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January 22, 2013
U7-C-NINA-NRC-130005

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

The Attachment provides a supplemental response to NRC staff questions 02.03.01-24 related to the Combined License Application (COLA) Part 2, Tier 2, Section 3H. Following the audit performed during the week of December 10, 2012, the NRC staff requested in a phone call that Nuclear Innovation North America LLC provide an update in the COLA to ensure consistency in the velocity pressure exposure coefficient. This supplemental response completes the action requested by the NRC staff.

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 Scott Head at (979) 316-3011 or Bill Mookhoek at (979) 316-3014.

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

Executed on 1-22-2013

M/A McBurnett
Mark McBurnett
Chief Executive Officer and Chief Nuclear Officer
Nuclear Innovation North America LLC

jep
Attachment:

RAI 02.03.01-24, Supplement 6

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NRO

STI 33647836

cc: w/o attachment except*
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RAI 02.03.01-24, Supplement 6

QUESTION:

10 CFR 52.79(a)(1)(iii) states, in part, that the COL FSAR should include the meteorological characteristics of the proposed site with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated. 10 CFR 100.20(c)(2) states that the meteorological characteristics of the site that are necessary for safety analysis or that may have an impact upon plant design must be identified and characterized and 10 CFR 100.21(d) states, in part, that the meteorological characteristics of the site must be evaluated and site parameters established such that potential threats from such physical characteristics will pose no undue risk to the type of facility proposed to be located at the site.

10 CFR Part 50, Appendix A, GDC 2 requires that SSCs that are important to safety be designed to withstand the effects of natural phenomena, such as tornadoes and hurricanes, without loss of the ability to perform their safety functions. 10 CFR Part 50, Appendix A, GDC 4 requires that SSCs that are important to safety be appropriately protected against the effects of missiles that may result from events and conditions outside the nuclear power unit.

Nuclear power plants must be designed so that they remain in a safe condition under extreme meteorological events, including those that could result in the most extreme wind events (tornadoes and hurricanes) that could reasonably be predicted to occur at the site. Initially, the U.S. Atomic Energy Commission (predecessor to the NRC) considered tornadoes to be the bounding extreme wind events and issued RG 1.76, ''Design-Basis Tornado for Nuclear Power Plants,'' in April 1974. The design-basis tornado wind speeds were chosen so that the probability that a tornado exceeding the design basis would occur was on the order of 10^{-7} per year per nuclear power plant. In March 2007, the NRC issued Revision 1 of RG 1.76, ''Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants." Revision 1 of RG 1.76 relied on the Enhanced Fujita Scale, which was implemented by the National Weather Service in February 2007. The Enhanced Fujita Scale is a revised assessment relating tornado damage to wind speed, which resulted in a decrease in design-basis tornado wind speed criteria in Revision 1 of RG 1.76. Since design-basis tornado wind speeds were decreased as a result of the analysis performed to update RG 1.76, it was no longer clear that the revised tornado design basis wind speeds would bound design-basis hurricane wind speeds in all areas of the United States. This prompted an investigation into extreme wind gusts during hurricanes and their relation to design basis hurricane wind speeds, which resulted in issuing RG 1.221, "Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants," in October 2011.

RG 1.221 also evaluated missile velocities associated with several types of missiles considered for different hurricane wind speeds. The hurricane missile analyses presented in RG 1.221 are based on missile aerodynamic and initial condition assumptions that are similar to those used for the analyses of tornado-borne missile velocities adopted for Revision 1 to RG 1.76. However, the assumed hurricane wind field differs from the assumed tornado wind field in that the hurricane wind field does not change spatially during the missile's flight time but does vary with height above the ground. Because the size of the hurricane zone with the highest winds is large relative to the size of the missile trajectory, the hurricane missile is subjected to the highest wind speeds throughout its trajectory. In contrast, the tornado wind field is smaller, so the tornado missile is subject to the strongest winds only at the beginning of its flight. This results in the same missile having a higher maximum velocity in a hurricane wind field than in a tornado wind field with the same maximum (3-second gust) wind speed.

The STP COLA incorporates by reference the ABWR Design Control Document (DCD). Section 3.5.1.4 of the DCD states, in part, that "tornado-generated missiles have been determined to be the limiting natural phenomena hazard in the design of all structures required for safe shutdown of the nuclear power plant. Since tornado missiles are used in the design basis, it is not necessary to consider missiles generated from other natural phenomena." However, Section 3.5.4.2 of the DCD states, in part, that the COL applicant "shall identify missiles generated by other site-specific natural phenomena that may be more limiting than those considered in the ABWR design and shall provide protection for the structures, systems, and components against such missiles."

Accordingly, the applicant is requested to address the following:

a. Consistent with the requirements of 10 CFR 52.79(a)(1)(iii), 10 CFR 100.20(c)(2), 10 CFR 100.21(d), and the Combined License Information requirement of ABWR DCD Section 3.5.4, please identify hurricane wind speed and missile spectra for the STP site. RG 1.221 describes a method that the staff considers acceptable in selecting site-specific hurricane wind speed and hurricane-generated missiles.

b. Pursuant to the requirements of GDC 2, GDC 4, and the Combined License Information requirement of ABWR DCD Section 3.5.4, please confirm that the ABWR standard plant and STP site-specific SSCs important to safety are designed to protect against the combined effects of hurricane winds and missiles defined in question a above.

c. Please revise the appropriate FSAR sections to appropriately reflect the results of questions a and b above.

SUPPLEMENTAL RESPONSE:

Supplement 5 to the response to RAI 02.03.01-24 was submitted with Nuclear Innovation North America (NINA) letter U7-C-NINA-NRC-130001, dated January 3, 2013. Supplement 6 to RAI 02.03.01-24 provides COLA changes due to increase in the minimum value of velocity pressure exposure coefficient (Kz) in COLA Section 3H.11.1 from 0.85 to 0.87 to eliminate discrepancy with Standard Review Plan (SRP) 3.3.1 requirements.

See Enclosure for COLA mark-ups.

Enclosure

3H.11.1 Hurricane Parameters, Loads and Load Combinations

(1) Hurricane Wind Pressure (W_h)

Unlike tornado wind pressures, there is no reduction in hurricane wind pressures due to size of the structure. In addition, hurricane wind pressures vary along the height of the structure, whereas, tornado wind pressures are considered uniform along the height of the structure. Hurricane wind pressures are computed using the procedure described in Chapter 6 of ASCE 7-05, in conjunction with the maximum wind speed defined above and the following parameters:

- Exposure Category C
- Importance factor 1.15
- Velocity pressure exposure coefficient as per ASCE 7-05 Table 6-3, but ≥ ~~0.85~~0.87
- Topographic factor 1.0
- Wind directionality factor 1.0

Table 3H.6-5 Factors of Safety Against Sliding, Overturning, and Flotation for UHS Basin and RSW Pump House

Load Combination	Calculated Safety Factor			Notes
	Overturning	Sliding	Flotation	
D + F'	---	---	1.77	
D + H + W	2.15	11.5	---	2, 3
D + H + Wt	2.11	7.2	---	
D + H' + E'	1.47	1.11	---	2, 3, 4, 5, 6
D + H + W_{th}	~~2.11~~2.10	~~8.57~~8.55	---	2, 3

Notes:

(1) Loads D, H, H', W, Wt, and E' are defined in Subsection 3H.6.4.3.4.1. F' is the buoyant force corresponding to the design basis flood. Load W_{th} is defined in Subsection 3H.11.1.

(2) Reported safety factors are conservatively based on considering empty weight of the UHS Basin.

(3) Coefficients of friction for sliding resistance are 0.3 under the RSW Pump House and 0.4 under the UHS Basin.

(4) The calculated safety factor for sliding requires less than half of the available passive pressure to be engaged for sliding resistance.

(5) The seismic values considered for stability are based on the full basin case and the empty basin case.

(6) The seismic sliding forces and overturning moments from SSI analysis are less than the seismic sliding forces and overturning moments used in the stability evaluations.

Table 3H.7-2 Factors of Safety against Sliding, Overturning and Flotation for DGFOT

Load Combination	Calculated Safety Factor			Notes
	Overturning	Sliding	Flotation	
D + F_b	---	---	1.70	
D + H + W	1.58	3.47	---	2, 3 (Sliding Only)
D + H + W_t	1.10	1.10	---	2, 4
D + H' + E'	1.30	1.28	---	2, 3, 5
D + H + W_{th}	1.10	1.10	---	2, 6

Notes:

(1) Loads D, H, H', W, W_t, and E' are defined in Section 3H.7.4.3.4. F_b is the buoyant force corresponding to the design basis flood. Load W_{th} is defined in Subsection 3H.11.1.

(2) Coefficients of friction for sliding resistance are 0.58 for static conditions and 0.39 for dynamic conditions for the Diesel Generator Fuel Tunnel.

(3) The calculated safety factors consider the full passive pressure.

(4) The minimum calculated safety factor against sliding and overturning for tornado wind is 2.32. For tornado wind in conjunction with tornado missile, subsequent detailed design of the restraints for the Access Regions will provide sliding and overturning safety factors greater than 1.10.

(5) The seismic sliding forces and overturning moments from SSI and SSSI analysis are less than the seismic sliding forces and overturning moments used in the stability evaluations.

(6) The minimum calculated safety factor against sliding and overturning for hurricane wind is ~~1.23~~1.21. For hurricane wind in conjunction with hurricane missile, subsequent detailed design of the restraints for the Access Regions will provide sliding and overturning safety factors greater than 1.10.

Table 3H.11-1 Hurricane Missile Impact Evaluations for UHS/RSW Pump House

Local Check	**UHS / RSW Pump House Walls and Roof**		Minimum Required Thickness to Prevent Penetration, Perforation, and Scabbing = 15.4"
			Minimum Provided Thickness = 18"
Overall Check of Impacted Element (See Note 1)	**RSW Pump House**	**Roof**	Shear Controls. Maximum impact load including Dynamic Load Factor (DLF) of 1.0 = 161 Kips Minimum capacity = 188 Kips
		Walls	Shear Controls. Maximum impact load including Dynamic Load Factor (DLF) of 1.53 = 1566 Kips Minimum capacity = ~~1732 Kips~~1731 Kips
	UHS	**Fan Enclosure Walls**	Flexure Controls. Ductility demand = 2.1 Ductility limit = 10
		Basin Walls	Shear Controls. Maximum impact load including Dynamic Load Factor (DLF) of 1.0 = 1024 Kips Minimum capacity = 1130 Kips

Notes:

(1) The reported impact loads for the subject wall(s) are the resulting loads due to a horizontal automobile missile impact with a minimum impact load of 1024 kips (the peak triangular impulse load for a horizontal impact). The reported impact loads for the subject slab(s) are the resulting loads due to a vertical automobile missile impact with a minimum impact load of 445 kips (the peak triangular impulse load for a vertical impact).