February 14, 2023 Docket No. 52-050

U.S. Nuclear Regulatory Commission
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SUBJECT: NuScale Power, LLC Submittal of Presentation Materials Entitled "US460 Design and SDAA Overview Update," PM-135236, Revision 0 (Open Session)

The purpose of this submittal is to provide presentation materials to the NRC for use during the upcoming Advisory Committee on Reactor Safeguards (ACRS) NuScale Subcommittee Meeting on February 15, 2023. The materials support NuScale's presentation of the US460 design and overview of the NuScale Standard Design Approval Application.

The enclosure to this letter is the nonproprietary version of the presentation entitled "US460 Design and SDAA Overview Update (Open Session)."

This letter makes no regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions, please contact Thomas Griffith at 541-452-7813 or tgriffith@nuscalepower.com.

Sincerely,

Mark W. Shaver
Acting Director, Regulatory Affairs
NuScale Power, LLC

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Enclosure: "US460 Design and SDAA Overview Update," PM-135236, Revision 0 (Open Session)

Enclosure:

“US460 Design and SDAA Overview Update ,” PM-135236, Revision 0 (Open Session)

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US460 Design and SDAA Overview Update

ACRS Presentation (Open Session)

February 15th, 2023

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Acknowledgement and Disclaimer

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Agenda – Open Portion

- SDAA Content
- US460 Design Overview
- Topical and Technical reports

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Why we are here and how did we get here?

- The SDA submittal is an engineering optimization of the NuScale DCA to allow for better customer use and deployment. The SDA maintains the approved technical and licensing basis from the DCA while maintaining the overall safety and risk profile.

High Level Design Changes

- Redesigned site layout to accommodate a 6 NPM configuration
- NPM optimized for increased power output; ease of maintenance, manufacturing and operation while maintaining safety margins:
  - Steam generator was over designed for 160MWth application (DCA) and allows for increased power output while maintaining design limits
  - Additional testing has been performed to validate performance of NPM engineered safety features at an increased power level
  - Additional engineered safety features added to eliminate certain events and simplify Chapter 15 analysis
- Current evaluation of SDA design changes does not significantly alter the DCA PRA risk insights.

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Standard Design Approval (SDA) Application Content

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SDA Application Content

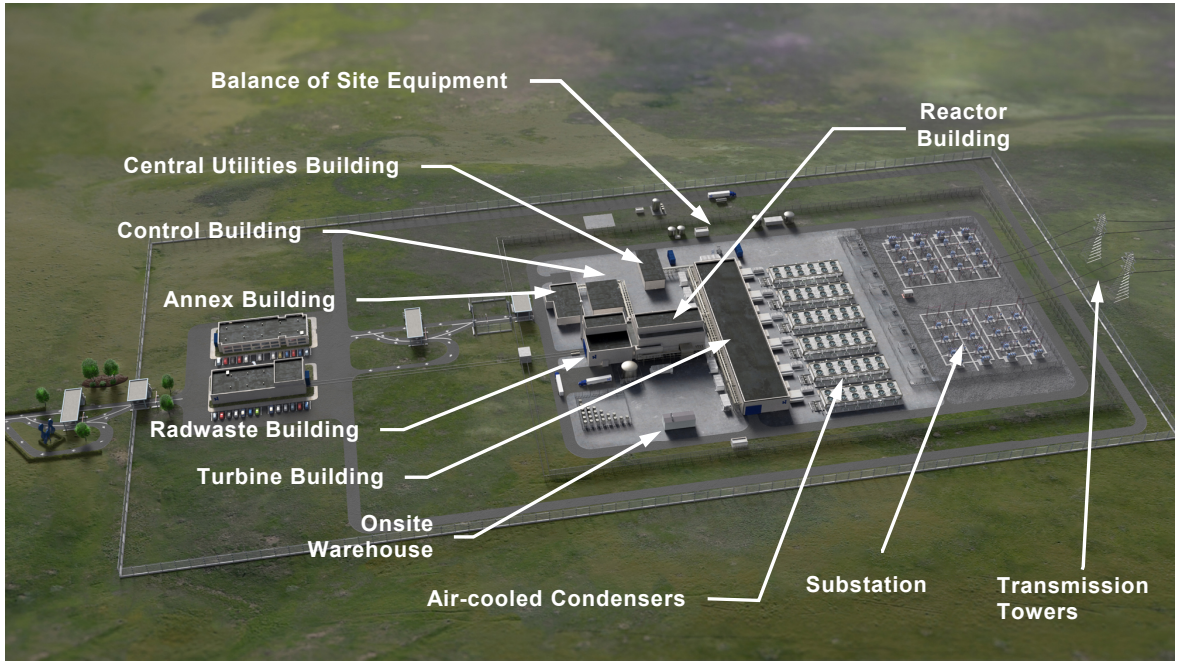
APPLICATION PART	DESIGN CERTIFICATION (10 CFR 52 subpart B)	SDAA – Required by Regulation (10 CFR 52 subpart E)	SDAA – Needed to Support COL	Include as Part of SDAA Submittal
Transmittal Letter	Yes	Yes	N/A	Yes
Part 1: General and Financial Information	(financial info. Not required)	(financial info. Not required)	N/A	Yes
Part 2: Safety Analysis Report – Tier 1	Yes	No	No	No
• Ch. 1 – Introduction	Yes	No	No	No
• Ch. 2 – Unit Specific SSCs Design Descriptions and ITAAC	Yes	No	ITAAC Only	ITAAC Only (see Part 08)
• Ch. 3 – Shared SSCs and Non-SSCs Design Descriptions and ITAAC	Yes	No	ITAAC Only	ITAAC Only (see Part 08)
• Ch. 4 – Interface Requirements	Yes	No	No	No
• Ch. 5 – Site Parameters	Yes	No	No	No (in FSAR Ch. 2)
Part 2: Safety Analysis Report – Tier 2	Yes	Yes	Yes	Yes
Part 3: Environmental Report	Yes	No	No	No
Part 4: Technical Specifications	Yes	No	Yes	Yes
Part 5: Emergency Plans	Optional (Limited Scope) Not in NuScale DCA	No	No	No
Part 6: Security Plans	Optional (Limited Scope) Not in NuScale DCA	No	No	No
Part 7: Exemptions, Departures, and Variances	Yes, if Applicable	Yes, if Applicable	N/A	Yes – Exemptions
Part 8: License Conditions; Inspections, Tests, Analyses and Acceptance Criteria	Yes, (ITAAC only) NuScale DCA references Part 2 Tier 1	No	Yes (only ITAAC)	Yes (only ITAAC)
Part 9: Withheld Information	Yes, NuScale DCA provides list of tables and figures	Yes	N/A	Yes
Part 10: Quality Assurance Program Description	Yes, NuScale DCA references separate topical report	Yes	Yes	Yes
Part 11: Supplemental Information (e.g., Limited Work Authorization)	Yes, if applicable None for NuScale DCA	No	No	No

Gold – differences from DCA Green – Included for COLA

US460 Design Changes

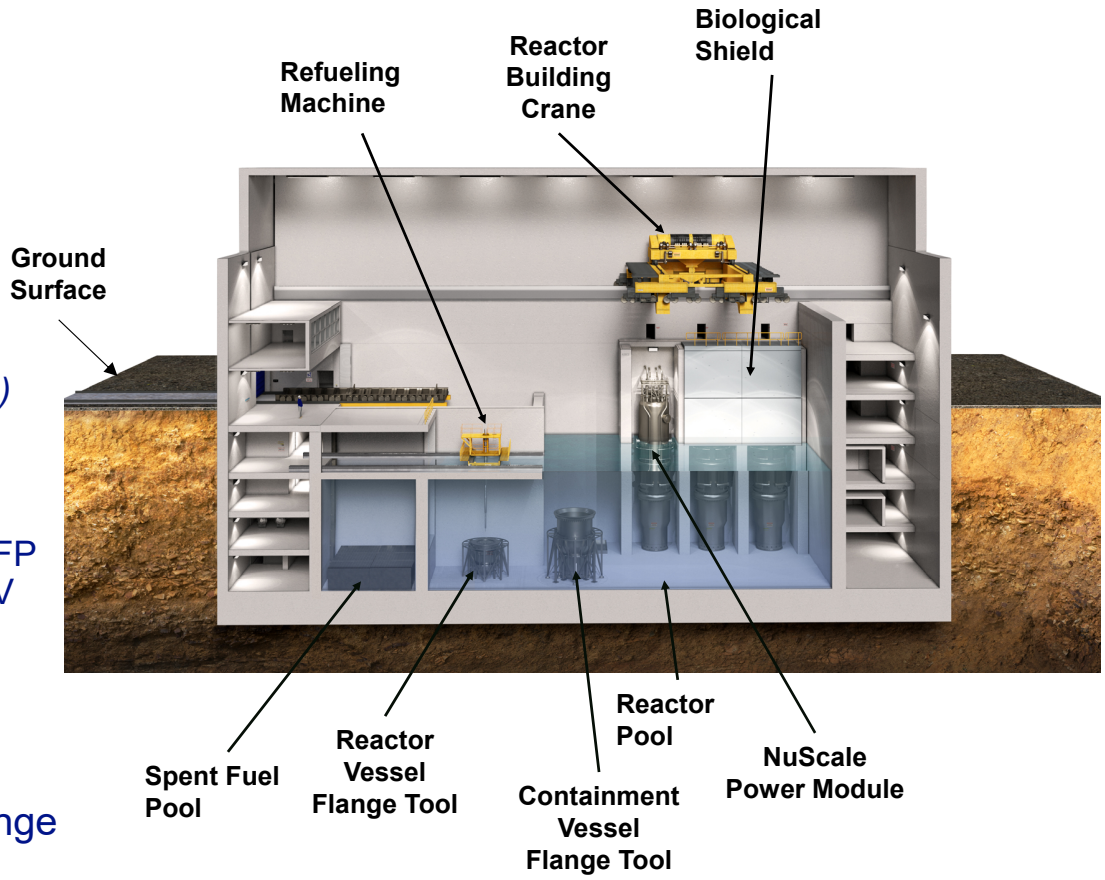
Site Design Changes

- Reduced footprint
- Dry cooling via air-cooled condensers
- Single (1x6) turbine building
  - Rather than two (2x3)
- Conforming site layout changes

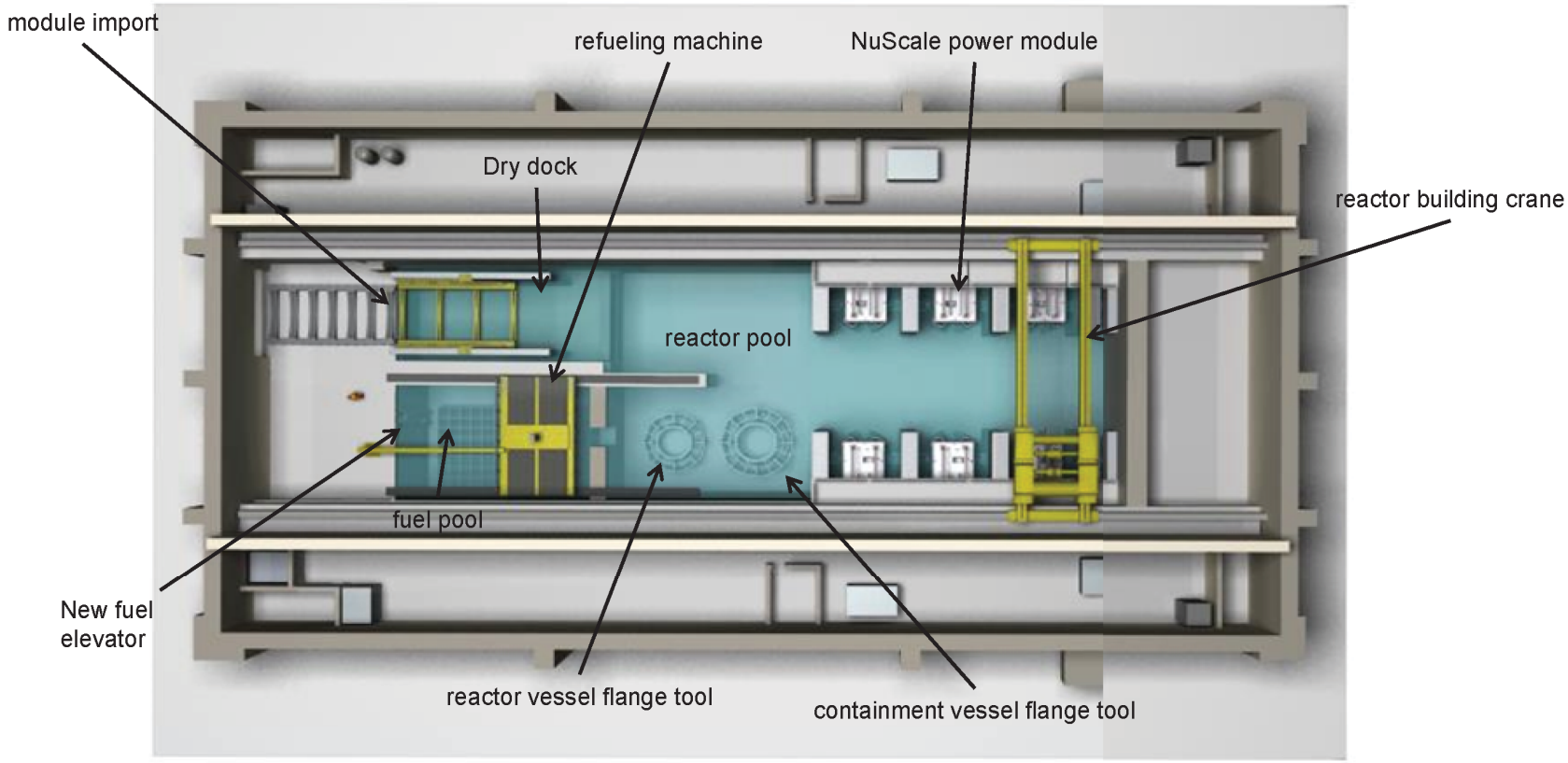


RXB Design Changes

- Six modules
  - 2x3 configuration
- Reclassify seismic class of RXB
  - Some floor and roof slabs are SC-II
- Steel plate composite walls *(from reinforced concrete)*
  - Supported by the BDAM LTR
- Lower Pool Level
  - Improves long term cooling, while still maintaining SFP and ECCS coverage. Allows room to re-arrange CNV penetrations.
- Reduction in sizes and quantities of SSC in RXB
- Conforming changes – i.e., RBC, Bioshield
- COL Items for spent fuel storage racks, reactor flange tool.

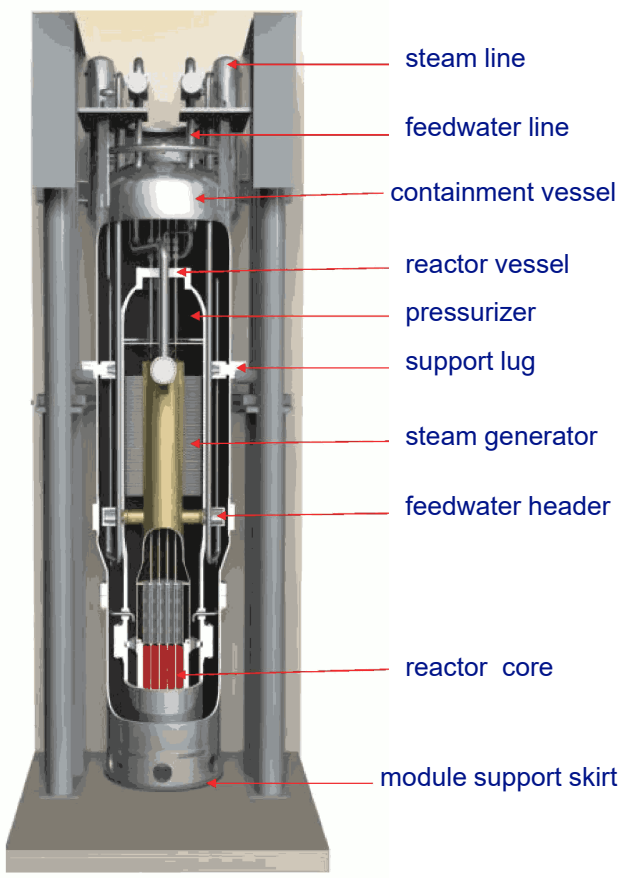


Reactor Building Overhead View



NPM Design Changes

- Increased Power Level *(250MW$_{th}$ from 160MW$_{th}$)*
  - Includes conforming changes (e.g., pressures, temperatures)
  - Safety-related and risk significant
  - Re-performing safety analyses in SDAA
- Lower RPV material change from SA-508 low alloy SS to FXM-19 austenitic SS
  - No expected radiation embrittlement, allows removal of the RPV surveillance program
- Upper CNV Material change from SA-508 low alloy SS to F6NM martensitic SS
  - Stronger material allows for higher design pressure with reduced wall thickness and no need for cladding



Module Protection System Setpoints for Design Basis Events

Setpoints with Changes	DCA	SDAA
High Power (% RTP) [for ≥15% RTP]	120	115
High RCS Hot Temperature (°F)	610	620
High RCS Average Temperature (°F)	N/A	555
High Pressurizer Pressure (psia)	2000	2100
Low Pressurizer Pressure (psia)	1720	1850
Low Low Pressurizer Pressure (psia)	1600	1200
Low Low Pressurizer Level (%)	20	15
High Main Steam Pressure (psia)	800	1200
Low RCS Flow (ft^3/sec)	1.7	1.0
High CNV Water Level (inches)	240 – 264	N/A
Low RCS Pressure (psia)	800	N/A
Low RPV Riser Level (inches)	N/A	540 – 552
Low Low RPV Riser Level (inches)	N/A	460 – 472

Setpoints without Changes	
High Power (% RTP) [for <15% RTP]	25
Source and Intermediate Range Log Power Rate (decades per min)	3
High Power Rate (±% RTP per min)	15
High Source Range Count Rate (counts per sec)	5.0E+05
High Subcritical Multiplication	3.2
High Containment Pressure (psia)	9.5
High Pressurizer Level (%)	80
Low Pressurizer Level (%)	35
Low Low Main Steam Pressure (psia)*	20
Low Main Steam Pressure (psia)*	300
High Main Steam Superheat (°F)	150
Low Main Steam Superheat (°F)	0
Low Low RCS Flow (ft^3/sec)	0
Low AC Voltage (seconds)	60
High Under-the-Bioshield Temperature (°F)	250

*In SDAA, the setpoint bypass is changed from RTP=15% to T_{hot}=500 °F

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Topical Reports

SDAA Topical Reports

- Approved Topical Reports
  - Nuclear Analysis Codes and Methods (NACM)
  - Highly Integrated Protection System (HIPS) Platform
  - Accident Source Term (AST)
  - Risk Significance Determination
  - Control Room Staffing
  - Soil-Structure-Fluid Interaction
  - Building Design and Analysis Methodology (BDAM)
  - Framatome Fuel Methodologies Applicability
  - Evaluation Model for Stability Analyses
- Under NRC review
  - Critical Heat Flux (CHF)
  - Statistical Subchannel Analysis Methodology
  - Rod-Ejection Analysis (REA)
- Acceptance Review ongoing
  - Quality Assurance Program Description (QAPD)
  - LOCA Analysis Methodology
  - Non-LOCA Analyses Methodology
  - Density Wave Oscillation (DWO)
  - Extended Passive Cooling and Reactivity Control

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Technical Reports

SDAA Technical Reports (by Chapter)

- Pipe Rupture Hazards (3)
- Containment Vessel Ultimate Pressure Integrity (3)
- US460 NPM Seismic Analysis (3)
- NuScale CVAP Analysis (3)
- NuScale CVAP Measurement and Inspection Plan (3)
- NPM Short-Term Transient Analysis (3)
- NuFuel-HTP2™ Fuel and CRA Designs (4)
- Use of Austenitic Stainless Steel for NPM Lower Reactor Pressure Vessel (5)
- Pressure and Temperature Limits Methodology (5)
- Fluence Calculation Methodology and Results (5)
- Containment Leakage Integrity Assurance (6)
- Instrument Setpoint Methodology (7)
- Effluent Release (GALE Replacement) Methodology and results (11)
- NuScale Design of Physical Security System (13)
- Treatment of DC Power in Safety Analyses (15)
- US460 SDAA Technical Specification Development (16)
- Human Factor Engineering and Concept of Operations (18) – 10 Technical Reports

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