EPRI Project: Guidance for Transition from Operations to Decommissioning

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Overview

- US Transition Period Regulations
- EPRI Transition Project
- Experiences
Decommissioning Technology Program Membership

- E.On - Germany
- Electrabel - Belgium
- EDF - France
- ENRESA - Spain
- Chubu, TEPCO - Japan
- KHNP - S. Korea
- TaiPower - Taiwan
- Southern California Edison, Pacific Gas and Electric, Dominion, Exelon - US
Current US Decommissioning Transition Period Regulations
Power Reactors Decommissioning Status

Four Sites

Seven Sites

Twelve Sites

Three Sites

SAFSTOR
DECON
ISFSI (Independent Spent Fuel Storage Installation)
License Terminated

Decommissioning Completed

Source: US NRC Website
US Plants in Transition

- **Unplanned Reactor Shutdowns**
  - **Crystal River Unit 3** - Crystal River, Florida (February 2013)
  - **Kewaunee Power Station** - Kewaunee Wisconsin (May 2013)
  - **San Onofre Nuclear Generating Station, Units 2 & 3** - San Clemente, California (June 2013)
  - **Vermont Yankee Nuclear Power Station** - Vernon, Vermont (December 2014)

- **Planned Reactor Shutdown**
  - **Fitzpatrick Nuclear Station** - Oswego, New York (Announced Shutdown for 2017)
  - **Oyster Creek Nuclear Generating Station** - Forked River, New Jersey (Announced Shutdown for 2019)
  - **Pilgrim Nuclear Power Station** - Plymouth, MA (Announced Shutdown for 2019)
US Transition Regulations

- The US does not have a formal period for transitioning from operating to decommissioning, unlike some other countries.
- The decommissioning process in the US is structured around several regulatory submittals, including:
  - Certification of Permanent Cessation of Operations
  - Post Shutdown Decommissioning Activities Report (PSDAR)
  - Site-Specific Decommissioning Cost Estimate
  - Revisions to Plant Licensing Design Basis Documents
    - Defueled Safety Analysis Report
- Submittals have been made by the four sites currently in transition each with multiple exemption requests for
  - Emergency Preparedness (Part 50, Appendix E)
  - Security Plan and Procedures (CFR Part 73)
  - Use of Decommissioning Trust Fund (CFR 50.82)
  - Insurance and Financial Protection (CFR 50.54 an Part 140)
- Submittal of these documents permits utilities to access their decommissioning fund and to begin certain dismantling activities.
Nuclear Regulatory Commission Direction on Decommissioning Rulemaking

- **SRM SECY-14-0066**, Commission directed staff to report its views on the need for an integrated rulemaking for decommissioning.

- **SRM SECY-14-0118**, Commission directed staff to complete rulemaking in 2019.

- **SECY-15-0014**, NRC Staff Responded to both SRMs and provided high-level schedule and resource needs.
Scope of NRC Decommissioning Rulemaking

- The Commission Requested Staff to Address the Following Issues in the Rulemaking, as Discussed in SECY-00-0145:
  - Graded Approach to Emergency Preparedness;
    - Fuel in pool
    - Fuel in Dry Storage
  - Lessons Learned;
  - NRC Approval of Post-Shutdown Decommissioning Activity Report;
  - Maintaining Three Existing Decommissioning Options (i.e., SAFSTOR, DECON, ENTOMB) and Associated Timeframes;
  - Role of State and Local Governments and Non-Governmental Stakeholders;
  - Other Issues Deemed Relevant by Staff.
NRC Milestones Associated with Decommissioning Rulemaking

- **Major Milestones**
  - Advance Notice of Proposed Rulemaking: Request for Comment (published November 2015)
  - Regulatory Basis
  - Proposed Rule/Draft Regulatory Guidance
  - Final Rule/Final Regulatory Guidance (2019)

- **Public Participation**
EPRI Transition Project
Background

- A wide range of key activities are necessary after permanent shutdown of a nuclear power plant before active dismantlement of the plant can begin
  - For example, defueling, management of operational wastes, fulfilling regulatory requirements, staffing plan, changes to plant technical specifications, full-system chemical decontamination, etc.

- In some cases these activities are prescribed by regulation and in others they may be more practically driven or even optional

- Planning for transition should optimally take place prior to final shutdown and execution of some transition period activities, such as filing required regulatory submittals, may be performed prior to plant shutdown

- In the EPRI project, guidance is being developed for transitioning from operational to decommissioning status
Goals of Project / Project Overview

- Compile country-specific transition period regulations
  - Countries will be selected to provide a wide range of regulations (i.e., structured vs. unstructured transition)

- Compile industry transition period operating experience
  - Identify activities that can be performed / planned for before shutdown
  - Identify long-lead activities that should be prioritized
  - Identify cost-saving activities that should be performed early after shutdown

- Provide guidance for the development of a plan to transition from operational to decommissioning status
Motivation for Project

- The cost of decommissioning is highly influenced by overall staffing costs, which is related to the overall length of decommissioning.

It is anticipated that the guidance developed in this work will help shorten the length of the transition period, and thus shorten the overall length and decrease the cost for decommissioning.
Recent transition period experiences from the 11 plant sites outlined in purple will be summarized.

- Oyster Creek experience will also be summarized – Not shutdown, but transition plans have been made.

- Distribution of selected experiences

<table>
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<th>Reactor</th>
<th>Type</th>
<th>Commercial Operation</th>
<th>Shutdown</th>
<th>Years Operational</th>
<th>Status a</th>
<th>Fuel Onsite</th>
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<td>May-72</td>
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<td>Fermi 1</td>
<td>Fast Breeder</td>
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<td>Sep-72</td>
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Decommissioning Completed

- a) ISFSI = Independent spent fuel storage installation, which is a stand-alone facility within the plant constructed for the interim storage of spent nuclear fuel. "ISFSI Only" means the plant license has been reduced to include only the ISFSI.
- b) TMI 2 is in a post-defueling monitored storage (PDMS) state, where the plant is in SAFSTOR but the fuel has been removed.
- c) Some low-level waste is also stored at Rancho Seco in addition to its ISFSI.
US Transition Period Experience

Example – Connecticut Yankee Transition Period Timeline

- Power Operations
- Defueling
- Permanent Shutdown
- Permanent Shutdown Announced To NRC
- Initial Decommissioning Planning/Site Scoping Survey
- Improved Health Physics Program Development
- PSDAR Submitted
- Decommissioning Public Meeting
- Initial Site Characterization and Historical Site Assessment
- Bulk Asbestos Insulation Removal
- DSAR Submitted
- Full System Chemical Decontamination
- Operating License Amended to Reflect Permanent Shutdown
- Fuel Building Upgrades Completed
- Subcontract to Decommissioning Operations Contractor
- Steam Generator/Pressurizer Removals *
- Operating License Amended to Reflect Decommissioning *
- Reactor Pressure Vessel Internal Segmentation Project *
- License Termination Plan Submitted *
- Site Characterization Report Submitted to NRC *

*Work to support activity likely started during transition period
US Transition Period Experience
Example – SONGS Unit 2/3 Transition (2 years) & Decon Period

Timeline

20 Year Plan

- All Systems Retired
- Plant Cold & Dark

DECOMMISSIONING POWER RING
Temporary power ring supplies all equipment for Cold and Dark

SPENT FUEL POOL ISLANDING
Engineering and modification implementation

PERMANENTLY DEFUELED TECHNICAL SPECIFICATIONS
Approved

E-PLAN SUBMITTAL
Submitted

TECHNICAL SPECIFICATIONS IMPLEMENTED

ISFSI PROJECT
Engineering and Procurement

ISFSI Permit Amendment

HISTORICAL SITE ASSESSMENT & SITE CHARACTERIZATION
Submitted

DECOMMISSIONING GENERAL CONTRACTOR

DECOMMISSIONING GENERAL CONTRACTOR

DGC AWARD

SAFSTOR WET

START DECONTAMINATION & DISMANTLEMENT (D&D) 10 years

ISFSI OFFLOAD CAMPAIGN

ALL FUEL IN ISFSI (DRY)

ISFSI PAD EXPANSION

ISFSI CANISTER FABRICATION

MAJOR D&D COMPLETE

COMPLETION OF REMAINING SITE RESTORATION WORK

LICENSE TERMINATION PLAN

FINAL SITE RESTORATION

Harry A. Horlick, Director

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US Transition Period Experience

Example – Exelon Nuclear Mgmt. Model Transition Period Timeline

*Initial Plant Only – Management Model Addition

** PSDAR Submission Tied to Strategy Approvals; PSDAR Does Not Require NRC Approval, DCE (Decommissioning Cost Estimate) for PSDAR plan will be submitted with or shortly after PSDAR submittal. No approval required for DCE.
US Transition Period Experience

Example – List of Decommissioning Transition Activities (1/2)

- Cost Estimating
- Preparation/submittal of Regulatory Submittals
- Systems, Structures and Component (SSCs) Re-Categorization
- Revised Technical Specifications
- Cold and Dark Program (repower certain systems)
- Project Management Model
- Re-design Work Control Process
- Develop Communications Plan
  - Both internal and external
- Human Resources
  - Retention of key staff
  - Labor agreement impacts
  - Relocation of other staff
- Perform Historical Site Assessment and Initial Site Characterization
- Disposal of Operational (Legacy) Wastes
US Transition Period Experience

Example – List of Decommissioning Transition Activities (2/2)

- Fuel Building Modifications to Isolate from Other Plant Systems
- Certified Fuel Handler Program
- Transfer of Spent Fuel to Dry Casks / ISFSI
  - Design of the Dry Fuel Storage System
  - Building and System Modifications to support the Dry Fuel Storage System
  - Fabrication of Dry Fuel Storage Canisters, Storage Cells and Other Related Equipment
  - Design and Construction of the ISFSI
- Dismantling of Non-Nuclear Facilities
- Upgrade Plant /Infrastructure (e.g. rail) to Facilitate Removal of Wastes
- Full System Chemical Decontamination
- Hot Spot Reduction
- Asbestos and Flammable Materials Removal
- Preparation for Post-Transition Decommissioning Activities
  - Major Component Removal Planning
  - Reactor Vessel and Internals Segmentation Planning
  - Balance of plant dismantlement
EPRI Transition Project – Ongoing/Future Work

- Continue to compile transition period operating experience
- Summarize French, German, Spanish, and Swiss transition period regulations
- Evaluate regulations and operating experience to develop guidance for transitioning from operating to decommissioning
- Schedule for completion: Draft report Q1 2016
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