

October 18, 2022

Docket No. 99902078

U.S. Nuclear Regulatory Commission  
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**SUBJECT:** NuScale Power, LLC Submittal of Presentation Materials Entitled “SDAA Pre-Application Presentation: Overview of NuScale’s Air Cooled Condenser Design,” PM-127144, Revision 0

The NRC technical staff requested a meeting with NuScale Power, LLC (NuScale) on October 25, 2022, to discuss the use of air cooled condensers in the SDAA design.

NuScale’s presentation materials for the meeting, “SDAA Pre-Application Presentation: Overview of NuScale’s Air Cooled Condenser Design,” are enclosed with this letter.

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

If you have any questions, please contact Liz English at 541-452-7333 or at [eenglish@nuscalepower.com](mailto:eenglish@nuscalepower.com).

Sincerely,



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Manager, Licensing  
NuScale Power, LLC

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Enclosure 1: “SDAA Pre-Application Presentation: Overview of NuScale’s Air Cooled Condenser Design,” PM-127144, Revision 0

**Enclosure 1:**

“SDAA Pre-Application Presentation: Overview of NuScale’s Air Cooled Condenser Design,”  
PM-127144, Revision 0

NuScale Nonproprietary



# SDAA Pre-Application Presentation

October 25, 2022

## Overview of NuScale's Air Cooled Condenser Design

Samuel D'Amico, Licensing Engineer

Barry Reichelderfer, Supervisor, Mechanical Systems

Austin Cocke, Mechanical Engineer

Open Session

## Acknowledgement and Disclaimer

This material is based upon work supported by the Department of Energy under Award Number DE-NE0008928.

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## Agenda

- Meeting Purpose and Objective
- Overview of design
- Regulatory compliance
- Summary

## Purpose

- Provide design information on the Air Cooled Condenser System (ACCS) and Condenser Air Removal System (CARS), a subsystem of the ACCS.
- Provide safety information on the ACCS and CARS.

## Objective

- The NRC gains a better understanding of the ACCS design prior to SDAA submittal to facilitate a smoother review process.

## ACCS and CARS are not Safety-Related Systems

- The ACCS and CARS serve no safety-related functions, are not risk significant, are not credited for mitigation of a design basis accident (DBA), and have no safe shutdown functions.
- Quality Group D and Seismic Category III.
- The CARS subsystem has a nonsafety-related with augmented requirements (NSAR) function to provide post-accident instrumentation to monitor variables such as radioactivity monitoring.

# Overview of ACCS Design



## Why use Air Cooled Condensers?

- Water is becoming a scarce/expensive resource
- Some customers will not have water access
- ACCS in SDAA establishes a baseline moving forward

## NuScale's Decision to Choose ACCs

- Secondary systems are nonsafety-related, not risk-significant
- Extensive vendor engagement with multiple vendors
  - Given operating conditions, they provided efficiency and backpressure information to inform turbine generator design.
- Not a significant cost difference between wet and dry cooling

## NuScale's Decision to Choose ACCs

- ACCs are a proven technology
  - One vendor has over 35 plants worldwide with combined generation of over 12GW (over 5GW in the United States)



<https://spgdrycooling.com/references/>

## NuScale's Decision to Choose ACCs

- Introduced to and engaged with the ACC Users Group

“Established in 2009 to foster collaboration among owner/operators of power plants with air-cooled condensers.”

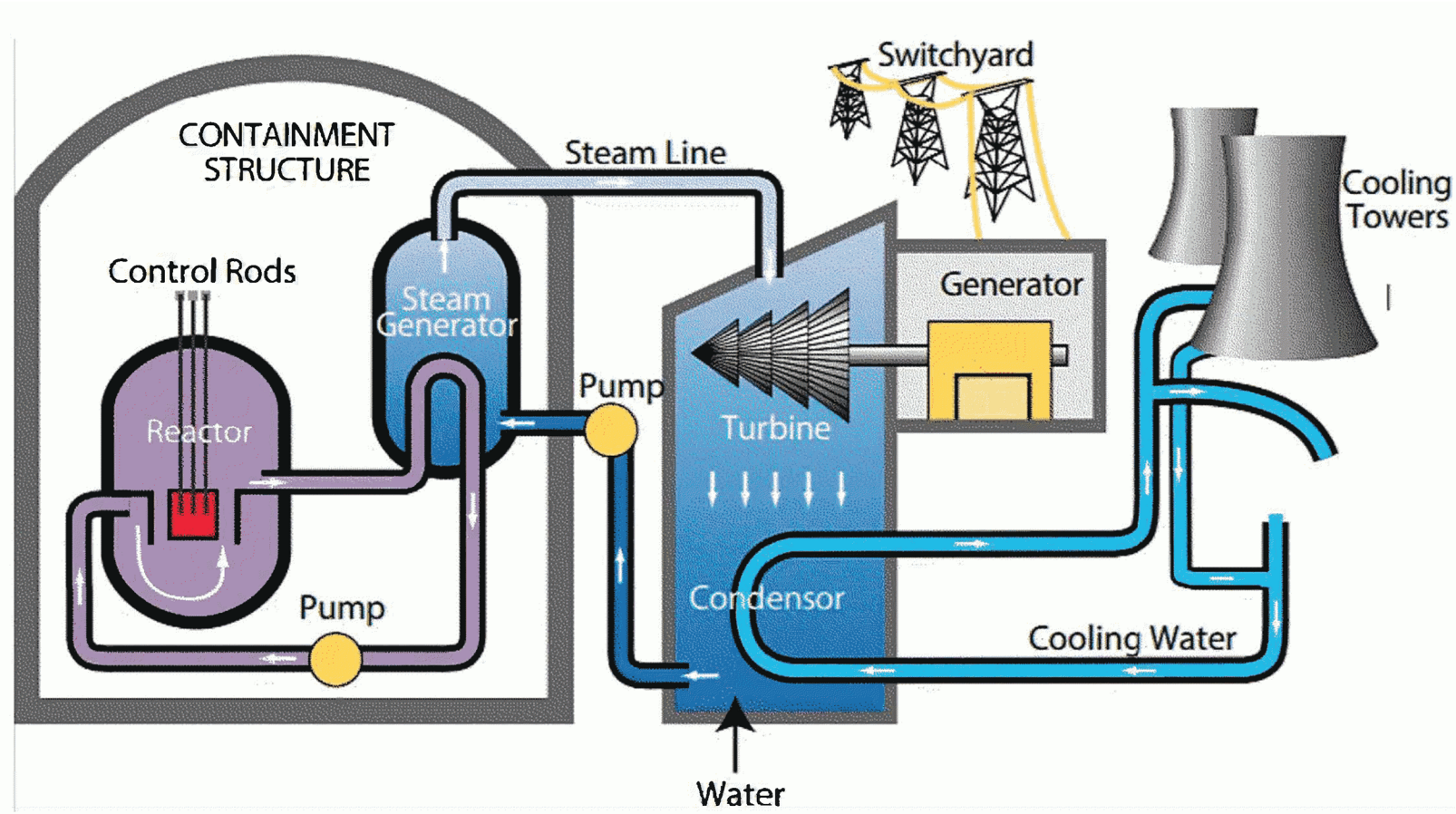
“The electric power industry’s only user group dedicated to resolving issues with air-cooled condensers. User participants include water chemists and O&M personnel at steam plants, combined-cycle facilities, and other types of generating stations relying on dry cooling.”

## Air Cooled Condenser System

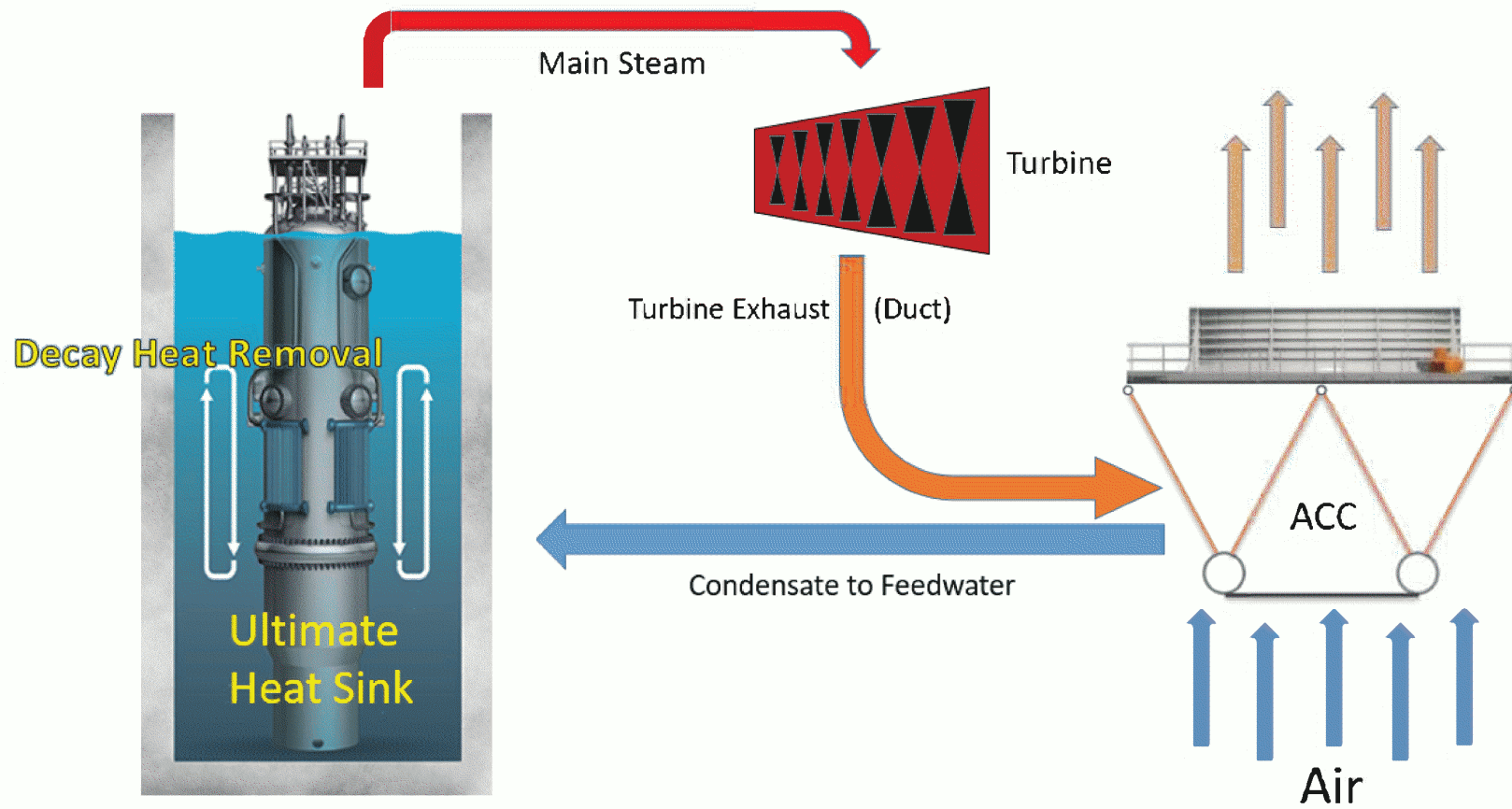
The principal functions of the ACC system are:

- Condense exhaust steam from the turbine exhaust
- Reduce dissolved oxygen (DO) level in the feedwater
- Maintain ACC vacuum condition by removing air and noncondensibles from the main condenser
- Provide adequate capacity for condensate and feedwater system (FWS) during normal operation

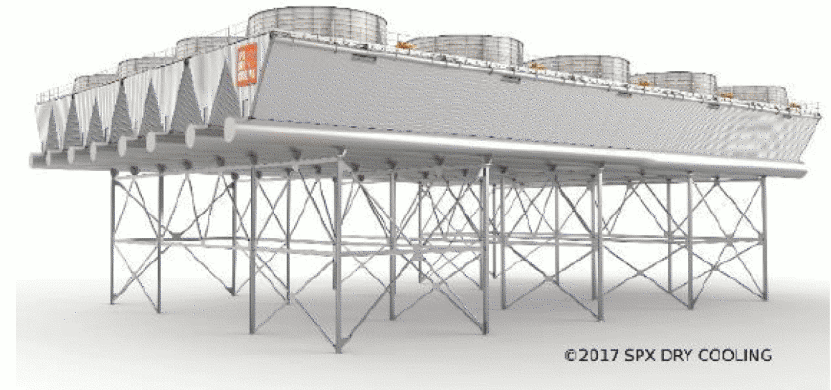
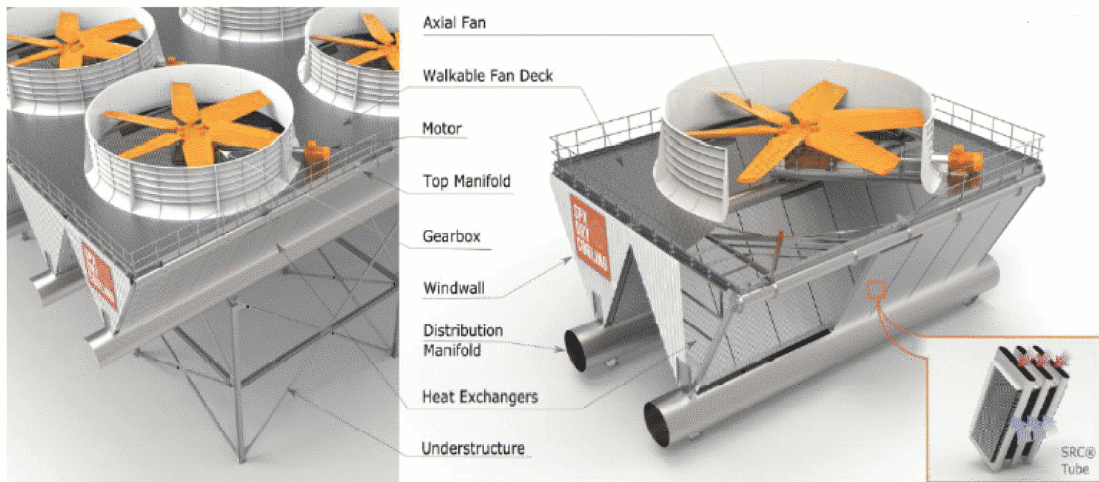
# Primary, Secondary, and Tertiary Loop Coolant Systems



# Primary, Secondary, and Tertiary Loop Coolant Systems



# Air Cooled Condensers System based on W-style design from SPG Dry Cooling USA, LLC

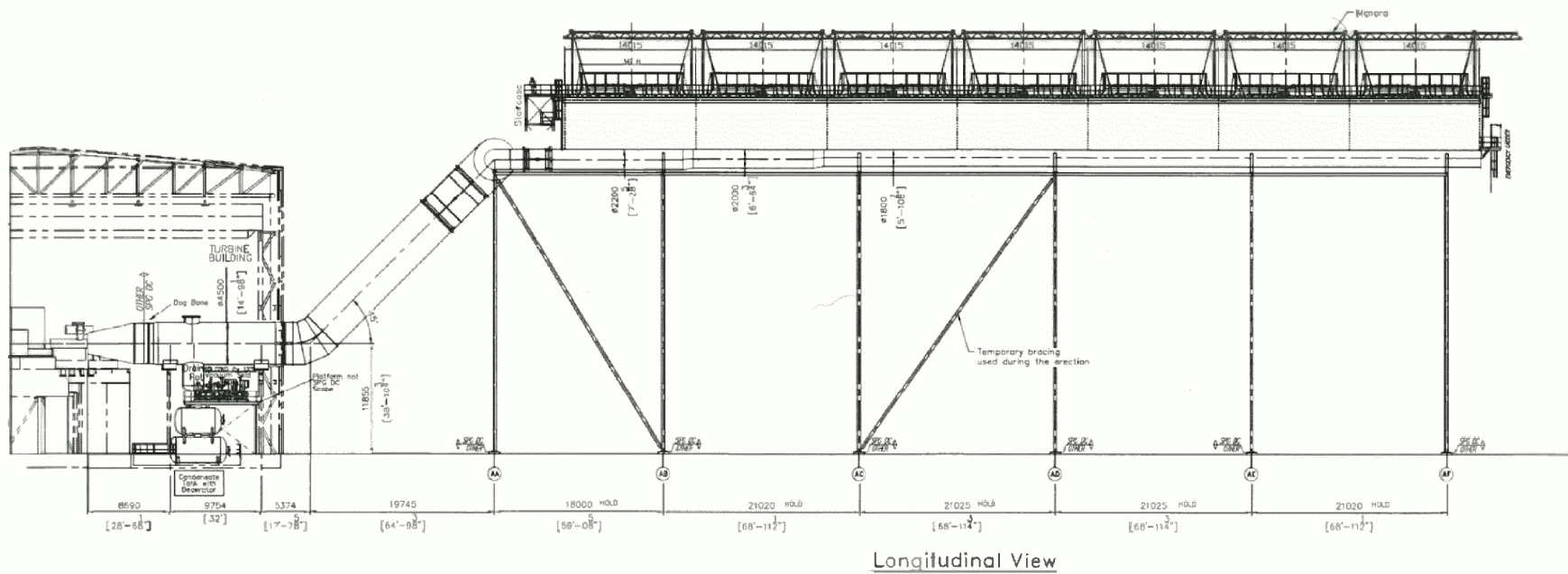


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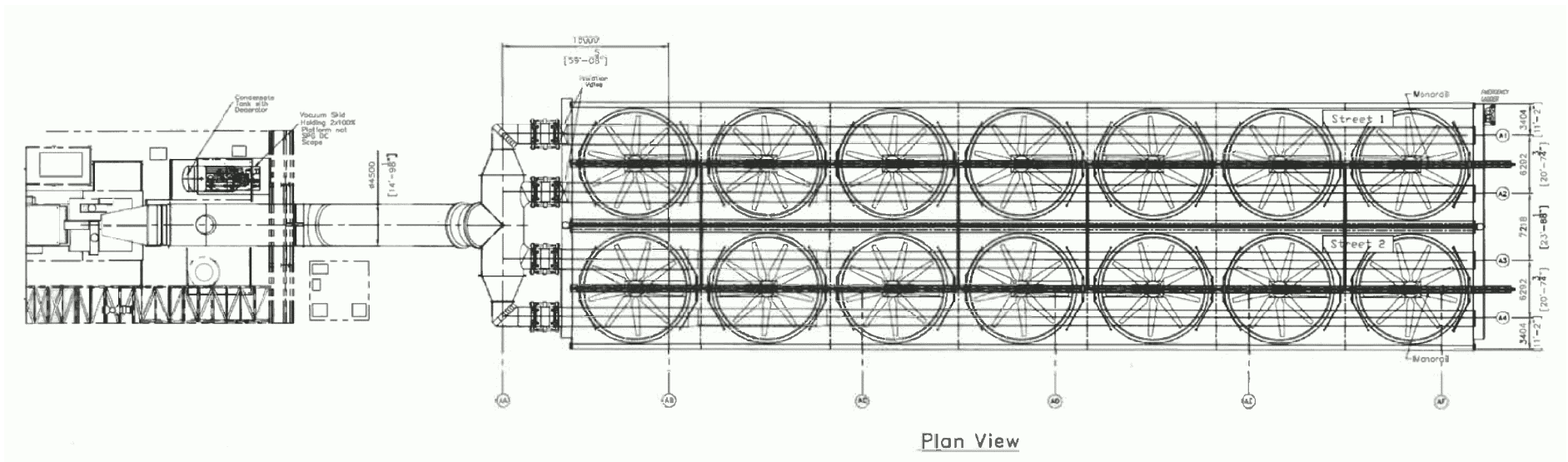




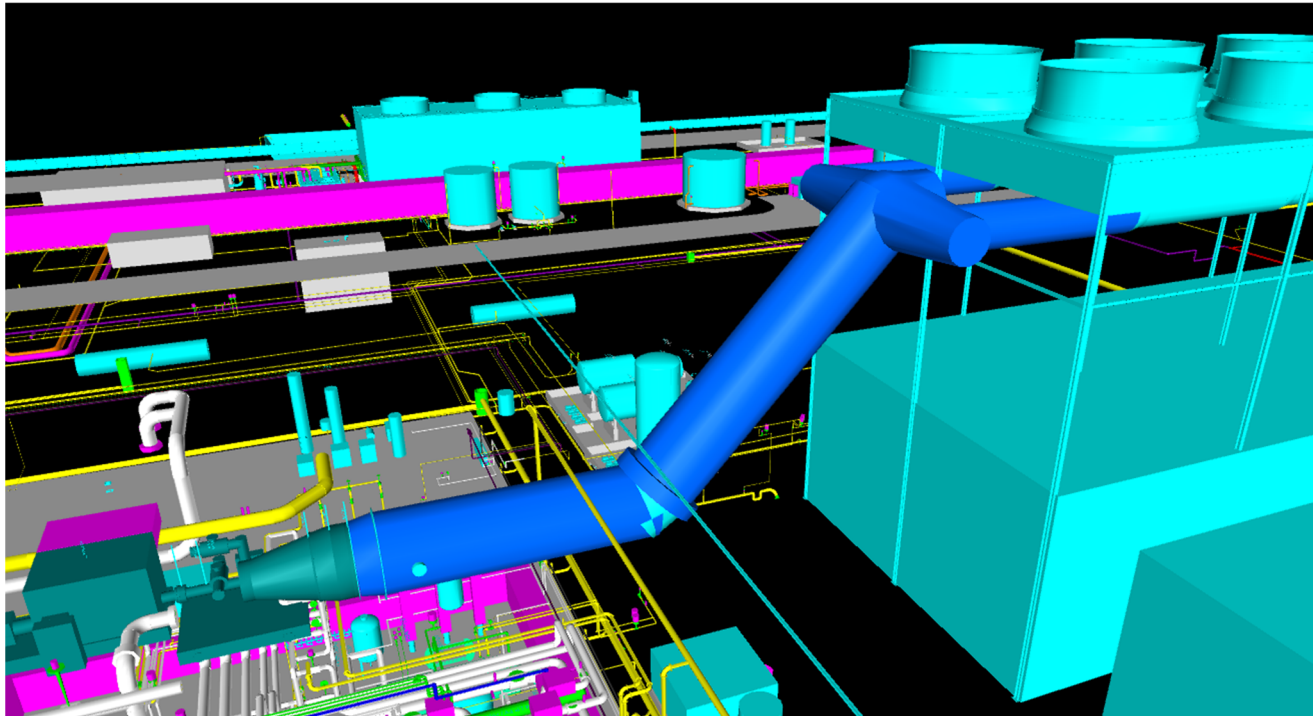
# NuScale Preliminary General Arrangement Drawings



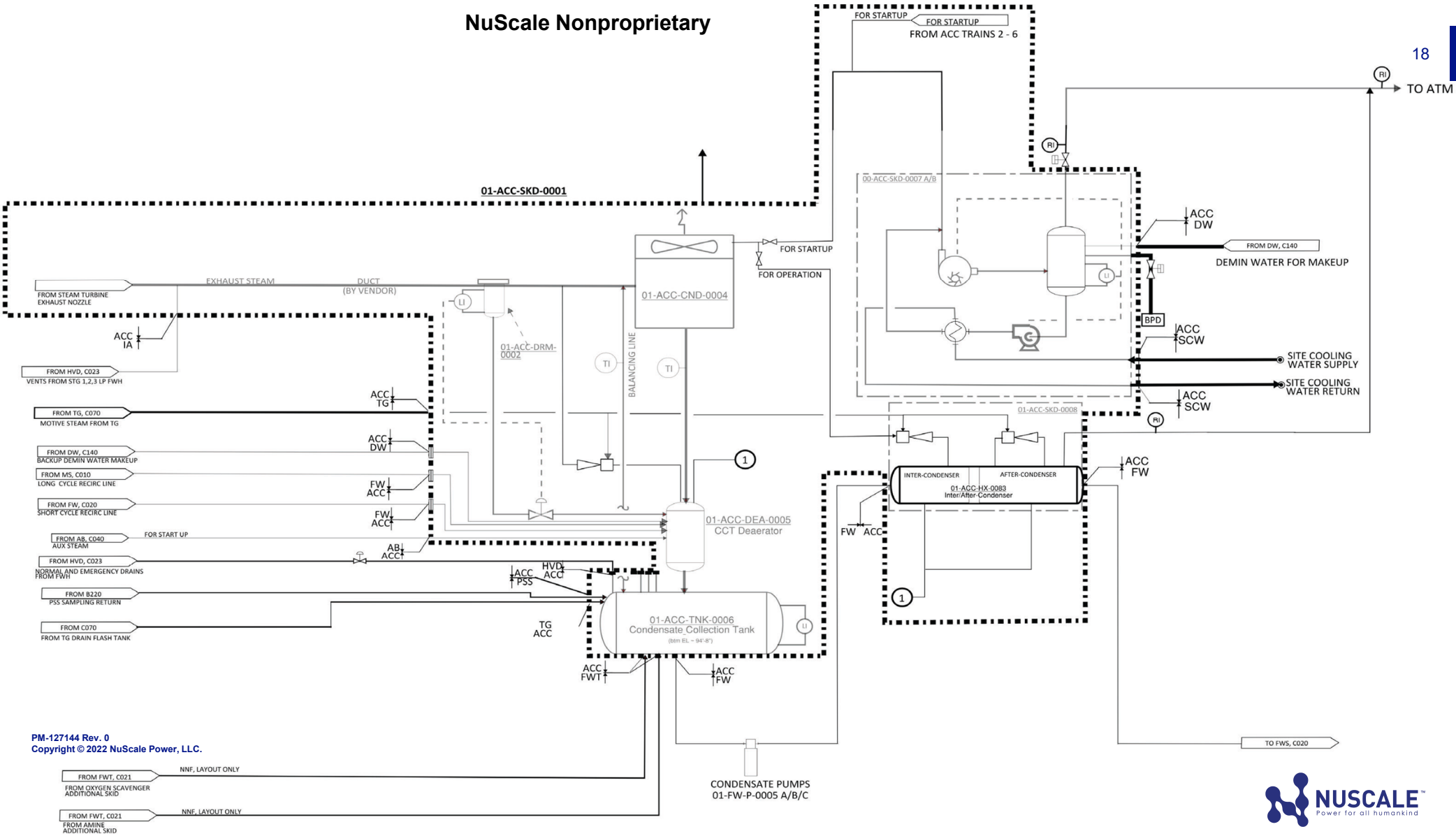
# NuScale Preliminary General Arrangement Drawings



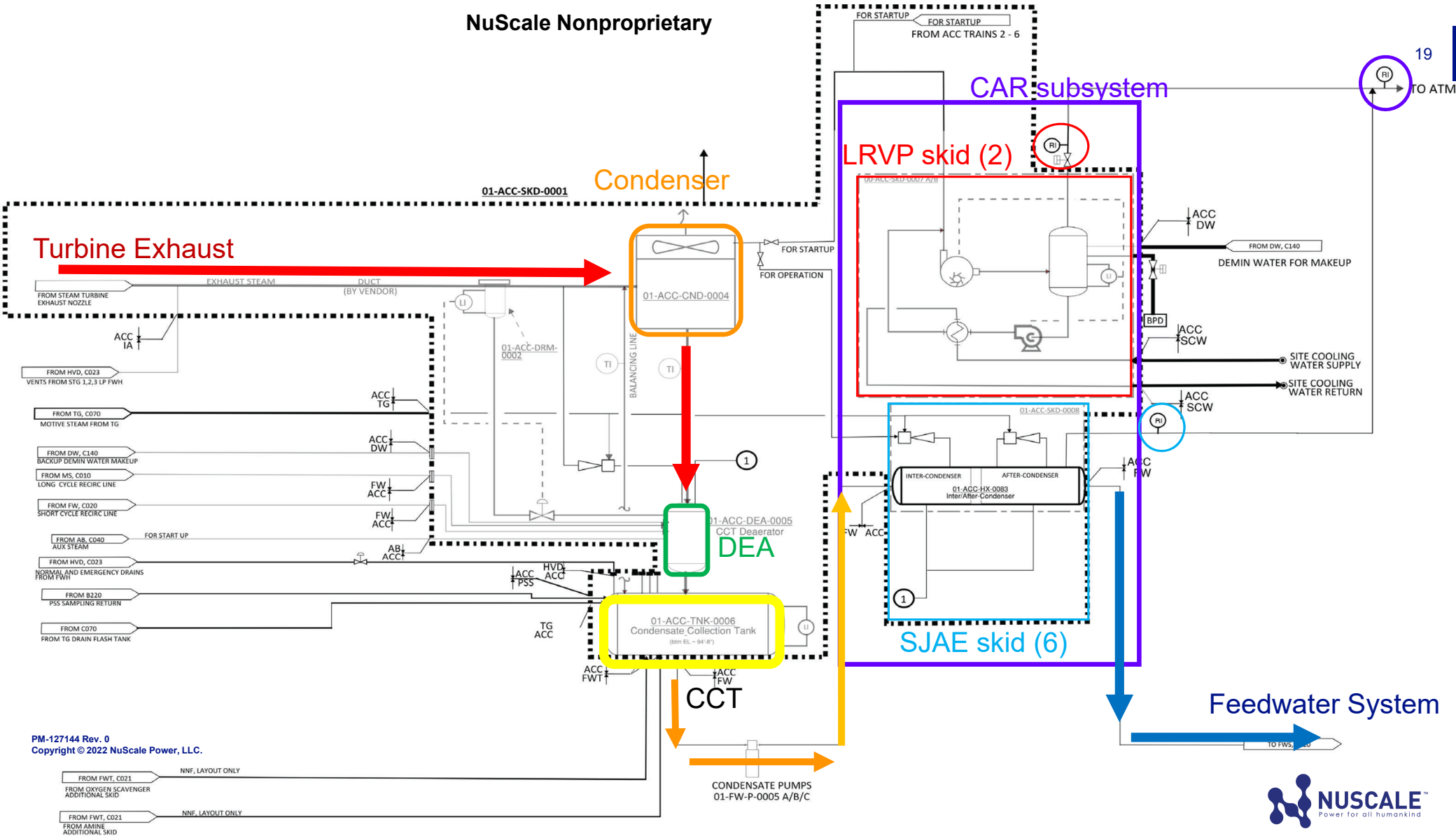
## NuScale Preliminary 3D Model



# NuScale Nonproprietary



NuScale Nonproprietary



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- FROM FWT, C021 NNF, LAYOUT ONLY
- FROM OXYGEN SCAVENGER ADDITIONAL SKID
- FROM FWT, C021 NNF, LAYOUT ONLY
- FROM AMINE ADDITIONAL SKID



## Radiation Monitors

- Radiation monitoring is provided for the liquid ring vacuum pump (LRVP) and steam jet air ejector (SJAE) gaseous effluent and at the common exhaust header that collects and releases gaseous effluent to the atmosphere.
- Provide early indication of primary-to-secondary leakage radiation and alarms in the main control room to enable operators to shut down and isolate leak paths.
- Integrated sampling skids provide provisions for representative grab samples.

# ACCS Regulatory Compliance

## ACCS Regulatory Compliance

- GDC 60 - Control of releases of radioactive materials to the environment.
- GDC 64 - Monitoring radioactivity releases.
- 10 CFR 52.47(b)(1) - A DC application contains the proposed inspections, tests, analyses, and acceptance criteria (ITAAC)
  - Not required for the SDAA but the NuScale FSAR addresses ITAAC



## CARS Regulatory Compliance

- GDC 2 - Design bases for protection against natural phenomena
- GDC 3 - Fire protection
- GDC 4 - Environmental and dynamic effects design bases
- GDC 5 - Sharing of structures, systems, and components
- GDC 60 - Control of releases of radioactive materials to the environment
- GDC 64 - Monitoring radioactivity releases
- 10 CFR 20.1406 - minimization of contamination of the facility
- RG 1.29 - not located in areas that contain safety-related components and is not required to operate during or after an accident. The CARS is Seismic Category III.

## Summary

- The NuScale ACCS uses a proven air cooled condenser design to condense turbine exhaust steam and maintain vacuum.
- The ACCS and its CARS subsystem fulfill the Standard Review Plan (NUREG-0800) and ensure safe operation without external cooling water supply.

# Acronyms

ACC	Air Cooled Condensers	LRVP	Liquid Ring Vacuum Pump
ACCS	Air Cooled Condenser System	NSAR	Nonsafety-related with Augmented Requirements
CARS	Condenser Air Removal System	RG	Regulatory Guide
CCT	Condensate Collection Tank	SDAA	Standard Design Approval Application
CFR	Code of Federal Regulations	SDA	Standard Design Approval
DBA	Design Basis Accident	SJAE	Steam Jet Air Ejector
DO	Dissolved Oxygen		
DC	Design Certification		
FWS	Condensate and Feedwater System		
GDC	General Design Criteria		