RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**235-8275**
SRP Section:	**12.03-12.04 – Radiation Protection Design Features**
Application Section:	**12.3-12.4**
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Question No. 12.03-24

10 CFR 20.1101(b) requires that the licensee use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA).

Regulatory Guide 8.8, Regulatory Position 2.i(4) indicates that, “Where filters or other serviceable components can constitute substantial radiation sources, exposures can be reduced by providing features that permit operators to avoid the direct radiation beam and that provide remote removal, installation, or servicing. Standardization of filters should be considered.”

FSAR Section 11.4.2 indicates that after spent filters are transferred to the compound building in a shielded cask, where they are then placed and capped in a 55 gallon drum. Please update the FSAR to discuss how exposure to workers will be maintained ALARA when transferring the filter to the drum and during servicing of the drum to remove water.

Provide information regarding any shielding provided for the drum during this process.

Response

Spent filter handling is described in DCD Tier 2 Subsections 11.4.2 and 11.4.2.2.2. The spent filter handling subsystem consists of a working shield plug, a remote controlled spent filter handling cask, automatic capping station, and mobile transport.

Before the spent cartridge filter is removed from the liquid filter vessels using the working shield plug and the shielded spent filter handling cask, the filter vessel is fully drained by opening the vent and drain valves to minimize the residual water contained in the spent filter and reduce the potential water contents in the filter handling cask and the 200L drum that will contain spent cartridge filters during storage. This minimizes free standing water to meet transportation and disposal requirements.

In addition, the spent filter handling cask is designed to remotely open and close the sliding door, which has a watertight seal and is located on the bottom of the cask. This helps maintain an exposure to workers that is ALARA and the spread of contamination will be prevented.

Spent filters are lifted into a shielded filter handling cask and the cask is moved to the properly radiologically controlled area next to the filter vessel room by using an overhead crane. The spent filter will then be taken out from the shielded filter handling cask and loaded into a fresh 200L (55 gallon) drum located in the shielded automatic capping station after positioning the filter handling cask at the top of the automatic capping station. All of these operations are performed in a radiologically controlled area and remotely controlled so that the plant operators will limit their exposure.

After the packaging of the spent filters, the drum with automatic capping station will be moved to the temporary storage area in the compound building using a hoist and mobile transport.

DCD Tier 2, Subsection 11.4.1.5 and 11.4.2 will be updated to incorporate the above description.

Impact on DCD

DCD Tier 2, Subsections 11.4.1.5 and 11.4.2 will be revised as indicated in the Attachment.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

d. R/O concentrates are dried to reduce the volume and converted to a granular or bead form. The dried concentrates are packaged in a 200 L (55 gal) drum or HIC.

The generation of mixed waste is minimized by prohibiting the use of hazardous materials. However, if mixed waste cannot be avoided, the mixed wastes are collected separately in a 200 L (55 gal) drums and stored prior to shipment to an appropriately licensed processor.

The SWMS is designed to provide 30-day storage of packaged wastes in accordance with the guidance of ANSI/ANS 55.1 (Reference 14). The storage facility is designed with adequate shielding to minimize the radiation dose to the operators, as described in Sections 12.3 and 12.4.

11.4.1.5 Radioactive Source Terms in SWMS

Source terms for solid radwaste are calculated for high-activity spent resin, low-activity spent resin, spent filter, and R/O concentrate. Tables 11.4-2 and 11.4-3 present the expected and design basis (1 percent fuel defect) radionuclide quantities in various solid radioactive wastes.

The spent resin long-term storage tank (SRLST) in the SWMS is designed to accumulate and contain high-activity spent resins from the purification, deborating, pre-holdup, and boric acid condensate ion exchangers of the CVCS for 10 years. The source terms for the SRLST are calculated by summing the source terms for each CVCS ion exchanger resin bed considering decay of up to 10 years.

The low-activity spent resin tank (LASRT) contains spent resins from the LWMS, SFPCCS, and SGBDS. The source term in the LASRT is determined based on spent resin generation assuming a one-time replacement of each ion exchanger bed. Because the buildup activities of SGBD and SFPCC spent resins are low, it is conservatively assumed that the LASRT is filled only with spent resins generated from the LWMS.

The high-activity spent filters generated from the CVCS, SFPCCS, and SGBDS are removed by means of a shielded plug and a shielded ~~cask and transferred to the filter capping area in the compound building via the filter transporter and capped in a 200 L (55~~ filter handling cask and moved to the filter capping area next to the filter vessel room. The spent filter is loaded into a 200 L drum, which is located in advance in the shielded automatic capping station. After capping, the spent filter drum is moved to the temporary storage area in the compound building using the shielded automatic capping station and mobile transport.

~~gal) drum for offsite storage.~~ The activity level of spent filters is determined by summing the buildup of radionuclide activities on each filter for 1 year.

The R/O concentrate is collected, drummed, dried, and moved to the temporary waste storage area in the compound building. The activities in the concentrate are determined using the inflow activities in each liquid waste stream to an R/O package and the corresponding decontamination factor of the R/O. The expected radioactive concentrations of the inflows to the equipment waste tank, chemical waste tank, and floor drain tanks and their flow rates are used to calculate the annual buildup activities in the R/O concentrate.

The methodology that is used to determine SWMS component safety classification follows NRC RG 1.143 (Reference 15), and is described in Subsection 11.2.1.4. The results are provided in Table 11.4-4.

11.4.1.6 Site-Specific Cost-Benefit Analysis

The cost-benefit numerical analysis as required by 10 CFR 50, Appendix I (Reference 22), Section II, Paragraph D, demonstrates that the addition of items of reasonably demonstrated technology would not provide a favorable cost-benefit. The COL applicant is to perform a site-specific cost-benefit analysis, following the guidance in NRC RG 1.110 (Reference 23) (COL 11.4(2)).

11.4.1.7 Mobile Equipment

The spent resin dewatering system is designed as a modular and mobile system. The mobile design facilitates equipment replacement when advanced treatment technologies are developed or when the equipment is broken, or both. The mobile system includes an exhaust fan and HEPA filter to control airborne dust, in accordance with BTP 11-3 (Reference 12). The exhaust air is discharged to the compound building HVAC system. The mobile system is designed to meet the provisions and conformance requirements of ANSI/ANS-40.37-2009, “Mobile Radioactive Waste Processing Systems” (Reference 25). The COL applicant is to provide reasonable assurance that the provisions and requirements of ANSI/ANS-40.37-2009 (Reference 25) are met (COL 11.4(3)).

shipment to the onsite interim storage facility or offsite disposal facility. The boundaries and descriptions for SWMS subsystems are presented as follows:

Spent Resin Transfer and Packaging Subsystem

The boundary of the spent resin transfer and packaging subsystem starts at the spent resin discharge isolation valve from each of the demineralizers and terminates at the temporary waste storage area for packaged spent resins.

The spent resin transfer and packaging subsystem is designed to transfer spent radioactive resins from the demineralizer vessels to the spent resin tanks where the resin is held up prior to being processed. The major components of this subsystem are the low-activity spent resin tank and the spent resin long-term storage tank. The process flow diagram for the spent resin transfer and storage subsystem is shown in Figure 11.4-1. The COL applicant is to provide piping and instrumentation diagrams (P&IDs) (COL 11.4(4)).

The spent resin tanks provide a settling capacity for radioactive resins transferred from various demineralizers. The spent resin long-term storage tank and low-activity spent resin tank are provided to hold up the spent resin for decay prior to processing. The spent resins in the CVCS demineralizers are transferred to the spent resin long-term storage tank hydraulically using demineralized water for sluicing. The sluice water in the SRST is then removed and routed to the LWMS for processing and release. The relatively low-activity spent resins from the LWMS, SFPCCS, and SGBDS are transferred to the low-activity spent resin tank via a similar method. Each spent resin tank has a connection for the transfer of spent resin to the mobile dewatering system.

Spent Filter Handling Subsystem

The boundary of the spent filter handling subsystem starts at the point of removal of the filter media from the filter housing and terminates at the temporary waste storage area.

The filter handling subsystem provides the capability to replace normally radioactive filters with a minimum of personnel radiation exposure. Following the detection of a pressure drop across the filter at a predetermined level, spent filters are removed from the filter vessel through a shield plug and a shielded ~~transfer cask. Spent filters are transferred to~~

~~the compound building via the filter transporter and then placed and capped in a 200 L (55 gal) drum~~. R/O membranes are dewatered and packaged in a 200 L (55 gal) drum. Low-activity filters, such as drain filters of the detergent waste subsystem and the HEPA filters of the GRS, are removed manually and disposed of in drums. Absorbent materials may be put into the filter disposal drums to minimize any standing water to meet transportation and disposal requirements.

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Dry Active Waste Subsystem

The dry active waste subsystem boundary starts at the collection point of dry active wastes from the various generation areas in the plant and terminates at the temporary waste storage area.

The dry active wastes are collected and sorted at the generation area by plant personnel. Non-contaminated wastes are not processed in the SWMS and are handled separately. A space is also provided to sort miscellaneous contaminated dry solids for appropriate and cost-effective packaging and temporary storage. Miscellaneous solid waste consisting of contaminated rags, paper, clothing, glass, and other small items is collected at the DAW sorting area located in the compound building. Wastes are compacted and/or packaged into approved disposal containers and transferred to and stored in a temporary waste storage area in the compound building prior to shipment to the offsite disposal facility.

Charcoal used in the GRS is not expected to be replaced. Therefore, spent charcoal waste is not generated routinely. If spent charcoal waste is generated from the GRS, it is processed in accordance with the process control program provided by the COL applicant (COL 11.4(5)).

R/O Concentrate Treatment Subsystem

The R/O concentrate treatment subsystem boundary starts at the R/O concentrate discharge isolation valve from the R/O concentrate feed module of the LWMS and terminates at the temporary waste storage area.

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filter handling cask. The filter vessel is fully drained to minimize the residual water contained in the spent filter. The shielded filter handling cask is designed to remotely open and close the watertight sliding door. This helps maintain an exposure to workers that is ALARA and the spread of contamination will be prevented. The shielded filter handling cask is moved remotely to the radiologically controlled area next to the filter vessel room by using an overhead crane. The spent filter will then be taken out from the shielded transfer cask and loaded into a 200 L drum, which is located in advance in the shielded automatic capping station. The shielded automatic capping station can be operated remotely to cap a drum. After capping the shielded capping station and drum are transported to the temporary waste storage area of compound building by using a hoist and mobile filter transport.