NON-PROPRIETARY

NuScale Refueling Process

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Introduction

- Goals of Presentation
  - Provide an overview of the refueling process
  - Cover unique aspects of refueling the NuScale Nuclear Power Module
  - Communicate recognized challenges and allow for early dialog
- Caveats
  - The drawings that have been provided are illustrative
  - Details of the process are subject to change pending completion of detailed design

Reactor and Refueling Pool

Building Layout

4a,b

Reactor Shutdown and Long Term Cooling Alignment

- Module shut down and tripped
- Primary system is borated
- Cooled using steam generators
- Containment flooded
- Decay Heat Removal System placed in-service
- [ ] 4a,b

[ ] 4a,b

Module Access and Rigging

- Shield covers are removed
- Module attached to crane
- No disassembly occurs until the module is secured
- Working platforms put in place

4a,b

Module Disassembly and Instrumentation

- Shielding hung as necessary
- [ ] 4a,b
- Piping disconnected and capped

[ ] 4a,b

Disconnections and Verification

- Module is designed to support transfer
- The design of disconnects will include evaluation of
  - Ease of operation
  - Durability
  - EEQ considerations
- Trunion cap designs will allow local removal by plant personnel
- Verification of disconnection

Module Transfer

4a,b

Containment Disassembly

- Containment flange disassembled
- Reactor and upper section of Containment moved to Reactor flange stand

4a,b

Reactor Disassembly

- Reactor flange is opened
- Reactor moved into refueling position
- Control rods are moved with fuel
- In Mast sipping
- Upper Containment and Reactor are moved to test pit

4a,b

Module Testing and Steam Generator Access

- Testing access will be a focus of design
- The test pit will be equipped to support all valve, instrument and penetration testing

4a,b

Vessel Closure

- Both flanges are closed in the stands that were used to disassemble the vessels
- Verification and testing of the restored flanges will occur in the refueling pool

4a,b

Module Restoration

- Restoration is the reverse of the disassembly process
- Crane stays attached until all connections are restored
- Containment remains flooded until steam generators are in-service

4a,b

Spent Fuel Pool Design

4a,b

Safety Advantages of NuScale Refueling System

- Very robust Decay Heat Removal system
- Dedicated Refueling Crew – part of plant staff
- Dedicated Refueling Location – Equipment pre-staged
- Potential to use spare module and associated reduction in schedule pressure
- Improved contamination control

Conclusions

- The NuScale refueling process is unique
- NuScale has reviewed the refueling plan to ensure that challenges presented by the process are considered in the design and future validation
- Overall this refueling plan will improve both safety and performance over existing facilities

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