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.:	**225-8254**
SRP Section:	**12.03-12.04 - Radiation Protection Design Features**
Application Section:	**12.3-12.4**
Date of RAI Issue:	**09/24/2015**

Question No. 12.03-13

10 CFR 52.47(a)(5) requires that the FSAR contain the kinds and quantities of radioactive materials expected to be produced in the operation and the means for controlling and limiting radioactive effluents and radiation exposures within the limits set forth in 10 CFR 20.

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 indicates that appropriate station layout and design features should be provided to reduce the potential doses to personnel who must operate, service, or inspect station instrumentation and controls.

The gaseous radwaste management system contains four delay beds in two cubicles. The areas are listed as potential very high radiation areas using the design basis failed fuel source term. The design also includes two guard beds to reduce moisture to the delay beds which are also listed as significant radiation areas. In addition, FSAR Chapter 11 discusses the possibility of replacing the delay beds if necessary. However, the FSAR does not provide any information on accessing requirements for the delay bed or guard bed area.

1. Please update the FSAR to specify the need and frequency for access the delay bed and guard bed areas, such as to check temperature or humidity levels or to perform other activities or inspections. In the FSAR discussion indicate how the design features limit worker exposure, consistent with RG 8.8 and 10 CFR 20.1101(b).

2. Also update the FSAR to discuss the process for replacing the beds, if they need to be replaced. In the FSAR discussion indicate how the design is commensurate with limiting worker exposure consistent with RG 8.8 and 10 CFR 20.1101(b).

Response

1. Components such as valves and instrumentation are not installed in the delay bed and guard bed rooms in order to minimize the radiological exposure to the plant operator as described in the DCD Tier 2, subsection 12.3.1.1.a, General Arrangement Design Feature.

   The temperature and humidity instrumentation are installed at wall mounted piping racks that include valves, which are located in relatively low radiation areas outside those rooms, and remotely monitored in the radwaste control room located at Compound Building El. 120'.

2. Although it is not expected to replace the charcoal in the charcoal delay bed during the life of the plant, the gaseous radwaste system includes provisions for charcoal replacement in the event of an unexpected condition such as the wetting of the delay bed. If wetting occurs, the leading delay bed is isolated and bypassed and the charcoal delay beds are rearranged in series for continued operation and to allow for the regeneration or replacement of charcoal in the isolated delay bed. As described in DCD Tier 2 Section 11.3.2, the charcoal in the beds is regenerated by drying the beds with nitrogen gas. The charcoal is regenerated in case of the wetting of the delay bed in order to minimize the potential for charcoal replacement. When the replacement of charcoal would be required, the spent charcoal is then quickly removed through the charcoal removal port at the bottom of the bed using temporary vacuum charcoal removal system at the top of the bed and the fresh charcoal is uniformly loaded into the beds. The radioactive gases in the bed are purged with nitrogen gas before the replacement in order to minimize the radiological exposure to plant workers. According to COL 12.1(2), the COL applicant is to describe the operational radiation protection program to provide reasonable assurance that occupational radiation exposures are ALARA, if necessary.

   DCD Tier 2, Section 11.3.2 will be updated to add the above description.

Impact on DCD

DCD Tier 2, Section 11.3.2 will be revised as indicated in the attached markup.

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.

bed further protects the main charcoal delay bed from moisture. Humidity sensors are installed upstream and downstream of the charcoal guard bed to monitor the charcoal wetting condition. Temperature sensors are installed at the guard beds and delay beds. Iodine is held up for decay in the charcoal guard beds.

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~~The four delay beds are normally operating in series. The leading delay beds can be isolated for regeneration or replacement, if needed.~~ This mode of operation is temporary and the delay beds can be switched back in when they are ready. During this mode of operation, the gas velocity remains unchanged, but the adsorption rate of the xenon and krypton gases is temporarily increased to compensate for the beds in maintenance mode. Nitrogen purge is available to dry the charcoal beds in the event of excessive moisture contamination. The four charcoal delay beds, containing a total of 9,525 kg (21,000 lb) of charcoal, are used for xenon and krypton delay. All GRS components are located in a shielded cubicles.

After passing through the charcoal delay beds, the waste gas flows through a HEPA filter where particulates, including charcoal fines, are removed, and then it is vented to the compound building HVAC system.

The GRS operates at pressures slightly above atmospheric to provide the necessary pressure to route the gas flow into the HVAC ventilation exhaust. Operating at this slightly pressurized condition also minimizes the potential for oxygen inleakage. Leakage from the GRS is further limited through the use of welded connections wherever the connections are not restricted for maintenance purposes. Control valves are provided with bellow seals to minimize leakage through the valve stem.

The GRS is designed to prevent the formation or buildup of explosive mixtures of hydrogen and oxygen by monitoring the concentrations of hydrogen and oxygen through one of the two gas analyzers (continuous monitoring). The concentrations are confirmed by periodic sampling and analysis at several routing locations. When the oxygen concentration is detected to be higher than the predetermined setpoint (high-high setpoint), nitrogen is injected to dilute the concentration to below the lower flammable limit of 4 percent. Along the gas flow paths, there are process vessels (VCT, RDT, EDT, gas stripper, GRS header drain tanks, and associated piping) that are designed in accordance with ASME VIII (Reference 25) for pressure vessels. Accordingly, design pressures are assigned to contain significant margins above the normal operating pressure, and relief valves are provided for each vessel to protect against surges in pressure. A loop seal is provided downstream of

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Although it is not expected to replace the charcoal in the charcoal delay bed, the gaseous radwaste system includes provisions for charcoal replacement in the event of an unexpected condition such as the wetting of the delay bed. If wetting occurs, the leading delay bed is isolated and bypassed and the charcoal delay beds are rearranged in series for continued operation and to allow for the regeneration or replacement of charcoal in the isolated delay bed. When the replacement of charcoal would be required, the spent charcoal is then quickly removed through the charcoal removal port at the bottom of the bed using the temporary vacuum charcoal removal system at the top of the bed and the fresh charcoal is uniformly loaded into the beds. The radioactive gases in the bed are purged with nitrogen gas before the replacement in order to minimize the radiological exposure to plant workers.