Response to SDAA Audit Question

Question Number: A-12.3.1.1-2

Receipt Date: 05/01/2023

Question:

SDAA Figures 11.4-2a, “Process Flow Diagram for Wet Solid Waste,” and Figures 11.4-2b, “Solid Radioactive Waste System Diagram,” shows that the phase separator tanks and spent resin storage tanks vent directly to the radioactive waste building ventilation system. Please discuss any design features that prevent or limit radioactive material from these tanks from contaminating the building ventilation system. For example, the NuScale DCA included break pot tanks in the vent lines of these tanks to prevent contamination of the ventilation system. The break pot tanks were discussed in both Chapters 11 and 12 of the DCA but do not appear to be included in the SDAA.

Response:

NuScale replaced the break pot tanks with a hooded vent for the solid radioactive waste system (SRWS) phase separator tanks (PST) and spent resin storage tanks (SRST). The hooded vents on the SRWS PST and SRST consist of tank vent piping that terminates below a vent hood and directs air into the Radioactive Waste Building Ventilation System. The vent piping exiting the storage tanks contains an internal screen designed to prevent solids (i.e., resin) from escaping. An air gap between the tank vent piping and the vent hood minimizes contamination from entering the Radioactive Waste Building Ventilation System. Liquid overflow flows out of a vent pipe into shielded cubicles lined with stainless steel.

NuScale has updated Section 11.4.1.2 and Table 12.3-38 to reflect the above-stated information.

Markups of the affected changes, as described in the response, are provided below:

If operational conditions develop such that condensate polisher demineralizer resins require removal as contaminated waste, operators transfer resins to HICs or other suitable containers and transfer the containers to the SRWS area for processing and storage.

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In accordance with BTP 11-3, components and piping that contain slurries have flushing capabilities via the LRW clean-in-place skid or directly from the demineralized water break tank. The spent resin storage and PSTs are ASME Section VIII tanks that can use compressed service air to pressurize the tanks and pneumatically transport resin to a HIC. The associated pressure relief valves on the spent resin storage and PSTs are vented to the tank's cubicle, which are vented to the RWBVS. The hooded vents on the SRWS PST and SRST consist of tank vent piping that terminates below a vent hood and directs air into the RWBVS. The vent piping exiting the storage tanks contains an internal screen designed to prevent solids (i.e., resin) from escaping. An air gap between the tank vent piping and the vent hood minimizes contamination from entering the RWBVS. Liquid overflow flows out of a vent pipe into shielded cubicles lined with stainless steel.

Figure 11.4-2a and Figure 11.4-2b are process flow diagrams of the spent resin handling system.

To avoid the generation of explosive gas mixtures and exothermic reactions, the upstream systems (LRWS, pool cooling and cleanup system, CVCS) that transfer resins to the SRST or phase separator tank (PST) do not use chemicals (e.g., nitrates, nitrites) that can generate exothermic reactions with resins.

The main source of oily waste is expected to come from floor drains. Operators direct the oil to the SRWS from the LRWS oil separators and manually collect it in drums. The drums of contaminated oil are sent to an offsite treatment facility.

11.4.1.3 Mixed Waste Handling

Mixed waste is a combination of radioactive waste mixed with Resource Conservation and Recovery Act-listed hazardous waste as defined in 40 CFR 261 Subpart D. The generation of mixed waste volume is expected to be low. Mixed waste can only be disposed of in a permitted mixed waste disposal facility. Operators collect mixed waste near the source and transfer in drums to a permitted facility.

11.4.1.4 Packaging, Storage, and Shipping

The Process Control Program (PCP) classifies waste as Class A, Class B, Class C, or greater than Class C in accordance with 10 CFR 61.55 and 10 CFR 61.56. Table 11.4-2 and Table 11.4-3 provide the expected annual volumes of solid waste and shipment offsite estimates. The packaging and shipment of radioactive solid waste for disposal complies with 10 CFR 20, Appendix G, 10 CFR 61.56, and 49 CFR 173, Subpart I.

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Table 12.3-38: Regulatory Guide 4.21 Design Features for Solid Radioactive Waste System

Objective	Design Features
Objective 1 - Minimize the potential for leaks or spills and provide containment areas	The low activity phase separator tanks and the high activity SRSTs are designed with stainless steel material and welded construction to minimize degradation over the life of the plant due to corrosion.
	The HEPA filter, downstream of the dewatering fill head vent and the Compactor vent, captures radioactive particles before discharging to the RWBVS.
	The high and low activity waste storage areas (Class A and B) are designed with epoxy-coated floors and drainpipes to direct drainage to a floor drain sump for collection and subsequent pumping to the LRWS for treatment and release to the environment.
	Tank cubicles, in which contaminated materials are handled and stored, have lined stainless steel walls and floors to contain the whole tank content if a leak develops. The floors are sloped to direct leakage to a low point floor drain in the tank room for ease of transfer and cleaning. Drain lines direct floor drains to the local sump tanks, which are equipped with level switches to detect liquid accumulation and pumps are provided to transfer the fluid to the LRWS for proper treatment.
	The SRWS is designed with above-ground piping to the extent practical. Buried or embedded piping is minimized. In the event that buried or embedded piping cannot be avoided, double-wall piping is used.
Objective 2 - Provide leak detection capability	Four resin storage tanks are designed with vibrating fork level switches and radar level transmitters to provide reasonable assurance of the integrity of the SSC. Leak detection (level switches) is located in each tank cubicle and provides alarm to warn the operators of leaks.
	Video monitoring is provided in the high and low activity waste storage area for waste handling operation and to monitor for container leakages.
	The fill head is designed with a local control panel with closed-circuit television and level indication to monitor HIC level during the resin transfer and dewatering operations. The closed-circuit television in the dewatering room monitors external leakages associated with HIC overflow or hose or joint failures in the dewatering room.
Objective 3 - Reduce contamination to minimize releases, cross-contamination and waste generation	The SSC are designed with life-cycle planning using nuclear, industry-proven materials compatible with the chemical, physical, and radiological environment, thus minimizing cross-contamination and waste generation.
	The process piping containing contaminated slurry is sized properly to facilitate easier flow and with sufficient velocity to prevent settling. The piping is designed to reduce fluid traps, thus reducing the decontamination needs and waste generation. Decontamination fluid is collected and routed to the LRWS for processing and release.
	Utility connections are designed with a minimum of two barriers (double isolation valves) to prevent contamination of non-radioactive systems from potentially radioactive systems.
	An air gap between the storage tank vent piping and the vent hood minimizes contamination from entering the RWBVS.
Objective 4 - Facilitate decommissioning	The SSC are designed for the 60-year design life and are fabricated, to the maximum extent practicable, as individual assemblies for removal.
	The SSC are designed with decontamination capabilities. Design features, such as welding techniques and surface finishes, are included to minimize the need for decontamination and minimize waste generation.
	Instruments that interface with contaminated fluid or slurry are designed with diaphragm seals to reduce decontamination requirements during decommissioning.