Today’s eLunch Presenters

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Agenda

• Update on Recent/Upcoming Plant Closures
• Overview of Decommissioning Process
• Current Topics in Decommissioning
Overview of Recent and Planned Plant Closures
Decommissioning Basics

- Decommissioning must be completed within 60 years of permanent cessation of operations
- Licensees may choose from three alternative decommissioning strategies:
  - DECON (immediate dismantling)
  - SAFSTOR (deferred dismantling)
    - Facility maintained and monitored in a condition that allows the radioactivity to decay
    - Dismantled and decontaminated at a later date
  - ENTOMB
    - Radioactive contaminants permanently encased on site in structurally sound material
    - Maintained and monitored until the radioactivity decays to a level permitting restricted release of the property
    - To date, no NRC-licensed facilities have requested this option
- A licensee may combine DECON and SAFSTOR based on a range of factors, such as economics, rate of radioactive decay, and availability of disposal sites
## Decommissioned Reactors

<table>
<thead>
<tr>
<th>Reactor</th>
<th>Location</th>
<th>Shutdown</th>
<th>Status</th>
<th>Fuel Onsite?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Rock Point</td>
<td>Charlevoix, MI</td>
<td>08/29/97</td>
<td>ISFSI Only</td>
<td>Yes</td>
</tr>
<tr>
<td>Fort St. Vrain</td>
<td>Platteville, CO</td>
<td>08/18/89</td>
<td>ISFSI Only</td>
<td>Yes</td>
</tr>
<tr>
<td>Haddam Neck</td>
<td>Haddam Neck, CT</td>
<td>12/09/96</td>
<td>ISFSI Only</td>
<td>Yes</td>
</tr>
<tr>
<td>Maine Yankee</td>
<td>Bath, ME</td>
<td>12/06/96</td>
<td>ISFSI Only</td>
<td>Yes</td>
</tr>
<tr>
<td>Pathfinder</td>
<td>Sioux Falls, SD</td>
<td>09/16/67</td>
<td>License Terminated</td>
<td>No</td>
</tr>
<tr>
<td>Rancho Seco</td>
<td>Sacramento, CA</td>
<td>06/07/89</td>
<td>ISFSI Only</td>
<td>Yes</td>
</tr>
<tr>
<td>Saxton</td>
<td>Saxton, PA</td>
<td>05/01/72</td>
<td>License Terminated</td>
<td>No</td>
</tr>
<tr>
<td>Shoreham</td>
<td>Suffolk Co., NY</td>
<td>06/28/89</td>
<td>License Terminated</td>
<td>No</td>
</tr>
<tr>
<td>Trojan</td>
<td>Portland, OR</td>
<td>11/09/92</td>
<td>ISFSI Only</td>
<td>Yes</td>
</tr>
<tr>
<td>Yankee Rowe</td>
<td>Franklin Co., MA</td>
<td>10/01/91</td>
<td>ISFSI Only</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- An independent spent fuel storage installation (ISFSI) is a stand-alone facility within the plant boundary constructed for the interim dry storage of spent nuclear fuel.
- “ISFSI Only” means the plant license has been reduced to include only the spent fuel storage facility.
Completed Decommissioning

Maine Yankee (www.courant.com)

Yankee Rowe – Before and After (www.yankeerowe.com)

Trojan (www.tdn.com)
Reactors Undergoing Decommissioning

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal River – Unit 3</td>
<td>Crystal River, FL</td>
</tr>
<tr>
<td>Dresden – Unit 1</td>
<td>Dresden, IL</td>
</tr>
<tr>
<td>Fermi – Unit 1</td>
<td>Newport, MI</td>
</tr>
<tr>
<td>General Electric Co.</td>
<td>Alameda, CA</td>
</tr>
<tr>
<td>Humboldt Bay</td>
<td>Eureka, CA</td>
</tr>
<tr>
<td>Indian Point – Unit 1</td>
<td>Buchanan, NY</td>
</tr>
<tr>
<td>Kewaunee</td>
<td>Kewaunee, WI</td>
</tr>
<tr>
<td>LaCrosse Boiling Water Reactor</td>
<td>Genoa, WI</td>
</tr>
<tr>
<td>Millstone – Unit 1</td>
<td>Waterford, CT</td>
</tr>
<tr>
<td>Nuclear Ship Savannah</td>
<td>Baltimore, MD</td>
</tr>
<tr>
<td>Peach Bottom – Unit 1</td>
<td>Delta, PA</td>
</tr>
<tr>
<td>San Onofre – Unit 1</td>
<td>San Clemente, CA</td>
</tr>
<tr>
<td>San Onofre – Unit 2</td>
<td>San Clemente, CA</td>
</tr>
<tr>
<td>San Onofre – Unit 3</td>
<td>San Clemente, CA</td>
</tr>
<tr>
<td>Three Mile Island – Unit 2</td>
<td>Middletown, PA</td>
</tr>
<tr>
<td>Vallecitos Boiling Water Reactor</td>
<td>Sunol, CA</td>
</tr>
<tr>
<td>Zion – Units 1 &amp; 2</td>
<td>Zion, IL</td>
</tr>
</tbody>
</table>

Source: [www.nrc.gov](http://www.nrc.gov)
Current and Future Decommissionings

- Reasons for Closure Vary
  - Economics of Single-Unit Plants
  - Market Factors
  - Regulatory Uncertainty
  - Environmental Issues
- More Announcements Possible

- Crystal River
- Kewaunee
- San Onofre 2 and 3
- Vermont Yankee (2014)
- Oyster Creek (2019)
Overview of Decommissioning Process
Prior to Decommissioning (During Operations)

- Licensees must provide assurance that funds will be available to decommission a reactor and site at end of licensed operations
  - NRC “decommissioning” refers only to radiological decommissioning: reduce residual radioactivity to permit site release
- Licensees must demonstrate financial assurance for decommissioning by:
  - **Prepayment**: a deposit by the licensee at the start of operation in a separate account such as a trust fund
  - **Surety, insurance, or parent company guarantee method**: assurance that the cost of decommissioning will be paid by another party should the licensee default
  - **External sinking fund**: separate account outside the licensee’s control to accumulate funds over time: if the licensee can recover the cost of decommissioning through ratemaking or non-bypassable charges
    - **Nuclear Decommissioning Trust (NDT)**
  - **Combination of above methods**
• NRC decommissioning trust funds may be used only if the expenditure is for:
  – Legitimate radiological decommissioning activities as defined in 10 C.F.R. 50.2

• Funds may be maintained in qualified decommissioning trusts for non-NRC decommissioning activities – if collected for those purposes and separately accounted for:
  – Greenfield site restoration, ISFSI decommissioning, and spent fuel management
  – Greenfield expenditures are subject only to requirements of the trusts and/or State regulators (not NRC)
Early Phases of Decommissioning

- Within 30 days of a decision to permanently cease operations, a licensee must submit a certification to the NRC stating the date on which operations have ceased or will cease.
- Once fuel is permanently removed, a licensee must file with the NRC a certification of permanent fuel removal:
  - Specifies the date on which the fuel was removed.
  - License for the plant deemed to no longer authorize operation.
- After certifications: Licensee may submit, and NRC must approve, amendments or exemptions to change or reduce requirements that are no longer necessary:
  - Security
  - Emergency planning
  - Offsite liability insurance
  - Recordkeeping requirements
Intermediate Phase

• Within 2 years of permanent cessation of operations, a licensee must:
  – Submit a Post-Shutdown Decommissioning Activities Report (PSDAR), describing planned decommissioning activities and schedule
  – Submit a Site-Specific Decommissioning Cost Estimate (which may be together with or separate from the PSDAR)
  – Submit a Spent Fuel Management Plan, including funding until the fuel is removed from the site by the Department of Energy

• NRC will notice receipt of the PSDAR in the Federal Register and make the PSDAR available for public comment
  – NRC will hold a public meeting near the licensee’s facility to discuss the PSDAR
  – NRC does not approve the PSDAR

• Initially, NDT may be accessed for up to 3% of the generic decommissioning formula funding amount
  – Used only for “decommissioning planning”
Conduct of Decommissioning Activities

- 90 days after the PSDAR has been received by the NRC, a licensee may (but is not required to) perform major decommissioning activities
  - A “major decommissioning activity” is “any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components for shipment containing greater than class C waste”
  - A licensee may take actions permitted by 10 C.F.R. 50.59, but must notify the NRC before performing any decommissioning activity inconsistent with the actions and schedule described in the PSDAR

- A licensee **may not** perform decommissioning activities that:
  - Foreclose release of the site for unrestricted use;
  - Result in significant environmental impacts not previously reviewed; or
  - Result in there no longer being reasonable assurance that adequate funds will be available for decommissioning
Nuclear Decommissioning Trust Expenditures

• Licensee must submit *annual* report on the status of its trust fund during decommissioning
• 90 days after submitting the PSDAR, up to an additional 20% of the generic decommissioning funding amount may be used for decommissioning
• Once a site-specific decommissioning cost estimate has been submitted to the NRC, licensee may begin using balance of decommissioning funds for authorized radiological decommissioning activities
  – May be before or with PSDAR (bypassing the 23% limit)
• Written notice of intent to make disbursement or payment for non-radiological decommissioning must be given to NRC
  – 30 working days before planned disbursement
NRC Decommissioning Regulatory Timeline (example)

- **Shutdown Decision**
  - SD=0
  - SD + 30 days

- **Notice to NRC**
  - ?

- **Cessation of Operations**
  - T=0
  - T + 2 years
  - T + 60 years

- **Defueling Complete**
  - Certification to NRC of Defueling:
    - License no longer authorizes operation
    - Begin applications to reduce programs/requirements

- **PSDAR**: Preliminary plans + site-specific cost info, including SNF management

- **Site Specific Decom Cost Estimate**: 100% Decom funding available

- **PSDAR**: Preliminary plans + site-specific cost info, including SNF management

- **License Termination Plan**
  - P=0
  - P + 90 days
  - ≥ 2 years

- **Major Decom Activities may begin**
  - 23% formula amount available

- **50.54(bb) Plan for SNF**: management and costs (if early shutdown)

- **Major Decom Activities may begin**
  - 23% formula amount available

- **License Termination Plan**
  - P=0
  - P + 90 days
  - ≥ 2 years

- **License Termination Plan**
  - P=0
  - P + 90 days
  - ≥ 2 years

- **Decom complete/license terminated**
  - T + 60 years

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License Termination Plan

• At least 2 years prior to completion of decommissioning and expected license termination, a licensee must submit an application to terminate the NRC license
  – Application must be accompanied or preceded by a license termination plan (LTP)
  – LTP demonstrates compliance with radiological site release criteria

• LTP includes:
  – Site characterization
  – Identify remaining dismantlement activities
  – Plans for site remediation
  – Detailed plans for a final radiation survey
  – Description of the end use of the site, if restricted
  – Update cost estimate for remaining activities
  – Supplement to environmental report
Final Phase of Decommissioning

- **NRC approves the LTP by license amendment**
  - NRC will notice receipt of the LTP and make it available for public comment.
  - NRC will hold a public meeting near the facility to discuss the LTP
  - There is an opportunity for a public hearing on the LTP

- **NRC conducts inspections during decommissioning**
  - Ensures compliance with applicable requirements and, once approved, the LTP
  - Includes in-process and confirmatory radiological surveys

- When decommissioning complete, licensee submits final radiation survey report

- Until spent fuel is removed from the site, licensees may:
  - Reduce the site to just an ISFSI
  - Reduce the site boundary area
License Termination

• NRC terminates the license if it determines that:
  – Remaining dismantlement was performed in accordance with the approved LTP; and
  – Final radiation survey demonstrates that the site is suitable for release
  – If residual radiation is below 25 millirem/year, site released for unrestricted use

• State release/site restoration criteria may be more rigorous
  – Decommissioning fund allocations must reflect those criteria for non-NRC site restoration
Key Guidance Documents

- NUREG-1757, Volumes 1-3, “Consolidated Decommissioning Guidance”
Hot Topics in Decommissioning
Decommissioning Planning Rule

  – Principal focus on conduct of operations
    • Minimize operational releases
    • Scoping surveys during operation
  – Additional reporting on costs of decommissioning and spent fuel management
    • More detailed decommissioning cost estimate at time of decommissioning
    • ISFSI cost estimates
  – Minor changes to funding/reporting requirements
    • Site-specific cost estimates to include results of operational scoping surveys
    • Eliminate line of credit option (unused by licensees)
    • Eliminate escrow account option (lower assurance than trust)

• Regulatory Guide 4.22, “Decommissioning Planning During Operations” (December 2012)
Prompt Remediation Rulemaking

• Potential Rulemaking to require remediation of residual radioactivity during operations to “avoid complex decommissioning challenges that can lead to legacy sites.” NRC Docket ID NRC-2011-0162

• Federal Register Notice issued a revised Technical Basis, intended to justify rulemaking (78 Fed. Reg. 33008 (June 3, 2013))
  – Draft Technical Basis (DTB) deficient in several areas
  – NEI Comment Letter, August 2, 2013
    • DTB assumes rulemaking, rather than analyzing whether rulemaking is appropriate
    • No clear identification of a problem that requires addressing
    • Failure to address backfit considerations
    • Contrary to joint NRC and industry efforts to avoid adverse cumulative effects
  – In response, Staff recommended 2 years of additional study (SECY-13-0108; October 7, 2013)
  – Commission accepted Staff recommendation (SRM, December 20, 2013)
Minimum Funding Levels

• Staff Findings on the Table of Minimum Amounts Required to Demonstrate Decommissioning Funding Assurance, SECY-13-0066; June 20, 2013
  – 2006 Staff Requirements Memorandum directed the NRC staff to review the minimum funding formula (SRM to SECY-06-0065)
  – NRC Staff reevaluation
    • Pacific Northwest National Lab study
    • Stakeholder comments, including NEI Comments, dated April 26, 2012
      – NEI argued adjustments to the formula were unnecessary in view of the overall decommissioning funding process and industry experience
  • Public Meetings
  – NRC Staff does not recommend changing the minimum formula amounts
    • Formula amount intended only to assure the bulk of the funds are being collected
    • Multiple levels of regulation provide decommissioning funding assurance
    • Overall “robust [NRC] program” for assuring adequate decommissioning funding is available when needed
NRC Revision of NUREG-1307 Review Process

  – Report provides information to be used by licensees to estimate the waste burial factor for use in the minimum decommissioning funding assurance formula
  – During review of a draft Revision 15 numerous errors identified by stakeholders
    • Most significantly was a misallocation of the radioactive waste streams.
    • Draft assumed higher fraction of high-level waste sent to disposal sites than actually expected
  – Numerous meetings and submittals to the NRC by industry
  – NRC substantially revised draft in response to comments
  – Agreement with staff to move toward a more interactive process for development of future revisions of NUREG-1307
  – Next revision anticipated to be in support of 2015 biennial reports
Parent Company Guarantees

• SECY-11-0133, “Options to Evaluate Requests to Use Discounted Parent Company Guarantees to Assure Funding of Decommissioning Costs for Power Reactors,” September 28, 2011

• Parent Company Guarantee coupled with sinking fund
  – NRC precedent and licensee practice, guarantee same amount as needed to fund sinking fund (Net Present Value (NPV))
  – NRC staff proposal would not allow for guarantee contribution to assume earnings, rather would require a guarantee of full funding amount (2/27/12)

• Commission Voting: (1) no prohibition of use of NPV, (2) case-by-case consideration with conditions proposed by NRC staff not supported

• NEI Position, Letter to Chairman, March 30, 2012
  – Reconfirming interpretation that the Commission has not disallowed use of NPV, and would be permitted with proper conditions that provide reasonable decommissioning funding assurance

• No Additional Commission Activity
Licensee Biennial Reports

• NRC Findings (SECY-13-0105; October 2, 2013)
  – 13.1% increase in total funds accumulated ($45.7 billion) over 2 years
  – 100/104 power reactors provided adequate decommissioning funding assurance as of December 31, 2012
    • All four of the facilities requiring additional funding assurance demonstrated adequate funding assurance by June 2013 (earnings and/or parent company guarantees)
    • Remaining issue with one plant, from 2011, also resolved
    • Licensee submittal quality improved, fewer RAI’s

• Formal Closure of Reviews Pending
Markey Letter to Chairman Macfarlane (May 6, 2013)

- Focus on decommissioning funding adequacy
  - “[A]pproximately 70% of NRC licensees are not required to have all of the funds needed for decommissioning their plant today.”
  - Asserting increases in decommissioning costs
  - Takes issue with formula amount
  - Possible review of investments

NRC Response Pending
Enforcement Examples

• Non-cited violation for underreporting the total value of securities held in a decommissioning trust fund (Crystal River, March 14, 2011)
  – Apparent Violations – Closed without enforcement (River Bend, March 11, 2011)
  – Contracts for funding (not relied on by Entergy for NRC funding assurance) not referenced in biennial report

• NRC Issued “Choice Letter” regarding specific Exelon decommissioning filings – January 31, 2013
  – Involved certain Exelon biennial filings
    • OI report had questioned method of presentation of satisfying decommissioning funding assurance in biennial reports
    • NO questions regarding funding adequacy
  – Enforcement conference held in early 2013
  – Resolution still pending
• Trust Fund Allocation
  – NRC allows licensees to comingle in a Trust Fund money to be used for different purposes (NRC and non-NRC purposes)
    • NRC recognizes easier to manage investments
    • NRC does not distinguish between IRS 468A qualified and non-qualified trust funds
  – However, the NRC expects licensees to be able to “account for” for funds to be used for different purposes to permit NRC ability to confirm reasonable assurance of decommissioning funding
    • NRC decommissioning (radiological; more narrow than IRS 468A definition)
    • NRC spent fuel management
    • NRC ISFSI decommissioning
    • Non-NRC decommissioning, greenfield
  – Recent post-shutdown experience suggests potential need for licensees to be more precise in “accounting for” different purposes
    • Potential need for exemptions to define the allocations before expenditures
    • Suggests operating reactors should re-evaluate their ability to account for the different funding purposes
Small Modular Reactors

• SECY-11-0181, “Decommissioning Funding For Small Modular Reactors,” December 22, 2011
  – Near Term: Allow SMRs to deviate from existing regulations through exemption requests
    • No cost estimates in current rule
    • Reduced size, footprint, accessibility, single module cost, funding schedules for multiple modules
  – Long Term: Rulemaking
IRS Developments

- No Recent Activity Related to IRS 468A Regulations
- IRS Private Letter Rulings – 2013
  - Thirteen PLRs in 2013
    - Restructuring (continued qualification, non-recognition of gain/loss) (5)
    - Revised ruling amounts (license renewal, anticipated license renewal (change in PUC allowance), revised cost estimates, post-shutdown planning) (8)
Questions?
Thank You.
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