Response to SDAA Audit Question

Question Number: A-11.5-4 (follow up)

Receipt Date: 09/21/2023

Question:

Original Question:

Please discuss the interrelationship between the sampling points in FSAR Tables 11.5-2 and 11.5-3 and the sampling points identified in the Section 9.3.2 tables. Some sampling points appear to be repetitive in both Section 11.5 and Section 9.3.2, while other points only appear in one section. For example, the containment evacuation system (CES) sample tank radionuclide sampling point is identified in both Table 9.3.2-4 and Table 11.5-3, but the chilled water return lines radionuclide sample point is identified only in Table 9.3.2-4 and is not identified in Chapter 11.

In addition, there were many more sample points identified and more specificity in the NuScale US600 design than in the US460 design, including sampling points for the purpose of identifying radioactivity. Please discuss the reduction in the sampling points in the US460 design and if the sample points in the US460 design are adequate to address potential leakage paths to the environment and unintentional contamination of normally clean systems? For example, the US600 design specified sample points for each radioactive waste drain system sump tank, the reactor building chemical drain tank, and the reactor component cooling water system drain tank. In the US460 design it just indicates that there is a sample point for the radioactive waste drain system (without any additional specificity where in that system).

Staff's feedback on the response to audit issue A-11.5-4

The DCA had identified liquid and gaseous sampling in the solid radwaste system in FSAR Tables 11.5-2 and 11.5-3. Solid radwaste system sampling is not included in the same tables in the SDA. In addition, Section 11.4 of the DCA had discussed an automatic inline sampler located upstream of the dewatering system to sample resins from the spent resin storage tank and phase separator tank (there is no information related to sampling the spent resins from these tanks in the SDA).

The NuScale DSRS discusses the need to sample solid radioactive waste. Please discuss why no solid radioactive waste system sampling is identified in the SDA, including for spent resin from the spent resin storage and phase separator tanks.

Response:

The solid radioactive waste system includes sampling of spent resin and charcoal media. The waste is sampled during transfer to a HIC. NuScale is updating SDAA Section 11.4.1.2 and Table 11.5-3 to include the sampling of spent resin and charcoal media.

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

- process and package waste into disposal containers that are approved by the Department of Transportation and are acceptable to licensed waste disposal facilities for offsite shipment and burial.
- meet federal regulations and protect the worker and the general public from radiation by maintaining dose levels ALARA.
- transfer liquid wastes to the RWDS or LRWS.

The SRWS design handles three types of generated wastes: WSWs, DSWs, and miscellaneous wastes.

The boundaries of the SRWS begin at the connection to a particular waste stream source and end at the packaged waste container offsite shipment. For WSW, these connections usually involve flanged joints, and boundary valves at the system inlets. For DSW, the boundaries are not always physical because much of DSW is collected from a variety of locations and transported through corridors to the solid radioactive waste sorting area.

For spent resins and granular activated charcoal, the SRWS starts downstream of the boundary valve from each demineralizer and carbon bed. Operators sluice spent resin into the SRSTs or PSTs for decay, and to waste containers.

For spent cartridge filters, the SRWS starts at the filter extraction point. Operators remove the spent filter from the filter housing and place it in a shielded spent filter transfer cask.

11.4.1.1 Dry Solid Waste

Dry solid waste includes heating ventilation and air conditioning filters, tools and equipment, used personnel protective equipment, rags, paper, wood and miscellaneous cleaning supplies. Figure 11.4-1 summarizes the DSW handling and storage operation.

During some anticipated operational occurrences, such as refueling, the rate of DSW generation is higher than during normal operations. Major equipment items, such as core components and containment vessel components, are not processed in the SRWS.

11.4.1.2 Wet Solid Waste

The WSW processing system receives and processes three major waste streams:

- radioactive spent resin and spent charcoal
- spent cartridge filters

Audit Question A-11.4-4

- ~~filter membranes and~~ reverse osmosis filter membranes

Audit Question A-11.5-4

The WSW is homogenized, sampled, and analyzed to classify the waste in accordance with 10 CFR 61. The waste is sampled during transfer to a high

integrity container (HIC). Operators transfer spent resin and spent charcoal to ~~high integrity containers (~~HICs~~)~~ that are connected to a dewatering system located inside a confined enclosure.

Operators cap and seal containers after dewatering, and survey and decontaminate the containers, as necessary, to meet 49 CFR 173 requirements.

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.

Audit item A-12.3.1.1-2

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.

Audit Question A-11.5-4

Table 11.5-3: Provisions for Sampling Liquid Process and Effluent Streams

No.	Liquid Process or Waste System	Sample Provisions[a]	
		Process	Effluent
1	Balance of Plant Drain System	S&A, H3	-
2	Containment Evacuation System[c]	S&A	-
3	Condensate Polisher Resin Regeneration System	S&A	-
4	Chemical and Volume Control System	S&A, H3	-
5	Demineralized Water System	S&A, H3	-
6	Liquid Radioactive Waste System[b]	S&A	S&A, H3
8	Reactor Component Coolant Water System	S&A	
9	Radioactive Waste Drain System[b]	S&A	-
10	Site Cooling Water System	S&A	S&A, H3
11	Utility Water System	S&A	S&A,H3
12	Solid Radioactive Waste System (spent media sampled during transfer to HIC)	S&A	

(a) - Sample point is available to obtain grab samples for laboratory analyses.
(b) - The provisions for sampling potentially contaminated system and the use of the RWDS and LRWS for waste collection in the Reactor Building ensure compliance to occupational exposure limits in accordance with 10 CFR 20.1201 and 10 CFR 20.1202, and limit contamination per 10 CFR20.1406.
(c) - An installed mechanical liquid grab sampler located downstream of the CES sample vessel allows for the samples to be taken and analyzed in the laboratory for a more finite definition of the radionuclide content of the condensate, and to serve as a redundant means of measuring process radiation level. The mechanical sampler is designed to conform with RGs 8.8 and 8.10 and enhance plant staff capability to meet ALARA goals and contamination control in accordance with 10 CFR 20.1406. Compliance with RG 1.45 requirements and the capabilities of the CES sample vessel are discussed in Section 5.2.5.

NG -Noble gas radioactivity
I - Iodine radioactivity
H3 - Tritium
S&A -Sampling and analysis of radionuclides, including gross radioactivity, identification and concentration of principal or significant radionuclides, and concentration of alpha emitters.