Nuclear Innovation
North America LLC
4000 Avenue F, Suite A
Bay City, Texas 77414

August 30, 2011
U7-C-NINA-NRC-110114

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville MD 20852-2738

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 Staff question included in Request for Additional Information (RAI) 03.07.02-32 letter number 381 related to the Combined License Application (COLA) Part 2, Tier 2, Section 3.7. This completes the response to this NRC letter.

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 8/30/11

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

jep

Attachment:
RAI 03.07.02-32

D091
NRO

STI 32925692

cc: w/o attachment except*
(paper copy)

Director, Office of New Reactors
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011-8064

Kathy C. Perkins, RN, MBA
Assistant Commissioner
Division for Regulatory Services
Texas Department of State Health Services
P. O. Box 149347
Austin, Texas 78714-9347

Alice Hamilton Rogers, P.E.
Inspection Unit Manager
Texas Department of State Health Services
P. O. Box 149347
Austin, Texas 78714-9347

*Steven P. Frantz, Esquire
A. H. Gutterman, Esquire
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Ave. NW
Washington D.C. 20004

*Tom Tai
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852

(electronic copy)

*George F. Wunder
*Tom Tai
Charles Casto
U. S. Nuclear Regulatory Commission

Jamey Seely
Nuclear Innovation North America

Peter G. Nemeth
Crain, Caton and James, P.C.

Richard Peña
Kevin Pollo
L. D. Blaylock
CPS Energy

RAI 03.07.02-32

QUESTION:

RAI for Interaction of Non-Seismic Category I Structures, Systems and Components with Seismic Category I Structures, Systems and Components

In FSAR Section 3.7.2.8, the applicant stated that the non-category I structures that can interact with seismic category I structures include the turbine building (TB), radwaste building (RWB), service building (SB), control building annex (CBA), and the stack on reactor building roof. The applicant also provided the seismic input motions for design of the above five non-category I structures and included the sliding and overturning factors of safety under site-specific SSE for TB, RWB, SB, and CBA. The applicant further stated that for each non-category I structure, either: (1) it is determined that the collapse of the non-category I structure will not cause the non-category I structure to strike a category I structure; or (2) the non-category I structure will be analyzed and designed to prevent its failure under SSE conditions in a manner such that the margin of safety of the structure is equivalent to that of seismic category I structures. The above description for analysis and design of non-category I structures included in the FSAR only states the guidance provided in SRP 3.7.2 for analysis and design of these structures, and does not provide any information for review by the staff if analysis and design of these structures meet the guidance provided in SRP 3.7.2. Further, the FSAR does not clearly describe how seismic demand and restoring forces were determined for calculation of sliding and overturning factors of safety. Therefore, in order for the staff to conclude that there is no potential for any unacceptable interaction between non-category I structures and seismic category I structures during an SSE, and to address the COL action stated in Section 3.7.5.4 of ABWR DCD, the applicant is requested to provide the following information, and update the FSAR, as necessary:

1. Clearly describe in the FSAR the criterion used to determine that collapse of a non-category I structure will not cause the non-category I structure to strike a category I structure. Also, clarify in the FSAR that non-category I structures that are not identified in the FSAR as structures that can interact with category I structures, meet this criterion.

2. Describe in the FSAR the analysis and design of each non-category I structure that can interact with category I structures, to demonstrate that it is analyzed and designed to prevent its failure under SSE conditions in a manner such that the margin of safety of the structure is equivalent to that of seismic category I structures. Also, include site-specific ITAAC for each structure to confirm that the as-built structure is analyzed and designed as described in the FSAR.

3. For each non-category I structure, describe in the FSAR the stability evaluation procedure including how seismic demand and restoring forces for stability evaluation are determined.

RESPONSE:

1. A specific criterion will be added in the COLA Part 2, Tier 2 Section 3.7.2.8 that if the above grade height of the non-Category I structure is less than the shortest horizontal distance between the non-Category I structure and the closest Category I structure, collapse of the non-Category I structure will not cause the non-Category I structure to strike a Category I structure. The COLA will also be revised to reflect that non-Category I structures that are not identified in the FSAR as structures that can interact with category I structures, meet this criterion.

2. The analysis and design of non-Category I structures that can interact with Category I structures, except for the stack on the Reactor Building roof, is included in the COLA mark-up provided for Sections 3.7.2.8 and 3.7.3.16 in RAI 03.07.02-13 Supplement 3, submitted with NINA Letter U7-C-NINA-NRC-110103, dated July 27, 2011. Some additional information has been added in the mark-up to COLA Section 3.7.2.8 included in the Enclosure to complete the information requested in this RAI.

   The design of the stack on the Reactor Building roof is covered under the certified design of the Reactor Building.

   Also, new site-specific ITAAC Tables 3.0-21 through 3.0-25 are included in the enclosed COLA mark-up for confirmation that as-built non-Category I structures are analyzed and designed as described in the FSAR

3. The stability evaluation procedure, including how seismic demand and restoring forces for stability evaluation are determined, is also described in the COLA mark-up provided for Sections 3.7.2.8 and 3.7.3.16 in RAI 03.07.02-13 Supplement 3, submitted with NINA Letter U7-C-NINA-NRC-110103, dated July 27, 2011.

Enclosure 1 provides the COLA mark-up. For ready reference, included in this mark-up is the mark-up provided to Sections 3.7.2.8 and 3.7.3.16 in response to RAI 03.07.02-13 Supplement 3, submitted with NINA Letter U7-C-NINA-NRC-110103, dated July 27, 2011. The mark-up included in the Enclosure 1 supersedes the mark-up for Section 3.7.2.8 provided in this earlier RAI response. The changes to the mark-up are highlighted by revision bars.

Enclosure 1

For ready reference, included in this mark-up is the mark-up provided to Sections 3.7.2.8 and 3.7.3.16 in response to RAI 03.07.02-13 Supplement 3, submitted with NINA Letter U7-C-NINA-NRC-110103, dated July 27, 2011. The mark-up included in this Enclosure supersedes the mark-up for Section 3.7.2.8 provided in this earlier RAI response. The changes to the mark-up are highlighted by revision bars.

3.7.2.8 Interaction of Non-Seismic Category I Structures, Systems and Components with Seismic Category I Structures, Systems and Components

The Category I structures and their physical proximity to nearby non-Category I structures are shown in Figure 3.7-40. None of the non-Category I structures proposed as part of STP Units 3 and 4 is intended to meet Criterion (2) of DCD Section 3.7.2.8. Rather, for each non-Category I structure, either: (1) it is determined that the collapse of the non-Category I structure will not cause the non-Category I structure to strike a Category I structure ; or (2) the non-Category I structure will be analyzed and designed to prevent its failure under SSE conditions in a manner such that the margin of safety of the structure is equivalent to that of Seismic Category I structures. Criterion (1) is met if the above-grade height of the non-Category I structure is less than the shortest horizontal distance between the non-Category I structure and the closest Category I structure. Based on this criterion, ~~N~~non-Category I structures that can interact with Seismic Category I structures include the Turbine Building (TB), Radwaste Building (RWB), Service Building (SB), Control Building Annex (CBA) and the stack on the Reactor Building roof. Other non-Category I structures shown in Figure 3.7-40 meet Criterion (1). ~~Table 3H.6-14 provides sliding and overturning factors of safety under site-specific SSE for TB, RWB, SB, and CBA.~~

The seismic input motions for the II/I design of the ~~five~~ non-seismic ~~c~~Category I structures noted above, except for the stack on the Reactor Building roof, are described in the following. The design of the stack on the Reactor Building roof is covered by the certified design of the Reactor Building.

- TB: 0.3g Regulatory Guide 1.60 spectra.
- RWB: as described in Sections 3.7.3.16 and 3H.3.5.3 and shown in Figures 3.7-~~40~~41 through 3.7-~~42~~43.
- SB: as described in Section 3.7.3.16.~~0.3g Regulatory Guide 1.60 spectra.~~
- CBA: as described in Section 3.7.3.16 and shown in Figures 3.7-38 and 3.7-39.

~~Stack on the Reactor Building roof: seismic loading at its location, resulting from the SSE analysis of the Reactor Building.~~
The design of non-Category I structures is based on IBC-2006. However, the structures are designed to remain elastic such that the margin of safety of the structure is equivalent to that of the Category I structures.

The seismic input motions for II/I stability evaluations of TB, RWB, SB, and CBA are described in more detail in the following:

- TB: site-specific SSE
- RWB: as described in Sections 3.7.3.16 and 3H.3.5.3 and shown in Figures 3.7-44 through 3.7-46
- SB: as described in Section 3.7.3.16
- CBA: as described in Section 3.7.3.16

The restoring forces and moments for ~~S~~sliding and overturning stability evaluations of TB, RWB, SB, and CBA are ~~performed~~ in accordance with the methodology outlined in Figure

3H.3-52.

Seismic demands along each orthogonal direction for stability evaluation of TB, RWB, and SB are determined using response spectrum analysis of a fixed base stick model representing each of these structures. The input motions for these response spectrum analyses are as described above. The base shears and moments from these response spectrum analyses are adjusted manually to account for the additional shears and moments due to basemat excitation which are calculated considering zero period acceleration (ZPA) of the input motions. The three orthogonal seismic demands of each structure are combined using the 100%-40%-40% rule as outlined in Regulatory Guide 1.92, Revision 2.

Seismic demands along each orthogonal direction for stability evaluation of the CBA are calculated using manual calculation where the CBA is idealized as a single degree of freedom structure. The three orthogonal seismic demands of each structure are combined using the 100%-40%-40% rule as outlined in Regulatory Guide 1.92, Revision 2.

Table 3H.6-14 provides sliding and overturning factors of safety under site-specific SSE for TB, RWB, SB, and CBA.

3.7.3.16 Analysis Procedure for Non-Seismic Structures in Lieu of Dynamic Analysis

For the Control Building Annex (CBA) II/I design, the SSE input at the foundation level (Figures 3.7-38 and 3.7-39) is the envelope of 0.3g RG 1.60 response spectra and the induced acceleration response spectra due to site specific SSE that is determined from an SSI analysis which accounts for the impact of the nearby Control Building (CB). In this SSI analysis, five interaction nodes at the depth corresponding to the bottom elevation of the CBA foundation are added to the three dimensional SSI model of the CB. These five interaction nodes correspond to the four corners and the center of the CBA foundation. The average response of these five interaction nodes is enveloped with the 0.3g RG 1.60 spectra to determine the SSE input at the CBA foundation level.

For the stability evaluation of the CBA, the SSE input is the envelope of the average response of the five interaction nodes from the SSI analysis described above and the site specific SSE.

For the Radwaste Building (RWB) II/I design, the SSE input (see Figures 3.7-41 through 3.7-43) ~~at the foundation level~~ is the envelope of 0.3g RG 1.60 response spectrum and the induced acceleration response spectrum due to site-specific SSE that is determined from an SSI analysis which accounts for the impact of the nearby Reactor Building (RB). In this SSI analysis, five interaction nodes at the ~~depth~~ground surface ~~corresponding to the bottom elevation of the RWB foundation~~ are added to the three dimensional SSI model of the RB. These five interaction nodes correspond to the four corners and the center of the RWB foundation. The average response of these five interaction nodes is enveloped with the 0.3g RG 1.60 spectra to determine the SSE input at the foundation level.

For the stability evaluation of the RWB, the SSE input (see Figures 3.7-44 through 3.7-46) is the envelope of the average response of the five interaction nodes from the SSI analysis

described above and the site specific SSE.

For the Service Building (SB) II/I design, the SSE input is the envelope of 0.3g RG 1.60 response spectrum and the induced acceleration response spectrum due to site-specific SSE that is determined from an SSI analysis which accounts for the impact of the nearby CB Building. In this SSI analysis, five interaction nodes at the ground surface are added to the three dimensional SSI model of the CB. These five interaction nodes correspond to the four corners and the center of the SB foundation. The average response of these five interaction nodes is enveloped with the 0.3g RG 1.60 spectra to determine the SSE input at the foundation level.

For the stability evaluation of the SB, the SSE input is the envelope of the average response of the five interaction nodes from the SSI analysis described above and the site specific SSE.

3.8.4 Other Seismic Category I Structures

Other Seismic Category I structures which constitute the ABWR Standard Plant are the Reactor Building and *Control Building. ~~and Radwaste Building substructure.~~ Figure 1.2-1 shows the spatial relationship of these buildings. The ~~only other~~* non-Category I *structure*s which could interact with *~~in close proximity to~~ these structures ~~is~~*are the Radwaste Building, Service Building, Control Building Annex, the stack on the Reactor Building roof, and *the Turbine Building. ~~It is~~*These structures, except the stack, are *structurally separated from the other ABWR Standard Plant buildings.* The analysis and design of these non-Category I structures are described in Sections 3.7.2.8 and 3.7.3.16.

3.0 Site-Specific ITAAC

- Main Turbine System
- Turbine Building- Seismic II/I Interaction
- Service Building- Seismic II/I Interaction
- Radwaste Building- Seismic II/I Interaction
- Control Building Annex- Seismic II/I Interaction
- Stack on the Reactor Building Roof- Seismic II/I Interaction

Table 3.0-21 Turbine Building- Seismic II/I Interaction

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
The Turbine Building is designed and constructed to prevent its failure under the safe shutdown earthquake, such that the margin of safety is equivalent to that of Category I structures.	a. A structural analysis will be performed to confirm that the Turbine Building, as designed and constructed, has a margin of safety against failure, under the safe shutdown earthquake, equivalent to that of Category I structures.	a. A structural analysis report exists which concludes that the Turbine Building, as designed and constructed, has a margin of safety against failure, under the safe shutdown earthquake, equivalent to that of Category I structures.
	b. Inspection of as-built Turbine Building will be performed to confirm that the configuration is consistent with the design.	b. As-built configuration is consistent with the design.

Table 3.0-22 Service Building- Seismic II/I Interaction

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
The Service Building is designed and constructed to prevent its failure under the safe shutdown earthquake, such that the margin of safety is equivalent to that of Category I structures.	a. A structural analysis will be performed to confirm that the Service Building, as designed and constructed, has a margin of safety against failure, under the safe shutdown earthquake, equivalent to that of Category I structures.	a. A structural analysis report exists which concludes that the Service Building, as designed and constructed, has a margin of safety against failure, under the safe shutdown earthquake, equivalent to that of Category I structures.
	b. Inspection of as-built Service Building will be performed to confirm that the configuration is consistent with the design.	b. As-built configuration is consistent with the design.

Table 3.0-23 Radwaste Building- Seismic II/I Interaction

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
The Radwaste Building is designed and constructed to prevent its failure under the safe shutdown earthquake, such that the margin of safety is equivalent to that of Category I structures.	a. A structural analysis will be performed to confirm that the Radwaste Building, as designed and constructed, has a margin of safety against failure, under the safe shutdown earthquake, equivalent to that of Category I structures.	a. A structural analysis report exists which concludes that the Radwaste Building, as designed and constructed, has a margin of safety against failure, under the safe shutdown earthquake, equivalent to that of Category I structures.
	b. Inspection of as-built Radwaste Building will be performed to confirm that the configuration is consistent with the design.	b. As-built configuration is consistent with the design.

Table 3.0-24 Control Building Annex- Seismic II/I Interaction

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
The Control Building Annex is designed and constructed to prevent its failure under the safe shutdown earthquake, such that the margin of safety is equivalent to that of Category I structures.	a. A structural analysis will be performed to confirm that the Control Building Annex, as designed and constructed, has a margin of safety against failure, under the safe shutdown earthquake, equivalent to that of Category I structures.	a. A structural analysis report exists which concludes that the Control Building Annex, as designed and constructed, has a margin of safety against failure, under the safe shutdown earthquake, equivalent to that of Category I structures.
	b. Inspection of as-built Control Building Annex will be performed to confirm that the configuration is consistent with the design.	b. As-built configuration is consistent with the design.

Table 3.0-25 Stack on the Reactor Building Roof- Seismic II/I Interaction

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
The stack on the Reactor Building roof is designed and constructed to prevent its failure under the safe shutdown earthquake, such that the margin of safety is equivalent to that of Category I structures.	a. A structural analysis will be performed to confirm that the stack on the Reactor Building roof, as designed and constructed, has a margin of safety against failure, under the safe shutdown earthquake, equivalent to that of Category I structures.	a. A structural analysis report exists which concludes that the stack on the Reactor Building roof, as designed and constructed, has a margin of safety against failure, under the safe shutdown earthquake, equivalent to that of Category I structures.
	b. Inspection of as-built stack on the Reactor Building roof will be performed to confirm that the configuration is consistent with the design.	b. As-built configuration is consistent with the design.