, and low-level waste sites. It ensures effective communications and working relationships between the NRC and other governmental entities and administers the Agreement State Program (through which States have signed formal agreements with the NRC to assume regulatory responsibility over certain byproduct, source, and small quantities of special nuclear materials). It also develops and implements rules and guidance for these activities.

- Office of Information Services. The Office of Information Services plans, directs, and oversees the delivery of centralized information technology infrastructure, applications, and information management services, in addition to the development and implementation of information technology and management plans, architecture, and policies to support the mission, goals, and priorities of the agency.

- Regional Offices. The four regional offices conduct inspection, enforcement, and emergency response programs in the United States nuclear reactor facilities.

Supporting the Executive Director for Operations are the Offices of Administration, Human Resources, Small Business and Civil Rights, and Computer Security:

- Office of Administration. The Office of Administration provides centralized services in the areas of contracts, facilities and security, property management, and administration, including support for rulemaking and agency directives, transportation, parking, translations, audiovisual needs, food services, mail distribution, labor services, furniture and supplies, and other areas.

- Office of Human Resources. The Office of Human Resources provides overall leadership and management of the agency's human capital planning and training and development programs. Accordingly, this office is responsible for implementing human resource policy and operations agency-wide. This includes overseeing the development and implementation of human resources management and information systems for staffing, strategic workforce planning, and other corporate activities to support a skilled and dynamic workforce. The office's training and development programs are designed to establish, maintain, and enhance the skills employees need today and to meet the agency's future skill needs.

- Office of Small Business and Civil Rights. The Office of Small Business and Civil Rights is responsible for facilitating equal employment opportunity for all NRC employees, applicants for employment, and business partners through an on-going affirmative employment and diversity management process, implementation of civil rights statues, execution of outreach and compliance coordination mandates, and employment of maximum small business participation in adquisitions.

- Computer Security Office. The Computer Security Office plans, directs, and oversees the implementation of a comprehensive, coordinated, integrated and cost-effective NRC information technology security program, consistent with applicable laws, regulations, and Commission, Executive Director for Operations, and Chief Information Officer direction, management initiatives, and policies.

8.1.3.4 Advisory Committees

The three principal advisory committees for NRC programs are the Advisory Committee on Reactor Safeguards, the Advisory Committee on Medical Uses of Isotopes and the Committee to Review Generic Requirements. In addition, the NRC has established an ad hoc Licensing Support Network Advisory Panel. Most relevant to this report are the Advisory Committee on Reactor Safeguards and the Committee to Review Generic Requirements. The Advisory Committee on Reactor Safeguards reviews and reports on safety studies and reactor facility license and license renewal applications, advises the Commission on the hazards of proposed and existing reactor facilities and the adequacy of proposed reactor safety standards, advises the Commission on issues associated with nuclear materials and waste management, initiates reviews of specific generic matters or nuclear facility safety-related items, and reviews the NRC's research activities. The Committee to Review Generic Requirements ensures that proposed generic backfits to be imposed on NRC-licensed power reactors and selected nuclear materials licensees are appropriately justified, based on the backfit provisions of applicable NRC regulations and the Commission's backfit policy.

8.1.3.5 Atomic Safety and Licensing Board Panel

In addition to the advisory committees, the NRC has an Atomic Safety and Licensing Board Panel. This panel conducts hearings for the Commission and performs such other regulatory functions as the Commission authorizes. The Chief Administrative Judge develops and applies procedures governing the activities of boards, administrative judges, and administrative law judges. This person also makes appropriate recommendations to the Commission concerning the rules governing the conduct of hearings.

8.1.4 International Responsibilities and Activities

The NRC conducts international activities related to statutory mandates, international treaties and conventions, international organizations, bilateral relations, and research.

U.S. law or international treaties and conventions mandate several NRC international activities; other activities are discretionary. In particular, the NRC is statutorily mandated to serve as the U.S. licensing authority for exports and imports of nuclear materials and equipment.

The NRC supports U.S. foreign policy in the safe and secure use of nuclear materials and in guarding against the spread of nuclear weapons. The agency actively participates in developing and implementing a variety of legally binding treaties and conventions that create an international framework for the peaceful uses of nuclear energy. The NRC provides technical and legal advice and assistance to international organizations and foreign countries as they work to develop effective regulatory organizations and rigorous safety standards. Some activities are carried out within the programs of IAEA, the Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation and Development, or other international organizations. The NRC conducts other activities directly with counterpart agencies in other countries under cooperation agreements.

International Treaties. Treaties that legally bind the NRC and the U.S. Government's peaceful uses of nuclear energy and nuclear applications include the 1978 Nuclear Non-Proliferation Treaty, the 1980 Convention on Physical Protection of Nuclear Material, the 1994 Convention on Nuclear Safety, the 1986 Convention on Early Notification of a Nuclear Accident, the 1986 Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency, and the 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. NRC staff members regularly participate in international meetings related to these conventions and have held a variety of convention leadership positions. In its bilateral work with regulatory counterparts worldwide, the NRC seeks to exchange experience and good practices in order to further the goals of these international instruments.

In addition to these legally-binding obligations, the United States has agreed to comply with certain activities to enhance the safe and secure uses of nuclear applications. For example, the U.S. has made a political commitment to implement the IAEA Code of Conduct on the Safety and Security of Radioactive Sources. This commitment has been codified in U.S. statute as part of the Energy Policy Act of 2005 and is reflected in the NRC's export and import regulations.

Export-Import. The NRC's key international responsibility is licensing the export and import of nuclear materials and equipment for civilian use, such as low-enriched uranium fuel for nuclear power plants, high-enriched uranium for research and test reactors, nuclear reactors themselves, certain nuclear reactor components (such as pumps and valves), and radioisotopes used in industrial, medical, agricultural, and scientific fields. The NRC ensures that such exports and imports are consistent with the goals of the safe and peaceful use of these materials and equipment, limiting the proliferation of nuclear weapons, and promoting the Nation's common defense and security. The Atomic Energy Act, the Nuclear Non-Proliferation Act of 1978, and 10 CFR Part 110, "Export and Import of Nuclear Equipment and Material," detail the standards and procedures for issuing export and import licenses. The NRC also coordinates closely with other U.S. Government agencies, including the U.S. Department of State, U.S. Department of Commerce, and DOE, on export- or import-related matters that fall within these agencies' jurisdictions.

International Organizations and Associations. In consultation with the executive branch agencies, the NRC actively participates in the full scope of programs of the two major international nuclear organizations, IAEA and NEA. For example, since 1996, the United States has or is planning to participate in more than 30 Operational Safety Assessment Review Team (OSART) missions. Some experts on these teams come from the NRC, while others come from industry. The NRC coordinates closely with the Institute of Nuclear Power Operations (INPO) in this process. The NRC is currently working with IAEA and industry in planning an OSART mission to Seabrook Unit 1 in 2011 and intends to continue to plan for an OSART mission in the United States every 3 years. Since 1999, the NRC has participated in more than 20 Integrated Regulatory Review Teams or IRRS missions, sending high-level technical experts on approximately four missions per year. In October 2010, the United States will host an IRRS mission, focused on the U.S. operating reactor program.

The NRC holds leadership roles in the four IAEA Safety Standards Committees and the Commission on Safety Standards. These activities, together with regular NRC staff participation in IAEA meetings to draft and revise safety and security guidance in coordination with other U.S. Government agencies, enable the NRC to use its broad regulatory experience to contribute to the safe and secure use of nuclear and radioactive materials in IAEA Member States.

The NRC also participates in the NEA Steering Committee, and holds leadership positions on NEA's Committee on the Safety of Nuclear Installations, the Committee on Nuclear Regulatory Activities, the Committee on Radiation Protection and Public Health, and the Radioactive Waste Management Committee. The NRC also holds leadership roles in, and is otherwise represented on, many of the NEA committee-chartered working groups. These activities provide diverse forums for nuclear regulators and research organizations to share information and work together to leverage resources for mutual benefit.

The NRC continues to participate in the Multinational Design Evaluation Program, with the goal of leveraging the experience of international counterparts in the review of new reactor designs. Through this program, the NRC is (1) sharing information with other regulatory authorities in the reviews of the Westinghouse's Advanced Passive (AP) 1000 and AREVA Nuclear Power's U.S. Evolutionary Power Reactor (US EPR) designs, (2) cooperating in vendor inspections, and (3) pursuing possible convergence of regulations, codes, and standards associated with the design reviews of new reactors.

The NRC has been working closely with IAEA in support of countries seeking to develop new nuclear power programs or expand small or dormant programs. The NRC staff has been active in guidance document development in this area and has participated in numerous workshops and training activities to provide so-called "new entrant" countries with information and experience on building a robust, independent, regulatory infrastructure. In 2010, the NRC provided a cost-free expert to assist IAEA in its activities in this area. The NRC also funded a comparable position at NEA to assist in identifying how NEA's work, within its focused membership, may benefit countries with more established technical and regulatory programs.

In addition to staff participation in more than 100 IAEA and NEA meetings each year, the NRC Chairman routinely participates in the IAEA General Conference and biannual meetings of the International Nuclear Regulators Association. Members of the Commission also travel to international conferences around the world to deliver keynote remarks, participate in panel discussions, and otherwise share insight on a variety of topics with diverse international audiences.

Bilateral Relations. The NRC works closely with nuclear safety agencies in more than 40 countries. The NRC and its foreign counterparts routinely exchange operational safety data and other regulatory information. Subject to outside funding, the NRC provides safety, security, emergency preparedness and safeguards advice, training, and other assistance to countries that seek U.S. help to improve their regulatory programs.

The NRC's information exchange arrangements serve as communication channels with foreign regulatory authorities, establishing a framework for the agency to gain access to non-U.S. safety information that can (1) alert the U.S. Government and industry to potential safety problems, (2) help identify possible accident precursors, and (3) provide accident and incident analyses, including lessons learned, that could be directly applicable to the safety of U.S. nuclear power plants and other facilities. The arrangements also serve as vehicles for the assistance the NRC provides to countries to establish and improve their regulatory capabilities and infrastructure. Thus, the arrangements facilitate the NRC's strategic goal to support U.S. interests in the safe and secure use of nuclear materials and in nuclear nonproliferation. The NRC currently has 38 active bilateral arrangements with its foreign regulatory counterparts. These arrangements allow the staff to conduct regular bilateral exchanges on a variety of levels. The NRC also has bilateral interactions with countries with which there is no active arrangement, although the absence of an arrangement limits the type of information that can be exchanged. The NRC Chairman typically meets with at least 20 foreign counterparts at IAEA's annual General Conference. In addition, members of the Commission travel abroad to hold bilateral meetings with their regulatory counterparts, tour nuclear power plants and other facilities, and exchange information and good practices. Often, these visits result in increased communication between the NRC and its counterparts, providing opportunities for enhanced information exchange based on first-hand knowledge of various programs.

International Assistance Programs. In the early 1990s, the NRC began offering assistance to nuclear regulatory programs in several former Soviet states. The agency initially focused its efforts on those countries in which Soviet-designed reactors were operated. Following the September 11, 2001, terrorist attacks, the NRC expanded its assistance efforts to specifically include assisting countries in their efforts to improve regulatory oversight of radioactive sources. In addition, the NRC is assisting the Government of Iraq in its efforts to develop a sound regulatory structure, including the provision of assistance in developing the law and regulations that will be the legal framework for the project of decommissioning former Iraqi facilities that used radioactive materials. The NRC is also providing bilateral assistance to countries seeking to establish nuclear power programs, in close consultation with IAEA. IAEA and the U.S. Government are both actively promoting regional cooperation, and have been engaged in workshops and training activities to further that goal.

Research Programs. The NRC conducts confirmatory regulatory research through the implementation of more than 100 bilateral and multilateral agreements in partnership with nuclear safety agencies and institutes in more than 30 countries. This research supports regulatory decisions on emerging technologies, aging equipment and facilities, and various other safety issues. The NRC and other nuclear regulatory and safety organizations carry out cooperative research projects to achieve mutual research needs with greater efficiency.

8.1.5 Financial and Human Resources

8.1.5.1 Financial Resources

As of September 30, 2009, the NRC's financial condition was sound in that the agency had sufficient funds to meet program needs and adequate control of these funds in place to ensure that obligations did not exceed budget authority. The sum of all funds available to obligate for FY 2009 was $1,165.2 million, which is a $136.4 million increase over the FY 2008 amount of $1,028.8 million

The NRC FY 2010 budget will be financed with $912.2 million from user fees, $125.7 million from the General Fund, and $29 million from the Nuclear Waste Fund. The NRC FY 2011 budget will be financed with $915.3 million from user fees, $128.3 million from the General Fund, and $10.0 million from the Nuclear Waste Fund.

8.1.5.2 Human Resources

The NRC worked aggressively to hire the highly skilled staff needed to regulate the existing fleet of operating nuclear reactors and to meet the demands of new reactor and materials license application reviews. The NRC is now hiring at a slower pace. For example, in 2008, the agency hired more than 500 new employees, while in 2009 it brought in 287 new employees, and approximately half of these were hired to replace staff members who left. The NRC is now working diligently to meet the challenge of training and integrating a new and increasingly younger workforce, providing them with the necessary infrastructure to successfully carry out the organization's mission.

Responses to employee viewpoint surveys show that the agency is on the right path. In 2007 and 2009, the NRC was ranked as the best place to work in the Federal Government. The results of the 2009 survey reflect that employees feel strongly engaged, understand how their work contributes to the agency's mission, and view their work as meaningful and important. Survey results also indicated that employees agree that they have the training, development, information, and skills needed to perform their work. The safety culture survey conducted by the Office of the Inspector General similarly reflected positive employee perceptions, even when compared to organizations viewed as the best in class. The NRC continues to use such surveys to choose areas for further focus and improvement in its management of human resources. For example, the NRC implemented initiatives to (1) ensure that all employees understand the relevance to their work of an open, collaborative working environment (OCWE) and strong safety culture, (2) further communicate information about benefits to all staff members, (3) enhance work-life flexibilities such as telecommuting and flexible work schedules, and (4) continuously improve performance management and communications.

Recruitment and Hiring Process. To meet current hiring demands and to increase efficiency in hiring, the NRC identified the need to focus its recruitment activities and streamline the hiring process. As a long-standing practice, the NRC actively recruits for its Nuclear Safety Professional Development Program at targeted universities with a history of graduating technically strong, diverse candidates. In addition, the NRC has maintained its recruitment activities at professional society conferences and career fairs. The agency advertises in trade journals and on web sites to attract professionals in specialized technical disciplines and in local newspapers around the country in areas where technical engineers and scientists may be interested in re-locating because of job cutbacks.

The agency continued to make prudent, targeted use of recruitment, relocation, and retention incentives and pension offset waiver (rehiring annuitants without reduction of salary or pension) in order to hire and retain employees of the quality necessary to carry out the agency's mission. Such incentives are particularly useful for unusual occupations or highly specialized disciplines for which candidates may be scarce. The NRC offers non-supervisory employees referral awards when they are instrumental in helping the agency fill positions. The NRC also continues to strengthen its programs for developing and hiring students in critical specialties through programs such as partnerships with colleges and universities; university grants, scholarships, and fellowships; cooperative education programs; and payment of transportation and lodging expenses for student employees.

Training and Knowledge Management and Transfer. Nearly half of NRC staff members have been with the agency for less than 4 years. Rapidly training and integrating this large number of new employees into the agency is a significant challenge, but it is essential for the NRC's and the employees' future success and productivity. To address this challenge, the NRC is expanding the use of existing learning tools, including mentoring; structured independent learning activities; and on-the-job, formal classroom, and online training. Senior staff train and spend time helping newer staff with both mastering technical issues and assimilating into the NRC culture. A major challenge is the multigenerational population now working together, each with different ways of learning and approaching work.

The NRC uses an integrated approach to learning to provide new employees with consistent information from branch to branch and division to division. To assist new employees, the NRC has developed a virtual orientation center. This advanced training tool allows new hires to enter a computer generated or virtual world where they can obtain information about the NRC organization, its mission, and employee benefits before starting their first day of work. Additionally, new hires receive position-specific training. The offices, such as the Office Nuclear Reactor Regulation, have developed a qualification program that consists of three parts: general requirements, position-specific requirements, and oral qualification boards. The NRC is continuing to develop its qualification plans and other position-specific training for groups such as project engineers or project managers. It is also identifying course needs at its Technical Training Center and Professional Development Center.

Workforce Planning and Deployment. With a renewed emphasis on hiring to meet the expected increase in new reactor work, the Office of Nuclear Reactor Regulation realigned to emphasize the area of new reactors, and the Office of Nuclear Material Safety and Safeguards reorganized to enhance cooperation with States and to implement a holistic approach to fuel issues including transportation, storage, and disposal. The NRC's strategic workforce planning tool facilitated the changes in these two offices by allowing for a smoother planning process to improve workforce deployment, maintain technical capacity, and make informed decisions on human capital strategies for recruitment, development, and retention.

Leadership and Knowledge Management. The NRC has organized its leadership development programs into the Leaders Academy, consisting of systematic competency-based training, assessment, and development programs for all levels of leadership, from individual contributors to senior executives. The NRC also continues its executive succession planning process, through which it identifies skills needed and potential successors for senior leadership positions, determines development that would benefit executives to prepare them for such NRC positions, and considers strategies for filling positions for which NRC has few potential successors. The process informs selections for NRC positions and the establishment of executive development plans for all executives.

Knowledge management is a part of strategic human capital management, along with strategic workforce planning, recruitment, and training and development. As part of this effort, the NRC coordinates its activities to implement knowledge management strategies.

In addition, the NRC uses an agency-wide knowledge management plan that serves as a framework to integrate new and existing approaches that generate, capture, and transfer knowledge and information relevant to the NRC's mission. This plan includes both near- and long-term strategies, such as the following:

- Capture relevant critical knowledge of departing personnel.
- Recapture departed knowledge where possible.
- Communicate leadership's expectation for a knowledge-sharing culture.
- Formalize knowledge management values and principles.
- Incorporate knowledge management within process workflows.

Current knowledge management and knowledge transfer activities include the following.

- Branch Chief and Team Leader Seminars - As the role of the NRC branch chiefs has evolved from the provisions of senior technical expertise to that of a manager, it is essential that the branch chiefs have the information they need to succeed in their positions. As a community of practice, the branch chiefs/team leaders meet monthly to hear presentations by agency experts in topics such as performance management, budget, and communications.

- Branch and Team Meetings - To ensure that staff members in each branch or team are kept up-to-date in areas under their purview, branch chiefs and team leaders hold regularly scheduled staff meetings. During some of these meetings, senior staff members give presentations to staff regarding an area in which they are considered experts or to pass their knowledge of past events on to newer staff. Some branch chiefs also have their more junior staff give presentations. This facilitates the interaction of junior staff with senior staff members, since the junior staff member may need to interview more senior staff to glean information for their presentations.

- Video Interviews – The NRC conducted a pilot project to capture knowledge from retiring senior staff using video interviews. One video captured knowledge regarding steam generators; another was entitled "Nuclear Knowledge for the Next Generation." The interviews included questions about licensing issues, recruiting and mentoring new hires, leadership, operations center experience, and reactor licensing performance metrics.

- Web Sites – The NRC has developed the "NRC Knowledge Center" Web page that links a number of communities and topics. Office-specific knowledge management programs supplement this agencywide site. For example the Office of Nuclear Reactor Regulation has a Web site devoted to knowledge management entitled "Sharing Expert Experience and Knowledge"; this site contains information such as the Inspector Best Practices Booklet and Inspector Newsletters, supervisor and team leader seminars, new employee orientation and training guide, key reference materials for reviews, qualification plans, strategic workforce planning, knowledge management, and other communities of practice.

Retaining Staff. The NRC is interested in retaining highly experienced staff who could retire if they wished, as well as more recent recruits whose skills are highly marketable outside the agency. The NRC relies on all aspects of its human resource management system, from providing challenging and meaningful work, comprehensive training and development, constructive performance management, and awards and recognition, to opportunities for career growth, financial incentives when needed, and a range of benefits, health, and work-life programs. These work-life programs include flexible work schedules and work-at-home plans. The agency's goal is to create an OCWE where people feel valued and challenged and in which employees and leaders at all levels model the NRC's core values: integrity, service, openness, commitment, cooperation, excellence, and respect.

8.1.6 Position of the NRC in the Governmental Structure

This section explains the relationship of the NRC to the executive branch, the States, and Congress.

8.1.6.1 Executive Branch

The components of the executive branch with which the NRC has the most frequent contact and interaction are the White House, OMB, U.S. Department of State, DOE, U.S. Environmental Protection Agency (EPA), FEMA, U.S. Department of Labor, U.S. Department of Transportation, and U.S. Department of Justice. Section 8.2 of this report discusses the NRC's relationship to DOE. The following summarizes the agency's relationships with other components of the Federal Government:

- The White House. As noted in Section 8.1.2.2, as an independent regulatory agency, the White House cannot directly set NRC policy. It can, however, influence NRC policy by (1) appointing Commissioners and Chairmen in whose outlook and judgment it has confidence and (2) making its views known on non-adjudicatory matters. In certain areas, such as national security policy, the Commission has declared its intent to give great weight to the views of the executive branch. In informal policy matters, such as rulemaking, White House and executive branch officials may properly try to influence NRC decisions, either publicly or privately. Ultimately, however, the NRC must make the decision and accept responsibility for it.

- U.S. Office of Management and Budget. The NRC submits its annual budget requests, including proposed personnel ceilings, to OMB for approval.

- U.S. Department of State. By law, the NRC must license the export and import of nuclear equipment and material. For significant applications, the Commission requests the U.S. Department of State to provide executive branch views on whether the license should be issued.

  The NRC also works with the U.S. Department of State negotiating international agreements in the nuclear field and interacting with IAEA and other international organizations of the United Nations, as well as NEA of the Organisation for Economic Co-operation and Development. In general, these interactions serve to develop policy on nuclear issues that are under NRC purview and to plan and coordinate programs of nuclear safety and safeguards assistance to other countries.

- U.S. Environmental Protection Agency. The responsibilities of the NRC and EPA intersect or overlap in areas in which EPA issues generally applicable environmental standards for activities that are also subject to NRC licensing. Examples include standards for high-level waste repositories, decommissioning standards, and standards for public and worker protection. EPA has the ultimate authority to establish generally applicable environmental standards to protect the environment from radioactive material.

- Federal Emergency Management Agency. FEMA assists the NRC's licensing process by preparing reviews and evaluations and by presenting witnesses to testify at licensing hearings. FEMA also participates with the NRC in observing and evaluating emergency exercises at nuclear plants. FEMA findings are not binding on the NRC, but they are presumed to be valid unless controverted by more persuasive evidence. FEMA is now part of the U.S. Department of Homeland Security (DHS).

- U.S. Department of Transportation. The NRC and the U.S. Department of Transportation share responsibility for the control of radioactive material transport. U.S. Department of Transportation regulations cover all aspects of transportation, including packaging, shipper and carrier responsibilities, documentation, and all levels of radioactive material.

- U.S. Department of Labor. The NRC monitors discrimination actions related to NRC-licensed activities filed with the U.S. Department of Labor under Section 211 of the Energy Reorganization Act and develops enforcement actions when there are properly supported findings of discrimination, either from the NRC's Office of Investigations or from U.S. Department of Labor adjudications.

- U.S. Department of Justice. The NRC has independent litigation authority. But any NRC litigation almost always requires coordination with the U.S. Department of Justice. Under the Administrative Orders Review Act (commonly called the Hobbs Act), the United States is a party to petitions for review challenging NRC licensing decisions or regulations.

  The Office of Investigations, which investigates allegations of wrongdoing by NRC applicants and licensees, as well as by their contractors, normally works with the Fraud Section of the Criminal Division at the Department's Headquarters and with U.S. Attorneys.

  The Office of the Inspector General reports to the Department of Justice whenever it has reasonable grounds to believe that an NRC employee or contractor has violated Federal law. The Inspector General refers cases for review for possible criminal prosecution to the U.S. Attorney's Office for the area in which the potential violation occurred. When the Department of Justice desires support from the Office of the Inspector General for investigations or grand jury work, it makes the request directly to the Inspector General.

8.1.6.2 The States (i.e., of the United States)

At the NRC, the Office of Federal and State Materials and Environmental Management Programs is responsible for establishing and maintaining effective communications and working relationships between the NRC and the States. This office serves as the primary contact for policy matters, keeping the States apprised about NRC activities and informing the NRC of State activities and views that may affect NRC policies, plans, and activities. Other NRC offices provide major support to implement State relations program policy and guidance, for example, through regional State liaisons and State agreements officers.

As explained in Article 7, the Atomic Energy Act confers on the NRC preemptive authority over health and safety regulation of nuclear energy and Atomic Energy Act materials. As a result, the general rule is that nuclear power plant safety, like airline safety, is the exclusive province of the Federal Government and cannot be regulated by the States. The courts would thus void a State law that attempted to set nuclear safety standards. However, the courts will not overturn a State law that regulates nuclear energy for purposes other than health and safety, such as economics, unless it conflicts with an NRC requirement. Similarly, the courts will not ordinarily question a State's declared purpose in enacting legislation.

However, the Atomic Energy Act did not entirely exclude States from the regulation of nuclear matters. Section 274 of the Act created the Agreement State Program, under which the NRC may relinquish its authority over most nuclear materials to those States willing to assume that authority. The NRC may not relinquish authority over such facilities as reactors, fuel reprocessing and enrichment plants, imports and exports, critical mass quantities of special nuclear material, high-level waste disposal, or certain other excepted areas.

Many States have signed formal agreements with the NRC and have assumed regulatory responsibility over certain byproduct, source, and small quantities of special nuclear materials. Agreement States receive no Federal funding to support their regulatory programs. The NRC conducts performance-based reviews of Agreement State programs to ensure that they remain adequate to protect public health and safety and are compatible with the NRC materials program.

Some States have shown a desire to participate in matters relating to nuclear power plants. In response, the NRC issued a policy statement in February 1989 declaring its intent to cooperate with States in the area of nuclear power plant safety by keeping States informed of matters of interest to them and considering proposals for State officials to participate in NRC inspection activities, pursuant to a memorandum of understanding between the State and NRC. The policy statement makes clear that States must channel their contacts with the NRC through a single State Liaison Officer, appointed by the Governor. States are authorized only to observe and assist in NRC inspections of reactors, and they cannot conduct their own independent health and safety inspections.

Through its intergovernmental liaison program, the NRC works in cooperation with Federal, State, and local governments; interstate organizations; and Native American Tribal Governments to maintain effective relations and communications with these organizations and to promote greater awareness and mutual understanding of the policies, activities, and concerns of all parties involved as they relate to radiological safety at NRC-licensed facilities.

8.1.6.3 Congress

The following oversight committees and subcommittees in the Senate and House have jurisdiction over aspects of the NRC's activities:

- Senate Oversight. In the U.S. Senate, the Committee on the Environment and Public Works has jurisdiction over domestic nuclear regulatory activities. With the committee, the Subcommittee on Clean Air and Nuclear Safety has responsibility for regulation and oversight of the NRC. The Energy and Natural Resources Committee and the Environment and Public Works Committee share jurisdiction over nuclear waste issues.

- House Oversight. In the U.S. House of Representatives, the Committee on Energy and Commerce has jurisdiction over domestic nuclear regulatory activities. Within the committee, the Subcommittee on Energy and Environment has responsibility for regulation and oversight of the NRC.

- Other Relevant Committees. In addition to the committees and subcommittees mentioned above, the House and Senate Appropriations Subcommittees on Energy and Water Development play a key role in approving the Commission's annual budget. A number of other committees frequently interface with the NRC concerning international affairs, research, security, and general Governmental operations.

8.1.7 Report of the Integrated Regulatory Review Service Self-Assessment Team

The U.S. has invited an IAEA IRRS Mission scheduled for October 17 – 29, 2010. The preparatory meeting took place October 21 – 23, 2009. Subsequent to this meeting, a new IRRS Mission team leader was assigned. Therefore, a second preparatory meeting with the new team leader took place on March 12, 2010. To prepare for the mission, the NRC performed a complementary self-assessment in 2009 to update a self-assessment previously performed in 2007.

The mission will focus specifically on the operating power reactor program. U.S. preparatory activities initially followed the IAEA procedure titled, "Guidelines for the Integrated Regulatory Review Service (IRRS)," dated February 2008, but were realigned to follow the February 2010 IRRS guidance following its issuance. The U.S. mission will include all 10 core modules of the 2010 guidance, as well as some additional thematic and optional modules, and will discuss three Elective Policy Issues. The three Policy Issues are: (1) transparency and openness, (2) long-term operation and aging management of nuclear facilities, and (3) human resources and knowledge management.

8.2 Separation of Functions of the Regulatory Body from Those of Bodies Promoting Nuclear Energy

Although both the NRC and DOE have responsibilities for managing nuclear facilities and materials, they maintain separate, independent functions. The partitioning of the U.S. Atomic Energy Commission in the mid-1970s provided distinct entities for the U.S. Government's regulatory and promotional responsibilities in nuclear applications.

Specifically, the Energy Reorganization Act redistributed the functions performed by the U.S. Atomic Energy Commission to two new agencies. This act created the NRC to regulate the commercial nuclear power sector and ERDA to promote energy and nuclear power development and to develop defense applications. The NRC was established as an independent authority to regulate the possession and use of nuclear materials as well as the siting, construction, and operation of nuclear facilities. ERDA was established to ensure the development of all energy sources, increase the efficiency and reliability of energy resource use, and carry out the other functions, including but not limited to the U.S. Atomic Energy Commission military and production activities and general basic research activities.

The NRC performed its regulatory mission by issuing regulations, licensing commercial nuclear reactor construction and operation, licensing the possession of and use of nuclear materials and wastes, safeguarding nuclear materials and facilities from theft and radiological sabotage, inspecting nuclear facilities, and enforcing regulations. The NRC regulates the commercial nuclear fuel cycle materials and facilities. Regarding the regulatory control of commercial spent nuclear fuel and radioactive waste, the NRC is responsible for licensing commercial nuclear waste management facilities, independent spent fuel management facilities, and DOE facilities for the disposal of high-level waste and spent fuel.

DOE addresses the U.S. Government's need to unify energy organization and planning. The DOE Organization Act brought a number of Federal agencies and programs, including ERDA, into a single agency with responsibilities for nuclear energy technology and nuclear weapons programs. Over the past decade, DOE has expanded its new nuclear-related activities to include nonproliferation and the environmental cleanup of contaminated sites and facilities. DOE retains authority under the Atomic Energy Act for regulating its nuclear activities, including the responsibility for activities such as regulating the disposal of its own low-level radioactive waste.

ARTICLE 9. RESPONSIBILITY OF THE LICENSE HOLDER

Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant license and shall take the appropriate steps to ensure that each such license holder meets its responsibility.

The NRC, through the Atomic Energy Act, ensures that the prime responsibility for the safety of a nuclear installation rests with the licensee. Steps the NRC takes to ensure that each licensee meets its primary responsibility include the licensing process, discussed in Articles 18 and 19, the Reactor Oversight Process, discussed in Article 6, and the enforcement program, discussed below. This update revises the debt collection dollar amount and discusses the Alternative Dispute Resolution Program and current experience.

9.1 Introduction

The NRC's regulatory programs continue to be based on the premise that the safety of commercial nuclear power reactor operations is the responsibility of NRC licensees. The NRC is responsible for regulatory oversight of licensee activities to ensure that safety is maintained. The NRC reviews the safety of a reactor design and the capability of an applicant to design, construct, and operate a facility. If an applicant satisfies the requirements of the *Code of Federal Regulations*, the NRC then issues a license to operate the facility. Such licenses specify the terms and conditions of operation to which a licensee must conform. Failure to conform subjects the licensee to enforcement action, which can include modifying, suspending, or revoking the license. The NRC can also order particular corrective actions or issue civil penalties. The following sections discuss these enforcement mechanisms in greater detail.

9.2 The Licensee's Prime Responsibility for Safety

As discussed in Article 7 of this report, the Atomic Energy Act, Section 103, Chapter 10, grants the NRC authority to issue licenses for nuclear reactor facilities. Moreover, Section 103 states that these licenses are subject to such conditions as the NRC may establish by rule or regulation to implement the purposes and provisions of the Atomic Energy Act. Consistent with the Act, before issuing a license, the Commission determines that the applicant is (1) equipped and agrees to observe such safety standards to protect health and minimize danger to life or property as the Commission may establish by rule and (2) agrees to make available to the Commission such technical information and data about activities under such license as the Commission may determine necessary to promote the common defense and security and to protect public health and safety.

Embedded in each license is the explicit responsibility for the license holder to comply with the terms and conditions of the license and the applicable Commission rules and regulations. The licensee is ultimately responsible for the safety of its activities and the safeguarding of nuclear facilities and materials used in operation.

When the Commission or licensee determines that the licensee is not complying with the Commission's rules or regulations, the NRC takes action to ensure that the facility is returned to a condition compliant with its license.

9.3 NRC Enforcement Program

As discussed in Article 7, the NRC has enforcement powers. As discussed in Sections 7.2.3 and 7.2.4, the enforcement process complements the Reactor Oversight Process. The NRC uses enforcement as a deterrent to emphasize the importance of compliance with regulatory requirements and to encourage prompt identification and prompt, comprehensive correction of violations.

The NRC identifies violations through inspections and investigations. All violations are subject to civil enforcement action and may be subject to criminal prosecution. Unlike the burden of proof standard for criminal actions (beyond a reasonable doubt), the NRC uses the Administrative Procedure Act standard (preponderance of evidence) in enforcement proceedings. After an apparent violation is identified, it is assessed in accordance with the Commission's enforcement policy, described in the NRC Enforcement Policy, last updated on November 28, 2008, which is available to NRC licensees and members of the public. The NRC Office of Enforcement maintains the current policy statement on the NRC's public web site. Because it is a policy statement and not a regulation, the Commission may deviate from it, as appropriate, given the circumstances of a particular case.

The NRC has three primary enforcement sanctions available: notices of violation, civil penalties, and orders.[3] A notice of violation identifies a requirement and how it was violated, formalizes a violation pursuant to 10 CFR 2.201, "Notice of Violation," requires corrective action, and normally requires a written response. A civil penalty is a monetary fine issued under authority of the Atomic Energy Act, Section 234, or the Energy Reorganization Act, Section 206. Section 234 of the Atomic Energy Act provides for penalties of up to $100,000 per violation per day; however, that amount is adjusted every 4 years by the Federal Civil Penalties Inflation Adjustment Act of 1990, as amended by the Debt Collection Improvement Act of 1996, and is currently $140,000. Section 161 of the Atomic Energy Act gives the Commission broad authority to issue orders; this authority extends to any area of licensed activity that affects public health and safety or the common defense and security. Orders modify, suspend, or revoke licenses, or they may require specific actions by licensees or persons. The NRC issues notices of violations and civil penalties on the basis of violations. The agency may issue orders for violations or, in the absence of a violation, because of a concern involving public health and safety or the common defense and security.

After identifying a violation, the NRC assesses its significance by considering the following factors:

- actual safety consequences
- potential safety consequences
- potential for impacting the NRC's ability to perform its regulatory function
- any willful aspects of the violation

[3] The NRC also uses administrative actions, such as notices of deviation, notices of nonconformance, confirmatory action letters, and demands for information to supplement its enforcement program.

Given those factors, the NRC takes one of the following actions based on the significance of the violation:

- assigns a severity level, ranging from Severity Level IV (more than minor concern) to Severity Level I (the most significant)

- associates the violation with findings assessed through the Reactor Oversight Process significance determination process (described in Article 6) and assigns a color code of green, white, yellow, or red based on increasing risk significance

The Commission recognizes that there are violations of minor safety or environmental concern that are below Severity Level IV violations, as well as below violations associated with green findings. These minor violations are not assigned a severity level category or a color assessment.

The NRC may hold a pre-decisional enforcement conference or a regulatory conference with a licensee before making an enforcement decision if (1) escalated enforcement action appears warranted, (2) the NRC decides a conference is necessary, or (3) the licensee requests it. The purpose of the conference is to obtain information to assist the NRC in determining the appropriate enforcement action, such as a common understanding of facts, root causes, and missed opportunities associated with the apparent violations; corrective actions taken or planned; and the significance of issues and the need for lasting, comprehensive corrective actions.

At several junctions during the enforcement process involving cases of discrimination or willful violation of NRC regulations, the agency offers its licensees (including their contractors) or individuals the opportunity to participate in the Alternative Dispute Resolution Program. Alternative dispute resolution is a general term encompassing various techniques for resolving conflict outside of court using a neutral third party. The NRC uses mediation, a technique in which a neutral mediator with no decisionmaking authority helps parties clarify issues, explore settlement options, and evaluate how best to advance their respective interests. Neutral mediators are selected from a roster of experienced mediators provided by a neutral program administrator who is under contract with the NRC. The mediator's responsibility is to assist the parties in reaching an agreement. However, the mediator has no authority to impose a resolution upon the parties. Mediation is a confidential and voluntary process. If the parties to the process (the NRC and the licensee or individual) agree to use alternative dispute resolution, they select a mutually agreeable neutral mediator and share equally the cost of the mediator's services. In cases in which the NRC and the other party reach an agreement, the agency issues a confirmatory order reflecting the terms of the agreement.

The agency normally assesses civil penalties for Severity Level I and II violations, as well as knowing and conscious violations of the reporting requirements of Section 206 of the Energy Reorganization Act. Civil penalties are considered for Severity Level III violations. Although not normally used for violations associated with the Reactor Oversight Process, civil penalties (and the use of severity levels) are considered for issues that are willful, that have the potential to affect the regulatory process, or that have actual consequences.

Although each severity level may have several associated considerations, the outcome of the assessment process for each violation or problem (absent the exercise of discretion) results in one of three outcomes, which may involve no civil penalty, a base civil penalty, or twice the base civil penalty.

The NRC may issue orders to modify, suspend, or revoke a license; issue orders to cease and desist from a given practice or activity; or take such other action as may be proper. The agency may issue orders in lieu of, or in addition to, civil penalties. Additionally, the NRC may issue an order to impose a civil penalty when a licensee refuses to pay a civil penalty or an order to an unlicensed person (including vendors) when the agency has identified deliberate misconduct. By statute, a licensee or individual may request a hearing upon receiving an order. Orders are normally effective after a licensee or individual has had an opportunity to request a hearing (i.e., 30 days). However, orders can be made immediately effective without prior opportunity for a hearing when the agency determines it is the best interest of public health and safety to do so. Subsequent to the hearing process, a licensee or individual may appeal the administrative hearing decision to the Commission and, if desired, appeal the Commission's decision to a U.S. court of appeals.

Providing interested stakeholders with enforcement information is very important to the NRC. Conferences that are open to public observation appear in the listing of public meetings on the NRC's public web site. The agency issues a press release for each proposed civil penalty or order. All orders are published in the *Federal Register*. Significant enforcement actions (including actions to individuals) are included in the enforcement document collection in the Electronic Reading Room of the NRC's public web site.

During 2008, the NRC issued a variety of significant enforcement actions to operating power reactors. These actions included 23 escalated notices of violation without civil penalties, 3 civil penalties, and 3 orders.

During 2009, the NRC issued a variety of significant enforcement actions to operating power reactors including 22 escalated notices of violation without civil penalties, 1 civil penalty, and 4 orders.

To provide accurate and timely information to all interested stakeholders and enhance the public's understanding of the enforcement program, the NRC publishes related information on the agency's public web site.

ARTICLE 10. PRIORITY TO SAFETY

Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.

NRC policies that give due priority to safety covered under this article are PRA policy statements and policies that apply to licensee safety culture and safety culture at the NRC.

Other articles (e.g., Articles 6, 14, 18, and 19) also discuss activities undertaken to achieve nuclear safety at nuclear installations.

Updates to this section discuss new regulations, developments in PRA, and safety culture.

10.1 Background

The United States has made substantial progress in developing and using the results of PRAs for all operating reactor facilities, and the NRC has developed extensive guidance regarding the role of PRA in U.S. regulatory programs. The NRC has extensively applied information gained from PRA to complement other engineering analyses in improving issue-specific safety regulation and in changing the current licensing bases for individual plants. The move toward risk-informing the current regulations and processes continues to mark perhaps the most significant changes at the NRC. For example, 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components," modifies the scope of the special treatment regulations by creating an alternative regulatory framework that enables licensees to use a risk-informed approach to categorize structures, systems, and components (SSCs), and their associated treatment, according to their safety significance. As another example, 10 CFR 50.48(c) allows an operating nuclear power plant licensee to adopt a risk-informed, performance-based fire protection program (discussed further in the Survey of Regulatory and Current Issues section of this report) The NRC is continuing a program to develop additional changes to the specific technical requirements in the body of 10 CFR Part 50.

10.2 Probabilistic Risk Assessment Policy

Three policy statements form the basis for the NRC's current treatment of PRA and the related regulatory safety goals and objectives - the "Policy Statement on Severe Reactor Accidents Regarding Future Designs and Existing Plants," dated August 8, 1985; the "Safety Goals for the Operation of Nuclear Power Plants; Policy Statement; Republication," dated August 21, 1986; and the "Policy Statement on Use of PRA Methods in Nuclear Activities," dated August 16, 1995. Previous U.S. National Reports have detailed these policies.

10.3 Applications of Probabilistic Risk Assessment

The NRC applies PRA to resolve severe accident issues, evaluate new and existing requirements and programs, implement risk-informed regulation, and improve data and methods of risk analysis. The NRC also engages in cooperative activities with industry (such as pilot programs for 10 CFR 50.69, 10 CFR 50.48(c), and RG 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," dated March 2009) and in activities that assess risk in determining plant-specific changes to the licensing basis. The NRC staff will use RG 1.200 to assess technical adequacy of the supporting PRA for all risk-informed applications.

The NRC maintains a risk-informed and performance-based plan, updated annually, which sets forth the agency's planned actions to make its regulatory activities risk informed and performance based. In the past, the Risk-Informed Regulation Implementation Plan (for example, SECY-09-0159 "Annual Update of the Risk-Informed and Performance-Based Plan," dated October 27, 2009) focused largely on risk-informed initiatives. The current improved plan has expanded the objectives to more fully achieve a risk-informed and performance-based regulatory structure. The NRC has created a public Web site for the risk-informed and performance-based plan with links to documents that specifically describe activities and status.

The NRC and industry representatives have cooperated in a number of activities and pilot programs to develop and apply risk-informed methodologies for specific regulatory applications. The staff uses the lessons learned from these activities to enhance the effectiveness of developed guidance. These activities, described in the sections below, include special treatment, inservice inspection, technical specification changes, and standards development.

10.3.1 Risk-Informed Special Treatment

The agency has approved or is reviewing several applications of risk-informed inservice testing, of generally limited scope. For example, in August 2001, the staff granted a risk-informed exemption request from the licensee of the South Texas Project regarding special treatment requirements for low-risk and nonrisk-significant safety-related nuclear components (including an exemption from prescriptive inservice testing requirements). Having successfully implemented this exemption, the staff developed a new rule, 10 CFR 50.69 (discussed in Section 10.1 of this report), to allow the application of risk insights to reduce the special treatment requirements in 10 CFR Part 50 for SSCs that are categorized as being of low safety significance.

The Commission approved the final rule, with some modifications, in October 2004. The final rule was published in the *Federal Register* on November 22, 2004. The NRC staff issued RG 1.201, Revision 1, "Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance," in May 2006.

A topical report, WCAP-16308-NP, Revision 0, "Pressurized Water Reactor Owners Group 10 CFR 50.69 Pilot Program – Categorization Process – Wolf Creek Generating Station," dated September 25, 2006, proposed a categorization process used by Wolf Creek Nuclear Operating Corporation in support of a future licensee submittal requesting approval to implement 10 CFR 50.69. The staff completed its review of the topical report and issued its final safety evaluation in March 2009. The staff found the categorization process described in the topical report to be acceptable, but it did not approve or endorse any specific treatment process. Treatment programs being implemented under 10 CFR 50.69 do not require prior approval from the NRC as part of the license amendment review process.

The staff plans to develop guidance for sample inspections to be conducted at plants voluntarily choosing to implement 10 CFR 50.69. The performance of sample inspections is consistent with the statement of considerations accompanying the final 10 CFR 50.69 rule. The staff plans to issue draft guidance to obtain stakeholder input and issue final guidance by summer 2011. Inspection efforts will be focused on the most risk significant aspects related to implementation of 10 CFR 50.69 (i.e., proper categorization of SSCs and treatment of Risk-Informed Safety Class (RISC)-1 and RISC-2 SSCs). Additionally, the inspections are expected to be performance based, with SSCs with a lower safety significant function, such as those classified RISC-3, not receiving a major portion of inspection focus unless adverse performance trends are observed.

The staff recognizes the need for an effective, stable, and predictable regulatory climate for the implementation of 10 CFR 50.69. Inspection guidance developed with industry stakeholder input is viewed as an efficient vehicle for reaching a common understanding of what constitutes an acceptable treatment program for SSCs, since the NRC does not review specific treatment plans as part of a licensee's application to implement 10 CFR 50.69.

10.3.2 Risk-Informed Inservice Inspection

The NRC uses the inservice inspection guidance in RG 1.178, Revision 1, "An Approach for Plant Specific Risk-Informed Decision-making for Inservice Inspection of Piping," dated September 2003, and NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Section 3.9.8, "Risk-Informed Inservice Inspection of Piping," dated September 2003. The agency-approved industry methodologies, one developed by the Westinghouse Owners Group and the other by EPRI, regarding alternatives to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), Section XI, Inservice Inspection Program continue to be used for inservice inspections.

ASME has developed Code Case N-716, "Alternative Piping Classification and Examination Requirements, Section XI Division 1." Code Case N-716 is founded, in large part, on the risk-informed inservice inspection process as described in EPRI Topical Report 112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," dated December 1999, which the NRC reviewed and approved. Code Cases provide alternatives to existing ASME Code requirements that ASME has developed and approved. RG 1.147, Revision 15, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," dated October 2007, identifies the Code Cases that the NRC has determined to be acceptable alternatives to applicable parts of ASME Code, Section XI. RG 1.147 has not endorsed Code Case N-716 because the technical adequacy of a PRA that can be used to develop a risk-informed inservice inspection program is not well defined. The NRC has reviewed and approved about 12 plant-specific risk-informed inservice inspection programs that are based on the methodology described in Code Case N-716 supplemented with information related to the plant's PRA. By letter dated February 18, 2009, EPRI submitted for NRC staff review Topical Report 1018427, "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs." The staff is scheduled to complete its review of Topical Report 1018427 by December 2010. If the NRC endorses Topical Report 1018427, it will determine whether RG 1.147 can endorse Code Case N-716, supported by Topical Report 1018427. Licensees may implement Code Cases endorsed in RG 1.147 without prior NRC staff review and approval.

The NRC regularly participates in the ASME Code development process to resolve issues regarding risk-informed inservice inspection methodology.

10.3.3 Risk-Informed Technical Specification Changes

Since the mid-1980s, the NRC has reviewed and granted improvements to technical specifications that are based, at least in part, on PRA insights. In its "Final Policy Statement on Technical Specification Improvements for Nuclear Power Reactors," published in the *Federal Register* on July 22, 1993, the Commission stated that it expects licensees to use a plant-specific

PRA or risk survey in preparing submittals related to technical specifications. The Commission reiterated this point when it revised 10 CFR 50.36, "Technical Specifications," in July 1995.

The NRC continues to use RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," dated August 1998, and a companion section of NUREG-0800 to guide licensees in making risk-informed changes to plant technical specifications. The agency uses RG 1.177 as well as RG 1.174, Revision 1, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," dated November 2002, to improve plant technical specifications. . The industry and the NRC continue to increase the use of PRA in developing improvements to technical specifications. As discussed in a letter from NEI to the NRC dated June 8, 2001 (Agencywide Documents Access and Management System Accession No. ML011690233), the industry developed eight separate initiatives to improve existing technical specification configuration control requirements through use of risk insights. The following summarizes the major accomplishments in this area:

- Initiative 1, "Modified End States" - This initiative would allow (following a risk assessment) some equipment to be repaired during hot shutdown rather than cold shutdown. The NRC has approved the topical reports and model applications supporting this initiative for BWRs and for Combustion Engineering and Babcock & Wilcox plants. The staff is currently reviewing the Westinghouse topical report, submitted September 2005.

- Initiative 4b, "Risk-Informed Completion Times" - The overall objective of this initiative is to modify technical specifications to reflect a configuration risk management approach that is more consistent with the approach of the Maintenance Rule (10 CFR 50.65(a)(4)). Industry guidance has been approved, and the South Texas Project pilot was approved in 2007. The NRC expects to receive a model application in 2010 for review and approval.

- Initiative 5b, "Risk Informed Method for Control of Surveillance Frequencies" - This initiative allows licensees to modify the frequency of technical specification surveillances based on test data and a risk-informed evaluation. The staff approved industry guidance and a model application, and it has approved pilot applications for the Limerick Generating Station in 2006 and Diablo Canyon in 2009. The staff is currently receiving and reviewing applications for this initiative.

- Initiative 6, "Modification of Limiting Condition for Operation 3.0.3, Actions and Completion Times" - This initiative provides a 24-hour completion time for a limited scope of technical specification systems when both safety trains are inoperable. The industry is in the process of resolving discrepancies between its Combustion Engineering topical reports WCAP-16125, Revisions 1 and 2, "Justification for Risk-Informed Modifications to Selected Technical Specifications for Conditions Leading to Exigent Plant Shutdown," dated December 2007 and May 2009, respectively, and the NRC's draft safety evaluation. The NRC is currently reviewing the May 2009 document. The NRC expects to receive a BWR topical report in FY2010.

- Initiative 7, "Non-Technical Specifications Support System Impact in Technical Specifications System Operability": This initiative permits a risk-informed delay time before entering limiting condition for operation actions for inoperability attributable to a loss of support function provided by equipment not addressed in technical specifications. Guidance documents have been approved for snubbers and hazard barriers, and the industry is considering additional proposals.

- Initiative 8, "Remove/Relocate Non-Safety and Non-Risk Significant Systems from Technical Specifications" - This initiative would review technical specifications to remove certain system functions that had been included solely because they were judged to be risk significant at one time, but additional analysis could show them not to be. The industry and staff are in preliminary discussions on this initiative.

10.3.4 Development of Standards

The NRC worked with ASME and the American Nuclear Society (ANS) to develop a national consensus standard for PRA quality. In February 2009, ASME and ANS issued their joint PRA quality standard, ASME/ANS-RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications," and the NRC endorsed it in RG 1.200, Revision 2, in March 2009. The Survey of Current Regulatory and Safety Issues section of this report provides further information on the PRA standard for external events.

The agency plans further revisions to the RGs to incorporate revisions to the ASME/ANS standards as they are published, including standards addressing low power and shutdown modes, and Level 2 and 3 PRA.

10.4 Safety Culture

An important means to implement any policy that gives due priority to safety is to foster a strong safety culture in the organization. The following discussion focuses upon safety culture, and efforts to improve safety culture, in the NRC and in the nuclear industry.

10.4.1 NRC Monitoring of Licensee Safety Culture

This section covers the policies, programs, and practices that apply to licensee safety culture.

10.4.1.1 Background

Section 6.3.2 of this report describes the Reactor Oversight Process. Based on lessons learned from the Davis-Besse reactor pressure vessel head degradation event and other considerations, the NRC enhanced the Reactor Oversight Process to more fully address safety culture and identify safety culture problems earlier so that corrective steps can be taken to address the problems and prevent further plant performance degradation.

10.4.1.2 Enhanced Reactor Oversight Process

The NRC has adopted the IAEA International Nuclear Safety Advisory Group's definition of safety culture provided in Safety Series No.75-INSAG-4, "Safety Culture," dated February 1991, as "that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear safety issues receive the attention warranted by their significance."

On the basis of a review of safety culture attributes developed or applied by IAEA, NEA, INPO, regulatory bodies in other countries, and other domestic organizations, staff expertise, and input and feedback from NRC stakeholders, the staff identified the following components as important to safety culture:

- decisionmaking
- resources
- work control
- work practices
- corrective action program
- operating experience
- self- and independent assessments
- environment for raising safety concerns
- preventing, detecting, and mitigating perceptions of retaliation
- accountability
- continuous learning environment
- organizational change management
- safety policies

The Reactor Oversight Process inspection guidance documents define each one of the safety culture components in a greater level of detail (e.g., cross-cutting aspects). The Reactor Oversight Process applies the safety culture components, and their associated aspects, in different ways. The first nine safety culture components are applied in the baseline inspection and assessment program. All 13 safety culture components are applied in selected baseline, event followup, and supplemental inspection procedures (IPs).

Licensees perform periodic, voluntary self-assessments of safety culture in accordance with industry guidelines. There are no regulatory requirements for licensees to perform safety culture assessments routinely. However, depending on the extent of deterioration of licensee performance, the NRC has a range of expectations regarding regulatory actions and licensee safety culture assessments, as described below.

The Reactor Oversight Process employs a graded approach, such that plants that are performing in a specified manner warrant only a routine level of inspection and oversight. However, as licensee performance deteriorates, inspection and oversight become increasingly more intrusive to ensure safe plant operation. The Reactor Oversight Process safety culture enhancements continue to allow licensees to self-diagnose and implement corrective actions for their performance problems before the NRC performs followup inspections.

For most licensees (i.e., those listed in the Licensee Response column, Column 1, of the Reactor Oversight Process Action Matrix), the NRC performs the baseline inspection program. In the routine or baseline inspection program, the inspector will develop an inspection finding and then identify whether an aspect of a safety culture component is a significant causal factor of the finding. The NRC communicates the inspection findings to the licensee along with the associated safety culture aspect.

The NRC revised the IP that focuses on problem identification and resolution to allow inspectors to have the option to review licensee self-assessments of safety culture. The problem identification and resolution IP also instructs inspectors to be aware of safety culture components when selecting samples. In addition, questions related to safety-conscious work environment were enhanced in the procedure.

The agency revised IP 71153, "Followup of Events and Notices of Enforcement Discretion," dated June 10, 2006, to direct inspection teams to consider contributing causes related to the safety culture components as part of their efforts to fully understand the circumstances surrounding an event and its probable cause(s).

As part of the assessment process (conducted twice per year), the NRC considers the aspects of safety culture components associated with inspection findings to determine whether common themes exist at a plant. If, over three consecutive assessment periods (i.e., 18 months), a licensee has the same safety culture issue with the same common theme, the NRC may ask the licensee to conduct a safety culture self-assessment.

As licensee performance declines (Regulatory Response column, Column 2, of the Reactor Oversight Process Action Matrix), the inspectors, through a specific supplemental IP, verify that the licensee's root cause, extent of condition, and extent of cause evaluations for the risk-significant finding(s) appropriately considered the safety culture components.

When the licensee performance degrades further (Degraded Cornerstone column, Column 3, of the Reactor Oversight Process Action Matrix), the NRC expects that the licensee's root cause evaluation for the risk-significant finding(s) determined whether any safety culture component contributed to the risk-significant performance issues. If through the conduct of supplemental IP 95002, "Inspection for One Degraded Cornerstone or any Three White Inputs in a Strategic Performance Area", dated June 22, 2006, the NRC determines that the licensee did not recognize that safety culture components caused or significantly contributed to the risk-significant performance issues, the NRC may request the licensee to complete an independent assessment of its safety culture.

Finally, for licensees with more significant performance degradation (Multiple/Degraded Cornerstone column, Column 4, of the Reactor Oversight Process Action Matrix), the NRC will expect the licensee to conduct a third-party independent assessment of its safety culture. The NRC will review the licensee's assessment and will conduct an independent assessment of the licensee's safety culture via a specific supplemental IP that was substantially revised to provide guidance for these assessments. The staff applied this revised IP for the first time at the Palo Verde plant in 2007.

In July 2006, the NRC implemented revisions to the Reactor Oversight Process inspection and assessment processes related to safety culture. The NRC inspectors received training on safety culture in general and on the changes to the Reactor Oversight Process before implementation. Ongoing inspector training now includes safety culture topics. In 2008, the NRC conducted a self-assessment to review the changes to the Reactor Oversight Process over the initial 18-month implementation period. Lessons learned from the initial 18-month implementation period and from the Palo Verde supplemental inspection resulted in IP and program guidance changes. Some of the more significant changes included using a graded approach to evaluating safety culture assessments and the inclusion of additional guidance related to safety-conscious work environment considerations.

The safety culture changes made to the Reactor Oversight Process were intended to provide the NRC staff with (1) better opportunities to consider safety culture weaknesses and to encourage licensees to take appropriate actions before significant performance degradation occurs, (2) a process to determine the need to specifically evaluate a licensee's safety culture after performance problems have resulted in the placement of a licensee in the Degraded Cornerstone column of the Reactor Oversight Process Action Matrix, and (3) a structured process to evaluate the licensee's safety culture assessment and to independently conduct a safety culture assessment for a licensee in the Multiple/Repetitive Degraded Cornerstone column of the action matrix.

By using the existing Reactor Oversight Process framework, the NRC's safety culture oversight activities are based on a graded approach and remain transparent, understandable, objective, risk informed, performance based, and predictable.

10.4.2 The NRC Safety Culture

As previously noted in Section 10.4.1, the NRC recognizes the importance of nuclear plant operators establishing and maintaining a strong safety culture -- a work environment where management and employees are dedicated to putting safety first. In November 2009, the agency published the draft Safety Culture Policy Statement in the *Federal Register* that set forth the expectation that all licensees and certificate holders establish and maintain a positive safety culture. Similarly, given the NRC's safety and security mission, the NRC recognizes the importance of maintaining its own strong safety culture and the need to continuously seek to improve its internal organizational effectiveness.

In response to the identification of licensee safety culture weaknesses as contributing factors to events, the agency revised the Reactor Oversight Process in 2006 to better address safety culture; enhancement efforts to the Reactor Oversight Process continue. These external efforts prompted internal reflection on how to improve the agency's own safety culture. Accordingly, in October 2008, the agency chartered the NRC Internal Safety Culture Task Force to provide a report to the Commission outlining potential initiatives that could improve the agency's internal safety culture.

Based on the results from a range of data collection activities and the experience and knowledge of its members, the NRC Internal Safety Culture Task Force developed a set of recommendations. These recommendations, which are being implemented, aim to create effective and lasting improvements for supporting a strong safety culture. Actions include the following:

- the appointment of an agency Safety Culture Program Manager
- integrating safety culture into the NRC's Strategic Plan and integrating performance management tools
- developing training on safety culture principles and expectations
- evaluating the agency's problem identification, evaluation, and resolution processes
- establishing clear expectations and accountability for maintaining current policies and procedures

SECY-09-0068, "Report of the Task Force on Internal Safety Culture," dated April 27, 2009, and SECY-10-0009, "Internal Safety Culture Update," dated January 26, 2010, provide more details, including, in the latter, a status on the implementation of the recommendations in the task force report.

Complementing this new initiative is the agency's ongoing effort to encourage the free and open discussion of differing professional views in order to develop sound regulatory policy and decisions. The NRC strives to establish and maintain an OCWE that encourages all employees and contractors to promptly voice differing views without fear of retaliation. The staff created the OCWE Web page (http://www.nrc.gov/about-nrc/values/open-work-environment.html) in 2007 to clearly communicate that the NRC encourages trust, respect, and open communication to foster and promote a positive work environment that maximizes the potential of all individuals and improves regulatory decisionmaking. The OCWE Web page also identifies some of the policies in place that permit employees at all levels in all areas to provide professional views on virtually all matters pertaining to the agency's mission.

The NRC Open Door Policy (first communicated to agency employees in 1976), the NRC Differing Professional Opinions Program (formally established in 1980), and the NRC Non-Concurrence Process (established in 2006) illustrate the NRC's commitment to the free and open discussion of professional views. In 2008, the NRC created the NRC Team Player awards, which recognize and celebrate behaviors that support an OCWE where differing views are welcomed, valued, fairly considered, and addressed.

The agency uses the Office of the Inspector General's periodic Safety Culture and Climate Survey as a means to assess the effectiveness of these new and existing safety culture efforts. In 1998, the Office of the Inspector General conducted the first in a continuing series of Safety Culture and Climate Surveys as a means to identify areas for additional organizational improvements. The surveys are voluntary, provide for anonymity, and are offered to all NRC employees, supervisors, and managers. In addition, the use of a survey makes it possible to compare category-level results for the NRC to other U.S. organizations that have completed such a survey. The Office of the Inspector General has conducted the Safety Culture and Climate Surveys four times: 1998, 2002, 2005, and most recently in 2009.

An unprecedented 87-percent survey response rate in 2009 surpassed the response rate of 71-percent in 2005 and the average rate of return of 80 percent of high-performance companies. Compared to results for the 2005 Safety Culture and Climate Survey, the agency saw substantial improvements in 16 of 17 categories surveyed, and scores were generally in line with or better than those of U.S. high-performance companies. Those categories showing outstanding improvement include the following:

- mission and Strategic Plan
- image
- performance management
- commitment to continuous improvement
- management leadership
- OCWE

The Office of the Inspector General's detailed report on the 2009 survey is available on the NRC's Web site at http://www.nrc.gov/reading-rm/doc-collections/insp-gen/2009. The NRC is addressing the survey responses to maintain areas identified as strengths and to improve areas identified as challenges. The staff is developing office and agency action plans and conducting agencywide focus groups to gain further insight into survey findings in order to pursue continuous improvement in both safety culture and organizational effectiveness.

10.5 Managing the Safety and Security Interface

Safety and security have always been the primary pillars of the NRC's regulatory programs. In today's environment, with a greater emphasis on security-related matters, safety and security activities have become closely intertwined, and it is critical that consideration of these activities be integrated so as not to diminish or adversely impact either safety or security. While many safety and security activities complement each other, there is the potential for security measures to adversely affect plant safety, and for safety activities to adversely affect security. Recognizing this potential for adverse impact, the NRC has increased its attention to the interfaces between these two areas.

The NRC's mission statement and strategic goals establish a firm foundation for our regulatory framework that stresses the importance of maintaining both safety and security. The NRC is implementing a number of efforts in the areas of rulemaking, licensing and inspection to recognize, establish and improve this interface. The NRC has been working multilaterally with the IAEA and bilaterally with our international counterparts to promote this concept. Since the fourth U.S. National Report was issued, the NRC promulgated 10 CFR 73.58, "Safety/Security Interface Requirements for Nuclear Power Reactors," that requires licensees to assess and manage changes to safety and security activities so as to prevent or mitigate potential adverse affects that could negatively impact plant safety or security. In addition, as part of the reactor security rulemaking effort, the NRC developed guidance on safety and security interfaces at nuclear power plants, RG 5.74, "Managing the Safety/Security Interface."

The section of this report on major regulatory accomplishments discusses the power reactor security rulemaking in more detail.

In 2000, NRC revised the Reactor Oversight Process to establish a risk-informed baseline inspection program and to set documented risk-informed thresholds for licensee safety and security performance, above which increased NRC oversight would be warranted. This initiative affirmed the NRC's commitment to better integrate security into the oversight process, by enhancing the safety and security interface as part of the NRC's approach to assess licensee performance.

Satisfactory licensee performance in the Reactor Oversight Process cornerstones provides reasonable assurance of safe and secure facility operation and that the NRC's safety and security missions are being accomplished. Like the other cornerstones, the security cornerstone contains inspection procedures and performance indicators to ensure that its objectives are being met. NRC addresses the safety and security interface issues in evaluating their implications among the cornerstones and in the cross-cutting areas of human performance, safety conscious work environment, and problem identification and resolution. Therefore, safety and security are integrated into the NRC's regulatory framework and evaluated by the NRC staff using a common process. To ensure licensees are complying with the regulations, the NRC has incorporated the evaluation of the licensee's interfaces with nuclear security into its inspection procedures.

The section of this report on nuclear programs and section 6.3.2 of this report discuss the Reactor Oversight Process in more detail.

Another example of where NRC is promoting strong linkages between safety and security is in the area of organizational culture. In 2008, the NRC began to expand its policy on safety culture to address the unique aspects of security and to make it applicable to all licensees and certificate holders. This effort is ongoing and has included interactions and a public meeting with a wide range of stakeholders, including nuclear power plant licensees.

Most participants in the public meeting supported a joint policy statement that addressed safety culture and security culture rather than separate policy statements. Stakeholders generally believed that the policy statement should recognize that security culture is one of several integrated parts of a licensee's overall safety culture. In other words, it was recognized that there is no real distinction between cultures, for example, there is not a standalone radiation safety culture, a nuclear criticality safety culture, a fire safety culture, or an environmental protection culture. Each of these programs is focused on safety for a particular discipline; the licensee safety culture is made up of all the disciplines in an integrated manner.

The resulting safety culture policy statement was submitted to the Commission in SECY 09 0075, "Safety Culture Policy Statement," dated May 18, 2009. In October 2009, the Commission directed in SRM-SECY-09-0075, "Staff Requirements – SECY-09-0075 – Safety Culture Policy Statement," that the staff publish the policy statement in the Federal Register for public comment. This action will continue to engage a broad range of stakeholders and will seek opportunities to harmonize terminology with existing standards and references. The NRC expects to issue a revised safety culture policy statement in 2011. This revision to the safety culture policy statement will provide another mechanism to strengthen and reinforce the safety and security interface.

The section of this report on major regulatory accomplishments and section 10.4 discuss the NRC safety culture in more detail.

ARTICLE 11. FINANCIAL AND HUMAN RESOURCES

1. **Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.**

2. **Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training, and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.**

This section explains the requirements about financial resources that licensees must have to support the nuclear installation throughout its life, and the regulatory requirements for qualifying, training, and retraining personnel.

11.1 Financial Resources

Adequate funds for the safe construction, operation, and decommissioning of nuclear installation are necessary for the protection of public health and safety. Although there does not appear to be a consistent relationship between a licensee's finances and operational safety, some evidence suggests that financial pressures have limited the resources devoted to corrective actions, plant improvements, and other safety-related expenditures. Furthermore, because a power reactor must operate to supply the revenues for eventual plant decommissioning, any shutdown of a plant before its owner has accumulated sufficient funds for decommissioning could potentially hinder the safe decommissioning of that plant.

Additionally, many States in the U.S. have undertaken economic deregulation of nuclear power plants. Traditionally, nuclear power plant owners in many States have been large, vertically integrated companies with substantial assets in generation, transmission, and distribution. In exchange for having exclusive franchises to supply electric power in defined geographical areas, nuclear plant owners have had the rates they charge to their customers regulated by State government. This system of rate-based regulation has ensured a source of funds for construction, operation, and decommissioning of nuclear power plants. Nonetheless, this model of rate-based regulation has been changing and the NRC has adjusted its processes in response.

The NRC distinguishes among financial qualifications for construction, operation, and decommissioning of nuclear power plants, and has separate regulations and programs that apply to each. The NRC also implements programs to ensure that the public has financial protection for bodily injury and property damage losses in the event of an accident. Finally, the agency has implemented requirements to ensure that licensees have insurance to help pay onsite recovery costs resulting from accidents and to supply funds for post-accident restart or decommissioning.

11.1.1 Financial Qualifications Program for Construction and Operations

This section explains the financial qualifications program for construction and operations and describes NRC reviews for construction permits, operating licenses, combined licenses, post-operating non-transferred licenses, and license transfers.

Section 182.a of the Atomic Energy Act provides that "each application for a license ... shall specifically state such information as the Commission, by rule or regulation, may determine to be necessary to decide such of the technical and financial qualifications of the applicant ... as the Commission may deem appropriate for the license." To implement this provision, the NRC has developed the regulations and guidance discussed below.

11.1.1.1 Construction Permit Reviews

As required by 10 CFR 50.33(f)(1), applicants for construction permits must submit information that "demonstrates that the applicant possesses or has reasonable assurance of obtaining the funds necessary to cover estimated construction costs and related fuel cycle costs." Appendix C, "A Guide for the Financial Data and Related Information Required to Establish Financial Qualifications for Facility Construction Permits," to 10 CFR Part 50 gives more specific directions for evaluating the financial qualifications of applicants.

11.1.1.2 Operating License Reviews

An "electric utility" as defined in 10 CFR 50.2, "Definitions", is "any entity that generates or distributes electricity and which recovers the cost of this electricity, either directly or indirectly, through rates established by the entity itself or by a separate regulatory authority." Electric utilities are exempt under 10 CFR 50.33(f) from reviews of financial qualifications of applications for operating licenses. The reason for this exemption is that cost-of-service rate regulation, as it has existed in the United States, has ensured that ratepayers provide a source of funds for the safe operation of nuclear power plants. Applicants for operating licenses that are not electric utilities are required under 10 CFR 50.33(f)(2) to submit information that demonstrates that they possess or have reasonable assurance of obtaining the necessary funds to cover estimated operating costs. Nonelectric-utility applicants for operating licenses are also required to submit estimates for the total annual operating costs for each of the first 5 years of operation of their facilities and must state the sources of funds to cover operating costs.

11.1.1.3 Combined License Application Reviews

As authorized in 10 CFR Part 52, applicants may apply for a combined construction permit and operating license. Under 10 CFR 52.77, "Contents of Applications; Technical Information," such applications must contain all of the information required under 10 CFR 50.33, "Contents of Applications; General Information," including information about financial qualifications. The NRC uses the procedures described above to review future combined license applications.

11.1.1.4 Postoperating License Nontransfer Reviews

The NRC does not systematically review the financial qualifications of power reactor licensees once it has issued an operating license, other than for license transfers as described below. However, as provided in 10 CFR 50.33(f)(4), the NRC can seek additional information on licensees' financial resources if the agency considers such information appropriate.

11.1.1.5 Reviews of License Transfers

The NRC regulations in 10 CFR 50.80, "Transfer of Licenses," require agency review and approval of transfers of operating licenses, including licenses for nuclear power plants that are owned or operated by electric utilities. The NRC performs these reviews to determine whether a proposed transferee or new owner is technically and financially qualified to hold the license.

NUREG-1577, Revision 1, "Standard Review Plan on Power Reactor Licensee Financial Qualifications and Decommissioning Funding Assurance," dated February 1999, describes the agency's overall review process of applicant and licensees' financial qualifications for nuclear power plant construction and operation.

11.1.2 Financial Qualifications Program for Decommissioning

Among other sections of the Atomic Energy Act, Section 182.a establishes the basis for the NRC's regulations and guidance on decommissioning funding assurance. In addition, 10 CFR 50.75, "Reporting and Recordkeeping for Decommissioning Planning," gives the requirements for licensee recordkeeping and reporting of nuclear decommissioning funds to the NRC.

11.1.3 Financial Protection Program for Liability Claims Arising from Accidents

The Price-Anderson Act of 1957, which became Section 170 of the Atomic Energy Act, governs the U.S. financial protection program. Along with related definitions in Section 11, Section 170 supplies the financial and legal frameworks to compensate those who suffer bodily injury or property damage as a result of accidents at nuclear facilities covered by the law. The NRC regulations implementing the provisions of Section 170 for NRC licensees are codified in 10 CFR Part 140, "Financial Protection Requirements and Indemnity Agreements."

The Price-Anderson Act was enacted to (1) remove the deterrent to private-sector participation in atomic energy presented by the threat of potentially enormous liability claims in the event of a catastrophic nuclear accident and (2) ensure that adequate funds are available to the public to satisfy liability claims if such an accident were to occur.

The Price-Anderson Act was revised most recently in 2005, when Congress renewed the Commission's authority to cover new facilities until 2020. Under the current law, power reactors over 100 megawatts electric must contribute to a funding pool that replaces the U.S. Government as the second provider of funds if the first layer of financial protection (liability insurance, now $375 million) is exhausted.

After an accident, reactor operators must pay into a "retrospective premium pool" in maximum annual installments not to exceed $15 million, up to a total of $111.9 million each. But payment is called for only if the accident exhausts the first layer of financial protection, and only if and to the extent that, additional funds are needed to pay the damages. With 104 reactors currently participating in the system, the total financial protection available under the Price-Anderson Act for any one accident is approximately $12 billion ($375 million primary coverage plus ($111.9 million per reactor times 104 reactors)) which is also the limit on liability. As reactors leave the retrospective premium system as a result of permanent closure or join as the result of construction of new reactors, this coverage limit may fall or rise. A change in the limit may also occur when the $111.9 million contribution is adjusted for inflation, as must be done every 5 years. In any event, Congress will address any damages exceeding the total sum that reactors must contribute to the pool and will decide upon the next steps needed for compensation.

The public benefits significantly from another feature of the Price-Anderson Act. Claimants need only prove that the accident caused their injury to receive compensation for damages from any accident with significant offsite releases of radiation (i.e., an "extraordinary nuclear occurrence"). Neither proof of fault nor proof of what caused the accident is necessary.

Claims for more than 150 alleged incidents involving nuclear material have been filed under various liability policies since the inception of the Price-Anderson Act in 1957. The insured losses and expenses paid so far total more than $125 million. Most payments arose out of the accident at Three Mile Island Unit 2.

11.1.4 Insurance Program for Onsite Property Damages Arising from Accidents

Among other sections of the Atomic Energy Act, Section 182.a gives the basis for the NRC's onsite property damage insurance requirements for operating nuclear power reactors contained in 10 CFR 50.54(w).

The U.S. nuclear industry has not experienced an accident involving radioactive release since the Three Mile Island Unit 2 event in 1979.

11.2 Regulatory Requirements for Qualifying, Training, and Retraining Personnel

This section explains the regulatory requirements for qualifying, training, and retraining personnel. It discusses the governing documents, the process for implementing requirements, and experience. It also discusses INPO accreditation activities.

11.2.1 Governing Documents and Process

The NRC regulates the training requirements for licensed operators and licensed senior operators under 10 CFR Part 55, "Operators' Licenses," which allows facility licensees to have operator requalification program content that is derived using a systems approach to training (SAT), as defined in 10 CFR 55.4, "Definitions," or that meets the requirements outlined in 10 CFR 55.59(c). Subpart D, "Applications," of 10 CFR Part 55 requires that operator license applications must contain information about an individual's training and experience, unless the facility licensee certifies that the applicant has successfully completed a Commission-approved training program that is SAT-based and uses an acceptable simulation facility.

The operator licensing process at power reactors includes a generic fundamentals examination covering the theoretical knowledge that is required to operate a nuclear power plant. License applicants must pass the generic fundamentals examination before they can take a site-specific examination. The site-specific examination consists of a written examination and an operating test that includes a plant walkthrough and a dynamic performance demonstration on a simulation facility.

The NRC staff has transferred most of the responsibility for developing site-specific licensing examinations to facility licensees. In 1999, the NRC amended 10 CFR Part 55 to allow nuclear power reactor licensees to prepare the written examinations and operating tests that the agency uses to evaluate the competence of applicants for operators' licenses at those facilities. Licensees that elect to prepare their own examinations are required to establish procedures to control examination security and integrity. They prepare and submit proposed examinations and operating tests to the NRC according to the guidance in NUREG-1021, Revision 9, Supplement 1, "Operator Licensing Examination Standards for Power Reactors," dated October 2007. The NRC reviews the facility-prepared examinations, prepares examinations for facility licensees upon request, administers all operating tests, makes the final licensing decisions, and issues the licenses.

As required by 10 CFR 50.120, "Training and Qualification of Nuclear Power Plant Personnel," licensees must establish, implement, and maintain training programs using a SAT approach for eight categories of non-licensed workers at nuclear power plants and for the shift supervisor, who is licensed in accordance with 10 CFR Part 55. These provisions complement the requirements for training based on a systems approach for the requalification of licensed operators and licensed senior operators. RG 1.8, Revision 3, "Qualification and Training of Personnel for Nuclear Power Plants," dated May 2000, contains guidance to implement the regulations.

The NRC continues to endorse the training accreditation process managed by INPO. The staff recognizes that training programs developed in accordance with INPO guidelines and accredited by the National Nuclear Accrediting Board are SAT based; therefore, accredited programs are considered to be consistent with the regulations in 10 CFR Part 55 and 10 CFR Part 50.120. The NRC also recognizes that INPO-managed accreditation and associated training evaluation activities are an acceptable means of self-improvement in training. Such recognition encourages industry initiative and reduces NRC evaluation and inspection activities.

In accordance with its memorandum of agreement with INPO, the NRC monitors INPO accreditation activities as part of its continuing assessment of the effectiveness of the industry's training programs. Specifically, the NRC staff observes selected accreditation team visits and NRC managers periodically observe National Nuclear Accrediting Board meetings. These observations are intended to monitor the implementation of programmatic aspects of the accreditation process, but they also give an opportunity to assess the selected performance areas of facility licensees.

If the National Nuclear Accrediting Board has concerns about the performance of an accredited training program, it will place the program on probation. This does not necessarily place a training program in non-compliance with either 10 CFR Part 55 or 10 CFR 50.120 because training programs are accredited to a standard of excellence rather than to a minimum level of regulatory compliance. However, the NRC does review the circumstances leading to the probation to ensure safe operations and continued compliance with the regulations.

The National Nuclear Accrediting Board may also withdraw accreditation in response to major deficiencies in a licensee's accredited training program. If accreditation is withdrawn, the NRC would ask that the licensee report the circumstances of the withdrawal for the staff to determine the significance of the issues related to the withdrawal. If the NRC determines that compliance with the regulations is not affected, it may not be necessary to take any further action. If the withdrawal is linked to a breakdown in the training process or a safety-significant issue, the NRC will conduct an immediate inspection focused on the process problem or safety issues. If appropriate, the agency would take further action, such as issuing confirmatory action letters or orders.

The NRC monitors industry performance in implementing the training requirements of 10 CFR Part 50 and 10 CFR Part 55 by (1) reviewing licensee event reports and inspection reports for training issues, (2) observing the accreditation process, and (3) reviewing the results of operator licensing activities. Guidance for periodically inspecting the licensed operator requalification training program at every facility is given in IP 71111.11, "Licensed Operator Requalification Program," dated January 5, 2006. When appropriate for cause, the NRC will also use IP 41500, "Training and Qualification Effectiveness," dated June 13, 1995, which references the guidance in NUREG-1220, Revision 1, "Training Review Criteria and Procedures," dated January 1993, to verify compliance with SAT requirements.

11.2.2 Experience

The NRC reviewed training issues contained in licensee event reports and inspection reports during 2009 using data from the Human Factors Information System, which is described in Article 12. The review revealed that the proportion of human performance issues attributable to training for U.S. nuclear power plants in 2008 was 4 percent. As noted in the 2007 version of this report, this figure decreased from 8 percent in 1999 to 4 percent in 2005. The training-related issues identified by the review concentrated in two subcategories: (1) training less than adequate and (2) individual knowledge less than adequate. The NRC annually assesses the effectiveness of training in the nuclear industry and prepares a report of its findings; the reports for 1999 through 2007 appear on the NRC's public web site.

Although the NRC identified some limited specific weaknesses in training programs, all indicators suggest that the industry is successfully implementing training programs in accordance with the regulations. The NRC will continue to monitor selected performance areas, emphasizing the identification and resolution of training process problems.

ARTICLE 12. HUMAN FACTORS

Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.

This section explains the NRC program on human performance. This program has seven major areas: (1) human factors engineering issues, (2) emergency operating procedures and plant procedures, (3) working hours and staffing, (4) fitness for duty, (5) Human Factors Information System, (6) support to event investigations and for-cause inspections, and (7) training.

12.1 Goals and Mission of the Program

The NRC has a comprehensive program for ensuring that human performance is properly addressed in a risk-informed regulatory framework for maintaining reactor safety. The NRC developed the program based on reviewing risk information and activities in the domestic and international nuclear industry.

12.2 Program Elements

The Reactor Oversight Process (discussed in Article 6) focuses on cornerstones of safety that are assessed through a combination of performance indicators and risk-informed inspections that focus on risk-significant activities and systems related to the cornerstones. The three elements that cut across the cornerstones are human performance, a safety-conscious work environment, and corrective actions. The Human Performance Program has contributed directly to the development of a supplemental IP related to the human performance cross-cutting element. The Human Performance Program is also engaged in the other two elements, as a safety-conscious work environment and many of the actions involved in corrective action programs result from human performance problems.

The Human Performance Program also supports the risk-informed and performance-based plan by generating, collecting, and evaluating data on human performance for use in human reliability analysis models. The staff evaluates information to gain insights supporting risk-informed regulation and to find human performance data for human reliability analysis. The NRC is developing the Human Event Repository and Analysis system to analyze and collect human performance information from commercial nuclear power plants and other related technologies to support regulatory applications in human reliability analysis and human factors. The system aims to supply empirical evidence to justify or improve human error probabilities in the PRA. The Human Event Repository and Analysis system stores human performance information obtained from event analysis, using the information collection methods and process documented in NUREG/CR-6903, Volumes 1 and 2, "Human Event Repository and Analysis (HERA) System," dated July 2006 and November 2007, respectively.

The Human Performance Program monitors technological developments and emerging issues to help prepare the NRC for the future. Two ongoing activities include developing regulatory guidance for reviewing designs of control stations and processing requests related to deregulation. Because licensees are replacing aging analog controls and displays with digital components, and the NRC must be prepared to review safety issues for human-system interfaces resulting from such new designs and technologies. The NRC has been processing many industry requests to transfer operating licenses, which may involve changes in organizational structure affecting human performance.

12.3 Significant Regulatory Activities

The NRC performs significant regulatory activities in the following seven areas to address human performance:

- human factors engineering issues
- emergency operating procedures and plant procedures
- shift staffing
- fitness for duty
- Human Factors Information System
- support to event investigations and for-cause inspections
- training

The following sections cover the first six activities; Article 11 describes training.

12.3.1 Human Factors Engineering Issues

This section discusses human factors activities related to engineering issues.

Governing Documents and Process. The NRC evaluates the human factors engineering design of the main control room and control centers outside of the main control room using NUREG-0800, Chapter 18, Revision 2, "Human Factors Engineering," dated March 2007, NUREG-0700, Revision 2, "Human System Interface Design Review Guideline," dated May 2002, and NUREG-0711, Revision 2, "Human Factors Engineering Program Review Model," dated February 2004. These documents provide guidance for the review of human-system interface issues in connection with the design certification of nuclear installations and the NRC's inspection program. The NRC also uses NUREG-1764, Revision 1, "Guidance for the Review of Changes to Human Actions," dated September 2007, to review license amendment requests that credit the use of manual actions. Moreover, Information Notice (IN) 97-78, "Crediting of Operator Actions in Place of Automatic Actions and Modifications of Operator Actions, Including Response Times," dated October 23, 1997, identifies references that the NRC uses to review the completion times of operator manual actions and how the actions will be reflected in the licensee's emergency procedures and operator training. In October 2007, the staff published NUREG-1852 "Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire," for use in evaluating exemptions from fire protection requirements that assume credit for timely manual actions.

In an effort to make some of the current human factors guidance simpler, clearer, and more relevant to the digital environment, the staff published interim staff guidance entitled, "Digital Instrumentation and Controls DI&C-ISG-05 Task Working Group #5 Highly-Integrated Control Rooms—Human Factors Issues (HICR—HF) ISG" Revision 1, dated November 3, 2008, about computer-based procedures, minimum inventory (of controls and displays to support plant shutdown), and crediting manual operator actions in diversity and defense-in-depth analyses. The staff intends to incorporate this interim guidance into permanent regulatory format (such as the standard review plans, NUREGs, RGs, or industry standards) over the next few years.

Experience. The NRC reviews licensees' requests that involve aspects of human factors engineering. Examples include crediting operator manual actions in amendments to plant technical specifications, transferring facility operating licenses, and increasing the reactor's authorized power level (i.e., power uprates). Recent license amendment requests from Oconee Units 1, 2, and 3 and Edwin Hatch Units 1 and 2 are examples of NRC reviews involving new or modified operator manual actions. The amendment from Oconee proposed changes to manual actions as a result of a digital upgrade of the reactor protection system and engineered safety features actuation system. The amendment request from Hatch involved new operator manual actions to support an alternate source term.

The NRC has also evaluated some requests to transfer facility operating licenses, which affected management and organization, staffing, and technical qualifications. The NRC used NUREG-0800, Chapter 13, as the principal guidance for these reviews.

The NRC also reviews and approves requests for power uprates from currently licensed plants. For such requests, the NRC examines the effect of the power uprate on plant procedures, controls, displays, and alarms, and required operator actions using Section 2.11.1 or Review Standard (RS-001), "Review Standard for Extended Power Uprates," dated December 2003. (RS-001 is available on the NRC's public Web site along with additional general information on power uprates.) The agency recently reviewed and approved power plant uprates for Comanche Peak Units 1 and 2, Millstone Unit 3, and Calvert Cliffs.

12.3.2 Emergency Operating Procedures and Plant Procedures

Licensees must have programs to develop, implement, and maintain emergency operating and plant procedures. Article 16 discusses emergency preparedness; the discussion here is limited to the human factors aspect of emergency operating procedures.

Governing Documents and Process. On December 17, 1982, the NRC issued GL 82-33, "Requirements for Emergency Response Capability," which transmitted Supplement 1 to NUREG-0737, "Requirements for Emergency Response Capability," requiring each licensee to submit a set of documents for developing emergency operating procedures.

Experience. No significant examples of emergency operating and plant procedures have been identified since 2007.

12.3.3 Shift Staffing

Governing Documents and Process. In 10 CFR 50.54(m), the NRC specifies the minimum number of licensed operators and senior operators required for nuclear power reactor facilities. Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," and Appendix E, "Emergency Planning and Preparedness for Production and Utilization Facilities," to 10 CFR Part 50 contain the NRC staffing requirements for fire brigades and emergency response personnel.

In September 2002, the NRC began work on a process to evaluate exemption requests from the requirements in 10 CFR 50.54(m) resulting from the changing demands and new technologies presented by advanced reactor control room designs and significant light-water reactor control room upgrades. In July 2005, the NRC published NUREG-1791, "Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)." The purpose of reviewing the exemption requests is to ensure public health and safety by verifying that the applicant's staffing plan and supporting analyses sufficiently justify the requested exemption. NUREG/CR-6838, "Technical Basis for Regulatory Guidance for Assessing Exemption Requests from the Nuclear Power Plant Licensed Operator Staffing Requirements Specified in 10 CFR 50.54(m)," dated February 2004, explains the justification for the recommended process.

Experience. No significant examples of shift staffing were identified for 2007–2009.

12.3.4 Fitness for Duty

This section discusses the NRC's requirements pertaining to the fitness for duty of nuclear power plant workers, including requirements regarding the control of work hours and management of worker fatigue.

Governing Documents and Process. As required by 10 CFR Part 26, "Fitness for Duty Programs," each licensee authorized to operate or construct a nuclear power reactor must implement a fitness for duty program for all personnel having unescorted access to the protected area of its plant. For performance objectives, 10 CFR Part 26 requires that licensees establish programs that (1) give reasonable assurance that nuclear power plant personnel perform their tasks in a reliable and trustworthy manner and are not under the influence of any substance, legal or illegal, or mentally or physically impaired from any cause, (2) provide reasonable measures for the early detection of persons who are not fit to perform activities, and (3) have a goal of achieving a drug-free workplace and a workplace free of the effects of such substances.

The NRC issues annual reports on statistical data and lessons learned by licensees from their fitness for duty program performance reports. The most recent of these is IN 2008-16, "Summary of Fitness-for-Duty Program Performance Reports for Calendar Year 2007," dated September 2, 2008. A project to automate the reporting and trending of performance data using a web-based approach is ongoing. In addition, the NRC has established an email address for licensees and individuals to submit fitness for duty questions, as well as a Web site where performance reports and the answers to frequently asked questions are publicly available.

For worker fatigue, on March 31, 2008, the NRC published a rule that included new regulations in 10 CFR Part 26, Subpart I, "Managing Fatigue." The NRC required licensees to implement the requirements in the rule by October 1, 2009, giving them an 18-month period to hire and train individuals as needed to ensure proper implementation of the work hour control requirements. Subpart I strengthens the effectiveness of fitness for duty programs by ensuring that worker fatigue does not adversely affect public health and safety. It also establishes enforceable requirements for the management of worker fatigue. In addition to the rulemaking and its associated analyses, the NRC issued RG 5.73, "Fatigue Management for Nuclear Power Plant Personnel," in March 2009 to provide guidance on how to implement the rule.

Experience. Licensees have successfully implemented the fitness for duty requirements, as shown by the small number of violations that have occurred to date. However, several issues were identified that needed further staff clarifications and actions. For example, on September 24, 2009, the NRC issued EGM-09-008, "Dispositioning of Violation of NRC Requirements for Work Hours Control Before and Immediately After an Emergency Hurricane Declaration," about staffing before and after a hurricane. Under 10 CFR Part 26, Subpart I, licensees need not meet the work hour control requirements during declared emergencies. The EGM effectively extends this provision by allowing licensees to sequester personnel on site during defined periods before and after a hurricane.

12.3.5 Human Factors Information System

Governing Documents and Process. The Human Factors Information System is designed to store, retrieve, sort, and analyze human performance information extracted from NRC inspection and licensee event reports. Initiated in 1990, this automated information management system can generate a variety of specialized reports that are not readily available from other NRC sources. In 2006, the NRC improved this system to better align the coding scheme with the Reactor Oversight Process and to enhance the system's search capabilities. The Human Factors Information System now captures information related to training, procedures and reference documents, fitness for duty, oversight, problem identification and resolution, communications, human-system interface and environment, and work planning and practices.

Experience. The NRC responds to stakeholder and public inquiries and data requests on this system on a regular basis. For example, inspectors use the data generated by this system in preparing inspection activities related to human performance. In addition, the NRC's Office of Nuclear Regulatory Research uses the data to support activities in human performance and human reliability analysis. Other NRC program offices use the data to gain insights about human performance, to monitor the frequency of human performance issues, and to inform several types of reports, such as internal operating experience reports and the NRC's annual report on the effectiveness of training in the nuclear industry (discussed in Section 11.2.2 of this report). The NRC also uses a web page to disseminate information on human performance issues at individual nuclear power plant sites.

12.3.6 Support to Event Investigations and For-Cause Inspections and Training

Governing Documents and Process. NRC staff members with human factors expertise often participate in special inspections, incident investigation team inspections, augmented team inspections, event investigations, and supplemental inspections. Human factors experts have assessed management effectiveness, procedures, training issues, staffing issues, human-machine interfaces, personnel performance issues, safety-conscious work environment, and safety culture.

For training issues, inspectors use IP 41500. For procedure issues, inspectors use IP 42001, "Emergency Operating Procedures," dated June 28, 1991, and IP 42700, "Plant Procedures," dated November 15, 1995. For baseline inspections under the Reactor Oversight Process, inspectors use IP 71152, "Problem Identification and Resolution," dated February 26, 2010, which is intended to establish confidence that each licensee is detecting and correcting problems in a way that limits the risk to the public and includes a review of the licensee's safety-conscious work environment. A key premise of the Reactor Oversight Process is that weaknesses in problem identification and resolution programs will manifest themselves as performance issues that can be identified during the baseline inspection program or by crossing predetermined indicator thresholds.

For supplemental inspections, IP 95003, "Supplemental Inspection for Repetitive Degraded Cornerstones, Multiple Degraded Cornerstones, Multiple Yellow Inputs or One Red Input," as revised in October 2006, includes requirements for the NRC staff to review the licensee's third-party safety culture assessment and independently assess the licensee's safety culture. Staff members with technical expertise in human factors and safety culture perform the safety culture inspection activities. The NRC first implemented the revised IP 95003 at the Palo Verde Nuclear Generating Station in October 2007. Based on the lessons learned from the 2007 NRC inspection and on input from the industry and the public, the staff updated Inspection Manual Chapter 0305, "Operating Reactor Assessment Program," in 2009.

Experience. In 2007, NRC staff with human factors expertise participated in an IP 95003 inspection at Palo Verde to assess human performance at the site. The inspectors determined that some findings related to procedure adherence had strong human performance contributions. The NRC discussed its safety concerns, and how and when these issues were identified with Palo Verde. Palo Verde made a commitment to take action to improve their performance.

The NRC increased its plant oversight and conducted numerous inspections. The results of these inspections demonstrated that performance at Palo Verde had improved substantially. In March 2009, the NRC determined that the commitments previously made by Palo Verde had been completed and decided to reduce its oversight at this site.

The NRC continued to monitor Palo Verde to verify that the facility is operating safely and that the licensee's performance improvements are being sustained by focusing on the effectiveness of site's programs and processes. The NRC plans to perform additional inspection activities in selected areas over a 2-year period to monitor Palo Verde improvement initiatives and to look for any indications of potential decline in safety performance at the site. The first of these inspections was performed in January 2010 to assess the effectiveness of the licensee's corrective actions in addressing the human performance issues identified during the IP 95003 inspection. The staff expects that the results of this inspection will be publicly available by mid-2010. The NRC staff will perform another inspection in January 2011.

ARTICLE 13. QUALITY ASSURANCE

Each Contracting Party shall take the appropriate steps to ensure that quality assurance programmes are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.

This section describes quality assurance requirements and guidance for design and construction, operational activities, and staff licensing reviews. It also describes quality assurance programs and regulatory guidance.

13.1 Background

Nuclear power facilities must be designed, constructed, and operated in a manner that ensures: (1) the prevention of accidents that could cause undue risk to public health and safety and (2) the mitigation of adverse consequences of such accidents if they should occur. A primary means to achieve these objectives is to establish and effectively implement a nuclear quality assurance program. Although a licensee may delegate aspects of the establishment or execution of the quality assurance program to others, the licensee remains ultimately responsible for the program's overall effectiveness. Licensees carry out a variety of self-assessments to validate the effectiveness of their quality assurance program implementation. The NRC reviews descriptions of quality assurance programs and performs onsite inspections to verify aspects of the program implementation.

13.2 Regulatory Policy and Requirements

The NRC describes requirements for a license to design, construct, and operate commercial nuclear power plants in both 10 CFR Part 50 and 10 CFR Part 52. Specifically, 10 CFR Part 50 describes the requirements for a construction permit and a separate operating license and 10 CFR Part 52 includes the requirements for a single combined license, which allows for both construction and operation of a nuclear power plant.

For either type of license, an applicant must describe its quality assurance program for all activities affecting the safety-related functions of SSCs that prevent or mitigate the consequences of postulated accidents that could cause undue risk to public health and safety. High-level criteria for determining which plant SSCs are safety-related appear in 10 CFR 50.2. Based upon these criteria, licensees' engineering organizations develop plant-specific listings of safety-related SSCs.

Under 10 CFR Part 50 licensing process, each applicant for a construction permit must describe its quality assurance program in its preliminary safety analysis report in accordance with 10 CFR 50.34(a)(7). This program should apply to the design, fabrication, construction, and testing of SSCs. In accordance with 10 CFR 50.34(b)(6)(ii), each applicant for an operating license under 10 CFR Part 50 must describe the managerial and administrative controls that will be implemented during the operation of the nuclear power plant. The applicant must also describe how it will satisfy the applicable requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants."

Each applicant for a combined license under 10 CFR Part 52 must describe its quality assurance program in a safety analysis report and give a description of the managerial and administrative controls that will be implemented during the operation of the nuclear power plant. Like a 10 CFR Part 50 applicant, an applicant under 10 CFR Part 52 must also describe how it will satisfy the applicable requirements of 10 CFR Part 50, Appendix B.

13.2.1 Appendix A to 10 CFR Part 50

Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 details the general requirements for establishing quality assurance controls. General Design Criterion 1, "Quality Standards and Records," contains requirements that apply to the quality assurance of items important to safety. The scope of items that are "important to safety" includes a subset of plant equipment classified as safety-related. Appendix B to 10 CFR Part 50 (discussed in Section 13.2.2 of this report) contains quality assurance program requirements for safety-related SSCs. Other regulatory guidance discusses quality assurance program controls that are appropriate for some types of nonsafety-related equipment.

13.2.2 Appendix B to 10 CFR Part 50

Appendix B to 10 CFR Part 50 outlines the quality assurance requirements that apply to activities affecting the safety-related functions of SSCs that prevent or mitigate the consequences of postulated accidents. Appendix B defines quality assurance as all planned and systematic actions that are necessary for adequate confidence that SSCs will perform satisfactorily in service. Toward that end, it specifies 18 criteria that the commitments in a licensee's quality assurance program must satisfy. These criteria cover such topics as organizational independence, design control, procurement, document control, test control, corrective action, and audits. Appendix B also stipulates that licensees establish measures to ensure that the documents for procurement of safety-related materials, equipment, and services, whether purchased by the licensee or its contractors or subcontractors, include or reference the applicable regulatory requirements, design bases, and other requirements that are necessary to ensure adequate quality. Consistent with the importance and complexity of the products or services to be provided, licensees (or their designees) are responsible for periodically verifying that suppliers' quality assurance programs comply, as appropriate, with the applicable criteria in Appendix B and that they are effectively implemented. Additionally, as outlined in 10 CFR 21.41, "Inspections," the NRC staff performs inspections at vendors who supply basic components to the nuclear industry.

Because the requirements of Appendix B are written at a conceptual level, the NRC and the industry needed to develop consensus standards that include acceptable ways to conform to these requirements. The NRC then issued companion RGs, which endorsed (with conditions, if warranted) quality assurance codes and standards.

13.2.3 Approaches for Adopting More Widely Accepted International Quality Standards

The NRC has reviewed options for adopting more widely accepted international quality standards, such as International Organization for Standardization Standard 9001, 2000 edition, by considering how international standards compare with the existing framework in 10 CFR Part 50, Appendix B. On the basis of this review, the NRC concluded that supplemental quality requirements would be needed when implementing Standard 9001 within the existing regulatory framework. As part of the ongoing multinational design evaluation program, the NRC will continue to assess various international quality assurance standards to achieve a greater degree of international convergence.

13.3 Quality Assurance Regulatory Guidance

The NRC has developed or endorsed quality assurance guidance for use by the NRC staff, applicants for construction permits or operating licenses, and licensees. This guidance is applicable to the design, construction, and operational phases of a nuclear power plant.

13.3.1 Guidance for Staff Reviews for Licensing

NUREG-0800, Section 17.5, "Quality Assurance Program Description – Design Certification, Early Site Permit and New License Applicants," dated March 2007, provides guidance to the NRC staff for the review of applications for construction permits, operating licenses, and combined licenses. The specific review guidance in NUREG-0800 correlates with the 18 criteria of 10 CFR Part 50, Appendix B and integrates a review of licensee commitments to adopt the NRC's quality assurance-related RGs and apply the industry's quality assurance codes and standards.

13.3.2 Guidance for Design and Construction Activities

Licensees may apply consensus standards developed by the American National Standards Institute (ANSI) in its N45.2 series or by ASME in its NQA-1 series to comply with the requirements of 10 CFR Part 50, Appendix B. The NRC has endorsed ANSI and ASME standards through its RGs. Through its consensus codes and standards activities, the NRC continues to participate with ASME NQA-1 committees to revise the latest edition of the NQA-1 standard. As part of this effort, the NRC staff is planning to issue a revision to RG 1.28, "Quality Assurance Program Requirements (Design and Construction)," dated August 1985, to endorse NQA-1-2008 and the 2009-10 addenda.

13.3.3 Guidance for Operational Activities

The NRC has conditionally endorsed the consensus standard ANSI N18.7-1976, "Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants" through RG 1.33, Revision 2, "Quality Assurance Program Requirements (Operations)," dated February 1978, as complying with the requirements of 10 CFR Part 50, Appendix B.

13.4 Quality Assurance Programs

The NRC inspects quality assurance programs under the Reactor Oversight Process for operating reactors and under the Construction Inspection Program (see Article 18 of this report) for new reactors. The NRC also conducts augmented inspection activities as needed.

The baseline inspection program of the Reactor Oversight Process includes one primary procedure related to quality assurance issues, IP 71152. Inspectors use this procedure to assess the effectiveness of licensees' programs to find and resolve problems through a performance-based review of specific issues. In particular, inspectors look for cases in which a licensee may have missed generic implications of specific problems and for the risk significance of combinations of problems that individually may not have significance. They do not inspect other aspects of quality assurance program implementation in the baseline inspection program but may do so through supplemental inspections.

Some equipment in the nuclear facility may be classified as nonsafety-related and yet still be important to safety for some unique reason. In specific cases, the NRC has specified that quality assurance controls are warranted for equipment determined to be more important than commercial-grade equipment. However, the quality assurance controls do not have to meet Appendix B requirements, which apply only to activities affecting safety-related functions. Typically, applying quality assurance controls to this important-to-safety, yet nonsafety-related, equipment is called "augmented quality control."

The Construction Inspection Program provides oversight for future nuclear plants licensed under 10 CFR Part 52, including quality assurance program inspection. The quality assurance inspection program focuses on an applicant or licensee establishing and implementing a quality assurance program in accordance with the requirements of Appendix B to 10 CFR Part 50.

As provided in the Construction Inspection Program, the nuclear plant will transition from the Construction Inspection Program to the Reactor Oversight Process for commercial operation when, in accordance with 10 CFR 52.103(g), the Commission determines that all of the inspections, tests, analyses, and acceptance criteria in the combined license have been met.

13.5 <u>Quality Assurance Audits Performed by Licensees</u>

Appendix B to 10 CFR Part 50 requires licensees to verify the effectiveness of their quality assurance program by performing internal audits of their programs. These audits are performed in accordance with the licensee's procedures by appropriately trained and qualified personnel who do not have direct responsibility for performing the activities being audited. The results of these audits are documented and given to management for review and corrective action.

13.5.1 Audits of Vendors and Suppliers

Appendix B to 10 CFR Part 50 requires licensees who procure material, equipment, or services from contractors or subcontractors to perform audits to ensure that suppliers implement an effective quality assurance program, consistent with the requirements of Appendix B and the licensee's technical requirements.

Licensees perform these activities by using their own technical and quality assurance staff. Industry initiatives to promote effective and efficient standardization of these audit activities have resulted in licensees sharing their technical resources through joint audits of suppliers.

ARTICLE 14. ASSESSMENT AND VERIFICATION OF SAFETY

Each Contracting Party shall take the appropriate steps to ensure that:

(i) comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body

(ii) verification by analysis, surveillance, testing, and inspection is carried out to ensure that the physical state and the operation of nuclear installations continue to be in assurance with its design, applicable national safety requirements, and operational limits and conditions

This section explains the governing documents and process for ensuring that systematic safety assessments are carried out during the life of the nuclear installation, including for the period of extended operation. It focuses on assessments performed to maintain the licensing basis of a nuclear installation. Finally, this section explains verification of the physical state and operation of the nuclear installation by analysis, surveillance, testing, and inspection.

Other articles in this report (e.g., Articles 6, 10, 13, 18, and 19) also discuss activities to achieve safety at nuclear installations.

14.1 Ensuring Safety Assessments throughout Plant Life

Before a nuclear facility is constructed, commissioned, and licensed, an applicant must perform comprehensive and systematic safety assessments for NRC review and approval. Article 18 of this report discusses these assessments and reviews.

This section focuses on the assessments that are required throughout the life of a nuclear installation (i.e., assessments required to maintain the licensing basis). To show conformance with the licensing basis, a licensee must maintain records of the original design bases and any changes. This section explains how such changes are documented, updated, and reviewed. Renewal of a license depends on a licensee's continuing to meet its current licensing basis; this section explains how the license renewal process accounts for this requirement.

14.1.1 Maintaining the Licensing Basis

The NRC carries out regulatory programs to give reasonable assurance that plants continue to conform to the licensing basis. Article 6 of this report discusses these programs.

This section explains the governing documents and process used to maintain the licensing basis. The main governing documents are 10 CFR 50.90, "Application for Amendment of License or Construction Permit, or Early Site Permit," 10 CFR 50.59, "Changes, Tests, and Experiments," and 10 CFR 50.71, "Maintenance of Records, Making of Reports."

14.1.1.1 Governing Documents and Process

A licensee is to operate its facility in accordance with the license and as described in its final safety analysis report. To change its license or reactor facility, a licensee must follow the review and approval processes established in the regulations. For license amendments, including changes to technical specifications, the licensee must ask for NRC approval in accordance with 10 CFR 50.90. However, 10 CFR 50.59 contains requirements for the process by which, under certain conditions, licensees may make changes to their facilities and procedures as described in the safety analysis report without prior NRC approval.

<u>10 CFR 50.59</u>. In 10 CFR 50.59 the NRC establishes the conditions under which licensees may make changes to the facility or procedures and conduct tests or experiments without prior NRC approval. Proposed changes, tests, and experiments that satisfy the definitions and one or more of the criteria in the rule must be reviewed and approved by the NRC before implementation. Thus, the rule provides a threshold for regulatory review, not the final determination of safety, for proposed activities. After determining that a proposed activity is safe and effective through appropriate engineering and technical evaluations, the 10 CFR 50.59 process is applied to determine if a license amendment will be required before implementation. The process involves three basic steps: (1) applicability and screening to determine if a 10 CFR 50.59 evaluation is required, (2) an evaluation that applies the eight evaluation criteria of 10 CFR 50.59(c)(2) to determine if a license amendment must be obtained from the NRC, and (3) documentation and reporting to the NRC of activities implemented under 10 CFR 50.59.

A licensee shall obtain a license amendment pursuant to 10 CFR 50.90 before implementing a proposed change, test, or experiment if the change, test, or experiment would do any of the following:

- result in more than a minimal increase in the frequency of occurrence of a previously evaluated accident
- result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety
- result in more than a minimal increase in the consequences of a previously evaluated accident
- result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety
- create a possibility for an accident of a different type than any previously evaluated
- create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated
- result in exceeding or altering a design basis limit for a fission product barrier
- result in a departure from a method of evaluation used in establishing the design bases or in the safety analyses

According to 10 CFR 50.90, whenever a holder of a license or construction permit wants to amend the license or permit, it must file an application for an amendment with the Commission, as specified in 10 CFR 50.4, "Written Communications," fully describing the changes desired, and following, as far as applicable, the form prescribed for original applications. The NRC performs and documents a safety evaluation in these instances before it authorizes the change.

10 CFR 50.71. In 10 CFR 50.71(e), the NRC describes another process for making changes. This regulation requires licensees to update their final safety analysis reports periodically to incorporate the information and analyses that they submitted to the Commission or prepared pursuant to Commission requirements. Revisions to the updated final safety analysis reports are to include the effects of changes that occur in the vicinity of the plant, changes made in the facility or procedures described in the report, safety evaluations for approved license amendments and for changes made under 10 CFR 50.59, and safety analyses conducted at the request of the Commission to address new safety issues.

14.1.1.2 Regulatory Framework for the Restart of Browns Ferry Unit 1

As an example of the application of the regulatory framework, this section describes the safety assessment and verification for a plant that was restarted after being shut down for some years.

The Browns Ferry site, located near Decatur, AL, has three BWRs (General Electric (GE), BWR-4, Mark-1 containment). All three units were shut down in 1985 to address management and regulatory issues. After resolving these issues, TVA successfully restarted Units 2 and 3 in the 1990s, but kept Unit 1 in a defueled layup condition. In May 2002, TVA decided to initiate a restart effort for Unit 1. The three Browns Ferry units are similar in design and licensing basis. TVA has implemented programs for Unit 1 that are similar to those used to restart Units 2 and 3, incorporating improvements, lessons learned, and dedicated resources, including personnel with experience restarting Units 2 and 3. The restart of Unit 1 differed from the restart of Units 2 and 3 in that TVA applied simultaneously for both a license renewal and an extended power uprate for the unit.

The regulatory framework for the restart of Browns Ferry Unit 1 consisted of two major elements: inspection and licensing activities. The NRC performed inspections in accordance with Inspection Manual Chapter 2509, "Browns Ferry Unit 1 Restart Project Inspection Program," dated September 2003, and conducted the licensing activities consistent with its August 2003 regulatory framework letter discussed below.

TVA has submitted many and varied licensing actions over the years. The August 2003 regulatory framework letter included a detailed list of generic communications and other licensing actions requiring regulatory review, approval, and follow-up inspection. To facilitate communication with key stakeholders, the NRC held periodic public meetings at the site and developed a public outreach Web page similar to the Reactor Oversight Process web page.

As part of its inspection program, the NRC staff reviewed TVA programs and plant activities related to the recovery of Unit 1. These activities included replacement, renovation, and removal of equipment and a review of plant programs, process, and training of plant personnel. The NRC inspections of structural, electrical, mechanical, and fire protection modifications resulted in satisfactory findings. Onsite monitoring and review determined that activities involving replacement, renovation, and removal of equipment were satisfactorily carried out so as to maintain adequate nuclear and radiological safety.

The NRC also conducted an operational readiness assessment team inspection in April 2007 to assess management controls, implementation of site programs and personnel readiness to support safe restart and operation of Unit 1. The inspection focused on the effectiveness of licensee management oversight, safety-significant activities, operator training and experience, corrective action programs, maintenance program, operator response to annunciators and general plant conditions affecting safety, and readiness to support three-unit operations. The inspection concluded that site programs, personnel, and procedures were adequate for restart of Unit 1 and three-unit power operations.

On May 15, 2007, the NRC authorized TVA to restart Browns Ferry Unit 1. The unit was restarted on May 22, 2007, and reached 100-percent power on June 8, 2007. TVA completed post-restart testing.

After extensive reviews, inspections, and resolution of regulatory framework issues, the NRC is now conducting oversight for Browns Ferry in accordance with its Reactor Oversight Process. However, because of the lack of valid historical data specific to this plant for the mitigating systems performance indicators of the Reactor Oversight Process, the NRC will conduct additional Reactor Oversight Process baseline inspections until sufficient plant-specific data become available in the third quarter of calendar year 2010.

14.1.2 License Renewal

This section explains license renewal, including the governing documents, regulatory process, recent experience, and relevant examples.

14.1.2.1 Governing Documents and Process

Background. The Atomic Energy Act and NRC regulations limit commercial power reactor licenses to 40 years but permit such licenses to be renewed. The original 40-year term was selected on the basis of economic and antitrust considerations, not technical limitations.

The NRC has established a license renewal process that can be completed in a reasonable time period and has clear requirements to ensure safe plant operation for up to 20 additional years of plant life. The NRC's current schedule is to complete renewal reviews within 30 months of receipt of the application if a hearing is conducted, and within 22 months if a hearing is not conducted. Currently, five applications are in the hearing process, and two applications are experiencing extended reviews. The decision to seek license renewal rests entirely with nuclear power plant owners and typically is based on the plant's economic situation and whether it can meet NRC requirements.

Research has concluded that aging phenomena are readily manageable and do not pose technical issues that would prevent life extension for nuclear power plants. Studies have also found that facilities deal adequately with many aging effects during the initial license period, and that credit should be given for these existing programs, particularly those under the NRC's Maintenance Rule (10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"), which helps manage plant aging.

The license renewal process proceeds along two tracks: one for the review of safety issues and another for environmental issues. An applicant must give the NRC an evaluation that addresses the technical aspects of plant aging and describes the ways it will manage those effects. It must also prepare an evaluation of the potential impact on the environment if the plant operates for up to 20 more years. The NRC reviews the application and verifies the safety and environmental issues through on-site audits and inspections. The NRC documents its findings in a safety evaluation report and an environmental impact statement.

Public participation is an important part of the license renewal process. Members of the public have opportunities to comment on the environmental review and question how aging will be managed during the period of extended operation. All information related to the review and approval of a renewal application is publicly available. Significant safety and environmental concerns may also be litigated in an adjudicatory hearing if any party who would be adversely affected ask for a hearing.

10 CFR Part 54. Known as the License Renewal Rule, 10 CFR Part 54 establishes the technical and procedural requirements for renewing operating licenses. License renewal requirements for power reactors are based on two key principles:

(1) When continued into the extended period of operation, the regulatory process, which assesses and verifies safety, is adequate to ensure that the licensing basis of all currently operating plants provides an acceptable level of safety. The possible exception is detrimental effects of aging on certain SSCs, and possibly a few other issues applying to safety only during the period of extended operation.

(2) Each plant must maintain its licensing basis throughout the renewal term.

Guidance that applies to license renewal includes RG 1.188, Revision 1, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," dated September 2005, to help applicants apply to renew a license; and NUREG-1800, Revision 1, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," dated September 2005, which guides the staff in reviewing applications. The standard review plan for license renewal incorporates by reference NUREG-1801, Revision 1, "Generic Aging Lessons Learned (GALL) Report," dated September 2005, which generically documents the basis for determining when existing programs are adequate for license renewal and when they should be augmented. As lessons are learned from the review of renewal applications or generic technical issues are resolved, the NRC issues improved guidance for interim use by applicants until the guidance is incorporated into the next formal update of the documents. The staff is currently preparing a revision to both the standard review plan for license renewal and the Generic Aging Lessons Learned Report. The NRC obtained comments from the public on these documents and plans to issue them for use by December 2010.

10 CFR Part 51. The NRC's environmental protection regulation, 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," also applies to license renewal. The agency amended this regulation to facilitate its environmental review process for license renewal. The review requirements for 10 CFR Part 51 are founded on the conclusion that certain environmental issues can be resolved generically and need not be evaluated in each plant-specific application. NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," dated May 1996, describes these issues. The NRC performs plant-specific reviews of the environmental impacts of license renewal to determine whether the effects are so great that they should preclude license renewal as an option for energy-planning decisionmakers.

RG 4.2, Supplement 1, "Preparation of Supplemental Environmental Reports for Applications to Renew Nuclear Power Plant Operating Licenses," dated August 1991, provides guidance to applicants preparing environmental reports for license renewal. NUREG-1555, "Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1, "Operating License Renewal," dated March 2000, guides the NRC staff's review of the environmental issues associated with a renewal application. The NRC, with public participation, is currently revising its regulations and guidance in this area. The rulemaking proposing changes to Part 51 was issued in the *Federal Register* in 2009. The staff expects to issue the final rulemaking in 2011.

14.1.2.2 Experience

The NRC issued the first renewed licenses for the Calvert Cliffs Nuclear Power Plant and the Oconee Nuclear Station in 2000. As of March 2010, 59 reactors have received renewed licenses. Four of the 59 reactors have completed 40 years of operation and are operating in the extended period. Three more reactors will enter the period of extended operation in the second half of 2010. On the basis of industry statements, the NRC expects that essentially all remaining plants will apply for license renewal.

14.1.2.3 Operating Beyond 60 Years

The provisions of 10 CFR 54 Part 54 do not preclude subsequent license renewals after the initial renewal. The earliest that a licensee can submit a license renewal application is 20 years before the expiration of its current license; therefore, a licensee is eligible to apply for a subsequent license renewal once it enters the initial period of extended operation (the 20-year renewal period beyond its initial 40-year license period). While several industry representatives have informally inquired about the possibility of license renewal beyond 60 years, the Commission has not received any formal letter of intent to pursue such a renewal.

The regulatory process for evaluating applications for license renewal beyond 60 years is expected to be very similar as the current license renewal process. However, the NRC staff may need additional information to aid its license renewal review of SSCs for plant life beyond 60 years. To encourage early and proactive discussion of factors potentially affecting subsequent license renewal decisions, the Commission and DOE jointly sponsored "Life Beyond 60: NRC/DOE Workshop on U.S. Nuclear Power Plant Life Extension Research and Development," on February 19 – 21, 2008. Based on the results of the workshop and the staff's long-term research plan, potential additional areas of focus for a subsequent license renewal include aging management of reactor vessel and internal materials, cable insulation, buried piping, submerged structures, and concrete exposed to high temperature and radiation.

14.1.3 The United States and Periodic Safety Reviews

The international community, to a large extent, conducts periodic safety reviews (typically carried out every 10 years) to assess the cumulative effects of plant aging, plant modifications, operating experience, technical developments, and siting. The reviews include an assessment of plant design and operation against current safety standards and practices, with the objective of ensuring a high level of safety throughout the plant's operating lifetime.

Some countries use routine comprehensive safety assessment programs that deal with specific safety issues, significant events, and changes in safety standards and practices as they arise. These programs, if applied with appropriate scope, frequency, depth, and rigor, achieve the same review standards and objectives as a periodic safety review. Some countries also use periodic safety reviews to support the decisionmaking process for long-term operation or license renewal. However, alternate processes, such as the NRC license renewal process, are considered equally adequate and acceptable.

This section explains how the U.S. regulatory approach provides a continuum of assessment and review that ensures public health and safety throughout the period of plant operation. Plant safety is maintained, and aspects are improved, by a combination of the ongoing NRC regulatory process, oversight of the current licensing basis, backfitting, broad-based evaluations, license renewal, and licensee initiatives that go beyond the regulations.

14.1.3.1 The NRC's Robust and Ongoing Regulatory Process and the Current Licensing Basis

Before issuing an operating license, the NRC determines that the design, construction, and proposed operation of the nuclear power plant satisfy the NRC's requirements and reasonably ensure the adequate protection of public health and safety. However, the licensing basis of a plant does not remain fixed for the 40-year term of the operating license. The licensing basis evolves throughout the term of the operating license because of the NRC's continuing regulatory activities and the licensee's activities.

The NRC carries out many regulatory activities that, when considered together, constitute a process providing ongoing assurance that the licensing bases of nuclear power plants provide an acceptable level of safety. This process includes inspections (both periodic regional inspections as well as daily oversight by the resident inspectors), audits, investigations, evaluations of operating experience, regulatory research, and regulatory actions to resolve identified issues. The NRC's activities may result in changes to the licensing basis for nuclear power plants through promulgation of new or revised regulations, acceptance of licensee commitments to modify nuclear power plant designs and procedures, and the issuance of orders or confirmatory action letters. The agency also publishes the results of operating experience analysis, research, or other appropriate analyses through generic communication documents such as bulletins, INs and GLs. Licensee commitments in response to these documents also change the plant's licensing basis. In this way, the NRC's consideration of new information gives ongoing assurance that the licensing basis for the design and operation of all nuclear power plants provides an acceptable level of safety. This process continues for plants that receive a renewed license to operate beyond the original operating license.

In addition to NRC-required changes in the licensing basis, a licensee may also voluntarily seek changes to the current licensing basis for its plant. These changes are subject to the NRC's formal regulatory controls on changes (such as those described in 10 CFR 50.54, "Conditions of Licenses," 10 CFR 50.59, 10 CFR 50.90, and 10 CFR 50.92, "Issuance of Amendment"). These regulatory controls ensure that licensee-initiated changes to the licensing basis are documented and that the licensee obtains NRC review and approval, if necessary, before implementing them. The licensee must report to the NRC any changes or modifications it makes to the licensing basis without prior NRC review at least every 2 years. Region-based NRC inspectors perform a sampling inspection of those changes in accordance with the Reactor Oversight Process to ensure that the licensee has properly characterized the changes or modifications.

14.1.3.2 The Backfitting Process: Timely Imposition of New Requirements

In the late 1970s and early 1980s, the NRC recognized the need for a process to determine when to address generic issues for all plants. The NRC deemed prudent to consider new requirements systematically rather than depending on other regulatory processes to decide on plant upgrades. As a result, the NRC developed the "backfitting" process and established the Committee to Review Generic Requirements to review staff-proposed backfits on licensees.

The Backfitting Rule, 10 CFR 50.109, "Backfitting," promulgated in 1985, applies to both generic and plant-specific backfits for power reactors. The rule defines a "backfit" as any modification of or addition to (1) plant systems, (2) structures, (3) components, (4) design approvals, (5) manufacturing licenses, or (6) procedures or organization required to design, construct, or operate a facility that may result from the imposition of a new or amended rule or regulatory staff position.

In 1988, the NRC amended the Backfitting Rule to state that economic costs will not be considered in cases of ensuring, defining, or redefining adequate protection of public health and safety, or in cases of ensuring compliance with NRC requirements or written licensee commitments. The rule requires a cost-benefit analysis except in the case of backfits that are imposed to bring a licensee back into compliance with its license or to ensure adequate protection of public health and safety or the common defense and security. The NRC must determine through a backfit analysis that the proposed backfit will substantially increase the overall protection of public health and safety or the common defense and security and that the direct and indirect costs for the facility are justified in view of the increased protection.

Compliance and adequate protection backfits are justified differently. The NRC requires a documented evaluation that gives the basis and states the objectives and purpose of the proposed backfit.

Backfitting is expected and is an inherent part of the regulatory process. However, it is permitted only after a formal, systematic review to ensure that changes are properly justified and suitably defined. The requirements of this process are intended to ensure order, discipline, and predictability and to optimize the use of NRC staff and licensee resources.

The controls on generic backfitting include review by the Committee to Review Generic Requirements, a committee of senior managers from various NRC offices. Established in 1981, this committee operates under a charter that specifically identifies the documents to be reviewed and the analyses, justifications, and findings to be supplied. Its objectives include eliminating unnecessary burdens on licensees, reducing radiation exposure to workers while implementing requirements, and optimizing use of NRC and licensee resources to ensure safe operation. Thus, the Committee to Review Generic Requirements charter is a key implementing procedure for generic backfitting, although the primary responsibility for proper backfit considerations belongs to the initiating organization.

14.1.3.3 The NRC's Extensive Experience with Broad-Based Evaluations

In the mid-1970s, the NRC recognized the importance of assessing the adequacy of the design and operation of currently licensed nuclear power plants, understanding the safety significance of deviations from applicable current safety standards that may have been approved after those plants were licensed, and providing the capability to make integrated and balanced decisions about the need for backfit modifications at those plants.

Consequently, in 1977, the NRC initiated the Systematic Evaluation Program (SEP). From a list of approximately 800 potential issues and topics related to nuclear safety, the SEP found that the regulatory requirements for 137 issues had changed sufficiently to warrant evaluation. The staff compared the designs of 10 of the older plants to the licensing criteria delineated in the then recently issued standard review plan.[4] After further review, the staff determined that 27 issues required some corrective action at one or more plants and that resolution of those issues could lead to safety improvements at other operating plants built at about the same time. These 27 issues became known as the "27 SEP lessons learned."

In 1984, NRC staff presented the 27 SEP lessons learned to the Commission as part of a proposal for an Integrated Safety Assessment Program (ISAP). The staff developed this program to review safety issues for a specific plant in an integrated manner instead of continuing the SEP at other older operating reactors. In "Commission Policy Statement on the Systematic Evaluation of Operating Nuclear Power Reactors," dated November 1984, the Commission said that issues relating to the safety of operating nuclear power plants can be more effectively and efficiently implemented in an integrated, plant-specific review. For the first time, the Commission discussed probabilistic safety analysis as a method to obtain consistent and comparable results that could be used to enhance a safety assessment. The SEP process was transformed into the ISAP pilot program.

In May 1985, the NRC initiated the ISAP pilot at two plants, Millstone Unit 1 and Haddam Neck (Connecticut Yankee). The ISAP pilot identified some benefits; however, the Commission deferred extending it beyond the pilot phase until the staff gave an integrated package of options that clarified the relationship between the proposed follow-on program to the ISAP pilot (ISAP II) and the newly proposed individual plant examination process.

The Commission determined that, since ISAP II would be voluntary and the individual plant examination program, through the NRC's GL process, would require a licensee response, the staff should give priority to the individual plant examination program. Many of the same benefits that might have been derived through the proposed ISAP II were derived instead through the individual plant examination process (e.g., probabilistic safety analysis).

In the late 1980s and throughout the 1990s, the NRC continued to strengthen its regulatory infrastructure and ensure the continued safe operation of commercial nuclear power plants through inspection, broad-based assessment, and, where appropriate, establishment of new generic requirements. For example, the Commission determined that licensees should assess the accessibility and adequacy of their design-basis information and determine whether their plants needed a design-basis reconstitution program. The Commission expressed its expectations in "Availability and Adequacy of Design Bases Information at Nuclear Power Plants; Policy Statement" in the *Federal Register* on August 10, 1992. The Commission also expanded the individual plant examination program to consider external events and, recognizing the relationship between maintenance, equipment reliability, plant risk, and safety, in 1991 the Commission promulgated the Maintenance Rule codified in 10 CFR 50.65.

The Maintenance Rule requires licensees to monitor the performance or condition of SSCs against licensee-established goals continuously, to give reasonable assurance that these SSCs are capable of fulfilling their intended functions. The NRC verifies the licensee's

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[4] Standard review plans help ensure the quality and uniformity of staff reviews and provide a well-defined base from which to evaluate a licensee or applicant submittal. Standard review plans are also intended to make information about regulatory matters widely available, to enhance communication with interested members of the public and the nuclear power industry, and to improve the understanding of the staff review process.

implementation of the Maintenance Rule through the Reactor Oversight Process, periodic regional inspections, and daily oversight by the resident inspectors.

As late as 1991, some plants had not definitively resolved the 27 SEP lessons learned. As the staff considered a process to renew the operating licenses for the operating nuclear power plants, it assessed the best way to address these 27 issues.

Of the 27 issues, four had been completely resolved for all plants. One other issue was of such low safety significance that it required no additional action. The staff determined that none of the remaining 22 issues required immediate action to protect public health and safety. The staff placed these 22 issues into the established regulatory process for determining the safety significance of generic issues.[5]

14.1.3.4 License Renewal Confirms Safety of Plants

In developing the License Renewal Rule, the Commission concluded that issues material to the renewal of a nuclear power plant operating license are limited to those issues that the Commission determines are uniquely relevant to protecting public health and safety and preserving the common defense and security during the period of extended operation. Other issues would, by definition, be relevant to the safety and security of the public during current plant operation. Given the Commission's ongoing obligation to oversee the safety and security of operating reactors, the existing regulatory process within the present 40-year license term addresses issues related to current plant operation rather than deferring the issues until the time of license renewal. The NRC manages these issues by implementing the Reactor Oversight Process, generic communications, and the generic safety issues program. (Section 6.3.2 of this report describes the NRC Reactor Oversight Process.)

The NRC promulgated the License Renewal Rule in 1995 (in 10 CFR Part 54). The license renewal process focuses on passive and long-lived SSCs because degradation in active components is more readily detected by complying with the Maintenance Rule. License renewal applicants are required to complete an environmental assessment and an integrated plant assessment[6] and to evaluate time-limited aging analyses. The current licensing basis must be maintained throughout the period of extended operation. (Section 14.1.2 of this report describes the NRC license renewal process.)

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5 A generic issue is a regulatory matter that is not sufficiently addressed by existing regulations, guidance, or programs. Through its systematic assessment of plant operation, the NRC has identified certain issues that seem prevalent among plants. The NRC documents and tracks resolution of these "generic safety issues." The generic safety issue program provides for (1) identifying generic issues, (2) assigning them priorities, (3) developing detailed action plans for their resolution, (4) overseeing progress in their resolution by senior managers, and (5) informing the public of the status of progress in resolution. The resolution of these issues may involve new or revised rules, new or revised guidance, or revised interpretation of rules or guidance that affect nuclear power plant licensees or nuclear material certificate holders. The U.S. Congress requires that the NRC maintain this program.

6 An integrated plant assessment identifies and lists structures and components subject to an aging management review. These include "passive" structures and components that perform their intended function without moving parts or without a change in configuration or properties. Examples of these are the reactor vessel, the steam generators, piping, component supports, and seismic Category I structures. To be in scope, the item must also be long-lived to be considered during the license renewal process. Long-lived means the item is not subject to replacement based on a qualified life or specified time period.

14.1.3.5 Risk-Informed Regulation and the Reactor Oversight Process

The NRC is actively increasing the use of risk insights and information in its regulatory decisionmaking. For reactors, risk-informed activities occur in the five broad categories of (1) applicable regulations, (2) licensing process, (3) Reactor Oversight Process, (4) regulatory guidance, and (5) risk analysis tools, methods, and data. Activities within these categories include revisions to technical requirements in the regulations; risk-informed technical specifications; a framework for inspection, assessment, and enforcement actions; guidance on risk-informed inservice inspections; and improved standardized plant analysis risk models.

In 2000, the NRC implemented a revised Reactor Oversight Process using risk insights and lessons learned from more than 40 years of regulating nuclear power plants. The previous oversight process evolved during a period when the nuclear power industry was less mature and there was much less operational experience on which to base rules and regulations. Very conservative judgments governed the rules and regulations. Significant plant operating events occurred with some frequency, and the oversight process tended to be reactive and prescriptive, closely observing plant performance for adherence to the regulations and responding to operational problems as they occurred.

After nearly four decades of operational experience and generally steady improvements in plant performance, the Reactor Oversight Process now focuses more of the agency's resources on the relatively small number of plants with performance problems. The process is a means to collect information about licensee performance, assess the information for its safety significance, and provide for appropriate licensee and NRC response, including corrective and enforcement actions, when appropriate. Areas such as emergency preparedness, radiation safety, human performance, safety culture, and problem identification and resolution are among those evaluated.

The Reactor Oversight Process makes greater use of objective performance indicators. Together, the performance indicators and inspection findings give the information needed to support quarterly reviews of plant performance. The Reactor Oversight Process also features expanded semiannual reviews, which include inspection planning and a performance report (all posted on the NRC's public Web site). The Reactor Oversight Process is more effective at correcting performance or equipment problems today because the agency's response to problems is more timely and predictable. (Section 6.3.2 of this report provides a full description of the NRC Reactor Oversight Process.)

14.1.3.6 Licensee Responsibilities for Safety: Regulations and Initiatives Beyond Regulations

As in many countries, U.S. nuclear power plant licensees are responsible for the safety of their facilities. This responsibility is embedded in their license and in the NRC's regulatory infrastructure. Under the regulatory umbrella, licensees routinely assess new technologies, off-normal conditions, operating experience, and industry trends to make informed decisions about safety enhancements to their facilities.

The NRC does not specifically mandate some of these reviews. Rather, they are self-imposed initiatives over and above regulations, motivated by the licensees' self-described pursuit of excellence and by the recognition that safety and economics are directly linked in the competitive, free-market U.S. energy industry. Licensees have, for example, voluntarily replaced analog instrumentation and control systems with digital systems, upgraded their plants to increase production of electricity, and managed their plants to performance levels above the NRC's performance indicator thresholds.

Under the U.S. regulatory structure, 10 CFR Part 50, Appendix B requires that all nuclear power plant licensees maintain a quality assurance program. Quality assurance comprises all those planned and systematic actions necessary for adequate confidence that an SSC will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to the physical characteristics of a material, structure, component, or system that provide a means to control quality to predetermined requirements.

Licensees carry out a comprehensive system of planned and periodic audits to verify compliance with all aspects of the quality assurance program and to determine the effectiveness of the program. Appropriately trained personnel who do not have direct responsibilities in the areas being audited perform these audits in accordance with written procedures or checklists. Audit results are documented and reviewed by management with responsibility in the area audited, and appropriate followup is initiated.

14.1.3.7 The NRC's Regulatory Process Compared with International Safety Reviews

IAEA and the Western European Nuclear Regulators' Association (WENRA) have developed guidance[7] and objectives for conducting periodic safety reviews that have much in common. Consistent with the guidance of both organizations, periodic safety reviews are comprehensive assessments with the following purposes:

- to determine, at the time of the review, whether the plant complies with its licensing basis
- to identify the extent to which the current licensing basis remains valid, in part by determining the extent to which the plant meets current safety standards and practices
- to provide a basis for implementing appropriate safety improvements, corrective actions, or process improvements
- to provide confidence that the plant can continue to be operated safely

For the reasons discussed above and summarized below, the shared objectives associated with the IAEA and WENRA periodic safety review guidance are substantively accomplished in the United States on an ongoing basis.

First, the NRC's regulatory process provides a robust foundation for ongoing assessments, evaluations, and, when appropriate, imposition of new requirements. Currently, the NRC and the U.S. nuclear industry consider new information in a more risk-informed manner as it becomes available; adjust the regulatory oversight and plant safety priority, respectively; and

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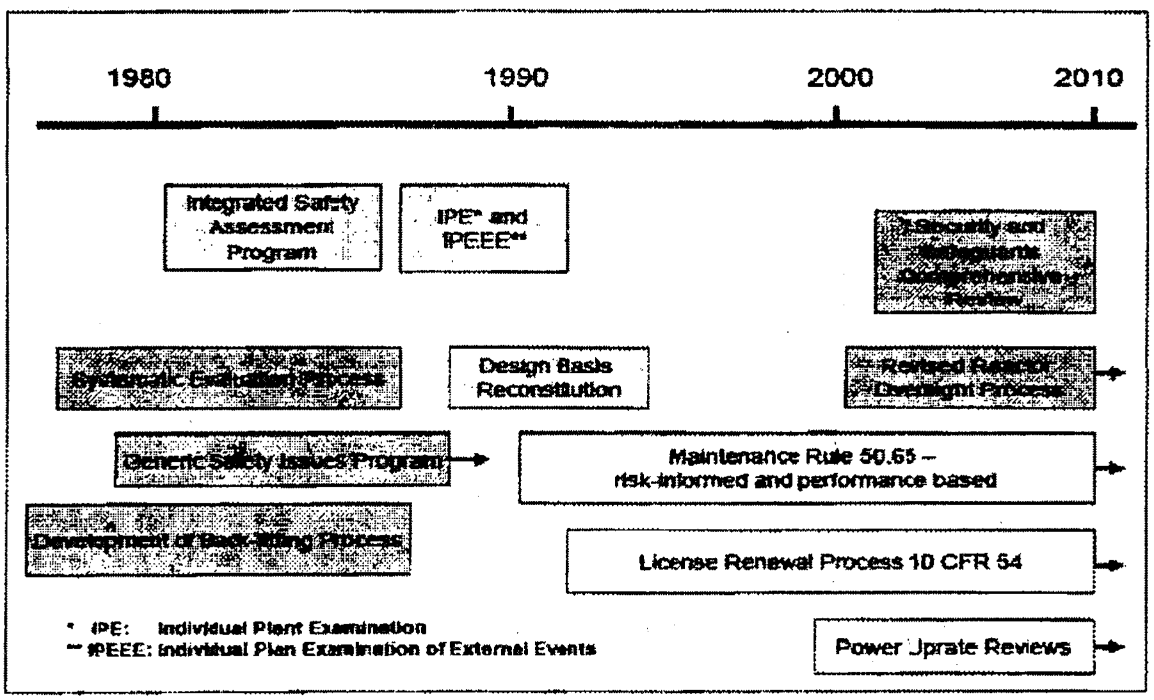
7 IAEA guidance appears in Safety Standards Series No. NS-G-2.10, "Periodic Safety Review of Nuclear Power Plants Safety Guide," issued in 2003. WENRA guidance appears in "Pilot Study on Harmonization of Reactor Safety in WENRA Countries," WENRA Working Group on Reactor Harmonization, March 2003.

provide ongoing assurance that the licensing basis for the design and operation of all nuclear power plants provides an acceptable level of safety. Development of the Maintenance Rule and License Renewal Rule are two examples of new requirements that serve this purpose.

Second, the NRC and the U.S. nuclear industry have a 30-year history of implementing broad-based plant assessments. The regulatory history of implementing broad-based assessments is a direct result of an adaptive, probing, and independent regulatory process. These assessments have included the SEP, the ISAP, and the individual plant examinations. They provide additional confidence that plant safety continues to be the highest priority and that the NRC and industry continue to pursue enhancements that improve safety. As shown in the figure included below, over a period of almost 25 years, broad-based NRC assessments and regulatory initiatives have provided a continuum of assessment, improvement, and oversight, which ensures that licensed plants continue to operate safely.

The NRC's transition to a more risk-informed regulatory framework and the Reactor Oversight Process offers an ongoing approach and basis for implementing appropriate safety improvements, corrective actions, or process improvements and provides confidence that the plant can continue to be operated safely. The NRC's more risk-informed approach helps ensure that resources are optimally focused on those issues most important to safety.

Finally, U.S. licensees establish performance expectations above the thresholds required by the NRC. These self-imposed expectations and initiatives -- over and above the regulations -- result from the licensee's self-described motivation to pursue excellence and by the recognition that safety and economics are directly linked in the competitive, free-market U.S. energy industry.



14.2 Verification by Analysis, Surveillance, Testing, and Inspection

Licensees are required to verify that they are operating their nuclear installations in accordance with the plant-specific design and requirements. The technical specifications (for surveillance) and national consensus codes (for testing and periodic inspections) contain the requirements for verification.

In 10 CFR 50.55a, "Codes and Standards," the NRC gives requirements for applying industry codes and standards to nuclear power reactors during design, construction, and operation. This section states, "Systems and components of boiling and pressurized water-cooled nuclear power reactors must meet the requirements of the ASME Boiler and Pressure Vessel Code specified in paragraphs (b) through (g) of this section." In addition, 10 CFR 50.55a provides for alternatives to the ASME Code when authorized by the NRC.

Through analysis, surveillance, testing, and inspection, the NRC verifies that the physical state and operation of nuclear installations continue to be in accordance with the designs, applicable national safety requirements, and operational limits and conditions. As discussed in Article 6 of this report, the NRC's Reactor Oversight Process includes inspections to verify that licensees are fulfilling their obligations to carry out such surveillances and testing and take corrective action. The agency's Reactor Oversight Process collects the data for performance measure in two ways. First, NRC inspectors collect inspection findings at least quarterly, using formal detailed IPs to review plant operations and maintenance. NRC managers review inspection findings to assess their significance as part of the Reactor Oversight Process' significance determination process. Second, licensees collect data for performance indicators and submit this information to the NRC at least quarterly. The thresholds for each indicator determine the significance of the data. The NRC performs inspections of licensee processes for collecting and submitting the data to ensure completeness, accuracy, consistency, timeliness, and validity. The NRC publishes the inspection findings and performance indicators on its web site and incorporates feedback from all stakeholders as appropriate.

Annually, senior agency managers review plants that have performance issues and report these results to the Commission. An integral part of the evaluative process used by the agency to ensure the operational safety performance of nuclear licensees, this annual Agency Action Review Meeting provides another opportunity for the NRC's senior management to discuss significant events, licensee performance issues, trends, and the actions to mitigate recurrences.

The NRC also focuses on aging management. NUREG-1800, Chapter 3, "Aging Management Review Results," dated September 2005, addresses aging management review of reactor vessel, internals, reactor coolant system, engineered safety features, auxiliary systems, steam and power conversion system, containment, structures, component supports, electrical systems and instrumentation and controls. NUREG-1800, Chapter 4, "Time-Limited Aging Analyses," addresses the identification of time-limited aging analyses. The list of potential time-limited aging analyses comprises certain plant-specific safety analyses that are based on an assumed 40-year plant life. Under 10 CFR 54.21(c)(1), the NRC requires a license renewal applicant to list time-limited aging analyses, as defined in 10 CFR 54.3, "Definitions." The NRC evaluates the adequacy of the time-limited aging analyses identified by the applicant.

Under special circumstances, the Commission may also require under 10 CFR 50.54(f) that licensees submit written statements to enable the Commission to determine whether the license should be modified, suspended, or revoked.

The NRC updates, revises, and improves existing regulatory programs in light of operating experience and significant new safety information. Article 19 of this report discusses these activities.

ARTICLE 15. RADIATION PROTECTION

Each Contracting Party shall take the appropriate steps to ensure that, in all operational states, the radiation exposure to the workers and to the public caused by a nuclear installation shall be kept as low as reasonably achievable, and that no individual shall be exposed to radiation doses which exceed the prescribed national dose limits.

This section summarizes the authorities and principles of radiation protection, which include the regulatory framework, regulations, and radiation protection programs for controlling radiation exposure for occupational workers and members of the public. Article 17 of this report discusses radiological assessments that apply to licensing and facility changes.

15.1 Authorities and Principles

Generally, U.S. radiation control measures are founded on radiological risk assessments by the United Nations Scientific Committee on the Effects of Atomic Radiation and the U.S. National Academy of Sciences Committee on the Biological Effects of Ionizing Radiation. The risk management recommendations promulgated by the International Commission on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP) reflect these assessments. On the basis of these assessments and recommendations, EPA develops Federal guidance signed by the President of the United States, and "generally applicable radiation standards" for use by the other Federal agencies, including the NRC. The responsible agencies, such as the NRC, then establish regulations

that considers these recommendations and standards. U.S. radiation protection programs are based on principles generally consistent with the principles espoused by ICRP: (1) it is known that large doses of ionizing radiation can be deleterious to human health, and (2) it is considered prudent to assume that small doses may also be harmful, with the probability of a deleterious effect being proportional to the dose. The U.S. programs acknowledge, include, and use the ICRP-recommended protection principles of "limitation," "justification," and "optimization" as appropriate.

Of these principles, "limitation" is the most practicable and most directly included in the regulatory structure. The regulations establish dose limits that cannot be exceeded without violating the regulations. There is a lengthy history of the doses being kept within the limits for workers (NUREG-0713, Volume 30, "Occupational Radiation Exposure at Commercial Nuclear Power Reactors and Other Facilities," dated January 2010) and members of the public living near nuclear power plants (NUREG/CR-2850, Volume 14, "Dose Commitments Due to Radioactive Releases from Nuclear Power Plant Sites in 1992," dated March 1996).

"Justification," is the recommendation that any activity involving radiation exposure be shown to be beneficial before the activity is undertaken. However, the risks or benefits of a new application of radioactive material can seldom be determined in advance with complete accuracy. Furthermore, radiation protection considerations are only one contributor to overall decisions on whether a particular exposure situation is justified. The "justification" activities in the U.S. are carried out during the licensing process. In general, the NRC will reject an application to use or produce radioactive materials if it determines that the application is frivolous (i.e., that the overall benefit to society is outweighed by the risk of the radiation exposure associated with the activity). For some large applications, such as the generation of electricity from nuclear power, national policy establishes the justification. Because national energy policy favors nuclear power (i.e., the net benefit for the United States is deemed to be positive), the licensing process under

10 CFR Part 50 does not specifically address the justification for licensing a nuclear power plant.

Rather than using the term "optimization," the U.S. has used the term "as low as is reasonably achievable" (ALARA). In most circumstances, these two terms are consistent and represent the same underlying principle. As a guiding principle, ALARA (with varying terminology) dates back to 1939 in the U.S. and is defined in the regulations for occupational workers and members of the public.

For decades before 1994, 10 CFR Part 20 addressed the ALARA criterion for occupational radiation exposure, but more as an admonition than as a requirement. In 1994, the NRC changed the regulation to require that all licensees develop, document, and carry out an ALARA program. The NRC would judge compliance with this requirement on the basis of a licensee's capability to track and, if necessary, reduce exposures, rather than on whether exposures and doses represented an absolute minimum or whether the licensee had used all possible methods to reduce exposures.

For control of radiation exposure from nuclear power plants to members of the public, the NRC modified 10 CFR Part 50 by adding Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low As Is Reasonably Achievable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents." Issued in 1975, this appendix established design objectives to keep radioactive releases from nuclear power plants ALARA. The ALARA requirement led to the establishment of numerical objectives (for example, 0.00005 sievert (Sv) (0.005 rem) in a year for the most highly exposed individual). Similar EPA requirements for other facilities soon followed. These NRC and EPA requirements are consistent with ICRP principles and result in public doses that are well below the local variation in doses from natural sources.

Although U.S. regulations are generally consistent with ICRP recommendations, certain constraints have limited the extent to which U.S. regulations match those of ICRP. One important constraint has been the U.S. desire for regulatory stability. Revising the regulations to incorporate every new ICRP position would impose a serious burden on the licensees without a commensurate benefit. Furthermore, for nuclear power reactors, new requirements are constrained by the Backfit Rule (10 CFR 50.109), which requires that any increase in regulatory requirements be justified by a commensurate improvement in safety. Consequently, U.S. regulations were founded on older (rather than the most recent) ICRP recommendations. Nevertheless, the NRC directed the staff to work closely with ICRP and other national and international organizations to help develop revised recommendations. After publication of the new ICRP recommendations (ICRP Publication 103, "The 2007 Recommendations of the International Commission on Radiological Protection," dated March 2007), the NRC staff provided options for Commission consideration in SECY-08-0197, "Options to Revise Radiation Protection Regulations and Guidance with Respect to the 2007 Recommendations of the International Commission on Radiological Protection," dated December 18, 2008. The Commission approved the staff initiating stakeholder dialogue and technical basis development to explore the benefits and effects of increasing alignment with ICRP. As part of this process, the NRC staff is currently in active dialogue with all segments of the licensed community in the U.S. The NRC may revise its regulations, in whole or in part, depending on the outcome of these discussions.

15.2 Regulatory Framework

The NRC developed requirements for radiation protection to implement three laws passed by the U.S. Congress: the Atomic Energy Act of 1954, as amended; the Energy Reorganization Act of 1974; and the Uranium Mill Tailings Radiation Control Act of 1978.

NRC regulations establish the primary direct controls over licensees. Various documents provide additional guidance and clarification, including RGs, topical staff and contractor reports (NUREG series), GLs, technical specifications, and license conditions. These documents are supported by international standards, consensus national standards, and authoritative recommendations (such as those of ICRP and NCRP). However, these supporting documents have no official status unless they are referenced in or adopted by a regulation or documents providing regulatory guidance, such as RGs or standard review plans. Of particular importance are NUREG-0800, which guides the staff in reviewing safety analysis reports, and RG 1.70, Revision 3, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," dated November 1978, which guides the applicant in writing safety analyses. Chapter 11 of NUREG-0800 addresses the control of radioactive effluents. Chapter 12 addresses radiation protection. Chapter 15 details how to calculate offsite and control room operator doses for design-basis accidents. Under 10 CFR 50.34(g), the facility must be evaluated against the standard review plan.

As Article 6 of this report discussed, the Reactor Oversight Process has cornerstones for radiation safety. The cornerstone public radiation safety focuses on the effectiveness of the plant's programs in meeting applicable Federal limits on the exposure, or potential exposure, of members of the public to radiation and in ensuring that the effluent releases from the plant are ALARA. The cornerstone for occupational radiation safety focuses on the effectiveness of the plant's program(s) in maintaining the worker dose within the regulatory limits and providing occupational exposures that are ALARA.

15.3 Regulations

The regulations that apply to radiation protection are 10 CFR Part 20 and 10 CFR Part 50.

10 CFR Part 20. The NRC regulations in 10 CFR Part 20 establish requirements for radiation protection for all NRC licensees. The NRC gives additional requirements for specific operations and specific kinds of licensesin other parts of Title 10: 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material;" 10 CFR Part 34, "Licenses for Industrial Radiography and Radiation Safety Requirements for Industrial Radiographic Operations;" 10 CFR Part 35, "Medical Use of Byproduct Material;" 10 CFR Part 39, "Licenses and Radiation Safety Requirements for Well Logging;" 10 CFR Part 40, "Domestic Licensing of Source Material;" 10 CFR Part 50; 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material;" 10 CFR Part 71, "Packaging and Transportation of Radioactive Material;" and 10 CFR Part 72.

The most recent major revision of 10 CFR Part 20, issued in 1991, adopted the recommendations, quantities, and models recommended in ICRP Publication 26, "Recommendations of the International Commission on Radiological Protection," dated January 1977, and in ICRP Publication 30, "Limits of Intakes of Radionuclides by Workers," dated 1978-1982, as well as some recommendations from NCRP Report No. 91, "Recommendations on Limits for Exposure to Ionizing Radiation," dated June 1987. The 1991 revision to 10 CFR Part 20 also adopted the same dose limit for a member of the public recommended in ICRP Publication 60, "1990 Recommendations of the International Commission on Radiological Protection" dated November 1990. Providing relatively comprehensive coverage of general requirements for radiation protection, 10 CFR Part 20 is divided into subparts, with each subpart addressing a specific area of radiation protection, such as occupational and public dose limits, positing, surveys, monitoring, waste disposal, and reporting.

The details of the requirements in 10 CFR Part 20 are not entirely consistent with international standards such as IAEA's Safety Standards, Safety Series No. 115, "International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources," dated February 1996. The main areas of difference between 10 CFR Part 20 and the Basic Safety Standards include the use of the effective dose equivalent in 10 CFR Part 20 versus use of the effective dose in the Basic Safety Standards, an annual occupational dose limit on the effective dose equivalent of 0.05 Sv in 10 CFR Part 20 versus 0.02 Sv in the Basic Safety Standards, and use of the biokinetic models from ICRP Publication 30 in 10 CFR Part 20 versus the more recent models used in the Basic Safety Standards. The NRC is engaging stakeholders in a dialogue to consider revising its regulations in the near future to better align with new international standards. In the interim, NRC licensees are permitted to use the effective dose in place of the effective dose equivalent and to use the more recent internal dosimetry models in place of those recommended in ICRP Publication 30, with prior NRC approval.

In addition, many licensees and agencies have administrative dose limits that are similar to or lower than those in the Basic Safety Standards. Most other licensees operate at occupational doses far below those limits and standards and therefore are considered ALARA. In some cases, the occupational doses do exceed 0.02 Sv per year (2 rem per year), but these are a very small fraction of the total, and efforts are continuing to reduce these doses to lower levels. In the interim and until the completion of NRC considerations that may better align its regulations with international standards, the current 10 CFR Part 20 provides a level of radiation protection that in almost all situations is comparable to that provided by international standards.

<u>10 CFR Part 50</u>. Although 10 CRR Part 50 is the principal regulation addressing the safety of nuclear power plants, only a small section of it directly addresses radiation protection. Even so, the sections of 10 CFR Part 50 that do affect radiation protection are significant. Of particular importance are 10 CFR 50.34a, "Design Objectives for Equipment to Control Releases of Radioactive Material in Effluents-Nuclear Power Reactors," 10 CFR Part 50, Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion "As Low as is Reasonably Achievable" for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents," and 10 CFR 50.34(g), which requires NRC review of in-plant radiation protection program. In 10 CFR 50.36a, "Technical Specifications on Effluents from Nuclear Power Reactors," the NRC also requires licensees to limit effluents from nuclear power reactors to the values in Appendix I to 10 CFR Part 50. The revised dose criteria for design-basis accidents appear in 10 CFR 50.34(a)(1)(ii)(D) for licensing actions after implementation of the revised rule in 1997. (The dose criteria for siting and determining the exclusion area low population zone and population center distance for nuclear power reactors appear in 10 CFR 100.11(a).)

15.4 Radiation Protection Activities

Radiation protection activities apply to occupational workers and to members of the public.

15.4.1 Control of Radiation Exposure of Occupational Workers

In addition to focusing on personnel qualifications for licensing, the NRC's oversight and regulation of radiation protection programs ensure that the safety analysis report and radiation protection plan properly address each item in 10 CFR Part 20, as well as the provisions for instructions to workers in 10 CFR Part 19, "Notices, Instructions, and Reports to Workers: Inspection and Investigations," and the provisions in relevant RGs, such as RG 1.8, "Qualification and Training of Personnel for Nuclear Power Plants," dated March 1971 (as revised September 1975, May 1977, April 1987, and May 2000), and RG 8.8, Revision 3, "Information Relevant to Ensuring that Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As is Reasonably Achievable," dated June 1978.

Once the NRC issues a license, it maintains an active regulatory program that includes routine inspection and monitoring of nuclear plants to alert NRC staff of potential problems in radiation safety. Significant health physics problems can trigger significant reactive regional inspections or a generic communication to the industry.

The NRC staff has been collecting the annual occupational exposure data for light-water reactors since 1969. Because the amount and kind of maintenance performed strongly influences the doses, the individual plant collective doses fluctuate from year to year. Still, clear trends are evident. Using the average collective dose per reactor as the reference, statistic analysis show that the doses varied almost randomly before the accident at Three Mile Island Unit 2. Thereafter, the doses increased as a result of the extensive modifications required of all nuclear power plants in response to new NRC requirements. The average collective dose reached a peak of 7.91 person-Sv (791 person-rem) per reactor in 1980. Since then, doses have declined almost steadily to the current level below 1 person-Sv (100 person-rem) per reactor, where they have remained for the past 5 years (2004–2008, the last year for which the data have been compiled). The 2008 average collective dose value of 0.88 person-Sv (88 person-rem) per reactor was the lowest average collective dose recorded since data collection began in 1969. Although the average doses for both PWRs and BWRs have been steadily declining, the average BWR dose has exceeded the average PWR dose since 1974. Over the past 5 years, the average BWR dose has exceeded the average PWR dose by roughly 90 percent (in part because of the higher average dose rates and larger work force at BWRs).
In 2008, the 118,692 workers at nuclear plants received 91.96 person-Sv (9,196 person-rem) for an average of 0.00077 Sv (0.077 rem) per worker. This represents a 92-percent drop in average worker dose from the 1973 value of 0.0095 Sv (0.95 rem) per worker.

15.4.2 Control of Radiation Exposure of Members of the Public

The regulations in 10 CFR 20.1301, "Dose Limits for Individual Members of the Public," and 10 CFR 20.1302, "Compliance with Dose Limits for Individual Members of the Public," control radiation exposures to members of the public. In addition to the 1.0 millisievert (100 millirem) annual dose limit in 10 CFR Part 20, the EPA regulations in 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations," establish a regulatory standard such that the annual dose to a member of the public from exposures to sources associated with the entire uranium fuel cycle does not exceed 0.25 millisievert (25 millirem).

The regulations in 10 CFR 50.34a, 10 CFR 50.36a, and 10 CFR Part 50, Appendix I, define the ALARA plant objectives for effluents. Appendix I also specifies effluent monitoring, environmental monitoring, investigations, land-use censuses, and reporting. Section IV.B of 10 CFR Part 50, Appendix I, requires the licensee to establish an appropriate surveillance and monitoring program that will accomplish the following:

- Provide data on quantities of radioactive material released in liquid and gaseous effluents.

- Provide data on measurable levels of radiation and radioactive materials in the environment to evaluate the relationship between quantities of radioactive material released in effluents and resultant radiation doses to individuals from principal pathways of exposure.

- Identify changes in the use of unrestricted areas (e.g., for agricultural purposes) to permit modifications in monitoring programs for evaluating doses to individuals from principal pathways of exposure.

Appendix I requirements are supplemented by 10 CFR Part 20.1501, "General," which requires, in part, that a licensee perform surveys to evaluate potential radiological hazards and to demonstrate compliance with the public dose limits in 10 CFR 20.1301 and 10 CFR 20.1302. Therefore, a licensee is responsible for performing radiation surveys at its facility for radioactive materials that have the potential to affect workers and members of the public. Potential survey sites can include areas that have been previously affected by licensed radioactive material, as well as areas that may be affected by licensed radioactive material in the future. For onsite spills and leaks that may contain licensed radioactive material, 10 CFR 20.1501 requires a licensee to perform appropriate radiation surveys and monitoring to determine the radiological hazard (i.e., dose assessment) to workers and to determine if there is a viable pathway to the unrestricted area that could result in a potential radiological hazard to members of the public. The surveys and monitoring can continue over a period of time or become an ongoing monitoring program so that the licensee can adequately characterize the extent and source of the contamination from the spills or leak.

Since 2004, there have been several discoveries of radioactive ground water contamination at nuclear power facilities in the U.S. Investigation has determined that most of the contamination resulted from undetected leakage from facility SSCs that contained or transported radioactive liquids. All unmonitored releases resulted in varying levels of onsite tritium ground water contamination, with two facilities detecting low levels of tritium (below EPA drinking water standards) in offsite residential drinking wells. Current data show no immediate public health effects and a very low probability that there will be an effect in the future.

The NRC has responded to reports of ground water contamination by carrying out inspections, assessing the safety significance of these events, and evaluating licensee performance in finding and taking corrective actions. The NRC has also issued INs 2004-05, "Spent Fuel Pool Leakage to Onsite Groundwater," dated March 3, 2004, and IN 2006-13, "Ground-Water Contamination Due to Undetected Leakage of Radioactive Water," dated July 10, 2006, describing unmonitored and unplanned leakage at several nuclear power stations.

Both the NRC and the nuclear industry have worked to resolve the technical and programmatic issues leading to the ground water contamination events. In March 2006, the NRC Executive Director for Operations established a Liquid Radioactive Release Lessons Learned Task Force to assess lessons learned from the unmonitored release of radioactive liquid to the environment at power reactor sites and to recommend possible agency actions. The task force completed its assessment and issued its report on September 1, 2006. The most significant conclusion was that these events had no public health effect. However, because of the high level of public concern and the potential for contaminated ground water to migrate off site undetected, the task force made several recommendations to the NRC. In response to the task force recommendations, the NRC revised its guidance in RG 1.21, "Measuring, Evaluating, and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste," and RG 4.1, "Radiological Environmental Monitoring for Nuclear Power Plants," both dated June 2009, to clarify its expectations concerning monitoring and reporting leaks and spills.

In parallel with the NRC's efforts, the nuclear industry also responded to the ground water contamination events. The NEI has developed a voluntary Groundwater Protection Initiative that licensees have endorsed unanimously. The initiative required each participating nuclear plant to have a plan in place by July 2006 that established several short-term actions, such as developing an enhanced communications protocol to ensure notification of State and local officials of less significant unmonitored release events. The industry initiative also required several long-term actions to improve leak detection monitoring capability and understanding of site hydrology and geology.

The NRC has initiated a special inspection effort to monitor the licensee's implementation of the industry's Groundwater Protection Initiative. As a result of the enhanced monitoring, the NRC has identified several additional occurrences of low-level tritium contamination in onsite ground water. To date, levels of contamination have been below any NRC-required reporting level and well below the ALARA dose objectives in 10 CFR 50, Appendix I. However, the NRC continues to oversee licensee's responses to each of these occurrences and is actively considering whether additional regulatory requirements or guidance are warranted for the integrity of buried piping and subsurface SSCs.

ARTICLE 16. EMERGENCY PREPAREDNESS

(i) Each Contracting Party shall take the appropriate steps to ensure that there are onsite and offsite emergency plans that are routinely tested for nuclear installations, and cover the activities to be carried out in the event of an emergency.

(ii) For any new nuclear installation, such plans shall be prepared and tested before it [the installation] commences operation above a low power level agreed [to] by the regulatory body.

(iii) Each Contracting Party shall take appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.

(iv) Contracting Parties that do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.

This section discusses (1) emergency planning and emergency planning zones, (2) offsite emergency planning and preparedness, (3) emergency classification system and action levels, (4) recommendations for protection in severe accidents, (5) inspection practices and regulatory oversight, (6) response to an emergency, and (7) international arrangements.

16.1 Background

The NRC's responsibilities for radiological emergency preparedness stem from NRC licensing functions under the Atomic Energy Act and the Energy Reorganization Act. Both statutes authorize the Commission to promulgate regulations that it deems necessary to fulfill its responsibilities under the acts. Following the accident at Three Mile Island Unit 2 in March 1979, the NRC amended the regulations to require significant changes in emergency planning and preparedness for U.S. commercial nuclear power plants. The NRC's emergency planning regulations are now an important part of the regulatory framework for protecting public health and safety and have been adopted as an added conservatism in the NRC's defense-in-depth safety philosophy of multiple-barrier containment and redundant safety systems. Before a full-power operating license can be issued, NRC regulations require a finding that there is reasonable assurance that adequate measures to protect public health and safety can and will be taken in a radiological emergency (10 CFR 50.47(a)).

Emergency planning in the United States recognizes that a spectrum of accidents could exceed the design-basis accidents that nuclear plants are required to accommodate without significant public health and safety effects. For design-basis accidents, the small releases that might occur would not likely require responses such as evacuating or sheltering the general public. These actions become important only when considering accidents that are much less probable than design-basis accidents. NUREG-0396, "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light-Water Nuclear Power Plants," dated December 1978, and NUREG-0654/FEMA-REP-1 (NUREG-0654), Revision 1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," dated November 1980, describe the emergency planning basis.

16.2 Offsite Emergency Planning and Preparedness

The accident at Three Mile Island Unit 2 revealed that better coordination and more comprehensive emergency plans and procedures were needed if the NRC and the public were to have confidence in the readiness of onsite and offsite emergency response organizations to respond to a nuclear emergency. Participation by State and local governments in emergency planning for nuclear power plants in the United States was, and still remains, largely voluntary. Before the accident at Three Mile Island Unit 2, there had been no clear obligation for State and local governments to develop emergency plans for radiological accidents, and the Federal role was one of assistance and guidance. After the accident, the NRC amended its emergency planning regulations to require, as a condition of licensing, that each applicant or licensee submit the radiological emergency response plans of the State and local governments that are within the plume exposure zone, as well as the plans of State governments within the ingestion pathway zone (10 CFR 50.33(g) and 10 CFR 50.54(s)).

In December 1979, the President directed FEMA to take the lead in ensuring the development of acceptable State and local offsite emergency plans and activities for nuclear power plants. The NRC and FEMA regulations, as well as a memorandum of understanding between the two agencies, dated June 17, 1993, subsequently codified the role and responsibilities of FEMA.

FEMA provides its findings on the acceptability of the offsite emergency plans to the NRC, which has the ultimate responsibility for determining the overall acceptability of radiological emergency plans and preparedness for a nuclear power reactor. The NRC will not issue a license to operate a nuclear power reactor unless it finds that the state of onsite and offsite emergency preparedness provides reasonable assurance that protective measures can and will be taken in a radiological emergency. The NRC bases its decision on a review of the FEMA findings and determinations on whether State and local emergency plans are adequate and can be carried out, and on its own assessment of whether the onsite emergency plans are adequate and can be implemented (10 CFR 50.47(a)).

The principal guidance for preparing and evaluating radiological emergency plans for licensee, State, and local government emergency planners is NUREG-0654, a joint NRC and FEMA document. NUREG-0654 gives evaluation criteria for meeting the emergency planning standards in the NRC and FEMA regulations (10 CFR 50.47(b) and 44 CFR Part 350, "Review and Approval of State and Local Radiological Emergency Plans and Preparedness," respectively). These criteria provide a basis for licensees, States, and local governments to develop acceptable emergency plans.

The NRC and FEMA coordinate their evaluation of periodic emergency response exercises and require all operating nuclear power plant sites to conduct an exercise every 2 years, as outlined in Section IV.F.2(b) of 10 CFR Part 50, Appendix E. These mandatory full-participation exercises are integrated efforts by the licensee, State, and local radiological emergency response organizations that have a role in support of the licensee's emergency plan. The NRC evaluates the licensee's performance, while FEMA evaluates the response by State and local agencies. In some cases, other Federal response agencies also participate in these exercises. Any weaknesses or deficiencies identified by the NRC or FEMA as a result of the exercise must be corrected through appropriate remedial actions. Section IV.F.2(d) of Appendix E, requires the State's response personnel to participate in biennial exercises of their plume exposure pathway plans every 2 years and in an ingestion pathway exercise with a nuclear power plant located within their State every 6 years. However, there are no requirements to involve members of the public in any of the emergency preparedness exercises.

16.3 Emergency Classification System and Emergency Action Levels

NRC regulations establish four classes of emergencies in order of increasing severity: (1) unusual event, (2) alert, (3) site area emergency, and (4) general emergency. The specific class of emergency is declared on the basis of plant conditions that trigger the emergency action levels. Licensees have established specific procedures for carrying out emergency plans for each class of emergency. The event classification initiates all appropriate actions for that class, including notification of offsite authorities, activation of onsite and offsite emergency response organizations, and -- where appropriate -- protective action recommendations for the public. These same emergency classes are also found in the State and local emergency plans that support each nuclear power plant.

NUREG-0654 gives examples of initiating conditions for each of the four emergency classes. These conditions form the basis for each licensee to establish specific indicators, known as "emergency action levels." These levels provide a clear basis for rapidly identifying a possible problem, alerting the onsite emergency response organization, and notifying the offsite authorities that an emergency exists. NRC regulations require the licensee, State, and local government authorities to discuss and agree upon the emergency classification levels, which the NRC must approve. In RG 1.101, Revision 4, "Emergency Planning and Preparedness for Nuclear Power Reactors," dated July 2003, the NRC endorsed the guidance in NUMARC/NESP-007, Revision 2, "Methodology for Development of Emergency Action Levels," dated January 1992; and NEI 99-01, Revision 4, "Methodology for Development of Emergency Action Levels," dated January 2003, as acceptable alternatives for developing emergency action levels.

16.4 Recommendations for Protective Action in Severe Accidents

The technical basis and guidance for determining protective actions in the United States for severe (core damage) reactor accidents appear in NUREG-0654/FEMA-REP-1, Supplement 3, Revision 1, "Criteria for Protective Action Recommendations for Severe Accidents," dated July 1996, and EPA 400-R-92-001, "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," dated May 1992. These documents reflect the conclusions that were developed from severe accident studies, such as NUREG-1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants," dated December 1990.

The agency provides guidance for response procedures and training manuals for NRC staff in NUREG/BR-0150, Volume 1, Revision 4, "Response Technical Manual 96," dated March 1996. The NRC's guidance on evacuation and sheltering in the event of a nuclear power plant accident is consistent with guidance in IAEA TECDOC-953, "Method for the Development of Emergency Response Preparedness for Nuclear or Radiological Accidents," and TECDOC-955, "Generic Assessment Procedures for Determining Protective Actions During a Reactor Accident," both issued in 1997.

The NRC considers evacuation and sheltering to be the two primary protective actions and prefers prompt evacuation for the population near a plant in a severe reactor accident. However, the NRC is currently evaluating this position, as under some circumstances, it may be better to shelter in place. A draft revision to NUREG-0654/FEMA-REP-1, Supplement 3, was published in the *Federal Register* on March 8, 2010, for public comment and placed on http://www.regulations.gov under docket NRC-2010-0080.

A supplemental protective action for the general population is using the thyroid-blocking agent potassium iodide. The NRC amended its regulations for emergency planning associated with potassium iodide, 10 CFR 50.47(b)(10), in 2001. This amendment requires that each State consider giving potassium iodide to the general public as a protective measure, supplementing the evacuation and sheltering protective actions. The NRC found that potassium iodide is a reasonable, prudent, and inexpensive supplement to evacuation and sheltering for specific local conditions. For States that choose to give potassium iodide to the general public as part of their emergency plans, the NRC funded an initial supply and replenishment of expired potassium iodide tablets. To date, 23 States have asked for and received potassium iodide tablets, which the NRC distributes in 65 milligram pills. In January 2002, the NRC, in cooperation with the cognizant agencies, updated the Federal policy statement on potassium iodide prophylaxis to reflect the changes in NRC regulations. In September 2006, the Commission approved replenishment plans for initial State supplies.

16.5 Inspection Practices—Reactor Oversight Process for Emergency Preparedness

The NRC's Reactor Oversight Process addresses emergency preparedness. The process allows licensees to manage their own emergency preparedness programs, including corrective actions, as long as the performance indicators and inspection findings are within an acceptable performance band. The NRC handles inspection findings through its significance determination process. Article 6 of this report discusses the NRC's Reactor Oversight Process and significance determination process.

Emergency preparedness is a component of the Reactor Oversight Process, one of its seven cornerstones of safety. The objective of this cornerstone is to "ensure that the licensee is capable of implementing adequate measures to protect the public health and safety during a radiological emergency." Oversight of this cornerstone is achieved through three performance indicators and a supporting risk-informed inspection program. The performance indicators are drill and exercise performance, emergency response organization drill participation, and alert and notification system reliability. The performance indicator for drill and exercise performance monitors timely and accurate licensee performance in drills, exercises, and actual events when presented with opportunities to classify emergencies, notify offsite authorities, and recommend protective actions. The indicator for emergency response organization drill participation measures the percentage of key members of the licensee's emergency response organization who have participated in proficiency-enhancing drills, exercises, training opportunities, or an actual event over a determinant amount of time. The alert and notification system reliability indicator monitors the reliability of the offsite alert and notification system, which is a critical link for communicating with the public.

The emergency preparedness cornerstone of the Reactor Oversight Process includes the following areas for inspection:

- Correction of Emergency Preparedness Weaknesses - Inspectors evaluate the licensees' programs on problem identification and resolution for emergency preparedness.

- Drill Evaluation - Inspectors evaluate drills and simulator-based training evolutions in which shift operating crews and licensee emergency response organization members participate.

- Exercise Evaluation - Inspectors independently observe the licensee's performance in classifying, notifying, and developing recommendations for protective actions, and other activities during the exercise. The inspectors also ensure that the licensee's self-critique is consistent with their observations.

- Alert and Notification System Evaluation - Inspectors verify how well the testing program complies with program procedures.

- Emergency Action Level Changes - Inspectors review all of the licensee's changes to emergency action levels to determine if any of the changes have decreased the effectiveness of the emergency plan.

- Emergency Response Organization Staffing and Augmentation System - Inspectors review the augmentation system to determine whether, as designed, it will support augmentation of the emergency response organization in accordance with the goals for activating the emergency response facility.

- Reactor Safety/Emergency Preparedness - Inspectors verify that the data reported for the performance indicator values are valid.

- Emergency Plan Changes - Inspectors sample changes to the emergency plan to ensure that the effectiveness of the emergency plan has not decreased.

- Force-on-Force Exercise Evaluation - Inspectors primarily assess the nuclear plant's physical protection strategy to defend against the design basis threat. A full inspection, spanning several weeks, includes both table-top drills and exercises, which simulate combat between a mock commando-type adversary force and the nuclear plant security force. As part of these inspections, the NRC's inspectors assess the licensee's integration of emergency response actions into its overall response to the threats.

It is important to note, however, that even though FEMA has no direct regulatory authority over State or local governments and their full-participation exercise evaluations are not considered inspections, FEMA's exercise findings carry substantial weight in the NRC regulatory process. FEMA notifies the State government and the NRC of any significant deficiencies in offsite performance shortly after the exercise. FEMA also issues a formal exercise report within 90 days of the exercise's completion describing the FEMA exercise findings. Because of the potential effect of deficiencies on offsite emergency preparedness, findings are expected to be corrected within 120 days of the exercise. Failure of offsite organizations to correct deficiencies promptly could lead FEMA to withdraw its finding of "reasonable assurance." This would cause the NRC to assess the continued operation of the facility.

16.6 Responding to an Emergency

Fundamental changes in the response to national emergencies have occurred as a result of the publication of the National Response Framework in January 2008 and the update of its associated annexes. Additionally, DHS has revised and republished the National Incident Management System (NIMS) document in December 2008.

This section explains the roles of the NRC, other Federal agencies, licensees, States, and local governments during the response to an incident. It also explains the security issues associated with supporting the response efforts.

16.6.1 Federal Response

The Federal response structure has been revamped with the creation of DHS and the implementation of Homeland Security Presidential Directive 5, "Management of Domestic Incidents," dated March 4, 2003. This directive establishes the Secretary of Homeland Security as the primary Federal official for managing domestic incidents. Under the Homeland Security Act of 2002, DHS is responsible for coordinating Federal operations within the United States to prepare for, respond to, and recover from terrorist attacks, major disasters, and other emergencies.

DHS will assume overall Federal incident management coordination responsibilities when any one of the following four conditions applies:

(1) A Federal department or agency acting under its own authority has requested DHS assistance.

(2) The resources of State and local authorities are overwhelmed, and the appropriate State and local authorities have requested Federal assistance.

(3) More than one Federal department or agency has become substantially involved in responding to the incident.

(4) The President of the U.S. has directed the Secretary to assume incident management responsibilities.

In 2008, the governing documents outlining the responsibilities of the Secretary of Homeland Security, DHS, and other Federal, State, and local entities were updated. These documents were related to NIMS and the National Response Framework and its associated annexes.

NIMS is a comprehensive, national approach to incident management that is applicable at all jurisdictional levels and across functional disciplines. NIMS enables Federal, State, and local entities to work together to prevent, protect against, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity, in order to reduce the loss of life and property and harm to the environment. NIMS provides an organized set of scalable and standardized operational structures that is critical for allowing various organizations and agencies to work together in a predictable, coordinated manner.

NIMS works hand-in-hand with the National Response Framework. NIMS provides the template for the management of incidents, while the National Response Framework describes the structures and mechanisms for national-level policy for incident management. The National Response Framework provides guidance on Federal coordinating structures and processes to prepare for, respond to, and recover from domestic incidents such as terrorist attacks, major disasters, and other emergencies.

The Federal response to a potential nuclear or radiological incident is designed to support the efforts of the facility operator and offsite officials. For such emergencies, Federal response activities are carried out in accordance with the National Response Framework's Nuclear/Radiological Incident Annex, which describes the roles of DHS, coordinating agencies (e.g., the NRC during an incident with one of its licensees), and other supporting Federal agencies. During an incident that meets the criteria of Homeland Security Presidential Directive 5 (invoked during a terrorist-related incident or at a general emergency level for an NRC licensee), DHS is responsible for the overall domestic incident management, while the coordinating agency coordinates the Federal on-scene actions and helps State and local governments determines measures to protect life, property, and the environment. The coordinating agency may respond as part of the Federal response as requested by DHS under the framework, or in accordance with its own authorities. During less severe incidents, coordinating agencies will oversee the onsite response, monitor and support owner or operator activities (when there is an owner or operator), provide technical support to the owner or operator if asked, serve as the principal Federal source of information about onsite conditions, and, if asked, advise the State and local government agencies on implementing protective actions. The coordinating agency will also provide a hazard assessment of onsite conditions that might have significant offsite effects and ensure that onsite measures are taken to mitigate offsite consequences.

16.6.2 Licensee, State, and Local Response

The NRC recognizes the nuclear power plant operator (licensee) and the State or local government as the two primary decisionmakers during a radiological incident at a licensed power reactor. The licensee is primarily responsible for mitigating the consequences of an incident on site and recommending timely protective actions to State and local authorities. The States or local governments are ultimately responsible for implementing appropriate protective actions for public health and safety.

16.6.3 The NRC's Response

In fulfilling its legislative mandate to protect the public health and safety, the NRC has developed a plan and procedures detailing its response to incidents involving licensed material and activities (NUREG-0728, Revision 4, "NRC Incident Response Plan," dated April 14, 2005). In accordance with that plan, the NRC will initially assess any reported event and decide whether or how it will respond as an agency. To meet its statutory and regulatory obligations as the coordinating agency, the NRC will usually dispatch a team to the site for all serious incidents. The team may help the State interpret and analyze technical information, update other responding Federal agencies on event conditions, and coordinate any multiagency Federal response.

Once the NRC has decided to respond as an agency, it activates the NRC Headquarters Operations Center in Washington, DC, and the associated regional incident response center. The NRC Headquarters Operations Center will then take the following actions: (1) maintain continuous communications with the facility, (2) assess the incident, (3) advise the facility operator and offsite officials, (4) coordinate the Federal radiological response with other Federal agencies, and (5) respond to inquiries from the national media. The staff at the NRC Headquarters Operations Center includes emergency preparedness and response experts and personnel experienced with liaison activities. Because regional office personnel usually have firsthand knowledge of the details of the affected facility, early in an incident the Regional Administrator provides operational authority from the affected regional office and, if necessary, from the regional incident response center. When NRC onsite presence is required, the NRC will dispatch a team from the affected regional office.

As soon as the NRC site team arrives at the facility and is ready to assume the agency's leadership role, it may be delegated certain responsibilities that may include the authority to direct the agency's on site response.

The NRC site team consists of many technical specialists and representatives who respond to the designated response centers used by the facility and offsite officials to coordinate the response. These response centers include the affected State's emergency operations center, the first-responder's incident command post, the joint information center, established by the facility or local government to interact with the media, and, if necessary, the joint field office (the primary Federal incident management field structure that is usually established 48 to 72 hours after an incident). Through participation in these response centers, the NRC site team has access to wide-ranging State and Federal response assets, as well as to extensive radiological monitoring capabilities through DOE (i.e., field teams and aerial monitoring).

The NRC regularly participates in nuclear power plant, and Federal interagency exercises each year to ensure its readiness to respond. The NRC also participates in the planning and conduct of the Eagle Horizon and National Level exercises each year. The NRC's participation in such exercises gives the agency a valuable perspective on multi-event response. This perspective improves interagency cooperation and imparts a better understanding of response roles during emergencies.

16.6.4 Aspects of Security that Support Response

Before September 11, 2001, the security measures at nuclear facilities provided reasonable assurance that public health and safety would be protected in the event of an attack encompassed by the design-basis threats for radiological theft and sabotage, which are described in 10 CFR 73.1, "Purpose and Scope." Since September 11, 2001, the nuclear industry has significantly enhanced its defensive capability through the voluntary actions taken by licensees in response to NRC advisories and as required by the orders issued on February 25, 2002, January 7, 2003, and April 29, 2003. The enhancements outlined in the orders include security measures against threats from an insider, waterborne attack, vehicle bomb attack, and land-based assault. The three orders issued on April 29, 2003, also identified a revised design basis threat against which licensees must be prepared to defend. The NRC has codified through rulemaking many of the security requirements that it newly imposed on licensees by order following September 11, 2001. The NRC will consider additional measures in the future as necessary. (The Other Major Regulatory Accomplishments section of this report provides more details about the power reactor security rulemaking.)

The NRC receives a substantial and steady flow of information from the national intelligence community, law enforcement, and licensees and continually evaluates this information to assess threats to regulated facilities or activities. The NRC works with a variety of other Federal agencies, particularly DHS and the Federal Bureau of Investigation, to ensure that security around nuclear power plants is well coordinated and that law enforcement responders are prepared for a significant event. If an event were to occur, the NRC would have significant resources accessible to it and as many as 18 Federal agencies available to help mitigate the radiological consequences of a serious accident or successful attack.

16.7 International Arrangements

The NRC has agreements with its neighbors, principally Canada and Mexico, and commitments to IAEA.

Under its signed agreements with Canada and Mexico, the NRC will promptly notify and exchange information in the event of an emergency that has the potential for trans-boundary effects. The agreement with Canada, "Agreement Between the Government of the United States of America and the Government of Canada on Cooperation in Comprehensive Civil Emergency Planning and Management," is implemented by the procedure specified in "Administrative Arrangement Between the United States Nuclear Regulatory Commission and the Atomic Energy Control Board of Canada for Cooperation and the Exchange of Information in Nuclear Regulatory Matters," both dated June 21, 1989. The agreement between the NRC and the Canadian Nuclear Safety Commission, which replaced the Atomic Energy Control Board, was most recently renewed in 2007.

The agreement with Mexico, "Agreement for the Exchange of Information and Cooperation in Nuclear Safety Matters," is implemented by the "Implementing Procedure for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters Between the Nuclear Regulatory Commission of the United States of America and the Comision Nacional de Seguridad Nuclear y Salvaguardias of Mexico," both dated October 6, 1989. This agreement was most recently renewed in 2007.

To meet the U.S. commitment under the IAEA Convention on Early Notification of a Nuclear Accident, the NRC will promptly notify IAEA if a serious accident occurs at a commercial nuclear power plant. Afterward, the NRC will work with the U.S. Department of State to update IAEA.

Since 2001, the United States has fully participated in the International Nuclear Event Scale by evaluating operating reactor events and reporting to IAEA any events resulting in a categorization of International Nuclear Event Scale Level 2 or higher.

ARTICLE 17. SITING

Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented for

(i) evaluating all relevant site-related factors that are likely to affect the safety of a nuclear installation for its projected lifetime

(ii) evaluating the likely safety impact of a proposed nuclear installation on individuals, society, and the environment

(iii) re-evaluating, as necessary, all relevant factors referred to in subparagraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation

(iv) consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request, providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation

This section explains the NRC's responsibilities for siting, which include site safety, environmental protection, and emergency preparedness. First, this section discusses the regulations applying to site safety and their implementation, emphasizing regulations applying to seismic, geological, hydrological, meteorological, and radiological assessments. Next, it explains environmental protection. Article 16 of this report discusses emergency preparedness and international arrangements, which would apply to Contracting Parties in obligation iv, above.

17.1 Background

The NRC's siting responsibilities stem from the Atomic Energy Act, the Energy Reorganization Act, and the National Environmental Policy Act. These statutes confer broad regulatory powers on the Commission and authorize the NRC to promulgate regulations that it deems necessary to fulfill its responsibilities under the acts.

The NRC's siting regulations are integral to protecting public health and safety and the environment. Siting away from densely populated centers has been, and will continue to be, an essential component of the NRC's defense-in-depth safety philosophy (see Article 18 of this report), which also includes multiple-barrier containment and redundant and diverse safety systems. The primary factors that determine public health and safety are reactor design and construction and operation of the facility. However, siting factors and criteria are important ensure that radiological doses from normal operation and postulated accidents will be acceptably low, natural phenomena and man-made hazards will be properly accounted for in the design of the plant, and the human environment will be protected during the construction and operation of the plant.

For the first time since the 1970s, the nuclear power industry in the United States is seeking approval for sites that could host new nuclear power plants. To ensure that the agency can effectively carry out its responsibilities associated with, among others, an early site permit application, the NRC consolidated regulatory functions to (1) manage near-term future licensing activities, (2) work with stakeholders on new reactor licensing activities, and (3) assess the NRC's readiness to perform new reactor licensing reviews.

In 2003, applicants submitted three early site permit applications to the NRC for sites in Virginia, Illinois, and Mississippi; in 2007, the NRC issued the three early site permits. In 2006, an applicant submitted an early site permit application for a site in Georgia with a subsequent request for authorization to perform limited work; in 2009 the NRC issued the permit and the limited work authorization. These four sites are near existing nuclear power plants, which enables the applicants to use existing physical and administrative infrastructures, programs, and siting information and to reduce the effects on the environment compared with using an undeveloped location. In 2010, one applicant submitted an early site permit application for a previously undeveloped ("green-field") site in Texas and another applicant submitted an early site permit application for a site near existing nuclear power plants in New Jersey.

In anticipation of these applications and to ensure that future license applicants and the public understand the NRC's process for reviewing programs and siting information, the NRC documented its review process and criteria in RS-002, "Processing Applications for Early Site Permits," dated May 3, 2004.

The NRC received an unprecedented number of applications that require siting evaluations under the combined license application provisions of 10 CFR Part 52. While many of these applications were for locations close to existing facilities, some will be at locations where applicants requested construction permits under 10 CFR Part 50 but plants were not completed, and others at "green-field" sites. In 2007, applicants submitted five combined license applications for a total of eight units for sites in Texas, Alabama, Maryland, Virginia, and South Carolina. In 2008, applicants submitted 11 combined license applications for a total of 16 units for sites in North Carolina, Mississippi, South Carolina, Florida, Michigan, Texas, Louisiana, Missouri, New York, and Pennsylvania. In 2009, one applicant submitted a combined license application for two units at a site in Florida.

17.2 Safety Elements of Siting

This section explains the safety elements of siting. After providing a short background, it explains seismic and geological assessments. Finally, it discusses radiological assessments performed for initial licensing, as a result of facility changes, and according to regulatory developments since the licensing of all U.S. operating plants.

17.2.1 Background

The NRC's site safety regulations consider societal and demographic factors, manmade hazards (such as airports and dams), and physical characteristics of the site (such as hydrological, seismic, and meteorological factors) that could affect the design of the plant. The requirements are specified in 10 CFR Part 100, "Reactor Site Criteria," Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," 10 CFR Part 100, Subpart B, "Evaluation Factors for Stationary Power Reactor Site Applications on or after January 10, 1997," and 10 CFR 100.23, "Geologic and Seismic Siting Criteria." The requirements in 10 CFR 100.23 apply to applicants for an early site permit, a combined license, a construction permit, or an operating license on or after January 10, 1997. RGs 1.27, Revision 2, "Ultimate Heat Sink for Nuclear Power Plants," dated January 1976; RG 1.59, Revision 2, "Design Basis Floods for Nuclear Power Plants," dated August 1977; RG 1.102, Revision 1, "Flood Protection for Nuclear Power Plants," dated September 1976; and RG 1.208, "A Performance-Based Approach to Define the Site-Specific

Earthquake Ground Motion," dated March 2007, describe methods acceptable to NRC staff for implementing those requirements.

The applicant's safety analysis report must describe the physical characteristics in and around the site and contain accident analyses that are relevant to evaluating the suitability of a site. A number of RGs provide guidance on issues of site safety that applicants need to address. NUREG-0800 guides the staff in reviewing the site safety content of these reports. RS-002 identifies parts of NUREG-0800 that apply to the review of early site permits.

Once licensed to operate, the licensee is expected to monitor the environs around the nuclear power plant and report in its safety analysis report changes in the environs that may affect the continued safe operation of the facility.

17.2.2 Assessments of Seismic and Geological Aspects of Siting

The NRC's siting regulations listed in Section 17.2.1 of this report detail the assessments applying to seismic and geologic aspects of siting. Recent developments in assessments include the performance-based approach for determining the site-specific ground motion response spectrum and the safe-shutdown earthquake. The performance-based approach combines the site seismic hazard curves and seismic fragility curves for nuclear structures to meet a specified performance target. RG 1.208, which the NRC developed as a replacement for RG 1.165, "Identification and Characterization of Seismic Sources and Determination of Safe Shutdown Earthquake Ground Motion," dated March 1977, describes this new approach in detail.

RG 1.208 also incorporates recent developments in seismic hazard assessment, including the use of cumulative absolute velocity filtering in place of a lower-bound magnitude cutoff and guidance on the development of earthquake time histories, site response analysis, and the location of the ground motion response spectrum within the soil profile.

In 2003, the three early site permit applicants used the EPRI central and eastern U.S. seismic source models as a starting point for their site applications. Applicants updated the EPRI source models to reflect advances in central and eastern U.S. seismic and geologic source modeling. In 2004, EPRI also updated its ground motion models for generic use in new plant probabilistic seismic hazard analyses for sites located in the central and eastern U.S.

The NRC reviews and certifies advanced reactor designs under 10 CFR Part 52. The designs use high seismic design input that is independent of any site but capable of being sited in most currently existing sites. The NRC requires all new and advanced reactor designs to demonstrate that they have a plant-level seismic margin of 1.67 times the design-basis safe-shutdown earthquake with high confidence (i.e., 95 percent) in low (i.e., 5 percent) probability of failure.

17.2.3 Assessments of Radiological Consequences

The Reactor Site Criteria Rule, 10 CFR Part 100, is the regulation under which all U.S. operating plants were licensed. It contains provisions for assessing whether radiological doses from postulated accidents will be acceptably low. The NRC has issued the following regulatory guidance for licensees to implement the requirements regarding of 10 CFR Part 100:

- RG 1.3, Revision 2, "Assumptions Used for Evaluating the Potential Radiological

Consequences of a Loss-of-Coolant Accident for Boiling-Water Reactors," dated June 1974

- RG 1.4, Revision 2, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss-of-Coolant Accident for Pressurized-Water Reactors," dated June 1974

- RG 1.145, Revision 1, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants," dated November 1982

Although applicants analyze dose primarily to support reactor siting, licensees are required to evaluate the potential increase in the consequences of accidents that might result from modifying facility SSCs. Commitments (including the radiological acceptance criteria) made by the applicant during siting and documented in its final safety analysis report remain binding until modified. A licensee must evaluate the potential consequences of design changes against these radiological criteria to demonstrate that the changes will result in a design that still conforms to the regulations and commitments. If the consequences increase more than minimally, as outlined in 10 CFR 50.59 or require a change to the technical specifications, as discussed in Article 14 of this report, the licensee must obtain NRC approval before implementing the proposed modification.

Regulatory developments since the licensing of all U.S. plants now operating include a revision to 10 CFR Part 100 in 1996; NUREG-1465, "Accident Source Terms for Light-Water Nuclear Power Plants," dated February 1995; RG 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," dated July 2000, which guided the use of NUREG-1465; and 10 CFR 50.67, "Accident Source Term," which allowed licensees to use alternative source terms.

The NRC has applied the 1996 revision to 10 CFR Part 100, along with the alternative source term, in its design certification review for a passive advanced light-water reactor, the AP600. More recently, the agency has applied the practice to the AP1000 reactor with similar results and is applying it for all contemplated light-water reactor design certification application reviews, including the Economic Simplified Boiling-Water Reactor (ESBWR), the U.S. EPR, and the U.S. Advanced Pressurized Water Reactor (US-APWR). For other than light-water reactor designs, including advanced reactors, applicants will have to describe their rationale for an appropriate accident source term characterization that will be subject to NRC independent review.

The industry continues to explore the use of the alternative source term in implementing cost-beneficial licensing actions at operating reactors. Some of these applications resulted in improved safety equipment reliability and reduced occupational exposures. Since the issuing of 10 CFR 50.67, more than half of the operating reactor licensees requested either full implementation of the alternative source term or selective implementation for certain regulatory applications. Operating plant licensees have also used the alternative source term to analyze the adequacy of certain engineered safety features in meeting the operability requirements in their operating reactor technical specifications.

17.3 Environmental Protection Elements of Siting

This section explains the environmental protection elements of siting. It covers the governing documents and site approval process. Since the last operating plants in the United States received licenses, issues have arisen that must be considered in siting reviews. This section explains the effect of these issues.

17.3.1 Governing Documents and Process

The environmental protection elements of siting consist of the plant's demands on the environment (e.g., water use and effects of construction and operation). These elements are addressed in 10 CFR Part 51, which implements the National Environmental Policy Act consistent with the NRC's statutory authority and reflects the agency's policy to voluntarily apply the regulations of the President's Council on Environmental Quality, subject to certain conditions. Integrating environmental reviews into its routine decisionmaking, the NRC considers environmental protection issues and alternatives before taking any action that may significantly affect the human environment.

The site approval process leading to the construction or operation of a nuclear power plant requires the NRC to prepare an environmental impact statement. The updated and revised environmental standard review plans (NUREG-1555, "Standard Review Plans for Environmental Reviews for Nuclear Power Plants," dated March 2000) guide the staff's environmental reviews for a range of applications, including green field site reviews for construction permits and operating licenses under 10 CFR Part 50, for early site permits under 10 CFR Part 52, Subpart A, "Early Site Permits," and for combined licenses under 10 CFR Part 52, Subpart C, "Combined Licenses," when the application does not reference an early site permit. The NRC issued updates to review practices in 2007 and 2010 to reflect experience gained from early site permit reviews, account for the changes resulting from the amendment to the limited work authorization rule (discussed later in this section), and include consideration of the environmental effects of greenhouse gas emissions and climate change. Article 19 of this report, in RG 1.206, "Combined Operating Licenses for Nuclear Power Plants," dated June 2007, and RS-002, dealing with early site permits, discuss these governing documents and processes. Environmental standard review plans are also appropriate for environmental reviews of applications for combined licenses under 10 CFR Part 52, Subpart C, when the applications reference an early site permit. Reviews of early site permit applications are limited because the reviews focus on the environmental effects of reactor construction and operation that have characteristics that fall within the postulated site parameters and because the reviews need not assess benefits (e.g., the need for power) or alternative energy sources. The environmental information in applications for combined licenses that reference an early site permit is limited to (1) information to demonstrate that the design of the facility falls within the parameters specified in the early site permit, (2) new and significant information on issues previously considered in the early site permit proceeding, and (3) any significant environmental issue not considered in any previous proceeding on the site or design.

The environmental standard review plans in Supplement 1 to NUREG-1555 guide the staff's environmental review for license renewal applications under 10 CFR Part 54. Article 14 of this report discusses the license renewal process in more detail.

Several other NRC actions on siting and site suitability require environmental reviews, including issuance of limited work authorizations (10 CFR 50.10(e); 10 CFR 52.25, "Extent of Activities Permitted"; and 10 CFR 52.91, "Authorization to Conduct Site Activities"), early partial decisions (10 CFR 2.600, "Scope of Subpart," in Subpart F, "Additional Procedures Applicable to Early Partial Decisions on Site Suitability Issues in Connection with an Application for a Permit to Construct Certain Utilization Facilities," of 10 CFR Part 2), and pre-application early reviews of site suitability issues (Appendix Q, "Pre-application Early Review of Site Suitability Issues," to 10 CFR Part 50).

With its 2007 amendment to the limited work authorization licensing framework (10 CFR 50.10, "License Required; Limited Work Authorization"), the Commission limited its authority to construction activities that have a "reasonable nexus to radiological health and safety or common defense and security" and defined "construction" within the context of its authority. The effect of this change is not limited to limited work authorizations. Other activities related to building the plant that do not require NRC approval (but may require a permit from other regulatory agencies) may occur before, during, or after NRC-authorized construction activities. These activities called "preconstruction" in 10 CFR 51.45(c), may be regulated by other local, State, Tribal or Federal agencies. On September 12, 2008, the NRC and the U.S. Army Corps of Engineers signed an updated memorandum of understanding to enhance the effectiveness of reviews of nuclear power plant license applications that would require multiple Federal permits under separate statutes. The NRC and the U.S. Army Corps of Engineers are participating as cooperating agencies in the preparation of many environmental impact statements.

17.3.2 Other Considerations for Siting Reviews

Since the NRC last issued construction permits under 10 CFR Part 50 in the 1970s and coincident with the publication of the initial environmental standard review plan, many changes to the regulatory environment have affected the NRC and applicants seeking site approvals. These include new environmental laws and regulations, changes in policies and procedures resulting from decisions of courts and administrative hearing boards, and changes in the types of authorizations, permits, and licenses issued by the NRC. This section highlights some of these changes and their effects on the environmental standard review plans.

In the late 1980s, the NRC issued regulations that gave an alternative licensing framework to 10 CFR Part 50, which required a construction permit followed by an operating license. The new framework in 10 CFR Part 52 introduced the concepts of approving designs independent of sites and approving sites independent of designs, and then efficiently linked the approvals to approve construction and operate the facility. As discussed in Section 17.1 of this report, the NRC has received four early site permit applications under 10 CFR Part 52 and is actively conducting siting reviews.

Toward that end, the NRC issued RS-002, which embodies the environmental guidance in NUREG-1555, the environmental standard review plan, and the outcome of interactions with stakeholders. In addition, in 2007, the NRC revised 10 CFR Part 52 to reflect experience gained in its use and to provide guidance on the preparation of combined license applications; as part of that rulemaking the NRC issued RG 1.206, which includes guidance on the assessment of environmental issues.

As described in previous U.S. National Reports, other relevant regulatory developments include the following:

- Presidential Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low-Income Populations," dated February 1994, which instructed Federal agencies to make "environmental justice" part of each agency's mission by addressing disproportionately high and adverse human health or environmental effects of Federal programs, policies, and activities on minority and low-income populations

- the Yellow Creek Decision, which determined that the authority of the NRC is limited in matters that are expressly assigned to EPA
- changes in the economic regulation of utilities that have expanded the options to be addressed in considering the need for power in environmental impact statements
- design alternatives to mitigate the consequences of severe accidents
- EPA rules about cooling water intake structures

17.4 Consultation with Other Contracting Parties To Be Affected by the Installation

At this time, the NRC does not have any specific international arrangements with neighboring states for siting new builds. However, the agency's current arrangements with its Canadian and Mexican regulatory counterparts for the exchange of information and experience would serve as the mechanism for any cooperative dialogue if such a situation arose.

ARTICLE 18. DESIGN AND CONSTRUCTION

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defense in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur

(ii) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis

(iii) the design of a nuclear installation allows for reliable, stable, and easily manageable operation, with specific consideration of human factors and the man-machine interface

This section explains the defense-in-depth philosophy and how it is embodied in the general design criteria of U.S. regulations. It explains how applicants meet the defense-in-depth goals and how the NRC reviews applications and conducts inspections before issuing licenses to ensure that this philosophy is implemented in practice. Next, this section discusses measures for ensuring that the applications of technologies are proven by experience or qualified by testing or analysis. Finally, this section discusses requirements for reliable, stable, and easily manageable operation, specifically considering human factors and the man-machine interface. Article 12 of this report also provided information on these obligations.

18.1 Defense-in-Depth Philosophy

This section explains the defense-in-depth philosophy followed in regulatory practice, governing documents and regulatory process for designing and constructing a nuclear power plant. It also discusses relevant experience and examples.

18.1.1 Governing Documents and Process

The defense-in-depth philosophy, as applied in regulatory practice, requires that nuclear plants contain a series of independent, redundant, and diverse safety systems. The physical barriers for defense in depth in a light-water reactor are the fuel matrix, the fuel rod cladding, the primary coolant pressure boundary, and the containment. The levels of protection in defense in depth are (1) a conservative design, quality assurance, and safety culture, (2) control of abnormal operation and detection of failures, (3) safety and protection systems, (4) accident management, including containment protection, and (5) emergency preparedness.

Appendix A to 10 CFR Part 50 embodies the defense-in-depth philosophy. General design criteria cover protection by multiple fission product barriers, protection and reactivity control systems, fluid systems, containment design, and fuel and radioactivity control. The NRC staff amplified its defense-in-depth philosophy in RG 1.174, which provides guidance on using a PRA in risk-informed decisions on plant-specific changes. The general design criteria establish the minimum requirements for the principal design criteria, which in turn establish the necessary design, fabrication, construction, testing, and performance requirements for SSCs that are important to safety.

To ensure that a plant is properly designed and built as designed, that proper materials are used in construction, that future design modifications are controlled, and that appropriate maintenance and operational practices are followed, a good quality assurance program is needed. To meet this need, 10 CFR Part 50, Appendix A, General Design Criterion 1, "Quality Standards and Records," and its implementing regulatory requirements specified in 10 CFR Part 50, Appendix B, establish quality assurance requirements for all activities affecting the safety-related functions of the SSCs.

Pursuant to the two-step licensing process under 10 CFR Part 50, an applicant for a construction permit must present the principal design criteria for a proposed facility in its preliminary safety analysis report (see 10 CFR 50.34, "Contents of Applications; Technical Information"). For guidance in writing a safety analysis report, the applicant may use RG 1.70. The safety analysis report must also contain design information for the proposed reactor and comprehensive data on the proposed site. The report must also discuss various hypothetical accident situations and the safety features to prevent accidents or, if accidents occur, to mitigate their effects on both the public and the facility's employees.

After obtaining a construction permit under 10 CFR Part 50, the applicant must submit a final safety analysis report to support an application for an operating license, unless it submitted the report with the original application. This report should give the details of the final design of the facility, plans for operation, and procedures for coping with emergencies. The preliminary and final safety analysis reports are the principal documents the applicant provides for the staff to determine whether the proposed plant can be built and operated without undue risk to the health and safety of the public. The NRC expects that future applications to build nuclear power plants will use the combined license process under 10 CFR Part 52. Applications submitted under 10 CFR Part 52 must meet all of the 10 CFR Part 50 requirements. A significant difference in the 10 CFR Part 52 process is that the final safety analysis report must be submitted before authorization is granted to begin construction. Article 19 of this report describes the combined license review process.

The NRC staff reviews safety analysis reports according to NUREG-0800 to ensure that the applicant has satisfied the general design criteria and other applicable regulations. The staff reviews each application to determine whether the plant design meets the Commission's regulations (10 CFR Part 20, 10 CFR Part 50, 10 CFR Part 73, "Physical Protection of Plants and Materials," and 10 CFR Part 100). These reviews include, in part, the characteristics of the site. In addition, each application for a nuclear installation must include a comprehensive environmental report that provides a basis for evaluating the environmental impact of the proposed facility. RG 4.2, Revision 2, "Preparation of Environmental Reports for Nuclear Power Stations," dated July 1976, gives applicants information on writing environmental reports. The NRC staff reviews the environmental reports according to NUREG-1555. In reviewing an application, the staff, supported by outside experts, conducts independent technical studies to review certain safety and environmental matters. The staff states its conclusions in an environmental impact statement and a safety evaluation report, which it may update before granting the license. Under the two-step licensing process in 10 CFR Part 50, the NRC does not issue an operating license until construction is complete and the Commission makes the findings required under 10 CFR 50.57, "Issuance of Operating License." For applications submitted under 10 CFR Part 52, the Commission must find that all acceptance criteria in the combined license are met before operation of the facility.

The NRC monitors nuclear power plant construction to ensure compliance with the agency's regulations to protect public health and safety and the environment. In anticipation that future applicants for construction of a nuclear power plant will apply for a combined license, the NRC has developed an inspection program for future nuclear plants licensed under 10 CFR Part 52.

The new inspection program revises the 10 CFR Part 50 Construction Inspection Program. It incorporates inspections, tests, analyses, and acceptance criteria (ITAAC) from 10 CFR Part 52, as well as lessons learned from the inspection program used in the previous construction era (1970-1980). It also considers modular construction at remote locations.

Before construction, the NRC inspection program focuses on the applicant's establishment of a quality assurance program to verify that applications submitted to the NRC meet specified requirements in 10 CFR Part 52 and are of a quality suitable for docketing. Inspection Manual Chapter 2501, "Construction Inspection Program: Early Site Permit (ESP)," dated October 3, 2007, lists inspections for this phase.

Once the NRC receives an application, the inspection program focuses on supporting the NRC staff's preparation for the mandatory Atomic Safety and Licensing Board hearing and the final Commission decision on whether a combined license should be granted. Inspection Manual Chapter 2502, "Construction Inspection Program: Pre-Combined License (Pre-COL) Phase," dated October 3, 2007, lists inspections for this phase.

During construction, inspectors sample the spectrum of the applicant's activities related to the ITAAC in the design-basis document to confirm that the applicant is adhering to quality and program requirements. NRC inspectors will verify successful ITAAC completion on a sampling basis and will review all ITAAC. The NRC will publish notices in the *Federal Register* of completed ITAAC. Inspection Manual Chapter 2503, "Construction Inspection Program: Inspections of Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)," dated October 3, 2007, lists inspections for this phase.

As the applicant completes construction, the inspection program focuses on verifying the adequacy of the licensee's preoperational programs such as fire protection, security, training, radiation protection, startup testing, and programs that enable the transition of the organization from construction to power operations. Inspection Manual Chapter 2504, "Construction Inspection Program—Inspection of Construction and Operational Programs," dated October 15, 2009, lists inspections for this phase.

18.1.2 Experience

18.1.2.1 Regulatory Framework for the Reactivation of Watts Bar Unit 2

The Watts Bar Nuclear Plant, owned by TVA, is located in southeastern Tennessee. The site has two Westinghouse designed PWRs. Watts Bar Unit 1 received a full-power operating license in early 1996 and was the last new power reactor licensed in the U.S. TVA stopped construction at Watts Bar Unit 2 in the mid-1980s. TVA has now resumed Watts Bar Unit 2 construction, and its operating license application is currently pending before the Atomic Safety and Licensing Board. The construction permit for Watts Bar Unit 2 is currently active and expires in 2013.

In its regulatory framework for the completion of Unit 2, TVA proposed and the Commission approved (staff requirements memorandum, dated July 25, 2007, on SECY-07-0096, "Possible

Reactivation of Construction and Licensing Activities for the Watts Bar Nuclear Plant Unit 2," dated June 7, 2007) a licensing review approach that employs the current licensing basis for Watts Bar Unit 1 as the reference basis for review and licensing of Unit 2. This approach will ensure safety while preserving design and operational consistency between the units. However, considering the construction status of the unit, the NRC encouraged TVA to adopt updated standards wherever feasible and look for opportunities to resolve any generic safety issues where the unirradiated state of Unit 2 makes the issue easier to resolve before plant operation. The NRC's licensing review will include safety design, environmental review, and inspection of construction activities.

TVA has updated its initial 1970s operating license application. The NRC has published notice of the operating license in the *Federal Register* to provide public notice and an additional opportunity for a hearing. To date, the Southern Alliance for Clean Energy has asked for and received a hearing before an Atomic Safety and Licensing Board. TVA has submitted its final supplemental environmental impact statement for the completion and operation of Watts Bar Unit 2. The NRC has also held public outreach meetings in the vicinity of the site to inform the public about its licensing and inspection activities, including how the public can monitor and participate in the licensing process.

The NRC has established a dedicated team at both at its headquarters and regional offices for review and inspection of the Unit 2 activities. The staff has independently reviewed TVA's regulatory framework and documented its results in a safety evaluation report (NUREG-0847, Supplement 21, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Unit 2," dated February 2009). The review identified the items that must be completed before issuance of an operating license. The NRC Region II office is performing necessary inspections and oversight activities. It developed Inspection Manual Chapter 2517, "Watts Bar Unit 2 Construction Inspection Program," dated February 2008, to provide guidance for these inspection activities. The NRC Region II office is examining historical inspection records, employee concerns, operating experience, scope of new or re-work, and construction deficiency reports. The NRC has established a resident inspector office, with a senior and two resident inspectors dedicated to performing inspections at Watts Bar Unit 2.

As always, safety is the NRC's main focus. Before issuing an operating license, the NRC will confirm that TVA has safely designed and constructed Watts Bar Unit 2 in accordance with regulatory requirements, and that the facility can be safely operated.

The NRC has established a Web page for its Watts Bar Unit activities at http://www.nrc.gov/reactors/plant-specific-items/watts-bar.html.

18.1.2.2 Design Certifications

For more than 30 years, the Atomic Energy Commission and the NRC have reviewed applications submitted under the two step licensing process in 10 CFR Part 50 and have documented their reviews in safety evaluation reports and supplements for 110 nuclear installations. Since 1997, the NRC has certified four standard plant designs under the design certification process in 10 CFR Part 52: GE's advanced BWR (1997), and Westinghouse System 80+ (designed and licensed by Combustion Engineering), AP600, and AP1000 (1997, 2000, and 2006 respectively). The NRC staff is currently performing the following design certification reviews: GE-Hitachi Nuclear Energy's, ESBWR, Westinghouse's AP1000 design certification amendment, AREVA Nuclear Power's US EPR, Mitsubishi Heavy Industries, Ltd.'s

US-APWR and South Texas Project Nuclear Operating Company's Advanced Boiling-Water Reactor (ABWR) design certification application to address the aircraft impact rule.

18.2 Technologies Proven by Experience or Qualified by Testing or Analysis

In 10 CFR 50.43(e), the NRC requires that new technologies are demonstrated to be proven. This rule requires demonstration of new technologies through analysis, appropriate test programs, experience, or a combination thereof. In its safety analysis reports for the AP600 and AP1000 standard plant designs, Westinghouse used separate effects tests, integral systems tests, and analyses to demonstrate that its passive safety systems will perform as predicted. Section 14.2 of this report discusses the qualification of currently used technologies.

18.3 Design for Reliable, Stable, and Easily Manageable Operation

The NRC specifically considers human factors and the human-system interface in the design of nuclear installations. For safety analysis reports, the NRC reviews the human factors engineering design of the main control room and the control centers outside of the main control room. Article 12 of this report also discusses human factors.

18.3.1 Governing Documents and Process

To support its reviews of the human factors engineering issues associated with the certification and licensing of new plant designs, the NRC uses NUREG-0800, Chapter 18, Revision 2, and NUREG-0700, Revision 2, "Human-System Interface Design Review Guidelines," dated May 2002. The NRC also uses NUREG-0711, Revision 2, "Human Factors Engineering Program Review Model," dated February 2004, for evaluating the design of next-generation main control rooms. NUREG-0800, Section 14.3.9, "Human Factors Engineering - Inspections, Tests, Analyses, and Acceptance Criteria," dated March 2007, provides additional guidance. The NRC has recently initiated work to update these review guidelines. Additionally, the NRC developed guidance for reviewing combined license applications, RG 1.206, which includes sections that address the human factors engineering review of combined license applications.

18.3.2 Experience

The NRC's Office of New Reactors is actively reviewing new plant designs and combined license applications.

18.3.2.1 *Human Factors Engineering*

The NRC is currently conducting design certification reviews of the ESBWR, U.S. EPR, and US-APWR, as well as reviewing applications to amend the design certification rule for the ABWR and AP1000. The NRC has also received 18 combined license applications that are in various review stages and status. The NRC's human factors engineering reviews for design certification applications principally focus on evaluating implementation plans for the design of the control facilities to ensure that the design process will be carried out consistent with state-of-the-art human factors principles. The NRC will verify acceptable implementation of these plans through specified ITAAC (i.e., design acceptance criteria).

18.3.2.2 Digital Instrumentation and Controls

Nuclear facility and byproduct licensees are replacing their analog instrumentation and control equipment with digital equipment. Although digital technology can improve operational performance, the introduction of this technology into nuclear facilities and applications can pose a variety of challenges for the NRC and the nuclear industry:

- the increased complexity of digital technology compared to analog technology
- rapid changes in digital technology that require the NRC to update its knowledge of state-of-the-practice in digital system design, testing, and application
- new failure modes associated with digital technology
- the need to update the acceptance criteria and review procedures used in consistently assessing the safety and security of digital systems

In response to these technical challenges, in January 2007, the NRC formed the Digital Instrumentation and Control Steering Committee. The Steering Committee focuses on the NRC regulatory activities in progress across several offices, interfaces with the industry on key issues, and facilitates consistent approaches to resolving technical and regulatory challenges. The members of the Steering Committee include management representatives from the various NRC offices that have regulatory responsibilities related to digital instrumentation and control.

Digital instrumentation and control raises issues that were not relevant to analog systems. Examples of such issues include the following:

- A common-cause failure attributable to software errors was not possible with analog systems. This potential weakness may require consideration of diversity and defense in depth in the application of digital instrumentation and control systems.

- Digital system network architectures raise issues such as interchannel communication, communication between non-safety and safety systems, and cyber security that must be reviewed closely to ensure that public safety is preserved.

- Highly integrated control room designs with safety and nonsafety displays and controls will be the norm for new reactor designs. Human factors design and quality assurance during all phases of software development, control, and validation and verification are critical.

The Digital Instrumentation and Control Steering Committee has formed seven task working groups focusing on the following key areas of concern:

- cyber security
- diversity and defense in depth
- risk-informed digital instrumentation and control
- highly integrated control room - communications
- highly integrated control room - human factors
- licensing process issues
- fuel cycle facilities

Each of the task working groups developed interim staff guidance for NRC review of new and innovative digital instrumentation and control systems that are found in new reactors and digital upgrades at currently operating reactors. The guidance also provides the industry with the expectations and criteria that their designs will be evaluated against to determine compliance with NRC regulations. The staff is using the interim staff guidance its review of design certifications, combined licenses, and digital upgrades at currently operating reactors. The staff is in the process of incorporating the interim staff guidance into permanent NRC staff guidance in NUREG-0800 and associated RGs. The interim staff guidance can be found at http://www.nrc.gov/reading-rm/doc-collections/isg/digital-instrumentation-ctrl.html.

The NRC also actively participates in the Multinational Design Evaluation Program, an international assembly of nuclear regulators addressing common issues with the licensing of new reactors. The NRC is involved with the Digital Instrumentation and Control Issue-Specific Group, which is looking at ways to harmonize requirements, standards, and guidance for instrumentation and control, and the EPR digital instrumentation and control task group, which is a collaboration of regulators that are reviewing the EPR instrumentation and control design. The Multinational Design Evaluation Program allows the NRC to share digital instrumentation and control information to support regulatory infrastructure improvements and licensing decisions.

18.3.2.3 Cyber Security

After September 11, 2001, the NRC issued two security-related orders, NRC Order EA-02-026, "Issuance of Order for Interim Safeguards and Security Compensatory Measures," dated February 2002, and NRC Order EA-03-086, "Issuance of Order Requiring Compliance with Revised Design Basis Threat for Operating Power Reactors," dated April 2003, that require power reactor licensees to implement measures to enhance cyber security. These security measures required immediate identification and assessment of computer-based systems deemed to be critical to the operation and security of the facility. Additionally, licensees were expected to implement any immediate and necessary corrective measures to protect against the cyber threats at the time the orders were issued.

Recognizing that licensees likely used various approaches in the architectural design and implementation of plant computing networks, the NRC began an effort to develop a cyber security self-assessment methodology that could be uniformly applied to U.S.-based nuclear facilities. Development of such a methodology would provide a means to ensure that the assessments performed by each facility would follow a consistent, repeatable approach, thereby providing comparable metrics to understand the relative cyber security posture of each facility.

The assessment methodology was developed by a multidisciplinary team from Pacific Northwest National Laboratory with input from the NRC and nuclear power industry representatives and issued in October 2004 as NUREG/CR-6847, "Cyber Security Self-Assessment Method for U.S. Nuclear Power Plants." NUREG/CR-6847 provided licensees with information useful for developing an interim cyber security program for their facilities before the codification of cyber security requirements. It does not provide an acceptable means for complying with current cyber security regulations.

Using NUREG/CR-6847 as a foundation, the NEI Cyber Security Task Force developed a comprehensive guidance document, NEI 04-04, "Cyber Security Programs for Power Reactors," dated November 18, 2005, which licensees could use to develop and manage their cyber security programs. In December 2005, the NRC staff accepted NEI 04-04 as an acceptable method for establishing and maintaining a cyber security program at nuclear power plants. At the time of the NRC's endorsement of NEI 04-04, the NRC had not yet proposed comprehensive cyber security regulations.

In March 2009, the NRC issued a new rule on cyber security, 10 CFR 73.54, "Protection of Digital Computer and Communication Systems and Networks." It requires licensees to provide high assurance that nuclear power plants' safety, safety-related, security, and emergency preparedness functions are protected from cyber attacks up to and including the design-basis threat. This new regulation required licensees and combined operating license applicants to submit a cyber security plan, including an implementation schedule, to the NRC for review and approval by November 23, 2009. Essential elements of a plan include describing the process for finding critical digital assets, describing the defensive model (i.e., protective strategy), referencing a comprehensive set of security controls, and describing the process for addressing each control. The cyber security plan must also acknowledge a commitment to maintain the cyber security program and provide adequate documentation of how that will be accomplished.

In January 2010, the NRC published RG 5.71, "Cyber Security Programs for Nuclear Facilities," which provides implementation guidance to licensees and applicants on an acceptable method for satisfying the requirements of 10 CFR 73.54. This guidance describes an acceptable method licensees can follow to address potential security vulnerabilities in each life-cycle phase of critical digital assets that perform safety, safety-related, security, and emergency preparedness functions. It is equally applicable to the combined license applicants and the current fleet of operational reactors. The guidance embodies recommended best practices from standards organizations such as the International Society of Automations, the Institute of Electrical and Electronics Engineers, the National Institute of Standards and Technology, and DHS. In addition, the NRC is in the process of clearly defining the scope of an instrumentation and control review and a cyber security review for the NRC staff and the industry in RG 1.152, Revision 3, "Criteria for Use of Computers in Safety Systems of Nuclear Power Plants," which is currently under review.

In January 2010, the NRC and the North American Electric Reliability Corporation also entered into a 5–year memorandum of understanding to address nuclear plant cyber security roles, responsibilities, and areas of coordination between the two organizations. In essence, the NRC will continue to be responsible for the inspection of digital systems that can affect the safety, security, and emergency preparedness of a nuclear power plant. The North American Electric Reliability Corporation will continue to regulate digital systems related to the generation of electric power. The memorandum of understanding recognizes the need for coordination, information sharing, and incident management and response between the two organizations.

The NRC has implemented a significant and continuing research program in cyber security for digital plant control systems. Also, the NRC is currently in the process of codifying the mandated cyber security enhancement requirements in the two security-related NRC orders by amending its regulations.

18.4 New Reactor Construction Experience Program

The nuclear industry in the United States faced many construction quality and design issues in the 1970s and 1980s. In 1984, the NRC issued NUREG-1055, "Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants," to document the lessons learned from plant construction. Since then, the NRC has revised some of its licensing review processes and construction oversight programs in order to implement recommendations that were made in NUREG-1055. In 2007, the NRC began developing a construction experience (ConE) program to focus on collecting, analyzing, and applying lessons learned from the design and construction of new reactors. To achieve this goal, the NRC staff developed a risk-informed process to obtain, screen, evaluate, communicate, and incorporate construction experience insights into its new reactor licensing and construction oversight activities.

Since 2007, the NRC staff has actively obtained and evaluated ConE information from various domestic and international sources. The ConE program also reviews of all the operating experience from operating reactors, because the root causes of many events at currently operating reactors date back to the period when these plants were being designed and constructed. To make the ConE information available and accessible to all NRC staff members, including technical reviewers located at NRC Headquarters and inspectors located in regional offices, the staff has designed and launched a web-based ConE database. This database enables all NRC staff to search and retrieve ConE information through word search, plant information, technical discipline, applicable NRC guidance documents, IPs, technical branches, and other methods. As of February 2010, this database contains about 200 ConE events. Using information in the ConE database, the NRC staff has issued five generic communications in the form of INs to communicate lessons learned from the evaluation of ConE information. The NRC staff continues to actively obtain and evaluate applicable operating and ConE information and plans to develop a publicly available version of its ConE database. The staff also plans to continue to communicate the lessons learned from the ConE program with the industry and international counterparts through issuing generic communications.

The NRC staff values close cooperation with the international community for the exchange of information on design and construction of new reactors. The NRC ConE program has been working closely with several countries that are currently building new nuclear power plants. These interactions are carried out through established agency bilateral and multilateral agreements with other countries. For example, the NRC ConE program staff is contributing to the work of the NEA working group on regulation of new reactors, working group on operating experience, and the European Commission Joint Research Center. The NRC ConE staff also visits international sites under construction every year to further its cooperation and exchange of technical and regulatory information with other regulatory agencies. The NRC has also hosted several staff members from foreign nuclear safety regulatory agencies. The NRC values such partnerships with other regulatory agencies and is committed to continuing its collaborative relationship with the international community to promote nuclear safety, security, and protecting people and the environment.

ARTICLE 19. OPERATION

Each Contracting Party shall take appropriate steps to ensure that:

(i) the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning program demonstrating that the installation, as constructed, is consistent with design and safety requirements

(ii) operational limits and conditions derived from the safety analysis, test, and operational experience are defined and revised as necessary for identifying safe boundaries for operation

(iii) operation, maintenance, inspection, and testing of a nuclear installation are conducted in accordance with approved procedures

(iv) procedures are established for responding to anticipated operational occurrences and to accidents

(v) necessary engineering and technical support in all safety related fields is available throughout the lifetime of a nuclear installation

(vi) incidents significant to safety are reported in a timely manner by the holder of the relevant license to the regulatory body

(vii) programs to collect and analyze operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies

(viii) the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal

The NRC relies on regulations in Title 10 of the *Code of Federal Regulations* and internally developed associated programs in granting the initial authorization to operate a nuclear installation and in monitoring its safe operation throughout its life. This section describes the most significant regulations and programs corresponding to each obligation of Article 19.

19.1 Initial Authorization to Operate

All currently operating reactors in the United States received licenses under the two-step process in 10 CFR Part 50. This licensing process requires both a construction permit and an operating license. The additional licensing processes in 10 CFR Part 52 provide for site approvals and design approvals in advance of construction authorization. In addition, 10 CFR Part 52 includes a process that combines a construction permit and an operating license with conditions into one license (a combined license). Both the two-step and the combined license processes require NRC approval to construct and operate a nuclear power plant.

The Advisory Committee on Reactor Safeguards, an independent statutory committee established to advise the NRC on reactor safety, reviews each application to construct or operate a nuclear power plant. The committee begins its review early in the licensing process by selecting the proper stages at which to meet with the applicant and NRC staff. Upon completing its review, the committee reports to the Commission.

The public also has an opportunity to have its concerns addressed. The Atomic Energy Act requires that NRC hold a public hearing before it may issue a construction permit, early site permit, or combined license for a nuclear power plant. A three-member Atomic Safety and Licensing Board, consisting of one lawyer who acts as chairperson and two technically qualified persons, conducts the public hearing. Members of the public may submit statements to the licensing board, or they may petition for leave to intervene as full parties in the hearing.

To obtain NRC approval to construct or operate a nuclear power plant, an applicant must submit safety analysis and environmental reports. Article 18 describes the final safety analysis report and the NRC's review of the application for an operating license. A public hearing is neither mandatory nor automatic for an application for an operating license under 10 CFR Part 50. However, soon after the NRC accepts the application for review, it publishes a notice in the *Federal Register* stating that it is considering issuing the license. This notice states that any person whose interest might be affected by the proceeding may petition the NRC for a hearing. If a public hearing is held, the same process applies as for the public hearing for a construction permit.

An early site permit issued under 10 CFR Part 52, Subpart A, provides for resolution of site safety, environmental protection, and emergency preparedness issues, independent of a specific nuclear plant design review. The application for an early site permit must address the safety and environmental characteristics of the site and evaluate potential physical impediments to the development of an acceptable emergency plan or security plan. The applicant may submit additional on emergency preparedness issues up to a complete emergency plan. The staff documents its findings on site safety characteristics and emergency planning in a safety evaluation report and its findings on environmental protection issues in an environmental impact statement. The early site permit may also allow limited construction activities, subject to redress, before the issuance of a combined license. The NRC will issue a *Federal Register* notice for a mandatory public hearing, and the Advisory Committee on Reactor Safeguards will perform an independent safety review. The duration of an early site permit is 10 – 20 years, and the permit may be renewed. A construction permit or combined license application may reference the early site permit.

The NRC may also certify a standard plant design through a rulemaking under 10 CFR Part 52, Subpart B, "Standard Design Certifications." The design certification process resolves final design information for an essentially complete plant, independent of a specific site, and the Advisory Committee on Reactor Safeguards performs an independent safety review. The NRC has certified four standard plant designs under the design certification process: GE's ABWR, and Westinghouse's System 80+ (originally designed by Combustion Engineering), AP600, and AP1000. The duration of a design certification is 15 years, and the certification may be renewed.

A combined license, issued under 10 CFR Part 52, Subpart C, authorizes construction of a facility in a manner similar to a construction permit under 10 CFR Part 50. An application for a combined license may incorporate by reference an early site permit, design certification, both, or neither. The advantage of referencing an early site permit or design certification is that issues resolved during those processes are not considered at the combined license stage. Just as for a construction permit, the NRC must hold a hearing before the decision to issue a combined license. However, the combined license will specify the inspections, tests, and analyses that the licensee must perform and the acceptance criteria that, if met, are necessary and sufficient to provide reasonable assurance that the facility has been constructed and will be operated in conformity with the license and the applicable regulations.

After issuing a combined license, the NRC staff will verify that the licensee has performed the required inspections, tests, and analyses, and before operation of the facility the Commission must find whether the licensee has met the acceptance criteria. Periodically during construction, the NRC staff will publish notices of the successful completion of inspections, tests, and analyses in the *Federal Register*. Not less than 180 days before the date scheduled for initial loading of fuel, the NRC will publish a notice of intended operation of the facility in the *Federal Register*. An opportunity for a second hearing exists, but petitions for this hearing will be considered only if the petitioner demonstrates that one or more of the acceptance criteria have not been (or will not be) met, and the specific operational consequences of nonconformance would be contrary to providing reasonable assurance of adequate protection of the public health and safety.

19.2 Definition and Revision of Operational Limits and Conditions

The license for each nuclear facility must contain technical specifications that set operational limits and conditions derived from the safety analyses, tests, and operational experience. The regulations contained in 10 CFR 50.36 define the requirements that apply to the plant-specific technical specifications. At a minimum, the technical specifications must describe the specific characteristics of the facility and the conditions for its operation that are required to adequately protect the health and safety of the public. Each applicant must note items that directly apply to maintaining the integrity of the physical barriers that are designed to contain radioactive material. In 10 CFR 50.36 the NRC requires that the technical specifications must be derived from the analyses and evaluations in the safety analysis report. Licensees cannot change the technical specifications without prior NRC approval.

In 1992, the NRC issued improved, vendor-specific (e.g., Babcock and Wilcox, Westinghouse, Combustion Engineering, and GE) standard technical specifications in NUREGs 1430-1434 and periodically revises them on the basis of experience. The NRC issued Revision 3 to these NUREGs in June 2004.

The NRC encourages licensees to use the improved standard technical specifications as the basis for plant-specific technical specifications. The agency also considers requests to adopt parts of the improved standard technical specifications, even if the licensee does not adopt all of the improvements. These parts, which will include all related requirements, will normally be developed as line-item improvements. To date, over half of the operating commercial nuclear plants have converted their technical specifications to the improved standard technical specifications.

Consistent with the Commission's policy statements on technical specifications and the use of PRAs, the NRC and the nuclear industry are developing risk-informed improvements to technical specifications. These improvements and initiatives are intended to maintain or improve safety while reducing unnecessary burden and to make technical specifications congruent with the agency's other risk-informed regulatory requirements (in particular, the risk management requirements of the Maintenance Rule in 10 CFR 50.65(a)(4)).

19.3 Approved Procedures

In the U.S., operations, maintenance, inspection, and testing of a nuclear installation are conducted in accordance with approved procedures. Each nuclear facility is required to follow the quality assurance requirements in 10 CFR Part 50, Appendix B. Criterion V "Instructions, Procedures, and Drawings," of Appendix B to 10 CFR Part 50, requires that licensees establish measures to ensure that activities that affect quality will be prescribed by appropriate documented instructions, procedures, or drawings. RG 1.33, Revision 2, "Quality Assurance Program Requirements (Operation)," dated February 1978, provides supplemental guidance. The NRC addresses the need to perform maintenance according to approved procedures in 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." In 10 CFR 50.65(a)(4) it requires licensees to assess and manage the increase in risk that may result from proposed maintenance activities.

19.4 Procedures for Responding to Anticipated Operational Occurrences and Accidents

The NRC gives recommendations and guidance on procedures for responding to anticipated operational occurrences and accidents in NUREG-0737, "Clarification of TMI Action Plan Requirements," dated November 1980; NUREG-0737, Supplement 1, "Requirements for Emergency Response Capability," dated January 1983; and NUREG-0899, "Guidelines for the Preparation of Emergency Operating Procedures," dated August 1982.

After the 1979 accident at Three Mile Island Unit 2, the NRC issued orders requiring licensees to develop procedures for coping with certain plant transients and postulated accidents. It also issued NUREG-0737 in 1980 and Supplement 1 to that document in 1983, which recommend that licensees develop procedures to cope with accidents and transients that are caused by initiating events analyzed in the final safety analysis report with multiple failures of equipment.

NUREG-0899 gives programmatic guidance for developing emergency operating procedures. To ensure that proper procedures had been developed to respond to plant transients and accidents, the NRC reviewed each plant using the guidance in NUREG-0800, Section 13.5.2.1.

19.5 Availability of Engineering and Technical Support

The NRC's Reactor Oversight Process, described in Article 6 of this report, includes techniques to ensure that adequate engineering and technical support is available throughout the lifetime of a nuclear installation. Several of the IPs focus on ensuring the maintenance of adequate support programs. Licensees also report performance indicators. Depending on inspection findings and performance indicators, the NRC conducts additional inspections to focus on the causes of the performance problems as prescribed by the Reactor Oversight Process Action Matrix.

19.6 Incident Reporting

Two of the many elements contributing to the safety of nuclear power are emergency response and the feedback of operating experience into plant operations. The licensee event reporting requirements of 10 CFR 50.72, "Immediate Notification Requirements for Operating Nuclear Power Reactors," and 10 CFR 50.73, "Licensee Event Report System," help to achieve these goals, as 10 CFR 50.72 requires immediate notification requirements via the emergency notification system, and 10 CFR 50.73 requires 60-day written licensee event reports. All 10 CFR 50.72 event notifications and 10 CFR 50.73 licensee event reports, except those containing sensitive security-related information, are publicly available on the NRC Web site.

The NRC staff uses the information reported under these regulations to respond to emergencies, monitor ongoing events, confirm licensing bases, study potentially generic safety problems, assess trends and patterns of operational experience, monitor performance, identify precursors of more significant events, and provide operational experience to the industry. Evaluations of events as documented in NRC inspection reports are publicly available on the NRC Web site. The annual abnormal occurrence report to Congress (NUREG-0090), which details specific events that result in a conditional core damage probability greater than 1×10^{-4} and other events of significant interest, is also publicly available.

The NRC modified these rules in 1992 and 2000 to delete reporting requirements for some events that were determined to be of little or no safety significance. The modified rules continue to provide the Commission with reports of significant events for which the NRC may need to act to maintain or improve reactor safety, or to respond to heightened public concern. The modified rules also better align requirements on event reporting with the type of information that the NRC needs to carry out its safety mission. The NRC issued NUREG-1022, Revision 2, "Event Reporting Guidelines, 10 CFR 50.72 and 50.73," in October 2000, concurrent with the rule changes.

NUREG-1022 is structured to help licensees promptly and completely report specified events and conditions. It discusses general issues that have been difficult to implement in the past, such as engineering judgment, time limits for reporting, multiple failures and related events, deficiencies discovered during licensee engineering reviews, and human performance issues. It also includes a comprehensive discussion of each reporting criterion with illustrative examples and definitions of key terms and phrases.

Event reporting under these rules since 1984 has contributed significantly to focusing the attention of the NRC and the nuclear industry on the lessons learned from operating experience to improve reactor safety. Over the years, improvements in reactor safety system performance and decreasing trends in the number of reactor transients and significant events have been evident. Between 2007 and 2010, there were no significant reactor events (defined as having a conditional core damage probability greater than 1×10^{-4}).

Since 2001, the NRC has reviewed each reported reactor-related event and assigned a rating of 1 through 7 on the International Nuclear and Radiological Event Scale. The agency submits events with a rating of 2 or higher to the IAEA nuclear events Web-based system for public posting. Other events whose ratings are specifically requested by other member states are also considered for posting regardless of the International Nuclear and Radiological Event Scale rating. The NRC describes this process in RIS 2002-01, "Changes to NRC Participation in the International Nuclear Event Scale," dated January 2002, and IN 2009-27, "Revised International Nuclear and Radiological Event Scale User's Manual," dated November 2009.

19.7 Programs To Collect and Analyze Operating Experience

As outlined in GL 82-04, "Use of INPO See-in Program," dated March 1982, INPO and the individual licensees are jointly responsible for compiling and analyzing operating experience within the industry. The effectiveness of licensee operating experience programs is subject to NRC inspection under IP 71152.

The NRC revised its Operating Experience Program in 2005 in response to the recommendations of the Reactor Operating Experience Task Force, established in response to the findings of the Davis Besse Lessons Learned Task Force. Upon launching the revised Operating Experience Program, the NRC implemented some recommendations for better defined roles and responsibilities, a central clearinghouse, and improved collection, storage, and retrieval of information on operating experience. The program process has four phases: (1) collection, (2) screening, (3) evaluation, and (4) application of operating experience data, with a common theme of communication running throughout.

The NRC facilitates the collection, storage, and retrieval of operating experience data with the Operating Experience Gateway, a centralized repository of links to databases relevant to operating experience on the NRC internal Web site, including event reports, international reports, and inspection findings. A database currently under development will provide the same type of centralized data storage and retrieval options for lower level operating experiences, which can be a useful source of information for long-term trending and analysis even though they do not rise to the threshold of reportable events.

The NRC's clearinghouse for operating experience screens event notifications and lower level operating experience from resident inspector feedback to the regional offices daily to determine the level of followup required by each item. The clearinghouse also considers licensee event reports, reports of defects and non-compliance under 10 CFR Part 21, "Reporting of Defects and Noncompliance," international operating experience received from the International Nuclear and Radiological Event Scale Web site and from the IAEA incident reporting system, and any items of potential interest brought forward by the Office of New Reactors and the Office of Nuclear Regulatory Research.

For items that are screened out, followup actions can include e-mail notifications to technical review groups of low-level items for trending and analysis or an operating experience communication distributed internally throughout the agency summarizing the issue and its significance. Items that meet the screening criteria of being both safety significant and generically applicable are screened in as "issues for resolution" (the term used to describe the evaluation phase of the process). Evaluation of an issue for resolution involves an examination of the technical aspects of the issue, and its potential safety significance, as well as an evaluation of previous operating experience.

Finally, the operating experience program applies the results of the evaluation of an issue for resolution. Application may include the issuance of a generic communication, a proposal for rulemaking, a referral for further study as a generic safety issue, or a revision of IPs.

The NRC participates in the International Nuclear and Radiological Event Scale and the IAEA incident reporting system to both communicate operating experience internationally and review events posted by other member States. Operating experience personnel review all reactor event notifications received by the agency and rate them on the International Nuclear and Radiological Event Scale. As Section 19.6 of this report discusses, events with a rating of 2 or higher are posted to the International Nuclear and Radiological Event Scale Web site within 48 hours. All international events posted to this Web site are screened by the NRC's clearinghouse, as possible issues for resolution based on safety significance and applicability to U.S. plants. The clearinghouse uses the same criteria to screen the IAEA incident reporting system reports as they are posted. The NRC submits all U.S. reactor-related generic communications to the IAEA incident reporting system for communication to the international community.

19.8 Radioactive Waste

The NRC has regulations and guidance for nuclear power reactor licensees to ensure the safe management and disposal of low-level radioactive waste. Onsite low-level waste must be managed in accordance with the NRC regulations in 10 CFR Part 20 and 10 CFR Part 50. For example, 10 CFR Part 20, Subpart K, "Waste Disposal," deals with licensee treatment and disposition of radioactive waste. In addition, GL 1981-38, "Storage of Low-Level Radioactive Wastes at Power Reactor Sites," dated November 10, 1981, provides guidance on measures for ensuring the safe storage of low-level waste.

Notwithstanding these regulations and guidance, the economics of waste disposal in the United States have encouraged practices to minimize radioactive waste. In the past decade or so, disposal costs have risen significantly, and volumes of waste produced have decreased greatly as operations technology evolves. In June 2008, the NRC published RG 4.21, "Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning." Currently, nuclear power reactors generate only small amounts (about 1,000-2,000 cubic feet per unit) of operational waste each year.

For storage, waste is conditioned into a form that is stable and safe to minimize the likelihood that it will migrate (e.g., as it would if it were a liquid). Waste that is placed into storage is in a form that is suitable for disposal, or at least a form that can be made suitable for future disposal. The NRC maintains specific regulations for the independent storage of spent nuclear fuel, high-level radioactive waste, and reactor-related low-level waste greater than Class C in 10 CFR Part 72 and detailed regulations for designing and operating low-level waste disposal facilities in 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste."

The U.S. Government addresses in detail the spent fuel and radioactive waste programs, including high-level waste, in a report prepared to satisfy the reporting requirements of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The latest report (DOE/EM-0654, Revision 2, "United States of America Third National Report for the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management," dated October 2008) is available on the DOE Environmental Management web site. In June 2008, DOE submitted a license application to the NRC for the construction of a high-level waste repository at Yucca Mountain, NV. However, in March 2010, DOE filed a motion to withdraw its application from NRC review. Concurrently, at the direction of the President of the United States, DOE established the Blue Ribbon Commission on America's Nuclear Future to comprehensively review policies for managing the back end of the nuclear fuel cycle, including all alternatives for the storage, processing, and disposal of civilian and defense used nuclear fuel and nuclear waste. This commission is expected to make final recommendations to DOE by January 2012. The NRC will continue to ensure the safe storage of civilian high-level waste until the DOE implements a new disposal solution.

Convention on Nuclear Safety Report:

The Role of the Institute of Nuclear Power Operations in Supporting the United States Commercial Nuclear Power Industry's Focus on Nuclear Safety

August 2010

INPO®

1. Executive Summary

Following the event at Three Mile Island, the U.S. nuclear power industry established the Institute of Nuclear Power Operations (INPO) in 1979 to promote the highest levels of safety and reliability (i.e., to promote excellence) in the operation of its nuclear power plants. The Institute is a nongovernmental corporation that operates on a not-for-profit basis. Under the United States (U.S.) tax law, the company is classified as a charitable organization that "relieves the burden of government."

Since its inception, all organizations that have direct responsibility and legal authority to operate or construct commercial nuclear plants in the U.S. have maintained continuous membership in the Institute, which currently has 26 members. In addition, many organizations that jointly own these nuclear power plants are associate members. A number of international utility organizations and major supplier organizations also voluntarily participate in the Institute's activities and programs.

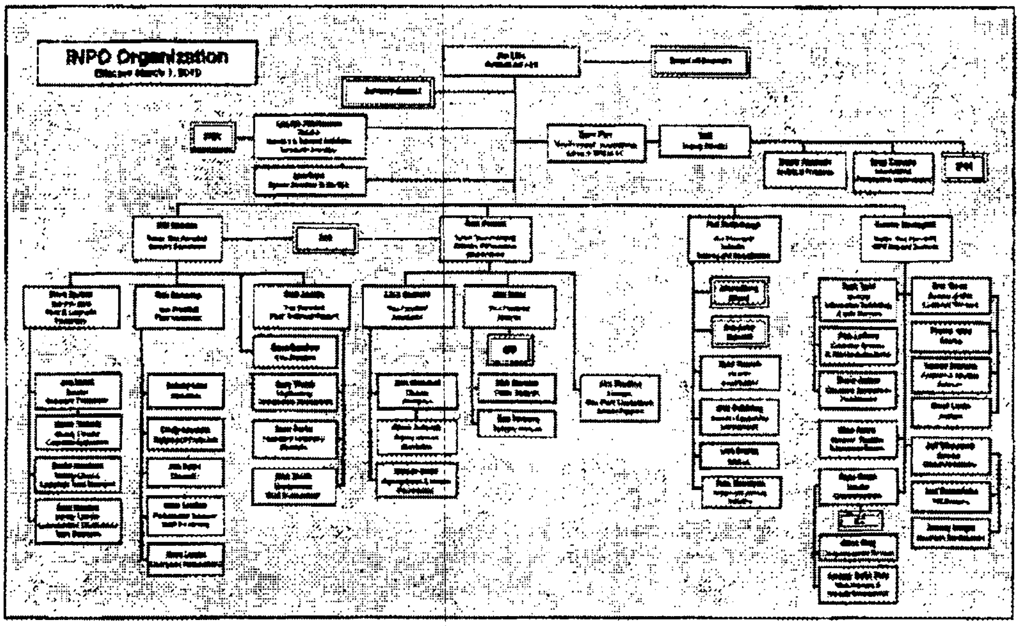
In forming INPO, the nuclear utility industry took an unusual step. The industry placed itself in the role of overseeing INPO activities, while at the same time endowing INPO with ample authority to bring pressure for change on individual members and the industry as a whole. This feature makes INPO unique. The industry clearly established and accepted a form of self-regulation through peer review by helping to develop and then committing to meet INPO performance objectives and criteria (POCs). The industry's recognition that all nuclear utilities are affected by the action of any one utility motivated its support of INPO. Each individual member is solely responsible for the safe operation of its nuclear plants. The U.S. Nuclear Regulatory Commission (NRC) has statutory responsibility for overseeing the licensees and verifying that each licensee operates its facility in compliance with Federal regulations to ensure public health and safety. INPO's role -- encouraging the pursuit of excellence in the operation of commercial nuclear power plants -- is complementary but separate and distinct from the role of the NRC.

The nuclear industry's commitment to go beyond regulatory compliance and continually strive for excellence, with INPO's support, has resulted in substantial performance improvements over the last 30 years. For example, in the early 1980s the typical nuclear plant had a capacity factor of 63 percent, experienced six automatic scrams per year, had high collective radiation dose, and experienced numerous industrial safety accidents among its staff. Today, median industry capacity factor is above 91 percent, most plants have no automatic scrams per year, and collective radiation dose and industrial accident rates are both lower by a factor of 7 when compared to the rates of the 1980s.

This report is intended to provide an understanding of the Institute's role and its major programs in support of the U.S. commercial nuclear power industry.

2. Organization and Governance

In many ways, the Institute's organizational structure is similar to a typical U.S. corporation. A Board of Directors, composed of senior executives from INPO's member organizations, provides overall direction for the Institute's operations and activities. Currently, the Board consists of 13 chief executive officers (CEOs) and one president from the member utilities. The Institute's bylaws specify that at least two directors must have recent experience in the direct supervision of operation of a facility that generates electricity or steam for commercial purposes through the application of nuclear power. Also, at least one director must represent a public utility. The president and CEO of the Institute, normally a single individual, is elected by and reports to its Board of Directors. An organization chart is presented below.



Because the INPO Board of Directors is made up of utility executives, the industry believes that it is important to also have support from an Advisory Council of distinguished individuals, mainly from outside the nuclear generation industry, to provide diversity of experience and thought. This Advisory Council of 9 to 15 professionals selected from outside INPO's membership meets periodically to review Institute activities and provide advice on broad objectives and methods to the Board of Directors. Members include prominent educators, scientists, engineers, and business executives, as well as experts in organizational effectiveness, human relations, and finance.

Institute activities to enhance nuclear plant safety and reliability are reflected primarily in its four cornerstone programs: periodic onsite evaluations of each nuclear plant and corporate support organizations, training and accreditation, events analysis and information exchange, and assistance. Nuclear technical divisions are organized to carry out the cornerstone functions. Other functional areas, such as support services, industry and external relations, and communications, support the nuclear technical divisions as well as the Institute's overall mission.

The National Academy for Nuclear Training operates under the direction of INPO and integrates the training efforts of all U.S. nuclear utilities, the activities of the National Nuclear Accrediting Board, and the training-related activities of the Institute. An INPO executive serves as the executive director of the Academy.

Non-U.S. nuclear organizations from 18 different countries or provinces participate in the Institute's International Participant Program, managed by the World Association of Nuclear Operators (WANO)-Atlanta Centre at INPO's request. This program involves the active exchange of information on nuclear plant operations among utility organizations around the world. Each international participant organization is represented on an advisory committee that provides advice on the operation of this program as well as input on other Institute programs as appropriate. An INPO executive serves as the director of WANO – Atlanta Centre.

Organizations engaged in providing commercial design, engineering, nuclear fuel cycle, or other services directly related to the construction, operation, or support of nuclear electric generating plants also participate in INPO through the Supplier Participant Program. This program allows supplier organizations to share experience and expertise with Institute members and provides a means to provide feedback on operational experience to the suppliers. Currently, 22 companies from around the world are involved in the Supplier Participant Program.

The industry actively participates in the oversight of INPO's programs. Representatives from member utilities serve on the Executive Advisory Group, the Academy Council, the Analysis Review Board, and the Industry Communications Council. The Executive Advisory Group, which consists of the chief nuclear officers of all of the member organizations, advises INPO management on the programs and products in the nuclear technical areas. The Academy Council provides advice in the areas of training, accreditation, and human performance. The Analysis Review Board advises INPO on analysis activities, and the Industry Communications Council advises on effective communication of INPO programs and activities. Frequently, INPO establishes ad hoc industry groups to provide input on specific initiatives.

Financial and Human Resources

The 2010 operating budget for INPO was $95 million, primarily funded through member dues. Dues, approved annually by the Board of Directors, are assessed based on the number of each member's nuclear plant sites and units.

The Institute's permanent staff of about 340 is augmented extensively by industry professionals who serve as loaned employees or international liaison engineers on assignments of typically 18 to 24 months. Loaned and liaison employees comprise about one-third of the total technical staff. They gain extensive experience and training while providing current industry expertise and diversity of thought and practices. A small number of permanent Institute employees serve in loaned assignments to member organizations, primarily for professional development. The total number of both permanent and loaned employees is approximately 400 people.

Institute resources and capabilities are further enhanced by the extensive use of U.S. and international utility peers and executive industry advisors. These peers participate in a wide range of short-term activities, especially on evaluation and accreditation teams that visit nuclear plants. Peers enhance the effectiveness of the INPO teams by offering varied perspectives and providing additional current experience. The peers benefit from learning other ways of conducting business that can be shared with their stations. In 2009, the industry provided INPO with more than 650 peers for short term assignments.

3. INPO's Role within the Federal Regulatory Framework

The nuclear utility industry in the United States, like other industries that may affect the health and safety of the general public, is regulated by the Federal Government. This regulatory function is based principally on the Atomic Energy Act of 1954, as amended, and is carried out by the NRC. In 1979, following the accident at Three Mile Island Nuclear Station, the President of the United States appointed a commission to investigate the accident. The commission, which came to be known as the Kemeny Commission, helped influence the industry's decision to create INPO as a method of self-regulation.

The industry created INPO to provide the means whereby the industry itself could, acting collectively, improve the safety and reliability of nuclear operations. Industry leaders envisioned that peer reviews and POCs based on excellence would be effective in bringing about improvements. In the broad sense, the ultimate goals of the NRC and INPO are the same in that both organizations strive to protect the public; therefore, both review similar areas of nuclear power plant operations. In granting INPO its not-for-profit status, the U.S. Government acknowledged that INPO's role reduces the burden on the Government through the conduct of its activities. However, the industry does not expect INPO to supplant the regulatory role of the NRC. It was recognized that in establishing and meeting its role, INPO would have to work closely with the NRC while at the same time not becoming or appearing to become an extension of or an advisor to the NRC, or an advocacy agent for the utilities. As recognition of their different roles but common goals, the NRC and INPO have entered into a Memorandum of Agreement that includes coordination plans that cover specific areas of mutual interest.

The conduct of plant and corporate evaluations is one of INPO's most important functions. It is also the function that is closest to the role of a regulator. While the two roles -- evaluation and regulation -- may appear similar, they do differ in some ways. The industry and INPO jointly develop numerous POCs. INPO then conducts regular, extensive, and intrusive evaluations to determine how well they are being met. These performance objectives are broad statements of conditions that reflect a higher level of overall plant performance—striving for excellence and often exceeding regulatory requirements. These performance objectives, by their very nature, are difficult to achieve consistently.

Because of the differences in the roles of INPO and the NRC, the industry maintains a clear separation between INPO evaluations and NRC inspections. The industry expects INPO to keep the NRC apprised of its generic activities. While INPO interactions with an individual member remain private between that member and INPO, stations are encouraged to make their INPO plant evaluation and accreditation results available to the NRC for review at each utility or site.

The industry recognizes the need for the NRC to assess the overall quality of INPO's products and the success of its programs. Therefore, the industry expects INPO to provide the NRC with information on INPO programs and activities, including the following:

- copies of selected generic documents
- access to other pertinent information, such as the Equipment Performance Information Exchange (EPIX) database, as described in specific agreements
- observation of certain INPO field activities by NRC employees, with agreement from members

- observation of National Nuclear Accrediting Board sessions

INPO regularly participates in industry-led working groups and task forces that interface with the NRC on specific regulatory issues and initiatives relative to the Institute's mission and strategic objectives. These cooperative interactions have led to the elimination of some redundant activities, benefiting INPO members while enabling both the NRC and INPO to maintain or strengthen focus on their respective missions. For example, the Consolidated Data Entry System, operated by INPO, collects operating data that the NRC uses in its industry oversight process.

INPO has implemented a policy and appropriate procedures with regard to the handling of items that are potentially reportable to the NRC. INPO's policy is to inform utility management of such items during the normal course of business so that the utility can evaluate and report the items as appropriate. If INPO becomes aware of a defect or failure to comply that requires a report under Federal regulation, the Institute has an obligation to ensure that the item is reported, if the utility has not already done so.

4. Responsibilities of INPO and Its Members

INPO members are expected to strive for excellence in the operation of their nuclear plants, to meet INPO performance objectives, and to meet the intent of INPO guidelines. This effort also includes the achievement and maintenance of accredited training programs for personnel who operate, maintain, and support their nuclear plants. Members are expected to be responsive to all areas for improvement identified through INPO evaluation, accreditation, and events analysis programs.

A special procedure, approved by the INPO Board of Directors, provides guidance if a member is not responsive to INPO programs, is unwilling or unable to take action to resolve a significant safety issue, has persistent shortfalls in performance, or has accreditation for its training programs put on probation or withdrawn by the National Nuclear Accrediting Board. The procedure specifies that INPO and the member's management work to resolve any issues in contention using a graduated approach of increasing accountability. Specific options for accountability include interactions between INPO's CEO and the member's CEO and, if necessary, the member's Board of Directors. One option also includes suspending INPO membership if the member continues to be unresponsive. Suspension of membership has never been needed but would have a significant impact on the utility's continued operation, including limiting its ability to obtain insurance.

Furthermore, members are expected to participate fully in other generic INPO programs designed to enhance nuclear plant safety and reliability industrywide. Examples include providing INPO with detailed and timely operating experience information and participating fully in the loaned employee, peer evaluator, and WANO performance indicator programs. Members share information, practices, and experiences to assist each other in maintaining high levels of operational safety and reliability.

In return, INPO is expected to provide members with results from evaluation, accreditation, and review visits, including written reports and an overall numerical assessment that characterizes performance relative to standards of excellence. The industry expects INPO to follow up and verify that effective corrective actions are implemented.

There is clear understanding between INPO and its members that all parties must maintain the confidentiality of INPO evaluation reports and related information, including not distributing this information external to the member utility organization. Members and participants are also expected to use information provided by the Institute to improve nuclear operations and not for other purposes, such as to gain commercial advantage. Members avoid involving INPO or INPO documents in litigation.

INPO members that are also members of the collective insurance organization, Nuclear Electric Insurance Limited (NEIL), have authorized and instructed INPO to make available to NEIL copies of INPO evaluation reports and other data at the Institute's office. NEIL reviews these reports and data for items that could affect the insurability of its members.

INPO POCs are written with input from and the support of the industry. However they are written without regard to constraints or agreements, such as labor agreements, of any individual member. Each member is expected to resolve any impediments to their implementation that may be imposed by outside organizations.

INPO does not engage in public, media, or legislative activities to promote nuclear power. Such activities would undermine INPO's objectivity and credibility and may jeopardize the Institute's not-for-profit status.

5. Principles of Sharing (Openness and Transparency)

Throughout the changes that have occurred in the U.S. electric industry, including the process of electric deregulation, the industry has reaffirmed INPO's mission to promote the highest levels of safety and reliability (i.e., to promote excellence) in the operation of nuclear power plants. Even with U.S. utilities now in competition in certain areas, there is a clear understanding of the need to continue sharing pertinent operational information to continuously strengthen safety and reliability. Nuclear utility owners believe that this cooperation is fundamental to the industry's continued success.

Through INPO, nuclear utilities quickly share information important to safety and reliability, including operating experience, operational performance data, and information related to failure of equipment that impacts safety and reliability. The industry also actively encourages benchmarking visits to support the sharing of best practices and the concepts of emulation and continuous improvement.

INPO facilitates industry information sharing by including participation of industry peers in the INPO cornerstone programs—plant evaluations, training and accreditation, analysis and information exchange, and assistance. INPO communicates and shares information through a variety of methods, including the secure member Web site, Nuclear Network®, written guidelines, and other publications.

While the industry and INPO recognize that rapid and complete sharing of information important to nuclear safety is essential, there is a clear understanding that certain information is private in nature and is not appropriate to share. Examples are INPO plant-specific details of evaluation and accreditation results, personal employee and individual performance information, and appropriate cost and power marketing data.

6. **Priority to Safety (Safety Culture)**

The U.S. nuclear industry believes that a strong safety culture is central to excellence in nuclear plant operations, partly because of the special and unique nature of nuclear technology and the associated hazards—radioactive byproducts, concentration of energy in the reactor core, and decay heat. Within our members' power plants and within INPO, the elements, activities, and behaviors that are part of a strong safety culture are embedded in everything that we do day to day and have been since INPO was formed in 1979.

> ***The U.S. nuclear industry has defined safety culture as follows: An organization's values and behaviors—modeled by its leaders and internalized by its members—that serve to make nuclear safety the overriding priority.***

To support line managers in fostering a strong safety culture, the nuclear industry developed the *Principles for a Strong Nuclear Safety Culture* in November 2004. The principles were incorporated into the POCs as the foundation of nuclear safety in May 2005. The following eight principles are the foundation of a strong nuclear safety culture:

1. Everyone is personally responsible for nuclear safety.
2. Leaders demonstrate commitment to safety.
3. Trust permeates the organization.
4. Decision-making reflects safety first.
5. Nuclear technology is recognized as special and unique.
6. A questioning attitude is cultivated.
7. Organizational learning is embraced.
8. Nuclear safety undergoes constant examination.

INPO activities reinforce the primary obligation of the operating organizations' leadership to establish and foster a healthy safety culture, to periodically assess safety culture, to address shortfalls in an open and candid fashion, and to ensure that everyone from the board room to the shop floor understands his or her role in safety culture.

As part of its focus on safety, the industry utilizes INPO, through evaluations and other INPO activities, to identify and help correct early signs of decline in safety culture at any plant or utility. Further, the industry has defined INPO's role as follows:

- Define and publish standards relative to safety culture.
- Evaluate safety culture at each plant.
- Develop tools to promote and evaluate safety culture.
- Assist the industry in providing safety culture training.
- Develop and issue safety culture lessons learned and operating experience.
- Make safety culture visible in various forums such as professional development seminars, assistance visits, working meetings, and conferences including the CEO conference.

In 2002, INPO published Significant Operating Experience Report (SOER) 02-4, "Reactor Pressure Vessel Head Degradation at Davis-Besse Nuclear Power Station." The purpose of the report was to describe the event and the shortfalls in safety culture that contributed to the event, as well as to recommend actions to prevent similar safety culture problems at other plants. This event is considered a defining moment in the U.S. nuclear power industry, highlighting problems that can develop when the safety culture at a plant receives insufficient attention. Every U.S. nuclear power station has implemented the SOER recommendations, and INPO evaluation teams have reviewed each station's actions. Briefly, the recommendations encompass discussing a case study on the event with all managers and supervisors in the nuclear organization, periodically conducting a self-assessment to determine the organizational respect for nuclear safety, and identifying and resolving abnormal plant conditions or indications that cannot be readily explained. This SOER has also been shared with WANO and republished as a WANO document.

Safety culture is thoroughly examined during each plant evaluation. Each evaluation team is expected to evaluate safety culture throughout the process, including during the pre-evaluation analysis of plant data and observations made at the plant. The results of this review are included in the summary on organizational effectiveness and may be documented as an area for improvement, as appropriate. The INPO evaluation team discusses aspects of a plant's safety culture with the CEO of the utility at each evaluation exit briefing.

In February 2009, INPO proposed aligning the language used by INPO and the NRC when describing safety culture. In June 2009, leadership from the NRC and INPO met to discuss the possibility of this happening and define high-level expectations. In December 2009, the NRC announced a series of meetings, planned for 2010, where a selected panel of stakeholders would jointly craft a high-level definition of safety culture and identify/define the major components within safety culture.

Also in 2009, and in response to industry requests, INPO developed an addendum to the *Principles for a Strong Nuclear Safety Culture*. This addendum lists specific behaviors that are indicative of a strong nuclear safety culture. These behaviors are more specific than those listed in the *Principles for a Strong Nuclear Safety Culture* and are arranged by organizational level, from senior managers to individual contributors.

7. Cornerstone Activities

a. Evaluation Programs

Members host regular INPO evaluations of their nuclear plants approximately every 2 years. Additional evaluative review visits are periodically conducted on corporate support and other more specific areas of plant operation. During these evaluations and reviews, the INPO teams use standards of excellence based on the POCs and their own experience, as well as their broad knowledge of industry best practices. This approach shares beneficial industry experience while promoting excellence in the operation, maintenance, and support of operating nuclear plants. Written POCs, developed by INPO with industry input and review, guide the evaluation process and are the bases for identified areas for improvement. The evaluations are performance oriented, emphasizing both the results achieved and the behaviors and organizational factors important to future performance. The evaluations focus on those issues that impact nuclear safety and plant reliability.

I. Plant Evaluations

Teams of approximately 15 to 20 qualified and experienced individuals conduct evaluations of operating nuclear plants, focusing on plant safety and reliability. In 2009, U.S. utilities received 38 plant evaluations or WANO peer reviews. The evaluation teams are augmented by senior reactor operators, other peer evaluators from different utilities, host utility peer evaluators, and an executive industry advisor. The scope of the evaluation includes the following functional areas:

- operations
- maintenance
- engineering
- radiological protection
- chemistry
- training

In addition, teams evaluate cross-functional performance areas (i.e., processes and behaviors that cross organizational boundaries) and address process integration and interfaces. The following cross-functional areas are evaluated:

- safety culture
- operational focus
- configuration management
- equipment reliability and work management
- performance improvement (learning organization)
- organizational effectiveness

Team leaders, in addition to leading and coordinating team activities, provide a focal point for evaluation of station management and leadership, concentrating on evaluating leadership, organizational effectiveness, safety culture, and nuclear oversight topics.

The performance of operations and training personnel during simulator exercises is included as a key part of each evaluation. Also included, where practicable, are observations of refueling outages, plant startups, shutdowns, and major planned evolutions.

The evaluation team provides the utility with formal reports of strengths and areas for improvement, along with a numerical rating of overall plant performance. As part of the 1983 annual INPO CEO workshop, INPO prepared a set of indicators for each nuclear station that reflected station participation in and commitment to INPO programs. INPO provided this information to each CEO. One of these indicators was an assessment of each station's overall performance based on INPO evaluations and the judgment of INPO team managers and senior management.

With the approval of the Board of Directors, INPO decided that an assessment of overall station performance in the context described above would be made after each evaluation and shared privately with the CEO at the exit meeting. Eventually a numerical assessment was developed, and each station is now provided an assessment from category 1 (Excellent) to 5, which is defined as a level of performance where the margin to nuclear safety is substantially reduced. Such a process reflects the desire of utility managers to know more precisely how their station's performance compares relative to the standards of excellence. It is also in keeping with INPO's responsibility to the individual CEO and to its members for identifying low-performing nuclear plants and for stimulating improvement in performance.

Even though standards for performance have risen substantially over the years, the number of plants in categories 1 and 2 has remained relatively constant, even as standards of excellence have improved. Additionally, several conclusions can be drawn from evaluations over the years. Excellent plants (category 1) and category 2 plants show strong leadership, are self-critical, do not tolerate complacency, are operationally focused, have exceptional equipment performance, and effectively use training to improve performance. Attributes of category 3 and 4 stations may include leaders not setting high standards, a weak self-critical attitude, weak day-to-day operations, broad equipment problems, and deficient fundamental knowledge and skills in several areas. It has been over a decade since a station has been assessed in category 5.

The final report includes utility responses to the identified areas for improvement, along with their commitments to specific corrective action. In subsequent evaluations and other interactions, INPO specifically reviews the effectiveness of actions taken to implement these improvements.

In addition to the strengths and areas for improvement provided in the evaluation report, subjective team comments are often communicated to the member CEO during the evaluation exit meeting. These comments, often more intuitive, are intended to help utilities recognize and address potential issues before they adversely affect actual performance. Copies of the plant evaluation report are distributed according to a policy approved by the Institute's Board of Directors.

The industry also hosts WANO peer reviews conducted by the WANO-Atlanta Centre. These are conducted at each U.S. station approximately every 6 years and are performed in lieu of an INPO plant evaluation at each station. These peer reviews use a methodology similar to that of plant evaluations, but with teams augmented with international peers.

Numerous improvements have been made in plant safety and reliability as a result of addressing issues identified during evaluations, peer reviews, plant self-assessments and comparison and emulation among plants. The time plants operate versus the amount of time they are shutdown has improved significantly, the frequency of unplanned shutdowns has decreased markedly, and the reliability and availability of safety systems has improved measurably.

II. Corporate Evaluations

Member utilities that operate multiple nuclear stations request that INPO conduct corporate evaluations on an interval of 4 to 6 years. Corporate evaluations at single nuclear station utilities are conducted when requested by the utility or when deemed necessary by INPO. The INPO-conducted corporate evaluations reflect the important role of the company headquarters in supporting the successful operation of plants within a multi-site fleet. INPO conducted five corporate evaluations in 2009.

A tailored set of POCs define the scope of activities and the standards for corporate evaluations. The corporate evaluation focuses on the impact that the corporation has on the safe operation of its nuclear plants. Areas typically evaluated during a corporate evaluation include the following:

- direction and standards for station operation, including the organizational alignment, communications, and accountability for strategic direction, business and operational plans, and performance standards
- governance, monitoring and independent oversight of the nuclear enterprise
- support for emergent station issues and specialty areas such as major plant modifications, including replacement of steam generator and reactor vessel heads and station upgrades to extract more power and efficiency
- performance of corporate functions, such as human resources, industrial relations, fuel management, supply chain management and other areas, as applicable to the nuclear organization

INPO members use corporate evaluation results to help ensure that essential corporate functions are providing the leadership and support necessary to achieve and sustain excellent nuclear station performance. As a consequence of responding to issues identified during corporate evaluations, appropriate resources and leadership attention have often been refocused on improving station safety and reliability.

At the request of its members, INPO meets with utility boards of directors to provide an overview of plant, and when applicable, fleet performance. These briefings are used by the boards of directors as an input to their assessment of operational risk.

III. Other Review Visits

The industry also utilizes INPO to conduct review visits in selected industrywide problem areas to supplement the evaluation process. These visits are typically initiated by INPO and are evaluative in nature. The results of review visits may be used as an input to the evaluation process. The visits are designed as in-depth reviews of technical areas that could have a significant impact on nuclear safety and reliability. Such areas include critical materials issues that affect the structural integrity of the reactor coolant system and reactor vessel internals of both boiling-water reactors (BWRs) and pressurized-water reactors (PWRs). Other areas include components or systems that are significant contributors to unplanned plant transients and forced loss rate, including main generator and transformer, switchyard, and electrical grid components. In 2009, INPO conducted 109 review visits.

Similar to plant evaluations and peer reviews, review visits evaluate station performance against the INPO POCs to a standard of excellence. In some areas, such as materials, industry groups have developed detailed technical guidance that each utility has committed to implement. The materials review visit teams also use this guidance to ensure that program implementation is consistent and complete and meets the industry-developed standards.

Review visit teams are led by an INPO employee and include industry personnel who have unique expertise in the area of the review that is not typically within the skill set of INPO members of plant evaluation or peer review teams. Review visits typically include a week of preparation followed by a week on site.

Review visit reports contain beneficial practices and recommendations for improvement. These reports are sent to the station site vice president. For potential safety-significant recommendations, INPO may request a response. The subsequent plant evaluation or WANO peer review team follows up on each of the recommendations that require a response to ensure that identified issues are addressed. Periodically, INPO compiles the beneficial practices and recommendations and posts the information on the secure member Web site to allow all utilities to benchmark their programs.

The following sections discuss the details of selected review visit programs.

Pressurized-Water Reactor Steam Generator Review Visits

INPO initiated steam generator review visits in 1996. In the early 1980s, steam generator tube leaks and ruptures were significant contributors to lost power generation and were the cause of several events deemed significant by INPO. The industry as a whole became more sensitive to the importance of steam generator integrity as a contributor to core damage frequency analysis. The industry, through the Electric Power Research Institute (EPRI) Steam Generator Management Program, developed and maintained detailed guidance on qualification and implementation of nondestructive testing techniques, engineering assessments of steam generator integrity, and detection and response to tube leakage and ruptures. In mid-1995, the industry requested that INPO help improve the prevention and detection of steam generator degradation by verifying correct and consistent implementation of industry guidance at individual stations and to evaluate steam generator management programs against standards of excellence. As a result, INPO established the steam generator review visit program. Other review visits that were initiated later used the steam generator review visit process as a model.

Steam generator review visits focus on steam generator in-service inspection and repair, use of qualified personnel and techniques for eddy-current examinations of tubes; tube plugging procedures; assessment of current inspection results; chemistry conditions that affect steam generators; and steam generator primary-to-secondary leak detection, monitoring, and response.

In general, steam generator management programs have steadily improved and are implemented effectively, as evidenced by the lack of safety-significant events and events that contribute to lost generation. Steam generator replacements have also contributed to overall improved performance. Consequently, steam generator review visits currently identify few significant issues. However, the review visits have identified a need for improved timeliness in implementing industry-developed or revised guidance, and improved rigor in inspecting for, evaluating, and retrieving loose parts.

Boiling-Water Reactor Vessel and Internals Review Visits

In 2001, INPO initiated BWR vessel and internals review visits at the request of the industry. In the early 1990s, vessel and internal issues caused by intergranular stress-corrosion cracking became significant contributors to lost power generation. Safety concerns associated with this degradation prompted the industry to form the EPRI BWR Vessel and Internals Project. This group developed detailed guidance to address inspection, mitigation, repair, and evaluation of degradation for components important to safety and reliability.

BWR vessel and internals review visits focus on nondestructive examinations; inspection scope and coverage; evaluation of crack growth and critical flaw size; effectiveness of strategies to mitigate intergranular stress-corrosion cracking, including hydrogen addition and application of noble metals; and chemistry conditions that affect long-term health, including potential effects on fuel.

Industry overall performance has improved as evidenced by the lack of safety-significant events and events that contribute to lost generation.

Pressurized-Water Reactor Primary Systems Integrity Review Visits

INPO initiated PWR primary systems integrity review visits in 2003. Since the early 1980s, a number of notable events associated with leakage from PWR borated systems have resulted in additional oversight by the NRC and INPO. In some cases, these leakage events have resulted in corrosion and wastage of reactor coolant system pressure-retaining components. The EPRI PWR Materials Reliability Program was formed as an industry initiative in 1998 to develop guidance to address materials degradation issues. Because of the importance of primary systems integrity, INPO began performing in-depth review visits focused on boric acid corrosion control and Alloy 600 degradation management, including dissimilar metal butt welds.

PWR primary systems integrity review visits focus on the inspection and evaluation of reactor coolant system pressure-retaining components; the qualification of nondestructive examination personnel and techniques; and the monitoring and response to unidentified leakage in containment, including management guidance and operator procedures.

As a result of these industry efforts, performance appears to be improving. Stations are identifying degradation before leakage occurs. Stations have also more aggressively pursued indications of minor unidentified leakage. Alloy 600 dissimilar metal butt weld examinations and mitigation will continue over the next few years as the enhanced industry-defined actions continue to be performed and inspections take full advantage of improved nondestructive examination techniques.

Transformer, Switchyard, and Grid Review Visits

INPO initiated transformer, switchyard, and grid review visits in 2004. Many transformers have been in service for numerous years and are often the original station transformers. Considering this aging—along with the recent trends of power uprates, license renewal, and increased loading—these transformers may be operating with a reduction in margin. With this decrease in margin, the need for increased monitoring, trending, and predictive and preventive maintenance became apparent in order to identify and mitigate potential problems before they result in on-line failure. Additionally, a series of events in 2003, including the blackout in the northeastern United States and parts of Canada, reinforced the need for nuclear plants to have reliable offsite power. There was also renewed focus on how nuclear plant conditions and electrical power system line-ups to the switchyards can help minimize and prevent grid events.

The transformer, switchyard, and grid review visits focus on communication and coordination with grid operators, including formal agreements and implementing procedures, adequacy of offsite power, and predictive and preventive maintenance for large power transformers and switchyard equipment.

While isolated events related to switchyards, transformers, and grids continue to occur, additional rigor in maintenance and interfaces has shown some improvement. Additionally, sharing of information and lessons learned among utilities is resulting in implementation of barriers to prevent future events. It is expected that as the review visits continue, the number and significance of events will be reduced.

Main Generator Review Visits

The industry initiated main generator review visits were in 2004 following identification of an adverse trend involving failures of main generators and related support systems. The number of main generator failures that hindered power production or extended an outage, or both, had doubled from 1999 to 2003. During this time, unplanned scrams caused by generator problems increased to around five per year from the previous average of two per year. The most frequent generator maintenance challenges involved support systems, such as stator cooling water and the exciter, and often included human performance elements. As a result of industry identification of this adverse performance, INPO began conducting main generator review visits to focus on improving the performance of main generators.

Main generator review visits focus on performance and condition monitoring to ensure that the generator is operating within design parameters and to detect early signs of equipment degradation, preventive and condition-based maintenance to address the effects of aging, outage planning to ensure that important main generator work is performed, and knowledge and skill levels of personnel to ensure proper workmanship.

Emergency Preparedness

In 2007, INPO reestablished its emergency preparedness section to help the industry continue to improve its readiness to respond to radiological and other site emergencies. INPO began this initiative in response to a need identified in 2002 by the Nuclear Energy Institute and a subsequent industry review led by INPO of 25 plants over 3 years. These visits identified opportunities for improvement that included more timely and accurate classifications, notifications, and protective action recommendations; strengthened drill programs; and increases in emergency response organization staffing. The emergency preparedness review visit program is a formal INPO program with each site receiving a visit every 4 years.

In 2010, INPO entered its fourth year of conducting emergency preparedness review visits. During this time, INPO identified several industrywide issues, which are being addressed by working groups comprising industry leaders and facilitated by INPO. INPO developed and published a guideline that provides a basic task analysis and training program elements for key emergency response organization members. The Institute is drafting additional guidance on how to better control equipment important to emergency preparedness and on how to develop realistic training and evaluation of shift manager oversight during emergencies. INPO anticipates that published guidance on these topics will be available to the industry in 2010.

INPO also conducted the fourth annual emergency preparedness manager seminar in 2010. As turnover and attrition continues to challenge the industry, demand for qualified emergency preparedness managers spotlights the need for this highly sought after seminar. The 1-week seminar is intended to address this ongoing turnover. Another initiative expected to prove valuable the establishment of periodic industrywide working meetings at INPO. These meetings will address a broad range of industry issues identified by our members and are expected to capitalize on gathering a broad range of experienced program owners to address specific topics.

The INPO Emergency Plan and the recently updated Emergency Response Center is used to assist members in mobilizing the resources of the nuclear industry and to provide other resources or assistance as necessary, following classification of an emergency event. INPO recently completed an emergency response drill, performed with support of an industry fleet emergency preparedness organization. This drill demonstrated the value of a collaborative relationship with industry members in providing needed support.

b. Training and Accreditation Programs

The U.S. commercial nuclear power industry strongly believes that proper training of plant operators, maintenance workers, and other support group workers is of paramount importance to the safe operation of nuclear plants. As a result, the industry established the National Academy for Nuclear Training in 1985 to operate under the responsibility of INPO. The industry formed the Academy to focus and unify high standards in training and qualification and to promote professionalism of nuclear plant personnel. The Academy integrates the training-related activities of all members, the independent National Nuclear Accrediting Board, and the Institute. Through INPO, the Academy conducts seminars and courses and provides other training and training materials for utility personnel.

All U.S. nuclear plants have accredited training programs and are branches of the Academy. A utility becomes a member of the Academy when all of its operating plants have achieved accreditation for all applicable training programs.

INPO interacts with all members in preparing for, achieving, and maintaining accreditation of training programs for personnel involved in the operation, maintenance, and technical support of nuclear plants. These interactions, similar in content to the accreditation efforts of schools and universities, include evaluations of accredited training programs, activities to verify that the standards for accreditation are maintained, and assistance at the request of member utilities. Written objectives and criteria are jointly developed with the industry and guide the accreditation process.

Unlike our role in the plant evaluation and assessment process described above, INPO is not the accrediting agency. The independent National Nuclear Accrediting Board examines the quality of utility training programs and makes all decisions with respect to accreditation. If training programs meet accreditation standards, the Board awards or renews accreditation. If significant problems are identified, the Board may defer initial accreditation, place accredited programs on probation, or withdraw accreditation. Accreditation is maintained on an ongoing basis and is formally renewed for each of the training programs every 4 years. The National Nuclear Accrediting Board, comprised of training, education, and industry experts, is convened and supported by INPO, but it is independent in its decisionmaking authority. Board members are selected from a pool of individuals from utilities, post-secondary education, nonnuclear industrial training, and NRC nominations. Each Board consists of five sitting members, with a maximum of two utility representatives to ensure Board independence from the nuclear industry.

The accreditation process is designed to identify strengths and weaknesses in training programs and to assist in making needed improvements. The process includes self-evaluations by members, with assistance provided by INPO staff; on-site evaluations by teams of INPO and industry personnel; and decisions by the independent National Nuclear Accrediting Board. Members are expected to seek and maintain accreditation of training programs for the following positions or skill areas:

- shift managers
- senior reactor operators
- reactor operators
- nonlicensed operators
- continuing training for licensed personnel
- shift technical advisors
- instrument and control technicians and supervisors
- electrical maintenance personnel and supervisors
- mechanical maintenance personnel and supervisors
- chemistry technicians
- radiological protection technicians
- engineering support personnel

In 2002, the industry updated the accreditation objectives to place additional emphasis on training for performance improvement. It was recognized that in striving for excellence, training must be an integral part of each plant's business strategy and daily operations to ensure a highly skilled workforce. This approach strengthens the link between the analysis of performance gaps and the training that results in tangible improvements in people and plant activities. The five-step systematic approach to training remains the essential tool for providing training that is results oriented. Both line and training organizations are expected to work together to analyze performance gaps and to design, develop, and deliver training that enhances knowledge and skills to measurably improve plant performance. Such an approach to improving worker knowledge and skills contributes to high levels of safety, as seen in industry gains in equipment reliability, safety system availability, collective radiation exposure, and worker safety, as well as fewer events. The role of training will continue to be vital in coming years as many experienced workers retire and new workers enter the workforce.

In 2009, the National Nuclear Accrediting Board renewed accreditation for 164 of 182 training programs. Eighteen programs at three stations were placed on 6-month probation and required to upgrade their training programs. After considerable corrective actions and investment, both stations were successful in having their programs' accreditation renewed following the probation period and after presenting their improvements to the Accrediting Board. The third station will return to the Accrediting Board in 2010.

While the accreditation process is independent of the NRC, it is recognized and endorsed by the NRC as a means for satisfying regulatory training requirements. In its "Annual Report on the Effectiveness of Training in the Nuclear Industry," the NRC noted that, "Monitoring the INPO managed accreditation process continued to provide confidence that accreditation is an acceptable means of ensuring the training requirements contained in 10 CFR 50 and 10 CFR 55 are being met." In addition, the NRC assessment of the accreditation process indicates that continued accreditation remains a reliable indicator of successful systematic approach to training implementation and contributes to the assurance of public health and safety by ensuring that nuclear power plant workers are being trained appropriately.

i. Training and Qualification Guidelines

The Academy develops and distributes training and qualification guidelines for operations, maintenance, and technical personnel. These guidelines are designed to assist the utility in developing quality training programs and in selecting key personnel.

Training and qualification guidelines are revised and updated periodically to incorporate changes to address industry needs and to take into account lessons learned from other INPO programs such as evaluations, events analyses, working meetings, and workshops. These training and qualification guidelines provide a sound basis for utility training programs.

ii. Courses and Seminars

The industry benefits extensively from courses and seminars that the Academy conducts to help personnel better manage nuclear technology, more effectively address leadership challenges, and improve their personal performance. In 2009, nearly 1,400 industry employees, including many international representatives, participated in more than 70 courses and seminars. Examples of courses and seminars conducted are as follows:

- Goizueta Director's Institute (focused on the directors of member boards) (INPO, in partnership with the Goizueta Business School of Emory University, conducts "The Impact of Governance on the Nuclear Power Industry," a nuclear education course designed for directors in the nuclear industry. Since its inception in 2006, the program has attracted 146 participants from member and international utilities.)
- Reactor Technology Course for Utility Executives

- Senior Nuclear Executive Seminar
- Senior Nuclear Plant Management Course
- Human Performance Fundamentals Course
- High Performance Teamwork Development
- Operations Supervisor Professional Development Seminar
- First-Line Leadership Seminar
- Next-Level Leadership Seminar
- Seminars for new plant managers and for new managers in operations, radiological protection, chemistry, maintenance, engineering, nuclear oversight, and training

In February 2006, INPO launched the National Academy for Nuclear Training e-Learning (NANTeL) system. Using Web-based technologies allowing distance learning, NANTeL training includes courses and proctored examinations for plant access, radiation worker, human performance, and industrial safety qualification to industry standards. By July 2006, all member utilities had agreed to participate in the system by accepting generic training and updating the industry's Personnel Access Data System for training course completions. The system offers 42 generic and 215 utility or site-specific training courses. Between March 1, 2006, and December 31, 2009 more than 100,000 industry workers have completed a total of 1,059,840 courses.

Meeting the challenges of developing a well-trained, knowledgeable workforce in the future continues to receive attention. Early in 2008, INPO began work on the first phase of a new industry initiative called the Future of Learning. Developed with extensive industry participation, this initiative lays out a strategy to guide training efforts in the years ahead. It will help the industry deal with workforce renewal, the training of a new generation of workers, and the training of even more workers to support new plant construction.

INPO efforts to help prepare and energize the nuclear workforce of tomorrow include a new leadership seminar designed for emerging nuclear leaders. Also, the "Nuclear Citizenship for New Workers" course, emphasizing the uniqueness of our nuclear industry, has been made available, as well as an industrywide instructor training and certification program that uses a blend of distance learning and classroom instruction.

c. Analysis and Information Exchange Programs

The analysis and information exchange programs improve plant safety by identifying the causes of industry events that may be precursors to more serious events. Stations are required to share operating experiences and lessons learned with INPO. INPO then analyzes and rapidly communicates the information to the industry through a variety of methods and products. In addition, INPO analyzes a variety of operational data to detect trends in industry performance and communicates the results to the industry.

INPO operates and maintains extensive computer databases to provide members and participants ready access to information on plant and equipment performance and operating experience. These databases are accessible from INPO's secure member Web site. For example, the industry uses Nuclear Network®, a worldwide internet-based communication system, to exchange information on the safe operation of nuclear plants. WANO also uses Nuclear Network® as a primary means for communicating and exchanging operating experience among its members and regional centers.

I. Events Analysis Program

INPO reviews and analyzes operating events from both domestic and international nuclear plants through its Significant Event Evaluation and Information Network (SEE-IN) Program. The program is designed to provide in-depth analysis of nuclear operating experience and to apply the lessons learned across the industry. Events are screened, coded, and analyzed for significance; those with generic applicability are disseminated to the industry in one or more of the following forms, beginning with events of greatest importance:

- SOERs
- Significant Event Reports (SERs)
- Significant Event Notifications (SENs)

Members support the events analysis program by providing INPO with detailed and timely operating experience information. Operating experience information is freely shared among INPO members. The U.S. industry submits more than 2,000 operating experience entries every year, or about 30 to 40 per station. These entries enable a single station to multiply its experience base for identifying problems. This experience base includes safety systems, which have similar components across many stations. For example, one station recently discovered scoring of a cylinder on an emergency diesel generator (EDG) that could render the EDG inoperable. Other stations were able to use this information to take actions to inspect their EDGs before actual equipment malfunction. A key to this success is the timeliness of reporting. Stations typically report events in less than 50 days after occurrence.

Members are required to evaluate and take appropriate action on recommendations provided in SOERs. During on-site plant evaluations, INPO teams follow up on the effectiveness of each station's actions in response to SOER recommendations. For example, during a recent plant evaluation, team members reviewing SOER recommendations identified a potentially significant transformer problem that likely would lead to catastrophic failure if not corrected in a timely manner. This event was avoided because of lessons documented in an SOER. Topics of SOERs in recent years include loss of grid, reactivity management, reactor core designs, transformers, unplanned radiation exposures, and rigging and lifting of heavy loads.

Members should review and take actions as appropriate on SENs, SERs, and other reports provided by INPO. INPO evaluates the effectiveness of utility programs in extracting and applying lessons learned from industrywide, as well as internal station, operating experience.

INPO maintains all operating experience reports since the start of the SEE-IN Program in searchable databases available on the secure member Web site. This information supports members in applying historical lessons learned as new issues are analyzed or activities are planned. INPO also provides "just-in-time" briefing summaries in numerous topical areas in a format designed to help plant personnel prepare to perform specific tasks. These documents provide ready-to-use materials to brief workers on problems experienced and lessons learned during recurring activities.

ii. Other Analysis Activities

INPO analyzes industry operational data from a variety of sources—events, equipment failures, performance indicators, and regulatory reports—to detect trends in industry performance. INPO communicates the results of analyses to the industry using several methods, including topical reports. These documents typically review events and other data over a period of years to summarize performance trends and causes and suggest actions. Subjects of recent topical reports include fuel reliability, foreign material intrusion, intake cooling blockage, large motor failures, and contractor personnel performance. Stations use these reports to assess their performance and identify improvements. In addition, individual plant performance data are analyzed, with results used to support other INPO activities, such as evaluations and assistance.

iii. Nuclear Network® System

Nuclear Network is an international electronic information exchange for sharing nuclear plant information. It is the major communication link for the SEE-IN and WANO event reporting system. The system transmits operating experience information, SERs, and other nuclear technical information.

The system includes a special dedicated method for reporting unusual plant situations. This feature allows the affected utility to provide timely information simultaneously to all Nuclear Network® users, including the U.S. industry, INPO's international and supplier participants, and WANO members, so the affected station does not have to respond to multiple inquiries. In addition, members are promptly informed of problems occurring at one station, allowing them to implement actions to prevent a similar occurrence.

iv. Performance Data Collection and Trending

INPO operates and maintains a consolidated data entry system as a single process by which to collect data and information related to nuclear plant performance. Members provide routine operational data in accordance with the WANO Performance Indicator Program or regulatory requirements on a quarterly basis. These plant data are then consolidated for trending and analysis purposes. Industrywide data, plus trends developed from the data, are provided to member and participant utilities for a number of key operating plant performance indicators. Members use these data for comparison and emulation, in setting specific performance goals, and in monitoring and assessing performance of their nuclear plants.

In the mid-1980s, the industry worked with INPO to establish a set of overall performance indicators focused on plant safety and reliability. These indicators have gained strong acceptance and use by utilities to compare performance, set targets, and drive improvements. Examples of indicators collected and trended include unplanned automatic scrams, safety systems performance, unit capability factor, forced losses of generation, fuel reliability, collective radiation exposure, and industrial safety accidents.

The industry has established long-term goals for each indicator on a 5-year interval, beginning in 1990. Annex 2 of this report provides key performance indicator graphs for U.S. plants.

v. Equipment Performance Data

INPO operates and maintains the EPIX system, which tracks the performance of equipment important to safety and reliability. The industry reports equipment performance information to EPIX in accordance with established guidance. Member utilities use the data to identify and solve plant equipment performance problems, with the goal of enhancing plant safety and reliability. The information is also used by the Institute for performance trending to identify industrywide performance problems. INPO also makes the data available to the NRC to support equipment performance reviews by the regulator.

vi. Operating Experience for New Plant Construction

In 2009, a means for collecting and distributing experience from construction problems was established through the U.S. industry's Nuclear® Network System. Nuclear Network® has long been the forum for rapid and secure communications and has hosted the industry's operating experience program. The new construction experience program has a similar mission to that of the operating experience, but it is tailored to the unique needs of utilities with construction projects.

d. Assistance Programs

Between evaluations, a station can request and receive assistance in specific problem areas to help improve plant performance. In addition, INPO monitors the performance of member utility stations between evaluations to identify areas in which assistance can be used to improve plant performance or respond to declining performance. The purpose of this monitoring is to identify, as early as possible, stations that exhibit indications of declining performance so that focused assistance can be provided to help reverse the performance trend. INPO also provides members with comparisons of their plants' performance to overall industry performance in a variety of areas.

A majority of assistance visits to member utilities by INPO personnel and industry peers are at the request of the stations. This assistance is targeted for specific technical concerns, as well as for broader management and organizational issues. While assistance is generally requested by a station, in some cases INPO may suggest assistance in a specific area to stimulate improvements.

Assistance resources are provided using a graded approach that provides a higher priority to those plants that need greater performance improvement. An INPO management senior representative is assigned to each station to facilitate assistance efforts. Station and utility management maintains close liaison with the senior representative to help identify where INPO resources can best be used to address specific issues and help improve overall station performance.

When significant performance shortfalls persist at a station or when performance trends indicate chronic conditions that could detract from safe and reliable plant operation INPO will follow a policy of graduated engagement with the member utility. For a nuclear plant that shows either consistently poor performance over several evaluation cycles or a significant decline in performance between evaluation cycles, the INPO staff will recommend and obtain concurrence from the INPO CEO to include the plant in a special focus category. For plants that need special focus, INPO will establish a Special Focus Oversight Board that will conduct scheduled periodic reviews to determine the effectiveness of station improvement activities and provide rapid feedback. Board members will usually include both industry and INPO executives.

INPO provides documents that describe nuclear safety principles, effective leadership and management practices, and good work processes and practices to assist member utilities. Members help INPO develop these documents and then use them to address specific improvement needs.

Workshops, seminars, working meetings, and other activities are also conducted to assist in the exchange of information among members and to support the development of industry leaders and managers.

INPO facilitates information exchange among member utilities by identifying and cataloging information on a wide range of activities that stations are doing especially well. The information on effective programs and practices is shared with members on request and through a number of other forums. This assistance fosters comparison and the exchange and emulation of successful methods among members.

i. **Assistance Visits**

Members may request assistance visits in specific areas of nuclear operations in which INPO personnel have experience or expertise. INPO personnel and industry peers normally conducts such visits. For example, if a member requests assistance in some specific aspect of maintenance, INPO will include a peer from another plant that handles that aspect of maintenance particularly well. INPO provides written reports that detail the results of the visits to the requesting utility. In most cases, the assistance visit includes actual methods and plans for improving performance as part of the assistance visit.

In 2009, INPO provided 144 assistance visits with 110 industry peers. Key areas of assistance provided included operational focus, maintenance and work management, engineering programs, chemistry, radiological protection, human performance, and industrial safety. Additional areas of assistance conducted in 2009 involved supplier participants, with a focus on supplemental personnel and fuel performance. In addition to assistance visits to stations for specific functional areas during 2009, senior representatives made 140 visits to their assigned stations to interact with station management and to monitor for early signs of performance decline. Senior representative-led INPO teams made 16 assistance visits at stations designated as special focus.

Effectiveness reviews performed by INPO approximately 6 months after assistance visits show that assistance visits are highly valued by station management and are contributing to improved performance.

ii. Development of Documents and Products

Several categories of documents and other products are designed and developed to help member utilities and participants achieve excellence in the operation, maintenance, training, and support of nuclear plants. Key categories of INPO documents and products are as follows:

- Principles documents address professionalism, management and leadership development, human performance, and other cross-functional topics important to achieving sustained operational excellence. INPO prepares these documents with substantial involvement of industry executives and managers. The principles extracted from the documents are used extensively in evaluation and assistance activities.

  The first of the principles documents entitled, *Principles for Enhancing Professionalism of Nuclear Personnel*, which addresses human resource management areas focused on developing nuclear professionals, including personnel selection, training and qualification, and career development. Two supplemental documents—*Management and Leadership Development* and *Excellence in Human Performance*—build on the original document. Utility executives use *Management and Leadership Development* to assist in the identification, development, assessment, and selection of future senior managers. *Excellence in Human Performance* provides practical suggestions for enhancements in the workplace that promote excellent human performance.

  In 1999, INPO distributed *Principles for Effective Self-Assessment and Corrective Action Programs*. This document emphasizes the importance of establishing a self-critical station culture and identifying the key elements of effective self-assessment and corrective action programs.

- Guideline documents establish the bases for sound programs in selected areas of plant operation, maintenance, and training, as well as cross-functional areas of direct importance to the operation and support of nuclear stations. Guidelines assist members in meeting the objectives used in evaluations and accreditation. The guidelines are recommendations based on generally accepted industry methods. They are not directives, but are intended to help utilities maintain high standards. Although member utilities do not have to follow each specific method described they are expected to strive to meet the intent of INPO guidelines.

- INPO provides good practices, work process descriptions, Nuclear Exchange documents, and other documents to assist members. Typically, these documents are developed from programs of member utilities and INPO's collective experience. INPO synthesizes the information into a document by the INPO staff, with industry input and review. In general, the documents define one method of meeting INPO performance objectives in specific areas, although other programs or methods may be as good or better. Utilities are encouraged to use these documents in developing or improving programs applicable to their plants. These documents can be used in whole or in part, as furnished, or modified to meet the specific needs of the plant involved.

INPO produces various other documents, such as analysis reports and special studies, as needed. Other assistance products include lesson plan materials, computer-based and interactive video materials, videotapes, and examination banks. The National Academy for Nuclear Training magazine, *The Nuclear Professional,* published quarterly, features how plant workers have solved problems and made improvements that enhanced safety.

iii. Workshops and Meetings

INPO sponsors workshops and working meetings for specific groups of managers on specific technical issues as forums for information exchange. This exchange provides an opportunity for INPO and industry personnel to discuss challenges, performance issues, and areas of interest. It also allows individuals from members and participants to meet and exchange information with their counterparts. In 2006, nearly 1,200 industry personnel participated in more than 70 meetings and workshops.

8. Key Initiatives 2010 – 2014

The nuclear industry continues to change and move at a demanding pace—new technologies, new people, and plans for new plants are adding even more challenges to the mix. The future will bring with it new demands for INPO and its members.

Cross-functional INPO teams began developing a strategic plan in mid-2008, building on the success and lessons learned from the previous plan. This was done by taking into account the needs of stakeholders and focusing on key areas in which INPO wants to have significant impact in the coming years.

The plan centers around four strategic focus areas:

SFA1: Increase accountability—both at INPO and in the industry—for full and timely resolution of adverse trends and issues.

SFA2: Advance industry performance in the areas of management, leadership, safety culture, recovery, and sustainability.

SFA3: Identify, develop, acculturate, and sustain a highly capable, professional, and knowledgeable workforce to lead and support nuclear organizations effectively.

SFA4: Advance nuclear safety worldwide using a network of partnerships that leverage our standards, methods, and global best practices to improve safe operations.

The 5-year business plan is built around high-priority organizational themes, critical for accomplishing INPO's vision. They are cross-functional, transcending cornerstone, division, and department boundaries. The plan is not a checklist of activities or projects that INPO does, but a plan that describes the outcomes INPO intends to produce or influence.

The industry continuously provides feedback to INPO on issues that affect station operation. Many INPO initiatives are based on industry trends and important focus areas. One initiative that is underway is described below.

a. New Plant Design and Construction

For many years, no new nuclear plants have been built in the U.S. However, as a result of the need for additional power, concerns over the environmental effects of carbon-based fuels, the streamlined licensing process, and financial incentives provided by the 2005 Energy Policy Act, U.S. utilities are once again planning new plant construction. To support this effort, INPO formed a new plant deployment group in 2006 to engage with the nuclear industry and plan for INPO's involvement though application of its cornerstone programs.

In 2006, INPO updated a report entitled, *Operating Experience to Apply to Advanced Light Water Reactors*, which includes lessons learned from significant events. The update report includes experience from operations and maintenance activities that should be addressed in the design of new plants. INPO participant plant designers and utility groups are using this document in their review of the new designs.

INPO also engaged utilities planning to submit license applications in a series of benchmarking trips in 2006 and 2007 to international utilities and plant designers in France and Japan, an aircraft company, and a coal plant with advanced control systems. These trips provided an opportunity to learn more about new technologies that have evolved since the last period of nuclear plant construction, most notably in plant standardization, computerized man-machine interface, and modular construction. INPO is promulgating a report to its members that features the information gathered from these trips.

To support plans for training the new plant workforce, INPO prepared a report entitled *Initial Accreditation of Training Programs for New Reactors*, which provides a process for achieving accreditation of training programs before their implementation. In addition, INPO will be reviewing the guidelines of the National Academy for Nuclear Training and several technical process description documents to make any necessary adjustments for the new plant environment.

9. Relationship with World Association of Nuclear Operators

U.S. nuclear utilities are represented in WANO through INPO. As such, INPO coordinates the U.S. nuclear utilities' activities in WANO. INPO also provides operational support and facilities for the WANO-Atlanta Centre, one of the four WANO global regional centers. The WANO-Atlanta Centre Governing Board usually appoints an INPO executive to serve as the Atlanta Centre director.

WANO-Atlanta Centre contracts with INPO to provide resources in terms of seconded staff to support the Centre's day-to-day operation. WANO-Atlanta Centre also contracts with INPO to provide administrative support services, such as payroll, computer support, and employee benefit administration.

WANO-Atlanta Centre activities and programs include the following:

- Peer reviews are conducted at the request of INPO members by WANO teams of U.S. and international peer reviewers who identify strengths and areas for improvement associated with nuclear safety and reliability. When conducted at a U.S. INPO member plant, a WANO peer review is performed in lieu of an INPO plant evaluation.
- WANO exchange of operating experience information provides detailed descriptions of events and lessons learned to member utilities worldwide.
- Performance indicator data are collected, trended, and disseminated to facilitate goal setting and performance trending and to encourage emulation of the best industry performance.
- Technical support missions are conducted to allow direct sharing of plant operating experience and ideas for improvement.
- Professional and technical development courses, seminars, and workshops are designed for enhancing staff development and sharing operating experience.

WANO-Atlanta Centre provides management and support services for the conduct of INPO's International Participant Program. This program facilitates the direct exchange of information and experience through INPO access to the secure member Web site, seminars, workshops, INPO documents, and exchange visits. International participants may chose to have liaison engineers located in the INPO offices for training and professional development to assist in the exchange of information. The international participants also provide INPO with advice on a wide range of nuclear-safety-related issues through membership on the International Participant Advisory Committee. The INPO International Participant Program is smaller in scope and complementary to the broader industry participation in WANO.

The U.S. industry and INPO receive a substantial benefit through their relationship with WANO and the international nuclear community. Many improvements have been implemented in the U.S. based on lessons learned from the more than 340 units that exist outside of the U.S. INPO works to remain fully aware of trends in the global nuclear industry and continues to strengthen relationships in this area.

10. Conclusion

The U.S. commercial nuclear industry has made substantial, sustained and quantifiable improvement in plant safety and performance during the three decades since the Three Mile Island event. The leaders who guided this industry over decades of challenge and change showed great insight when they recognized the need for an unprecedented form of industry self-regulation through peer review. The industry members acknowledged that nuclear energy would remain a viable form of electric power generation only if it could ensure the highest levels of nuclear safety and reliability (i.e., the achievement of excellence) in nuclear power plants. The industry responded to this challenge by creating an independent oversight process of the highest integrity and requiring of itself an uncompromising commitment to the standards and ethical principles that are essential to success.

This insight and commitment to integrity has provided the foundation for a unique, sustained partnership between INPO and its members. INPO is pleased to serve as an essential element of an industry that has raised its standards and improved its performance in nearly every aspect of plant operation. INPO does not take credit for this success but takes pride in its contribution to it.

INPO also recognizes that the pursuit of excellence is a continuing journey, not a destination. The U.S. nuclear industry, as it evolves and advances, will continue to encounter situations that challenge both people and equipment in a business environment that is competitive, complex, and increasingly global in character.

These challenges, while demanding, are not insurmountable. The U.S. commercial nuclear industry, in partnership with INPO, will continue the tradition of both sharing insight and acting with integrity, and in so doing, will continue on the shared journey to ever-higher levels of excellence.

APPENDIX A
NRC STRATEGIC PLAN 2008 - 2013

The U.S. Nuclear Regulatory Commission (NRC) published the NUREG-1614, Volume 4, "Strategic Plan: Fiscal Years 2008–2013" in February of 2008. This Appendix summarizes the key points of this plan.

A Stable Regulator in a Dynamic Environment

The regulatory environment associated with the use of radioactive materials is changing. The expected receipt of applications to construct and operate new nuclear power plants and to dispose of spent nuclear fuel and high-level radioactive waste, are two of the major challenges potentially facing the NRC over the next several years.

To meet these challenges, the NRC must efficiently use its resources, update the agency's regulatory review and construction inspection guidelines, and provide adequate infrastructure to accommodate staff.

Even as the NRC works to address growth in the industry, the agency's mission and values remain unchanged. The NRC's priority continues to be ensuring the adequate protection of public, health, safety, and the environment, while promoting the common defense and security.

Safety and security remain the agency's core functions, and the goals and strategic outcomes of the Strategic Plan are based on these functions. This focus on safety and security ensures that the NRC remains a strong, independent, stable, and predictable regulator.

Over the strategic planning period, the Nation is likely to see the following occur:

- The NRC expects to receive additional applications from entities that want to build and operate new nuclear power plants. The NRC also expects to receive applications for new fuel cycle facilities, including a significant number of uranium recovery applications.
- The U.S. Department of Energy (DOE) may submit an application to construct a high-level radioactive waste repository at Yucca Mountain, NV.[8]
- Increasing quantities of spent nuclear fuel will be held in interim storage at reactor sites or transported to centralized interim storage sites awaiting permanent disposal.
- The NRC will continue to coordinate with a wide array of Federal, State, local, and Tribal authorities on issues related to license renewal, new reactor licensing, homeland security, emergency planning, and protection of the environment.
- The number of NRC Agreement States will increase, as will the number of medical, academic, and industrial entities using radioactive materials under the oversight of the Agreement States.

The NRC recognizes that these changes will create an even greater need for effective and open communication with public stakeholders about a variety of issues. These issues include the

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[8] In March 2010, DOE filed a motion to withdraw its application from NRC review. Section 19.8 of this report discusses radioactive waste in more detail.

safety and security of existing and proposed nuclear power plants and other licensed facilities and materials, emergency preparedness, and the impact on public health and safety and the environment from medical, academic, and industrial uses of licensed materials.

The unfolding of these complex regulatory issues also will require much more sophisticated techniques for the flow of documents and information, a process called knowledge management. The agency is in the process of attracting additional staff. The NRC realizes that to retain these highly skilled and educated professionals, who are critical to the agency, the agency must provide them with the necessary resources to do their jobs effectively and a high degree of workplace satisfaction. The agency's comprehensive knowledge management approach is focused on ensuring that all staff members are highly trained in the technical disciplines relating to their duties, the regulatory processes that govern agency actions, and the regulatory principles inherent in making the agency a strong, independent, stable, and predictable regulator.

Being a stable and predictable regulator implies having effective and structured regulatory processes in place and ensuring that these processes are followed. The agency will develop new regulatory initiatives in accordance with these processes, which will be open to public review and comment. The NRC is committed to considering and being responsive to stakeholder input before implementing any new regulatory initiative.

Key External Factors

The NRC's ability to achieve its goals depends on a changing mix of industry operating experience, national priorities, market forces, and availability of resources. A process for managing change should continue to be refined and implemented to ensure that the NRC is ready to address changing priorities in a timely manner. The following section discusses significant external factors, none of which the NRC can control but all of which could affect the agency's ability to achieve its strategic goals.

Receipt of New Reactor Operating License Applications. A resurgence of interest in new nuclear power plants is leading to intense competition for qualified individuals to serve as technical staff for both the NRC and its licensees and as nuclear power plant operating personnel. Increasing turnover and competition for qualified staff, as well as the loss of expertise as older members of the workforce retire, will remain an NRC challenge for the next several years.

Significant Operating Incident (Domestic or International). A significant incident at a licensed nuclear facility could cause the NRC to reassess its safety and security requirements, which could change the agency's focus on some initiatives related to its goals until the situation stabilizes. Because NRC stakeholders (including the public) are highly sensitive to many issues regarding the use of radioactive materials, events of relatively minor safety or security significance could potentially require a response that consumes considerable agency resources.

Significant Terrorist Incident. A significant terrorist incident anywhere in the United States would heighten the NRC's oversight and response stance. Subsequent new or changed security requirements or other policy decisions might affect the NRC, its partners, and the industry it regulates. A significant terrorist incident at a nuclear facility or activity anywhere in the world that departs from the agency's current evaluation of threat parameters could impact the NRC priorities, as well as U.S. policy regarding export activities, the NRC's role in international security, and requirements for security at U.S. nuclear power plants and other licensee facilities.

Emergency Preparedness and Incident Response. Emergency preparedness and incident response activities with Federal, State, local, and Tribal authorities continue to increase in scope and number. This affects the agency's priorities and workloads.

Timing of the DOE Application and Related Activities for the High-Level Waste Repository at Yucca Mountain. The licensing of the proposed repository for spent nuclear fuel represents a major effort for the NRC in terms of planning, review, analysis, and ultimate decision-making. DOE has indicated that it intends to submit a license application for a high-level waste repository by June 2008. The timing of DOE actions will heavily influence the NRC's resource allocation decisions over the next several years. Acceleration or delay in DOE activities may affect other programs that are directly associated with achieving the agency's goals.[9]

Legislative Initiatives. Legislative initiatives under consideration by the Congress can have a major impact on the NRC. For example, the Energy Policy Act of 2005 has greatly affected the agency's priorities and workload. Increasing interest in diversified sources of energy and energy independence is leading to an expected increase in license applications for nuclear power plants. The attendant increase in resources devoted to license review and analysis is affecting how the agency goes about achieving its goals for this planning period.

Advanced Fuel Cycle Development. DOE proposed the Global Nuclear Energy Partnership (GNEP) as a means to recycle (reprocess) nuclear fuel using proliferation-resistant technologies to recover more energy and reduce waste[10]. The impacts on the NRC could include developing the licensing requirements for, and then licensing, commercial reprocessing facilities, advanced burner reactors, and associated storage and waste facilities. The scope and schedule of NRC activities are uncertain.

9 In March 2010, DOE filed a motion to withdraw its application from NRC review. Section 19.8 of this report discusses radioactive waste in more detail.

10 In 2009, DOE cancelled the domestic GNEP program, focused primarily on domestic commercial recycling, and re-focused the program on continuation of research and development on proliferation-resistant fuel cycles and waste management strategies.

APPENDIX B
NRC MAJOR MANAGEMENT CHALLENGES FOR THE FUTURE

By law, the Inspector General of each Federal agency (discussed in Article 8 in Part 2 of this report) is to describe what he or she considers to be the most serious management and performance challenges facing the agency and assess the agency's progress in addressing those challenges. Accordingly, the Inspector General of the U.S. Nuclear Regulatory Commission (NRC) prepared his annual assessment of the major management challenges confronting the agency. The latest report, published in October 2009, can be found on the NRC's public Web site.

In his assessment, the Inspector General defined serious management challenges as "mission-critical areas or programs that have the potential for a perennial weakness or vulnerability that, without substantial management attention, would seriously impact agency operations or strategic goals." The challenges identified represent critical areas or difficult tasks that warrant high-level management attention. In the 2009 report, the Inspector General identified the following seven management challenges to be the most serious as of October 6, 2009.

Challenge 1: Protection of nuclear material used for civilian purposes

This challenge, which concerns materials control and accounting, is outside the scope of this report and is therefore not discussed.

Challenge 2: Managing information to balance security with openness and accountability

NRC employees often generate and work on sensitive information that needs to be protected. Such information can be sensitive unclassified information and classified national security information that is contained in written documents and electronic databases. In addressing continuing terrorist activity worldwide, the NRC continually reexamines its information management policies and procedures. The NRC faces the challenge of balancing the need to protect sensitive information from inappropriate disclosure with the agency's goal of openness in its regulatory processes. In 2008, the NRC made various efforts to improve public access to information while protecting sensitive information, including security-related information, from inappropriate disclosure.

Challenge 3: Ability to modify regulatory processes to meet a changing environment and to include the licensing of new nuclear facilities.

The NRC faces the challenge of maintaining its core regulatory programs while adapting to changes in its regulatory environment. The NRC must address a growing interest in licensing and constructing new nuclear power plants to meet the Nation's increasing demands for energy production. As of June 2009, the NRC had received 18 combined operating license (COL) applications and expects to receive an additional five COL applications by the end of fiscal year 2011.

While responding to the emerging demands associated with licensing and regulating new reactors, the NRC must maintain focus and effectively carry out its current regulatory responsibilities, such as inspections of the current fleet of operating nuclear reactors and fuel cycle facilities. The NRC intends to increase its safety focus on licensing and oversight activities through risk-informed and performance-based regulation.

Challenge 4: Oversight of radiological waste

The NRC regulates spent nuclear fuel generated from commercial nuclear power reactors, referred to here as high-level radioactive waste. The NRC faces significant issues involving the potential licensing of the proposed repository for storing high-level radioactive waste located in Yucca Mountain, NV[11]. Additional challenges in the high-level waste area include the interim storage of spent nuclear fuel, certification of storage and transportation casks, and the oversight of decommissioned reactors and other nuclear sites.

Additionally, the amount of low-level waste continues to grow; however, no new disposal facilities have been built since the 1980s and unresolved issues will multiply as once-operational disposal facilities shut down.

Challenge 5: Implementation of information technology and information security measures

The NRC needs to continue upgrading and modernizing its information technology and security capabilities both for employees and for public access to the regulatory process. Recognizing the need to modernize, the Office of Information Services established goals to improve the productivity, efficiency, and effectiveness of agency programs and operations and to enhance the use of information for all users inside and outside the agency. The NRC must also ensure that system security controls are in place to protect the agency's information systems against misuse.

Challenge 6: Administration of all aspects of financial management

NRC management is responsible for establishing and maintaining effective internal controls and financial management systems that meet the objectives of several statutes including the Federal Managers' Financial Integrity Act. This Act mandates that the NRC establish controls that reasonably ensure that (1) obligations and costs comply with applicable law; (2) assets are safeguarded against waste, loss, unauthorized use, or misappropriation; and (3) revenues and expenditures are properly recorded and accounted for. This Act encompasses program, operational, and administrative areas, as well as accounting and financial management.

In addition, the NRC's management of its expanded grant program must be conducted in accordance with Federal regulations, which includes ensuring that funds are distributed and used as intended.

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[11] In March 2010, DOE filed a motion to withdraw its application from NRC review. Section 19.8 of this report discusses radioactive waste in more detail.

Challenge 7: Managing human capital

The NRC's human capital needs are changing in response to the receipt of applications to construct and operate the next generation of nuclear reactors and to increase the number of fuel cycle facilities. To effectively manage human capital as these changes progress, while continuing to accomplish the agency's mission, the NRC must continue to implement the following initiatives:

- timely personnel security adjudication
- space planning
- recruitment, training, and knowledge management
- optimal use of resources

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APPENDIX D
ABBREVIATIONS

ABWR	advanced boiling-water reactor
ADAMS	Agencywide Documents Access and Management System (NRC)
ALARA	as low as reasonably achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
AP	Advanced Passive
ASME	American Society of Mechanical Engineers
BRIIE	Baseline Risk Index for Initiating Events
BWR	boiling-water reactor
BWRVIP	Boiling-Water Reactor Vessel and Internals Project
CEO	chief executive officer
CFR	*Code of Federal Regulations*
CNS	Convention on Nuclear Safety
DHS	U.S. Department of Homeland Security
DOE	U.S. Department of Energy
EDG	emergency diesel generator
EGM	enforcement guidance memorandum
EPA	U.S. Environmental Protection Agency
EPIX	Equipment Performance Information Exchange database
EPR	evolutionary power reactor
EPRI	Electric Power Research Institute
EPU	extended power uprate
ERDA	U.S. Energy Research and Development Administration
ESBWR	economic simplified boiling-water reactor
FEMA	U.S. Federal Emergency Management Agency
FY	fiscal year
GE	General Electric
GL	generic letter
GNEP	Global Nuclear Energy Partnership
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
IN	information notice
INPO	Institute of Nuclear Power Operations
IP	inspection procedure
IRRS	Integrated Regulatory Review Service
ISAP	Integrated Safety Assessment Program
ISG	interim staff guidance
ITAAC	inspection, test, analysis, and acceptance criterion/criteria

MWt	megawatt thermal
NANTeL	National Academy for Nuclear Training e-Learning
NCRP	National Council on Radiation Protection and Measurements
NEA	Nuclear Energy Agency
NEI	Nuclear Energy Institute
NEIL	Nuclear Electric Insurance Limited
NIMS	National Incident Management System
NRC	U.S. Nuclear Regulatory Commission
OMB	Office of Management and Budget
OSART	Operational Safety Assessment Review Team
POC	performance objectives and criteria
PRA	probabilistic risk assessment
PWR	pressurized-water reactor
RG	regulatory guide
RIS	regulatory issue summary
RISC	Risk-Informed Safety Class
RS	review standard
SAT	systems approach to training
SE	safety evaluation
SEE-IN	Significant Event Evaluation and Information Network
SEN	significant event notification
SEP	systematic evaluation program
SER	significant event report
SOER	significant operating experience report
SSC	structure, system, and component
Sv	sievert
TMI	Three Mile Island
TVA	Tennessee Valley Authority
US-APWR	U.S. Advanced Pressurized Water Reactor
US EPR	U.S. Evolutionary Power Reactor
WANO	World Association of Nuclear Operators
WENRA	Western European Nuclear Regulators' Association

APPENDIX E
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ANNEX 1
U.S. COMMERCIAL NUCLEAR POWER REACTORS

SOURCE: U.S. Nuclear Regulatory Commission NUREG-1350, Volume 21, "2009-2010 Information Digest," August 2009.

Plant Name and Operating Utility	Reactor Design Type	Licensed Power (MWt)	Operating Lifetime	
Arkansas Nuclear One 1 - Entergy Nuclear Operations, Inc.	PWR	2568	12/74	05/34
Arkansas Nuclear One 2 - Entergy Nuclear Operations, Inc.	PWR	3026	03/80	07/38
Beaver Valley 1 - FirstEnergy Nuclear Operating Company	PWR	2900	10/76	01/16
Beaver Valley 2 - FirstEnergy Nuclear Operating Company	PWR	2900	11/87	05/27
Braidwood 1 - Exelon Corp., Exelon Generation Co., LLC	PWR	3586.6	07/88	10/26
Braidwood 2 - Exelon Corp., Exelon Generation Co., LLC	PWR	3586.6	10/88	12/27
Browns Ferry 1 - Tennessee Valley Authority	BWR	3458	08/74	12/33
Browns Ferry 2 - Tennessee Valley Authority	BWR	3458	03/75	06/34
Browns Ferry 3 - Tennessee Valley Authority	BWR	3458	03/77	07/36
Brunswick 1 - Carolina Power & Light, Co., Progress Energy	BWR	2923	03/77	09/36
Brunswick 2 - Carolina Power & Light, Co., Progress Energy	BWR	2923	11/75	12/34
Byron 1 – Exelon Corp., Exelon Generation Co., LLC	PWR	3586.6	09/85	10/24
Byron 2 – Exelon Corp., Exelon Generation Co., LLC	PWR	3586.6	08/87	11/26
Callaway – AmerenUE, Union Electric Company	PWR	3565	12/84	10/24
Calvert Cliffs 1 - Constellation Energy	PWR	2700	05/75	07/34

Plant Name and Operating Utility	Reactor Design Type	Licensed Power (MWt)	Operating Lifetime	
Calvert Cliffs 2 - Constellation Energy	PWR	2700	04/77	08/36
Catawba 1 - Duke Energy Carolinas, LLC	PWR	3411	06/85	12/43
Catawba 2 - Duke Energy Carolinas, LLC	PWR	3411	08/86	12/43
Clinton - Exelon Corp., Exelon Generation Co., LLC	BWR	3473	11/87	09/26
Columbia Generating Station - Energy Northwest	BWR	3486	12/84	12/23
Comanche Peak 1- Luminant Generation Company, LLC	PWR	3612	08/90	02/30
Comanche Peak 2 - Luminant Generation Company, LLC	PWR	3458	08/93	02/33
Cooper - Nebraska Public Power District	BWR	2419	07/74	01/14
Crystal River 3 - Florida Power Corporation, Progress Energy	PWR	2609	03/77	12/16
Davis-Besse - FirstEnergy Nuclear Operating Co.	PWR	2817	07/78	04/17
Diablo Canyon 1 - Pacific Gas & Electric Co.	PWR	3411	05/85	11/24
Diablo Canyon 2 - Pacific Gas & Electric Co.	PWR	3411	03/86	08/25
Donald C. Cook 1 - Indiana/Michigan Power Co.	PWR	3304	08/75	10/34
Donald C. Cook 2 - Indiana/Michigan Power Co.	PWR	3468	07/78	12/37
Dresden 2 - Exelon Corp., Exelon Generation Co., LLC	BWR	2957	06/70	12/29
Dresden 3 - Exelon Corp., Exelon Generation Co., LLC	BWR	2957	11/71	01/31
Duane Arnold - FPL Energy Duane Arnold, LLC, Florida Power and Light Co.	BWR	1912	02/75	02/14
Edwin I. Hatch 1 - Southern Nuclear Operating Co.	BWR	2804	12/75	08/34
Edwin I. Hatch 2 - Southern Nuclear Operating Co.	BWR	2804	09/79	06/38
Fermi 2 – The Detroit Edison Co.	BWR	3430	01/88	03/25

Plant Name and Operating Utility	Reactor Design Type	Licensed Power (MWt)	Operating Lifetime	
Fort Calhoun Station – Omaha Public Power District	PWR	1500	09/73	08/33
R.E. Ginna - Constellation Energy	PWR	1775	07/70	09/29
Grand Gulf 1 - Entergy Nuclear Operations, Inc.	BWR	3898	07/85	11/24
H.B. Robinson 2 - Carolina Power & Light Co.	PWR	2339	03/71	07/30
Hope Creek 1 - PSEG Nuclear, LLC	BWR	3840	12/86	04/26
Indian Point 2 - Entergy Nuclear Operations, Inc.	PWR	3216	08/74	09/13
Indian Point 3 - Entergy Nuclear Operations, Inc.	PWR	3216	08/76	12/15
James A. FitzPatrick - Entergy Nuclear Operations, Inc.	BWR	2536	07/75	10/34
Joseph M. Farley 1 - Southern Nuclear Operating Co.	PWR	2775	12/77	06/37
Joseph M. Farley 2 - Southern Nuclear Operating Co.	PWR	2775	07/81	03/41
Kewaunee Power Station - Dominion Energy Kewaune, Inc.	PWR	1772	06/74	12/13
La Salle County 1 - Exelon Corp., Exelon Generation Co., LLC	BWR	3489	01/84	04/22
La Salle County 2 - Exelon Corp., Exelon Generation Co., LLC	BWR	3489	10/84	12/23
Limerick 1 - Exelon Corp., Exelon Generation Co., LLC	BWR	3458	02/86	10/24
Limerick 2 - Exelon Corp., Exelon Generation Co., LLC	BWR	3458	01/90	06/29
McGuire 1 - Duke Energy Power Company, LLC	PWR	3411	12/81	06/41
McGuire 2 - Duke Energy Power Company, LLC	PWR	3411	03/84	03/43
Millstone 2 – Dominion Nuclear Connecticut, Inc., Dominion Generation	PWR	2700	12/75	07/35

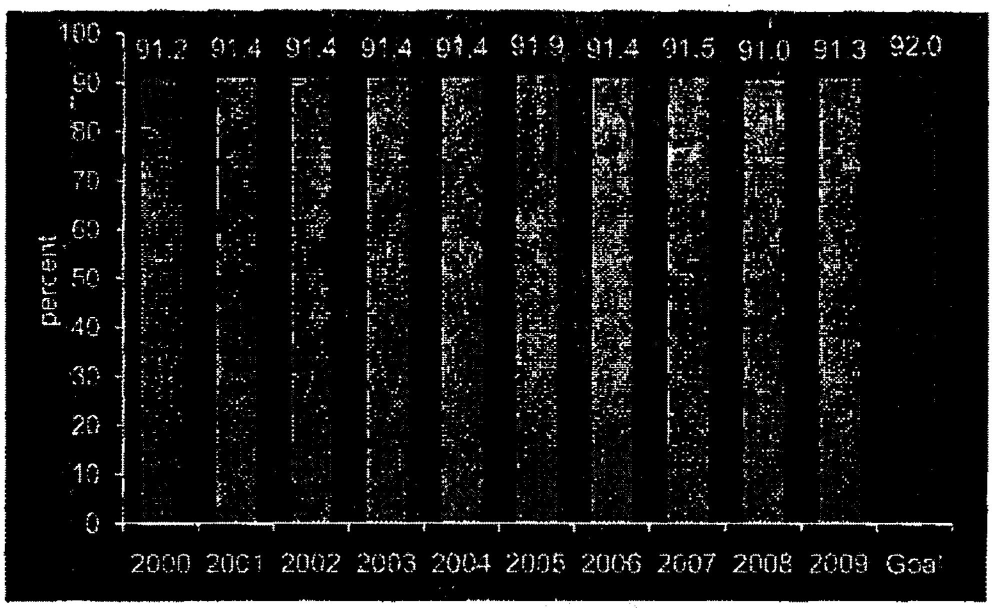
Plant Name and Operating Utility	Reactor Design Type	Licensed Power (MWth)	Operating Lifetime	
Millstone 3 - Dominion Nuclear Connecticut, Inc., Dominion Generation	PWR	3650	04/86	11/45
Monticello - Nuclear Management Co.	BWR	1775	06/71	09/30
Nine Mile Point 1 - Constellation Energy	BWR	1850	12/69	08/29
Nine Mile Point 2 - Constellation Energy	BWR	3467	03/88	10/46
North Anna 1 Virginia Electric & Power Co., Dominion Generation	PWR	2893	06/78	04/38
North Anna 2 - Virginia Electric & Power Co., Dominion Generation	PWR	2893	12/80	08/40
Oconee 1 - Duke Energy Power Company, LLC	PWR	2568	07/73	02/33
Oconee 2 - Duke Energy Power Company, LLC	PWR	2568	09/74	10/33
Oconee 3 - Duke Energy Power Company, LLC	PWR	2568	12/74	12/34
Oyster Creek - AmerGen Energy Co., LLC, Exelon Corp.	BWR	1930	12/69	04/29
Palisades - Entergy Nuclear Operations, Inc.	PWR	2565	12/71	03/31
Palo Verde 1 - Arizona Public Service Company	PWR	3990	01/86	06/25
Palo Verde 2 - Arizona Public Service Company	PWR	3990	09/86	04/26
Palo Verde 3 - Arizona Public Service Company	PWR	3990	01/88	11/27
Peach Bottom 2 Exelon Corp., Exelon Generation Co., LLC	BWR	3514	07/74	08/33
Peach Bottom 3 Exelon Corp., Exelon Generation Co., LLC	BWR	3514	12/74	07/34
Perry 1 - FirstEnergy Nuclear Operating Co.	BWR	3758	11/87	03/26
Pilgrim 1 - Entergy Nuclear Operations, Inc.	BWR	2028	12/72	06/12
Point Beach 1 - FLP Energy Point Beach, LLC, Florida Power and Light Co.	PWR	1540	12/70	10/30
Point Beach 2 - FLP Energy Point Beach, LLC, Florida Power and Light Co.	PWR	1540	10/72	03/33
Prairie Island 1 - Nuclear Management Co.	PWR	1650	12/73	08/13

Plant Name and Operating Utility	Reactor Design Type	Licensed Power (MWth)	Operating Lifetime	
Prairie Island 2 - Nuclear Management Co.	PWR	1650	12/74	10/14
Quad Cities 1 Exelon Corp., Exelon Generation Co., LLC	BWR	2957	02/73	12/32
Quad Cities 2 - Exelon Corp., Exelon Generation Co., LLC	BWR	2957	03/73	12/32
River Bend 1 - Entergy Nuclear Operations, Inc.	BWR	3091	06/86	08/25
Salem 1 - PSEG Nuclear, LLC	PWR	3459	06/77	08/16
Salem 2 - PSEG Nuclear, LLC	PWR	3459	10/81	04/20
San Onofre 2 - Southern California Edison Co.	PWR	3438	08/83	02/22
San Onofre 3 - Southern California Edison Co.	PWR	3438	04/84	11/22
Seabrook 1 - FPL Energy Seabrook, LLC	PWR	3648	08/90	03/30
Sequoyah 1 - Tennessee Valley Authority	PWR	3455	07/81	09/20
Sequoyah 2 - Tennessee Valley Authority	PWR	3455	06/82	09/21
Shearon Harris 1 - Carolina Power & Light Co.	PWR	2900	05/87	10/46
South Texas Project 1 - STP Nuclear Operating Co.	PWR	3853	08/88	08/27
South Texas Project 2 - STP Nuclear Operating Co.	PWR	3853	06/89	12/28
St. Lucie 1 - Florida Power & Light Co.	PWR	2700	12/76	03/36
St. Lucie 2 - Florida Power & Light Co.	PWR	2700	08/83	04/43
Surry 1 - Dominion Generation	PWR	2546	12/72	05/32
Surry 2 - Dominion Generation	PWR	2546	05/73	01/33
Susquehanna 1 - PPL Susquehanna, LLC	BWR	3952	06/83	07/22
Susquehanna 2 - PPL Susquehanna, LLC	BWR	3952	02/85	03/24
Three Mile Island 1 - AmerGen Energy Co., LLC	PWR	2568	09/74	04/14
Turkey Point 3 - Florida Power & Light Co.	PWR	2300	12/72	07/32

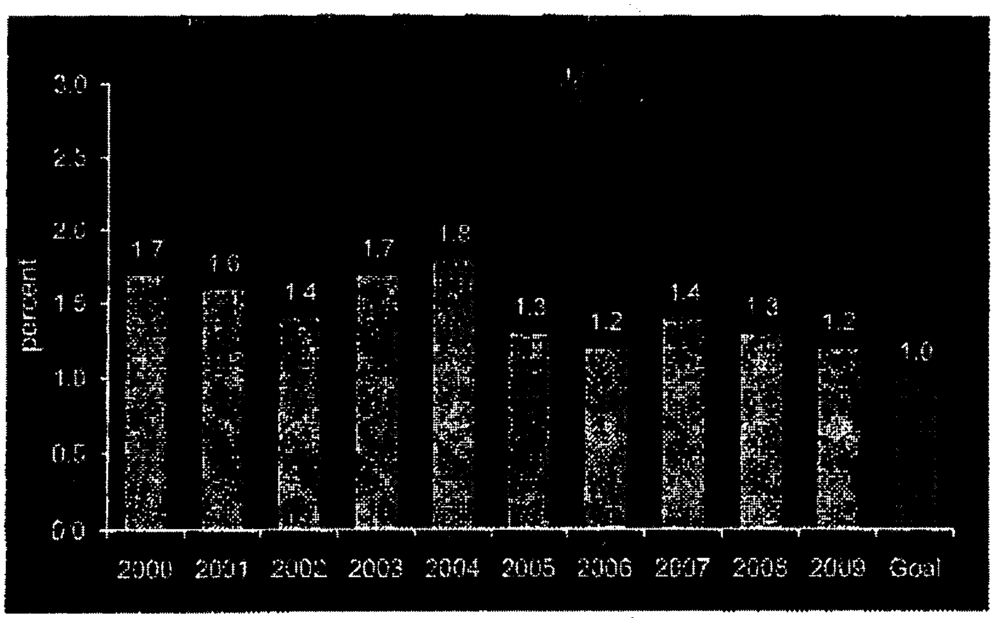
Plant Name and Operating Utility	Reactor Design Type	Licensed Power (MWth)	Operating Lifetime	
Turkey Point 4 - Florida Power & Light Co.	PWR	2300	09/73	04/33
V.C. Summer - South Carolina Electric & Gas Co.	PWR	2900	01/84	08/42
Vermont Yankee - Entergy Nuclear Operations, Inc.	BWR	1912	11/72	03/12
Vogtle 1 - Southern Nuclear Operating Co.	PWR	3625	06/87	01/47
Vogtle 2 - Southern Nuclear Operating Co.	PWR	3625	05/89	02/49
Waterford 3 - Entergy Nuclear Operations, Inc	PWR	3716	09/85	12/24
Watts Bar 1 - Tennessee Valley Authority	PWR	3459	05/96	11/35
Wolf Creek 1 - Wolf Creek Nuclear Operating Corp.	PWR	3565	09/85	03/45

ANNEX 2
U.S. NUCLEAR ELECTRIC INDUSTRY
PERFORMANCE INDICATOR GRAPHS

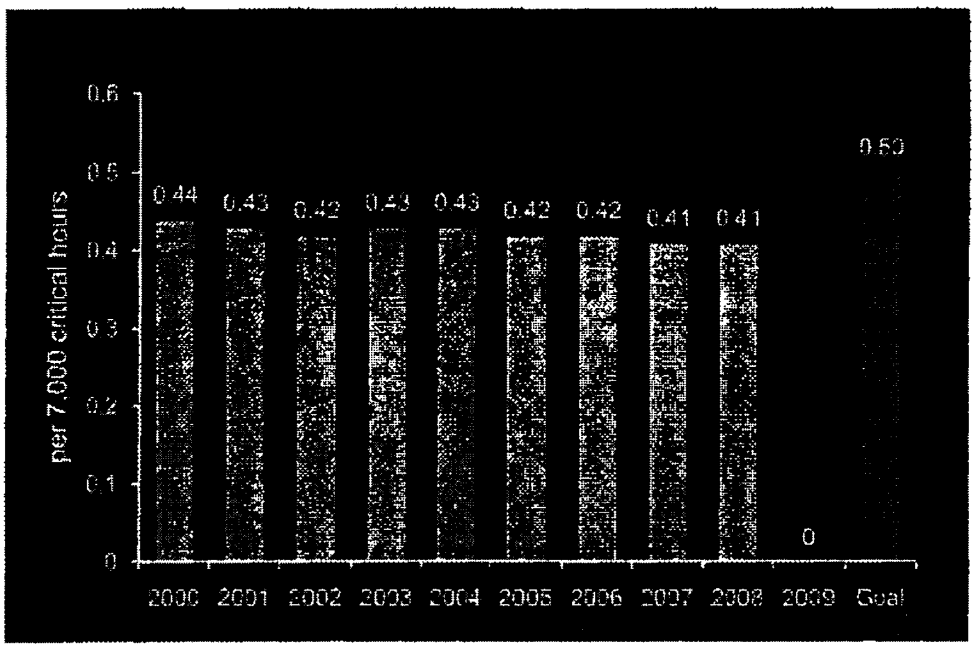
Unit Capability Factor
1-Year Median Values



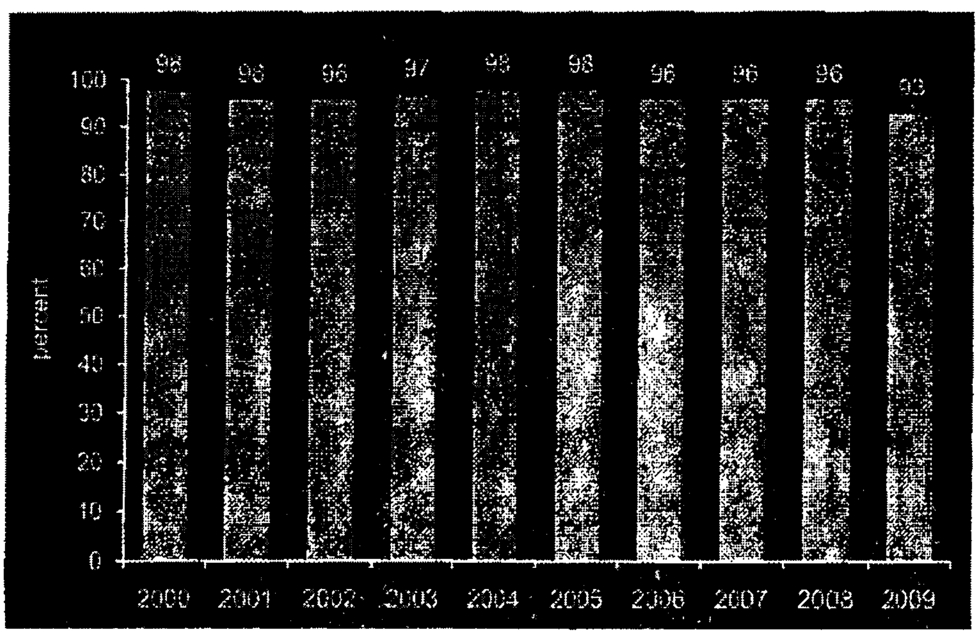
Forced Loss Rate
1-Year Median Values
December 2009



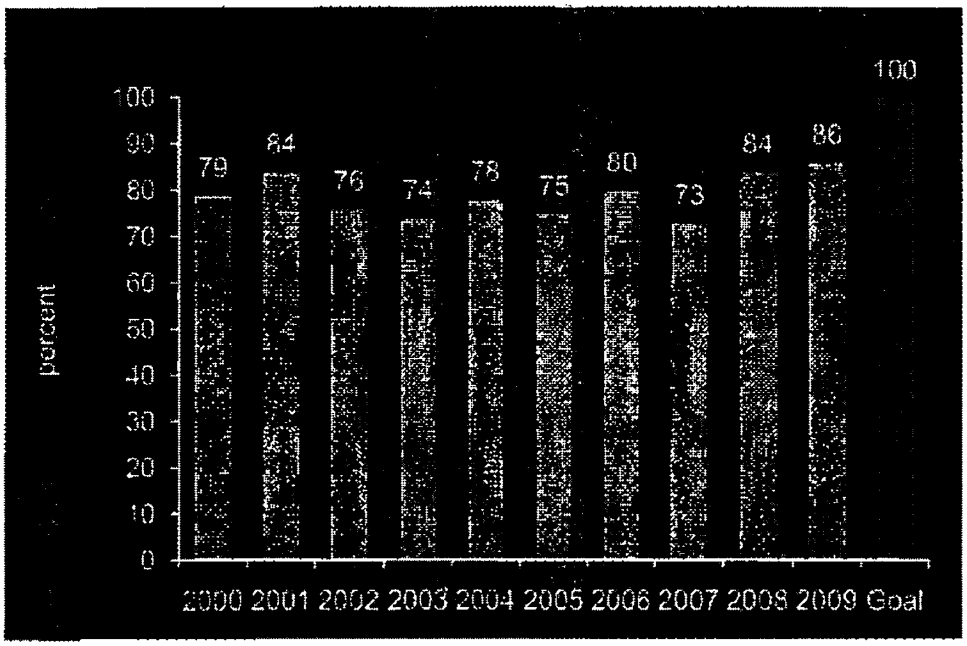
Unplanned Automatic Scrams
1-Year Median Values
December 2009



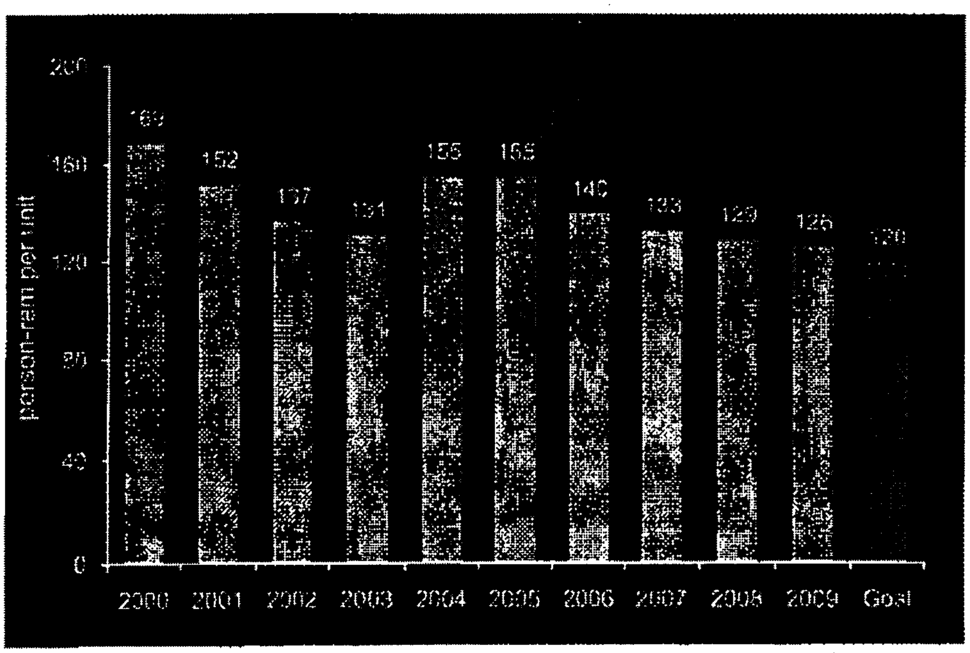
Safety System Performance
1-Year Median Values
December 2009



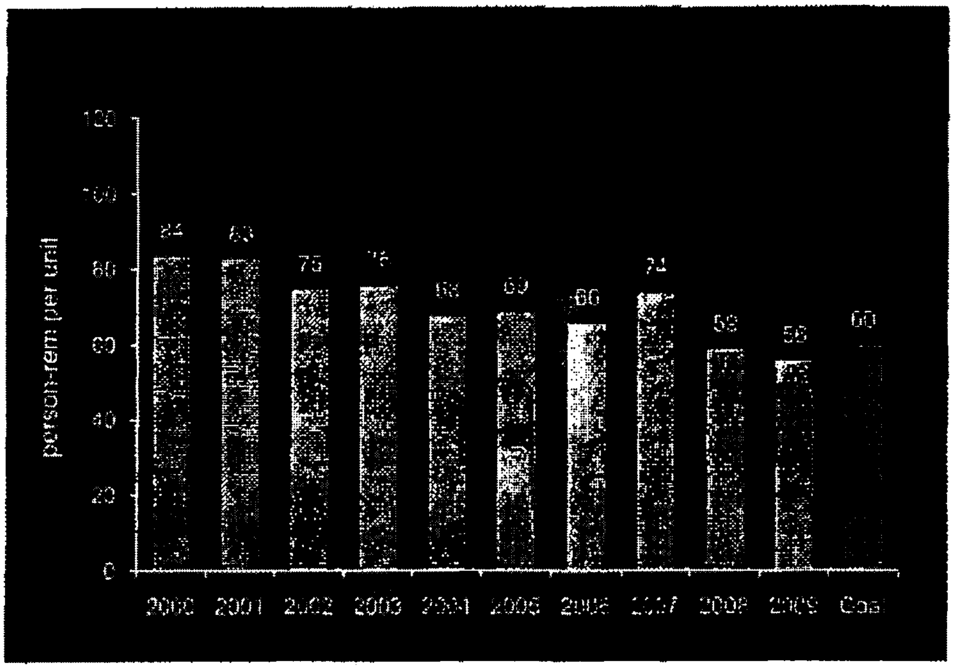
Fuel Reliability
1-Year Median Values
December 2009



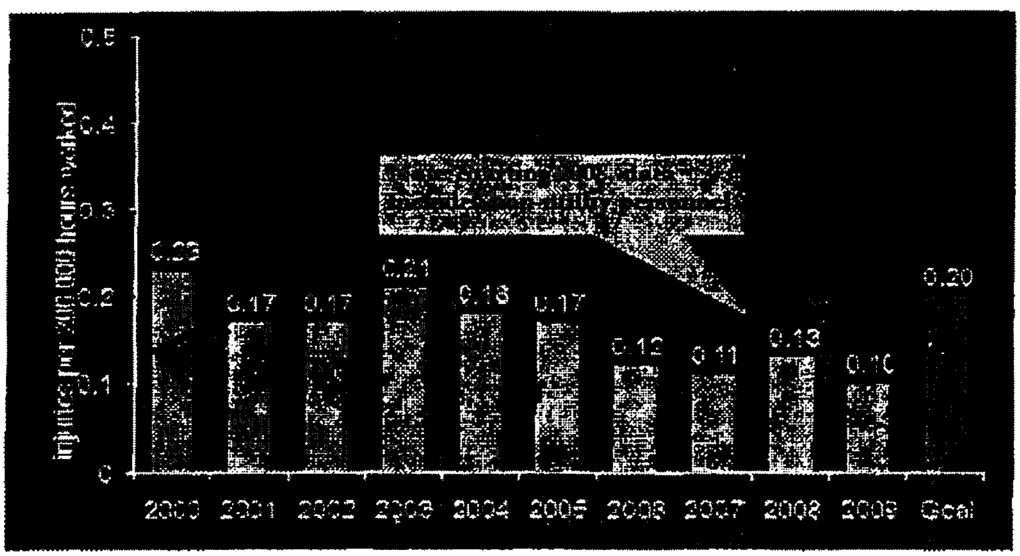
Collective Radiation Exposure (BWR)
1-Year Median Values
December 2009



Collective Radiation Exposure (PWR)
1-Year Median Values
December 2009



Total Industrial Safety Accident Rate
1-Year Median Values
December 2009



THE UNITED STATES OF AMERICA

FIFTH NATIONAL REPORT

FOR THE

CONVENTION ON NUCLEAR SAFETY

AUGUST 2010
DRAFT

U.S. NUCLEAR REGULATORY COMMISSION

WASHINGTON, DC 20555-0001

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POLICY ISSUE
INFORMATION

January 28, 2011 SECY-11-0012

FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: AGENCY LONG-TERM RESEARCH ACTIVITIES FOR FISCAL YEAR 2013

PURPOSE:

In SECY-07-0192, "Agency Exploratory Long-Term Research Activities for Fiscal Year 2009," dated October 31, 2007, the Office of Nuclear Regulatory Research (RES) staff indicated that it would provide the Commission with subsequent reports on long-term research activities yearly coincidently with the initiation of the budget formulation process. This paper provides the update for fiscal year (FY) 2013. This paper does not address any new commitments or resource implications.

SUMMARY:

RES plans to include a request for funding for long-term research in its FY 2013 budget request (b)(5) [redacted] The request will undergo review during the planning, budgeting, and performance management (PBPM) process, and the agreed-upon projects will be given a "high" priority. Staff from RES and the regulatory offices (the Office of Nuclear Reactor Regulation [NRR], the Office of New Reactors [NRO], the Office of Nuclear Material Safety and Safeguards [NMSS], the Office of Federal and State Materials and Environmental Management Programs [FSME], and the Office of Nuclear Security and Incident Response [NSIR] suggested projects for FY 2013, and a review committee comprising agency senior-level technical advisors from RES and the regulatory offices rated the projects. The directors of the lead offices (NRR, NRO, NMSS, and FSME) and the Director of RES will

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consider the rating results as well as other factors external to that review process when determining the projects to fund for FY 2013, as part of the PBPM process.

BACKGROUND:

The U.S. Nuclear Regulatory Commission (NRC) aligns the agency's research strategies with its role as a regulator. For example, if the industry conducts research to establish a safety case, NRC may conduct independent research to confirm the industry's research results and applications and to assess safety margins.

As a matter of routine, the agency currently identifies long-term or forward-looking research activities supporting potential longer term (within the next few years) regulatory needs. These forward-looking research activities are identified and pursued during the normal course of planning and budgeting processes (as discussed in Enclosure 1).

In contrast, for the purposes of the Commission papers on long-term research activities prepared annually since 2007, long-term research is defined as research not already funded or otherwise being worked on that will provide the fundamental insights and technical information needed to address potential technical issues or identified gaps to support anticipated future (>5 years) NRC needs. These Commission papers discuss candidate long-term research topics and estimate funding needs for use in budget preparation. The scope of projects funded under this long-term research program (LTRP) are limited to feasibility or scoping studies that typically should not exceed 1 year, and which result in an assessment of whether further research on the topic is warranted as part of the normal PBPM process.

The most recent Commission paper on the NRC's LTRP is SECY-10-0013, "Agency Long-Term Research Activities for Fiscal Year 2012," dated January 27, 2010. SECY-10-0013 discusses the use of a review committee composed of agency senior-level technical advisors to rate or score projects suggested by RES staff or the regulatory offices. The review committee used five criteria in the scoring process: (1) leveraging resources, (2) advancing the state of the art, (3) providing an independent tool to NRC, (4) applying to more than one program area, and (5) addressing gaps created by technology advancements. The resulting rankings were posted to the LTRP site: http://portal.nrc.gov/edo/res/DSA/ltrp/default.aspx.

DISCUSSION:

FY 2009 was the first year that resources—both funding and FTEs—were provided for projects under the sponsorship of the LTRP. The process was continued in FY 2010 and FY 2011 and included projects that had been deferred from FY 2009 because of redirections within the FY 2009 LTRP budget request. The process will continue in FY 2012 with the improvements discussed below. Enclosure 2 contains information about projects for all 4 fiscal years. FY 2012 funding is still within the budget process, so the list of projects that will be funded has not been finalized. (b)(5)
As can be seen from the descriptions in Enclosure 2, several long-term projects have been identified and funded to date through the LTRP. For example, in FY 2009, the Integral Effects

Test Facilities project was funded through a cooperative agreement between Oregon State University and NRC to design, construct, and utilize an integral effects test facility representing a scaled high-temperature gas-cooled reactor (HTGR). The project was initially funded through the LTRP to produce both a literature survey and a list and evaluation of key thermal-fluid and reactor physics phenomena to determine which required additional investigation via analysis or experiment. Based on the results of the initial investigation, the project moved forward to the next phase of separate and integral effects tests with funding from the U.S. Department of Energy (DOE) under an existing Memorandum of Understanding between DOE and NRC. As of December 2010, the test facility has been designed, construction is scheduled for 2011, and the experimental test program and code validation efforts will last through 2013. The experimental data will be utilized to validate NRC's HTGR thermal-fluid safety analysis codes. As another example, the complex project of Advanced Level 2/3 Probabilistic Risk Assessment (PRA) modeling techniques has been funded each year since FY 2009 with incremental progress each year. The project started with an internal scoping study to evaluate both methodological and implementation-oriented issues associated with the advancement of Level 2/3 PRA modeling techniques that indicated further work was warranted. The project continued with a contractor-led effort to develop recommendations on methodological variations and a detailed tool development and implementation plan. Work on the project will continue under the normal budget process. Based on experience with these and other projects funded thus far under the LTRP, the staff concludes that the program is serving its intended purpose of (1) identifying what (if any) additional research is desirable to support regulatory decisionmaking that is likely to be needed 5 to 10 years in the future and (2) planning and implementing the needed research if NRC is to do it.

In August 2010, a call for suggestions for long-term research projects was made to the regulatory offices and to RES to support the FY 2013 budget formulation process. The NRC staff provided suggestions for 14 projects. The review committee reviewed these suggestions and ranked three projects highly. The results of the review were provided to the RES Office Director in December 2010. During discussions with the RES Office Director, it was determined that one of the three recommended projects was already under way in RES. This project involves proactively communicating with DOE to understand DOE's plans to use a super computing hub to perform calculations as an alternative to testing in support of future modeling and potentially licensing of advanced nuclear power plants.

In consultation with the directors of the regulatory offices, the RES Office Director concluded that the remaining two projects should be included in the FY 2013 budget request. The office directors of the lead offices have agreed to rank them highly in the remainder of the FY 2013 budgeting process. The projects are described below.

Evaluating Remaining Service Life of Nuclear Power Plant Concrete Structures

Safety-significant concrete structures in nuclear power plants are subjected to high temperatures, elevated radiation, and other environmental conditions (e.g., moisture, salts) that can degrade performance over their service life. These structures can currently be tested to determine if they retain adequate performance under design basis scenarios. However, this testing yields little or no predictive information about how long the structure will continue to perform at this level as degradation continues. In addition, no existing standardized method is available for estimating the remaining service life of a concrete structure based on its existing condition. NRC's current research is focused on understanding the causal factors that contribute to degradation and evaluating aged and ex-plant materials to assess their design margin as a function of degradation. This long-term research activity will evaluate the feasibility of developing an assessment method for predicting remaining service life of concrete structures based on their current condition. This study will first evaluate existing inspection and assessment techniques used in nonnuclear applications such as highway bridge inspection. The staff plans to partner with the Federal Highway Administration to leverage its expertise in this area and with the National Institute of Standards and Technology, which has expertise in the computer modeling of concrete/cementitious materials degradation and service life. This evaluation will be used to identify promising destructive and nondestructive techniques that may provide the basis for predicting remaining service life. Then, the viability of applying these techniques in nuclear applications will be assessed and technical gaps will be identified. If applicable, a research plan will be developed to address remaining gaps and to provide a technical basis for applying this method in service. Products from this research would include (1) identifying viable tools for characterizing the durability of existing concrete structures, (2) evaluating protocols (e.g., material properties testing [both destructive and nondestructive]) for data inputs to service life, (3) assessing current concrete structure service life computer models, and (4) identifying gaps in the technologies for service life predictions. Based on the results of this long-term research project, NRC could pursue appropriate further research under the normal budgetary process. The eventual regulatory application of this work could be the development of revised inspection strategies and a surveillance-type program (as currently used for reactor pressure vessels) that would allow staff to assess a licensee's evaluation of remaining service life.

Assessing Climate Variability Contribution to Risk at Nuclear Facilities

This project will develop a strategy for assessing the currently unquantified uncertainty and level of potential risk at NRC-licensed nuclear facilities because of natural climate variability to improve risk-informed regulatory decisionmaking. Several systems, structures, and components important to safety, as well as significant onsite and nearby infrastructure, may be vulnerable to climate variability over the next few decades. Examples include flood protection systems, water-intake systems, effluent release systems, switchyards, backup power systems, bridges or highways needed for site access, and dams on nearby rivers. The treatment of these external events in PRA and risk-informed decisions is currently much less mature than the treatment of internal events, although the risk from external events may dominate total facility risk. The analytical approaches presently used for assessing meteorological and hydrometerological phenomena in the context of regulatory decisionmaking are primarily deterministic (e.g., the use of the probable maximum event approach for design-basis flood determination). The concern is that combinations of more frequent events (though individually less intense than the probable maximum event) may actually drive risk (e.g., much like small break loss-of-coolant accidents [LOCAs] were found to contribute more to nuclear power plant risk than the design-basis large break LOCAs). The initial focus of this work would be on flooding and intense precipitation phenomena. The product of this work, funded through the LTRP, would be an assessment of whether important incompleteness exists in current PRAs and risk-informed decisionmaking approaches. If important gaps are identified, further work in this area would be pursued under NRC's PBPM process. Insights from this work would eventually would help guide staff in risk-informed regulatory decisions.

PROCESS IMPROVEMENT:

In a December 28, 2010, note to the Commissioners' Assistants, the staff described its modification to the PBPM process in response to the Commission direction issued for SECY-09-0176 (February 12, 2010). As noted, the RES Office Director, in consultation with other lead office directors, will determine the long-term research activities to be high priority in the budget. In developing FY 2013 budget materials for the Commission's review, the RES staff will include a separate appendix reporting on the LTRP resources contained in the budget proposals. In addition, RES plans to improve future communication with project submitters by enhancing feedback. Proposal submitters will be notified of one of the following outcomes: (1) the project has been recommended for funding, (2) the project is not recommended at this time (because the current priority is not high enough) but will be reconsidered by the review committee next year, or (3) the project has not been recommended (with reasons why) but they can resubmit their idea for consideration in future years.

RESOURCES:

(b)(5)

COORDINATION:

The Office of the General Counsel reviewed this package and has no legal objection. The Chief Financial Officer reviewed this package for resource implications and has no objection.

The staff requests that this document be treated as "Official Use Only – Sensitive Internal Information" because of the presence of predecisional budget-related information.

/RA by Mike Weber for/

R. W. Borchardt
Executive Director
for Operations

Enclosures:
1. Forward-Looking Research
   January 2011
2. Long-Term Research Projects
   FY 2009, FY 2010, FY 2011, and FY 2012

The staff requests that this document be treated as "Official Use Only – Sensitive Internal Information" because of the presence of pre-decisional budget-related information.

/RA by Mike Weber for/

R. W. Borchardt
Executive Director
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ADAMS ACCESSION NO.: ML110100020 WITS200700129/EDATS:SECY-2010-0070

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Forward-Looking Research
January 2011

Commission papers on long-term research activities have been prepared each year since 2007. The papers discuss candidate long-term research topics and estimate funding needs for conducting the scoping analyses, for use in budget preparation. For the purposes of the annual Commission papers, long-term research is defined as research not already funded or otherwise being worked on that will provide the fundamental insights and technical information needed to address potential technical issues or identified gaps to support anticipated future (>5 years) U.S. Nuclear Regulatory Commission needs.

In addition to the scoping projects identified and funded as part of the long-term research program, the agency currently conducts other long-term, or forward-looking, research activities supporting potential longer-term regulatory needs. These forward-looking research activities are identified and pursued during the normal course of the planning and budgeting processes. To provide a better understanding of the total list of forward-looking research activities that are underway, current research programs that have a long-term component are listed below. For further examples, see Enclosure 1 to SECY-10-0013 and the enclosure to SECY-09-0021, which include lists of forward-looking research activities with accompanying descriptions.

<u>Current Forward-Looking Research</u>:

- Advances to probabilistic seismic hazard analysis.
- Probabilistic pressure boundary safety assessment.
- Developing interim technical guidance for the licensing of an aqueous homogeneous nonpower reactor.
- Research projects related to digital instrumentation and controls.
- Digital system probabilistic risk assessment.
- Halden Reactor Project.
- Human reliability analysis benchmarking using simulator data.
- Human performance for advanced control room designs.
- Collaborative research in risk and reliability analysis methods and applications.
- Research projects related to environmental transport
    - Framework for risk analysis in multimedia environmental systems.
    - Long-term efficacy of bioremediation for uranium-contaminated ground water.
    - Pore solution characterization of cementitious composites with chemical mineral admixtures.
- Rod Bundle Heat Transfer Facility at the Pennsylvania State University.
- Interfacial area transport research at the Purdue University.
- TRACE (TRAC/RELAP Advanced Computational Engine) development.
- TRACE input models for integral light-water reactor.
- Symbolic Nuclear Analysis Package development.
- MELCOR development.

- MELCOR Accident Consequence Code System development.
- Advanced reactor model development for the Next Generation Nuclear Plant.
- Research to support regulatory decisions related to second and subsequent license renewal applications.

LONG-TERM RESEARCH PROJECTS
FY 2009, FY 2010, FY 2011, AND FY 2012

Fiscal year (FY) 2009 was the first year that resources—both funding and full-time equivalents (FTEs)—were provided to projects under the sponsorship of the long-term research program (LTRP). The long-term research process has continued, and the resulting budget requests for FY 2010 and FY 2011 also included projects that had been deferred from FY 2009 because of the reprogramming of funds that occurred during the FY 2009 budget execution. The budget request for FY 2012 included those projects identified and selected in FY 2010. Enclosure 2 contains information about the projects selected for FY 2009 through FY 2012. The FY 2012 budget has not been finalized, so the list of projects below includes those that are planned for FY 2012. (b)(5) [redacted]

FY 2009 Projects

- Integral Effects Test Facilities for Advanced Non-Light-Water Reactors. A cooperative agreement was established between Oregon State University and the U.S. Nuclear Regulatory Commission (NRC) as a long-term research project to design, construct, and utilize an integral effect test facility representing a scaled high-temperature gas-cooled reactor (HTGR). The experimental data will be utilized to validate the NRC's HTGR thermal-fluid safety analysis codes. The project was initially funded through the LTRP to produce both a literature survey and a list and evaluation of key thermal-fluid and reactor physics phenomena to determine which required additional investigation via analysis or experiment. Based on the results of this LTRP project, a decision to construct the facility was made, and the effort was then supported using funds provided by the U.S. Department of Energy (DOE) under an existing Memorandum of Understanding between DOE and NRC. The experimental data will be utilized to validate NRC's HTGR thermal-fluid safety analysis codes. As of December 2010, the integral effects test facility has been designed and procurement of all components is underway. The facility is scheduled to be constructed in 2011, and initial shakedown testing will run through early 2012. The experimental test program and code validation efforts will last through 2013.
- Advanced Level 2/3 Probabilistic Risk Assessment (PRA) Modeling Techniques. In FY 2009, activity began on the project entitled, "Advanced Modeling Techniques for Level 2/3 PRA." The project started with an internal scoping study to evaluate both methodological and implementation-oriented issues associated with the advancement of Level 2/3 PRA modeling techniques. This scoping study included a meeting with targeted external stakeholders and was fully documented in a May 2009 report entitled, "Scoping Study on Advancing Modeling Techniques for Level 2/3 PRA" (ML091320454). The next phase of work began in July 2009 with the initiation of a methods development project at Sandia National Laboratories to demonstrate the feasibility of using dynamic simulation PRA methods to improve Level 2/3 modeling. The methods development utilizes the MELCOR severe accident analysis program in conjunction with a dynamic operator response model to create a dynamic

event tree within a more realistic contextual environment. The first part of the development phase focused on the creation of a methodology development plan that describes the detailed approach for developing the advanced Level 2/3 PRA analysis tool. Now that the development plan is complete (documented in a contractor letter report), the next phase will involve building the analysis tool and applying it to a suitable demonstration problem. Commensurate with the transition of the project from the scoping/planning phase (under the LTRP) to the implementation phase, future project funding (FY 2011 and beyond, if applicable) will be part of the routine budget process.

FY 2010 Projects

- Lead Cask Demonstration. Examination of low-burnup fuel that had been stored for 14 years yielded data that provided NRC with confidence that low-burnup spent nuclear fuel could be safely stored for extended periods of time. No comparable data are available for high-burnup (HBU) fuel (>45 GWD/MTU) and no demonstration is in progress using HBU fuel. A long-term cask demonstration program would allow NRC to obtain confirmatory data to determine if the extrapolations that were made from short-term data remain valid. If such a cask demonstration program were to be initiated, it would likely be a joint effort with the Electric Power Research Institute (EPRI) and DOE. The cost of the project would be large with the majority of the funding likely to come from DOE. Under the LTRP, the staff is identifying important phenomena that would require more study in a lead cask demonstration program. The Office of Nuclear Material Safety and Safeguards through a contract with Savannah River Laboratory initiated a gap assessment in FY 2010 to identify material degradation mechanisms important to the performance of spent fuel storage and transportation casks. The preliminary results of the gap assessment indicate the need for continued work on this topic. This work is expected to continue in FY 2011 as part of a user need funded through the planning, budgeting, and performance management (PBPM) process. The next steps for the work under this user need include: (1) an evaluation and consolidation of insights from gap assessments led by the NRC, DOE, and the Nuclear Waste Technical Review Board; and (2) if the results of the gap assessment are insufficient to guide and prioritize follow-on research and regulatory actions, a phenomena identification and ranking table methodology or other assessment tool will be developed and used to rank the phenomena in terms of their importance to safety performance, effective aging management practices, and the available technical knowledge to address safety issues.

- Fire Safety of Digital Instrumentation and Control and Electrical Systems. The anticipated installation of fiber optic cables and digital instrumentation and controls (I&C) systems in operating plants and in new reactors requires that new failure modes and effects be identified for these systems when exposed to fire. Work was performed under the LTRP to review past digital I&C test programs related to the effect of heat and smoke to provide insight into potential failure modes for the new systems and potential test methods that could be used. The Office of Nuclear Reactor Regulation (NRR) requested further work under User Need NRR-2008-003, Rev. 1, Task 25, "Better Understanding of Smoke Damage to Control Circuits," and funding was provided under the PBPM process. As part of this task, the Office of Nuclear Regulatory Research will prepare a

NUREG series report to document the state of knowledge of smoke damage to control circuits and recommend additional research, if warranted.

- Extended In Situ Real-Time Monitoring. This project was initiated in FY 2010 with the objective to identify (in concert with EPRI) those sensors and techniques that have the most promising viability to fill critical inspection or monitoring needs. This scoping study (now underway) focuses on sensors and techniques associated with (1) real-time materials degradation, (2) severe accident conditions, (3) fuel performance in long-term dry cask storage, and (4) early detection of abnormal releases of radionuclides from nuclear power plant (NPP) systems, structures, and components. This last item pertains to compliance with 10 CFR 20.1406. The scoping study will identify possible safety and regulatory issues and will determine what industry-sponsored and NRC-sponsored research is needed to address these issues. This study will also identify industry plans to incorporate these techniques into the nuclear fleet. As such, this work will support NRC's evaluation of industry's in-service inspection programs.

- Advanced Fabrication Techniques. This project was initiated in FY 2010. The objectives are to coordinate among NRC, DOE, and the nuclear industry to identify new construction and component manufacturing techniques planned for both light-water reactors (LWRs) and advanced (i.e., Generation IV) reactors and then identify and prioritize safety issues unique to NPP fabrication and operation. In FY 2010, staff conducted an initial scoping review and identified issues with narrow gap welding and a new steel-concrete composite, modular construction technology that should be addressed. These techniques are being proposed for safety-related structures for both new and advanced reactor applications. The staff will conduct a final scoping review in FY 2011 under the LTRP to survey fabrication and construction techniques that may be used and are unique to new and advanced reactors to determine if any safety or regulatory issues exist. The staff, in concert with DOE and the nuclear industry, then will prioritize the identified safety and regulatory issues from the scoping reviews and develop plans for addressing any other emerging issues. Work focused on the steel-concrete technology has been transitioned from the LTRP to being activity funded under the PBPM process. The first related U.S. standard is currently under development for this technology. The staff has been engaged in the development of that standard and is formulating plans for development of the technical basis for the review of the standard as well as the development of acceptance criteria. Research plans for FY 2011 through FY 2013 involve confirmatory testing of components as well as verification and validation of methods for use in confirmatory analysis. Possible international collaboration that can leverage funds from each country is being considered as part of those activities.

FY 2011 Projects

- Boiling-Water Reactor (BWR) Burnup Credit and Evaluation of Newly Available Isotopic and Criticality Data. The staff has performed work on burnup credit for pressurized-water reactors (PWRs) and anticipates that burnup credit for BWR spent fuel assemblies will be sought in the future. Given the inherent complexities of the design and operation of BWR fuel assemblies relative to PWR fuel assemblies, a scoping study is proposed to determine whether a conservative application of BWR burnup credit in spent fuel storage and transportation is feasible.

- Advanced Light-Water Reactor Fuels. Part of DOE's Fuel Cycle Research and Development program explores the application of advanced fuel designs in existing LWRs. The work is being conducted in cooperation with the U.S. nuclear industry. With deployments expected over the next 20 years, the objective of the LTRP is to address not only the applicable regulatory requirements but also to identify the research work necessary to support the application of these advanced fuels and cladding designs in current LWRs.

  The industry is interested in increasing the discharge burnup of nuclear fuel and extending reactor operating cycle length. Current fuel designs are limited in allowable burnup due to nuclear (e.g., enrichment), material (e.g., cladding) and operating (e.g., rod internal pressure) limits. New fuel types have been proposed, including the use of ceramic cladding and the use of all-metal fuel. Irradiation behavior of ceramic cladding has been examined in some U.S. test reactors, and testing fueled specimens is underway in the High Flux Isotope Reactor at Oak Ridge National Laboratory. Commercial use of an all-metal fuel design has been employed in Russian marine propulsion applications, and U.S. plans include irradiation testing of this design in the Idaho National Laboratory Advanced Test Reactor. Following these tests, industry proposes that approval will be sought for the use of these fuel types as lead test rods in a commercial LWR.

  Both of these designs represent significant departures from current technology and (in some cases) current regulations. Parts of NRC's regulatory requirements (e.g., the existing 10 CFR 50.46) are not relevant to ceramic cladding. The LTRP work would examine the regulatory requirements and determine whether any changes would be necessary to licensing, acceptance, testing, and surveillance criteria for these advanced fuel types. Future work, if necessary, would then be funded under the PBPM process.

- Nondestructive Evaluation (NDE) and Surveillance of Civil Structures. This research program will involve evaluating the effectiveness of advanced NDE technologies that have the capability to monitor, detect, and measure changes in concrete structure performance at NPPs and for cementitious grouts in waste structures (e.g., micrometer crack development and propagation, pH). Because access to many of these structures may be severely constrained, NDE techniques require advanced approaches that can be used to provide long-term measurement of parameters that may be precursors to impending failure. In FY 2011, plans for the LTRP scoping study will include a literature review of advanced surveillance techniques for civil structures in conjunction with preliminary identification of NPP structures and their related potential degradation modes for which surveillance would be a consideration.

- Materials Behavior in Performance Assessment. A scoping study will be conducted to review and evaluate the parameters that may indicate failure of barriers in waste structures over the long term and the monitoring strategy that may allow measurement and monitoring of those parameters.
- Advanced PRA. Advanced PRA research will involve (1) a critical review of the current capability of physics-of-failure modeling approaches to address the lack of performance data for new systems, structures, and components and (2) scoping studies addressing the costs and benefits of advanced quantitative risk assessment methods including probabilistic networks using Bayesian Belief Networks, multivariate sensitivity analysis methods, or simulation-based approaches.
- Smoke Effects and Transport. Two specific areas will be reviewed to determine if the state-of-the-art in fire modeling can be improved to reduce the uncertainty in potential regulatory applications. These areas include (1) the adequacy and accuracy of the current fire models to make combustion product generation and transport predictions and (2) the damage thresholds for computers and digital I&C components when exposed to products of combustion and secondary heating effects from fires.
- Uncertainty Methods for PRA. Research in uncertainty methods will involve (1) a scoping study of the potential benefits of tool development enabling practical use of state-of-the-art techniques and (2) a scoping study of the benefit of research and development activities to improve the state of the art. This work will be done in the context of NRC current and foreseeable regulatory applications. It will build off of the results of a joint NRC-University of Maryland workshop on uncertainty held in May 2009 and a cooperative research activity between NRC and the Massachusetts Institute of Technology.

FY 2012 Projects

- Advanced Reprocessing. NRC will follow developing public policy debates and decisions regarding the disposition of spent fuel. If policy decisions do not oppose reprocessing and potential commercial interest exists, it may be necessary to develop insights on the types of regulatory issues that might confront NRC in the area of advanced reprocessing. For example, pyro-processing, HTGR fuel reprocessing, and implications of burner reactors are all areas for future consideration. The first HTGR might be operating in the 2020 time period. The staff will conduct a scoping study to assess the status of advanced reprocessing and to identify key safety and regulatory issues. This work would build on NRC's Advisory Committee on Nuclear Waste and Materials white paper, "Background, Status, and Issues Related to the Regulation of Advanced Spent Nuclear Fuel Recycle Facilities," NUREG-1909, June 2008.

- Safety and Regulatory Issues of the Thorium Cycle. The *Washington Post Magazine* of August 2, 2009, carried an article about the favorable nonproliferation and small waste generation aspects of the thorium fuel cycle. The article references a 2005 International Atomic Energy Agency report, "Thorium Fuel Cycle – Potential Benefits and Challenges," in support of the developer's position. Existing literature and reports of previous experimental and operational experience, both domestic (e.g., the Shippingport reactor) and international (e.g., India); on the thorium cycle would be reviewed to identify any safety or regulatory issues. Fuel manufacturing issues associated with Th-232 will be included.

- Smart Grid Impacts on NPPs. Efforts to develop smart grids would be followed to ensure that no safety problems or unintended consequences result from those efforts and to determine if new tools are necessary to deal with problems that may be identified. For instance, if smart grid technology creates offsite electrical supply problems for NPPs, a suitable tool for evaluation of that impact will be necessary. Any NPP event that involves the loss of offsite power could be affected or influenced by the issues identified in this effort. A scoping study will assess the status of the smart grid effort and summarize potential safety and regulatory issues relating to the development of smart grid technology.

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ADJUDICATORY ISSUE

(Information)

March 29, 2011 SECY-11-0043

FOR: The Commissioners

FROM: Brooke D. Poole, Director **/RA/**
Office of Commission Appellate Adjudication

SUBJECT: STATUS OF ADJUDICATIONS THAT MAY BE AFFECTED BY THE RECENT NUCLEAR EVENTS IN JAPAN

PURPOSE:

[redacted] (b)(5) This memorandum, which was coordinated with the General Counsel, provides the Commission with historical information regarding actions taken in adjudications in connection with significant events, including the accident at Three Mile Island, Unit 2 (TMI), and the events of September 11, 2001. [redacted] (b)(5)

DISCUSSION:

Historical Overview

TMI – "Licensing Pause" and Temporary Changes to Rules of Practice

The Commission took a number of actions relevant to adjudications following the March 28, 1979, TMI accident, beginning soon after the event.[1] Then-Chairman Hendrie announced a

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[1] Following a May 31, 1979, meeting, the Commission directed the Staff to develop policy guidance addressing general principles for reaching licensing decisions, and to propose specific guidance to be applied for seven near-term operating licenses. *See* Staff Requirements – Discussion of Options Regarding Deferral of Licenses (May 31, 1979) (ADAMS accession no. ML041900359).

"licensing pause" on November 5, 1979, to permit the NRC to review the lessons learned from the accident.[2] Beginning around the same time, the Commission issued several policy statements in fairly quick succession. Initially, the Commission issued an interim policy statement where it determined that "new construction permits, limited work authorizations [LWA], or operating licenses for any nuclear power reactors would be issued only after action of the Commission itself."[3] In these cases, the Commission directed that "no full adjudicatory decision which authorizes issuance of such a permit, authorization or license shall be issued by an Atomic Safety and Licensing Board *except after* further order of the Commission itself."[4] Shortly thereafter, the Commission issued another statement of policy, which involved, in part, temporary suspension of the immediate effectiveness rule.[5]

Under this policy, Board decisions would not become effective until certain Atomic Safety and Licensing Appeal Board and Commission actions had taken place. For its part, the Appeal Board was given sixty days to decide any timely motions to stay Board decisions.[6] Unless otherwise ordered, the Appeal Board would conduct its normal appellate review of the Board decision after issuance of a decision on any stay request.[7] The Commission directed both the Board and the Appeal Board to identify aspects of the case which merited "prompt Commission policy guidance" – in essence, providing for referred rulings and certified questions.[8] Upon receipt of the Appeal Board decision, the Commission would review the matter on its own

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[2] *See* Steve Wynkoop, *Gossick Resigns; NRC Responds to Kemeny with License 'Pause,'* NUCLEONICS WEEK, Nov. 8, 1979, at 1. The "licensing pause" ended in February 1980 as to fuel loading and low-power testing. NUREG/BR-0175, Rev. 2, "A Short History of Nuclear Regulation, 1946-2009" (Oct. 2010) at 59.

[3] *See* Interim Statement of Policy and Procedure, 44 Fed. Reg. 58,559 (Oct. 10, 1979) (Interim Immediate Effectiveness Policy). At the same time, the Commission made clear that all other adjudicatory proceedings, "including enforcement and license amendment proceedings[,]" could continue, as could issuance of appellate decisions and partial initial decisions not related to issuance of new reactor licenses or permits. *See id.*

[4] *Id.* (Emphasis added.)

[5] *See* Suspension of 10 CFR 2.764 and Statement of Policy on Conduct of Adjudicatory Proceedings, 44 Fed. Reg. 65,049 (Nov. 9, 1979). The amended procedures were set out as Appendix B to 10 C.F.R. Part 2. In an *uncontested* operating license proceeding, the Commission would review informally the Staff recommendations, and the license would issue only after Commission action. *Id.* at 65,050. Then-section 2.764 has since been revised and renumbered as section 2.340.

[6] *Id.* If no stay requests were filed, the Appeal Board was directed to consider on its own whether a stay was warranted. *Id.*

[7] *Id.*

[8] *Id.*

motion, without further briefing from the parties (absent Commission direction otherwise).[9] The Commission set for itself a milestone for issuance of a decision within twenty days of receipt of the Appeal Board decision.[10] Also at this time, the Commission directed the Boards, in deciding issues before them, to use the existing regulations, with the understanding that post-TMI analyses were still under way, and that, ultimately, compliance with then-existing rules might not be sufficient for an application to be approved.[11]

In June 1980, the Commission issued a third statement of policy, after acting on three operating license applications and considering lessons learned.[12] The Commission determined that operating license applications should be measured against the regulations, as augmented by several new requirements.[13] To facilitate adjudications, the Commission therefore adopted a policy explaining how to litigate TMI-related issues in operating license proceedings.[14] The

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[9] *Id.*

[10] *Id.* at 65,050-51. The "Appendix B" process nominally resulted in some delay in the issuance of operating licenses. Therefore, two and a half years later, the Commission amended the immediate effectiveness rule as to operating license applications, by requiring direct, expedited Commission review of those decisions to determine whether their effectiveness should be delayed pending routine agency appellate review. The changes removed Appendix B and incorporated the revised procedures into 10 C.F.R. § 2.764. *See generally* Final Rule, Commission Review Procedures for Power Reactor Operating Licenses; Immediate Effectiveness Rule, 46 Fed. Reg. 28,627 (May 28, 1981). Shortly thereafter, the Commission again modified the immediate effectiveness rule, to delete the requirement that the Commission conduct an effectiveness review prior to fuel loading and low-power testing. *See generally* Final Rule, Commission Review Procedures for Power Reactor Operating Licenses; Immediate Effectiveness Rule, 46 Fed. Reg. 47,764 (Sept. 30, 1981). Concurrently, the Commission issued a brief policy statement announcing its intention that "in future uncontested cases full power operation will be authorized by the Commission. However, in such cases, the Director [of the Office of Nuclear Reactor Regulation] shall authorize fuel loading and low power testing [up to 5 percent rated power] without the need to obtain prior Commission approval." Statement of Policy on Issuance of Uncontested Fuel Loading and Low Power Testing Operating Licenses, 46 Fed. Reg. 47,906 (Sept. 30, 1981).

[11] *Id.* The Commission advised that it would provide "case-by-case guidance" on changes as part of its own reviews in adjudicatory proceedings, which the Boards should apply in cases before them. *Id.*

[12] *See* Further Commission Guidance for Power Reactor Operating Licenses; Statement of Policy, 45 Fed. Reg. 41,738 (June 20, 1980) (June 1980 Policy Statement). Commissioner Gilinsky provided separate views, and Commissioner Bradford dissented.

[13] *Id.* at 41,739 (citing NUREG-0694, "TMI-Related Requirements for New Operating Licenses" (June 1980)).

[14] *Id.* at 41,740. This guidance essentially expanded the scope of permissible contentions to include issues associated with TMI-related requirements that supplemented existing regulations.

policy statement included guidance on certain case management issues. Notably, the Commission considered the question of timeliness, and directed that, where the time for filing contentions had expired in a given case, no new TMI-related contentions would be accepted absent a showing of good cause and a balancing of the late-filing factors.[15] The Commission also directed that boards should strictly adhere to the standards for reopening record, where applicable.[16]

Just a few months later, the Commission approved a revision to its TMI Action Plan (NUREG-0737), which superseded the earlier document that formed the basis for the June 1980 Policy Statement.[17] The Commission's approval of the updated TMI Action Plan necessitated changes to the policy statement, and the Commission issued a revision in December 1980.[18] Of note, the Commission observed that many decisions made in the TMI Action Plan were appropriately addressed on a generic basis, rather than in individual adjudications. The Commission therefore recommended that litigants seeking to challenge new requirements provide additional, specific information supporting their challenges.[19]

(b)(5) [redacted] In 1981, the Commission proposed a rule that would have codified the TMI-related provisions in NUREG-0737 for operating license applicants.[20] The NRC never implemented a final rule, for several reasons. One of these related to adjudications:

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[15] *Id.* (citing 10 C.F.R. § 2.714(a)(1) (now renumbered as 10 C.F.R. § 2.309(c), (f)(2))).

[16] "[F]or example, where initial decisions have been issued, the record should not be reopened to take evidence on some TMI-related issue unless the party seeking reopening shows that there is significant new evidence, not included in the record, that materially affects the decision." *Id.*

[17] *See generally* NUREG-0737, "Clarification of TMI Action Plan Requirements" (Nov. 1980). "More explicit requirements, revisions in previous requirements, different time schedules for implementation, and new requirements in NUREG-0694, but taken from previously issued Commission bulletins and orders, form the core of NUREG-0737." *Statement of Policy: Further Guidance for Power Reactor Operating Licenses*, CLI-80-42, 12 NRC 654, 658-59 (1980) (December 1980 Policy Statement); *corrected by* Statement of Policy; Further Commission Guidance for Power Reactor Operating Licenses, 46 Fed. Reg. 15,242 (Mar. 4, 1981).

[18] *See generally* December 1980 Policy Statement. Chairman Ahearne dissented.

[19] *Id.* at 660 (recommending that parties state the nexus of the issue to the TMI-2 accident, the significance of the issue, and any differences between their positions and the rationale underlying the Commission's consideration of additional TMI-related requirements). The revised policy statement reiterated the Commission's expectations regarding the applicability of the late-filing and reopening rules. *Id.* at 661.

[20] *See generally* Proposed Rule, Licensing Requirements for Pending Operating License Applications, 46 Fed. Reg. 26,491 (May 13, 1981).

> A presumed potential benefit from a final rule is that it could serve to specifically define and bound the TMI-related issues that could be considered during the hearing process. The Commission has examined records of [operating license] hearings where NUREG-0737 issues were litigated. First, there were very few such hearings, and second, the Commission does not believe that the absence of a NUREG-0737 [operating license] rule will cause unnecessary delays in those hearings where the issues are raised.[21]

In 1989, the Commission revoked the December 1980 Policy Statement.[22] In the intervening years, the NRC, among other actions, completed a variety of rulemakings to update regulatory requirements on the basis of lessons learned from the accident. The NRC staff ultimately advised the Commission that all regulatory revisions needed to implement NUREG-0737 were completed, and that compliance with existing regulations and orders was sufficient to respond to all applicable TMI lessons learned.[23] The Commission therefore rescinded the December 1980 Policy Statement, but offered guidance for the litigation of TMI-related issues in operating license proceedings where the guidance might still be pertinent.[24]

Indian Point Discretionary Proceeding Stemming from 10 C.F.R. § 2.206 Petition

Several months after the TMI accident, the Union of Concerned Scientists (UCS) petitioned the NRC to revoke the provisional operating license for Indian Point Unit 1, and to suspend operation of Units 2 and 3, based upon concerns about the high population density near the site, the feasibility of evacuation, and the asserted need for additional severe accident mitigation measures.[25] A February 11, 1980, Director's Decision under 10 C.F.R. § 2.206 granted in part and denied in part the petition. The decision denied the portion of the petition requesting suspension of the licenses for Units 2 and 3, but called for the licensees to implement particular interim mitigation measures to further reduce the probability and consequences of a severe

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[21] Withdrawal of Proposed Rule, Licensing Requirements for Pending Operating License Applications, 48 Fed. Reg. 13,987, 13,988 (Apr. 1, 1983).

[22] *See* Statement of Policy on Litigation of TMI-Related Issues in Power Reactor Operating License Proceedings; Revocation of Superseded Policy Statement Concerning TMI-Related Procedures, 54 Fed. Reg. 7897 (Feb. 23, 1989).

[23] *Id.* at 7897.

[24] Briefly stated, the guidance provided that the parties to an operating license proceeding could challenge the NUREG-0737 guidance as unnecessary, or alternatively, insufficient, to satisfy existing regulations. *Id.* (also referencing additional guidance provided by the Commission in *Pacific Gas and Electric Co.* (Diablo Canyon Nuclear Power Plant), CLI-81-5, 13 NRC 361 (1981)). As an administrative matter, the Commission also formally rescinded the October 1979 Interim Immediate Effectiveness Policy. *Id.*

[25] *See* Notice of Receipt, 44 Fed. Reg. 67,251 (Nov. 23, 1979) (UCS petition filed Sept. 27, 1979).

reactor accident.[26]

The Commission invited public comment on the Director's Decision.[27] After considering the comments, the Commission on its own chose to initiate a special *discretionary* adjudicatory proceeding to consider severe accident concerns relating to Indian Point.[28] The Commission appointed an Atomic Safety and Licensing Board to preside over the proceeding and to make recommendations on the need for enforcement action for the Indian Point facility.

The Commission directed the Board to address seven questions, which largely focused on the risk of a severe accident at Units 2 and 3, whether additional mitigation measures should be mandated, and emergency planning concerns.[29] The Commission made clear that the hearing was not required under the Atomic Energy Act, but was a discretionary hearing to gather information on the question whether Units 2 and 3 should be shut down or other enforcement action should be taken.[30] If the Commission were to agree with Board recommendations for enforcement action, an enforcement order would issue, triggering the licensees' right to a formal hearing under § 189 of the Atomic Energy Act of 1954, as amended (AEA) to challenge the enforcement order.[31] The Commission directed that the Board use a formal hearing process, including discovery and cross-examination.[32] The Commission further authorized the Board to admit and formulate contentions "likely to be important to resolving the Commission's questions."[33]

The evidentiary hearing began in June 1982, included fifty-five days of hearings and twenty parties, and the hearing record closed on April 29, 1983.[34] The Board issued a lengthy decision on October 24, 1983, ultimately recommending particular "safety improvements" it found

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[26] *See generally* DD-80-5, Director's Decision Under 10 C.F.R. 2.206, 11 NRC 351 (1980), and attached Appendices B and C (Confirmatory Orders for Indian Point Units 2 and 3, respectively).

[27] Solicitation of Comments on Director's Decision, 45 Fed. Reg. 11,969 (Feb. 22, 1980).

[28] *See Consolidated Edison Co. of New York* (Indian Point, Unit 2); *Power Authority of the State of New York* (Indian Point, Unit 3), CLI-81-1, 13 NRC 1 (1981); *see also* CLI-81-23, 14 NRC 610 (1981).

[29] *See* CLI-81-1, 13 NRC at 4-5; *see also* CLI-81-23, 14 NRC at 612.

[30] *See* CLI-85-6, 21 NRC 1043, 1047 (1985).

[31] *Id.*

[32] CLI-81-1, 13 NRC at 5.

[33] CLI-82-15, 16 NRC 27, 34 (1982); CLI-81-23, 14 NRC at 610.

[34] CLI-85-6, 21 NRC at 1047.

necessary for reasonable assurance of public health and safety.[35]

After considering the Board's decision, the Commission concluded that shutdown of Units 2 and 3 was unwarranted, and further concluded that no additional remedial measures – beyond those already implemented by the licensees – were warranted.[36] The Commission reasoned that while additional measures would have a positive effect on risk reduction, they would not provide substantial additional protection of the public health and safety, and therefore need not be mandated.[37] The Commission did, however, direct the Staff to examine the vulnerability of the Unit 2 buildings to high winds and missile damage, and to "keep abreast" of research and operating experience with filtered vent containments to evaluate their potential worth as a mitigation measure.[38]

Adjudicatory Actions Related to the Events of September 11, 2001

The events of September 11, 2001, generated a flurry of litigation, involving both requests to suspend ongoing adjudications and new contentions. As discussed below, the Commission did not suspend ongoing proceedings, and for the most part declined to litigate issues associated with the events in individual proceedings. Instead, the agency pursued a top-to-bottom reassessment of its regulations and policies on terrorism generically, outside the adjudicatory process. In ruling on the admissibility of new contentions, late-filed contentions, and motions to reopen, the Commission did not deviate from its usual application of the Part 2 procedural rules.

In August 2001, intervenor Georgians Against Nuclear Energy (GANE) filed a petition to dismiss, or, alternatively, suspend the mixed-oxide (MOX) fuel fabrication facility proceeding. The Board denied the request in December 2001.[39] GANE and the Nuclear Control Institute (NCI) filed a fresh request with the Commission to suspend the proceeding in view of the events of September 11.[40] The Commission denied the petition, finding no health and safety reason justifying suspension of the proceeding, no injury beyond litigation costs, ample time to implement new rules if appropriate, and value in moving forward with the proceeding to resolve

[35] *See* LBP-83-68, 18 NRC 811, 1079 (1983).

[36] *See* CLI-85-6, 21 NRC at 1091-92.

[37] *Id.* at 1064-74, 1091-92. The Commission therefore rescinded all of the measures imposed by the 1980 Confirmatory Orders unless they were "required to meet other license requirements for the Indian Point units or are required to fulfill generic requirements applicable to similar types of power reactors." *Id.* at 1067.

[38] *Id.* at 1065, 1091. Commissioner Asselstine filed a dissenting opinion. *See id.* at 1092-1101.

[39] Memorandum and Order (Ruling on Motion to Dismiss) (Dec. 20, 2001) (unpublished).

[40] The Commission found that GANE had "status" to file the petition, but that NCI did not because it neither filed a hearing request nor asked to participate on any other basis.

it in a timely and efficient way.[41]

In its initial intervention petition (also filed in August 2001), GANE submitted a contention arguing that the environmental report should assess the environmental impacts of terrorism and inside sabotage. The Board admitted GANE's contention.[42] The applicant petitioned for review; the Commission granted the petition and ultimately reversed the Board's decision to admit the contention.[43]

New filings began in earnest shortly after September 11. As GANE had in the MOX proceeding, the State of Utah in the *Private Fuel Storage* independent spent fuel storage installation (ISFSI) proceeding petitioned the Commission to suspend licensing proceedings for the proposed ISFSI in light of the attacks.[44] The Commission made three principal findings, which led it to deny Utah's suspension petition. First, the Commission found that even if the licensing, construction, and shipping processes went forward as planned, no radiological materials would be present onsite for at least two years, so there was no immediate threat to public safety.[45] Second, the Commission found that the interest in efficient adjudication required that the proceeding go forward given the numerous safety and environmental issues involved in the proceeding—many with no link to terrorism— and that the relief requested by Utah—suspension of the entire proceeding—was not narrowly tailored to the goal of adjudicatory efficiency.[46] Finally, the Commission found that continuing the proceeding would not thwart regulatory review, and that suspending the proceeding was not necessary to guarantee that the full benefit of its post-September 11 review would be realized at the proposed facility.[47]

Concurrent with its suspension request, Utah petitioned the Board for admission of a late-filed contention related to the risk of a terrorist attack on the ISFSI. The Board applied the Commission's late-filed contention standards to Utah's petition, found the contention timely, but nonetheless denied admission of both the safety and environmental aspects of the contention.[48] The Board referred its rulings to the Commission for further consideration.[49] The Commission

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[41] *Duke Cogema Stone & Webster* (Savannah River Mixed Oxide Fuel Fabrication Facility), CLI-01-28, 54 NRC 393, 398-401 (2001), *reconsideration denied*, CLI-02-2, 55 NRC 5 (2002).

[42] *MOX*, LBP-01-35, 54 NRC 403, 446 (2001).

[43] *MOX*, CLI-02-24, 56 NRC 335 (2002).

[44] *Private Fuel Storage, L.L.C.* (Independent Spent Fuel Storage Installation), CLI-01-26, 54 NRC 376, 377-78 (2001).

[45] CLI-01-26, 54 NRC at 380-81.

[46] *Id.* at 381-82.

[47] *Id.* at 383.

[48] LBP-01-37, 54 NRC 476, 488 (2001).

[49] *Id.*

accepted review of the Board's ruling on the safety and environmental aspects of the contention, but did not accept the referral with respect to the Board's application of the late-filing factors.[50] The Commission ultimately affirmed the Board's decision.[51]

In the *Catawba/McGuire* license renewal proceeding, the Blue Ridge Environmental Defense League (BREDL) moved to dismiss an application to renew the operating licenses of four nuclear power units, as legally invalid. In the alternative, BREDL asked the Commission to hold the proceeding in abeyance pending the Commission's comprehensive post-September 11 review of its rules and policies. The Commission denied both the request to dismiss the proceeding and the alternative request to hold it in abeyance. Noting the early stage of the proceeding—contentions had only just been submitted and the Board had not yet ruled on them—the Commission found that there was no risk of immediate threat to public health and safety, that there were non-terrorism related contentions to be considered, and that the only "harm" to BREDL would be inevitable litigation costs. The Commission pointed out that any changes in rules that might bear on license renewal reviews could be addressed via late-filed contentions. Additionally, the Commission reasoned that there would be time to apply any new rules that might result from the generic review of terrorism-related issues.[52]

In a license amendment proceeding in which the adjudicatory record had closed, Connecticut Coalition Against Millstone and Long Island Coalition Against Millstone (Coalitions) submitted a contention arguing that the September 11 events required additional environmental analysis of a proposed re-racking of the Millstone spent fuel pool. The Board found that the Coalitions satisfied our rules for reopening the record and for late-filed contentions, but found that the contention was inadmissible. The Board referred its ruling to the Commission,[53] which subsequently affirmed the Board's decision.[54]

Nearly a year after the events of September 11, 2001, the Commission received another request for suspension based on those events in the *Diablo Canyon* ISFSI proceeding. There,

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[50] CLI-02-3, 55 NRC 155, 156 & 156n.9 (2002). The Commission took briefs on the legal issues. *Id.* at 156.

[51] CLI-02-25, 56 NRC 340, 357 (2002).

[52] *Duke Energy Corp.* (McGuire Nuclear Station, Units 1 and 2; Catawba Nuclear Station, Units 1 and 2), CLI-01-27, 54 NRC 385, 388-92 (2001). The Commission directed the Board to reject the safety and environmental terrorism-related contentions proposed in the proceeding. *See Catawba/McGuire*, CLI-02-26, 56 NRC 358 (2002).

[53] *Dominion Nuclear Connecticut, Inc.* (Millstone Nuclear Power Station, Unit 3), LBP-02-5, 55 NRC 131, 145 (2002).

[54] *Millstone*, CLI-02-27, 56 NRC 367, 371-72 (2002). Here again, the Commission took the unusual step of seeking additional briefing to assist in its decision-making process.

eleven petitioners[55] (collectively, SLOMFP) and one additional group[56] filed, directly with the Commission, a petition requesting the following relief: (1) a comprehensive review of the adequacy of the agency's safety requirements to protect against acts of terrorism; (2) suspension of the ISFSI proceeding; (3) if not suspended, then expansion of the proceeding to permit consideration of interim measures to enhance protection; and (4) public participation in the consideration of new requirements. The Commission rejected the suspension request and found the other requests for relief outside the scope of the proceeding. The Commission noted that some of the actions SLOMFP sought had already taken place—the comprehensive review of security rules and policies—and that the AEA already provides mechanisms for public participation. The Commission cited its rulings in *Private Fuel Storage*, *MOX*, and *Catawba/McGuire*,[57] and concluded that "the instant licensing proceeding neither conflicts with the Commission's ongoing review of terrorism-related matters nor forecloses the implementation of new rules," and that policy and case management principles weigh against suspending the proceeding (which was in its early stages).[58]

__Case Status__

(b)(5) [redacted]

Attachment: (b)(5) [redacted]

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[55] *See Pacific Gas and Electric Co.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), CLI-02-23, 56 NRC 230, 235 n.6 (2002).

[56] The Commission did not allow the group to participate since it had not filed a contention or otherwise sought to participate in the hearing. *See Diablo Canyon*, CLI-02-23, 56 NRC at 235 n.7.

[57] *Id.* at 238.

[58] *Id.* at 240. Ultimately, the question whether NEPA requires the agency to consider terrorism-related issues in this proceeding was decided by the Ninth Circuit, which, after appeal to the courts by SLOMFP, remanded to the Commission with direction to consider the issue. *See San Luis Obispo Mothers for Peace v. NRC*, 449 F.3d 1016 (9th Cir. 2006), *cert. denied*, 127 S.Ct. 1124 (2007).

(b)(5)

The attachment, consisting of 33 pages, is being withheld in its entirety under Exemption 5.