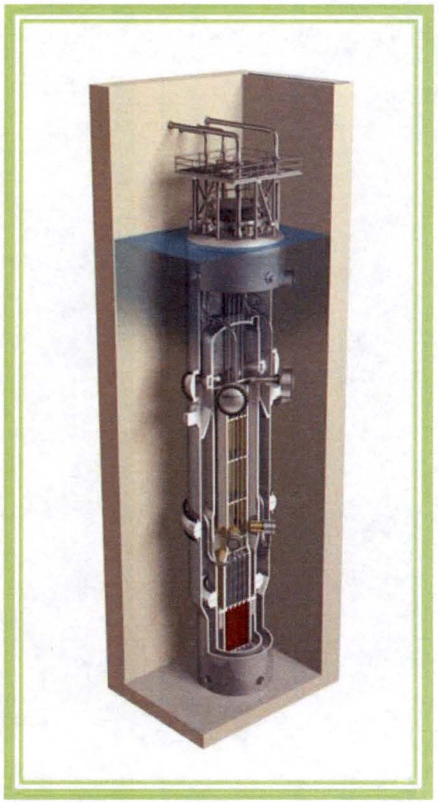
Enclosure 1:

"NuScale Integral Jet Impingement Shields and Pipe Whip Restraint (ISR) and Containment Evacuation System Design," PM-0716-50196-NP, Revision 0, nonproprietary version

NuScale Integral Jet Impingement Shields and Pipe Whip Restraint (ISR) and Containment Evacuation System (CES) Design



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Purpose and Agenda

Purpose: Provide NuScale's approach to the design and qualification of the integral jet impingement shields and pipe whip restraints (ISR). Provide design overview and describe the leak detection capabilities associated with the containment evacuation system (CES)

Agenda:

- Introductions and purpose of the meeting
- Overview of NuScale ASME III piping
- ISR design attributes
- ISR Maintenance and inspections
- ISR Analysis overview
- CES design

RXM Piping Layout

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RXM Piping Layout

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RXM Piping Layout

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CVCS Layout

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CVCS Layout

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FW Layout

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}}2(a),(c)

DHR Layout

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DHR Layout

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MS Layout

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Potential ISR Locations

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ISR Design Drawings

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ISR Design Drawings

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ISR Design Attributes

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Maintenance and Inspections

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Analysis

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Containment Evacuation System

Reactor Module

- Reactor pressure vessel (RPV) and containment vessel (CNV) form the reactor module (RXM) {{
- Reactor pressure vessel (RPV) has no physical thermal insulation
- Heat transfer from RPV to CNV is mitigated by maintaining the CNV atmosphere at a vacuum to reduce convective and conductive heat transfer

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Principal Functions of CES

- Create and maintain a vacuum in the containment vessel (CNV)
- Remove and transfer water vapor from the CNV
- Remove and transfer non-condensable gases from the CNV
- Provide leak detection capability by quantifying removed water
- Monitor removed liquids and gases for radioactivity

Simplified P&ID

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Design Codes

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Quality Group / Seismic Category

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Connection to RXM

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Location within Reactor Building

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SmartPlant View of Platform

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SmartPlant View of CES

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System Operation - CNV Drain

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System Operation – CNV Drain

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System Operation – Normal Operation

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System Operation – Normal Operation

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CES Operation Parameters

- Target operating pressure: {{ }}2(a),(c),ECI
  - calculated based on an assumed normal leakage

- Maximum target operating pressure:
  {{ }}2(a),(c),ECI
  - vapor pressure of water at 100 °F

- Containment isolation pressure (ESFAS):
  {{ }}2(a),(c),ECI
  - technical specification limit for CNV pressure is less than ESFAS setpoint

CES Vacuum Pumps

- Vacuum pump type: {{ }}2(a),(c),ECI
- Pump capacity: {{ }}2(a),(c),ECI
- Effective pump capacity: {{ }}2(a),(c),ECI
- Resistant to corrosive environments
- Design temperature: {{ }}2(a),(c),ECI
- Minimum maintenance interval: {{ }}2(a),(c),ECI

CES Condenser

- Shell and tube condenser
- Shell side drains to sample vessel

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CES Sample Vessel

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Leak Detection

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- Capacity exceeds leak detection criteria of Regulatory Guide 1.45:
  - 0.05 gpm unidentified leakage
  - Response time of < 1hr for a 1 gpm leak

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Leak Detection – CNV Pressure

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Leak Detection – Sample Vessel

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Leak Detection – Leak Before Break

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- For piping systems demonstrating LBB, sudden catastrophic failure of the pipe is not credible and dynamic effects of pipe ruptures can be excluded

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Critical Controls and Setpoints

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Critical Controls and Setpoints

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System Operation - High Radiation

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