Nuclear Innovation
North America LLC
122 West Way, Suite 405
Lake Jackson, Texas 77566
979-316-3000

July 23, 2013
U7-C-NINA-NRC-130039

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 are the Nuclear Innovation North America, LLC (NINA) responses to NRC staff questions in Request for Additional Information (RAI) letter numbers 425, 426, 427, 428, and 429 related to SRP Section 1.05. The attachments to this letter contain the responses to the following RAI questions:

01.05-11	01.05-12	01.05-13	01.05-14	01.05-15

There are no COLA changes in this submittal.

There are no commitments in this submittal.

If you have any questions, please contact me 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 7/23/13

Scott Head
Manager, Regulatory Affairs
NINA STP Units 3&4

Attachments:

1) RAI 01.05-11
2) RAI 01.05-12
3) RAI 01.05-13
4) RAI 01.05-14
5) RAI 01.05-15

STI 33721525

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NRO

(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

Robert Free
Radiation Inspections Branch 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

*Rocky Foster
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852

(electronic copy)

*George F. Wunder
*Rocky Foster
Fred Brown
U. S. Nuclear Regulatory Commission

Jamey Seeley
Nuclear Innovation North America

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

Richard Peña
Kevin Pollo
L. D. Blaylock
CPS Energy

QUESTION:

In regards to the response to RAI 01.05-5, the staff reviewed the applicant's response and determined that the response is insufficient to completely address the staff's concerns. The NRC staff needs sufficient information in order to reach a safety conclusion within the COLA review. The applicant should address the specific provisions in Interim Staff Guidance (ISG) JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (ML12229A174) dated August 29, 2012 that endorses the Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide". The ISG provides an acceptable method for satisfying Order EA-12-049. As stated in the ISG, other methods may be used to satisfy Order EA-12-049, but these methods will be reviewed by the NRC staff on a case-by-case basis to determine their acceptability. If the applicant proposes to use methods that differ from those in the ISG and endorsed guidance, the applicant should explain why these alternative methods are acceptable. Examples where additional information is needed include the following:

1. Demonstrate that after the load shed of the dc batteries the power supplies needed for Phase 1 core cooling will be available.

2. Discuss the environmental qualification of the dc batteries. Demonstrate that the qualification temperature will not be exceeded in the battery room at 36 hours into an extended loss of ac power (ELAP).

3. List the power sources under ELAP for all the valves and pumps that will be required for mitigation strategies for Phase 1 and for Phase 3 respectively including core cooling, containment overpressure protection, and spent fuel pool cooling. Also, identify all the manual operations for the pumps and valves.

RESPONSE:

Item 1: Demonstrate that after the load shed of the dc batteries the power supplies needed for Phase 1 core cooling will be available.

As stated in the response to RAI 01.05-13, Item 1, Nuclear Innovation North America (NINA) will make available for review a copy of the calculations entitled: "Extended Station Blackout Scenario," dated August 2012, which was performed by DP Engineering, Ltd., and 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, which was used as an input for this calculation. These calculations provide descriptions of the DC load shedding analysis including analytical methods, key assumptions, and results that determined the STP 3 & 4 battery discharge duration can be extended as assumed in "STP 3&4 ABWR FLEX Integrated Plan," dated May 2, 2013.

These calculations will be made available at the Westinghouse Reading Room in Rockville, Maryland, at any time mutually agreed upon between NINA and the NRC staff.

Item 2: Discuss the environmental qualification of the dc batteries. Demonstrate that the qualification temperature will not be exceeded in the battery room at 36 hours into an extended loss of ac power (ELAP).

The STP 3&4 ABWR FLEX Integrated Plan describes mitigation strategies that increase the defense-in-depth for a beyond-design basis external event (BDBEE) including an Extended Loss of AC power (ELAP) and loss of normal access to the ultimate heat sink (LUHS). The STP 3&4 ABWR FLEX Integrated Plan requires that the Class 1E 125V DC power, including the batteries, function as assumed during the 36-hour battery discharge during Phase 1 of the FLEX response and are capable of being recharged and restored to service during Phase 3 of the FLEX response.

Class 1E 125V DC power, including the batteries, are required to satisfy the requirements of COLA Part 2, Tier 2, Section 3.11, "Environmental Qualification of Safety-Related Mechanical and Electrical Equipment," which provides assurance that the batteries will function as required during and after a design basis event or during and after the 8 hour Station Blackout (SBO) described in COLA Part 2, Tier 2, Table 1C-1, "ABWR Design Compliance with 10 CFR 50.63 Regulations." NINA concluded that Class 1E 125V DC power, including the batteries, will function as assumed in the FLEX plan because the thermal performance (i.e., temperature increase) of the battery during the 36 hour discharge during Phase 1 of the FLEX response is enveloped by the thermal performance of the battery during both the 2-hour battery discharge assumed during a design basis event and the 8-hour battery discharge assumed during the SBO event.

The basis for the conclusion that the thermal performance of the battery during the FLEX response is enveloped by thermal performance during a design basis event or SBO is that all three of these events are assumed to result in a substantially complete discharge of the battery. The only significant difference between the events is the rate of battery discharge (i.e., battery current) and the duration of the discharge. During the discharge process, battery and battery room temperature increase because of resistance heating in the battery and cables inside the battery room. The total amount of heat generated during discharge is a function of the square of the discharge current (i.e., "I squared R" resistance heating) and the duration of the discharge. Therefore, a significantly lower amount of heat is generated during a complete discharge of the battery over a 36-hour period than a complete discharge of the battery over an 8-hour period or a 2-hour period.

During the discharge, battery and battery room temperature are stabilized by the heat capacity (specific heat times the mass) of the battery and the mass and area of the battery room walls. The heat capacity of the battery and battery room walls are the same for all of these events except that a longer discharge time will allow more time for temperatures to equalize throughout the battery and more time for battery room walls to act as a heat sink. Therefore, the thermal performance (i.e., temperature increase) of the battery during Phase 1 of the FLEX response is enveloped by the thermal performance of the battery during either the 2-hour discharge assumed to occur during a

design basis event or the 8-hour discharge assumed to occur during an SBO event. Because the Class 1E 125V DC power, including the batteries, are qualified for a design basis event in accordance with COLA Part 2, Tier 2, Section 3.11, the 36 hour discharge will not result in an increase in battery temperature sufficient to prevent the battery from: a) functioning as required during Phase 1 battery discharge; and, b) being recharged and made available during Phase 3.

Item 3: List the power sources under ELAP for all the valves and pumps that will be required for mitigation strategies for Phase 1 and for Phase 3 respectively including core cooling, containment overpressure protection, and spent fuel pool cooling. Also, identify all the manual operations for the pumps and valves.

The response to RAI 01.05-5 (letter U7-C-NINA-NRC-130031, dated May 2, 2013 (ML13128A140)) provided a copy of "STP 3&4 ABWR FLEX Integrated Plan." This plan, in conjunction with the calculation entitled, "Extended Station Blackout Scenario," dated August 2012, performed by DP Engineering, Ltd., described in the response to Item 1 above, provide a detailed listing of all valves, pumps, and manual operator actions required for the mitigation strategies and their power sources. Although substantially complete based on all available information, the level of detail provided in these documents is constrained because detailed design for STP 3 & 4 is not yet complete and operating procedures have not yet been developed. To ensure these plans are complete and are executed effectively, the FLEX Integrated Plan includes the requirement that STP 3&4 will implement the activities in the FLEX Integrated Plan using procedures developed based on industry guidance from the Owners Groups, EPRI, and NEI as part of the Procedure Development Plan described in FSAR Section 13.5. The procedures, training, and any walk-through validation will be in place and completed 180 days prior to the initial fuel load of Unit 3.

QUESTION:

In regards to the response to RAI 01.05-5, the staff reviewed the applicant's response and determined that the response is insufficient to completely address the staff's concerns. The NRC staff needs sufficient information in order to reach a safety conclusion within the COLA review. The applicant should address the specific provisions in Interim Staff Guidance (ISG) JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (ML12229A174) dated August 29, 2012 that endorses the Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide". The ISG provides an acceptable method for satisfying Order EA-12-049. As stated in the ISG, other methods may be used to satisfy Order EA-12-049, but these methods will be reviewed by the NRC staff on a case-by-case basis to determine their acceptability. If the applicant proposes to use methods that differ from those in the ISG and endorsed guidance, the applicant should explain why these alternative methods are acceptable.

Core Cooling, RCIC

Over the initial 36 hour timeline (Figure 1 shown in the STP 3& 4 ABWR FLEX- Integrated Plan, U7-C-NINA-NRC-130031), RCIC receives inventory from CST and SP for 27.5 and 8.5 hours, respectively. Therefore, significant credit is taken for the CST in the integrated plan. Provide information with a discussion that supports the position that the CST is "robust" and the switchover instrumentation mounted near the tank will be operational following and during ELAP events.

RESPONSE:

As documented in NINA's May 2, 2013 response to RAI 01.05-5 (ML13128A140), FSAR Appendix 1E, Subsection 1E.2.4 "Mitigating Strategies for Beyond Design Basis Events (4.2)" will be revised in the next routine revision of the COLA to stipulate that the Condensate Storage Tank (CST) for each unit will be constructed to withstand the site-specific Safe Shutdown Earthquake (SSE) of 0.15g, missile, flood, high wind, and other site specific severe weather hazards.

As stated in DCD Chapter 20, Question Response 440.47, the Class 1E CST level instruments will be seismically installed. In addition, DCD Subsection 9.2.9.1(8) documents that the CST level instrumentation is mounted in a safety-grade standpipe located in the Reactor Building secondary containment. Therefore, it is protected from missile, flood, high wind, and other site specific severe weather hazards.

CST level indication will be available at the Remote Shutdown Panel during ELAP events (see DCD Chapter 21, Figure 7.4-2).

QUESTION:

In regards to the response to RAI 01.05-5, the staff reviewed the applicant's response and determined that the response is insufficient to completely address the staff's concerns. The NRC staff needs sufficient information in order to reach a safety conclusion within the COLA review. The applicant should address the specific provisions in Interim Staff Guidance (ISG) JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (ML12229A174) dated August 29, 2012 that endorses the Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide". The ISG provides an acceptable method for satisfying Order EA-12-049. As stated in the ISG, other methods may be used to satisfy Order EA-12-049, but these methods will be reviewed by the NRC staff on a case-by-case basis to determine their acceptability. If the applicant proposes to use methods that differ from those in the ISG and endorsed guidance, the applicant should explain why these alternative methods are acceptable. Examples where additional information is needed include the following:

1. In STP 3&4 ABWR Flex Integrated Plan for extending loss of ac power (ELAP) event, the plan includes Class 1E 125v dc power that is available for remote shutdown instrumentation following a deep load shedding and divisional cross-connection strategy. The plan also referenced dc bus stripping calculation entitled, "Extended Station Blackout Scenario," to length battery life performed by DP Engineering, August 2012. The staff needs to review the dc load shedding analysis for its analytical methods, key assumptions, and results that determined the battery discharge duration can be extended for Flex Phase 1 and 2. Provide the dc load shedding profile that identifies all equipment based on its actual expected operation times, and its cell voltages (i.e., voltage vs. time curve) for the above duration.

2. After 36 hours, Phase 3 begins with core cooling provided by ACIWA (ac independent water addition) and operators would need to transfer diesel fuel from one of the three EDG fuel oil storage tanks to the ACIWA fuel storage tank and to add portable diesel generators. The Plan includes addition of two flex 480v 1500 kW diesel generators from offsite to provide ac power for battery charger operation, limited ventilation system operation, and other limited uses. In order to ensure the generator(s) has adequate capacity and capability, provide all electrical loads that will be connected and identify any additional onsite electrical distribution system modifications (temporary or permanent) to accommodate addition of the diesel generators under Phase 3.

RESPONSE:

Item 1: Provide the dc load shedding analysis including analytical methods, key assumptions, and results that determined the battery discharge duration can be extended for Flex Phase 1 and 2.

As stated in the response to RAI 01.05-11, Item 1, Nuclear Innovation North America (NINA) will make available for review a copy of the calculation entitled, "Extended Station Blackout Scenario," dated August 2012, which was performed by DP Engineering, Ltd., and 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, which was used as an input for this calculation. These calculations provide descriptions of the dc load shedding analysis including analytical methods, key assumptions, and results that determined the STP 3 & 4 battery discharge duration can be extended as assumed in the "STP 3&4 ABWR FLEX Integrated Plan," dated May 2, 2013.

These calculations will be made available at the Westinghouse Reading Room in Rockville, Maryland, at any time mutually agreed upon between NINA and the NRC staff.

Item 2: Ensure the two FLEX 480 volt, 1500 kW diesel generator(s) supplied from the Regional Resource Center have adequate capacity and capability. Provide all electrical loads that will be connected and identify any additional onsite electrical distribution system modifications (temporary or permanent) to accommodate addition of the diesel generators under Phase 3.

STP 3&4 are pre-construction plants and detailed design is not complete. As stated in the response to RAI 01.05-5 (letter U7-C-NINA-NRC-130031, dated May 2, 2013 (ML13128A140)), FSAR Appendix 1E, Subsection 1E.2.4, "Mitigating Strategies for Beyond Design Basis Events (4.2)" will be revised in the next revision of the COLA to include design changes to support the implementation of the FLEX Plan. This will include a requirement that the STP 3 & 4 final design include permanent electrical connections to allow the Phase 3 FLEX 480 V 1500 kW DGs to be connected outside the Reactor Building to provide power to ESF Load Centers. Because of this design requirement, no additional onsite electrical distribution system modifications (temporary or permanent) will be required to accommodate connection of the Phase 3 diesel generators.

As stated in the "STP 3&4 ABWR FLEX Integrated Plan," Phase 3 begins after 36 hours, at which time, two FLEX 480 Volt, 1500 KW diesel generators supplied from the offsite Resource Center will provide AC power for battery charger operation, limited ventilation system operation, and other limited uses. The STP 3&4 ABWR FLEX Integrated Plan specifies that Phase 3 will be an extension of Phase 1 and the following actions would be performed in Phase 3:

- Continue running the diesel driven ACIWA pump;
- Continue dumping heat to the suppression pool using SRV(s);
- Continue venting the containment via COPS;

- Switch ACIWA suction to the UHS;
- Add diesel fuel to the ACIWA fuel tank as necessary;
- Power up select battery chargers and safety-related loads from the 480V FLEX AC DG so that command and control can be re-established in the Main Control Room; and,
- Re-establish ventilation in the Reactor Building and Control Room.

These activities, including ventilation in the Reactor Building and Control Room, are flexible and can be prioritized to be well within the capacity provided by two 1500 KW diesel generators. STP 3&4 will implement these activities using procedures developed based on industry guidance from the Owners Groups, EPRI, and NEI as part of the Procedure Development Plan described in FSAR Section 13.5. Procedure development and validation will ensure that loads added to two FLEX 480 Volt, 1500 KW diesel generators will not exceed the capacity and capability of the available equipment. The procedures, training, and any walk-through validation will be in place and completed 180 days prior to the initial fuel load of Unit 3.

QUESTION:

In regards to the response to RAI 01.05-5, the staff reviewed the applicant's response and determined that the response is insufficient to completely address the staff's concerns. The NRC staff needs sufficient information in order to reach a safety conclusion within the COLA review. The applicant should address the specific provisions in Interim Staff Guidance (ISG) JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (ML12229A174) dated August 29, 2012 that endorses the Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide". The ISG provides an acceptable method for satisfying Order EA-12-049. As stated in the ISG, other methods may be used to satisfy Order EA-12-049, but these methods will be reviewed by the NRC staff on a case-by-case basis to determine their acceptability. If the applicant proposes to use methods that differ from those in the ISG and endorsed guidance, the applicant should explain why these alternative methods are acceptable.

CORE Cooling/RCIC

On page 15, the Integrated Plan states that RCIC will remain aligned to the CST (assumed volume of 250,000 gallons) until CST water level approaches the end of its usable volume at approximately 36 hours. Provide detailed information for the following parameters over the initial 36 hour period (include figures for these parameters with respect to time):

· RCIC flow rate decrease due to reduced steam flow

· CST level

· Core thermal power (decay heat).

RESPONSE:

The information requested is contained in Calculation NSO-2013-000311/PSNN-2013-0513. This calculation will be made available for NRC staff review at the audit scheduled for August 1 through September 13, 2013 (ML13189A249).

QUESTION:

In regards to the response to RAI 01.05-5, the staff reviewed the applicant's response and determined that the response is insufficient to completely address the staff's concerns. The NRC staff needs sufficient information in order to reach a safety conclusion within the COLA review. The applicant should address the specific provisions in Interim Staff Guidance (ISG) JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (ML12229A174) dated August 29, 2012 that endorses the Nuclear Energy Institute (NEI) 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide". The ISG provides an acceptable method for satisfying Order EA-12-049. As stated in the ISG, other methods may be used to satisfy Order EA-12-049, but these methods will be reviewed by the NRC staff on a case-by-case basis to determine their acceptability. If the applicant proposes to use methods that differ from those in the ISG and endorsed guidance, the applicant should explain why these alternative methods are acceptable.

Reactor Pressure Vessel Pressure Control

- Confirm that the portable Nitrogen bottles will be available to supplement the SRV accumulator for phase 2

- Discuss the impact that back pressure may have on the SRVs' operation to confirm that the SRV will be functional during ELAP conditions in the drywell

- Describe the STP-3/4 plans to implement the BWROG (NEDC-33771P R1) recommendation that ABWR "plants should evaluate their SRVs' qualification against the predicted containment response with FLEX implementation to ensure there will be sufficient DC bus voltage during the ELAP event."

RESPONSE:

- Confirm that the portable Nitrogen bottles will be available to supplement the SRV accumulator for phase 2

  STP 3 & 4 has no need for portable Nitrogen bottles since the High Pressure Gas Supply System (see DCD Section 6.7) has permanently installed Nitrogen gas bottles that provide backup to the normal supply. DCD Subsection 19E.2.1.2.2.2(2)(b) further describes the backup nitrogen supply to the SRV accumulators and the operator actions necessary for its use during station blackout conditions. In addition, DCD Subsection 19.9.22 documents that procedures will be developed regarding operation of the SRVs using the backup nitrogen supply to assure SRV operability during station blackout conditions. It should be noted that the SRVs will actuate at their spring setpoints until the operators control pressure manually.

- Discuss the impact that back pressure may have on the SRVs' operation to confirm that the SRV will be functional during ELAP conditions in the drywell

  DCD Subsection 19E.2.1.2.2.2(2)(b) documents that the ADS SRV accumulators have sufficient pressure and capacity to fully open the SRVs despite backpressure due to ELAP conditions in the drywell.

- Describe the STP-3/4 plans to implement the BWROG (NEDC-33771P R1) recommendation that ABWR "plants should evaluate their SRVs' qualification against the predicted containment response with FLEX implementation to ensure there will be sufficient DC bus voltage during the ELAP event."

  DCD Section 3I (Equipment Qualification Environmental Design Criteria) specifies the minimum set of plant environmental conditions, which envelope the actual environments expected over the plant life, for which safety-related systems and equipment are to be designed and qualified. Designing and qualifying the nitrogen supply solenoid valves in accordance with the prescribed environmental conditions in containment during accident and post-accident conditions will ensure that these valves will function during ELAP conditions.

  The STP 3 & 4 Equipment Requirement Specification for Main Steam Safety/Relief Valve (7B21-F001-3001-01), Section 4.6 stipulates the design conditions for the SRV actuator system. The design temperature for the pneumatic supply system, including the SRV solenoids, is 340°F (Subsection 4.6.1). In addition, the SRV solenoids will be designed to operate at 100 VDC (Subsection 4.6.4), which is lower than the minimum anticipated battery voltage during an ELAP event.

  Additionally, FSAR Section 3.11.6.1 "Environmental Qualification Document (EQD)" specifies that the EQD will summarize the qualification results of all safety-related electrical and mechanical equipment located in harsh environments and that it will be made available for NRC review as part of the ITAAC for basic configuration of components as provided in DCD Tier 1, Section 1.2.