ArevaEPRDCPEm Resource

From: Wunder, George
Sent: Wednesday, April 16, 2014 11:14 AM
To: ArevaEPRDCPEm Resource
Subject: FW: Response to US EPR DC FINAL RAI 625 RPAC (eRAI 7387)
Attachments: RAI 625 Response US EPR DC.pdf

From: RYAN Tom (AREVA) [mailto:Tom.Ryan@areva.com]
Sent: Wednesday, April 16, 2014 10:04 AM
To: Clark, Phyllis
Cc: HOTTLE Nathan (AREVA); GUCWA Len (EXTERNAL AREVA); SEALS Jeff (AREVA); RANSOM Jim (AREVA); LEIGHLITER John (AREVA); WILLIFORD Dennis (AREVA); ROMINE Judy (AREVA); DELANO Karen (AREVA); WILLS Tiffany (AREVA); BALLARD Bob (AREVA); Wunder, George; HONMA George (EXTERNAL AREVA); RYAN Tom (AREVA)
Subject: Response to US EPR DC FINAL RAI 625 RPAC (eRAI 7387)

Phyllis,

Attached please find AREVA's response to the subject request for additional information (RAI). The attached file, "RAI 625 Response US EPR DC.pdf," provides a schedule since a technically correct and complete response to the one question cannot be provided at this time.

The following table indicates the respective pages in the response document, "RAI 625 Response US EPR DC.pdf" that contain AREVA's response to the subject question.

Question #	Start Page	End Page
RAI 625 – 11.05-29	2	23

The schedule for technically correct and complete response to this question is provided below.

Question #	Response Date
RAI 625 – 11.05-29	August 14, 2015

Sincerely,

Tom Ryan
Manager, US EPR DCD
Regulatory Affairs
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From: Clark, Phyllis [mailto:Phyllis.Clark@nrc.gov]
Sent: Monday, March 17, 2014 10:45 AM
To: ZZ-DL-A-USEPR-DL

Cc: ArevaEPRDCPEm Resource; Wunder, George; Segala, John; HONMA George (EXT)
Subject: REF: US EPR DC FINAL RAI 625 RPAC (eRAI 7387)

Attached please find the final subject requests for additional information (RAI) 625 (eRAI 7387) regarding your application for standard design certification of the U.S. EPR. A revised draft of the RAI was provided to you on March 17, 2014. Your email dated March 17, 2014 stated that no clarification phone call was required on this RAI and that the RAI could be issued as "final". Therefore, the questions in this RAI remain unchanged from the revised draft version.

The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. Additionally, please make sure to include in your response letter a statement certifying whether or not your response contains any sensitive or proprietary information that needs to be withheld from public disclosure.

Sincerely,

Phyllis Clark

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U.S. EPR Design Certification
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Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 4861

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Subject: FW: Response to US EPR DC FINAL RAI 625 RPAC (eRAI 7387)
Sent Date: 4/16/2014 11:13:57 AM
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From: Wunder, George

Created By: George.Wunder@nrc.gov

Recipients:
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Return Notification: No
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Response to

Request for Additional Information No.625

03/17/2014
U.S. EPR Standard Design Certification
AREVA Inc.
Docket No. 52-020
SRP Section: 11.05 - Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems
Application Section: 11.5, 5.2.5, 6.2 9.4, 7.5, 10.4.8, 14.2.12

Question 11.05-29:

The following presents staff observations noted during the review of U.S. EPR FSAR Rev. 5, Tier 2, Chapter 11 topics. The review uses FSAR Rev. 5, Table 11.5-1 as the focal point and refers to other FSAR sections, as needed, for supporting information and compliance with regulatory requirements and endorsement of NRC and industry guidance. The order of presentation follows the sequence of instrumentation listed in FSAR Table 11.5-1. The applicant is requested to review staff observations listed below and make appropriate corrections, as needed.

As a result of this review, the observations noted below, and their incorporation in this supplemental RAI, supersede and subsume the open items in RAI 528, Question 11.05-28 on FSAR Chapter 11, and RAI 527, Question 14.02-163, on FSAR Section 14.2.12 for the related test abstracts. See Item 34 at the end of this compilation for details.

Moreover, this review does not address pending design changes to FSAR Section 10.4.8 on the steam generator blowdown system (SGBD) and FSAR Section 9.4 on process and effluent filtration treatment systems and confirmation that such changes do not impact assumptions used to derive gaseous effluent releases. See item 35 at the end of this compilation for details.

This punch list does not address related Tier I system descriptions and ITAAC. These aspects will be addressed in a separate staff evaluation of open RAIs against FSAR Rev. 5 and issue a supplemental RAI, as needed.

1. Gaseous waste processing system, Monitors R-1 and R-2

    a. Confirm and correct inconsistent descriptions of the types of check sources. FSAR Section 11.5.3.1.1 states that portable sources will be used to check the system, but FSAR Section 11.5.4.5 and Table 11.5-1 state that the sources are built-in.

    b. A review of Test Abstracts 099 and 216 indicates that both are on the gaseous waste processing system, have parallel objectives, and both have the same title. The applicant is requested to review both test abstracts and confirm whether the tests are redundant, revise test descriptions accordingly, and differentiate the titles. The title of Test Abstract 099 should be revised with a suffix denoting radiological monitoring. For Test Abstract 216, the title should be revised with a suffix denoting explosive gas monitoring. With respect to the monitoring and control of explosive gas mixtures, the appropriate test abstract (No. 099 or 216) should be revised and include in the acceptance criteria (Item 5) specific references to FSAR Sections 11.3.2.3 and 11.3.2.4 on associated instrumentation alarms and automatic control functions. As a result, FSAR Sections 11.3.2.3.15 and 11.3.2.4 and Table 11.5-1 should be revised to identify the appropriate test abstracts.

2. Vent system for air removal system, Monitor R-3

    a. Confirm whether the information, see FSAR Table 11.5-1 “In-Effluent Continuous” header, should include the TGSS system since monitor R-3 also measures radioactivity from the TGSS. Based on a review of FSAR Fig. 10.4.2-

1, 10.4.2-2, and 10.4.3-1, it is not clear as to where the TGSS exhaust connects to the MCES line upstream of radiation monitor R-3. This should be reviewed and clarified, as needed.

b. Confirm whether FSAR Sections 10.4.2.4 and 10.4.3.3 are correct in stating that the discharges of the MCES and TGSS are routed to the Turbine Bldg Air Vent System. This description is different than that of FSAR Section 11.5.3.1.2 and Fig. 9.4.3-3 which show the MCES exhaust going to the NABVS plenum and plant vent stack.

c. Confirm whether there is a sampling point to differentiate the origin of radioactivity between the MCES and TGSS, or does the grab sampling point assigned to the MCES serve that purpose for either system? This should be reviewed and clarified, as needed.

d. Confirm whether Test Abstract 064 should be assigned to those already listed for this monitor. Note that Test Abstract 064 refers to a radiation monitor, but does not specifically refer to R-3, confirm if it should. Also, Test Abstract 064 does not refer to FSAR Table 11.5-1 for test acceptance criteria.

e. Given the description in Test Abstract 065 (MCES), where Item 3.9 cites the use of sampling point R-65, confirm whether sampling point R-65 (Turbine Bldg Clean Drain) is an appropriate method to detect radioactive releases characterized mainly by the presence of noble gases and how would R-65 support the functions of radiation monitor R-3. If not, identify the alternate sampling point or method.

f. Confirm whether FSAR Sections 10.4.1.3, 10.4.1.5, 10.4.2.2.1, 10.4.2.4, 10.4.2.6, 10.4.3.3, and 10.4.3.5 (Safety evaluations and Instrumentation requirements) should refer to FSAR Section 11.5.3.1.2 and Table 11.5-1 for details on this radiation monitor.

3. Sampling activity monitoring system (vent stacks), Monitors R-4 to R-6

a. Confirm whether the description of monitor R-4, see FSAR Table 11.5-1 “In-Effluent Continuous” header, is consistent with the information presented in FSAR Section 11.5.3.1.3. The information infers that one continuous noble gas monitor is provided (possibly for routine operation) but it is assigned for accident monitoring functions in FSAR Table 11.5-1. There is a need to clarify the assignments of radiation monitoring functions between FSAR Section 11.5.3.1.3 and Table 11.5-1.

b. For monitor R-6, the response is described as ranging from 1.0E-04 to 1.0E+04 rad/hr for noble gases being discharged from the vent stack. It is not clear as to what is the basis of this range. It cannot represent a dose rate at the point of measurement within the stack. It may represent an expected range of dose rates at some distances away from the stack, but if so, additional information should be provided describing the basis and assumptions. Such information should include key assumptions, e.g., release rate, dispersion parameters at a specific location, etc. since airborne radioactivity levels are compared to concentration limits under

Part 20 App. B, Table 2, Col. 1, which are expressed in uCi/ml. The applicant is requested to provide additional information (e.g., as a footnote to FSAR Table 11.5-1 and Test Abstract 092 acceptance criteria) describing the underlying assumptions and basis for using exposure rates rather than effluent concentrations of noble gases that would be measured in the stack vent.

c. A review of Test Abstract 092 (Item 1.2) indicates that the test will confirm alarms and interlocks, but FSAR Section 11.5.3.1.3 and Table 11.5-1 do not describe functions that involve interlocks and automatic control features. This should be clarified.

4. Containment building low flow purge subsystem, Monitors R-7 to R-9

a. For monitors R-7 and R-8, the ranges presented in FSAR Table 12.3-4 are inconsistent with those of FSAR Table 11.5-1. FSAR Table 12.3-4 assigns ranges of 5.0E-04 to 3.0E+00 uCi which are not listed or described in FSAR Table 11.5-1. Since the monitors measure airborne radioactivity in ductwork, it is not clear as to what this radiological unit (uCi) means with respect to complying with Part 20, App. B concentration limits (occupational and effluent), which are expressed in uCi/ml.

b. For monitor R-9, the response is described as ranging from 1.0E-05 to 1.0E+00 rad/hr for noble gases flowing out of the effluent treatment system (FSAR Fig. 9.4.7-2) and going to the vent stack (FSAR Fig. 9.4.3-3). It is not clear as to what is the basis of this range. It cannot represent a dose rate at the point of measurement within the duct work leading to the stack vent. It may represent an expected range of ambient dose rates within specific containment compartments or containment annulus, but if so, additional information should be provided describing the basis and assumptions. Such information should include key assumptions, e.g., airborne concentrations, dimension and volume of compartments, air exchange rates, etc.) since airborne radioactivity levels are compared to concentration limits under Part 20, App. B, Table 1 (Col. 3, occupational) and Table 2 (Col. 1, plant effluents), which are expressed in uCi/ml. The applicant is requested to provide additional information (e.g., as footnotes to FSAR Tables 11.5-1 and 12.3-4 and Test Abstract 076 acceptance criteria) describing the underlying assumptions and basis for using exposure rates rather than process or effluent concentrations of noble gases that would be measured in ventilation exhausts.

c. A review of Test Abstract 076 (Items 1.5, 1.6, 3.7.2, and 3.12) indicates that the test will confirm alarms and automatic control features, but FSAR Section 11.5.3.1.4 and Table 11.5-1 do not describe functions that involve automatic control features or interlocks. The test abstract should be clarified to distinguish when automatic control features and actuation of interlocks are initiated by radiation monitors in systems with diverse means of automatic functions (radiological vs. other sensing parameters). This observation applies to other radiation monitors as well, and should be taken into consideration when reviewing the monitors listed in FSAR Table 11.5-1 and associated test abstracts.

d. Confirm whether the information for monitors R-7 to R-9, see FSAR Table 11.5-1 "Text" header, should be revised to include FSAR Section 9.4.7.5 as supporting information to FSAR Table 11.5-1.

e. Confirm whether the citation to Chapter 11.5 in FSAR 9.4.7.2.3 (top of p.9.4-94) should be revised from FSAR Section 11.5.3.1.5 to 11.5.3.1.4 instead in referencing radiation monitors R-7 and R-8.

f. A review of FSAR Sections 9.4.7.2.1 and 9.4.7.2.3 and Fig. 9.4.7-2 shows that the design of the containment purge exhaust system has a bypass around the HEPA and iodine filter trains. This design modification is not described in FSAR Section 11.5.3.1.4. Moreover, the ramifications of this design change need to be addressed in FSAR Section 11.3.3.2 (Estimated annual releases) given that it may impact estimated releases of particulates and iodines (Ci/yr) listed in FSAR Table 11.3-3 and associated doses to members of the public presented in FSAR Table 11.3-11. As noted, PWR-GALE code assumptions and parameters used in this analysis are presented in FSAR Table 11.2-3. Specifically, sheet 3 of Table 11.2-3 assumes a flow rate of 3120 CFM for the containment low flow purge rate and continuous filtration via HEPA (99%) and iodine (90%) filter trains. The applicant is requested to confirm that these assumptions on process and effluent filtration treatment (continuous filtration vs. only upon detecting elevated radioactivity levels) applied in FSAR Table 11.2-3 are still consistent with the current version of the design and other pending changes to FSAR Section 9.4 systems, and currently derived routine effluent releases and offsite doses presented FSAR Section 11.3.3.2 (calculations of offsite effluent concentrations and doses).

g. A comparison of FSAR Sections 11.5.3.1.4 and 11.5.3.1.6 against FSAR Section 9.4.7.2.1 indicates that the containment low flow purge design includes a provision to entirely bypass both HEPA and iodine filter trains. The applicant is requested to address the operational consequences of operating in this mode with respect to administrative procedures that would be used to control and monitor radioactive releases when operating in this mode, and how this mode of operation is consistent with the commitment of FSAR Section 12.3.6 in complying with Part 20.1406(b). In the context of complying with Part 20.1406(b), the applicant is requested to add, given an endorsement of NEI 08-08A, a citation for it to the references of FSAR Sections 11.2 to 11.5.

5. Containment building internal filtration subsystem, Monitor R-10

a. For monitor R-10, the ranges presented in FSAR Table 12.3-4 are inconsistent with those of FSAR Table 11.5-1. FSAR Table 12.3-4 assigns ranges of 5.0E-04 to 3.0E+00 uCi which are not listed or described in FSAR Table 11.5-1. Since this monitor measures airborne radioactivity in ductwork, it is not clear as to what this radiological unit (uCi) means with respect to complying with Part 20, App. B concentration limits (occupational or effluents), which are expressed in uCi/ml.

b. A review of FSAR Section 9.4.7.2.3 (system operation) indicates that the internal filtration system is isolated depending on radiological conditions while referring to radiation monitor R-10. As described, the information implies that radiation

monitor performs some automatic control functions, but it does not based on the information presented in FSAR Section 11.5.3.1.5 and Table 11.5-1. In addition, FSAR Section 9.4.7.2.3 refers to FSAR Section 11.5.3.1.5 for radiation monitors R-7 and R-8, but the correct citation should be FSAR Section 11.5.3.1.4.

c. Confirm whether the information for monitor R-10, see FSAR Table 11.5-1 "Text" header, should be revised to include FSAR Section 9.4.7.5 as supporting information to FSAR Table 11.5-1.

d. Confirm whether the citation to Chapter 11.5 in Test Abstract 075 (Item 5.4) should be revised from FSAR Section 11.5.3.1.4 to 11.5.3.1.5 instead in referencing radiation monitor R-10.

e. FSAR Sections 9.4.7.2.1 and 9.4.7.2.3 and Fig. 9.4.7-2 and 9.4.7-3 describe the design of the containment full flow purge exhaust system and internal HEPA and iodine filtration train. In part, the design details presented in this FSAR section are used to derive gaseous effluent releases (Ci/yr), which are presented in FSAR Section 11.3.3.2 and FSAR Table 11.3-3. As noted, PWR-GALE code model assumptions and parameters used in this analysis are presented in FSAR Table 11.2-3. Specifically, sheet 3 of Table 11.2-3 assumes a flow rate of 4100 CFM for the containment internal filter train and continuous filtration via HEPA (99%) and iodine (90%) filter trains. The applicant is requested to confirm that these assumptions on process and effluent filtration treatment applied in FSAR Table 11.2-3 are still consistent with the current version of the design and other pending changes to FSAR Section 9.4 systems.

f. A review of Test Abstract 075 (Item 4.4) indicates that the test will confirm alarms and automatic control features and interlocks, but FSAR Section 11.5.3.1.5 and Table 11.5-1 do not describe functions that involve automatic control features or interlocks. The test abstract should be clarified to distinguish when automatic control features and actuation of interlocks are initiated by radiation monitors in systems that have with diverse means of automatic functions (radiological vs. other sensing parameters).

6. Nuclear auxiliary building ventilation system, Monitors R-11 to R-16

a. In FSAR Section 11.5.3.1.6, the description refers to FSAR Fig. 9.4.3-3 in noting that an unmonitored ventilation line discharges air out of the reactor building via the reactor building full flow purge exhaust, which only operates in Mode 5. The description states that since fuel will have been offloaded, the reactor building may be open to the outside atmosphere, and no monitoring is required for that exhaust. The staff disagrees with this conclusion as there are significant levels of radioactive contamination present in open systems and as surface contamination, most of which available as potential airborne radioactivity. The applicant is requested to revise that last sentence in noting that the need for monitoring will be determined by radiological conditions of open plant systems and surface contamination levels in equipment and service compartments of the reactor building and consider outage activities that could generate airborne radioactivity.

b. Confirm whether the information for monitor R-14, see FSAR Table 11.5-1 “Text” header, should be revised to include FSAR Section 9.4.3.2.1 as supporting information to FSAR Table 11.5-1.

c. Confirm whether the descriptors for monitors R-15 and 16, see FSAR Table 11.5-1 “In Process Sample” header, should be revised to specifically state “laboratory room” and “laboratory room exhaust” as supporting information in FSAR Table 11.5-1. See related entry for R-14 for consistency.

d. Since FSAR Section 9.4.3.2.1 does not identify monitors R-14 and R-15, confirm whether the information and functions of these monitors, see FSAR Section 11.5.3.1.6 and Table 11.5-1, need to be included in FSAR Section 9.4.3.2.1 as they monitor air exhausted out of NABS Cell 2 (hot workshop) and Cell 3 (rad laboratory).

e. Confirm whether the information for sampling point R-16 should be added to FSAR Section 9.4.3.2.1 (3rd full para., p.9.4-35) in support of the description of the NABVS filtration train system of the laboratory exhaust shown for consistency with Fig. 9.4.3-5 and FSAR Section 11.5.3.1.6.

f. FSAR Sections 9.4.3.2.1 and 9.4.3.2.3 and Fig. 9.4.3-3 and 9.4.3-4 describe the design of the Nuclear auxiliary building exhaust ventilation system. In part, the design details presented in this FSAR section are used to derive gaseous effluent releases (Ci/yr), which are presented in FSAR Section 11.3.3.2 and FSAR Table 11.3-3. As noted, PWR-GALE code model assumptions and parameters used in this analysis are presented in FSAR Table 11.2-3. Specifically, sheet 3 of Table 11.2-3 assumes continuous filtration via HEPA (99%) and iodine (90%) filter trains. The applicant is requested to confirm that these assumptions on process and effluent filtration treatment applied in FSAR Table 11.2-3 are still consistent with the current version of the design and other pending changes to FSAR Section 9.4 systems.

7. Fuel building ventilation system, Monitors R-17 to R-19

a. Confirm whether the descriptors for monitor R-19, see FSAR Table 11.5-1 “In Process Continuous” and “In-Process sample” entries, should be revised to specifically state “fuel pool floor, Cell 5, or “fuel handling hall, Cell 5” as the area being monitored by this monitor given the use of various descriptors in FSAR Sections 9.4.2 and 11.5.3.1.7 and Test Abstract 081.

b. Confirm whether the information for monitor R-18, see FSAR Table 11.5-1 “Text” header, should be revised to include FSAR Section 9.4.3.2.1 as supporting information to FSAR Table 11.5-1. See related entry for R-14 for consistency.

c. In FSAR Sections 9.4.2.1 and 9.4.2.2.3, the descriptions should be expanded to note that upon detecting high radioactivity levels monitor R-19 diverts the exhaust flow to the SBVS.

d. In FSAR Section 9.4.2.1 (p.9.4-22), the description (see 3rd bullet) should be revised from "… Sections 12.1 and 12.3.3." to read instead as "… Sections 12.1 and 11.3.3."

e. In FSAR Section 9.4.2.5, the citation should also refer to FSAR Section 11.5.3.1.9 (SBVS) as supporting information since upon detecting high levels of radioactivity monitor R-19 would divert the exhaust flow to the SBVS.

f. In supporting information presented in FSAR Tier 2, Section 9.4.2.2.2 states that isolation dampers "… will fail as-is in case of loss of power." One outcome is that dampers could fail in an open position; thereby, venting out contaminated exhaust air to the environment. The applicant is requested to evaluate how this design feature is consistent with the commitment made in FSAR Section 12.3.6 stating that the U.S. EPR design complies with Part 20.1406 by applying design concepts to prevent unintended releases of radioactivity.

g. For monitor R-19, the response is described as ranging from 1.0E-05 to 1.0E+00 rad/hr for noble gases flowing out of the fuel building hall (Cell 5) (FSAR Fig. 9.4.2-1) and going to the NABVS (FSAR Fig. 9.4.3-3) via an exhaust shaft. It is not clear as to what is the basis of this range. It cannot represent a dose rate at the point of measurement within the duct work leading to the exhaust shaft. It may represent an expected range of ambient dose rates within the ambient area of the fuel building hall (Cell 5), but if so, additional information should be provided describing the basis and assumptions. Such information should include key assumptions, e.g., airborne concentrations, dimension and volume of compartments, air exchange rates, etc. since airborne radioactivity levels are compared to concentration limits under Part 20, App. B, Table 1 (Col. 3, occupational) and Table 2 (Col. 1, plant effluents), which are expressed in uCi/ml. The applicant is requested to provide additional information (e.g., as footnotes to FSAR Tables 11.5-1 and 12.3-4 and Test Abstract 081 acceptance criteria) describing the underlying assumptions and basis for using exposure rates rather than process or effluent concentrations of noble gases that would be measured in ventilation exhausts.

h. A review of Test Abstract 081 indicates that the test objective (Item 1), test methods (Item 3), and test acceptance criteria (Item 5) do not differentiate different automatic control functions of radiation monitors R-17 and R-18 vs. that of R-19. For radiation monitors R-17 and R-18, the tests should confirm that the flow is diverted to the NABVS upon detecting elevated levels of radioactivity. For radiation monitor R-19, the test abstract should confirm that the flow is diverted to the SBVS upon detecting elevated levels of radioactivity.

i. FSAR Sections 9.4.2.2.1 and 9.4.2.2.3 and Fig. 9.4.2-1 and 9.4.3-3 describe the design of the Fuel building exhaust ventilation system. In part, the design details presented in this FSAR section are used to derive gaseous effluent releases (Ci/yr), which are presented in FSAR Section 11.3.3.2 and FSAR Table 11.3-3. As noted, PWR-GALE code assumptions and parameters used in this analysis are presented in FSAR Table 11.2-3. Specifically, sheet 3 of Table 11.2-3 assumes continuous filtration via HEPA (99%) and iodine (90%) filter trains. The applicant is requested to confirm that these assumptions on process and effluent

filtration treatment applied in FSAR Table 11.2-3 are still consistent with the current version of the design and other pending changes to FSAR Section 9.4 systems.

8. Radioactive waste processing building ventilation system, Monitors R-20 to R-24

   a. In FSAR Section 9.4.8.2.1 the purpose of the automatic control features are internally inconsistent as to their operation. In FSAR Section 9.4.8.2.1 (2nd para., p.9.4-109), the description states that system exhaust is continuously filtered by two filter systems consisting of pre-filters, HEPA filters, and iodine adsorption charcoal filters. In contrast, In FSAR Section 9.4.8.2.1 (3rd para., p.9.4-109), the description states that if radioactivity is detected, monitors R-20 and R-22 automatically reroute the contaminated airflow to iodine adsorption charcoal filters prior to release to the vent stack. A review of the system flow diagram (Fig. 9.4.8-2) indicates that the flow monitored by R-20 and R-22 can be discharged in two modes: (i) total bypass with no filtration via HEPA and iodine filter trains; or (ii) full filtration via HEPA and iodine filter trains. It is not apparent from the current system diagram as to how a HEPA-filtered only exhaust path would be achieved in normal operation (i.e., with no elevated radioactivity levels). Accordingly, it is not clear as to how radiation monitors R-20 and R-22 would divert the flow only to the iodine filter trains. The applicant is requested to review and revise the operational descriptions of radiation monitors R-20 and R-22 in FSAR Section 9.4.8.2.1 and Fig. 9.4.8-2, FSAR Section 11.5.3.1.8, FSAR Tables 11.5-1 and 12.3-4, and in Test Abstract 080.

   b. In FSAR Section 11.5.3.1.8, the function of monitor R-21 is incomplete. It should be revised to include the provision for iodine sampling, given the description in FSAR Table 11.5-1. Similarly, the description of radiation monitor R-23 in FSAR Table 11.5-1 “In Process Continuous” and In-Process sample” entries should include iodine monitoring and sampling since this part of the exhaust system is equipped with iodine filtration trains.

   c. Confirm whether the information for monitor R-21 in FSAR Table 11.5-1 and FSAR Sections 9.4.8.2.1 and 9.4.8.2.3 is internally consistent with its intended operational function. FSAR Table 11.5-1 describes this monitor only as a sampling point, but FSAR Section 9.4.8.2.3 states that this monitor has alarming functions upon detecting high radioactivity levels. This observation and correction applies as well to Test Abstract 080 (Item 5.3), which lists monitor R-21 under the acceptance criteria in confirming that radiation monitors respond to radiation sources and measurement parameters listed in FSAR Table 11.5-1.

   d. A review of FSAR Section 9.4.8.2.1 (p.9.4-109, 1st full para.) should indicate for technical clarification that this part of the exhaust system services waste processing areas and decontamination rooms since this air flow is always treated by two HEPA and iodine filter trains and not subject to any automatic control features via radiation monitor R-23. As written, this description does not make this important distinction clear in differentiating sources of airborne radioactivity with exhaust flows that are monitored with and without automatic control functions. Any corrections made here as part of this comment should also be addressed in FSAR Table 12.3-4.

e. For monitors R-20 and R-22 to R-24, the ranges presented in FSAR Table 12.3-4 are inconsistent with those of FSAR Table 11.5-1. FSAR Table 12.3-4 assigns ranges of 5.0E-04 to 3.0E+00 uCi, which are not listed or described in FSAR Table 11.5-1. Since the monitors measure airborne radioactivity in ductwork, it is not clear as to what this radiological unit (uCi) means with respect to complying with Part 20, App. B concentration limits (occupational or effluent), which are expressed in uCi/ml.

f. FSAR Sections 9.4.8.2.1 and 9.4.8.2.3 and Fig. 9.4.8-1 and 9.4.8-2 describe the design of the Radwaste building exhaust ventilation system. In part, the design details presented in this FSAR section are used to derive gaseous effluent releases (Ci/yr), which are presented in FSAR Section 11.3.3.2 and FSAR Table 11.3-3. As noted, PWR-GALE code assumptions and parameters used in this analysis are presented in FSAR Table 11.2-3. Specifically, sheet 3 of Table 11.2-3 assumes continuous filtration via HEPA (99%) and iodine (90%) filter trains, where contaminated exhaust from the Radwaste building ventilation system is another process stream contributing to the total effluent source term. The applicant is requested to confirm that these assumptions on process and effluent filtration treatment applied in FSAR Table 11.2-3 are still consistent with the current version of the design and other pending changes to FSAR Section 9.4 systems.

9. Safeguard building ventilation system, Monitors R-25 and R-26

a. Monitor R-26 is depicted in FSAR Table 12.3-4 as having an automatic control feature, but this is contrary to the information presented in FSAR Section 11.5.3.1.9 and Table 11.5-1. While the functions of monitor R-26 is described in FSAR Section 11.5.3.1.9 and Table 11.5-1 and Test Abstract 083, a review of FSAR Sections 9.4.5.2, 9.4.5.3, and 9.4.5.5 indicates it is not described in these sections. The complementary accident functions of monitor R-26 should be included in FSAR Section 9.4.5 for consistency with the information presented in FSAR Section 11.5.3.1.9 and Table 11.5-1 and Test Abstract 083.

b. Confirm whether the information for monitor R-25, see FSAR Table 11.5-1 “Figure” header, should be revised to include FSAR Fig. 9.4.5-2 as supporting information to FSAR Table 11.5-1.

c. Confirm whether the number of accident monitoring channel(s) described in FSAR Table 7.5-1 (one for this system) is consistent with that of FSAR Table 11.5-1, which list two for accident monitoring. In the context of this question, the applicant is requested to compare and revise for consistency the listing of all other accident radiation monitoring channels described in FSAR Tables 7.5-1 and 11.5-1.

d. Confirm whether the information for monitors R-25 and R-26, as presented in FSAR Table 11.5-1, should consider a revision to FSAR Table 9.4.5-1 to include additional details on sensing locations of these two radiation monitors given the details of FSAR Fig. 9.4.3-3 and 9.4.5-2.

e. A review of Test Abstract 083 indicates that the test objective (Item 1), test methods (Item 3), and test acceptance criteria (Item 5) do not differentiate the different automatic control functions of radiation monitor R-25, while R-26 has no automatic control functions. For radiation monitor R-25, the tests should confirm that the flow is diverted to the NABVS iodine filter trains upon detecting elevated levels of radioactivity.

f. For monitor R-26, the response is described as ranging from 1.0E-04 to 1.0E+04 rad/hr for noble gases of various origins (FSAR Fig. 9.4.5.2), including the fuel building, containment building, and the safeguard building, all being discharged to the vent stack after filtration (FSAR Fig. 9.4.3-3). It is not clear as to what is the basis of this dose rate range. It cannot represent a dose rate at the point of measurement within the duct work leading to the vent stack plenum. It may represent an expected range of ambient dose rates in any of the buildings being serviced, but if so, additional information should be provided describing the basis and assumptions. Such information should include key assumptions, e.g., airborne concentrations, relative airflow from each building dimension and volume of compartments, air exchange rates, and which of these buildings is in an accident mode, etc. since airborne radioactivity levels are compared to concentration limits under Part 20, App. B, Table 1 (Col. 3, occupational) and Table 2 (Col. 1, plant effluents), which are expressed in uCi/ml. The applicant is requested to provide additional information (e.g., as footnotes to FSAR Tables 11.5-1 and 12.3-4 and Test Abstract 083 acceptance criteria) describing the underlying assumptions and basis for using exposure rates rather than process or effluent concentrations of noble gases that would be measured in ventilation exhausts.

g. FSAR Sections 9.4.5.2.1 and 9.4.5.2.3 and Fig. 9.4.5-1, 9.4.5-2, and 9.4.3-3 describe the design of the Safeguard building controlled-area ventilation system. In part, the design details presented in this FSAR section are used to derive gaseous effluent releases (Ci/yr), which are presented in FSAR Section 11.3.3.2 and FSAR Table 11.3-3. As noted, PWR-GALE code assumptions and parameters used in this analysis are presented in FSAR Table 11.2-3. Specifically, sheet 3 of Table 11.2-3 assumes continuous filtration via HEPA (99%) and iodine (90%) filter trains, where contaminated exhaust from the Safeguard building controlled-area ventilation system is another process stream contributing to the total effluent source term. The applicant is requested to confirm that these assumptions on process and effluent filtration treatment applied in FSAR Table 11.2-3 are still consistent with the current version of the design and other pending changes to FSAR Section 9.4 systems.

10. Annulus ventilation system, Monitors R-27 and R-28

a. Monitor R-27 is depicted in FSAR Table 12.3-4 as having an automatic control feature, but this is contrary to the information presented in FSAR Section 11.5.3.1.10 and Table 11.5-1. The function of monitor R-28 should be described as that of sampling only.

b. Confirm whether FSAR Sections 6.2.1.7 and 6.2.3.5 (Instrumentation requirements) should refer to FSAR Section 11.5.3.1.10 and Table 11.5-1 for details on this radiation monitor and sampling point.

c. Confirm whether FSAR Section 6.2.3.1 (Design bases) should refer to Part 50, Appendix A, GDC 60 as another relevant design requirement. In a parallel context of this question, the applicant is requested to review and insert, for consistency, the GDC 60 criterion in the design bases of radioactive exhaust ventilation systems equipped with radiation monitoring systems described in FSAR Section 9.4.

d. For monitor R-27, the response is described as ranging from 1.0E-04 to 1.0E+04 rad/hr for noble gases originating from the reactor building annulus (FSAR Fig. 6.2.3-2), and being discharged to the vent stack after treatment through the accident filtration train. It is not clear as to what is the basis of this dose rate range. It cannot represent a dose rate at the point of measurement within the duct work leading to the vent stack plenum. It may represent an expected range of ambient dose rates in the annulus being serviced, but if so, additional information should be provided describing the basis and assumptions. Such information should include key assumptions, e.g., airborne concentrations, relative airflow, annulus building dimension and volume, air exchange rates in an accident mode, etc. since airborne radioactivity levels are compared to concentration limits under Part 20, App. B, Table 1 (Col. 3, occupational) and Table 2 (Col. 1, plant effluents), which are expressed in uCi/ml. The applicant is requested to provide additional information (e.g., as footnotes to FSAR Tables 11.5-1 and 12.3-4 and Test Abstract 077 acceptance criteria) describing the underlying assumptions and basis for using exposure rates rather than process or effluent concentrations of noble gases that would be measured in ventilation exhausts.

e. FSAR Sections 6.2.3.2.1 and 6.2.3.2.2.3 and Fig. 6.2.3-1, 6.2.3-2, and 9.4.3-3 describe the design of the Annulus ventilation system. In part, the design details presented in this FSAR section are used to derive gaseous effluent releases (Ci/yr), which are presented in FSAR Section 11.3.3.2 and FSAR Table 11.3-3. As noted, PWR-GALE code assumptions and parameters used in this analysis are presented in FSAR Table 11.2-3. Specifically, sheet 3 of Table 11.2-3 assumes continuous filtration via HEPA (99%) and iodine (90%) filter trains, where contaminated exhaust from the Annulus ventilation system is another process stream contributing to the total effluent source term. The applicant is requested to confirm that these assumptions on process and effluent filtration treatment applied in FSAR Table 11.2-3 are still consistent with the current version of the design and other pending changes to FSAR Section 9.4 systems.

11. Control room ventilation system, Monitors R-29 and R-30

a. For monitors R-29 and R-30, the response is described as ranging from 1.0E-05 to 1.0E+01 rad/hr for particulates, iodines, and noble gases detected in the air intake of the control room ventilation envelope. Test Abstract 082 refers to FSAR Table 12.3-3 for details on the radiation monitoring system, but the information presented in this table refers yet to another operating range, 1.0E-04 to 1.0E+04

rem/hr. It is not clear as to what is the basis of these different dose rate ranges. It may represent an expected range of ambient dose rates within the control room, but if so, additional information should be provided describing the basis and assumptions. Such information should include key assumptions, e.g., airborne concentrations and relative radionuclide mix (e.g., as noble gases, iodines, and particulates), control room dimensions and volume, air exchange rates in an accident mode, etc.), as airborne radioactivity levels are compared to concentration limits under Part 20, App. B, Table 1 (Col. 3, occupational), which are expressed in uCi/ml, and Note 4 (on unity rule) for mixtures of radionuclides. The applicant is requested to provide additional information (e.g., as footnotes to FSAR Tables 11.5-1, 12.3-3, and 12.3-4 and Test Abstract 082 acceptance criteria) describing the underlying assumptions and basis for using exposure rates rather than influent concentrations of particulates, iodines, and noble gases that would be measured in control room air intakes.

b. A review of FSAR Section 6.4 indicates that a reference to FSAR Section 11.5.3.1.11 and Table 11.5-1 should be added to that of FSAR Section 12.3.4 (5th bullet) since technical details are presented in FSAR Section 11.5.3.1.11.

c. Confirm whether FSAR Section 9.4.1.5 (Instrumentation requirements) should refer to FSAR Section 11.5.3.1.11 and Table 11.5-1 for details on these radiation monitors.

d. In FSAR Section 9.4.1.1 (top of p.9.4-3), confirm that the citation to FSAR Section 6.4.2.4 should be revised to FSAR Section 6.4.2.2 instead, given that the topic addresses radiation monitoring.

e. In Test Abstract 082 (Item 5.5), confirm that the citation to FSAR Table 12.3-3 should be revised to FSAR Table 12.3-4 instead, given that the topic addresses the monitoring of radioactivity in air intakes and not ambient external radiation exposure rates.

12. Access building ventilation system, Monitor R-31

a. Based on a review of FSAR Sections 9.4.14.2.1 and 9.4.14.3.1, confirm whether the descriptions of the system and operation should refer to radiation monitor R-31 and cite FSAR Section 11.5.3.1.12 and Table 11.5-1 for supporting technical details.

13. Liquid radwaste effluent system, Monitor R-32

a. Confirm whether the information for monitor R-32, see FSAR Table 11.5-1 “ACF” header, should be revised since the description of the automatic control features (ACF) is not consistent with FSAR Sections 11.5.3.2 and 11.2.2.1.6. The entry in FSAR Table 11.5-1 does not mention that upon detecting elevated levels of radioactivity, R-32 also closes the upstream valves and shuts down recirculation and discharge pumps. In addition, the discharge valves are shutoff upon the detection of a loss of dilution flow rate, which is part of the basis in deriving and setting alarm set points. The applicant is requested to revise the description of

ACF functions for monitor R-32 in FSAR Table 11.5-1 for consistency with that presented in FSAR Sections 11.2.2.1.6 and 11.5.3.2.

b. A review of the associated Test Abstract 095 (Items 3.2 and 3.3) indicates that the listing of components is inconsistent with FSAR Section 11.2.2 and Table 11.2-2. Confirm whether the listing of components should include the screw centrifuge (feeding the evaporator in addition to the pump) and the spent-resin dewatering subsystem as components to be tested. With respect to FSAR Table 11.2-2 (p.11.2-44), confirm whether the number of cited ultra-filtration units that are part of the design should be changed from one to five instead. If so, confirm that the supporting discussions on FSAR p.11.2-7 (2nd bullet) and p.11.2-25 (last para.) are consistent with the information presented in FSAR Table 11.2-2.

c. A review of the associated Test Abstract 095 (Items 3.5 to 3.12) indicates that the list of operational verifications is inconsistent with FSAR Section 11.2.2 and Table 11.2-2. Confirm whether the listing should verify that R-32 shuts down recirculation and discharge pumps. Confirm that the descriptions of related Acceptance Criteria (Item 5) are fully consistent with updated test descriptions.

14. Unassigned tag monitors, Monitors R-33 and R-34

The table should state that monitor tag numbers R-33 and R-34 are not used in avoiding confusion.

15. Component coolant water system, Monitors R-35 to R-38

a. Confirm whether the information for monitors R-36 and R-37, see FSAR Table 11.5-1 “Text” header, should be revised by adding FSAR Section 9.2.2.3.1 since this section addresses normal operations and functions of these monitors.

b. Confirm whether the information for monitors R-38, see FSAR Table 11.5-1 “Text” header, should be revised by correcting the reference from FSAR Section 9.2.2.2.1 to Section 9.2.2.3.1 as the appropriate section for this information.

c. Confirm whether FSAR Fig. 9.2.2-1 (Component cooling water system, sheet 1) correctly depicts the placement of the four radiation monitors at one single location on the downstream line of the heat exchanger. When compared to FSAR Fig. 9.2.2-1, the placement of the radiation monitors described in FSAR Table 11.5-1 implies a separate system train location for each monitor. The applicant is requested to show the proper placements on the figure, or address the placement of radiation monitors in appropriate footnotes for each train.

d. Confirm whether FSAR Table 9.2.2-2 (CCWS user requirements summary) should be revised to identify alarm functions and operator actions in the event of detecting elevated levels of radioactivity by radiation monitors R-35 to R-38 for consistency with other listed systems. For examples, see FSAR Section 9.2.1 (Essential service water systems), and FSAR Section 9.2.8 (Safety chilled water system) for the listing of various alarm functions and expected operator actions.

16. Fuel pool cooling and fuel purification system, Monitor R-39

a. Confirm whether the information for monitor R-39, see FSAR Table 11.5-1 “Text” header, should be revised by deleting FSAR Table 9.3.2-2 since this table addresses sampling requirements for secondary coolant.

b. A review of FSAR Section 9.1.3 (Fuel pool cooling and purification system) and Fig. 9.1.3-2 (Fuel pool purification system) indicates that the function of sampling point R-39 is not described and shown in system drawings and associated footnotes. The applicant is requested to show the placement of this monitoring point on the figure, or address the placement of this monitoring point in appropriate footnotes.

17. Nuclear sampling system, Monitor R-41

a. A review of FSAR Table 11.5-1 indicates that monitor R-41 is used for monitoring noble gases and collecting gas sample, but FSAR Section 11.5.4.6 states that this monitor is also used to collect liquid samples. None of the supporting technical details presented in FSAR Table 11.5-1 supports the means to collect liquid samples. The applicant should review this information and address this inconsistency in FSAR Section 11.5.4.6 and Table 11.5-1 and Test Abstract 100.

b. Given the purpose of the nuclear sampling system, the applicant is requested to determine whether Test Abstracts 153 and 205 should be added to the listing of the test abstracts in FSAR Table 11.5-1 for radiation monitor R-41 given that it supports some of the TMI-related requirements of Part 50.34(f)(2) items. Confirm that for Test Abstract 153, the listed objectives (Item 1.3) should include new entry (e.g., Item 1.3.9) for the liquid waste management system as a parallel entry to the one already listed for the gaseous waste processing system. Moreover, the acceptance criteria (Item 5) of Test Abstracts 153 and 205 should include new entries that refer to FSAR Section 11.5 and Table 11.5-1, and FSAR Section 9.3.2 and Tables 9.3.2-1 and 9.3.2-2 for details on radiation monitoring and sample collection. Finally, confirm whether the acceptance criteria of Test Abstract 153 (e.g., inserted as new Items 5.4 and 5.5) should be revised to include a reference to FSAR Table 9.3.2-1 (Primary side sampling points) and Table 9.3.2-2 (Secondary side sampling points) for criteria (e.g., monitoring methods and sensitivity) for instrumentation used to monitor and confirm the integrity of systems known or likely to contain radioactive materials. In this context, FSAR Table 11.5-1 should be reviewed to ensure that Test Abstract 153 is added as supporting information or as a prerequisite to the radiation monitors listed in that table, such as monitors R-35 to R-38, R-41, R-46 to R-49, R-50, R-59, R-60, R-66 to R-69, and R-70.

18. Previously assigned monitor, Monitor R-42

a. The table should state that monitor tag number R-42 is not used since it is no longer associated with the laundry monitoring system. Given this deletion in FSAR Rev. 5, Footnote 11 to FSAR Table 11.5-1 should be revised to remove the “CR051: Frisker” designation since it no longer applies.

19. Solid waste management system, Monitor R-43

a. A review of Test Abstract 094 indicates that SWMS components listed in test methods (Item 3.1) is not consistent with those listed in FSAR Section 11.4.2.3.1 and Table 11.4-14. For example, the test abstract omits to include the cementing station and concentrate recirculation pumps. The applicant is requested to review the listing of components presented in Test Abstract 094 and make it consistent with that presented in FSAR Section 11.4.2.3.1 and Table 11.4-14.

b. While Test Abstract 094 is noted to be the primary test abstract for this system, the listing should also refer to Test Abstract 093 as a complementary supporting test addressing the structural integrity of the tubular shaft storage and drum store facilities in confirming that there is enough concrete shielding to safely store waste containing the expected inventories of radioactivity described in FSAR Sections 11.4 and 12.2. The applicant is requested to add Test Abstract 093 to FSAR Table 11.5-1.

20. Nuclear island vent and drain system, Monitors R-40 and R-44

a. Confirm whether the information for monitors R-40 and R-44, see FSAR Table 11.5-1 “Text” header, should be revised to include FSAR Section 9.3.3 (Equipment and floor drainage system) as supporting information. In addition, the operational and safety functions of these monitoring points should be described in these sections.

b. Confirm whether the information for monitors R-40 and R-44, see FSAR Table 11.5-1 “Figure” header, should be revised to include FSAR Fig. 9.3.2-1 (Nuclear sampling system) and Fig. 9.3.3-1 (Nuclear island drain and vent system) as supporting information.

c. A review of FSAR Fig. 9.3.2-1 (Nuclear sampling system) and Fig. 9.3.3-1 (Nuclear island drain and vent system) indicates that radiation monitoring points R-40 to R-44 are not shown in system flow diagrams, nor cited by tag numbers in footnotes. The applicant is requested to add specific references to these radiation monitoring points.

d. Given the purpose of the nuclear island vent and drain system, the applicant is requested to determine whether Test Abstract 205 should be added to the listing of the test abstracts in FSAR Table 11.5-1 for radiation monitors R-40 and R-44 given that they support some of the TMI-related requirements of Part 50.34(f)(2) items.

21. Reactor boron and water make system, Monitor R-45

a. Confirm whether the information for monitor R-45, see FSAR Table 11.5-1 “Figure” header, should be revised by deleting FSAR Fig. 9.3.4-4 (reactor boron and water makeup system) and adding instead FSAR Fig. 9.3.4-6 (coolant treatment system) as supporting information to FSAR Table 11.5-1. The location of sampling point R-45 should also be shown in the appropriate figure.

22. Steam generator blowdown system, Monitors R-46 to R-49

a. Confirm whether the information for monitors R-46 to R-49, see FSAR Table 11.5-1 “Process System and Initial Test Program” header, should be revised by adding Test Abstract 072 (SGBD demineralizer system). The conduct of this test has associated functions with monitors R-46 to R-49, including interdependent logic in protecting the SG BD demineralizers when SG blowdown exceeds a preset temperature.

b. Confirm that the primary test abstracts for this system should be Test Abstracts 067 and not 071, as shown in FSAR Table 11.5-1 “Process System and Initial Test Program” header.

c. Confirm whether FSAR Section 10.4.8.1 (Design bases) should be revised to include radiation monitor R-49 since it is omitted in that part of design commitments.

d. A review of FSAR Fig. 10.4.8-1 indicates that radiation monitors R-46 to R-49 are not shown in the system flow diagram, nor cited by tag numbers in footnotes. The applicant is requested to add in FSAR Fig. 10.4.8-1 specific references to these four radiation monitors.

e. A review of FSAR Section 5.2.5.3.2 (Steam generator tubes) indicates that there are no references to the function and performance criteria presented in FSAR Sections 11.5.3.1.2 and 11.5.4.3 and Table 11.5-1 for the associated radiation monitoring systems. The applicant is requested to add these references from FSAR Section 11.5 for technical details in FSAR Section 5.2.5.3.2. [Note: This observation and request for evaluation apply to FSAR Section 5.2.5.3.3 (Component cooling water system), and FSAR Section 5.2.5.5.4 (Main steam line radiation monitors for steam generator tube leakage).]

f. As the staff expects a number design changes to the SGBD, the staff retains the option of reviewing the proposed revision to the steam generator blowdown system. The review will assess any impact of design changes on FSAR Sections 9.3.2 and 11.5.4.3 and FSAR Table 11.5-1 and Test Abstracts 067, 071 and 072.

23. Turbine building drain system, Monitor R-50

a. Confirm whether the information for monitor R-50, see FSAR Table 11.5-1 “In-Effluent continuous” header, should be revised to include an equipment tag number (e.g., xxxxCR001) for consistency in the presentation of technical details with other radiation monitors that perform the same function.

24. Turbine building clean drain system, Monitor R-65

a. Confirm whether the information for monitor R-65, see FSAR Table 11.5-1 “Figure” header, should be revised to include a figure citation showing the location of that sampling point as supporting information to FSAR Table 11.5-1. The location of sampling tag R-65 should be shown in the appropriate FSAR Section 10.4 figure and described in FSAR Section 10.4.1.2.

25. Chemical and volume control system – high pressure coolers, Monitors R-51 to R-54

a. Confirm whether the information for monitor R-54, see FSAR Table 11.5-1 "Text" header, should be revised from FSAR Table 9.3.2-2 to Table 9.3.2-1 instead since this is where the monitor is listed.

b. Confirm whether FSAR Table 9.2.2-2 (CCWS user requirements summary) should be revised to identify alarm functions and operator actions in the event of detecting elevated levels of radioactivity by radiation monitors R-51 to R-54 for consistency with other listed systems. For examples, see FSAR Section 9.2.1 (Essential service water systems), and FSAR Section 9.2.8 (Safety chilled water system) for the listing of various alarm functions and expected operator actions.

26. Component cooling water system, Monitor R-64

a. Confirm whether the information for monitor R-64, see FSAR Table 11.5-1 "Text" header, should be revised by deleting FSAR Section 9.2.8.4 since this section address the safety chilled water system.

b. Confirm whether the description of the radiation monitoring functions in FSAR Section 9.2.2.3.1 (see partial description on p.9.2-37) should include monitors R-51 to R-54 and sampling point R-64, given that they are part of the system's description in FSAR Section 11.5.4.17 and Table 11.5-1.

c. Confirm whether Part 50, App. A, GDC 60 should be added to FSAR Section 9.2.2.1 (Design bases) since this criterion applies to radiation monitoring and sampling equipment.

27. Main steam lines, Monitors R-55 to R-58

a. A review of FSAR Rev. 5, Section 11.5.4.1 indicates that the response characteristics of these radiation monitors were revised when compared to Rev. 4.

i. The estimated N-16 concentration (top para., p.11.5-16) is now stated to be 2.0E-05 uCi/cc as opposed to 4.5E-06 uCi/cc in the prior revision.

ii. At 10% power, the instrumentation response range (bottom para., p.11.5-17) is now stated to be 7.5E-05 uCi/cc as opposed to 1.7E-07 uCi/cc in the prior revision.

iii. At 100% power, the instrumentation response range (bottom para., p.11.5-17) is now stated to be 2.0E-05 uCi/cc as opposed to 4.5E-06 uCi/cc in the prior revision.

iv. The corresponding range of external radiation levels (bottom para., p.11.5-17) is now stated to be 0.6 to 16.2 uR/hr as opposed to 0.14 to 3.6 uR/hr in the prior revision.

v. The stated ranges are also inconsistent with that presented in FSAR Table 11.5-1, see header "Noble gas, H-3 or N-16 monitor range."

The revision does not explain the basis of a 4-fold increase in estimated N-16 concentrations and external radiation levels. The applicant is requested to provide the justification for the revised response ranges in concentration levels and external radiation exposure rates for staff evaluation. (Note: As part of the prior evaluation, the staff had conducted a review of the associated calculation package and would do so again, if needed.)

b. A review of Test Abstract 062 indicates that the Acceptance Criteria (Item 5.7) refer to FSAR Section 11.5.4.1 and Table 11.5-1 for information on the containment high range activity signal. It should be noted that this information is presented in FSAR Section 12.3 and not in FSAR Section 11.5. The applicant should revise the citation for the criteria to FSAR Section 12.3 instead.

c. A review of FSAR Section 11.5.2 indicates that references to FSAR Sections 3.10 and 3.11 should be reviewed in confirming that the information on radiation monitors is consistently presented between FSAR Table 11.5-1 and FSAR Sections 3.10 and 3.11. For example, FSAR Table 3.11-1 (sheet 101 of 133) lists four N-16 gamma monitors (shown as BBX series) that are not listed in FSAR Tables 11.5-1 and 12.3-3. It is not clear if the BBX series N-16 radiation monitors are in addition to radiation monitors R-55 to R-58 or are extraneous to the listing presented in FSAR Table 3.11-1. In addition, FSAR Table 7.5-1 (item 18) assigns two accident monitoring channels, but FSAR Table 11.5-1 refers to four channels. Beyond radiation monitors R-55 to R-58, the applicant is requested to review the radiation monitors listed in FSAR Table 3.11-1 (sheets 72, 73, 74, 81, and 101) and confirm that system nomenclatures, instrumentation tag numbers, and assignment of safety class (S vs. NS-AQ) and PAM functions and inventory are consistent and complete when compared to FSAR Tables 11.5-1, 12.3-3, 7.3-1, and 7.5-1. The applicant should identify which radiation monitoring instrumentation falls within these requirements and update FSAR Sections 3.10 and 3.11 tables, as applicable. Finally, a review of FSAR Sections 11.5.4 and 7.1.1.1 (U.S. EPR I&C Systems) indicates that the 10th bullet (see p.7.1-6) should include a citation for FSAR Chapter 12 to those already listed since FSAR Chapter 12 describes systems that rely on radiation monitoring for process indications and component actuation.

28. Safety chilled water system, Monitors R-59 and R-60

a. Confirm whether FSAR Section 9.2.8.6 (Instrumentation requirements) should refer to FSAR Section 11.5.4-18 and Table 11.5-1 for details on radiation monitors R-59 and R-60.

b. Confirm whether FSAR Table 9.2.8-3 (Safety chilled water Instrumentation) should be revised to identify alarm functions and operator actions in the event of detecting elevated levels of radioactivity by radiation monitors R-59 to R-60 for consistency with other listed system components.

c. Confirm whether Part 50, App. A, GDC 60 should be added to FSAR Section 9.2.8.1 (Design bases) since this criterion applies to radiation monitoring and sampling equipment R-59 and R-60.

29. Safety chilled water for gaseous waste, Monitor R-61

    a. Confirm whether the information for monitor R-61, see FSAR Table 11.5-1 “Text” header, should be revised to include FSAR Sections 9.2.8 and 9.2.8.4. In addition, the operational and safety functions of this monitor should be described in these two sections.

    b. A review of FSAR Fig. 9.2.8-1 and 9.2.8-2 indicates that sampling point R-61 is not shown on either system drawing. The applicant is requested to add R-61 to the appropriate FSAR Section 9.2.8 system drawing.

30. Unassigned tag monitors, Monitors R-62 and R-63

The table should state that monitor tag numbers R-62 and R-63 are not used to avoid confusion.

31. Essential service water system – monitoring train, Monitors R-66 and R-69

    a. Confirm whether the information for monitors R-66 to R69, see FSAR Table 11.5-1 “Text” header, should be revised to include FSAR Sections 9.2.1.4 and 9.2.1.5 for supporting information. In addition, the operational details and safety functions of these monitors (and associated sampling point R-70) should be described in these two sections.

    b. Confirm whether FSAR Fig. 9.2.1-1 (Essential service water system, sheet 2) correctly depicts the placement of the four radiation monitors at one single location on the downstream line of the heat exchanger. When compared to FSAR Fig. 9.2.1-1, the placement of the radiation monitors described in FSAR Table 11.5-1 implies a separate train location for each monitor. The applicant is requested to show the proper placements (each train) on the figure, or address the placement of radiation monitors in appropriate footnotes.

    c. Confirm whether FSAR Table 9.2.1-3 (Alarm summary) should be revised to identify alarm functions and operator actions in the event of detecting elevated levels of radioactivity by radiation monitors R-66 to R-69 for consistency with other listed system components.

    d. Confirm whether FSAR Section 9.2.1.7.4 (Instrumentation requirements) should refer to FSAR Section 11.5.4.9 and Table 11.5-1 for details on these radiation monitors.

    e. A review of Test Abstract 048 indicates that the test objective (Item 1.6), test methods (Items 3.16 and 3.18), and test acceptance criteria (Item 5.4) refer to tests that would confirm the operation of automatic control functions of radiation monitors R-66 to R-69 and R-70. A review of FSAR Section 11.5.4.9 and Table 11.5-1 indicates these monitors have no automatic control functions. The applicant is requested to correct this inconsistency for radiation monitors R-66 to R-70.

32. Essential service water system – dedicated train, Monitor R-70

See comments noted on radiation monitors R-66 to R-69.

33. Reference to Information Presented in FSAR Chapter 14.2.12, ITP Test Abstracts

a. In FSAR Table 11.5-1, Footnote 10 states that other relevant test abstracts are listed in providing supplemental information. Among these, Test Abstract 144 (Process and effluent radiological monitoring) is cited for active radiation monitoring systems. The apparent exceptions are for monitor sampling point tag numbers R-16, R-21, R-28, R-31, R-39, R-40, R-44, R-45, R-61, and R-65, which are used only for sample collection. A review of the information presented in Test Abstract 144 indicates that one of the test objectives (Item 1.3) is to confirm that sampling points provide the means to collect representative samples. However, inconsistencies were noted in the listing of prerequisites (Item 2.8) as it includes specific requirements only for two monitoring sampling points, R-50 (turbine building drain) and R-61 (chilled water for gaseous waste). As noted above, the requirements of Test Abstract 144 would seem to apply to many other radiation monitoring and sampling points, given the information presented in FSAR Table 11.5-1. The applicant is requested to review the list of prerequisites (Item 2) and test methods (Item 3) and describe the applicability of this test and differentiate specific requirements for monitoring tag numbers that perform only on liquid and gaseous sampling and not equipped with electronic radiation monitoring instrumentation. For sample collection from gaseous process streams and effluent release points, such requirements should address differences when sampling for particulates, iodines, tritium, and noble gases.

b. A review of Test Abstracts 100 (Nuclear sampling and severe accident system), 153 (Integrity of systems likely to contain radioactive materials), 155 (Post-accident monitoring instrumentation), and 204 (Sampling primary and secondary system) revealed similar inconsistencies with respect to monitoring functions. In addition to monitor R-41, it is not clear as to why monitors R-10, R-40 and R-44 are not integrated in the descriptive functions of these tests given the information presented in FSAR Sections 11.5.3 and 11.5.4 and Table 11.5-1. As with the above observation, the tests do not clearly differentiate monitoring and sampling requirements between liquid and gaseous streams, and address differences in collecting samples in the forms of particulates, iodines, tritium, and noble gases.

c. A review of Test Abstract 090 (Plant laboratory equipment) indicates that this test should be assigned to all sampling points that will rely on laboratory analyses (e.g., chemical separation and analysis via alpha, beta, and gamma counting and gamma spectroscopy) in identifying radionuclides and levels of radioactivity in multi-media samples. The applicant is requested to confirm whether Test Abstract 090 should be added to FSAR Table 11.5-1 for sampling point tag numbers R-16, R-21, R-28, R-31, R-39, R-40, R-44, R-45, R-61, and R-65. The applicant is requested to add sample collection and analyses associated with the information presented in FSAR Tables 12.3-4, 9.3.2-1 and 9.3.2-2 into Acceptance Criteria (Item 5.3) of this test abstract.

d. A review of test abstracts (Item 3 describing test methods) indicates that for radioactive waste management systems described in FSAR Sections 11.2, 11.3, and 11.4, the associated test abstracts are inconsistent in listing components that should be tested. For example, Test Abstract 095 (liquid waste management) presents a partial listing, Test Abstract 099 (gaseous waste management – radiation monitoring) identifies none, Test Abstract 216 (gaseous waste management – combustible gas control) identifies none, and Test Abstract 094 (solid waste management) presents a partial listing. The applicant is requested to review these test abstracts and update the listing of system components in Item 3 (Test methods) that require testing and identify appropriate test acceptance criteria.

34. As noted in the introduction, the observations noted above supersede and subsume the open items in RAI 528, Question 11.05-28 on FSAR Chapter 11 and RAI 527, Question 14.02-163, on FSAR Section 14.2.12 for the related test abstracts. Specifically:

a. For RAI 528, Question 11.05-28, the information presented in FSAR Rev. 5 was found to be not acceptable in addressing the issues noted in Items 4, 7, 8, 13, 22, 25, 27, 28, 29, 32, 34, 35, 36, 37, 38, and 39. Given their inclusion in this supplemental RAI, this step closes Items 4, 7, 8, 13, 22, 25, 27, 28, 29, 32, 34, 35, 36, 37, 38, and 39 out of RAI 528, Question 11.05-28. The information in FSAR Rev. 5 was found to be acceptable for the remaining items listed in RAI 528, Question 11.05-28, and, therefore, closed out in the context of this supplemental RAI. The topics of concern to the staff are introduced in the above subsections as linked to system descriptions and radiation monitor tag numbers initially identified in RAI 528.

b. For RAI 527, Question 14.02-163, the information presented in FSAR Rev. 5 was found to be acceptable in responding to items 1 to 7, which are now closed. For RAI 527, Question 14.02-163, items 8, 9, and 10, the information in Rev. 5 was found to be inadequate and the topics are carried forward in this compilation. Given their inclusion in this supplemental RAI, this step also closes items 8, 9, and 10. The topics of concern to the staff are introduced in the above subsections as linked to system descriptions and radiation monitor tag numbers identified initially in RAI 527.

35. This review does not address pending design changes to FSAR Section 10.4.8 on the steam generator blowdown system (SGBD) and FSAR Section 9.4 on process and effluent filtration treatment systems. Specifically:

a. In considering modifications to the SGBD system, the staff will review and assess whether the information on radiation monitoring presented FSAR Section 11.5.4.3, Table 11.5-1, and Test Abstract 067 provide the means to comply with NRC regulations under Part 20, Appendix B, Table 2, effluent concentration limits, given NRC and industry guidance.

b. For exhaust ventilation systems, the staff will review process and effluent treatment systems to confirm that radiation monitoring features described FSAR Sections 11.5.3 and 11.5.4.3 and Table 11.5-1, along with related test abstracts,

provide the means to comply with NRC regulations under Part 20, Appendix B, Table 2, effluent concentration limits, given NRC and industry guidance.

c. For ventilation exhaust systems subject to design modifications, the staff will review process and effluent treatment systems to confirm that assumptions on process and effluent filtration treatment (continuous filtration vs. only upon detecting elevated radioactivity levels, and exhaust flow rates) described in FSAR Table 11.2-3 (sheet 3) are consistent with the current version of the design, including pending changes to FSAR Section 9.4 design features, against assumptions used in deriving routine effluent releases presented FSAR Rev. 5, Section 11.2.3 (Radioactive effluent releases), FSAR Section 11.3.3.2 (Estimated annual releases), and FSAR Section 11.3.3.4 (Estimated doses) in complying with NRC regulations under Part 20.1301 and 20.1302; Part 20, Appendix B, Table 2, effluent concentration limits; and Part 50 Appendix I design objectives.

Response to Question 11.05-29:

A response to this question will be provided by August 14, 2015.