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.:	**242-8276**
SRP Section:	**11.04 – Solid Waste Management System**
Application Section:	**11.4**
Date of RAI Issue:	**10/14/2015**

Question No. 11.04-3

10 CFR 50.34a relates to identifying and providing adequate design information on the expected generation rates of waste, and subsequent storage of the waste in the temporary waste storage area.

GDC 60 relates to having the necessary provisions to handle radioactive wastes produced during normal reactor operation.

In DCD section 11.4.2 the applicant states the following:

> "The temporary waste storage area is sized to accommodate the number of drums and HICs generated in a 6-month period of normal operation. The expected and maximum generation volumes, and their shipped volumes, are summarized and presented in Table 11.4-1."

Staff is requesting that the applicant provide the necessary information to verify the statement made in DCD section 11.4.2. Staff is requesting that the applicant provide the necessary information to verify the statement made in DCD section 11.4.2. The NRC staff would like references to plant drawings that contain the necessary information to confirm the expected area for temporary storage within the DCD, and to provide the surface area that would be utilized to store waste in the temporary storage area. NRC staff is also requesting the expected generation rate and maximum generation rate for dry active waste that would be stored in the low-level temporary waste storage area, as is described in section 11.4.2.1.1

Please address the items above and provide a mark-up on the proposed DCD changes.

Response

The plant drawing showing the temporary storage area is provided in DCD Tier 2, Figure 1.2-27 "General Arrangement Compound Building EL 100'-0"". The temporary storage area provides

six (6) months of waste storage with sufficient margin and is divided into two areas, the high activity waste area and the low activity waste storage area.

- The high activity waste storage area is designed with about 49 square meters of space to store 200 liter drums for spent filters and 1,400 liter capacity HICs for spent resin generated during a six month period. The actual storage area considering crane governing area is around 26 square meters of space, which can store up to sixteen HICs with a 2 x 4 arrangement with stacking assuming a 2 inch clearance between HICs with a diameter of 1.42 meters and store up to twenty 200L drums with a 5 x 4 arrangement without stacking assuming a 2 inch clearance between 200 L drums with a diameter of 0.6 meter. The storage area has the capacity with sufficient margin for storing two 200 liter drums for spent filters and seven 1,400 liter capacity HICs for spent resin generated during a six month period.

- The low activity storage area is designed with about 94 square meters of space for storing waste drums including dry active waste (DAW). The actual storage area is about 55 square meters, which can store up to 326 drums with a 13 x 10 arrangement with stacking assuming 2 inch clearance between 200 L drums of diameter 0.6 meter. The storage area has the capacity with sufficient margins for storing 290 drums of DAW, R/O concentrates, and R/O membranes generated during a six month period.

The waste generation volumes or shipped waste volumes are the average and the greatest volume after waste processing and are listed in DCD Tier 2 Table 11.4-1. The volumes have been estimated from ten years of operation data from the 1,000 MWe Korean NPP as indicated in DCD Tier 2 Table 11.4-1, footnote (1). The reference NPP has processed DAW with the similar methods applied in APR1400 DAW treatment such as sorting, segregation, and compaction, as described in DCD Tier 2 subsection 11.4.2.

The expected generation rate and maximum generation rate for DAW may be calculated from the above shipped waste volume by the ratio of compressible waste, the volume reduction factor of compactor for compressible waste, and packaging efficiency.

The ratio of compressible waste and the volume reduction factor of the compactor can be determined according to IAEA-TECDOC-1492. IAEA-TECDOC-1492 states that the typical generated compressible DAW has the range of 20% to 60% for dry solid waste and the compactors typically have a volume reduction factor ranging from 2 to 6. Based on this reference, it is assumed that 60% of compressible DAW is conservatively generated and volume reduction factor of the compactor is 3 in the estimation of the waste generation rate. In addition, the packaging efficiency of 90% is considered as described in Table 11.4-1. The calculation result of expected and maximum generation rate is as follows;

- Expected Waste Generation Volume

  $W_{shipped} = \{(W_{generation} \times 0.6 / 3) + (W_{generation} \times 0.4)\} / 0.9 = 50.19\ m^3/yr\text{-}unit$

  $W_{generation} = 75.29\ m^3/yr\text{-}unit$

  Where,

  $W_{generation}$ is expected generation rate

$W_{shipped}$ is expected shipped volume presented in DCD Tier 2, Table 11.4-1.

- Maximum Waste Generation Volume

$W_{shipped}$ = {($W_{generation}$ x 0.6 / 3) + ($W_{generation}$ x 0.4)} / 0.9 = 141.68 m^3/yr-unit

$W_{generation}$ = 212.52 m^3/yr-unit

Where,

$W_{generation}$ is maximum generation rate

$W_{shipped}$ is maximum shipped volume presented in DCD Tier 2, Table 11.4-1.

Even though the shipped waste volumes are considered to be more reliable than the waste generation rates and correlated with the generation rates as described above, DCD Tier 2 Table 11.4-1 will be updated to add the expected and maximum generation rate including a footnote describing the relationship between the shipped volumes and the generation rates for clarity.

Impact on DCD

DCD Tier 2, Table 11.4-1 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.

Table 11.4-1

Estimated Annual Solid Waste Generation

(Unit: m^3/yr-unit)

Waste Stream		Expected Generation	Expected Shipped Volume(1)	Maximum Generation	Maximum Shipped Volume(1)	Waste Classification(2)
Spent Filter	High Activity	0.19	0.21	0.38	0.42	B
	Low Activity	0.15	0.17	0.29	0.32	A
Spent Resin	High Activity	2.72	-	5.43	-	B
	Low Activity	8.64	8.64	17.28	17.28	A
R/O Membrane		3.24	3.6	3.24	3.6	A
R/O Concentrate		4.2	4.2	12	12	A
Dry Active Waste		75.29(5)	50.19	212.52(5)	141.68	A
Total		-	67.01	-	175.30	-

(1) Shipped volume is estimated based upon the following:
- Spent filters are packed in a 200 L (55 gal) drum or HIC. Packing efficiency of 90% is considered.
- Spent resin is packed in HIC.
- High-activity spent resins generated from CVCS are stored in the spent resin long-term storage tank for 10 years. The high-activity spent resin will be shipped after sufficient decay.
- R/O membranes are packed in a 200 L (55 gal) drum. Packing efficiency of 90% is considered.
- Volume of DAWs is estimated using the 1000 MWe plant's average and maximum packaged volume during 10 years. The factor for the increment of electric power generation (1400/1000) is reflected.

(2) Waste classification per 10 CFR 61.55

(3) Generation of mixed waste is prevented and minimized by prohibiting use of hazardous material.

(4) GRS delay bed charcoal is expected to be essentially permanent.

(5) The expected generation rate and maximum generation rate for dry active waste has been conservatively estimated from the shipped waste volume assuming the compressible waste ratio of 60%, compactor volume reduction factor of 3 for compressible waste, and packing efficiency of 90%.