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U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Request for Additional Information

Attached is the Nuclear Innovation North America LLC (NINA) response to NRC Request for Additional Information (RAI) 03.08.04-37 related to the Combined License Application (COLA) Part 2, Tier 2, Section 3.8. This completes the response to NRC letter number 384.

Where there are COLA markups, they will be made at the first routine COLA update following NRC acceptance of the RAI response.

There are no commitments in this letter.

If you have any questions regarding these responses, please contact me at (361) 972-7136 or Bill Mookhoek at (361) 972-7274.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 9/8/11

Scott Head
Manager, Regulatory Affairs
South Texas Project Units 3 & 4

jep

Attachment:
RAI 03.08.04-37

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NRO

STI 32935440

cc: w/o attachment except*
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RAI 03.08.04-37

QUESTION:

Radwaste Building Classification:

In Appendix 3H.3 of the FSAR, Revision 5, the applicant states that "The RWB is classified as RW-IIb (Hazardous) in accordance with RG 1.143." The staff finds the commitment to comply with the guidance in RG 1.143 for classification of RWB to be consistent with the evaluation of STD DEP T1 2.15-1 in FSAR, Part 7, Departure Report, and the guidance provided in Regulatory Guide 1.29. However, the FSAR did not include any discussion of how the guidance provided in RG 1.143 was implemented in establishing the classification of RW-IIb for RWB. Therefore, the applicant is requested to demonstrate that the classification of RW-IIb for the RWB is appropriate including the basis supporting the classification process presented in Regulatory Position C.5 of RG 1.143. Please include any changes to the FSAR to document the basis.

RESPONSE:

Radwaste Building (RWB) Classification Process

The criteria for the classification of radwaste systems, structures and components are provided in Section 5 of Regulatory Guide (RG) 1.143. Specifically, Subsection 5.2 states:

> "For a given structure housing radwaste processing systems or components, if the total design basis unmitigated radiological release (considering maximum inventory) at the boundary of the unprotected area is less than 500 millirem per year and the maximum unmitigated exposure to site personnel within the protected area is less than 5 rem per year, the external structure is classified as RW-IIb."

Subsection 5.1 states that if these dose criteria are exceeded, the structure is classified as RW-IIa. Therefore the classification of the RWB structure is based on the doses resulting from a "total design basis unmitigated radiological release (considering maximum inventory)." The following is a description of the scenario used at STP 3&4 to model an unmitigated release. The scenario consists of three parts: the RWB source term (i.e., inventory of radioactive material in the RWB), release pathways from the RWB, and exposure (dose) models for onsite personnel and a person at the boundary of the unprotected area.

RWB Source Term

The RWB at STP 3&4 contains primary components of the Liquid Waste Management System (LWMS) and the Solid Waste Management System (SWMS). The Gaseous Waste Management System is located in the Turbine Generator Building and therefore is not considered in the classification of the RWB. The primary components of the LWMS are collection tanks to hold contaminated liquid prior to processing, processing skids used to remove the radioactive material from the liquid, storage tanks used to hold the treated liquid prior to recycle or discharge, pumps to transfer the liquid between components, and piping that connects the components. The SWMS consists of the spent resin storage tanks, phase separators, a dewatering station, a storage area for dewatered solid radwaste, and the pumps and piping connecting the components. The maximum inventory of radioactive material in each of these components is provided in Chapter 12 of the STP 3&4 COLA.

The RWB is a concrete structure designed to accommodate the components in the LWMS and SWMS. The general layout of the building is that most components, including tanks containing a large amount of radioactive material, are located below grade in the RWB basement. Each major component is located in a separate room provided with radiation shielding to reduce the dose rate in adjacent areas. There is a floor at grade level that contains the processing skids and the dewatering station. The grade level slab, which provides shielding to reduce the dose rate due to components in the RWB basement, is designed with curbs and drains so that any liquid released from the components will be returned to collection sumps in the RWB basement. The grade level floor also contains a storage area for dewatered waste and other solid radioactive material. In addition the grade level floor contains permanent and moveable shield walls to reduce the dose from waste storage and processing operations. Because of this layout, all of the liquid radwaste is located in the RWB basement, except for the small amount of liquid in the process skids while they are operating.

RWB Release Pathways

In general, there are three potential building release pathways that could result in exposure to personnel outside the building: release of gaseous activity to the atmosphere, release of activity to the surface water, and release of activity to the groundwater. These pathways are discussed below as they apply to the RWB.

Any gaseous activity in the RWB atmosphere is routed to the plant stack for monitoring prior to release. Filtration is available if airborne activity is detected, but it is normally not used because there is normally no airborne activity. The components of the LWMS and SWMS are not pressurized, so there is little or no accumulation of gaseous activity in the RWB. Since there is no potential source of gaseous activity, this pathway is not significant to the classification of the RWB.

The surface water pathway is also not significant to the classification of the RWB. In order for activity to enter the surface water, it would have to flow out of the RWB. Since all of the components containing large volumes of liquid are located in the basement of the RWB any release would remain below grade level and would not reach the surface. Any releases from the processing skids would be returned to the RWB basement due to the curbs and drains provided in the RWB. The solid material stored at grade level in the RWB is not mobile and would not be released as a liquid from the RWB.

The basement of the RWB is located below the top of groundwater at the STP site. Therefore, any liquid releases from the RWB basement could enter the groundwater. This is very unlikely because the rooms containing large inventories of liquid radwaste are steel lined and designed to hold the contents of the equipment in the room. In addition, the basemat and walls of the RWB are substantial and unlikely to develop cracks. However, since the groundwater pathway is the only feasible pathway for a significant release from the RWB, the "total design basis unmitigated radiological release (considering maximum inventory)" for the purpose of the RG 1.143 classification of the RWB now becomes a release of all the liquid radwaste directly to the groundwater. Note that the activity that is contained on the solid radwaste material (spent resin tanks and phase separator) is not included in this release because the solid media will not migrate through the groundwater aquifer.

Exposure (Dose) Models

There are three ways personnel can be exposed to the activity in the environment due to the unmitigated release from the RWB:

Direct Radiation: The liquid radwaste will constitute an external radiation source that can cause radiation exposure due to direct "shine." This is a concern in areas such as the RWB where individuals can come in close proximity to the liquid radwaste (e.g., inside the RWB).

Submersion: If activity becomes airborne, individuals can be exposed to radiation by submersion in the cloud of radioactive material. Since no airborne activity would result from the unmitigated release from the RWB, submersion is not applicable.

Ingestion: Activity that enters the atmosphere or groundwater can be a source of internal exposure for individuals either directly, through ingestion or inhalation, or indirectly by the consumption of food contaminated by the activity released from the RWB.

Since the release path used to characterize the unmitigated release is a release to the groundwater, the exposure to a person at the boundary of the unprotected area will be through ingestion of the contaminated liquid in the groundwater. For personnel on site, the exposure will be direct radiation exposure from the liquid radwaste in the RWB.

Summary of Release Scenario

For the purpose of the classification of the RWB structure in accordance with RG 1.143, the total design basis unmitigated radiological release has now become a release of all of the liquid radwaste from components in the RWB and the subsequent release directly to the groundwater. Since the radwaste outside the RWB is under ground, on site personnel will be exposed to direct radiation from the radwaste inside the RWB, and a person at the boundary of the unprotected area will be exposed through the direct ingestion of contaminated groundwater.

Application of the RG 1.143 Acceptance Criteria

Site Personnel

The RWB is designed so that the area outside the RWB will have a dose rate that allows continuous access without radiation monitoring (Radiation Zone A, <0.6 mrem/hr). The unmitigated release will not compromise the radiation shielding for the RWB and the dose rate outside the RWB will remain below the Zone A limits. The RWB does not contain any safety related equipment, so access to the RWB is not required. Therefore, access will be controlled under normal plant procedures. Since the annual exposure is limited to 5 rem/yr by 10 CFR 20.1201 and the exposures of individuals is administratively controlled to this limit, the dose to site personnel due to the unmitigated release will be less than the RG 1.143 criterion of 5 rem/yr.

Person at the Boundary of the Unprotected Area

The dose due to the ingestion pathway (in this case, through drinking water) is determined by the concentration of radioactive material in the drinking water. To make a conservative, bounding estimate of the concentration in drinking water, the activity concentration in the liquid released from the RWB is assumed to be constant based on the maximum activity concentration in the LWMS. A comparison of the RWB sources indicates that the Low Conductivity Waste Collection (LCW) Tank has the highest concentration of activity for the liquid tanks in the RWB. For some nuclides, the reactor coolant concentrations shown in Chapter 11 of the COLA are higher than the concentrations in the LCW tank. To ensure the source term is conservative, a composite source was developed with the limiting concentration for each nuclide. Hence the total unmitigated release has now become a release of liquid radwaste with concentrations of radioactive material based on this composite source.

Liquid with the limiting concentration described above was assumed to be released to the groundwater adjacent to the RWB. This liquid is transported undiluted along with the groundwater to the closest point on the site boundary along the groundwater gradient, which represents the shortest transport time to a potential location of a well used by the public for drinking water. The closest point on the site boundary along the groundwater gradient is approximately 7300 feet from the RWB. The average travel time for individual nuclides, considering dispersion, advection, radioactive decay and retardation, is more than 100 years. Because of the long travel time, the concentration is reduced considerably by decay. To compare the concentration at the site boundary to the annual dose limit, the effluent concentration limits presented in Table 2, Column 2 of Appendix B to 10 CFR 20 (commonly called the ECL) are used. The ECL is the concentration that, if ingested continuously over the course of a year, will result in a dose of 50 mrem. As discussed in Section 2.4S.13 of the COLA, the concentrations of all nuclides at the site boundary will be less than the ECL, and the sum of the ECL fractions for all nuclides will be less than 1. Therefore, the dose due the unmitigated release to the groundwater will be less than 50 mrem/yr which is less than the 500 mrem/yr limit in RG 1.143 for the RW-IIb classification of structures.

Radwaste Building Classification

Since the maximum unmitigated dose at the site boundary is less than 500 mrem/yr and the unmitigated exposure to site personnel is less than 5 rem/yr, the classification of the RWB is RW-IIb in accordance with Subsection 5.2 of RG 1.143.

Following the issuance of the RAI, we received additional questions from NRC on August 24, 2011. Enclosure 2 provides responses to these additional questions.

As a result of this response, COLA Part 2, Tier 2, Appendix 3H will be revised as shown in Enclosure 1.

Enclosure 1

Mark-up to COLA Section 3H.3.1

3H.3.1 Objective and Scope

The scope of this subsection is to document the structural design and analysis of the Radwaste Building (RWB) for STP Units 3 & 4. The RWB is a not a Seismic Category I structure. The RWB is classified as RW-IIb (Hazardous) for STP 3 & 4 site per Section 5 of Regulatory Guide (RG) 1.143 Revision 2 and designed to meet or exceed applicable requirements of RG 1.143 Revision 2. The determination of the RWB classification is based on an evaluation of an unmitigated release from the RWB. The unmitigated release results in an annual dose outside the protected area of less than 500 mrem/yr and an annual dose to site personnel of less than 5 rem/yr. This results in a RW-IIb classification for the structure in accordance with Section 5.2 of RG 1.143. Although, the RWB is classified as RW-IIb, it is designed conservatively for earthquake, tornado and wind loadings based on the requirements for RW-IIa classification. Design for other loads is based on the requirements for RW-IIb classification.

Enclosure 2

Response to Additional NRC Questions

Response to additional NRC questions

Following the issuance of the RAI, we received additional questions from NRC on August 24, 2011. This attachment provides responses to these additional questions.

1. The use of an SRP 11.2, BTP 11-6 consequence analysis of radwaste tank failures is not appropriate since the assessment addresses offsite impacts for someone assumed to consume/use ground or surface water, either directly (drinking) or indirectly (ingredient in food products or for livestock watering). BTP 11-6 is clear on this and as well as the type of radiological analysis that need to be performed.

RESPONSE: As indicated in the discussion above, the dose analysis used to classify the RWB is based on RG 1.143 and a "total design basis unmitigated radiological release (considering maximum inventory)." Because of the largely below grade design of the building and the fact that the inventory in the RWB is contained in radwaste tanks, and the concentration in the liquid released to the groundwater is assumed to be constant based on the maximum concentration in the LWMS, the consequence analysis is essentially the same as the radwaste tank failure. The total volume of the liquid released would not affect the result.

2. RG 1.143 addresses itself to doses for someone located in the unprotected area and for plant workers. RG 1.143, Reg. Position C.5 and Fig. 1 are clear on this.

RESPONSE: The evaluation supporting the classification of the RWB addresses both plant workers and individuals in the unprotected area. Because the only exposure pathway is continuous ingestion of groundwater, the dose to the individual in the unprotected area is due to ingestion of groundwater from a well located on the site boundary at the nearest location along the groundwater gradient. Since there are no permanent residences inside the site boundary and the public is not permitted to place wells in the owner-controlled area, this is the closest point where an individual could access groundwater continuously for a year. An airborne release could cause higher exposures to an individual adjacent to the protected area, but in this case the airborne pathway is not significant.

3. The acceptance criteria are different: BTP 11-6 applies Part 20, App. B liquid ECLs for members of the public. RG 1.143 applies a dose of 500 mrem for someone located in the unprotected area and 5 rem for workers.

RESPONSE: As discussed above, the classification is based on the dose to someone located in the unprotected area being less than 500 mrem/yr and the dose to site personnel being less than 5 rem/yr, i.e., the acceptance criteria from RG 1.143.

4. The development of the radioactive source terms are different: BTP 11-6 focuses on a single tank with the development of the maximum expected radioactivity inventory for the selected system. RG 1.143 is for the LWMS, GWMS, and SWMS with the maximum expected inventory of radioactive materials and comparing that inventory to A1 and A2 quantities (Part 71, App. A) in determining whether the RWB structure and RWMS or components are RW-IIa, RW-IIb, or RW-IIc. RG 1.143, Reg. Positions C.5 and C.6 and Fig. 2 flowchart are clear on this.

RESPONSE: As discussed above, the only source in the RWB that could result in a dose to an individual in the unprotected area is from the LWMS. The RWB does not contain a GWMS, and releases from the SWMS would not result in exposure to an individual in the unprotected area. The calculation of the potential dose due to release of the total inventory of radioactive material in the LWMS conservatively assumes that all of the released liquid has a higher concentration of radioactive material than would be in any of the LWMS tanks. The calculation also assumes that when the plume of this material reaches the hypothetical well at the site boundary, it is continuously consumed by the individual in the unprotected area. The purpose of this evaluation is the classification of the RWB structure only, and therefore is limited to the criteria discussed in paragraphs 5.1 and 5.2 of RG 1.143. The A1 and A2 quantities discussed in paragraph 5.3 of RG 1.143 are used to classify individual systems and components. In accordance with paragraph 5.4 of RG 1.143, the highest classification for systems and components in a RW-IIb structure is RW-IIb. For this reason, all of the systems and components in the RWB would be classified RW-IIb.

5. With respect to RG 1.206, Part I, C.I.3 and SRP Sections 3.2.2 and 3.8.4:

RG 1.206, Section 3.2.1. states:

"The applicant should identify the radioactive waste management SSCs that require seismic design considerations and discuss differences from the recommendations of RG 1.143."

RG 1.206, Section 3.2.2 states:

"The applicant should indicate the extent to which it has followed the recommendations of RG 1.26, RG 1.143, and RG 1.151. The applicant should identify any differences between the recommendations and its application and justify each proposed quality group classification in terms of the reliance placed on those systems that perform any of the following functions:

(1) prevent or mitigate the consequences of accidents and malfunctions originating within the RCPB
(2) permit reactor shutdown and maintenance in the safe shutdown condition
(3) contain radioactive material

For such systems, the applicant should specify the proposed design features and measures that it would apply to attain a quality level equivalent to the level of the RG 1.26, RG 1.143 and RG 1.151 classifications (as applicable), including the QA programs that would be implemented."

RESPONSE: The COLA already contains statements indicating the radwaste systems are designed in accordance with RG 1.143. For example, Section 1.8 says that the FSAR conforms with RG 1.143, Rev. 2. Since there are no exceptions to RG 1.143 requirements, there are no differences to identify.

6. SRP Section 3.8.4 identifies RG 1.143 as an applicable acceptance criteria in evaluating other structures and not SRP 11.2, BTP 11-6.

RESPONSE: As indicated above, RG 1.143 is used to classify the RWB structure and the FSAR conforms with RG 1.143.