June 4, 2014

Mr. Scott Head, Manager
Regulatory Affairs
Nuclear Innovation North America, LLC.
122 West Way, Suite 405
Lake Jackson, TX 77566

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 447 RELATED TO STANDARD REVIEW PLAN, SECTION 1.5, FOR NUCLEAR INNOVATION NORTH AMERICA, LLC. COMBINED LICENSE APPLICATION

Dear Mr. Head

By letter dated September 20, 2007, South Texas Project (STP) submitted for approval a combined license application pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The U.S. Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed application.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter.

To support the review schedule, you are requested to respond within **30** days of the date of this letter. If changes are needed to the safety analysis report, the staff requests that the RAI response include the proposed wording changes.

If you have any questions or comments concerning this matter, I can be reached at 301-415-8484 or by e-mail at Tom.Tai@nrc.gov.

Sincerely,

/RA/

Tom M. Tai, Senior Project Manager
LB2 Branch
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-012
52-013

eRAI Tracking No. 7518

Enclosure:
Request for Additional Information

cc: William Mookhoek
Richard Scheide

If you have any questions or comments concerning this matter, I can be reached at 301-415-8484 or by e-mail at Tom.Tai@nrc.gov.

Sincerely,

/RA/

Tom M. Tai, Senior Project Manager
LB2 Branch
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-012
52-013

eRAI Tracking No. 7518

Enclosure:
Request for Additional Information

cc: William Mookhoek
Richard Scheide

Distribution

PUBLIC	LB2 R/F	RidNroLACSmith	JZimmerman, NRR
TMartinez, NRR	MSpencer, OGC	RidsNrrDeEeeb	RidsNroDnrlNge2

ADAMS Accession No. ML14153A571 NRO-002

OFFICE	DNRL/LB2/PM	DNRL/LB2/LA	NRR/DE/EEEB/TR	NRR/DE/EEEB/BC	DNRL/LB2/PM
NAME	TTai	CMurphy	TMartinez	KZimmerman	TTai
DATE	06/04/14	06/03/14	05/02/14	05/02/14	06/04/14

*Approval captured electronically in the electronic RAI system.

OFFICIAL RECORD COPY

Request for Additional Information 447

Issue Date: 05/13/2014

Application Title: South Texas Project Units 3 and 4 - Dockets 52-012 and 52-013
Operating Company: South Texas Project Nuclear Operating Co.

Docket No. 52-012 and 52-013

Review Section: 01.05 - Other Regulatory Considerations
Application Section: 01.05

QUESTIONS:

01.05-33

On April 2, 2014, and April 24, 2014, at the Westinghouse Offices in Twinbrook, Maryland, the staff performed an audit of the direct current (dc) bus stripping calculation entitled, "Extended Station Blackout Scenario," performed by DP Engineering, issued August 2012. The staff used the calculation U7-DCE-E-CALC-DESN-6001, "STP Units 3 & 4 Class IE 125 VDC Battery Sizing Analysis, Voltage Drop, Short Circuit and Charger Sizing Calculation", Revision A, as a reference, which was used as an input for the dc bus stripping calculation. The staff verified that Nuclear Innovation North America, LLC. (NINA) follows the battery sizing methodology described in Appendix A of Institute of Electrical and Electronics Engineers (IEEE) Standard 485, "IEEE Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications," based on number of positive plates. However, the U.S. Nuclear Regulatory Commission (NRC) staff needs further clarification for the following items:

1. During the review of the "Extended Station Blackout Scenario" calculation, the staff observed that the values shown in the worksheets did not identify the parameters associated with battery sizing as specified in the examples in Annex A of IEEE Standard 485. Provide the necessary parameters in a revised worksheet for the "Extended Station Blackout Scenario," or use the format of the applicable example provided in Annex A of IEEE Standard 485.

2. Provide the battery duty cycle diagram that depicts the dc load profile and the battery division(s) providing power to the corresponding loads along the timeline for the mitigating strategies to maintain core cooling, containment, and spent fuel pool cooling during all modes of operation.

3. Provide the basis for the assumed minimum battery voltage that is required to ensure proper operation of all electrical equipment as included in the load profile.

4. During the review of the "Extended Station Blackout Scenario" calculation, the staff observed tables showing the loads connected to each battery division. However, the load tables did not provide sufficient information on the potential impact of the environmental condition on this required equipment. Provide a discussion on the list of required equipment and its operability under the expected environmental conditions.

5. In its response to request for additional information (RAI) 01.05-11, NINA stated that although the calculations are substantially complete based on all available information,

the level of detail provided in the calculations is constrained because detailed design for South Texas Project (STP), Units 3 and 4, is not yet finalized. Provide a license condition that ensures that the final calculation for the Extended Blackout Scenario is finalized prior to fuel load.

01.05-34

Nuclear Energy Institute (NEI) 12-06, Section 11.5, states that "…mitigation equipment should be initially tested or other reasonable means used to verify performance conforms to the limiting FLEX requirements". The STP, Units 3 and 4, advanced boiling-water reactor (ABWR) FLEX Integrated Plan, Revision 1 (ML14114A194), Page 4, states that, following the determination that an Extended Loss of Alternate Current Power (ELAP) event has occurred, the Operation staff will:

> "…conduct a deep load shed of the ESF DC batteries to extend battery life…. It is expected that battery chargers will be re-energized and operating at about 36 hours into the event so sufficient battery margin is available."

Current regulatory guidance regarding battery duty cycles for safety-related batteries limits qualification to eight hours. IEEE Standard 535-1986, "IEEE Standard for Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations," as endorsed by Regulatory Guide (RG) 1.158, "Qualification of Safety-Related Lead Storage Batteries for Nuclear Power Plants," provides guidance for qualifying nuclear-grade batteries and describes a method acceptable to the NRC staff for complying with Commission regulations with regard to qualification of safety-related lead storage batteries for nuclear power plants. Based on a previous concern with extended battery duty cycle durations, the NRC staff requested an official interpretation of IEEE Standard 535-1986. The NRC specifically requested the IEEE to identify the length of the duty cycle for which a vented lead-acid battery is qualified per IEEE Standard 535 and to identify any limitations on the length of the duty cycle for a vented lead-acid battery. In its response to the NRC's interpretation request (ML13094A397), the IEEE stated that in order to meet the requirements of IEEE Standard 535, applications with duty cycles over eight hours will need to demonstrate that the battery cells fully comply with the qualification principles in clause 5 and meet the basis requirements in clause 8.2 of IEEE Standard 535.

Based on the background considerations stated above and the fact that STP is proposing to credit the use of the Class 1E batteries for mitigation strategies, there is concern about the capability of STP, Units 3 and 4's, batteries to provide DC power for the durations specified in the STP, Units 3 and 4, ABWR FLEX Integrated Plan, Revision 1; which does not include sufficient information to support a conclusion of batteries with duty cycles greater than eight hours can meet the ELAP battery duty cycles as credited.

NINA is requested to explain how STP 3 & 4 will validate battery duty cycles greater than 8 hours, and justify that the methodology used is consistent with applicable regulatory guidance regarding determination of battery duty cycles.

01.05-35

During battery charging, which is required in Phase 3 of the STP, Units 3 and 4, ABWR FLEX Integrated Plan, Revision 1, forced ventilation of battery rooms or racks may be required to

prevent an unacceptable buildup of hydrogen released during the charging process. In addition, ventilation of battery rooms may be needed to maintain an acceptable temperature for long-term operation using the batteries.

The STP, Units 3 and 4, ABWR FLEX Integrated Plan, Revision 1, does not identify considerations related to the need for battery room ventilation. NINA is requested to explain how STP, Units 3 and 4, mitigation strategies will address ventilation requirements in support of battery charging and operation. Provide a discussion on the hydrogen gas exhaust pathway. Also provide a discussion on how hydrogen concentration in the battery rooms will be maintained below the limits established by national standards and codes (i.e., less than 1 percent according to the National Fire Code and RG 1.128, "Installation Design and Installation of Vented Lead-Acid Storage Batteries for Nuclear Power Plants," which endorses IEEE Standard 484, "IEEE Recommended Practice for Installation Design and Installation of Vented Lead-Acid Batteries for Stationary Applications," with exceptions) when the batteries are being recharged during Phase 3. Specifically address considerations related to preventing unacceptable buildup of hydrogen and need for ventilation to maintain an acceptable temperature range for long-term battery operation.

01.05-36

NEI 12-06, Section 3.2.2, paragraph (13), says, in part, "The use of portable equipment to charge batteries or locally energize equipment may be needed under ELAP/LUHS conditions. Appropriate electrical isolations and interactions should be addressed in procedures/guidance."

The STP, Units 3 and 4, ABWR FLEX Integrated Plan, Revision 1, includes no discussion of electrical isolation that may be needed to support use of portable generators to charge batteries or locally energize equipment.

NINA is requested to provide additional information describing STP, Units 3 and 4, considerations of electrical isolation requirements for portable equipment used to provide temporary power to battery chargers or to locally energize other components during an ELAP event. Describe how the portable generators, and the Combustion Turbine Generators are isolated to prevent simultaneously supplying power to the same Class 1E bus in order to conform to NEI 12-06, Section 3.2.2, guideline (13).