ArevaEPRDCPEm Resource

From: Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent: Wednesday, October 14, 2009 5:45 PM
To: Tesfaye, Getachew
Cc: BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); WILLIFORD Dennis C (AREVA NP INC)
Subject: Response to U.S. EPR Design Certification Application RAI No. 273, FSAR Ch. 11
Attachments: RAI 273 Response US EPR DC.pdf

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 273 Response US EPR DC.pdf" provides technically correct and complete responses to 10 of the 42 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 273, Questions 11.02-11, 11.03-7, 11.03-9, 11.03-10, 11.04-10, 11.04-11 and 11.04-12.

The following table indicates the respective pages in the response document, "RAI 273 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

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A complete answer is not provided for 32 of the 42 questions. The schedule for a technically correct and complete response to these questions is provided below.

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RAI 273 — 11.02-5	November 6, 2009
RAI 273 — 11.02-6	November 6, 2009
RAI 273 — 11.02-7	November 6, 2009
RAI 273 — 11.02-8	November 6, 2009
RAI 273 — 11.02-9	November 6, 2009
RAI 273 — 11.02-12	November 6, 2009
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RAI 273 — 11.02-15	November 6, 2009
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RAI 273 — 11.03-5	November 6, 2009
RAI 273 — 11.03-8	November 6, 2009
RAI 273 — 11.03-12	November 6, 2009
RAI 273 — 11.03-13	November 6, 2009
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RAI 273 — 11.04-15	November 6, 2009
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RAI 273 — 11.05-7	November 6, 2009
RAI 273 — 11.05-8	November 6, 2009
RAI 273 — 11.05-9	November 6, 2009
RAI 273 — 11.05-10	November 6, 2009
RAI 273 — 11.05-11	November 6, 2009
RAI 273 — 11.05-12	November 6, 2009

Sincerely,

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To: ZZ-DL-A-USEPR-DL
Cc: Dehmel, Jean-Claude; Frye, Timothy; Jennings, Jason; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 273 (3450, 3459,3460, 3462), FSAR Ch. 11

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on August 11, 2009, and discussed with your staff on August 25, 2009. Draft RAI Question 11.04-9 was deleted, and Draft RAI Questions 11.02-4, 11.02-14, 11.03-4, 11.03-12, 11.03-13, 11.04-7, 11.04-12, 11.05-1, 11.05-4, and 11.05-5 were modified as a result of that discussion. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
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Hearing Identifier: AREVA_EPR_DC_RAIs
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Response to

Request for Additional Information No. 273 (3450, 3459, 3460, 3462), Revision 0

9/14/2009

U.S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 11.02 - Liquid Waste Management System
SRP Section: 11.03 - Gaseous Waste Management System
SRP Section: 11.04 - Solid Waste Management System
SRP Section: 11.05 - Process and Effluent Radiological Monitoring Instrumentation and Sampling Systems

Application Section: Chapter 11

QUESTIONS for Health Physics Branch (CHPB)

Question 11.02-4:

In Section 11.2.1, the FSAR describes the design basis of the LWMS. However, a review indicates that the design basis does not acknowledge SRP acceptance criteria, such as IE Bulletin 80-10 and industry standards. Also, the design basis does not consistently acknowledge the related commitments described in U.S. EPR Conformance with Standard Review Plan (NUREG-0800) Technical Report (AREVA, ANP-10292, Rev. 1). Accordingly, the applicant is requested to review the commitments made in ANP-10292 (Rev, 1) and Section 11.2 of the SRP, and confirm that the design basis is consistent with applicable SRP criteria and Regulatory Guide 1.206, and, if not, provide the justification that the alternate approach provides acceptable methods of compliance with NRC regulations.

Response to Question 11.02-4:

A response to this question will be provided by November 6, 2009.

Question 11.02-5:

In Sections 11.2.2.1.3, 11.2.2.1.6, and 11.2.2.2.3, the FSAR states that aerobic bacteria, chelating and anti-foaming agents will be used as chemical additives in treating some types of radwastes and for removing encrusted solids in the evaporator. Distillate discharges from the evaporator may be sent to the demineralizer system for further processing in removing radioactivity. The introduction of such chemical additives does not address NRC concerns on the generation of explosive gas mixtures (e.g., hydrogen and methane) and possibility of chelating and antifoaming agents causing exothermic reactions when coming in contact with ion-exchange resins. For example, IE Information Notices 83-14, 84-72, 88-08, and 90-50 and NUREG/CR-4601 caution power plant operators and waste generators about the introduction of microbial organisms and organic chemicals in waste streams that would come in contact with ion-exchange resins. Also, the introduction of chemical agents may reduce ion-exchange capacity and decontamination factors of ion-exchange resins; thereby, resulting in higher discharges of radioactivity levels. Accordingly, the description of this operational concept should acknowledge prior NRC information notices, identify measures that will be implemented in avoiding the inadvertent generation of explosive gas mixtures, monitoring system overpressures and temperature rises before exothermic reactions compromise the integrity of LWMS subsystems, and identify related operational requirements for consideration by COL applicants and holders.

Response to Question 11.02-5:

A response to this question will be provided by November 6, 2009.

Question 11.02-6:

In Section 11.2.2, the FSAR states that the radwaste processing building has spare space for the optional use of vendor-provided mobile waste processing equipment. A review of FSAR Figures 11.2-1 to 11.2-3 reveals that there are no connection points into existing LWMS subsystems to which mobile or skid-mounted processing equipment would be connected to. Accordingly, the LWMS drawings should be reviewed and evaluated as to whether such connections should be shown or footnoted in the appropriate subsystem drawings. In addition, the discussion should be expanded to address connections for support services (e.g., compressed air, water, radwaste ventilation, etc.), contamination controls in the context of IE Bulletin 80-10 and Part 20.1406 and RG 4.21, and address the need for the use of permanent or temporary radiation shielding in keeping ambient radiation exposure rates ALARA.

Response to Question 11.02-6:

A response to this question will be provided by November 6, 2009.

Question 11.02-7:

In Section 11.2.2.3, the FSAR describes a process by which radioactive process and effluent samples will be collected from various segments of the LWMS. However, a review of FSAR Figures 11.2-1 to 11.2-3 reveals that there are no sampling points identified in LWMS subsystems. A review of FSAR Tier 1, Figure 1.3-1 and FSAR Tier 2, Figure 1.7-1 indicates that there are no P&ID symbols for sampling points. Accordingly, the LWMS P&ID drawings and supporting legends in FSAR Tier 1 and 2 figures should be revised to include the locations and identification of sampling points in all associated LWMS subsystems.

Response to Question 11.02-7:

A response to this question will be provided by November 6, 2009.

Question 11.02-8:

In Section 11.2.2.2.3 and Figure 11.2-3, the FSAR describes the demineralizer subsystem and states that the inlet to the subsystem is equipped with prefilters to remove fine particles. A review of the drawing indicates that there are no filters to remove resin fines out of the demineralizers before sending process waste streams to the monitoring tanks for release to the discharge canal. Without resin traps in the outlet stream of the demineralizer, there is the possibility that high radioactivity resin fines could be discharged in the environment. Accordingly, the applicant should review the design and consider the installation of resin traps on the discharge line after the last demineralizer column so as to not exceed effluent concentration limits of Appendix B to Part 20 during releases via the LWMS discharge line.

Response to Question 11.02-8:

A response to this question will be provided by November 6, 2009.

Question 11.02-9:

In Section 11.2.2.4, the FSAR provides description of LWMS subsystem components. A review of the discussions indicates that the text does not match the details in the corresponding subsystem figures. For example:

1) The liquid radwaste storage tanks are described as having connections to the radwaste building ventilation system, but the drawing does not show such connections for any of the tanks. In contrast, the drawing for the evaporator does show a connection to the radwaste building ventilation system (see "KLF" point).
2) The drawing for the concentrate tanks shows two connections to the tank while the text states that there are nine connections, four on the top, four on the side, and one at the bottom.
3) The drawing for the centrifuge shows that two tanks are connected to the system for the collection of solids and sludge, but the text refers to drums being used for that purpose. The drums or connections to replaceable drums are not shown in the drawing.
4) The level of details and description of components for the demineralizer system is inconsistent with the corresponding drawings for the other subsystems. The drawing also shows components that are not described in the text, e.g., chemical additive system, and the text describes components that are not shown in the drawing, e.g., spent resin drying subsystem.
5) The description of the distillate tank, evaporator system, states that "… the distillate tank is treated waste water with little or no contamination." This statement is incorrect since the evaporator removes only radioactive materials suspended in particulate forms, while the presence and concentration of tritium in the collected distillate remains unchanged as compared to initial concentrations of influent streams to the evaporator.

Collectively, such types of observations apply to nearly all LWMS subsystems and should be reviewed and corrected accordingly.

Response to Question 11.02-9:

A response to this question will be provided by November 6, 2009.

Question 11.02-10:

In Section 11.2.2.4, the FSAR describes two design features that have not been evaluated as to the potential for radioactive cross contamination of non-radioactive systems and possibility for unmonitored and uncontrolled releases. The first design features is associated with spargers in liquid radwaste storage tanks designed to introduce compressed air into liquid radwaste. The second instance is associated with the evaporator vapor compressor shaft liquid sealing system where seal water from the shaft seal may be recycled to the demineralizer water distribution system or discharged to the distillate tank. In either case, the design should acknowledge NRC concerns identified in IE Bulletin 80-10 and requirements of Part 20.1406 and guidance of RG 4.21 in preventing non-radioactive systems from becoming contaminated and avoiding unmonitored and uncontrolled releases. These design features should be evaluated and the FSAR should describe system features that would prevent the compressed air and demineralizer supply systems from becoming contaminated by liquid radwaste or radioactive gases contained in tanks and vessels.

Response to Question 11.02-10:

The demineralized water distribution system (DWDS) supplying the evaporator vapor compressor shaft liquid sealing system was evaluated in the Response to RAI 228, Question 12.03-12.04-10. As a result of this evaluation, U.S. EPR FSAR Tier 2, Section 12.3.6.5 was added to address contamination control for systems, including the radioactive waste management system, the compressed air system, and the demineralized water distribution system.

The DWDS is protected from contamination by the system design and multiple interface barriers. The DWDS operating pressure is higher than the interfacing systems; this system pressure differential at the interface prevents contamination of the DWDS. Contamination of the DWDS during pressure loss is prevented by defense-in-depth consisting of multiple barriers such as isolating valves, check valves, air gaps, and anti-siphoning features that isolate and prevent back flow. These mechanical barriers are part of the interfacing systems or DWDS. The DWDS has additional barriers to prevent upstream contamination such as isolating valves and check valves located at the nuclear island building entrances to further prevent upstream contamination outside of the nuclear island. The overall design configuration of the DWDS and the contaminated interfacing systems contain sufficient barriers to prevent radioactive contamination of the DWDS.

Similarly, the compressed air distribution system has much higher design and operating pressures than that of the liquid waste storage tank, creating a pressure boundary. Control valves act as mechanical barriers.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 11.02-11:

In Section 11.2.2.5.2, the FSAR lists a number of items associated the pre-operational inspection program. Among others, one item listed addresses “demineralizer resin bed loading capacity.” The resin capacity is dependent on the installation of specified sizes of demineralizer columns, a step which should be confirmed as part of the post-construction inspection and system turnover. An equally important inspection step, not listed, is ensuring that the proper types and amounts of adsorption and filtration media have been initially loaded in each ion-exchange column. Accordingly, this listing should be revised to include a step ensuring that the proper types and amounts of adsorption media have been initially added to each LWMS subsystem. The listing should include similar provisions for portions of LWMS subsystems that rely on pre- and main filters and ultra-filtration media.

Response to Question 11.02-11:

The following additional steps will be included as a part of the pre-operational inspection and included in U.S. EPR FSAR Tier 2, Section 11.2.2.5.2:

- Proper types and amounts of adsorption and filtration media have been loaded into each demineralizer resin bed.
- Proper filter media, for the pre-filters, ultra-filters and main filters, have been loaded into the filter housings.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 11.2.2.5.2 will be revised as described in the response and indicated on the enclosed markup.

Question 11.02-12:

In Table 11.2-1, the FSAR provides estimates of processing rates for LWMS subsystems. A review of the discussion presented in Section 11.2.1.2.3 indicates that one operational option is to wait for "…natural radioactive decay…" to reduce activity level below release limits. Given that most of the radioactivity present in liquid radwaste is associated with long-lived radionuclides, the processing rates described in Table 11.2-1 should be qualified as to whether radioactive decay is being considered for specific waste streams and reflected in the stated processing rates of Section 11.2.1.2.1 and Table 11.2-1 and applied input rates for the GALE code analysis described in FSAR Table 11.2-3 in assessing offsite releases and doses to members of the public.

Response to Question 11.02-12:

A response to this question will be provided by November 6, 2009.

Question 11.02-13:

In Section 11.2.2.4.1, the FSAR states that the activity measurement tank, containing two radiation detectors, is located downstream of the release isolation valves. However, a review of FSAR Figure 11.2-1 indicates that two radiation detectors are located before the two isolation valves and not after. Also, the figure does not show the “activity measurement tank.” Accordingly, these inconsistencies should be reconciled and the descriptions of this portion of the system and figure depictions should match.

Response to Question 11.02-13:

A response to this question will be provided by November 6, 2009.

Question 11.02-14:

In Section 11.2.4, the FSAR presents the results of a cost-benefit analysis (CBA) in justifying that no system augmentation is needed given the requirements of Appendix I to Part 50. A review of the assumptions indicates that a 60-year life cycle was applied in the analysis for the selected radwaste processing equipment, while RG 1.110 applies a 30-year life cycle. Given the heavy duty operational cycle of such equipment, the CBA should provide the technical justification for an expected operational life of 60 years. Also, the CBA should provide the processing capacity rate of the supplemental demineralizer subsystem. The applicant is requested to provide sufficient information to enable the staff to conduct an independent confirmation of the CBA results.

Response to Question 11.02-14:

A response to this question will be provided by November 6, 2009.

Question 11.02-15:

A review of FSAR Table 11.2-2 and Figures 11.2-1 to 11.2-3 indicates that the listing of components in Table 11.2-2 is inconsistent with system descriptions. For example, Table 11.2-2 does not list components for the demineralizer system. Similarly, Table 12.2-2 lists components that are not shown in related drawings, e.g., the activity measurement tank. Accordingly, the text, tables, and figures should be reviewed and updated to include a complete and consistent presentation of the information for each LWMS subsystem.

Response to Question 11.02-15:

A response to this question will be provided by November 6, 2009.

Question 11.03-4:

In Section 11.3.1, the FSAR describes the design basis of the GWMS. However, a review indicates that the design basis does not acknowledge SRP acceptance criteria, such as Regulatory Guide 1.140 and IE Bulletin 80-10. Also, the design basis does not consistently acknowledge the related commitments described in U.S. EPR Conformance with Standard Review Plan (NUREG-0800) Technical Report (AREVA, ANP-10292, Rev. 1). Accordingly, the applicant is requested to review the commitments made in ANP-10292 (Rev, 1) and Section 11.3 of the SRP and Regulatory Guide 1.206 and confirm that the design basis is consistent with applicable SRP criteria and, if not, provide the justification that the alternate approach provides acceptable methods of compliance with NRC regulations.

Response to Question 11.03-4:

A response to this question will be provided by November 6, 2009.

Question 11.03-5:

In Section 11.3.2.3, the FSAR describes the various components of the GWMS. However, a review of FSAR Figures 11.3-1 and 11.3-2 reveals that there are no sampling points identified in GWMS subsystems. A review of FSAR Tier 1, Figure 1.3-1 and FSAR Tier 2, Figure 1.7-1 indicates that there are no P&ID symbols for sampling points. Accordingly, the GWMS P&ID drawings and supporting legends in FSAR Tier 1 and 2 figures should be revised to include the locations and identification of sampling points in all associated GWMS subsystems.

Response to Question 11.03-5:

A response to this question will be provided by November 6, 2009.

Question 11.03-6:

In Section 11.3.2.3, the FSAR describes the gas dryer and states that the dryer is followed by a gas filter. However, a review of FSAR Figures 11.3-1 reveals that the filter is a liquid filter instead. Note that the same observation was made for the filter (shown as a liquid filter in the drawing) located after the recombiner cooler. Accordingly, the description and details of the figure should be reviewed and made consistent as to the exact type of filter being used in that segment of the GWMS subsystem.

Response to Question 11.03-6:

The filter downstream of the gas drier is a sieve basket designed to remove particulate matter entrained from connected systems. However, the filter may be exposed to water condensed in the gas drier and entrained in the waste gas stream. For this reason, the filter downstream of the gas drier is equipped with a drain line that is routed to the nuclear island drain/vent system (NIDVS). The filter is shown as a liquid filter in U.S. EPR FSAR Tier 2, Figure 11.3-1 because of its probability of being exposed to water. In addition, the symbol for a liquid filter in U.S. EPR FSAR Tier 2, Figure 1.7-1 resembles the screening device symbol used in the gaseous waste processing system design P&ID. This symbol more accurately represents the function of this filter.

The filter downstream of the gas cooler is a sieve basket designed to prevent catalyst particles from the recombiner and entrained in the waste gas stream from causing damage to the measuring gas compressors. However, liquid formed by the recombination of hydrogen and oxygen and subsequently condensed by the gas cooler may be entrained in the waste gas stream and carried to the filter. For this reason, the filter is fitted with a drain line to release trapped condensate to the NIDVS. The filter is shown as a liquid filter in U.S. EPR FSAR Tier 2, Figure 11.3-1 because of its probability of being exposed to water. Likewise, the symbol for a liquid filter in Figure 1.7-1 most closely resembles the screening device symbol used in the gaseous waste processing system design P&ID. This symbol more accurately represents the function of this filter.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 11.03-7:

A review of FSAR Section 11.3.2.3 and Table 11.3-2 indicates that while some equipment are described in the text, some are not listed in Table 11.3-2. The listing of equipment in Table 11.3-2 should be reviewed and expanded to include important components, such as the O_2 and H_2 measurement cabinets as they perform essential functions in preventing the accumulation of explosive gas mixtures in GWMS subsystems.

Response to Question 11.03-7:

U.S. EPR FSAR Tier 2, Table 11.3-2 will be revised to include information (i.e., number of components, design pressure, temperature and flow rate) for the H_2 and O_2 measurement cabinets and radiation monitors.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 11.3-2 will be revised as described in the response and indicated on the enclosed markup.

Question 11.03-8:

In Section 11.3.2.3, the FSAR describes the various components of the GWMS. However, a review of FSAR Figures 11.3-1 and 11.3-2 reveals that there are no connections from cooler condensers drains to the LWMS. The drawings should be reviewed and revised to identify such connections to ensure that there are no unmonitored and uncontrolled releases of radioactive materials and that the design complies with the requirements of Part 20.1406 and guidance of RG 4.21.

Response to Question 11.03-8:

A response to this question will be provided by November 6, 2009.

Question 11.03-9:

In Section 11.3.2.3, the FSAR describes design features of the nitrogen purge gas and O_2 and H_2 supply systems. In either case, the design should acknowledge NRC concerns identified in IE Bulletin 80-10 and requirements of Part 20.1406 and guidance of RG 4.21 in preventing non-radioactive systems from becoming contaminated and avoiding unmonitored and uncontrolled releases. These design features should be evaluated and the FSAR should describe system features that would prevent such gas supply systems from becoming contaminated by the GWMS.

Response to Question 11.03-9:

Contamination of the gas supply systems is unlikely because:

1. This portion of the gaseous waste processing system (GWPS) is at a negative gauge pressure and is at a lower pressure than the gas supplies.

2. The gas delivery subsection of the GWPS is equipped with manual isolation valves both upstream and downstream of the pressure reducing valves. This prevents backflow from the valve train that is not in service.

3. The oxygen, nitrogen, and hydrogen gas supplies have check valves upstream of the manual isolation valves of the GWPS. This constitutes an additional barrier between the gas supplies and the GWPS (RG 4.21 App. A (a)).

These features are shown in the system P&IDs and are consistent with the guidance of RG 4.21 and the requirements of 10 CFR 20.1406. Furthermore, the design features address NRC concerns identified in IE-BL-80-10.

Design features which prevent contamination and unmonitored/uncontrolled releases are described in U.S. EPR FSAR Tier 2, Section 12.3. The description of design features for the GWPS in U.S. EPR FSAR Tier 2, Section 12.3.6.5.4 will be revised to indicate that the system operates at a negative pressure to prevent radioactive gases from flowing back towards the hydrogen, nitrogen, and oxygen gas supply systems. Multiple mechanical barriers are also used to prevent facility contamination through the gas supply systems.

U.S. EPR FSAR Tier 2, Section 11.3.2 was revised in the Response to RAI 228, Question 12.03-12.04-9 (Part 4) to include a cross-reference to U.S. EPR FSAR Tier 2, Section 12.3.6.5.4 for a description of radioactive waste management system design features to minimize contamination of the facility in compliance with 10 CFR 20.1406.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 12.3.6.5.4 will be revised as described in the response and indicated on the enclosed markup.

Question 11.03-10:

In Section 11.3.2.3, the FSAR describes design features of the gas delay beds, which includes three vessels each with a capacity of about 5,400 lbs of charcoal, and a gel drier, with a capacity of about 3.2 ft^3. However, the description does not address operational considerations for the periodic removal and disposal of contaminated or water-saturated gel and charcoal or the use of in-place charcoal regeneration. Accordingly, the descriptions of the delay beds and gel drier should be reviewed and expanded to include such operational considerations.

Response to Question 11.03-10:

Delay beds

There are no provisions for in situ regeneration of charcoal. The likelihood that any of the delay beds will be exposed to enough moisture to severely hinder their performance is very low because:

1. Protective interlocks isolate the delay section from moisture.

2. The delay beds are located at the highest point of the gaseous waste processing system (GWPS) which allows any liquid water to drain downwards towards the condensate collecting tank.

3. The presence of the gel drier.

Chemical contamination of the delay beds is unlikely because:

1. The high degree of leak-tightness required by the delay beds prevents chemical ingress (e.g., if painting is being performed in the vicinity),

2. The oxygen scavenger hydrazine is a liquid at the design conditions of the GWPS, and

3. The delay beds are protected from exposure by the same design features which prevent water incursion.

In the unlikely event that the first delay bed is contaminated by chemicals or water, it can be bypassed and operation can continue as long as regulatory dose limits are not exceeded.

The U.S.EPR FSAR will be revised to indicate that the design includes provisions to remove and replace charcoal, and any spent charcoal can be processed by the solid waste management system (SWMS)(see U.S. EPR FSAR Tier 2, Section 11.4). An editorial change will also be made to Tier 2, Table 1.1-1 to revise the acronym for the solid waste management system to SWMS.

Gel drier

The gel drier is also located at a high point in the GWPS and continuously regenerates during normal operation. The gel drier is conservatively sized to account for operational considerations and to prevent damage to the silica gel.

Like the delay beds, the gel drier will be provided with the capability to have spent desiccant manually removed and replaced. The U.S. EPR FSAR will be revised to indicate that the design includes provisions to remove and dispose of desiccant, with the spent desiccant capable of being processed by the SWMS.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 1.1-1 and Sections 11.3.2.3.8 and 11.3.2.3.9 will be revised as described in the response and indicated on the enclosed markup.

Question 11.03-11:

In Section 11.3.2.5.2, the FSAR describes the aspects of the pre-operational inspection program. Among others, one item addresses the loading of media in the gel drier and delay beds. An imp11.03-12rtant inspection step, not listed, is ensuring that the proper types and amounts of adsorption media have been initially loaded in the gel drier and delay beds. Accordingly, the discussion should be revised to include a step in ensuring that the proper types and amounts of adsorption media have been initially added to the GWMS subsystems in order to meet the radionuclide residence time in such media and effluent concentration limits of App. B to Part 20 and criteria of App. I to Part 50, as stated in FSAR Section 11.3.

Response to Question 11.03-11:

U.S. EPR FSAR Tier 2, Section 11.3.2.5.2, titled 'Preoperational Inspection', does include steps to provide that proper types and amounts of desiccant and adsorption media have been initially loaded into the gel drier and delay beds, respectively. U.S. EPR FSAR Tier 2, Section 11.3.2.5.2 states: "Adsorbent media loads in the gel drier and delay beds are inspected to confirm that sufficient media to achieve desired minimum performance are available."

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 11.03-12:

In Section 11.3.4, the FSAR presents the results of a cost-benefit analysis (CBA) in justifying that no system augmentation is needed given the requirements of Appendix I to Part 50. A review of the assumptions indicates that a 60-year life cycle was applied in the analysis for the selected GWMS processing equipment, while RG 1.110 applies a 30-year life cycle. Given the heavy duty operational cycle of such equipment and possibility for the contamination of charcoal by chemicals or water damage, the CBA should provide the technical justification for an expected operational life of 60 years. The applicant is requested to provide sufficient information to enable the staff to conduct an independent confirmation of the CBA results.

Response to Question 11.03-12:

A response to this question will be provided by November 6, 2009.

Question 11.03-13:

In Section 11.3.2.4, the FSAR presents a failure analysis of the GWMS. However, a review indicates that for each type of failure or event identified, the discussion does not address the associated radiological consequences, such as potential for radioactive releases, system or facility contamination, unmonitored releases to the environment, etc. Also, the analysis should identify an event associated the ~~failure~~ malfunction of GWMS radiation monitoring system and detectors located before and after the charcoal delay beds given that they have different radiation response characteristics, and one involving an operator error that include an estimate of the duration of the event and mitigating measures applied in terminating the event to a safe end point. For example, the equipment malfunction analysis should identify equipment assumed to fail (e.g., radiation monitor), describe the postulated malfunction (e.g., fails to indicate high radioactivity levels), describe the results (e.g., reading lost), and identify alternate or mitigating actions (e.g., conduct manual sampling and restore operability of instrumentation).

Response to Question 11.03-13:

A response to this question will be provided by November 6, 2009.

Question 11.04-7:

In Section 11.4.1, the FSAR describes the design basis of the SWMS. However, a review indicates that the design basis does not acknowledge SRP acceptance criteria, such as Part 20.2006, 20.2007, and 20.2108, and IE Bulletin 80-10. Also, the design basis does not consistently acknowledge the related commitments described in U.S. EPR Conformance with Standard Review Plan (NUREG-0800) Technical Report (AREVA, ANP-10292, Rev. 1). Accordingly, the applicant is requested to review the commitments made in ANP-10292 (Rev, 1) and Section 11.4 of the SRP and Regulatory Guide 1.206 and confirm that the design basis is consistent with applicable SRP criteria and, if not, provide the justification that the alternate approach provides acceptable methods of compliance with NRC regulations.

Response to Question 11.04-7:

A response to this question will be provided by November 6, 2009.

Question 11.04-8:

In Section 11.4.1, the FSAR states that both storage areas (drum storage and tubular storage) have a combined storage capacity of “several years” volume of solid waste.” However, a review of the data shown in Table 11.4-1 indicates that the storage capacity is less than 3 years for Class B and C wastes when the six-month decay-in-storage option is applied, as noted in the FSAR, and that all Class A wastes are being shipped as rapidly as they are being generated in providing storage space for Class B and C wastes. This approach and assumptions need to be evaluated for the purpose of confirming whether they are operationally feasible and can provide a storage capacity for several years.

Response to Question 11.04-8:

A response to this question will be provided by November 6, 2009.

Question 11.04-10:

In Section 11.4.2, the FSAR describes the various components of SWMS subsystems. A review of the description indicates that the information is presented inconsistently. Several components described in the text and Table 11.4-14 and Figure 11.4-1 are discussed in the text and not shown in a corresponding figure, or are not discussed in the text but shown in a figure. For example:

1) The interface between the LWMS and SWMS for the concentrate buffer tank is not shown in a corresponding P&ID drawing, see “KPC” connections for the chemical tank and concentrate tanks from LWMS Figure 11.2-1, and note lack of a KPC connection from the demineralizer subsystem to the SWMS.
2) The shredder and compactor systems and cementation station are not listed in Table 11.4-14.
3) Provisions for connecting mobile skid-mounted radwaste processing subsystems are not shown, while the FSAR states that it is an option.
4) There is no indication as to where within SWMS subsystems waste samples will be collected for radiological and chemical analyses in demonstrating compliance with Part 20 and Part 61 waste form classification and characteristics, and waste disposal acceptance criteria of disposal sites.
5) The location of the Drum Storage Facility and Tubular Shat Storage Facility are shown “On-Site” in Figure 11.4-1 as out of the Radwaste Processing Building, but the text in Section 11.4 implies that that they are located within the Radwaste Processing Building.

Collectively, such these observations apply to nearly all SWMS subsystem descriptions and should be reviewed and corrected accordingly in FSAR text and tables and figures.

Response to Question 11.04-10:

The addition of U.S. EPR FSAR Tier 2, Figure 11.4-2 in response to RAI 225, Question 11.04-5 addresses many of the inconsistencies in the solid waste management system (SWMS) in U.S. EPR FSAR Tier 2, Section 11.4. Responses to the specific comments in this question are as follows:

1. U.S. EPR FSAR Tier 2, Figure 11.4-2 will be revised to include the ability to pump spent resins from the liquid waste management system to the concentrate buffer tank of the SWMS.
2. As stated in U.S. EPR FSAR Tier 2, Section 11.4.2.3.1, the shredder and compactor are contained within the sorting box. The sorting box and cementation station will be added to the component data in U.S. EPR FSAR Tier 2, Table 11.4-14. U.S. EPR FSAR Tier 2, Table 11.4-14 will also be revised to update the number of condenser drying units from one to three.
3. A response to this question will be provided by November 6, 2009.
4. Connections to the nuclear sampling system that interface with the radioactive concentrates processing system are shown in U.S. EPR FSAR Tier 2, Figure 11.4-2,which was added in the response to RAI 225, Question 11.04-5. Some minor editorial corrections will be made to

interfacing system designations and equipment component IDs in U.S. EPR FSAR Tier 2, Figure 11.4-2 for consistency with other figures in Tier 2. In addition, a correction will be made to add another input stream from the liquid waste processing system (KPF) to the concentrate buffer tank in U.S. EPR FSAR Tier 2, Figure 11.4-2. Sampling points for the SWMS are described in U.S. EPR FSAR Tier 2, Sections 11.4.2.2.and 11.4.2.3.2.

As described in U.S. EPR FSAR Tier 2, Section 11.4.3, “A COL applicant that references the U.S. EPR will fully describe, at the functional level, elements of the Process Control Program (PCP). This program description will identify the administrative and operational controls for waste processing process parameters and surveillance requirements which demonstrate that the final waste products meet the requirements of applicable federal, state, and disposal site waste form requirements for burial at a 10 CFR Part 61 licensed low level waste (LLW) disposal site and will be in accordance with the guidance provided in RG 1.21, NUREG-0800, BTP 11-3 (Reference 1), ANSI/ANS-55.1-1992 (Reference 3) and Generic Letters 80-09 (Reference 4), 81-38 (Reference 5), and 81-39 (Reference 6).”

5. U.S. EPR FSAR Tier 2, Figure 11.4-1 will be revised to correctly show the location of the drum store facility and the tubular shaft store facility in the Radioactive Waste Processing Building (UKS).

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 11.4-14, and Figures 11.4-1 and 11.4-2 will be revised as described in the response and indicated on the enclosed markup.

Question 11.04-11:

In Section 11.4.2, the FSAR does not list the presence and projected amounts of spent charcoal and dessicant and HEPA filters as waste streams. The discussion does not address how large plant components will be processed either for disposal as radioactive waste or prepared for shipment to waste brokers or equipment refurbishers.

Response to Question 11.04-11:

U.S. EPR FSAR Tier 2, Section 11.4.2.4 will be revised to clarify that the solid waste system is design includes provisions for shipping spent charcoal, desiccant, and high efficiency particulate air (HEPA) filter wastes in 55-gallon drums. These wastes, which are characterized as dry active waste (DAW), may also be shipped in transportable cargo (e.g., SeaLand) as stated in U.S. EPR FSAR Tier 2, Section 11.4.2.4.

The expected waste volumes of spent charcoal, desiccants, and HEPA filters are addressed in U.S. EPR FSAR Tier 2, Table 11.4-1.

Large component waste processing is addressed in U.S. EPR FSAR Tier 2, Section 11.4.2.4.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 11.4.2.4 will be revised as described in the response and indicated on the enclosed markup.

Question 11.04-12:

In Section 11.4.2.2, the FSAR states that moisture content of wastes solidified in drums will be less that 10% by weight. This FSAR criterion is not consistent with the NRC's Revised Staff Technical Position on Waste Form (SP-91-13, January 1991), which states in its regulatory position on compliance with Part 61 that free liquids shall be less than 0.5% by volume for Class A, B and C stabilized waste products. Accordingly, the applicant is requested to update the criteria for the presence of moisture or free standing liquid to be consistent with the NRC's Revised Staff Technical Position on Waste Form, or stipulate that the Process Control Program (PCP), developed by COL applicants, will address compliance with 10 CFR Part 61 and waste acceptance criteria of disposal sites in meeting the requirements on waste form and stability.

Response to Question 11.04-12:

Free standing liquids remaining within the drum will be reduced to less than 0.5 percent by volume, per the NRC's Revised Staff Technical Position on Waste Form, to meet the requirements of 10 CFR 61. U.S. EPR FSAR Tier 2, Section 11.4.2.2 will be revised to state:

"The solid drum drying process reduces the moisture content of the solid block to meet the requirements in 10 CFR Part 61."

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 11.4.2.2 will be revised as described in the response and indicated on the enclosed markup.

Question 11.04-13:

In Sections 11.4.2 and 11.4.5, the FSAR does not acknowledge NRC concerns identified in IE Bulletin 80-10 and requirements of Part 20.1406 and guidance of RG 4.21 in preventing non-radioactive systems from becoming contaminated and avoiding unmonitored and uncontrolled releases. These design features should be evaluated for all SWMS subsystem interfaces and the FSAR should describe system features that would prevent non-radioactive systems from becoming contaminated by the SWMS.

Response to Question 11.04-13:

U.S. EPR FSAR Tier 2, Section 11.4.1 states that the design of the solid waste management system is consistent with the requirements of 10 CFR 20.1406. In the Response to RAI 228, Question 12.03-12.04-9 (Part 4), a cross-reference was added in U.S. EPR FSAR Tier 2, Section 11.4.2 to refer to Section 12.3.6.5.4 for information on design features that reduce contamination and demonstrate compliance with 10 CFR 20.1406.

Non-radioactive systems with which the solid waste management system interfaces include the seal water supply system (SEWSS), the demineralized water distribution system (DWDS), the compressed air system (CAS) and the component cooling water system (CCWS). Design features that prevent contamination of these systems are addressed in U.S. EPR FSAR Tier 2, Section 12.3.6.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 11.04-14:

In Section 11.4.3, the FSAR does not acknowledge NEI 07-10A PCP Template as an alternate means of demonstrating compliance with GL 89-01 and SECY-05-0197 until a plant-specific PCP is developed under a license condition. Note that FSAR Section 13.4 does not list the PCP as a mandated operational program under a license condition contrary to the SRP and RG 1.206. In addition to the above, add the PCP operational program to FSAR Section 13.4.

Response to Question 11.04-14:

A response to this question will be provided by November 6, 2009.

Question 11.04-15:

FSAR Table 11.4-1 presents estimates of yearly waste volumes and activity levels of radwaste shipped for disposal or processing by waste brokers. A review indicates that some entries show radioactivity levels being shipped in packages that are greater than predicted as yearly estimates. For example, the expected activity level for non-compressible DAW is 0.297 Ci per year, while the average activity shipped is 2.97 Ci per package. The factor of 10 is presumed to be associated with the assumed number of containers (shown as 0.1), but as tabulated the data imply that the average activity level per package is 10 times that of the total expected annual estimate. This inconsistency should be addressed and the header of the last column of Table 11.4-1 should be revised and explained with appropriate footnotes. The waste stream listed in Table 11.4-1 should be expanded to include waste volumes estimates for spent charcoal and dessicant and HEPA filters.

Response to Question 11.04-15:

A response to this question will be provided by November 6, 2009.

Question 11.05-1:

In Section 11.5.1, the FSAR describes the design basis of the PERMSS. However, a review indicates that the design basis does not acknowledge SRP acceptance criteria, such as implications of Rev. 3 vs Rev. 4 of Regulatory Guide 1.97 in defining operating ranges for Type E variables, and IE Bulletin 80-10. Also, the design basis does not consistently acknowledge the related commitments described in U.S. EPR Conformance with Standard Review Plan (NUREG-0800) Technical Report (AREVA, ANP-10292, Rev. 1). Accordingly, the applicant is requested to review the commitments made in ANP-10292 (Rev, 1) and Section 11.5 and BTP 7-10 of the SRP and Regulatory Guide 1.206 and confirm that the design basis is consistent with applicable SRP criteria and, if not, provide the justification that the alternate approach provides acceptable methods of compliance with NRC regulations.

Response to Question 11.05-1:

A response to this question will be provided by November 6, 2009.

Question 11.05-2:

In Sections 11.5.2, 11.5.3 and 11.5.4, the FSAR describes the various functions and components of PERMSS subsystems. A review of the description indicates that the information is presented inconsistently. Several components described in the text and Table 11.5-1 and Figure 11.5-1 are discussed in the text and not shown in a corresponding figure, or are not discussed in the text but shown in a figure. For example:

1) The descriptions do not address subsystem features to perform functional channel checks, source checks, and whether subsystems need to be brought off line to perform the surveillance and functional checks required by standard radiological effluent controls (see GL 89-01 and NUREG-1301).
2) The design features do not describe provisions and methods for offline radiation detectors to be purged or flushed with clean air or water, which portions of the LWMS and GWMS systems will contaminated purge or flush fluids be returned to, and provisions to prevent the cross-contamination of purge and flush supply systems.
3) The design features do not describe the calibration of subsystems under different operational conditions (e.g., routine, AOOs, and accident) given expected differences in radionuclide distributions; how raw instrument output data will be converted to meaningful radiological units in determining compliance with Part 20 Appendix B and Appendix I to Part 50; calibration frequencies of process and effluent of radiation monitoring subsystems and associated sampling equipment; and the QA/QC process that will be used to verify and validate computer codes and algorithm purchased through vendors or supplied with PERM instrumentation.
4) Subsystem figures and diagrams do not show sampling locations for liquid and gaseous process and effluent streams, and sample conditioning for specific systems to minimize sample loss and distortion of chemical and physical compositions. Also, the relationship with FSAR Section 9.3.2 is not well established in understanding shared used of equipment and sampling functions among LWMS and GWMS subsystems.
5) The design features do not address requirements for the derivation of lower limits of detection for liquid and gaseous effluent monitors and detection sensitivities for liquid and gaseous process monitors.
6) The design features do not address the placement of isolation or diversion valves and radiation detectors on process and effluent piping/ductwork in order to ensure the timely closure of such valves upon the detection of elevated radioactivity levels in liquid and gaseous effluent streams in terminating releases and isolating process streams from further contamination.
7) The design features of the liquid and gaseous monitoring systems do not consider how the failure of a radiation detector or its corresponding channel is indicated in local and control room panels. For example, does a detector or channel failure result in a high or zero instrumentation reading? Are there specific warnings differentiating various types of failures, such as loss of detector only, loss of an entire channel, loss of sampling flow from a process or effluent stream?

Collectively, these observations apply to nearly all PERMSS subsystem descriptions and should be reviewed against Section 11.5 of the SRP and Regulatory Guide 1.206 and corrected accordingly in FSAR subsystem descriptions and tables and figures.

Response to Question 11.05-2:

A response to this question will be provided by November 6, 2009.

Question 11.05-3:

In Sections 11.5.3.1 and 11.5.3.2, the FSAR does not acknowledge NEI 07-09A ODCM Template as an alternate means of demonstrating compliance with GL 89-01 and SECY 05-0197 until a plant and site-specific ODCM is developed under a license condition.

Response to Question 11.05-3:

A response to this question will be provided by November 6, 2009.

Question 11.05-4:

In Section 11.5.4.3, the FSAR describes the radiation monitoring system for the SG Blowdown. The discussion refers to releases occurring via TB roof ventilators in the event of SG tube ruptures. A review of FSAR Figure 11.5-1 indicates that this discharge path is not identified, as all gaseous effluent releases are shown to be discharged via the plant stack and FSAR Table 11.5-1 identifies this radiation monitor as a liquid effluent monitor and not as a gaseous effluent monitor. Accordingly, the applicant is requested to provide further information on whether releases from TB roof ventilators are unmonitored and uncontrolled release points to the environment. If the system design, as described in Section 11.5.4.3, allows the means to determine radionuclide distributions and concentrations during and after a SG tube rupture, describe methods and sources of radiological information with which to characterize such releases via TB roof ventilators and assess offsite doses to members of the public.

Response to Question 11.05-4:

A response to this question will be provided by November 6, 2009.

Question 11.05-5:

FSAR Sections 11.5.2 to 11.5.4 present the descriptions of PERMSS subsystems and Table 11.5-1 lists radiation monitoring instrumentation used to monitor process and effluent streams. However, a review of subsystems listed in Table 11.5-1 and Figure 11.5-1 indicates that the descriptions are inconsistent and incomplete. For example:

1) Several PERMSS subsystems listed in Table 11.5-1 are not described in FSAR Sections 11.5.2 to 11.5.4. Section 11.5.4 provides descriptions for six subsystems with in-process radiation detectors while Table 11.5-1 lists 15. Similarly, there are differences between the text and tables in nomenclatures used to describe subsystems, e.g., condenser air removal RMS (Section 11.5.4.2) vs condenser evacuation system (Table 11.5-1).
2) FSAR Table 11.5-1 does not differentiate between safety and non safety-related PERMSS subsystems.
3) FSAR Table 11.5-1 does not indicate which radiation detectors will be equipped with built-in radioactive check sources for the purpose of performing channel checks.
4) The operational range noted for the upstream radiation monitor of the GWMS delay beds is presented in a meaningless radiological unit. The range should be expressed in μCi/cc instead of counts per second (cps).
5) FSAR Section 10.4.3.2.2.states that the exhaust from the turbine gland seal exhausters is routed to the "turbine building air removal system" where they are monitored for radioactivity. Table 11.5-1 does not list a radiation monitor for the turbine air removal system. FSAR Section 9.4.4 states that the Turbine Building does not include the means to control radioactive effluents. Accordingly, the design descriptions of Section 10.4.3 and 9.4.4 should be reviewed and corrected to indicate that there is no turbine building air removal system and that instead the exhaust from the turbine gland seal exhausters is a system exhaust that is directed and discharged via the Nuclear Auxiliary Building Exhaust.
6) For the Nuclear Auxiliary Building exhaust, Figure 9.3.4-2 shows a radiation detector on the ductwork going into Cell 1 of the NABVS but it is not clear if this radiation detector is an extra one or is it the same as that shown in Figure 11.3-1 given its location.
7) Figure 9.3.4-2 shows a radiation detector in Cell 3 of the NABVS but it is not clear if this radiation detector is part of an existing PERMSS subsystem and not described in FSAR Sections 11.5 and 9.4.3, or is part of another system, such as used for monitoring ambient airborne radioactivity levels in radiological controlled areas.
8) Figure 9.4.3-3 does not include a radiation detector in the Reactor Building Exhaust (last input on lower left side of drawing).
9) FSAR Table 11.5-1 implies that there are two continuous noble gas monitors for the containment building ventilation purge subsystem, but FSAR Figure 9.4.7-2 shows one monitor on the low flow purge exhaust and none for the full flow purge exhaust.
10) FSAR Figure 11.5-1 shows a radiation monitor on the Turbine Building Plant drainage line, but this monitor is not listed in FSAR Table 11.5-1.

11) FSAR Table 11.5-1 does not indicate any automatic control features for GWMS, but FSAR Section 11.3.3.1 states that discharge requirements consider gaseous waste activity and "automatic isolation settings."

12) FSAR Table 11.5-1 does not indicate any automatic control features for the NABVS, but FSAR Section 9.4.3.2.1 states that the exhaust from the NABVS is diverted to an iodine filtration system upon receiving a radiation alarm.

13) FSAR Table 11.5-1 does not indicate any automatic control features (ACF) for the SBVS, but FSAR Section 9.4.5.1 states that the exhaust from the SBVS is diverted to charcoal filtration beds upon receiving a radiation alarm.

14) FSAR Table 11.5-1 presents operational ranges for gaseous and liquid process and effluent radiation monitors. A review of this information indicates that it is incomplete. For gaseous process and effluent monitors, the supporting text to this table does not present the technical basis for the stated operational ranges for those that are included and does not provide corresponding sets of values for the plant vent radiation monitor used in confirming compliance with Part 20, Appendix B effluent concentration limits. For particulate, iodine, and tritium expected in gaseous streams, Table 11.5-1 does not include operational ranges and surrogate radionuclides for the corresponding radiation monitoring systems. The above comments also apply to radiation monitors assigned to liquid process and effluent streams.

15) FSAR Table 11.5-1 presents operational ranges for gaseous process and effluent radiation monitors. A review of this information indicates that it is incomplete. The description does not indicate whether the plant vent radiation monitoring system will be used to monitor radioactivity levels during normal operations and accident conditions with a sufficient range to encompass the entire range of effluent concentration levels listed in Regulatory Guide (RG) 1.97 (Rev. 3) and BTP 7-10 (SRP, NUREG-0800) for Type E variables, as they relate to compliance with Part 50.34(f)(2)(xvii) and (xxvii). If multiple radiation monitoring components are part of the design of the plant vent monitor to comply with the operational ranges of RG 1.97, the FSAR should describe the additional radiation monitoring components and address overall system accuracies in the overlapping ranges of the components of both systems when operating in the upper end of expected radioactivity levels.

Collectively, the above observations should be reviewed and, if confirmed, should be corrected in the FSAR.

Response to Question 11.05-5:

A response to this question will be provided by November 6, 2009.

Question 11.05-6:

FSAR Sections 11.5.2 to 11.5.4 present descriptions of PERMSS subsystems and Table 11.5-1 lists radiation monitoring instrumentation used to monitor airborne effluent streams from the Fuel Building Ventilation System (FBVS), as described in FSAR Section 9.4.2. A review of subsystems listed in Table 11.5-1 and Figures 11.5-1 and 9.4.2-1 indicates that the descriptions are inconsistent and incomplete. Specifically:

a. Table 11.5-1states that the FBVS radiation monitor isolates the ventilation system on high radioactivity levels. However, Section 9.4.2.1 and Figure 9.4.2-1 show a radiation monitor only on the exhaust flow from Cell 5 and none on Cell 4 of the FBVS, but the FSAR states that iodine radioactivity is detected separately in each cell and each cell services about half of the FB's ventilation needs. Similarly, the exhaust from Cell 5 leading to the Safeguard Building Ventilation System does not show a radiation monitor and isolation dampers on the line going to the SBVS. Accordingly, system descriptions should be reviewed and revised as it is not clear if there is a need to show other radiation monitors on the exhaust line from Cell 4 before connecting to its exhaust shaft. Also, there is a need to clarify the isolation of the FBVS given the connection to the SBVS since the design basis implies a full isolation of the FBVS on detection of high radiation levels in exhaust duct of Cells 4 and 5.

b. Table 11.5-1states that the FBVS radiation monitor isolates the ventilation system on high radioactivity levels, but Section 9.4.2.1 and Figure 9.4.2-1 show a radiation monitor only on the exhaust flow from Cell 5 and none on Cell 4 of the FBVS. Accordingly, the automatic control features (ACF) provisions of Table 11.5-1 for the FBVS should be reviewed and revised to note whether the isolation of FB Cells 4 and 5 is part of the ACF design features for that radiation monitor.

c. A comparison of FSAR Sections 11.5 and 9.4.2 indicates that FSAR Section 9.4.2 does not refer to FSAR Section 11.5 for the associated airborne process radiation monitoring systems. Also, FSAR Section 9.4.2.5 refers to FSAR Table 9.4.1-1 for details on instrumentation, but this table addresses generic ESF features and not specifically those of the FBVS. Accordingly, FSAR Sections 11.5 and 9.4.2 should reviewed and revised to ensure a consistent use of internal references on radiation instrumentation design features in controlling airborne radioactivity releases via the plant vent.

Response to Question 11.05-6:

A response to this question will be provided by November 6, 2009.

Question 11.05-7:

FSAR Sections 11.5.2 to 11.5.4 present the descriptions of PERMSS subsystems and Table 11.5-1 lists radiation monitoring instrumentation used to monitor airborne effluent streams from the Nuclear Auxiliary Building Ventilation System (NABVS), as described in FSAR Section 9.4.3. A review of subsystems listed in Table 11.5-1 and Figures 11.5-1 and 9.4.3-2 to 9.4.3-4 indicates that the descriptions are inconsistent and incomplete. Specifically:

a. Table 11.5-1 does not identify the Automatic Control Features (ACF) of the radiation monitor for the NABVS radiation monitoring system. A review of FSAR Section 9.4.3 indicates that if elevated radiation levels are detected, the NABS exhaust flow is diverted to the iodine filtration train prior to discharge via the plant vent. Accordingly, the ACF provisions of Table 11.5-1 for the NABVS should be reviewed and revised to note whether the isolation of NABS Cells 1, 2 and 3 is part of the ACF design features for that radiation monitor.

b. FSAR Section 9.4.3.5 provides information on instrumentation requirements. However, Section 9.4.3.5 does not refer to FSAR Section 11.5 and Table 11.5-1 for specific details on the associated radiation monitoring equipment. Accordingly, FSAR Sections 11.5 and 9.4.3 should be reviewed and revised to ensure a consistent use of internal references on radiation instrumentation design features in controlling airborne radioactivity releases via the plant vent.

c. In support to FSAR Table 11.5-1, FSAR Section 11.5.3.1 should list all radiological exhaust ventilation systems supported by radiation monitoring instrumentation and sampling systems. Accordingly, FSAR Sections 9.3, 9.4, 11.2, 11.3, 11.4, and 11.5 should be reviewed and revised to ensure a complete and consistent presentation of all systems serviced by radiation instrumentation in controlling and monitoring airborne radioactivity releases via the plant vent.

Response to Question 11.05-7:

A response to this question will be provided by November 6, 2009.

Question 11.05-8:

FSAR Sections 11.5.2 to 11.5.4 present the descriptions of PERMSS subsystems and Table 11.5-1 lists radiation monitoring instrumentation used to monitor airborne effluent streams from the Safeguard Building Controlled-Area Ventilation System (SBVS), as described in FSAR Section 9.4.5. A review of subsystems listed in Table 11.5-1 and Figures 11.5-1 and 9.4.5-2 indicates that the descriptions are inconsistent and incomplete. Specifically:

a. Table 11.5-1 does not identify the Automatic Control Features (ACF) of the radiation monitor for the SBVS radiation monitoring system. A review of FSAR Section 9.4.5 indicates that if elevated radiation levels are detected, the SBVS exhaust flow is diverted to the iodine filtration train located in the Fuel Building prior to discharge via the plant vent. Sections 9.4.5.1 and 9.4.5.2.3 also state that in the event of an accident in the Fuel Building or Reactor Building, the exhaust flows from these systems are diverted to the iodine train of the SBVS. However, it is not clear if all stated isolation and diversion functions of exhaust flows from these systems are automatic or whether some require manual operation for the described abnormal operating conditions and accidents. Accordingly, the ACF provisions of Table 11.5-1 for the SBVS should be reviewed and revised to distinguish the automatic isolation of SBVS dampers in directing exhaust to the SBVS iodine filtration train, and isolation features (automatic or manual as the case may be) for abnormal operations and accident conditions occurring in the FB and RB but which depend on the design features of the SBVS.

b. Although FSAR Table 11.5-1 identifies the use of a multi-function process radiation monitor, its location could not be readily determined in FSAR Figure 9.4.5-2. Accordingly, Figure 9.4.5-2 should be reviewed to confirm whether its location is indicated and, if not, it should be added to the figure to ensure a complete representation of the system.

c. FSAR Section 9.4.5.5 provides information on instrumentation requirements. However, Section 9.4.5.5 does not refer to FSAR Section 11.5 and Table 11.5-1 for specific details on the associated radiation monitoring equipment. Accordingly, FSAR Sections 11.5 and 9.4.5 should be reviewed and revised to ensure a consistent use of internal references on radiation instrumentation design features in controlling airborne radioactivity releases via the plant vent.

Response to Question 11.05-8:

A response to this question will be provided by November 6, 2009.

Question 11.05-9:

FSAR Sections 11.5.2 to 11.5.4 present the descriptions of PERMSS subsystems and Table 11.5-1 lists radiation monitoring instrumentation used to monitor airborne effluent streams from the Radioactive Waste Building Ventilation System (RWBVS), as described in FSAR Section 9.4.8. A review of subsystems listed in Table 11.5-1 and Figures 11.5-1 and 9.4.8-1 and 9.4.8-2 indicates that the descriptions are inconsistent and incomplete. Specifically:

a. In FSAR Table 11.5-1, the entry on Automatic Control Features (ACF) for the RWBVS radiation monitoring system should state "n/a" or "none" as opposed to the ambiguous entry shown as "--- ". In addition, there is a need to ensure a consistent use of system nomenclature between figures and descriptions. For example, FSAR Sections 11.5 and 9.4.8 do not refer to RWBVS Cells 1 and 2 exhausts, while Figure 9.4.8-2 makes a distinction in differentiating sources with different radioactivity levels. Accordingly, FSAR Sections 11.5 and 9.4.8 should be reviewed and revised to ensure a consistent presentation of design features and nomenclatures used in demonstrating compliance with effluent concentration limits of Appendix B to Part 20.

b. Based on a review of FSAR Sections 11.5 and 9.4.8 figures and descriptions, it is not clear if a radiation detector is missing or one needs to be relocated in Figure 9.4.8-2 on the line coming from the RWBVS Processing Rooms (Line C from Sheet 1 to Sheet 2). In contrast, the corresponding lines from RWBVS Cells 1 and 2 show a radiation detector for Lines A and B from Sheet 1 to Sheet 2 before the filter trains. Accordingly, FSAR Sections 11.5 and 9.4.8 should be reviewed and revised to ensure a consistent presentation of design and operational features in understanding how RWBVS radiation monitors function and alert operators when effluent releases could exceed the effluent concentration limits of Appendix B to Part 20.

c. In FSAR Table 11.5-1, the entry for the RWBVS radiation monitoring system indicates that there are two iodine radiation monitors and four aerosol radiation monitors. A review of FSAR Figures 11.5-1 and 9.4.8-2 indicates that the placements of these monitors is not clear given that there are three input flows to the RWBVS exhaust, one for Cell 1 and one for Cell 2 (Lines A and B from Sheet 1 to Sheet 2), and one for the RWBVS Processing Rooms (Line C from Sheet 1 to Sheet 2). There is no rationale provided for having one set of radiation monitors before each particulate/charcoal train for Cells 1 and 2 vent exhausts and none after it, and no explanations for the placement of the Processing Rooms monitor after the particulate/charcoal train with none before it. Accordingly, FSAR Sections 11.5 and 9.4.8 should be reviewed and revised to provide the technical rationale for the placement of radiation monitoring instrumentation in ensuring that effluent releases do not exceed the effluent concentration limits of Appendix B to Part 20.

d. FSAR Section 9.4.8.5 provides information on instrumentation requirements. However, Section 9.4.8.5 does not refer to FSAR Section 11.5 and Table 11.5-1 for specific details on the associated radiation monitoring equipment. Accordingly, FSAR Sections 11.5 and 9.4.8 should be reviewed and revised to ensure a consistent use of internal references on radiation instrumentation design features in controlling airborne radioactivity releases via the plant vent.

Response to Question 11.05-9:

A response to this question will be provided by November 6, 2009.

Question 11.05-10:

FSAR Sections 11.5.2 to 11.5.4 present the descriptions of PERMSS subsystems and Table 11.5-1 lists radiation monitoring instrumentation used to monitor airborne effluent streams from the Access Building Ventilation System (ABVS), as described in FSAR Section 9.4.14. A review of subsystems listed in Table 11.5-1 and Figures 11.5-1 and 9.4.14-2 indicates that the descriptions are inconsistent and incomplete.

a. FSAR Table 11.5-1 identifies only a sampling system for the ABVS, while FSAR Figure 9.4.14-2 identifies a radiation monitor instead before the filtration train. Accordingly, FSAR Sections 11.5 and 9.4.14 should be reviewed and revised to ensure a consistent description of radiation instrumentation and design features used in controlling airborne radioactivity releases via the plant vent.

b. FSAR Section 9.4.14.6 provides information on instrumentation requirements for the ABVS. However, Section 9.4.14.6 does not refer to FSAR Section 11.5 and Table 11.5-1 for specific details on the associated radiation monitoring equipment for the ABVS. Accordingly, FSAR Sections 11.5 and 9.4.14 should be reviewed and revised to ensure a consistent use of internal references on radiation instrumentation design features in controlling airborne radioactivity releases via the plant vent.

Response to Question 11.05-10:

A response to this question will be provided by November 6, 2009.

Question 11.05-11:

FSAR Sections 11.5.2 to 11.5.4 present the descriptions of PERMSS subsystems and Table 11.5-1 lists radiation monitoring instrumentation used to monitor airborne effluent streams from the Containment Building Ventilation System (CBVS), as described in FSAR Section 9.4.7. A review of subsystems listed in Table 11.5-1 and Figures 11.5-1 and 9.4.7-1 to 9.4.7-5 indicates that the descriptions are inconsistent and incomplete.

a. In FSAR Table 11.5-1, the two entries for the CBVS radiation monitoring systems indicate that there are a total of four noble gas monitors (two process and two effluents), two aerosol monitors, two iodine monitors, and one tritium monitor, all as process monitors. A review of FSAR Figures 11.5-1, 9.4.7-2 and 9.4.7-3 indicates that the placements of these monitors is not clear given that there are two input flows to the CBVS exhaust, one from the low flow and one from the full flow purge exhaust. The figures also show the placement of radiation monitors at three locations. The locations are: one out of the low flow purge exhaust; one after the CBVS dual particulate/charcoal filter train servicing only the low flow purge exhaust; and one before the single particulate/charcoal filter train of the CBVS internal filtration subsystem. There is no rationale provided for the placement of radiation monitors at these locations, no explanation for the lack of a radiation monitor on the full flow purge exhaust line before being routed to the Nuclear Auxiliary Building Ventilation System (NABVS) and no details are provided in reconciling their locations shown in Figures 9.4.7-2 and 9.4.7-3. Accordingly, FSAR Sections 11.5 and 9.4.7 should be reviewed and revised to provide the technical rationale for the number and placement of radiation monitoring instrumentation in ensuring that effluent releases do not exceed the effluent concentration limits of Appendix B to Part 20.

b. In FSAR Table 11.5-1, the entries on Automatic Control Features (ACF) for the CBVS radiation monitoring system are left blank with no details as to whether this system includes features that perform automatic functions upon receiving a high radiation signal. A review of FSAR Sections 9.4.3, 9.4.5, and 9.4.7 indicates that if elevated radiation levels are detected, the CBVS exhaust flow can be diverted to the Safeguard Building Controlled-Area Ventilation System (SBVS) and Nuclear Auxiliary Building Ventilation System (NABVS). However, it is not clear if the isolation and diversion functions of exhaust flows from the CBVS are automatic based only on responses of the monitors listed for the CBVS; are dependent on conditions associated with the operations of the monitors assigned to the SBVS and NABVS; or require manual operations based on the described abnormal operating conditions and accidents. Accordingly, the ACF provisions of Table 11.5-1 for the CBVS should be expanded upon in distinguishing the automatic isolation of CBVS dampers in directing exhaust flows to the SBVS and NABVS, and isolation features (automatic or manual as the case may be) for abnormal operations and accident conditions in demonstrating compliance with effluent concentration limits of Appendix B to Part 20.

c. FSAR Section 9.4.7.5 provides information on instrumentation requirements for the CBVS. However, Section 9.4.7.5 does not refer to FSAR Section 11.5 and Table 11.5-1 for specific details on the associated radiation monitoring equipment for the CBVS. Accordingly, FSAR Sections 11.5 and 9.4.7 should be reviewed and revised to ensure a consistent use of internal references on radiation instrumentation design features in controlling airborne radioactivity releases via the plant vent.

Response to Question 11.05-11:

A response to this question will be provided by November 6, 2009.

Question 11.05-12:

FSAR Sections 11.5.2 to 11.5.4 present the descriptions of PERMSS subsystems and Table 11.5-1 lists radiation monitoring methods used to monitor airborne effluent streams from the Annulus Ventilation System (AVS), as described in FSAR Section 6.2.3. However, Section 6.2.3.5 does not refer to FSAR Section 11.5 and Table 11.5-1 for specific details on the associated radiation monitoring equipment for the AVS. Accordingly, FSAR Sections 11.5 and 6.2.3 should be reviewed and revised to ensure a consistent use of internal references on radiation instrumentation design features in controlling airborne radioactivity releases via the plant vent.

Response to Question 11.05-12:

A response to this question will be provided by November 6, 2009.

U.S. EPR Final Safety Analysis Report Markups

Table 1.1-1—U.S. EPR FSAR Acronyms and Descriptions
Sheet 18 of 19

Acronym	Description
SQDP	Seismic Qualification Data Package
SRI	Stanford Research Institute
SRM	Staff Requirement Memorandum
SRO	Senior Reactor Operator
SRP	Standard Review Plan
SRSS	Square Root of the Sum of the Squares
SS	Shift Supervisor
SSC	Structures, Systems and Components
SSE	Safe Shutdown Earthquake
SSI	Soil-Structure Interaction
S SLOCA	Seismic Small Loss of Coolant Accident
SSS	Startup and Shutdown System
SSSI	Structure-Soil-Structure Interaction
SSSS	Standstill Seal System
STA	Shift Technical Advisor
SU	Service Unit
SWMS	Solid Waste Management System
SWSC	Service Water System (Conventional)
SWYD	Switchyard
T_{AVG}	Temperature (Average)
TA	Task Analysis
TAF	Top of Active Fuel
TB	Turbine Building
TBS	Turbine Bypass System
TBVS	Turbine Building Ventilation System
TCV	Turbine Control Valve
TD	Theoretical Density
TG	Turbine Generator
TGSCC	Transgranular Stress Corrosion Cracking
TGSS	Turbine Gland Sealing System
TH	Thermo-Hydraulics
THD	Total Harmonic Distortion
THERP	Technique for Human Error Rate Prediction

11.03-10

- Demineralizer resin bed load capacity.
- Proper types and amounts of adsorption and filtration media have been loaded into each demineralizer resin bed.
- Proper filter media, for the pre-filters, ultra-filters, and main filters, have been loaded into the filter housings.

11.02-11

11.2.2.6 Instrumentation Design

Instrumentation readout is available in the main control room (MCR) and on a local control panel for major components. Instrumentation display for other components is available on a local control panel.

Releases to the environment are monitored using radiation sensors and flow sensors to limit and control offsite releases. See Section 11.2.1.2.3 for a description of this instrumentation.

In accordance with the guidelines of RG 1.143, each tank has level instrumentation that actuates an alarm on detection of high liquid level, allowing action to be taken to divert the flow to a backup tank to avoid a tank overflow. A summary of the tank level indication and associated alarms is provided in Table 11.2-12.

11.2.3 Radioactive Effluent Releases

For the U.S. EPR, releases of radioactive effluent via the liquid pathway only occurs by discharges from the monitoring tanks in the liquid waste storage system. Most of the activity carried into the liquid waste storage and processing systems is removed from the waste stream by a combination of chemical treatments, evaporation, inertial separation, and demineralization and filtration. These treatments may be performed repeatedly, with continuing concentration and chemical treatment cycles, until the wastewater meets release limits. Contaminants removed from the wastewater are transferred to the solid waste management system (see Section 11.4).

Treated wastewater held in the monitoring tanks must be sampled and analyzed in the laboratory before its release can be authorized. The laboratory analysis confirms that the activity of the wastewater in the monitoring tanks is within release limits. Once the laboratory results have been reviewed and confirmed to be within release limits, release is authorized. During the release, two radiation sensors in the activity-measurement tank and two flow sensors downstream of the tank continually monitor and record the discharge. If the sensors detect activity or an activity release rate in excess of release limits, or if a significant discrepancy exists between the two activity measurements or the two flow measurements, the sensors signal automatic valve closure, which terminates the release.

electric heating rods. The recombiner catalytically combines free hydrogen and oxygen gas present in the purge gas return stream into water to prevent potentially explosive accumulations of these gases in the gaseous waste processing system and connected components. The recombiner operates at elevated temperatures so that the water formed remains in the vapor state and does not precipitate on the catalyst (where it interferes with the catalytic chemical reaction). The chemical reaction that combines gaseous hydrogen and oxygen into water is exothermal; the energy released by that reaction also contributes to heat the recombiner. The recombiner is designed to remove gaseous hydrogen concentrations of up to four percent by volume of the purge gas stream; it simultaneously removes gaseous oxygen concentrations of up to two percent by volume from that stream.

11.3.2.3.7 Gas Cooler

The gas cooler reduces the temperature of the purge gas stream discharged from the recombiner. The gas cooler protects the waste gas compressors from operation at high temperatures, which can shorten compressor service life. The gas cooler is a stainless steel shell and tube heat exchanger. The operational chilled water system provides coolant to the tubes in the gas cooler. A filter located near the gas cooler outlet screens dust and particulates from the purge gas stream.

11.3.2.3.8 Gel Drier

11.03-10

The gel drier removes moisture from the waste gas stream entering the delay system during surge gas operation, which protects the hydroscopically sensitive activated charcoal in the delay beds. The stainless steel gel drier is a cylindrical pressure vessel. The desiccant in the gel drier is a silica gel consisting of porous spherical particles made of amorphous silicon dioxide. In the lower part of the gel drier, the silica gel used is not sensitive to liquid water. In the upper part of the gel drier, the silica gel used is sensitive to liquid water, but has enhanced adsorption properties. In the event that the gel drier inventory is damaged, the gel can be removed and replaced. Spent desiccant can be processed by the solid waste management system (SWMS).

Two motor-operated valves located in the piping interface between the purge system and the delay system control the direction of gas flow through the gel drier. Under normal conditions, the purge gas stream enters the top of the gel drier, flows down through the two types of silica gel desiccant, then returns to the purge system through reducing station 2. When the gaseous waste processing system automatically switches to surge gas operation, gas flow is redirected through the gel drier in the opposite direction for adsorptive drying en route to the delay beds.

11.3.2.3.9 Delay Beds

The delay beds retain the radioactive fission product gases that enter the delay system. These gases (e.g., xenon and krypton) are dynamically adsorbed by the activated charcoal media in the delay beds, which provides the holdup times required for natural decay. The holdup time for xenon is 27.7 days and the holdup time for krypton is 40 hours.

11.03-10

The delay beds consist of three vertical pressure vessels connected in series. Two moisture sensors are configured in parallel upstream of the delay beds to provide warning and interlock signals if the moisture content of waste gas entering the delay beds exceeds acceptable levels. A radiation sensor is also located upstream of the delay beds to monitor influent activity levels. Two pressure sensors monitor pressure upstream of the delay beds to provide warning signals for high or low operating pressure conditions and to provide interlock signals. Though the delay beds are protected from water and chemical contamination due to their physical location and protective interlocks, provisions to remove and replace spent charcoal are included in the vessel design. Spent charcoal can be processed by the SWMS.

11.3.2.3.10 Delay Line Gas Filter

The gas filter downstream of the delay beds protects reducing station 3 by removing particles that are generated in or passed through the delay beds, such as solid decay products or charcoal dust. The gas filter is a vertical pressure vessel with internal filter elements.

11.3.2.3.11 Release Isolation Valve

The waste gas processing system release isolation valve is a motor-operated valve located downstream of reducing station 3. It is the last active component in the gaseous waste processing system upstream of the nuclear auxiliary building ventilation system.

11.3.2.3.12 Release Radiation Sensor

The waste gas processing system release radiation sensor is located downstream of the release isolation valve, and monitors the activity of processed waste gas that is released to the nuclear auxiliary building ventilation system.

11.3.2.3.13 Measuring Gas Compressors

The measuring gas compressors draw batch gas samples from the purge gas process stream for analysis of the hydrogen and oxygen concentrations in the purge gas. The measuring gas compressors are double diaphragm compressors; the first diaphragm compresses the gas, and the second diaphragm provides a gas-tight seal in the event of a working membrane failure. A negative pressure is maintained between the two membranes and is monitored and alarmed to detect possible membrane failure.

Table 11.3-2—Gaseous Waste Processing System Component Data
Sheet 4 of 4

11.03-7

Components / Parameters	Nominal Value
Gas Filter	
Number	1
Type	Pressure vessel w/ filter elements
Design pressure	0.2–315 psia
Design temperature	212°F
Design flow rate	0.0765 lb_m/s
Filter efficiency	99.99%
Hydrogen Analyzer	
Number	3
Design pressure	189 psia
Design temperature	212°F
Design flow rate (upstream/downstream)[1]	0.0004/0.0002 lb_m/s
Oxygen Analyzer	
Number	3
Design pressure	189 psia
Design temperature	212°F
Design flow rate (upstream/downstream)[1]	0.0004/0.0002 lb_m/s
Radiation Monitor	
Number	2
Design pressure (upstream/downstream)[2]	315/15 psia
Design temperature (upstream/downstream)[2]	212/125°F
Design flow rate	0.0765 lb_m/s

Notes:

1. Upstream/downstream of the recombiner.

2. Upstream/downstream of the delay beds.

activity levels in the resin in the proportioning tank, a portion of the resin is transferred into the concentrate buffer tank with other liquid waste where it is mixed before leaving the concentrate buffer tank. Spent resin from the demineralizer system, which is part of the liquid waste processing system, may be sent directly to the HICs or transferred to the concentrate buffer tank. In addition to spent resins, this demineralizer system produces a small amount of solid waste from the back flush of the ultrafiltration system which is treated as a wet solid waste and either placed in a HIC and dewatered or into a drum and dried.

11.04-12

From the concentrate buffer tank, the liquid waste can be transferred into a waste drum in one of three drum drying stations where the water content is evaporated. In the drum drying station, a vacuum seal is established on the drum and heaters are energized to evaporate the water from the drum. The vacuum in the drum allows the water to boil off at a lower required heating temperature. The water vapor is condensed, collected, and the volume measured before it is drained to the condensate collection tank. The air and radioactive noncondensable gases are routed to the radioactive waste processing building ventilation system for processing. The radioactive waste processing building ventilation system is described in Section 9.4.8. After most of the liquid has been evaporated out of the drum, the drum is refilled with more waste from the concentrate buffer tank and the drying process starts again. This filling and evaporation process is repeated until the drum is filled with a solid precipitated dry active waste product. The solid drum drying process reduces the moisture content of the solid block to ~~less than 10 percent by weight~~meet requirements in 10 CFR Part 61.

When drying is complete, a final core sample of the dried contents is taken (one per batch) and the drums are sealed and capped at the drum-capping device. The core sample is analyzed via gamma spectroscopy to identify the radionuclides content and activity levels. The drum is then picked up by the drum store crane and transferred to the drum measuring device where the dose rate is obtained, main nuclides are identified, and the weight of the drum is measured. An array of five process radiation monitors displays the radiation levels at various drum elevations and azimuthal angles. Gamma spectroscopy capability is available to identify key radionuclides, such as cobalt-60 and cesium-137 in the liquid waste. Additional radiation monitors measure and record the background radiation level and dose rate from the drum. Finally, the drum is transported to temporary storage in the drum store or the tubular shaft store until the drum meets the requirements of 10 CFR Part 61 for disposal of solid radioactive waste.

If a leak or overflow occurs in the room containing solid waste, then the room contains the leak or overflow. The floor drain from the room can be opened to drain the leakage into a sump. From the sump, the liquid is pumped into a storage tank in the liquid waste storage system.

inserted in a shielded tube. After the drum is removed from under the hood, the shielded tube containing the core hole drill bit and sample are manually removed from the machine, capped, and transported to the laboratory. In the laboratory, the sample is removed from the core hole drill bit and analyzed for residual moisture content, activity, and main chemical composition. The core hole drill bit is cleaned to remove remaining waste material and reused to collect another sample.

Drum Handling Device

The drum handling device is used to transfer the empty drums from the pickup position conveyor to the bottom heater of one of the three drum drying stations. After the drums are filled and dried, the drum handling device then transfers the filled drum from the drum drying station back to the pickup position conveyor.

11.4.2.4 Packaging, Storage, and Shipping

Large pieces of waste may be stored in various rooms of the Radioactive Waste Processing Building and covered with plastic to act as a temporary shield prior to decontamination of the wastes in the decontamination rooms. Once decontamination operations are completed, the waste is placed in large transport containers or is taken apart, as much as possible, to allow it to fit in disposal containers. As addressed in Section 11.4.3, the elements of the Process Control Program will be described by the COL applicant. This program will include site-specific information on operational practices to indicate what fraction, if any, of waste processing will be contracted out to waste brokers or specialized facilities and whether such wastes will be returned to the plant for disposal or shipped directly by the processor for disposal.

The waste characteristics shipped for disposal meet the requirements specified in 10 CFR 61.56. For the transfer and manifesting of radioactive waste shipped offsite, the requirements of Appendix G, "Requirements for Transfers of Low-Level Radioactive Waste Intended for Disposal at Licensed Land Disposal Facilities and Manifests," to 10 CFR Part 20 will be met. Based on industry experience, the radioactive waste shipped offsite for disposal is expected to consist of 79 percent Class A, 11 percent Class B, and 10 percent Class C waste.

11.04-11

The containers used for solid waste shipments meet the requirements of 49 CFR Parts 171-180 (Department of Transportation Radioactivity Material Regulations) and 10 CFR Part 71 (Packaging of Radioactive Materials for Transport). The solid waste system is designed to allow for the use of 55-gallon drums for shipment of evaporator concentrates, wastes collected from the centrifuge portion of the liquid waste processing system, sludge from the bottom of the liquid waste storage system storage tanks, spent resins from the coolant purification system, spent resins from the demineralizer system, spent filter cartridges, wet solid wastes, DAW (including spent charcoal, gel desiccants from the GWPS, and HEPA filters), and mixed wastes.

Table 11.4-14—Solid Waste Management System Component Data

Components/Parameters	Nominal Value
Resin Proportioning Tank	
Number	1
Total Volume	150 gallons
Material	Stainless Steel
Concentrate Buffer Tank	
Number	1
Total Volume	3000 gallons
Material	Stainless Steel
Condensate Collection Tank	
Number	1
Total Volume	150 gallons
Material	Stainless Steel
Concentrate Recirculation Pump	
Number	1
Type	Centrifugal
Design Flow Rate	50 gpm
Material	Stainless Steel
Condensate Collection Pump	
Number	1
Type	Centrifugal
Design Flow Rate	15 gpm
Material	Stainless Steel
Drum Drying Stations	
Number	3
Material	Stainless Steel
Condenser Drying Units	
Number	~~1~~3
Type	Tube Bundle Heat Exchanger
Design Flow Rate (shell/tube)	< 1/5 gpm
Temperature Inlet (shell/tube)	140°F/100°F
Temperature Outlet (shell/tube)	< 110°F/120°F
Material	Stainless Steel
Cementation Station	
Number	1
Material	Stainless Steel
Sorting Box	
Number	1
Material	Stainless Steel

11.04-10

Next File

requirements specified in Section 11.4.1.2.5. A mobile or vendor-supplied system is a site-specific design feature that is outside the scope of the design certification.

The U.S. EPR liquid waste management system receives degasified liquids in the storage tanks. These tanks are continuously vented to the radioactive waste processing building ventilation system so that any generation of gaseous activity is continually removed. The primary design functions of the gaseous waste processing system are to collect radioactive waste gases from the various systems in which they are released, to process these waste gases and provide sufficient holdup time for radioactive decay to reduce the activity present, and to control the subsequent release of processed waste gases to the atmosphere in compliance with regulatory limits. To continuously vent the tanks, the system maintains a negative pressure to prevent the escape of radioactive gases from components connected to the building air.

Releases from the gaseous waste processing system are continuously monitored by radiation sensors in the delay system discharge line. The system also provides grab sample collections for analysis from several different points on the process stream, and from each of the delay beds along the discharge line. Gaseous waste processing system releases are routed through the filtration system of the nuclear auxiliary building ventilation system. The gaseous waste processing system operates at a negative pressure relative to its surroundings, preventing radioactive gases from leaking and contaminating the facility, or flowing back towards the hydrogen, nitrogen, and
11.03-9 oxygen gas supply systems. Multiple mechanical barriers are also used to prevent facility contamination through the gas supply systems.

In the drum drying station of the solid waste treatment unit, a vacuum seal is established on the drum and heaters are energized to evaporate the water from the drum. The vacuum in the drum allows the water to boil off at a lower required heating temperature. The water vapor is condensed, collected, and the volume measured before it is drained to the condensate collection tank. The air and radioactive non-condensable gases are routed to the radioactive waste processing building ventilation system for processing. Process monitors installed on the drum drying system detect in-process radiation levels to keep the operator informed.

The solid waste management system is equipped with a sorting box that is used to sort the various dry actives wastes produced in the controlled areas of the plant. The sorting box contains hand holes with rubber gloves for sorting the wastes. The sorting box is connected to the radioactive waste processing building ventilation system through a filling hood. Any airborne contaminants created during the sorting, shredding, or compaction processes are captured by the filling hood and subsequently treated in the radioactive waste building ventilation system.

The sampling box serves as the sampling point for the concentrate buffer tank. The box enclosure is equipped with gloves and a gate for inserting and removing the sample

Figure 11.4-1—Solid Waste

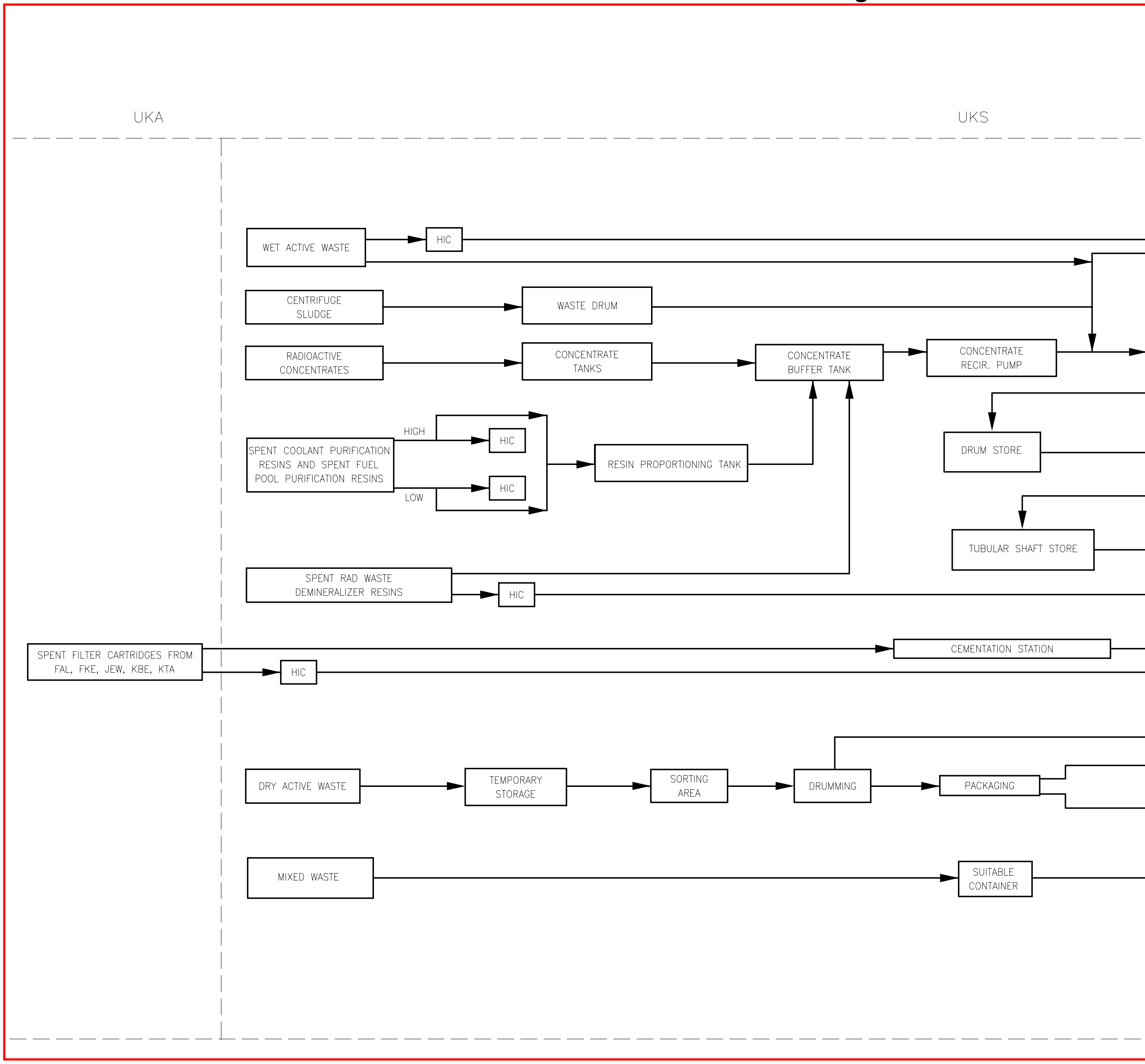

Figure 11.4-2—Radioactive Co