Analysis of Subsequent License Renewal for Nuclear Power Plants

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**BACKGROUND**

**US NUCLEAR POWER PLANTS**
- Initially Licensed for 40 years
- License Renewal (LR) for up to an additional 20 years
- Most plants have been approved for LR
- In 2016, ~20 plants have entered operations of greater than 40 years

**SUBSEQUENT LICENSE RENEWAL (SLR)**
- Operations beyond 60 years
- 2 Sites have informed the NRC of their intent to pursue SLR
  - Peach Bottom (Exelon); Surry (Dominion)

**Company Confidential**

- Atomic Energy Act established the original 40-year term based on economic and antitrust considerations, not technical limitations

- All plants will not automatically apply for SLR
- Some plants that apply for SLR may not be approved for an additional 20 years
- There is no regulatory limit on how many 20 year SLR extensions a plant can apply or be approved
• What we intend to accomplish
  – Derive a long-term operations qualitative vulnerability measure (QVM) to be utilized as an input to NEMS
  – Identify/define timing and duration for the application of a QVM and CapAdd in NEMS

• Key Deliverables
  – SLR Library
  – Identify and provide a vulnerability measure for each reactor to be applied in NEMS
  – SLR Manual (include all supporting documentation and materials)
• Review of nuclear industry information on LR, SLR, Aging Management
  - NRC, NEI, EPRI, National Labs
• Identify major technical, regulatory, and cost issues related to SLR
• Research issues for each plant or type/vintage of plant
• Rate applicable issue on likelihood to impact SLR
• Assign an overall SLR risk to each plant
1. Reactor Pressure Vessel **Condition** *
   a) Embrittlement of the reactor pressure vessel at high fluence
   b) Pressurized Thermal Shock (PTS) (PWRs only)
   c) Vessel welds

2. Irradiation-assisted stress corrosion cracking (SCC) of reactor internals and primary system*

3. Electrical Cables*
   a) Qualification
   b) Condition assessment

4. Possible concrete and containment degradation*
   a) Long-term radiation and high temperature exposure

5. Buried tanks and piping

6. Miscellaneous Items
   a) Recent Extended Power Uprate (EPU)
   b) Recent major equipment upgrades
   c) Regulated vs. merchant
   d) Rated power
   e) Multi-unit site

*Note: These are the major technical issues identified by the NRC. EIA does not evaluate or determine the operational safety of nuclear power plants.
What issues do the utilities see as critical to SLR success?
Reactor Pressure Vessel Fluence

Select W 73.6 EFPY 1T Fluence Values (PWRs)

- Westinghouse
- CE
- B&W

Power Plant Design

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• Fluence varies by plant design
• High fluence plants may have more issues with vessel embrittlement, PTS, and SCC.
• Increase to SLR Risk if the vessel may not last an extra 20 years
• Even with a higher risk, there may be viable solutions for plants with high fluence issues
  • Increased inspections, alternative PTS methods, fuel management changes, conditional NRC approval