



# **POWER REACTOR TRANSITION FROM OPERATIONS TO DECOMMISSIONING**

## **LESSONS LEARNED REPORT**

**October 2016**

**ML16085A029**

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## EXECUTIVE SUMMARY

The purpose of this report is to document the U.S. Nuclear Regulatory Commission (NRC) staff's lessons learned associated with recent permanent power reactor shutdowns during the period of 2013–2016. In particular, the staff's lessons learned focus on the transition from reactor operations to decommissioning for the following nuclear power plants: Kewaunee Power Station (KPS); Crystal River Unit 3 Nuclear Generating Plant (CR-3); San Onofre Nuclear Generating Station (SONGS), Units 2 and 3; and Vermont Yankee Nuclear Power Station (VY). The NRC staff completed reviewing the licensing requests for these plants to modify the operating reactors' licensing bases to reflect those of decommissioning reactors, then transferred the project management and oversight responsibility from the Office of Nuclear Reactor Regulation (NRR) to the Office of Nuclear Material Safety and Safeguards (NMSS). With the transfer of VY on February 1, 2016, regulatory oversight of all four sites was transferred to NMSS. NMSS will continue to provide the project management support for these decommissioning reactors until termination of the respective licenses. The report also provides a number of best practices that have been or are being implemented during the activities surrounding the nuclear power plants that plan to permanently shut down.

This report fulfills an objective of the Decommissioning Transition Working Group (DTWG) to capture the lessons learned for the transition period up to, and including, the transfer of project management responsibility to NMSS. NRR was the lead organization for the project management and licensing actions associated with the plants that were transitioning to decommissioning. NMSS was the lead for public meetings, communications with the public, and congressional and media inquiries. Both offices were supported by the Office of Nuclear Security and Incident Response (NSIR), Office of the General Counsel (OGC), Office of Congressional Affairs (OCA), Office of Public Affairs (OPA), and the regional offices. In addition, the NRC regional offices supported the transition from the operating Reactor Oversight Process to the decommissioning reactor inspection programs as the plants permanently shut down and entered into decommissioning.

The following highlights some of the challenges experienced by the NRC staff during the decommissioning transition licensing reviews from 2013 to 2016:

- The unexpected shutdown of these reactors prior to the expiration of their operating licenses limited the NRC staff's ability to plan and, consequently, required resources to be reallocated to support the processing of licensing requests to support the transition to decommissioning.
- Given the 15-year interval since conducting the prior decommissioning transition reviews (e.g., Zion Nuclear Power Station, Units 1 and 2 were permanently shut down on February 21, 1997 and September 19, 1996, respectively), the NRC and the licensees both experienced steep learning curves, which constrained the effective processing of the decommissioning transition-related licensing actions.
- Reviews were further challenged because of the limited availability of guidance for processing decommissioning transition licensing actions.

During the processing of the decommissioning transition licensing actions, the NRC staff took numerous actions to address these challenges, including:

- NRR utilized a centralized project management approach under one branch with a focused group of project managers to facilitate consistent licensing reviews for those plants that were transitioning to decommissioning. Furthermore, NMSS concurred on all of the decommissioning transition licensing reviews to help ensure knowledge transfer, consistency, and regulatory effectiveness.
- The NRC established the DTWG to identify and resolve complex technical and policy issues and to serve as a communications platform for the ongoing activities. The DTWG coordinated the efforts of NRR, NMSS, NSIR, OGC, OPA, and the regional offices. This has resulted in improved process controls, timely communications, interim staff guidance documents for emergency preparedness and security, and a more integrated approach to managing and reviewing proposed licensee actions and submissions, as well as addressing oversight issues identified during the course of inspection activities in a timely manner.
- The NRC staff has encouraged, and will continue to encourage, licensees to communicate and coordinate with the NRC staff early in the process regarding:
  - Their planned submittal dates—including submittals in advance of formal cessation of operation—and requested approval dates to support the licensees' established schedules of decommissioning activities. The NRC staff has already had several meetings with the licensees that have announced their intention to shut down before their license ends.
  - The use of regulatory precedent. Efficiency gains have already been realized in the reviews of the Certified Fuel Handler Training and Retraining programs for three Exelon plants that have announced their intention to permanently shut down.

Some additional challenges were addressed as follows:

- External stakeholders expressed significant interest in the NRC staff review of the decommissioning transition licensing activities, especially those associated with SONGS Units 2 and 3 and VY, as represented by media coverage, requests for public hearings and meetings, and questions to the NRC staff. As a result, the NRC staff developed communication plans and communication one-pagers in advance of, or concurrent with, the issuance of most of the licensing actions to timely and effectively inform internal stakeholders of significant actions and to prepare OPA and OCA for inquiries from external stakeholders. These communication plans and communication one-pagers were extremely helpful for SONGS and VY licensing actions.
- Both the operating and decommissioning inspection programs guidance for the oversight of plants as they transitioned from operating to permanently shut down required substantive revisions as the programs were not fully maintained and updated as

changes were made in the regulatory and oversight framework over the years. As a result, the NRC staff revised its inspection procedures to ensure appropriate oversight is maintained at sites whose licensees have announced their intention, and are preparing, to transition to a permanently shutdown condition.

In addition to the lessons learned and best practices discussed above, the report provides detailed project management guidance, lessons learned, recommendations, and documentation of precedent related to the reviews and evaluations specific to the types of licensing actions that are expected to be processed during the decommissioning transition period, including oversight activities and communications. Many of the lessons learned and recommendations described in this report will be considered by the NRC staff for inclusion in the ongoing decommissioning rulemaking (as discussed in the advance notice of proposed rulemaking published in the *Federal Register* on November 19, 2015, at 80 FR 72358). Until the rulemaking is completed, the recently issued exemptions, amendments, and other licensing actions for decommissioning reactors described in this report will be used by the staff to inform its reviews of future decommissioning transition licensing actions.

## ACRONYMS AND ABBREVIATIONS

ADAMS	Agencywide Documents Access and Management System
ADM	Office of Administration
ANPR	advance notice of proposed rulemaking
AV	audiovisual
BC	branch chief
BWR	boiling-water reactor
CAB	Community Advisory Board
CAC	Cost Activity Code
CAP	Community Advisory Panel
CAS	central alarm station
CDA	critical digital asset
CEC	California Energy Commission
CEMP	comprehensive emergency management plan
CFH	certified fuel handler
CFR	<i>Code of Federal Regulations</i>
CR-3	Crystal River Unit 3 Nuclear Generating Plant
CSP	cyber security plan
DBA	design-basis accident
DBT	design-basis threat
DCE	decommissioning cost estimate
DECON	decontamination and dismantlement
DEF	Duke Energy Florida, Inc.
DEK	Dominion Energy Kewaunee, Inc.
DLR	Division of License Renewal
DNMS	Division of Nuclear Materials Safety
DOC	Division of the Controller
DORL	Division of Operating Reactor Licensing
DPB	Division of Planning and Budget
DRP	Division of Reactor Projects
DRS	Division of Reactor Safety
DTF	decommissioning trust fund
DTWG	Decommissioning Transition Working Group
DUWP	Division of Decommissioning, Uranium Recovery, and Waste Programs
EA	environmental assessment
EAB	exclusion area boundary
EAL	emergency action level
EIS	environmental impact statement
ENS	emergency notification system
Entergy	Entergy Nuclear Operations, Inc.

ENTOMB	encasement of radioactive contaminants in a structurally long-lived material
EP	emergency preparedness
EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EPW	U.S. Senate Committee on Environment and Public Works
EPZ	emergency planning zone
ERDS	Emergency Response Data System
ERO	emergency response organization
FAQ	frequently asked question
FEMA	Federal Emergency Management Agency
FFD	fitness for duty
FONSI	finding(s) of no significant impact
FR	<i>Federal Register</i>
FRN	<i>Federal Register</i> notice
FTE	full-time equivalent
FY	fiscal year
G2G	government to government
GDC	general design criterion/criteria
HOO	headquarters operations officer
HP	health physics
ICM	interim compensatory measure
IFIB	Financial Analysis and International Projects Branch
IFMP	irradiated fuel management program
IMC	Inspection Manual chapter
IMP	Insider Mitigation Program
Indian Point Unit 3	Indian Point Nuclear Generating Unit No. 3
IP	inspection procedure
ISFSI	independent spent fuel storage installation
ISG	interim staff guidance
JAF	James A. FitzPatrick Nuclear Power Plant
KPS	Kewaunee Power Station
kWe	kilowatt(s) electric
LAR	license amendment request
LTP	license termination plan
MCR	main control room
MBDBE	mitigation of beyond-design-basis events



NAM	neutron-absorbing material
NCV	non-cited violation
NEI	Nuclear Energy Institute
NGO	nongovernmental organization
NMSS	Office of Nuclear Material Safety and Safeguards
NRC	U.S. Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
NSIR	Office of Nuclear Security and Incident Response
OCA	Office of Congressional Affairs
OCFO	Office of the Chief Financial Officer
OGC	Office of the General Counsel
OI	office instruction
OPA	Office of Public Affairs
Oyster Creek	Oyster Creek Nuclear Generating Station
P&P	Policy and Procedure
PAA	Price-Anderson Act
PAG	protective action guideline
PDEP	Permanently Defueled Emergency Plan
PDTS	permanently defueled technical specification
PM	project manager
PMDA	Program Management, Policy Development and Analysis
PS	physical security
PSDAR	post-shutdown decommissioning activities report
QA	quality assurance
QFR	Question(s) for the Record
RAI	request for additional information
REP	radiological emergency preparedness
RERB	Environmental Review and Guidance Update Branch
RG	regulatory guide
RIC	Regulatory Information Conference
RIS	regulatory issue summary
ROP	Reactor Oversight Process
RSLO	regional State liaison officer
SAFSTOR	safe storage
SAS	secondary alarm station
SCE	Southern California Edison Company
SE	safety evaluation
SFP	spent fuel pool
SLIV	Severity Level IV
SNM	Special Nuclear Material
SOC	Statement of Considerations
SONGS	San Onofre Nuclear Generating Station

SRI	senior resident inspector
SRM	staff requirements memorandum/memoranda
SRO	senior reactor operator
SSC	structure, system, and component
SSEP	safety, security, and emergency preparedness
TAC	Task Assignment Control
TOP	training, outreach, and planning
TS	technical specifications
UFSAR	updated final safety analysis report
VY	Vermont Yankee Nuclear Power Station

## 1.0 INTRODUCTION

### Background

In 1988, the U.S. Nuclear Regulatory Commission (NRC) promulgated the first comprehensive power reactor decommissioning regulations. Those regulations addressed decommissioning planning, timing, funding, and environmental review responsibilities. The NRC revised the power reactor decommissioning regulations in 1996. The revised rule redefined the decommissioning process and required licensees to provide the NRC notification of planned decommissioning activities starting at or about 5 years prior to the projected end of operations.

The primary rules for decommissioning a nuclear power plant are set forth in several NRC regulations such as Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, Subpart E, and 10 CFR 50.75, 50.82, 51.53, and 51.95. In addition, other regulations in 10 CFR Part 50 (10 CFR 50.59, 50.36(c)(6), 50.65, 50.48(f), and 50.54(y)) are explicitly applicable to decommissioning reactors. Some regulations are no longer applicable to decommissioning reactors once they are in a permanently shutdown and defueled condition. However, many operating reactor regulations continue to be applicable to decommissioning reactors. For decommissioning reactors, the types of potential accidents are fewer and risks of radiological releases are reduced when compared to an operating reactor. Therefore, to reflect this reduction in risk, licensees of decommissioning reactors have requested certain amendments to their licenses and certain exemptions from the NRC's regulations for operating plants. These licensing actions, which were processed during the transition from operation to decommissioning, establish the long-term regulatory framework for reactors that have permanently shut down and defueled. The NRC's transition period typically concludes with the transfer of regulatory responsibility from the operating reactor organization, the Office of Nuclear Reactor Regulation (NRR), to the nuclear materials program organization, the Office of Nuclear Material Safety and Safeguards (NMSS).

The primary NRC regulatory guidance for decommissioning transition is provided by:

- Regulatory Guide (RG) 1.184, "Decommissioning of Nuclear Power Reactors," Revision 1, dated October 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13144A840)
- RG 1.185, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report," Revision 1, dated June 2013 (ADAMS Accession No. ML13140A038)
- RG 1.202, "Standard Format and Content of Decommissioning Cost Estimate for Nuclear Power Reactors," dated February 2005 (ADAMS Accession No. ML050230008)
- NUREG-1713, "Standard Review Plan for Decommissioning Cost Estimates for Nuclear Power Reactors," dated December 2004 (ADAMS Accession No. ML043510113)

Other documents pertinent to reactor decommissioning include:

- NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Regarding the Decommissioning of Nuclear Power Reactors, Supplement 1, Volume 1: Main Report, Appendices A through M," dated November 2002 (ADAMS Accession No. ML023470304)

- NUREG-1628, “Staff Responses to Frequently Asked Questions concerning Decommissioning of Nuclear Power Plants,” dated June 2000 (ADAMS Accession No. ML003726190)
- Inspection Manual Chapter (IMC) 2561, “Decommissioning Power Reactor Inspection Program” (ADAMS Accession No. ML031270502)
- IMC 2202, “Security Inspection Program for Decommissioning Nuclear Power Reactors” (not publicly available)
- NRR Office Instruction (OI) COM-101, “NRR Interfaces with NMSS” (ADAMS Accession No. ML022110316, not publicly available)
- NMSS Policy and Procedure 5.1, “Reactor Decommissioning Program Procedures for Interfacing with the Office of Nuclear Reactor Regulation” (ADAMS Accession No. ML16081A172, not publicly available)

Although the 1996 rulemaking improved regulatory efficiency and effectiveness, decommissioning in the late 1990s indicated that additional regulatory enhancements were needed. Experience revealed that a substantial number of amendments and exemptions had to be processed during the first stage of decommissioning when the reactor transitions from operation to a permanently shutdown condition. A decommissioning rulemaking effort was initiated to address the transition issues but was subsequently suspended because of a shift in agency priorities following the terrorist attacks on September 11, 2001, in conjunction with the determination that no additional reactor licensee had announced any intention to decommission a reactor in the foreseeable future.

Between early 2013 and the end of 2014, five power reactors permanently ceased operation (Dominion Energy Kewaunee, Inc.—Kewaunee Power Station (KPS); Duke Energy Florida, Inc.—Crystal River Unit 3 Nuclear Generating Plant (CR-3); Southern California Edison Co. (SCE)—San Onofre Nuclear Generating Station (SONGS), Units 2 and 3; and Entergy Nuclear Operations, Inc. (Entergy)—Vermont Yankee Nuclear Power Station (VY)). These were the first reactors to transition to decommissioning since 1998—an interval of nearly 15 years without a power reactor permanently shutting down. Apart from VY, these recent power reactor shutdowns were unexpected and involved little preplanning. During an approximate 3-year period, over 70 decommissioning-related licensing actions and other regulatory actions were processed for the five transitioned reactors.

Because it had been 15 years since any reactor had entered decommissioning, licensees and NRC staff initially had limited experience in processing the decommissioning transition-related licensing actions. This was exacerbated by the limited preplanning between licensees and the NRC and limited guidance on regulatory bases for many of the licensing activities. From a knowledge management perspective, the licensee and NRC staff were both working on steep learning curves. The NRC staff was further challenged to review and process multiple concurrent licensing action applications in order to meet the licensees’ requested completion dates to support the licensees’ efficient and effective use of their decommissioning trust funds.

### Interim Staff Actions

In response to these challenges, NRC management consolidated decommissioning transition project management activities into one branch in NRR/Division of Operating Reactor Licensing

(DORL), to help ensure consistency, knowledge management, and regulatory effectiveness. The decommissioning licensing actions were also prioritized over routine operating licensing actions. For the more complex licensing actions related to emergency planning and security plan reviews, the NRC staff developed interim staff guidance to document the methodology used by the staff to perform the reviews and to facilitate future reviews.

The NRC management also directed the formation of the interoffice Decommissioning Transition Working Group (DTWG) with principal members at the branch chief and staff level. The Branch Chiefs representing NRR/DORL and NMSS/Division of Decommissioning, Uranium Recovery, and Waste Programs co-chaired the DTWG; NRR has the lead responsibility for the licensing work, and NMSS has the lead responsibility for public meetings and communications with the public, Congress, State and local governments, and nongovernmental organizations. An objective of the DTWG was to identify, prioritize, and resolve challenges, and to foster communications with both internal and external stakeholders. One of the primary objectives of the DTWG was to enhance reactor decommissioning knowledge management by capturing and documenting the NRC staff experience gained during the transition process and to recommend long-term actions to improve the power reactor decommissioning transition process, such as the development of guidance, rulemaking, and changes to policy or procedures. This report fulfills an objective of the DTWG to provide a final report to document the lessons learned from those plants that recently transitioned from operation to decommissioning.

#### Interim Findings, Summary Conclusions, and Next Steps

Overall, the NRC staff experience confirms that the current exemption and amendment processes for transitioning plants are sufficient to ensure adequate protection of public health and safety and of the environment, and are consistent with the common defense and security. Most of the licensee exemption and amendment requests do not involve safety issues and are based instead on efficiencies gained and the associated reduction of licensee resources required for a plant that is being decommissioned. The reviews of many of the requested licensing actions were informed by precedents established from the NRC staff review and approvals of amendments and exemptions of earlier plants undergoing decommissioning, where appropriate. Furthermore, reviews and processing of licensing actions became more efficient with time, as both the staff and licensees gained experience. The staff, through conducting the licensing reviews and performing its inspection activities, confirmed and concluded that the licensees of these five reactor units safely transitioned the plants from operation to decommissioning.

As of February 1, 2016, all five of the recently permanently shutdown reactors had been transitioned to decommissioning and transferred to NMSS.

The NRC staff recognizes that the continued need for exemptions by licensees transitioning to decommissioning reflects a gap in the regulatory structure. Use of regulatory exemptions has a number of drawbacks when compared to having explicit regulations applicable to decommissioning plants. The exemption approach is not as efficient or predictable, does not provide for public comment, and does not benefit from the thoughtful examination of an appropriate overall regulatory framework for decommissioning plants that a rulemaking would provide. Consequently, the staff has initiated a Commission-directed rulemaking to expand and enhance the reactor decommissioning regulations, with a specific focus on the transition period

from operation to permanently shut down. As documented in SECY-15-0014, “Anticipated Schedule and Estimated Resources for a Power Reactor Decommissioning Rulemaking,” dated January 30, 2015 (ADAMS Accession No. ML15082A089), the staff has initiated this proposed rulemaking with the goal of providing the final rulemaking to the Commission for approval in calendar year 2019.

Additional reactor licensees have announced their intent to permanently cease operations in the next few years:

- By letter dated August 25, 2016 (ADAMS Accession No. ML16242A127), the Omaha Public Power District notified the NRC staff that it plans to permanently cease operations at Fort Calhoun Station, Unit 1 on October 24, 2016.
- By letter dated March 16, 2016 (ADAMS Accession No. ML16076A391), Entergy notified the NRC staff that it plans to permanently cease operations at James A. FitzPatrick Nuclear Power Plant on January 27, 2017<sup>1</sup>.
- By letter dated June 20, 2016 (ADAMS Accession No. ML16172A137), Exelon Generation Company, LLC (Exelon) notified the NRC staff that it plans to permanently cease operations at Clinton Power Station, Unit 1 by June 1, 2017.
- By letter dated June 20, 2016 (ADAMS Accession No. ML16172A151), Exelon notified the NRC staff that it plans to permanently cease operations at Quad Cities Nuclear Power Station, Units 1 and 2 by June 1, 2018.
- By letter dated November 10, 2015 (ADAMS Accession No. ML15328A053), Entergy notified the NRC that it plans to cease operations at Pilgrim Nuclear Power Station no later than June 1, 2019.
- By letter dated January 7, 2011 (ADAMS Accession No. ML110070507), Exelon notified the NRC staff of its plan to permanently cease operations at Oyster Creek Nuclear Generating Station no later than December 31, 2019.

Based on current economic factors, it is reasonable to assume that additional nuclear power plants might permanently shut down over the next few years. The NRC reactor decommissioning rulemaking, currently in the early stages, could potentially benefit licensees of reactors that will permanently shut down after 2020; however, the NRC staff expects that the benefits of the anticipated regulatory changes will likely not be realized for reactors that shut down before 2020. In the interim, the NRC staff will continue to implement the best practices and address the recommendations contained in this report.

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<sup>1</sup> At the time of this report, Exelon was in negotiations with Entergy to transfer ownership of FitzPatrick to Exelon with the intention to continue operation of the reactor.

## **2.0 SCOPE AND IMPLEMENTATION OF THE REPORT**

The NRC staff has produced this lessons learned report to enhance the effectiveness and efficiency of future licensing activities related to the transition from the operating reactor phase to the decommissioning phase.

Decommissioning activities can be divided into three phases: (1) transition from reactor operation to decommissioning; (2) long-term storage, active dismantlement, and decontamination activities; and (3) license termination activities. This report focuses on the NRC regulatory processes for the first phase of decommissioning during the transition from operation to a permanently shutdown and defueled condition.

The main body of the report discusses the core regulatory functions (licensing, oversight, rulemaking) relative to the transition to decommissioning, as well as support functions (e.g., communications). Within each function, the report summarizes the various activities, the most comprehensive being the licensing actions. Key lessons learned and notable recommendations—many of which have already been implemented during this round of reactors that transitioned—are listed in Sections 4 and 5 of the body of the report. Appended to the report are more detailed discussions to assist NRC staff in preparing for and processing future requests for regulatory action by the licensees. The lessons learned and recommendations are provided in the specific topic sections of the appendices. The staff anticipates that the proposed decommissioning rulemaking will address most of the longer term recommendations.

The information provided in this report does not preclude alternate approaches and may be superseded by future changes to NRC policy, regulation, inspection, licensing, or understanding of decommissioning risk.

### **3.0 DISCUSSION**

All operating reactor licensees will eventually cease operation, decommission their reactors, and terminate their 10 CFR Part 50 and other licenses. A licensee may elect to enter into decommissioning at any time before the expiration of the operating license or at the end of the operating license period. However, a licensee may also request to renew its operating license, in which case the licensee would begin the transition to decommissioning at the end of the renewal period.

Recently, the forecasted long-term supply of less-expensive power, together with plant modification, maintenance, and repair costs, have led some reactor licensees to reexamine the economics of nuclear power. As a result, several licensees have opted to permanently shut down their plants earlier than anticipated. Each licensee for these permanently shutdown plants submitted plant-specific exemption requests for those regulations that it believes are no longer applicable to its facility and amendment requests to its licenses that reflect the decommissioning status of its facilities. The preparation and subsequent reviews of these exemption and amendment requests represent a large level of effort for both the licensees and the NRC staff.

Because the early closure of a nuclear facility can happen relatively quickly, it is important that the NRC project managers (PMs) encourage licensees to begin planning for permanent reactor shutdown and decommissioning as early as reasonably practicable. Because all operating reactors will eventually shut down, this preplanning will serve to provide for a smoother transition from reactor operation to decommissioning.

As noted in the introduction, the NRC staff is working on a decommissioning rulemaking with the goal of enhancing the efficiency and effectiveness of the decommissioning transition process. Until that rule is completed, this report should help provide practical guidance to NRC staff in addressing licensing activities associated with operating reactor licensees contemplating or implementing a permanent cessation of operation, permanent removal of all fuel from the reactor vessel, and transition to decommissioning.

#### **3.1 LICENSING**

##### **REGULATORY PROCESS FOR POWER REACTOR DECOMMISSIONING TRANSITION**

The primary reactor decommissioning requirements are codified in 10 CFR 50.82, "Termination of License." The associated primary decommissioning planning requirements are codified in 10 CFR 50.75, "Reporting and Recordkeeping for Decommissioning Planning." A nuclear power reactor licensee formally begins the decommissioning process when it certifies permanent cessation of operation and permanent removal of fuel from the reactor vessel under 10 CFR 50.82(a)(1). Once these certifications are docketed with the NRC, the 10 CFR Part 50 license no longer authorizes operation of the reactor. Despite this withdrawal of authority to operate, a decommissioning nuclear power plant continues to retain a 10 CFR Part 50 operating license. As such, the decommissioning plant continues to be subject to many of the requirements that apply to plants authorized to operate pursuant to 10 CFR Part 50.

Regulations that are designed to protect the public against reactor operation-related design basis events that include conditions of normal operation, anticipated operational occurrences,



and design-basis accidents (DBAs) are no longer applicable at a permanently shutdown and defueled reactor. For example, certain accident sequences, such as loss-of-coolant accidents and anticipated transient without scram, are no longer relevant to a permanently shutdown and defueled reactor. In addition, some regulations may not be relevant to certain structures, systems, and components (SSCs) since the SSCs are no longer required to be maintained, to operate, or to mitigate certain accidents, events, or transients, whether they are safety-related or security-related. Other regulations, although based on power operation of the plant, may continue to be applicable to the permanently defueled facility until an exemption is granted, such as the need for offsite radiological emergency preparedness (REP) plans under 10 CFR Part 50. Typically, the scope of these requirements can be reduced to those regulations and requirements that primarily pertain to the safe storage of the spent fuel in the spent fuel pool (SFP) as described in the site's final safety analysis report.

Upon a licensee's permanent cessation of reactor operation and permanent removal of fuel from the reactor vessel, the licensee will typically submit a significant number of requests for licensing actions based on the reduced risk profile. Licensees will likely seek amendments to their licenses, as well as exemptions from certain regulatory requirements that they have determined to have no beneficial contribution to safety or security when the reactor is permanently shut down and defueled. Licensees will also use the 10 CFR 50.59, "Changes, tests, and experiments," process and other specific change processes to make additional changes to the plant that do not require NRC approval. Such changes to the decommissioning design-basis analyses, SSCs, and licensee organizations, processes, and procedures would be reflected in the licensee's updated final safety analysis report. Licensees will also be using the provisions (among others) set forth in 10 CFR 50.54(p), and 10 CFR 50.54(q) to change the facility licensing bases.

The timing and implementation for some decommissioning licensing actions are based on an approach that recognizes further reduction in risk after cessation of power operations and removal of fuel from the reactor vessel. These risk reductions can be tied to several factors, including, but not limited to: (1) the radiological source term after cessation of power operations and removal of fuel from the reactor vessel; (2) elapsed time after permanent shutdown; and (3) type of long-term onsite fuel storage. The two areas where these additional risk reductions are considered in the early decommissioning transition process are emergency preparedness (EP) and facility insurance and indemnity. Exemptions in EP and insurance coverage requirements will not be approved until qualifying analyses confirm that there are no DBAs that would require protective actions for the public due to a release of radioactive material with a dose exceeding the U.S. Environmental Protection Agency (EPA) protective action guidelines (PAGs). The qualifying analyses also assess a postulated, very low probability, beyond-design-basis zirconium fire scenario. The analyses show that the decay heat generated by the spent fuel stored in the SFP would not reach the zirconium ignition temperature in less than 10 hours, conservatively assuming no water or air cooling of the fuel. The NRC staff has concluded that if 10 hours were available to initiate mitigative actions or, if needed, to implement offsite protective actions using a comprehensive emergency management plan (CEMP),<sup>2</sup> formal

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<sup>2</sup> A CEMP in this context, also referred to as an emergency operations plan (EOP), is addressed in the Federal Emergency Management Agency's (FEMA's) Comprehensive Preparedness Guide (CPG) 101, "Developing and Maintaining Emergency Operations Plans." CPG 101 is the foundation for State, territorial, Tribal, and local EP in the United States. It promotes a common understanding of the fundamentals of risk-informed planning and

offsite radiological emergency plans would not be necessary for permanently defueled nuclear power reactor licensees.

Additional risk reductions will occur when the spent fuel is removed from the SFP into dry cask storage at an independent spent fuel storage installation (ISFSI). Most decommissioning reactors will have an ISFSI licensed under the general license provisions of Subpart K, "General License for Storage of Spent Fuel at Power Reactor Sites," of 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste," and the licensees may opt to make changes to their emergency plans and security programs to align with the requirements of 10 CFR Part 72. This lessons learned report does not address licensing actions and changes to the 10 CFR Part 50 regulatory framework more than approximately 2 years after permanent shutdown. Removal of all fuel from the SFP will typically occur well after the initial decommissioning transition process ends and will be part of the long-term project management and regulatory oversight provided by NMSS.

The amount of licensing activity will vary throughout the entire decommissioning process until license termination. However, the largest amount of licensing activity is expected to occur during the transition from operation to decommissioning when the long-term regulatory framework for decommissioning is typically established.

## **TRANSITION ROADMAP**

Based on power reactor decommissioning experience from the 1990s, the NRC staff developed several reference documents that provide a general roadmap of the regulatory transition process from the operating phase to the decommissioning phase.

- NRR OI COM-101 defines the interactions, licensing program management responsibilities, and support functions for NRC staff regulatory oversight of decommissioning commercial nuclear power plants as project management responsibility transitions from NRR to NMSS. The instructions in COM-101 identify the regulatory milestones that are expected to be requested while project management is still maintained by NRR. Upon completion of the milestones, the licensing and regulatory basis of the facility is more representative of a materials licensee temporarily storing and processing radioactive waste than a commercial nuclear power reactor facility authorized to operate. Once these milestones are achieved, project management oversight and responsibility will be transferred to NMSS.
- NMSS Policy and Procedure 5.1 defines the NMSS responsibility for decommissioning transition and mirrors the requirements in COM-101.

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decisionmaking and helps planners at all levels of government in their efforts to develop and maintain viable, all-hazards, all-threats emergency plans. An EOP is flexible enough for use in all emergencies. It describes how people and property will be protected; details who is responsible for carrying out specific actions; identifies the personnel, equipment, facilities, supplies and other resources available; and outlines how all actions will be coordinated. A CEMP is often referred to as a synonym for "all hazards planning."

- NSIR/DPR-ISG-02, “Emergency Planning Exemption Requests for Decommissioning Nuclear Power Plants.” This interim staff guidance (ISG) provides guidance to NRC staff for conducting the technical review of requests for exemptions from the EP requirements for nuclear power reactors based on the projected or actual permanently shutdown and defueled condition of the facility. The ISG also provides guidance for the staff’s review of associated changes to the licensee’s emergency plan for a permanently shutdown and defueled reactor that reflects the as-granted EP exemptions.
- NSIR/DSP-ISG-03, “Review of Security Exemptions/License Amendment Requests for Decommissioning Nuclear Power Plants.” The purpose of this ISG is to provide guidance to NRC staff on conducting technical reviews and safety evaluations of a licensee’s requests for license amendments, alternative measures, and requests for exemption from security regulations for nuclear power plants that are undergoing the process of decommissioning.

The licensing activities a PM can anticipate during the decommissioning transition phase are generally grouped into the following main categories:

Decommissioning Planning	Post-shutdown decommissioning activities report (PSDAR) and related site-specific decommissioning cost estimate (DCE)
Operations Staff Qualifications	Certified fuel handler (CFH) training and retraining program, under which nonlicensed operators can qualify as a CFH and any necessary technical specification (TS) amendments to utilize CFHs in lieu of licensed operators at decommissioning reactors
Financial	Decommissioning trust fund (DTF) and offsite/onsite insurance
Emergency Preparedness	Regulatory exemptions and amendments to the emergency plan and emergency action level (EAL) scheme
TS	Defueled TS amendments
Security Related	Site-specific security plan changes and exemptions
License Conditions	Amendments to align conditions in the reactor operating license to a decommissioning facility
Order Rescissions	Requests to rescind various security or Fukushima-related orders

A more detailed listing of the expected decommissioning licensing activities is provided in Table 3-1 below. The order of the actions does not necessarily reflect the order that the licensee may submit its requests. With sufficient preplanning, many licensing actions can be submitted to the NRC prior to permanent shut down (see items marked with asterisk).

The appendix to this report provides additional discussions of specific topical areas encountered during the processing of the decommissioning licensing actions that were subject to regulatory evaluation issues, lessons learned efficiencies, or other NRC staff consideration. Most of the information provided in the appendix will contribute to the staff's decommissioning transition process knowledge management and knowledge transfer until a reactor decommissioning rulemaking is completed. Note that some areas addressed in the appendix (e.g., fitness for duty or aging management) present staff positions during decommissioning reviews but were not directly related to specific licensee-requested actions.

**Table 3-1 Expected Decommissioning Transition Licensing Activities**

<b>Licensing and Regulatory Actions</b>	<b>Exemption</b>	<b>Amendment</b>	<b>Other Actions</b>	<b>NRC Approval Required</b>	<b>NRC Assessment Only</b>
5 years prior to license expiration (or 2 years after permanent shutdown, whichever occurs first) -- irradiated fuel management program (IFMP) 10 CFR 50.54(bb) IFMP			X	X	
5 years prior to projected end of plant operation -- Preliminary DCE 10 CFR 50.75(f)(3)			X		X
Licensee communication regarding possibility of shutdown			X		
Licensee public announcement of permanent shutdown			X		
Public meeting with licensee on decommissioning planning			X		
Certification of permanent shutdown 10 CFR 50.82(a)(1)(i)			X		
Certification of permanent fuel removal 10 CFR 50.82(a)(1)(ii)			X		
Public information meeting on decommissioning transition			X		
Annual fee reclassification 10 CFR 171.15(c)(1)			X		

<b>Licensing and Regulatory Actions</b>	<b>Exemption</b>	<b>Amendment</b>	<b>Other Actions</b>	<b>NRC Approval Required</b>	<b>NRC Assessment Only</b>
<b>PSDAR *</b>					
PSDAR public meeting 10 CFR 50.82			X		
PSDAR meeting summary with transcripts			X		
PSDAR assessment closeout letter			X		X
Site-specific cost estimate 10 CFR 50.82(a)(8)(iii)			X		X
Final safety analysis report revision/update to reflect shutdown status 10 CFR 50.71(e)			X		
CFH training and retraining program *			X	X	
<b>TS *</b>					
TS section, "Administrative controls" amendment (CFH and other staffing changes)		X		X	
Amendment to remove irradiated fuel handling-related TSs		X		X	
Defueled TS— comprehensive amendment to all TSs		X		X	
<b>Financial</b>					
Use of DTF for spent fuel management *	X			X	
Insurance indemnity exemption 10 CFR 140.11(a)(4) and 10 CFR 50.54(w)	X			X	
Modifications to parent company guarantee support agreement			X	X	

Licensing and Regulatory Actions	Exemption	Amendment	Other Actions	NRC Approval Required	NRC Assessment Only
EP					
Emergency plan changes in the on-shift and Emergency Response Organization (ERO) staffing based on permanent shutdown and defueled condition of facility *		X		X	
EP exemptions 10 CFR 50.47 and 10 CFR Part 50, Appendix E *	X			X	
Commission approval of EP exemption per SECY-08-0024			X	X	
Permanently defueled emergency plan and associated changes to the EAL scheme implementing EP exemption, as granted*		X		X	
Termination of Emergency Response Data System (ERDS)			X		X
Permanently defueled emergency plan and EAL schemes reflecting removal of all spent fuel from the SFP to an onsite ISFSI (ISFSI only)		X		X	
Security					
Security plan changes 10 CFR 50.54(p) review and acknowledgement letter			X		X
Security plan amendment		X		X	
Site-specific security exemptions* 10 CFR 73.55(p)(i) & p(ii), 10 CFR 73.55(j)(4)(ii), etc.	X			X	
Amendments to license conditions (material possession, fire protection, license renewal, etc.)		X		X	

Licensing and Regulatory Actions	Exemption	Amendment	Other Actions	NRC Approval Required	NRC Assessment Only
Order Rescissions					
Security EA-02-026, EA-06-137			X	X	
Fukushima EA-12-049, EA-12-051, EA-13-109			X	X	
Miscellaneous					
Quality assurance (QA) program 10 CFR Part 50, Appendix B		X		X <sup>a</sup>	
Exemption from certain recordkeeping regulations	X			X	
<sup>a</sup> NRC approval required only if change is a decrease in commitments. <sup>*</sup> action that can be submitted to the NRC prior to permanent shutdown					

## DECOMMISSIONING PLANNING

The following information provides a high-level summary of the licensing actions processed as the reactors recently transitioned to decommissioning. More detailed information on these topical areas is provided in the appendix to this report.

The current 10 CFR Part 50 regulations for reactor decommissioning were designed for plants that were expected to be permanently shut down after their operating licenses expired, as opposed to plants that shut down prematurely. The decommissioning planning process is expected to start 5 years before the end of the license. The first five items in Table 3.1 would typically be performed in the planning period. Regardless of when the plant permanently shuts down, the certification of permanent shutdown and the certification of permanent fuel removal are required to be submitted to the NRC. The PSDAR is also required to be submitted to the NRC and is considered the key communication to the NRC, and the public, on the decommissioning plan for the reactor. To date, no licensee has operated a power reactor to the end of its licensed operating period.

### Post-Shutdown Decommissioning Activities Report

The regulation in 10 CFR 50.82(a)(4)(i) requires the licensee, prior to or within 2 years after permanent cessation of operations, to submit a PSDAR to the NRC and to send a copy to the affected States. RG 1.185 provides guidance on the contents of the PSDAR. The PSDAR must contain a description of the planned decommissioning activities, a schedule for the completion of these activities, an estimate of expected costs, and a discussion of the reasons for concluding that the environmental impacts associated with the site-specific decommissioning activities will be bounded by appropriate, previously issued environmental impact statements.

The NRC staff is required to notice the licensee's submission of the PSDAR in the *Federal Register* (FR) and make it available for public comment. In addition, the staff is required to hold

a public meeting in the vicinity of the site. Although the regulations do not require that the NRC staff approve the licensee's PSDAR, the NRC staff does perform a review of the PSDAR's content against the requirements in 10 CFR 50.82(a)(4)(i), and guidance and acceptance criteria in RG 1.202 and NUREG-1713, as they pertain to the estimate of expected costs contained in the PSDAR.

The NRC staff coordinates several activities immediately following submittal of the PSDAR. There is a 90-day waiting period from the date that the licensee's certifications under 10 CFR 50.82(a)(1) and PSDAR have been submitted until the licensee can perform any major decommissioning activities as defined in 10 CFR 50.2, "Definitions." During this period, the NRC staff reviews the contents of the PSDAR to ensure it meets the requirements of 10 CFR 50.82(a)(4)(i), as well as guidance and acceptance criteria in RG 1.202 and NUREG-1713, and holds the public meeting on the PSDAR. If the NRC staff cannot determine whether the PSDAR meets the requirements, they would issue a letter to the licensee with questions related to the specific requirements. The PSDAR closeout letter is then issued as soon as practical following the completion of the staff's review.

See Appendix Section 1.1.1 for additional information.

### **Irradiated Fuel Management Program**

One licensing action related to decommissioning planning is the licensee's submittal of an IFMP for preliminary staff approval as required in 10 CFR 50.54(bb). Specifically, 10 CFR 50.54(bb) requires licensees to submit an IFMP to the NRC for preliminary approval within 2 years following permanent cessation of operation of the reactor or 5 years before expiration of the reactor operating license, whichever occurs first. Licensees have, on occasion, satisfied this requirement by submitting an IFMP together with the preliminary DCE.

The purpose of the IFMP is to provide reasonable assurance that the licensee has a program or strategy to manage and fund the management of irradiated fuel during decommissioning in a manner that is consistent with NRC requirements and that will be timely implemented. In addition to the decommissioned plant submittals, licensees requesting to renew their operating licenses should have also submitted an IFMP within 5 years of the expiration date of the original operating license. While the IFMP may have been previously submitted by a decommissioning licensee and received preliminary approval 5 years before permanent shutdown (or during license renewal), the licensee will have to update the program upon permanent shutdown. As required by 10 CFR 50.82(a)(4)(i), the PSDAR includes a site specific DCE, including the projected cost of managing irradiated fuel. The IFMP may also be used to support an exemption request to permit use of the DTF for irradiated fuel management expenses.

See Appendix Section 1.1.2 for additional information.

### **Decommissioning Cost Estimate**

Another licensing action required to be submitted 5 years prior to the end of projected operation is a "preliminary" DCE pursuant to 10 CFR 50.75(f)(3). The purpose of the preliminary DCE is to provide the NRC with an up-to-date estimate of decommissioning costs and identify major factors that may impact the cost to decommission a facility. In addition, the comparison of this



estimate against the minimum decommissioning trust fund amount required in 10 CFR 50.75(b) and (c) provides reasonable assurance that the licensee's decommissioning trust will have sufficient funding to accomplish radiological decommissioning of the facility. Like the IFMP, there are many examples of the preliminary DCE reviews and evaluations since every licensee that has received a license renewal should have submitted its preliminary DCE within 5 years of the expiration date of the original license, as well as the licensees that have decommissioned their facilities. Guidance in RG 1.202 provides the standard format and content of decommissioning cost estimates for nuclear power reactors.

## **FINANCIAL**

### **Decommissioning Trust Fund Exemption Requests**

The NRC regulations in 10 CFR 50.82 and 10 CFR 50.75 restrict use of the trust funds to legitimate decommissioning activities—removal and decontamination of radioactive materials and license termination activities, but not irradiated fuel management (commonly referred to as spent fuel management)—and require 30 days' notice to the NRC for withdrawals for purposes other than legitimate decommissioning activities. Thus, licensees have requested exemptions to use these funds for spent fuel management and, in some cases, site restoration activities. The exemption will usually request that such withdrawals from the trust be done without prior notification to the NRC.

The NRC staff will review the licensee's DTF, the decommissioning approach and costs in the PSDAR and DCE, and the licensee's updated IFMP, in order to determine whether there is reasonable assurance that adequate funds will be available in the trust to complete decommissioning and license termination as well as perform the requested activities. In previously granted exemptions, the NRC concluded that using a portion of the trust for spent fuel management would not prevent the licensee from completing radiological decontamination and cleanup of the decommissioning reactor site through license termination.

Some licensees have also requested this exemption to support the accelerated transfer of spent fuel from the SFP to dry cask storage.

See Appendix Section 1.2.1 for additional information.

### **Granting of Exemption from Offsite Liability Insurance Requirements**

Most licensees of permanently shutdown reactors will request exemptions from certain requirements in 10 CFR 140.11(a)(4) during the decommissioning transition period. The exemption reduces the required amount of primary offsite liability insurance coverage from \$375 million (increasing to \$450 million effective January 2017) to \$100 million. In addition, the exemption will permit the licensee to remove the facility from participation in the secondary insurance pool. Consistent with precedent, this exemption is based on demonstrating that the spent fuel in the SFP is air coolable (and is similar to the type of beyond design basis zirconium fire accident scenario analyses that are used to assess offsite EP exemptions). Consequently, this exemption would be processed after the site has been granted a reduction in offsite EP.

See Appendix Section 1.2.2 for additional information.

## **Granting of Exemption from Onsite Property Damage and Cleanup Insurance Requirements**

Most licensees of permanently shutdown reactors will request exemptions from certain requirements in 10 CFR 50.54(w)(1) to reduce the required level of onsite property damage insurance from \$1.06 billion to \$50 million. Consistent with precedent, this exemption is based on demonstrating that the spent fuel in the SFP is air coolable (and is similar to the type of beyond design basis zirconium fire accident scenario analyses that are used to assess offsite EP exemptions). Consequently, this exemption would be processed after the site has been granted a reduction in offsite EP.

See Appendix Section 1.2.2 for additional information.

## **STAFFING**

### **Approval of Certified Fuel Handler Training and Retraining Program**

A nuclear power reactor that has permanently ceased operations and no longer has fuel in the reactor vessel does not require a licensed individual to monitor core conditions. In lieu of licensed operators, decommissioning reactors will utilize a CFH as the senior on-shift operations representative on site. The CFH is a nonlicensed operator position that was formalized as part of a 1996 rulemaking for power reactors that have permanently shut down and transitioned to decommissioning. The CFH will be the on-shift management representative responsible for supervising and directing the monitoring, storage, handling, and cooling of irradiated nuclear fuel, and responding to facility emergencies, in a manner consistent with ensuring adequate protection of the health and safety of the public. The CFH has the requisite knowledge and experience to evaluate plant conditions and make these judgements. As specified in 10 CFR 50.2, the CFH training and retraining program used to qualify a nonlicensed operator as a CFH must be approved by the NRC. As such, the NRC staff will review the CFH training and retraining program to verify that it contains the necessary training elements to provide the nonlicensed operator with the requisite knowledge and experience to qualify as a CFH, and thereby be qualified to make decisions and take actions to protect the health and safety of the public, provide appropriate oversight of decommissioning activities, and respond to plant emergencies.

Besides approval of the CFH training and retraining program, implementation of the CFH staffing position for decommissioning reactors, NRC has approved amendments to the staffing requirements in the Administrative Controls section of the licensee's TSs.

See Appendix Section 1.3.1 for additional information.

## **CHANGES TO THE LICENSE**

### **Defueled Technical Specifications—Comprehensive Amendment to All Technical Specifications**

All of the licensees of recently permanently shutdown reactors have proposed comprehensive amendments to their facilities' TSs to reflect their permanently shutdown and defueled status.

Most of the TSs for an operating power reactor specify modes of applicability that correspond to conditions of operation for the reactor or apply only when fuel is emplaced in the reactor vessel. For a permanently shutdown and defueled reactor, these modes refer to conditions that are no longer possible because the reactor cannot be operated and fuel cannot be placed in the core. In such cases, TSs with modes of applicability can be removed from the license without affecting the safety of the facility. In addition, substantial changes are also made to the Administrative Controls section of the TSs, including changes to facility staff responsibilities, staffing organization, and staffing levels. Some program and reporting requirements only applicable to operating reactors are also deleted or modified.

In addition to decommissioning-related amendments to the operating reactor TS described above, two narrow-in-scope TS license amendments may be requested early in the decommissioning transition process. One involves the use of the certified fuel handler, as discussed above. Another amendment may be needed to support irradiated fuel handling. The irradiated fuel handling amendment would remove the TS limiting conditions of operations related to certain safety-related systems that are typically required for irradiated fuel handling, such as the control room habitability systems, fuel handling building ventilation systems, actuation instrumentation, and supporting safety-related electrical systems.

See Appendix Section 1.4.1 for additional information.

## **LICENSE CONDITIONS**

All 10 CFR Part 50 reactor licenses contain license conditions that the NRC has imposed on licensees whenever it was deemed appropriate and necessary, in accordance with 10 CFR 50.50, "Issuance of Licenses and Construction Permits." When the licensee submits the 10 CFR 50.82 letters asserting that the reactor is permanently shut down and defueled, many of the license conditions are no longer relevant and can be modified or removed from the license.

Section 1 of a facility operating license should not be amended, because it documents the Commission's findings at the time of initial licensing. Some licensees have requested amendments to the license conditions in Section 2 of the reactor's facility operating license; however, since the licensee is not authorized to operate the plant or load fuel in the vessel, many of these license conditions are not relevant—even if left in place. In most circumstances, the Fire Protection Program license condition can be removed because it ensures protections are in place to reach safe shutdown in the event of a fire. The fire protection requirements for decommissioning reactors specified in 10 CFR 50.48 require the licensee to maintain fire protection capabilities for the rest of the plant to address fire events that may have radiological consequences. Removal of the operating reactor fire protection license condition should not impact fire protection at a decommissioning reactor. The license condition related to mitigating strategies for large fires and explosions should remain for the SFP. Based on recent experience with this license condition, licensees have elected to leave the condition unchanged and implement it as appropriate for site-specific conditions. It should be noted that the NRC staff's evaluation of the exemptions related to EP regulations relies heavily on the licensee's prompt implementation of the mitigating strategies license condition for the SFP. For reactors that have received renewed operating licenses, there may be some license conditions that need modification or removal depending on site-specific conditions.

See Appendix Section 1.4.4 for additional information.

## **EMERGENCY PREPAREDNESS**

During the decommissioning transition period, licensees have requested several EP licensing actions, including: an initial post-shutdown amendment to the emergency plan modifying the licensee's on-shift and ERO staffing under the existing regulatory requirements of 10 CFR Part 50; an exemption request for many of the EP regulations; and an amendment approving a permanently defueled emergency plan (PDEP) and EAL scheme implementing the EP regulatory exemptions. The NRC staff will also acknowledge the licensee's termination of the ERDS, if requested. Subsequently, the licensee may also submit a license amendment reflecting a further reduction in ERO staffing under the EP requirements, as exempted, to reflect the transferring of spent fuel from the SFP to an ISFSI.

### **Changes in the On-Shift and Emergency Response Organization Staffing upon Permanent Shutdown and Defueling**

Early in the decommissioning transition period, licensees may request an amendment to their emergency plans to remove certain on-shift and augmented ERO positions, based on the permanently shutdown and defueled condition of the facility, which no longer requires certain positions (e.g., core or thermo-hydraulic engineer) to respond to an event at an operating facility. These on-shift and augmented ERO positions would no longer be necessary after the licensee has certified under 10 CFR 50.82(a)(1) that the reactor has permanently ceased operation and fuel has permanently been removed from the reactor vessel, and the licensee has determined that credible accidents no longer exist that would require these functions. However, adequate on-shift and augmented ERO staffing must be maintained to support the prompt implementation of SFP mitigation strategies and the timely and effective communication and coordination with offsite response organizations in accordance with Federal Emergency Management Agency (FEMA)-approved State and local REP plans.

### **EP Exemptions and Permanently Defueled Emergency Plan and EAL Scheme Amendment**

For some period of time after the licensee permanently ceases reactor operations (normally 15–18 months), FEMA-approved offsite REP plans are required to be maintained under 10 CFR 50.47, "Emergency Plans." This period of time depends on the decay time of spent fuel stored in the SFP, as well as site-specific considerations to meet the EP exemption criteria. The EP exemption can be granted when the NRC staff determines that: (1) a postulated radiological release would not exceed the EPA PAGs at the exclusion area boundary for DBAs applicable to a permanently shutdown and defueled reactor, and (2) sufficient time would exist to take prompt mitigative actions in response to a postulated zirconium fire accident scenario in the SFP and, if warranted, for offsite officials to take offsite protective actions to protect public health and safety using a CEMP. If the EP exemption is granted, the NRC will no longer require a formal determination by FEMA of the adequacy of offsite REP plans.

Permanently shutdown and defueled power reactor licensees will likely request regulatory exemptions from certain standards as set forth in 10 CFR 50.47 and requirements of Appendix E to 10 CFR Part 50, "Emergency Planning and Preparedness for Production and

Utilization Facilities.” Decommissioning licensees will submit site-specific analyses supporting requested exemptions from emergency plan regulations, based on the criteria above. The licensee will also submit a corresponding license amendment request (LAR) to revise its emergency plan to implement the exemptions listed above, as part of a PDEP. In conjunction with, or as part of, the PDEP amendment, the licensee will also submit changes to the EAL scheme.

The PDEP, once implemented, would no longer require under 10 CFR 50.47 that State and local authorities maintain formal FEMA-approved, offsite REP plans, including the 10-mile Plume Exposure Pathway and 50-mile Ingestion Pathway emergency planning zones (EPZs), as well as a public alert and notification system. The licensee will continue to maintain an onsite emergency plan and response capabilities, including the notification of local government officials of an emergency declaration. If needed, offsite authorities may implement protective measures for the public using a CEMP (all-hazard) approach. The licensee will continue to notify the NRC and designated offsite agencies following the declaration of an emergency classification and maintain communications and interface responsibilities with offsite response organizations that may be called upon to provide assistance on site in the event of an emergency declaration. Provisions for fire, ambulance, and medical services will continue to be agreed upon via letters of agreement with local entities.

An important consideration in processing the EP licensing actions is the need to prepare a Commission paper requesting approval of the proposed exemptions from the EP regulations in accordance with the staff requirements memorandum (SRM) to SECY-08-0024, “Delegation of Commission Authority to Staff to Approve or Deny Emergency Plan Changes That Represent a Decrease in Effectiveness.”

### **ISFSI-Only Emergency Plan and EAL Scheme Amendment**

Based on the projected or actual permanent removal of all spent fuel from the SFP to dry cask storage at an onsite ISFI, a license may submit an LAR requesting further changes to its emergency plan, consistent with the requirements of 10 CFR 73.32(a) and the guidance in SFST-ISG-16, “Emergency Planning.”

### **Termination of the Emergency Response Data System**

The ERDS is a direct near real-time electronic data link between the licensee’s onsite computer system and the NRC Operations Center that provides for the automated transmission of a limited data set of selected parameters.

Appendix E to 10 CFR Part 50, Section VI, “Emergency Response Data System,” details the requirements for ERDS as they apply to operating power reactors. Once a reactor has permanently ceased operation and the licensee has permanently removed fuel from the reactor vessel, the licensee is no longer required to maintain the ERDS data link to the NRC. Therefore, the licensee may remove ERDS from service without prior NRC approval under

10 CFR 50.54(q). The licensee is required under 10 CFR 50.54(q)(5) to retain a record of each change to its emergency plan made without NRC approval for a period of 3 years.

Following notice from the licensee of its intent to terminate the ERDS data link, the NRC staff will issue a letter to the decommissioning reactor licensee acknowledging termination of the ERDS data link. In some cases, the State will have a memorandum of understanding with the NRC on the use of ERDS for monitoring emergency conditions at a reactor site. In this situation, the NRC will issue a letter to the State(s) within the 10-mile EPZ of the site informing them of the licensee's intent to terminate ERDS (see ADAMS Accession No. ML15117A520 as an example).

See Appendix Section 1.5 for additional information on EP licensing actions.

## **SECURITY**

The physical security (PS) requirements of 10 CFR 73.55, "Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors against Radiological Sabotage," and Appendix B, "General Criteria for Security Personnel," and Appendix C, "Licensee Safeguards Contingency Plans," to 10 CFR Part 73, "Physical Protection of Plants and Materials," continue to apply to a nuclear power reactor after permanent cessation of operations and removal of fuel from the reactor vessel. Currently, there are no explicit regulatory provisions distinguishing PS requirements for a power reactor that has been shut down from those for an operating power reactor. These security requirements are designed to protect against the design-basis threat of radiological sabotage as stated in 10 CFR 73.1.

Licensees have sought NRC approval of exemptions to reduce PS requirements for permanently shutdown reactors because the security-risk profile presented by a decommissioning plant is much less than when it was operating. The PS-related exemptions that were requested by the recent licensees to transition to decommissioning include areas such as severe weather and emergency authority of certified fuel handlers, communications between the central alarm station (CAS) and control room, number of armed responders, requirements for force-on-force (FOF) exercises, and combination of the CAS and secondary alarm station (SAS). Several of these exemptions requested by a decommissioning licensee were site specific and may not have been generically applicable.

Many of the PS program changes at decommissioning reactor sites can be accomplished without NRC approval under the provisions of 10 CFR 50.54(p) provided the licensees demonstrate no reduction in the effectiveness of the PS program. Experience has shown that, although the PS program changes may not require NRC approval, exemption, or a license amendment, significant NRC staff effort will be expended in the review and verification that the security plan remains effective.

See Appendix Section 1.6 for additional information on security-related licensing actions.

## **ORDER RESCISSIONS**

Orders related to the Fukushima Dai-ichi facility accident (EA-12-049, Mitigating Strategies; EA-12-051, Reliable SFP Instrumentation; EA-13-109, Hardened Vents) may be subject to

requests to be rescinded. However, the NRC expects that most licensees will comply with these orders within the next few years and the need for action in this area may be minimal depending on the timing of a licensee's reactor shutdown.

In addition, licensees may request the NRC rescind security-related orders that are no longer applicable to those licensees.

See Appendix Section 1.4.4 for additional information.

## **MISCELLANEOUS LICENSING ACTIONS**

### **Exemption from Certain Recordkeeping Regulations**

Licensees that are transitioning to decommissioning may request exemptions from certain parts of the following recordkeeping requirements that require records to be retained until termination of the license: Appendix B to 10 CFR Part 50, Criterion XVII, "Quality Assurance Records"; 10 CFR 50.59(d)(3); and 10 CFR 50.71(c). Licensees that have previously been granted these exemptions used the justification that, when the associated SSCs are removed from the licensing basis documents, the SSCs will no longer serve any function regulated by the NRC. Therefore, the need to retain the records will be, on a practical basis, eliminated.

The NRC staff has previously determined that the records subject to removal under these exemptions are associated with SSCs that had been important to safety during power operation but are no longer important operationally or capable of causing an event, incident, or condition that would adversely impact public health and safety, as evidenced by their appropriate removal from licensing basis documents. If the SSCs no longer have the potential to cause an event, incident, or other problem that would adversely impact public health and safety, then it is reasonable to conclude that the records associated with these SSCs would not be necessary to assist the NRC in determining compliance and noncompliance, taking action on possible noncompliance, and examining facts following an incident. Therefore, their retention would not serve the underlying purpose of the requirements.

Records associated with SSCs that maintain compliance and protect public health and safety are excluded from exemptions from certain recordkeeping regulations. Examples of these SSCs include those associated with programmatic controls, such as controls pertaining to residual radioactivity, security, QA, and SSCs associated with spent fuel assemblies or the SFP (while assemblies are still in the pool) and ISFSIs (see ADAMS Accession No. ML15344A243).

### **Approval of Changes to the Licensee's Quality Assurance Program**

A reactor licensee transitioning to decommissioning may elect to simplify and revise its current QA program commensurate with the permanently shutdown and defueled condition of the reactor, given the fewer number of SSCs for a decommissioning facility and the fewer number of quality standards that would apply. There are two types of changes: those that do not reduce commitments in the program description as accepted by the NRC and those that do reduce commitments.

- Changes to the QA program that do not reduce commitments must be submitted to the NRC, but do not require prior approval. Such changes include administrative improvements and clarifications; spelling corrections, punctuation or editorial corrections, the use of a QA standard approved by the NRC that is more recent than the QA standard in the licensee's current QA program, the use of a quality assurance alternative or exception approved by a previous NRC safety evaluation (SE), and others. All such changes are described in 10 CFR 50.54(a)(3).
- Changes that do reduce the commitments must be submitted to the NRC and receive approval prior to implementation, in accordance with 10 CFR 50.54(a)(4). Changes to the QA program description are considered accepted by the Commission upon receipt of a letter to this effect from the appropriate reviewing office of the Commission or 60 days after submittal to the Commission, whichever occurs first.

See Appendix Section 1.7 for additional information.

### **Preplanning of Decommissioning Licensing Actions**

If a licensee has sufficient time to preplan its decision to permanently cease operations, many of the licensing actions discussed above can be prepared and requested well in advance of permanent shutdown. By coordinating the submission schedule of these licensing actions with the NRC, significant gains in efficiency can be achieved in the NRC staff review effort and completion of the reviews to support implementation during decommissioning without delays. To facilitate timely staff review, licensees are encouraged to conduct presubmittal meetings with staff.

An example of advance decommissioning licensing action planning is provided in Table 3-2 below. This table shows an example of a decommissioning licensing action submission schedule for a reactor that has several years remaining in its license term. The decommissioning planning provides a window to process most of the licensing actions that will be needed during the decommissioning transition phase. It should be noted that this schedule also includes several ISFSI licensing actions that would be needed once all spent fuel has been removed from the SFP. While the ISFSI licensing actions are not typically processed during the decommissioning transition period, there is no reason why they cannot be processed in advance.



**Table 3-2 Example of a Decommissioning Licensing Action Submission Schedule with Several Years Preplanning**

<b>Licensing Action Type</b>	<b>Licensing Action Description/Title</b>	<b>Proposed Submittal Date</b>
Other	CFH training and retraining Program	24 months prior to SD*
License Amendment	Submit EP changes to on-shift and augmented ERO staffing based on permanent shutdown and defueled condition of facility	18 months prior to SD
License Amendment	Staffing and training requirement changes to TSs Section 6	18 months prior to SD
Exemptions	Exemptions to certain 10 CFR 50.47 and 10 CFR Part 50, Appendix E, EP requirements	18 months prior to SD
License Amendment	Proposed PDEP and EAL scheme implementing EP exemption, as granted	18 months prior to SD
License Amendment	PDTs/Bases and revised license conditions	18 months prior to SD
Exemptions	Permit suspension of certain security measures during severe weather conditions	12 months prior to SD
Exemptions	Exemption request(s) from certain security requirements (10 CFR Part 73)	12 months prior to SD
License Amendment	Changes to security plan for permanently defueled facility	12 months prior to SD
Exemptions	Use of the DTF for spent fuel management expenses	12 months prior to SD
Exemptions	Exemption from offsite liability insurance	6 months prior to SD
Exemptions	Exemption from onsite property damage insurance	6 months prior to SD
License Amendment	Deletion of license renewal condition for permanently defueled license	6 months prior to SD
Other	PSDAR and site-specific DCE	3 months prior to SD
<b>Permanent Shutdown of the Plant</b>		
Exemptions	Maintenance of records	18 months after SD
Other	Changes to Offsite Dose Calculation Manual	18 months after SD

Licensing Action Type	Licensing Action Description/Title	Proposed Submittal Date
License Amendment	Additional changes to Security Plan (supports ISFSI)	18 months after SD
License Amendment	PDEP and EAL scheme reflecting removal of all spent fuel from the SFP to an onsite ISFSI	18 months after SD
License Amendment	Operating license/TS "Clean-up" once all fuel is transferred to ISFSI	18 months after SD

\*SD is projected date of permanent shutdown

### Use of Precedent

Most licensing actions processed during decommissioning transition are based on precedent. The information in Table 3-3 provides the NRC staff a directory of the SEs and other related evaluations associated with the transition licensing action. Based on lessons learned, the NRC staff is strongly encouraged to review and understand the precedent developed by the staff in these referenced evaluations when assessing any decommissioning transition activities. The NRC staff should share this table with licensees as appropriate.

**Table 3-3 Key Licensing Action Evaluations for Future Reference**

Licensing and Regulatory Actions	KPS	CR-3	SONGS	VY
5 years prior to license expiration (or 2 years after permanent shutdown, whichever occurs first)—IFMP 10 CFR 50.54(bb)	ML092321079	ML14344A408	ML15182A256	ML15274A379
5 years prior to projected end of plant operation— Preliminary DCE 10 CFR 50.75(f)(3)	ML092321079	ML14344A408	N/A	ML14357A110
Licensee preliminary notification of intention to permanently shut down	ML12312A018	N/A	N/A	ML13273A204
Certification of permanent shutdown (10 CFR 50.82(a)(1)(i))	ML13058A065	ML13056A005	ML131640201	ML15013A426
Certification of permanent fuel removal (10 CFR 50.82(a)(1)(ii))	ML13135A209	ML13056A005	ML13204A304 ML13183A391	ML15013A426
Annual Fee Reclassification 10 CFR 171.15(c)(1))	ML13162A401	N/A	N/A	ML15014A041

<b>Licensing and Regulatory Actions</b>	<b>KPS</b>	<b>CR-3</b>	<b>SONGS</b>	<b>VY</b>
PSDAR submittal *	ML13063A248	ML13343A183	ML14272A121	ML14357A110
PSDAR meeting summary with transcripts	ML13168A570	ML14034A026	ML14352A063	ML15082A327
PSDAR assessment closeout letter	ML15036A528	ML14321A751	ML15204A383	ML15343A210
CFH training and retraining program *	ML14104A046	ML14155A181	ML13268A165	ML14162A209
<b>TSs *</b>				
TS section, "Administrative Controls" amendment (CFH and other staffing changes)	N/A	ML14097A145	ML14183B240	ML14217A072
Amendment to remove irradiated fuel handling-related TSs	ML14111A234	N/A	N/A	ML14304A588
Defueled TS—comprehensive changes to all TSs	ML14237A045	ML15224B286	ML15139A390	ML15117A551
<b>Financial</b>				
Site-specific cost estimate (10 CFR 50.82(a)(8)(iii)) SE input (not publicly available)	ML13135A169	ML14183B636	ML15008A096	ML15085A226
Use of DTE for spent fuel management *	ML13337A287	ML14247A545	ML14101A132	ML15128A219
<b>Insurance and indemnity exemptions</b>				
10 CFR 140.11(a)(4) Offsite Liability Protection	ML15026A522	ML14183B338	N/A	ML16012A144
10 CFR 50.54(w) Onsite Property Cleanup	ML15033A245	ML16020A432	N/A	ML16012A193
Modifications to parent company guarantee, support agreement, lines of credit	ML15294A304	N/A	N/A	ML15097A361 ML15107A074

<b>Licensing and Regulatory Actions</b>	<b>KPS</b>	<b>CR-3</b>	<b>SONGS</b>	<b>VY</b>
EP				
EP changes in the on-shift and augmented ERO * staffing based on the permanent shut down and defueled condition of the facility	N/A	N/A	N/A	ML14346A065
EP exemptions (10 CFR 50.47 and 10 CFR Part 50, Appendix E)	ML14261A223	ML15058A906	ML15082A204	ML15180A054
Commission approval SECY of EP exemption per SECY-08-0024	ML14072A257	ML14219A444	ML14251A554	ML14227A711
PDEP and EAL scheme implementing EP exemption, as granted	ML14279A482	ML15027A209	ML15126A461 (PDEP) ML15105A349 (EAL)	ML15233A166
Termination of ERDS	ML14363A302	ML15040A473	ML15040A428	ML15117A520 ML15274A084
Security				
Security plan changes (10 CFR 50.54(p)) review and acknowledgement letter	ML15247A022	ML15224A539	ML15288A469	ML16008B103
Security plan amendment	N/A	N/A	N/A	N/A

<b>Licensing and Regulatory Actions</b>	<b>KPS</b>	<b>CR-3</b>	<b>SONGS</b>	<b>VY</b>
Site-specific security exemptions, 10 CFR 73.5				
- 10 CFR 73.55(p)(i) & (p)(ii) Severe weather and emergency authority of CFH	ML14176A980	ML14176B078	N/A	ML14266A387
- 10 CFR 73.55(j)(4)(ii) Communications between CAS and control room	ML14217A228	N/A	N/A	N/A
- 10 CFR Part 73, Appendix B, Section VI, C.3, Exemption from licensee-conducted FOF	ML14190B127 (W)	ML14184A019 (W)	N/A	N/A
- Exemption from Minimum Number of Armed Responders	ML14349A416 (W)	N/A	N/A	N/A
- Exemption request to combine CAS and SAS	ML14282A519 (D)	N/A	N/A	N/A
Amendments to license conditions (material possession, fire protection, license renewal, etc.)	ML14008A297 Also see Defueled TS SE	See Defueled TS SE	See Defueled TS SE	See Defueled TS SE
Order rescissions				
Security				
- EA-02-026	ML14154A406		N/A	ML14227A912
- EA-06-137	N/A		N/A	ML14227A912
Fukushima				
- EA-12-049 Modifications to Mitigation Strategies	ML14059A411	ML13212A366	ML14113A572	ML14321A685
- EA-12-051 Reliable SFP Instrumentation	ML14066A204	ML13203A161	ML14111A069	ML14321A696
- EA-13-109 Hardened Vents	N/A	N/A	N/A	ML14055A323
Partial exemption from recordkeeping	N/A	N/A	N/A	ML15344A243
QA program (10 CFR Part 50, Appendix B)	N/A	N/A	ML15191A461	N/A
(W) Indicates requested action withdrawn. (D) Indicates requested action was denied. * Licensing actions can be submitted to the NRC prior to permanent shutdown.				

### 3.2 INSPECTION AND OVERSIGHT

The Reactor Oversight Process (ROP) for reactors licensed to operate ends and the Decommissioning Power Reactor Inspection Program begins when a licensee provides written certification under 10 CFR 50.82(a)(1) that the reactor has permanently ceased operation and permanently removed fuel from the reactor vessel. Specifically, the NRC transitions from IMC 2515, "Light-Water Reactor Inspection Program—Operations Phase," to IMC 2561, "Decommissioning Power Reactor Inspection Program," following the certification date for the permanent removal of all nuclear fuel from the reactor vessel in accordance with 10 CFR 50.82(a)(1)(ii). When this occurs, NRC oversight responsibilities within the regional offices typically transfer from the Division of Reactor Projects (DRP) to the Division of Nuclear Material Safety (DNMS). Based on the reorganization of NRC Regional responsibilities in 2003<sup>3</sup>, inspection oversight for power reactors located in Region II is transferred to Region I once the reactor permanently shuts down and defuels (as was the case for CR-3). The Reactor Decommissioning Inspection Program will remain in place until the license is terminated. NRR and NMSS coordinate with the regional offices on the transfer from IMC 2515 to IMC 2561, including resources and budget issues. The inspection program transfers are generally made within a few months of the permanent defueling. The decommissioning inspection and oversight program consists of core and discretionary inspection activities. The core inspection activities can be found in Appendix A of IMC 2561 and are performed on an annual basis. The non-core inspection activities are listed in Appendix B of IMC 2561 and implemented as needed based on licensee performance or activities being performed. The NRC oversees decommissioning of nuclear reactors through inspections that emphasize radiological controls, management, procedures compliance, spent fuel pool operations, and the safety review program. Many activities that occur during decommissioning are very routine and occur frequently in operating plants. These include decontamination of surfaces and components, surveys for radioactive contamination, waste packaging and disposal, and other activities. The overall inspection effort at plants being decommissioned is significantly less than at an operating reactor site.

Core inspections include:

- Organization and Management Control;
- Quality Assurance;
- Spent Fuel Wet Storage and Handling;
- Maintenance and Surveillance;
- Radiation Protection;
- Emergency Preparedness;
- Security; and
- Safety Evaluations.

Decommissioning activities are grouped into the following six categories:

1. Post-Operation Transition Phase
2. SAFSTOR, Fuel in the Pool
3. SAFSTOR, No Fuel in the Pool

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<sup>3</sup> NRC Regulatory Issue Summary 2003-15: Consolidation of the Region I and Region II Materials Program (ADAMS Accession No. ML032480409)

4. Actively Decommissioning, Fuel in the Pool
5. Actively Decommissioning, No Fuel in Pool
6. Final Surveys Underway, No Fuel in Pool

Inspection hour estimates are based on decommissioning activities and will vary from site to site. During active decommissioning, NRC inspectors may be at the facility 2 or 3 weeks of the month. During a long-term storage period, they would be present several times a year. Usually only one Resident Inspector will typically remain onsite for a period of 6 to 12 months after the 50.82(a)(1)(ii) certification is submitted. During this period, decommissioning inspections are performed by both the onsite resident inspector and regional inspectors specialized in decommissioning. After the Resident Inspector leaves the site, all inspection activities are completed by regional inspectors.

In general, during the most recent reactors that were transitioning to a decommissioning state, the NRC regional inspectors found that IMC 2561 and the associated Appendix A and B inspection procedure had not been maintained up-to-date with the various regulatory and oversight changes that had occurred since the last set of plants underwent decommissioning. Inspection procedures such as for adverse weather, SFP safety, and fire protection, were either not available or lacked adequate guidance for inspectors. In particular, security and emergency preparedness inspection procedures for a shutdown plant were initially unavailable. As a result NSIR created a series of physical security and EP inspection procedures.

Based on the reorganization of NRC regional responsibilities in 2003, Region I assumes oversight and inspection responsibility for power reactors in NRC Region II that have transitioned to decommissioning. However, there was no guidance in IMC 2561 on how this should be accomplished. Region I coordinated a highly successful and seamless transfer of oversight responsibility, including allegations, enforcement, and emergency response, from Region II to Region I for the first plant from Region II to transition into a decommissioning status.

The Regions also encountered issues with the lack of guidance on how the transition from IMC 2515 to IMC 2561 should be communicated and documented to the licensee and public.

The NRC staff also determined that additional guidance should be added to IMC 2515 to ensure appropriate oversight is maintained at sites whose licensees have announced their intention, and are preparing, to transition to a permanently shutdown condition. A revision to IMC 2515 was issued in February 2016. The revision included new ROP framework guidance (Section 15 and Appendix G) to adjust baseline inspection effort (e.g., hours and samples) when licensees begin the transition to permanent shutdown and decommissioning.

See Appendix Section 2 for additional information regarding the decommissioning reactor inspection and oversight program.

### **3.3 RULEMAKING**

By issuing a power reactor decommissioning rule, the NRC would be able to establish regulations that would maintain safety and security at sites transitioning to decommissioning without the need to grant specific exemptions or license amendments in certain regulatory areas. Specifically, the decommissioning rulemaking would have the following goals:

(1) continue to provide reasonable assurance of adequate protection of the public health and safety and common defense and security at decommissioning power reactor sites, (2) ensure that the requirements for decommissioning power reactors are clear and appropriate, (3) codify those issues that are found to be generically applicable to all decommissioning power reactors and have resulted in the need for similarly worded exemptions or license amendments, and (4) identify, define, and resolve additional areas of concern related to the regulation of decommissioning power reactors.

In the SRM to SECY-14-0066, "Request by Dominion Energy Kewaunee, Inc. for Exemptions from Certain Emergency Planning Requirements," dated August 7, 2014 (ADAMS Accession No. ML14219A366), the Commission directed that the staff should, based on lessons learned from the most recent operating plant closures, report to the Commission its views on the need for an integrated rulemaking for decommissioning and, as appropriate, provide the potential schedule and resources required for completion.

In the SRM to SECY-14-0118, "Request by Duke Energy Florida, Inc., for Exemptions from Certain Emergency Planning Requirements," dated December 30, 2014 (ADAMS Accession No. ML14364A111), the Commission provided further direction to the NRC staff to proceed with rulemaking on reactor decommissioning and set an objective of early 2019 for its completion.

Within this SRM, the Commission directed the staff to address the following:

- issues discussed in SECY-00-0145, "Integrated Rulemaking Plan for Nuclear Power Plant Decommissioning," such as the graded approach to EP;
- lessons learned from the plants that have already (or are currently) going through the decommissioning process;
- the advisability of requiring a licensee's PSDAR to be approved by the NRC;
- the appropriateness of maintaining the three existing options (DECON, SAFSTOR, and ENTOMB) for decommissioning and the timeframes associated with those options;
- the appropriate role of State and local governments and nongovernmental stakeholders in the decommissioning process; and
- any other issues deemed relevant by the NRC staff.

In SECY-15-0014, "Anticipated Schedule and Estimated Resources for a Power Reactor Decommissioning Rulemaking," dated January 30, 2015 (ADAMS Accession No. ML14357A177; not publicly available, although a redacted version of SECY-15-0014 is available in ADAMS under Accession No. ML15082A089), the NRC staff committed to proceed with a rulemaking on reactor decommissioning and provided an anticipated schedule and estimate of the resources required for the completion of a decommissioning rulemaking. In SECY-15-0127, "Schedule, Resource Estimates, and Impacts for the Power Reactor Decommissioning Rulemaking," dated October 7, 2015 (ADAMS Accession No. ML15211A095, not publicly available), the staff provided further information to the Commission on resource



estimates and work that will be delayed or deferred in fiscal year (FY) 2016 to enable the staff to make timely progress consistent with Commission direction to have a final rule submitted to the Commission by the end of FY 2019.

On November 19, 2015, the NRC published an advance notice of proposed rulemaking (ANPR) in the *Federal Register* (80 FR 72358) (ADAMS Accession No. ML15334A269) to obtain input from stakeholders on the development of a draft regulatory basis for Regulatory Improvements for Decommissioning Power Reactors rulemaking.

On December 9, 2015, the NRC conducted a public meeting to promote full understanding of the questions contained in this ANPR and facilitate public comment. The meeting summary was issued on January 5, 2016 (ADAMS Accession No. ML15362A099).

Based on numerous requests from the States and other stakeholders, the NRC published a notice in the *Federal Register* on December 28, 2015 (80 FR 80709), that extended the comment period for the ANPR from January 4, 2016, to March 18, 2016, thereby providing the public with a total of 120 days to submit comments on the ANPR.

The NRC received 161 comments representing various members of the public, including private citizens; community advisory panels; citizen advocacy groups; the nuclear industry and associated licensees; local, State, and Federal government agencies; and nongovernmental organizations (NGOs).

The milestones and associated opportunities for public interaction throughout the rulemaking process include the following:

#### Rulemaking Milestones / Public Interaction

- The ANPR was published on November 19, 2015.  
The public comment period ended on March 18, 2016.
- The Draft Regulatory Basis is estimated to be completed in November 2016 and will be published for public comment.  
*A public meeting will be held to discuss the Draft Regulatory Basis.*
- The Final Regulatory Basis is estimated to be completed in the fall of 2017.
- The Proposed Rule/Draft Regulatory Guidance is estimated to be completed in the summer of 2018 and will be published for public comment.  
*A public meeting will be held to discuss the Proposed Rule/Draft Regulatory Guidance.*
- The Final Rule/Final Regulatory Guidance is expected to be provided to the Commission in calendar year 2019.  
*An implementation public meeting will be held at an appropriate time.*

The NRC recognizes that it will take several years to issue a final rule. When additional reactors begin decommissioning before implementation of the final rule, the NRC anticipates

that licensees will continue to use existing regulatory processes described in this lessons learned report to establish their decommissioning regulatory framework.

### **3.4 COMMUNICATIONS**

Openness is one of the five principles of good regulation. The NRC recognizes the public's interest in the proper regulation of nuclear activities and provides various opportunities for citizens to share their opinions. The NRC seeks to elicit public involvement early in its regulatory processes, including decommissioning, so that members of the public can raise safety concerns for the NRC to consider during its deliberations of regulatory actions.

#### **Public Meeting Requirements**

The NRC regulations currently offer the public several opportunities to review and provide comments on licensees' documents during the decommissioning process. Specifically, under the NRC regulations in 10 CFR 50.82, the NRC is required to publish a notice of the receipt of the PSDAR, make the PSDAR available for public comment, schedule a meeting in the vicinity of the location of the licensed facility to discuss the PSDAR, and publish a notice of the meeting in the *Federal Register* and another forum readily accessible to individuals in the vicinity of the site. This meeting typically addresses three areas: (1) the decommissioning regulatory process, (2) the licensee's proposed post-shutdown plans and schedule, and (3) the NRC's continuing oversight throughout the transition and decommissioning phases.

Of note, licensees are prohibited from performing any major decommissioning activities until 90 days after the NRC has received the PSDAR and certifications of permanent cessation of operations and permanent removal of fuel from the reactor vessel, as required under 10 CFR 50.82(a)(1), have been submitted. For licensees that submit their PSDARs after the certifications have been submitted, the 90-day condition is based on the receipt of the PSDAR. In these cases, the public meetings are typically held within 30–60 days of receipt of the PSDAR such that the public can provide comments on the PSDAR prior to the start of major decommissioning activities. As discussed in the licensing section above, coordination with the licensee on the submittal schedule of the PSDAR is necessary to ensure the NRC can conduct the meeting within 30–60 days of receipt.

The other opportunity for public participation is near the end of the decommissioning when the license termination plan (LTP) is submitted for approval. The LTP is submitted to the NRC as a license amendment request pursuant to 10 CFR 50.90, "Application for Amendment of License, Construction Permit, or Early Site Permit." As such, pursuant to 10 CFR 50.91, "Notice for Public Comment; State Consultation," the NRC will provide a notice in the *Federal Register* that the LTP is available for comment and will provide an opportunity for hearing on the request. The NRC staff's review of the LTP will follow the normal license amendment process. In addition, all specific requests to amend the operating license during decommissioning follow the 10 CFR 50.90 amendment process and provide opportunity for public comment and request for hearing.

## Stakeholder Involvement

Also, consistent with the NRC's principle of openness, the NRC frequently interacts with interested stakeholders, including both NGOs and local and State government officials, in order to discuss any decommissioning topics that may be of interest to the public, interested stakeholders, and the surrounding community. These interactions include participation at existing community forums, government-to-government meetings, end-of-cycle plant performance meetings, congressional staff briefings, meetings with State and local officials, media boards and press briefings, and correspondence related to nuclear plant decommissioning. These meetings are scheduled and conducted in cooperation with the appropriate organizations (e.g., Office of Congressional Affairs (OCA) for congressional briefings and Office of Public Affairs (OPA) for media interest). A listing of many of the reactor decommissioning stakeholder outreach meetings is provided at the end of Appendix Section 3.

The NRC staff acknowledges the desire for and value of community involvement in the decommissioning of a nuclear power plant. Power plant decommissioning is a complex project, and the NRC believes that the impact of decommissioning and termination of a nuclear power reactor license needs to be communicated to the local community. As an independent regulator, the NRC ensures that all members of the public are given a fair and equal opportunity to comment on a licensee's decommissioning plans, commensurate with the risks involved. Therefore, the NRC does not officially recognize or endorse any specific special interest group, public or private organizations, community groups, coalitions, or individuals. This approach ensures that one or more organizations do not dominate a public forum and allows members of the public to provide alternative and differing viewpoints and comments to the NRC.

While not required, for many years the NRC has strongly recommended that licensees involved in decommissioning activities form a community committee to obtain local citizen views and concerns regarding the decommissioning process and spent fuel storage issues. The NRC has observed that the licensees who actively engage the community maintain better relations with the local citizens. The only NRC requirement to have a site-specific community board is for licensees that are seeking to terminate the license with restricted release.

It is important to note that community interest in reactor decommissioning activities can vary depending on the location and historical relationship between the licensee and State and local governments, labor unions, members of the public, and other stakeholders. The DTWG supported NRC staff development of a strategy that could be employed, when circumstances warrant, for enhancing public awareness and understanding of the activities surrounding the transition to decommissioning for power reactors within the existing regulatory framework. To accomplish these objectives, the staff developed or updated the following communication tools:

- "Communication Strategy for the Enhancement of Public Awareness regarding Power Reactors Transitioning to Decommissioning," dated February 2015 (ADAMS Accession No. ML15013A068). This document outlines the NRC strategy for communicating the key messages regarding the NRC process and practices for public and stakeholder engagement during the decommissioning of nuclear power plants as well as providing a resource for addressing related frequently asked questions (FAQs). This document is supplemented by other communication documents assembled NSIR related to the

exemptions from certain EP requirements requested by the four reactors that recently transition to decommissioning.

- FAQs have been made publicly available online at <http://www.nrc.gov/waste/decommissioning.html>.
- NMSS collected public questions from the recent transitioning reactors and is completing a revision to NUREG-1628, "Staff Responses to Frequently Asked Questions concerning Decommissioning of Nuclear Power Plants."
- An NRC brochure on decommissioning was updated and is available to the public at <http://www.nrc.gov/reading-rm/doc-ollections/nuregs/brochures/br0521/> as well as the NRC backgrounder on decommissioning at <http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/decommissioning.html>. Both of these information sources will also be updated and maintained as appropriate to ensure that decommissioning information available to the public is accurate and readily available.
- Communication one-pagers supporting issuance of regulatory decisions on specific regulatory requests. These one-pagers were developed for most of the decommissioning licensing actions to provide timely information to NRC internal stakeholders of significant actions and to prepare OPA and OCA for inquiries from external stakeholders. The NRC staff recognizes that strong internal communications through the use of one-pagers are an effective means of ensuring internal stakeholders are well informed regarding sometimes complex regulatory requirements and decommissioning activities. These communication one-pages have been collected and captured in ADAMS for future decommissioning transition activities (ADAMS Accession No. ML16082A165, not publicly available).
- Communication plans were developed for certain complex licensing actions to coordinate the public release, provide consistent key messages, and anticipate likely questions. These communication plans have been collected and captured in ADAMS with the communication one-pagers for future decommissioning transition activities (ADAMS Accession No. ML16082A165, not publicly available).

The NRC staff observed that, as part of the NRC's decommissioning communication strategy, communications promoting public awareness have had a positive benefit in the overall decommissioning process. The communication process begins with early engagement with the licensee regarding decommissioning planning and the NRC's advocacy of licensee-sponsored advisory panels, followed by the staff's continued development of communication tools and its ability to proactively interact with members of the public, NGOs, and affected State and local officials.

The NRC staff recognizes that strong internal communications and use of one-pagers and communication plans are effective means of ensuring internal stakeholders are well-informed. In addition, the communication tools enabled the staff to promptly support OPA and OCA in responding to external request for information.

Finally, extensive feedback was received from affected States and NGOs regarding the inability to provide public comment as part of the exemption process. The NRC staff is considering whether to change the current role of States, members of the public, or other stakeholders in the decommissioning process as part of the integrated decommissioning rulemaking effort.

## 4.0 LESSONS LEARNED

- (1) The premature permanent shutdown of a power reactor, without sufficient preplanning, can limit the NRC staff's ability to plan and allocate resources to support the licensees' licensing requests. The decommissioning licensees often requested expedited reviews of its decommissioning licensing actions in an attempt to minimize facility staffing levels and reduce expenditures from the DTFs. Premature unplanned shutdowns also impact other key stakeholders, such as the States, local governments, and communities. Planned early submission of decommissioning transition licensing actions, as demonstrated by VY, can increase the efficiency of the transition process. The NRC completed the transition of the project management function of VY from NRR to NMSS nearly a year earlier than the other recent decommissioning reactors, in part because of VY's submission of several licensing actions while it was still operating.
- (2) As experienced with the previous decommissioning reactors in the 1990s, the recent decommissioning reactor licensees submitted a large number of exemption requests and LARs to modify their licensing bases. Commensurate with the reduced risks of decommissioning, over 70 decommissioning-related licensing actions were received and processed by the NRC staff in less than 3 years. Where it is possible, staff with previous decommissioning transition licensing experience should be engaged in the review process for these licensing actions.
- (3) Due to the 15-year interval since conducting prior decommissioning transition reviews, a learning curve existed for both the NRC and the licensees to effectively process the decommissioning transition-related licensing actions. Furthermore, limited and, in some cases, outdated guidance was available in processing decommissioning transition licensing actions. For example, NRR OI COM-101 has not been revised since 2002. While it was still generally useful and applicable to the recent reactor decommissioning transitions, it is out-of-date in many areas, including document processing and office structure. In addition, although principal decommissioning regulatory guidance document RG 1.184 was revised in 2013, the experience gained in the recent decommissioning transitions could be used to further improve this guidance document.
- (4) The NRC staff has gained considerable experience in evaluating decommissioning EP exemption requests that resulted in the development of NSIR/DPR-ISG-02. For these exemptions, the staff continues to request Commission approval in accordance with the SRM for SECY-08-0024. The staff is considering whether to propose future changes to this process to the Commission to enhance overall efficiency and effectiveness.
- (5) Several decommissioning exemption requests were not adequately supported by documentation provided in the licensee's submittal. The NRC staff did not require an acceptance review on the decommissioning actions since the scope of applicability of NRR OI LIC-109, "Acceptance Review Procedures" (ADAMS Accession No. ML091810088), specifically excludes decommissioning reactors. Performing an acceptance review may have led to licensees supplementing their applications or nonacceptances, or both, instead of more requests for additional information. In some cases, the NRC staff expended resources evaluating licensing requests that were ultimately withdrawn.

- (6) NMSS has different practices regarding the distribution of documents. NRR uses electronic distribution, while NMSS uses paper. Continuing electronic distribution of documents would provide continuity in reaching the interested public stakeholders within the local vicinity of reactors that are currently preparing to transition to decommissioning.
- (7) The resources expended in project management of the decommissioning licensing actions were directly related to external stakeholder interest and involvement in the process. The staff resources expended in addressing stakeholder petitions, State concerns, and Congressional questions related to VY far exceeded similar activities for other decommissioning reactors.
- (8) In certain cases, licensees may determine, through an evaluation under the 10 CFR 50.59 process, that plant systems, equipment, or instruments may no longer be required after cessation of operation. However, in the past, some licensees have inappropriately used the 10 CFR 50.59 process in determining whether a reduction in effectiveness in the emergency plan exists without appropriately evaluating the impact on EALs under 10 CFR 50.54(q). While various EALs are linked to operating modes, which may no longer apply to a permanently shutdown and defueled reactor, a licensee should submit a proposed EAL scheme change for prior NRC approval as required under Appendix E to 10 CFR Part 50.
- (9) Many NRC staff evaluations are contingent on defined accidents. Typically, the accidents might include fuel handling accidents, cask drop accidents, radioactive release due to a fire, radioactive release due to a radioactive waste storage accident, or other site-specific accidents. These accidents are cited in many of the decommissioning transition licensing actions and are evaluated by the staff to determine the potential for offsite releases in excess of EPA PAG limits. Some of the previous decommissioning reactor transition reviews were not well communicated internally resulting in the same accidents being evaluated multiple times by different reviewers. Better coordination is needed to ensure technical staff reviews are not duplicative or redundant.

## 5.0 BEST PRACTICES

- (1) NRR utilized a centralized project management approach under one branch with a focused set of project managers to facilitate consistent licensing reviews for those plants that were transitioning to decommissioning. NRR plans to continue centralized project management for the recently announced planned decommissioning reactors.
- (2) The NRC staff continues the practice of early engagement and encouragement of submission of decommissioning transition licensing actions well ahead of permanent shutdown.
  - a. Early submission of licensing actions allows for greater schedule margin to critical decommissioning milestones when licensing action processing could delay expected staffing reductions and result in significant unnecessary expenditures from the DTF.
  - b. Early submission of licensing actions increases the NRC's options and flexibility in scheduling reviewers in parallel with higher priority operating reactor licensing actions.
  - c. Early submission of licensing actions allows for the use of the licensee's staff resources supporting an operating reactor that are typically not available after the reactor has permanently shut down.
  - d. When a licensee submits the PSDAR well in advance of permanent shutdown, the NRC staff can conduct its required public meeting and inform public stakeholders on the decommissioning process in a proactive manner that is unconstrained by the 90-day limit. This will also permit licensee access to the DTF for major decommissioning activities following the submittal of the 10 CFR 50.82(a)(1)(ii) certification.
- (3) Both licensees and NRC staff are encouraged to consider precedent safety evaluations when preparing and evaluating future decommissioning licensing action requests.
- (4) The NRC staff should continue to encourage licensees to engage with local community leaders and sponsor advisory panels to allow for local involvement.
- (5) The NRC staff initiated performing acceptance reviews on decommissioning related licensing requests.
- (6) The NRC staff issued two ISGs related to EP and security reviews.
- (7) The NRC staff revised its inspection procedures to ensure appropriate oversight is maintained at sites whose licensees have announced their intention, and are preparing, to transition to a permanently shutdown condition.
- (8) The NRC staff should continue the practice of using communication plans and informal communication one pagers in advance of or concurrent with the issuance of most of the



licensing actions. The use of these internal communications was very effective in informing internal stakeholders of significant events and preparing OPA and OCA for inquiries from external stakeholders. These communication plans and communication one-pagers were extremely helpful for SONGS and VY licensing actions.

## 6.0 RECOMMENDATIONS

- (1) NRR should revise NRR OI COM-101 to reflect the lessons learned and best practices documented in this report.
- (2) NMSS should adopt an electronic distribution service for NRC-initiated correspondence for reactors that have been transferred to NMSS for project management responsibility. NMSS management has begun using electronic distribution for the recently transitioned decommissioning reactors. The NRC staff recommends that this policy be formally documented.
- (3) The NRR staff should consider performing an acceptance review on all decommissioning licensing actions (both amendments and exemptions) consistent with LIC-109 and formalize this in the next revision of the OI.
- (4) The NRC should assess how best to proceed with the update to RG 1.184, "Decommissioning of Nuclear Power Reactors," in coordination with the decommissioning rulemaking effort.
- (5) In the SRM to SECY-08-0024, dated May 19, 2008 (ADAMS Accession No. ML081400510), the Commission provided direction that the staff should request Commission approval for any licensing request for an exemption from the EP requirements of 10 CFR 50.47(b) and Appendix E to 10 CFR Part 50. Therefore, each EP exemption request submitted by a decommissioning licensee requires the development and submittal of a Commission paper requesting approval of the proposed EP exemptions. Given the now routine nature of these requests, which are expected to follow the format and content guidance of NSIR/DPR-ISG-02, the NRC staff should consider ways to gain efficiency in this process, such as by requesting that the Commission delegate authority to approve decommissioning EP exemption requests to the Office Director of NRR. If pursued, this delegation would be for decommissioning EP exemptions only and would be contingent on the requested decommissioning EP exemptions being consistent with previous decommissioning EP exemptions and following the guidance of NSIR/DPR-ISG-02. Before proposing such a change, the staff would need to consider Commission precedent on the topic to ensure its recommendation is fully informed and does not revisit previous Commission decisions without an appropriate basis.
- (6) The NRC staff should communicate with the licensee, as part of presubmittal discussions, previous issues concerning the abandonment of EP-related equipment and whether the licensee can use the 10 CFR 50.54(q) change process to retire the equipment or will need an amendment to the licensee's emergency plan.
- (7) A licensee planning for decommissioning should include a review of active licensing requests and determine whether to request formal withdrawals of these requests. As a courtesy, following an informal notification by the licensee of its intention to withdraw certain active licensing requests, the project manager should contact the NRC staff and request that it stop work.

- (8) Other recommendations for the NRC staff to consider include:
- a. Develop an inspection procedure (IP) for oversight of aging management of long-lived, passive structures and components (e.g., neutron-absorbing materials, SFP liner) during decommissioning while fuel is in the SFP.
  - b. Develop a regulatory issue summary or some other type of generic communication that defines permissible decommissioning activities for which expenditures can be withdrawn from the DTF.
  - c. Encourage industry to submit a decommissioning Technical Specifications Task Force traveler that removes all MODE-related TSs for permanently shutdown and defueled reactors. Such changes should be applicable to all decommissioning reactors since there will no longer be a MODE at these facilities once they have permanently ceased operation and permanently defueled the reactor vessel. This would save a significant level of effort in the license amendment preparation by the licensee and review hours by the NRC staff.
  - d. Continue to engage the Nuclear Energy Institute (NEI) to develop industry standards for decommissioning topical areas as appropriate.
  - e. Develop a way to capture and characterize the potential risk of DTF shortfalls for reactors that may prematurely cease operation well before their license expiration dates.
  - f. Update NMSS Policy and Procedure 5.1 to reflect any changes made to NRR OI COM-101.
  - g. Revise Inspection Manual Chapter 2561 to reflect new EP and security decommissioning IPs in support of the decommissioning inspection program.
  - h. To the extent possible, consider additional options to complete the decommissioning licensing and rulemaking activities in a more efficient and effective manner, while continuing to ensure that the plants decommission safely.

**APPENDIX TO POWER REACTOR  
TRANSITION FROM OPERATIONS TO  
DECOMMISSIONING LESSONS  
LEARNED REPORT**

**(ML16302A022)**