Response to SDAA Audit Question

Question Number: A-11.5-2

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Question:

Initial Qustion:

In review of SDAA Section 11.5.1, the staff reviewed the system description SDAA pointers to other SDAA Sections for the purpose and functions of the effluent and process radiation monitors described in SDAA 11.5 along with the information provided for SDAA 11.5 Tables. From the staff's review of these pointers the staff notes the following:

- The Site Cooling Water system (SCWS) points to SDAA Section 9.2.7, the staff observed no discussions on the effluent monitoring in this SDAA section. The staff did observe discussions about leakage from the Heat Exchanger contained in SDAA Section 9.1.3.
- The Auxiliary Boiler System (ABS) points to SDAA Section 10.4.7, the staff did not observe and discussions about the function and purpose of the radiation monitor. Appears to point back to SDAA 11.5.
- The Chemical and Volume Control System (CVCS) points to SDAA Section 9.3.4, does not appear to contain discussions about the radiation monitors purpose and function. Previous discussions in the DCA 11.5 provide that there is radiation monitor on sampling line, and that this monitor provides an isolation function on high radiation. These details do not appear to be discussed in SDAA Section 9.3.4.
- The Condensate polisher resin regen system (CPS) points to SDAA 10.4.5, does not appear to discuss if there are any alarms associated with high radiation levels.
- The Containment Flooding and drain system (CFDS) points to SDAA 9.3.7, does not discuss any automatic functions associated with this monitor.
- The Demineralized Water System (DWS) points to SDAA 9.2.3, does not appear to contain and discussions regarding this monitor or the purpose and functions of the monitor associated with this system. Appears to point back to SDAA 11.5.
- The Main steam system (MSS) points to SDAA 10.3, does not appear to contain and discussions regarding this monitor or the purpose and functions of the monitor associated with this system. Appears to point back to SDAA 11.5.

- For the Turbine Generator System, not sure if the pointer should be more directly connected to the Turbine Gland Sealing System monitors instead.

In the references back to SDAA Section 11.5, the staff believes they were intended to be pointed back to SDAA Table 11.5-4 for the off normal radiation conditions which does provide insight into system response from various conditions, but the staff believes that for the monitor sections referenced above, that the SDAA sections should include the details about the monitors including its location, purpose, and function. This information was previously included in DCA Section 11.5 but was either moved to the various cited SDAA sections or removed.

Staff would like to confirm with NuScale if these SDAA sections have the corresponding monitoring discussions elsewhere within the SDAA application, or if there are any plans to add some of the discussions previously contained in DCA 11.5 to the corresponding SDAA Sections for each system.

Follow-Up Response:

In audit issue A-11.5-2, the staff asked NuScale to provide additional information relating to the location, purpose, and function of radiation monitors. NuScale indicated in the response that they have no plans to include additional information on the monitors.
The DCA application included significantly more information on the individual process and effluent monitors than is included in the SDA. While some of the details in the DCA text are not necessary in the SDA text, partially because of the information provided in Tables 11.5-1 and 11.5-4, there is necessary information for some monitors that does not appear to be included anywhere in the SDA application. For example, for some of the monitors identified in Table 11.5-1, no information is provided in Table 11.5-4 (for the monitors that are included in Table 11.5-4, Table 11.5-4 provides information on the purpose, function, alarms, location of the alarms, and automatic and manual actions as a result of high radioactivity. Monitors missing from Table 11.5-4 are missing some of this information). For some radiation monitors information on the purpose of the monitors, if and where the monitors alarm, and any automatic or manual actuations as a result of high radioactivity do not appear to be identified anywhere in the application. This type of information should be provided in the application. Specific examples include the following:

- Three Air cooled condenser system (ACCS) monitors are discussed in Table 11.5-1 but Table 11.5-4 does not provide any information on these monitors.
- The containment flood and drain system (CFDS) monitor is discussed in Table 11.5-1 but Table 11.5-4 does not provide any information on this monitor.
- For the control room ventilation system monitors (CRVS) Table 11.5-4 discusses high

radiation in the outside air intake monitors but doesn't provide any discussion of high radioactivity on the CRE Supply Air radiation monitors.

- For the chemical and volume control system (CVCS) radiation monitors, Section 9.3.4 discuss alarms on high radioactivity, but Table 11.5-4 only states, process sample line isolation. Table 11.5-4 should be expanded to provide additional information on alarms, automatic and/or manual actuations, and any additional purposes for the monitors.
- Table 11.5-4 discusses a monitor that monitors high radiation level in the charcoal bed cubicle and initiate (either manually or automatically nitrogen purge of the bed) but neither Table 11.5-1 nor Chapter 12 appears to discuss any area radiation monitor in the charcoal bed cubicle. It is unclear which monitor this is referring to. It is also unclear why the charcoal beds would be purged on high area radioactivity. Is this referring to high airborne radioactivity in the room?
- Table 11.5-4 discusses a high liquid radioactive waste system sample tank, but this monitor does not appear to be identified in Table 11.5-1. Is this just referring to high radiation from a sample and not a monitor?

- There are different reactor component cooling water system (RCCWS) monitors identified in Table 11.5-1 and no information on RCCWS monitors provided in Table 11.5-4. While some location and function information is provided in Table 11.5-1, it isn't clear which monitors have alarms and which do not. Also, it appears that the purpose of most of the RCCWS monitors is to alert operators with no automatic actuations but for the RCCWS monitor identified as "RCCW PSS primary sample chiller outlet radiation," its function is not described and it is unclear if there are any automatic actuations.
- Turbine generator system (TGS) monitors are identified in Table 11.5-1, but Table 11.5-4 does not provide any information on these monitors.
- Table 11.5-4 should be reviewed in its entirety and updated as appropriate to ensure that it is clear where alarms will be located (e.g., local, in control room, etc.) if the actuations being discussed are automatic actuations on high radioactivity or if they are manual actions that operators should take if high radioactivity is detected. If a monitor says PCS alarm, does that mean it will alarm in the control room?

Clarifcation Call Follow-up Letter:

This is follow-up on what the staff said he would look into in today's meeting (regarding the piece on if the Chapter 11 radiation monitors provide indications and alarms in the MCR).
The staff looked at some of the effluent monitors and notes there is information on the monitors and their alarm locations in different places of the FSAR (for some monitors there is information where the system is discussed, such as in Chapter 9 or Chapter 10, in some cases there is information in Table 11.5-4 or elsewhere), so it can be somewhat challenging to find information

on individual monitors. A specific example that the staff is not able to identify if a monitor indicates or alarms in the MCR and/or locally is the SCWS monitors. Section 9.2.7 doesn't provide any information on the alarms, Table 11.5-4 indicates that upon alarm, operators are alerted to abnormal conditions, but it isn't really clear where it is alarming (for the UWS, the monitor directly below that in Table 11.5-4, it specifically says that it alarms in the MCR and locally).
The staff's recommendation is to include a statement in 11.5 for the process and effluent monitors that says something very similar to what it says in Section 12.3.4 for the Chapter 12 area radiation monitors. The text from 12.3.4 reads as follows:

The fixed area radiation monitors (ARMs) are placed in selected general plant locations. They provide local and MCR indication of gamma radiation at each location and provide an alarm function both locally and in the MCR when predetermined thresholds are exceeded.

It seems like a similar statement appropriate for the process and effluent monitors should be a very simple resolution to the concern on monitor readout and alarm locations.

Follow-up NRC Response (letter):

1. The proposed markup to the FSAR text indicates that all of the monitors alarm in the MCR. However, the response itself states that all monitors have alarms in the main control room or the radiological waste control room. In a previous meeting, NuScale indicated that all of the monitors alarm in the MCR on high radiation. Please make sure the response is consistent with the FSAR text in this regard (the word "or" implies it is one or the other and that some monitors may not alarm in the MCR on high radiation). It makes sense that radwaste system alarms would also alarm in the waste management control room, this should also be specified, as appropriate.
2. While the proposed changes to Table 11.5-4 add a lot of clarification regarding if the proposed actions are automatic or manual, it is still not clear if the CVCS item of "process sample line isolation" includes an automatic isolation or not. This should be clarified in the table. If the line is normally open, an automatic isolation may be appropriate.
3. Regarding the PCWS item in Table 11.5-4, the response adds a parenthesis that indicates that appropriate safety actions may be taken "manual or automatic." The table should be updated to clarify what automatic system actions may occur on high radiation and explain what conditions would result in there being automatic system action versus manual actions.

Response:

NuScale is providing additional clarification for the chemical volume and control system in Table 11.5-4.

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

do not exceed those in 10 CFR 20 Appendix B, Table 2. The bases for establishing the alarm and trip setpoints for the initiating actions are documented in the Offsite Dose Calculation Manual (ODCM), with consideration given to site-specific liquid effluent dilution factors and gaseous effluent atmospheric dispersion conditions.

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All process and effluent monitors provide local and MCR indication of radiation at each location and provide an alarm function in the MCR when predetermined thresholds are exceeded.

11.5.1.3 Effluent Release Controls

The gaseous and liquid effluent control for the plant is described in the ODCM and includes a description of how effluent release rates are derived and parameters used in setting instrumentation alarm setpoints to control or terminate effluent releases in unrestricted areas that are above the effluent concentrations in Table 2 of Appendix B to 10 CFR Part 20.

11.5.1.4 Offsite Dose Calculation Manual and Radiological Environmental Monitoring Program

The ODCM contains a description of the methodology and parameters used for calculation of offsite doses for gaseous and liquid effluents. The ODCM also contains the planned effluent discharge flow rates and addresses the numerical requirements of 10 CFR 50, Appendix I.

The ODCM and Radiological Environmental Monitoring Program are developed and implemented in accordance with the recommendations and guidance of NEI 07-09A (Reference 11.5-2).

11.5.1.5 Process and Effluent Monitor Ranges

The process and effluent radiation monitor instrument ranges are based on 10 CFR 20, Appendix B, and Regulatory Guides 1.21, 1.45, and 1.97.

11.5.2 References

11.5-1 American National Standards Institute/Health Physics Society, "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities," ANSI/HPS N13.1-2011, Washington, DC.

11.5-2 Nuclear Energy Institute, "Generic FSAR Template Guidance for Offsite Dose Calculation Manual (ODCM) Program Description," NEI 07-09A, Revision 0, March 2009.

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Table 11.5-4: Effluent and Process Monitoring Off Normal Radiation Conditions

System	Condition	System Response
ABS	Radiation Detected	If high radiation is detected in the auxiliary boiler system skid vents, skid drains, or steam header drains, ~~then the auxiliary boiler superheater skid outlet valve closes, auxiliary boiler skid to superheater skid valve closes, the module specific main steam to auxiliary boiler header valves close, and the MCR receives an alarm~~then the auxiliary boiler superheater skid valve, auxiliary boiler skid to superheater skid valve, and module specific main steam to auxiliary boiler header valves automatically close. The MCR also receives an alarm.
BPDS	High Radiation	Upon alarm, the wastewater collection tank pumps are shut down, the discharge isolation valves directing the disposition of the water ~~are~~ both close~~d~~ automatically, and manual intervention is initiated. The chemical waste collection tank is also monitored for radiation and upon radiation detection, the two affected chemical waste collection tank pumps are disabled and the two affected discharge isolation valves are closed. The radiation monitor alarms in the main control room for action and the RWBS control for information and an operator is dispatched to assess the situation.
CES	High Radiation	Upon detection, the Purge Gas Supply to the vacuum pumps are automatically shut off and that discharge path is switched from the RBVS to the GRWS valve. The SA Connection valve receives a close signal.
CFDS	High Radiation or No Signal	Upon high radiation indication or loss of signal, the operating pumps are automatically shut off and the subject line is isolated.
CPS	Radiation Detection	Spent resin being sent to the condensate polisher resin regeneration skid and the regeneration sump are monitored for radiation. If radiation is detected, a local alarm and an alarm in the MCR automatically alerts operations staff.

Table 11.5-4: Effluent and Process Monitoring Off Normal Radiation Conditions (Continued)

System	Condition	System Response
CRVS	High Radiation levels continue to degrade or Radiation monitor power loss	Upon detection of a "high" radiation level in the outside air intake, the system is automatically realigned so that 100 percent of the outside air passes through the CRVS filter unit, containing HEPA and charcoal filters, to filter outside air and minimize radiation exposure to personnel with the CRB. If power is not available to either CRVS AHU or to any of the four EDS-C battery chargers (after a 10-minute time delay), or if levels of radiation greater than 10 times background in the CRE supply air duct or if toxic gas is detected in the CRE supply air duct, the PPS automatically isolates the CRE from the adjacent areas by closing the redundant CRE isolation dampers). The time delay is to allow operators time to restore power and start the stand-by AHU. The operating supply AHU and associated components, the general exhaust fan, and the battery exhaust fan are also turned off and the CRH is automatically initiated. The CRH provides a supply of breathable air for the CRE occupants and maintains the CRE at a positive pressure with respect to the surrounding areas. The heat sink capacity of surrounding structures of the CRE helps maintain the temperature in the CRE within acceptable tolerances.
CVCS	High Radiation or Radiation monitor power loss	Automatically shut the process sample system isolation valve.~~Process sample line isolation~~
DWS	Radiation Alarm	PCS alarms and automatically close the associated upstream on-off valve.
GRWS	High radiation level in a decay bed skid outlet	~~C~~Automatically close the inlet valve and outlet valve from the affected decay bed skid as well as the outlet valves to RWBVS.
GRWS	High radiation level in the connection line to the RWBVS	~~C~~Automatically close the outlet valves to the RWBVS to stop the system flow.
GRWS	High radiation level in charcoal bed cubicle	~~C~~Automatically close the inlet valves to the GRWS to stop the system flow. Open the nitrogen purge valve.
LRWS	High Radiation on Sample Tank	Pump to Collection Tank for reprocessing (manual operator action)
LRWS	High Radiation on single Point LRW discharge	Table 11.2-2

Table 11.5-4: Effluent and Process Monitoring Off Normal Radiation Conditions (Continued)

System	Condition	System Response
MSS	High Radiation	If a high radiation condition is detected on the main steam line radiation monitors, an alarm in the MCR cues the operators to take actions to mitigate the event per applicable operating procedures. If required, the main steam lines can be manually isolated from the MCR. Additionally, the MSS drain pots automatically isolate during high radiation for both normal operation or when a MPS isolation signal is present in order to ensure that the MSS does not contribute to unmonitored release of high radioactivity to the environment in the event of an abnormal tube leak. High radiation detection provides an alarm in the control room. If the drain pots and/or isolation valves to the ACC CCT are open, they close. Operator action from the MCR can isolate the MS lines, if required.
PCWS	High Radiation	Automatically a~~A~~larm in MCR ~~to~~for operator initiate appropriate safety actions. Operator manually closes the surge control storage tank vent line.
RBVS	High Radiation	Alarm in MCR but no automatic actions. Operating staff takes manual actions to determine the source of the contamination and isolate it.
RBVS (SFP Area)	High Radiation	SFP exhaust is automatically diverted through both the HEPA filters and the charcoal absorbers. Isolation dampers of the RXB general exhaust fans reduce speed in response to the damper closures to maintain the design exhaust header setpoint.
RWBVS	High Radiation	Upon high limit detection of radiation in the RWBVS exhaust effluent to the RBVS system, manual action is taken by plant operators to locate the source of contamination, however RWBVS continues to operate.
RWDS	High Radiation	PCS alarms and interlock automatically closes the valve back to the RCCW expansion tank.
SCWS	Radiation Detection	Upon alarm, operators are alerted to abnormal condition, prompting them to investigate and isolate leaks or terminate other conditions that contribute to the off-normal conditions, through manual valve closures.
UWS	High Radiation	Alarm in the MCR and locally. Operators are alerted to the abnormal condition, prompting them to investigate and isolate leaks or terminate other conditions that contribute to the off-normal conditions, through manual or automatic valve closures.