Greg Gibson
Vice President, Regulatory Affairs

750 East Pratt Street, Suite 1600
Baltimore, Maryland 21202

UniStar
NUCLEAR ENERGY

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April 15, 2009

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ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016
Response to Request for Additional Information for the
Calvert Cliffs Nuclear Power Plant, Unit 3,
RAI No. 78, Probabilistic Risk Assessment and Severe Accident Evaluation

References: 1) John Rycyna (NRC) to Robert Poche (UniStar Nuclear Energy), "RAI No 78 SPLA 1837.doc (PUBLIC)," email dated March 16, 2009

The purpose of this letter is to respond to the request for additional information (RAI) identified in the NRC e-mail correspondence to UniStar Nuclear Energy, dated March 16, 2009 (Reference 1). This RAI addresses Probabilistic Risk Assessment and Severe Accident Evaluation, as discussed in Section 19.1 of the Final Safety Analysis Report (FSAR), as submitted in Part 2 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined License Application (COLA), Revision 4.

The enclosure provides our responses to RAI No 78, Questions 19-8, 19-10 and 19-11. Our responses to Questions 19-8, 19-10 and 19-11 do not include any new regulatory commitments.

Our responses to Questions 19-8 and 19-10 include revised COLA content. A Licensing Basis Document Change Request has been initiated to incorporate the changes identified in the responses to Questions 19-8 and 19-10 in a future revision of the COLA.

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NRO

The response to RAI 78, Question 19-9 will be provided to the NRC by May 12, 2009.

If there are any questions regarding this transmittal, please contact me at 410-470-4205, or Mr. Michael J. Yox at (410) 495-2436.

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

Executed on April 15, 2009

Greg Gibson

Enclosure: Response to NRC Request for Additional Information, RAI No. 78, Probabilistic Risk Assessment and Severe Accident Evaluation, Calvert Cliffs Nuclear Power Plant Unit 3

cc: John Rycyna, NRC Project Manager, U.S. EPR COL Application
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application (w/o enclosure)
Loren Plisco, Deputy Regional Administrator, NRC Region II (w/o enclosure)
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2
U.S. NRC Region I Office

UN#09-157

Enclosure
Response to NRC Request for Additional Information
RAI No. 78
Probabilistic Risk Assessment and Severe Accident Evaluation
Calvert Cliffs Nuclear Power Plant Unit 3

RAI No 78

Question 19-8

The response to Question 19-166 on the U.S. EPR Final Safety Analysis Report (FSAR) includes a draft version of Table 19.1-109, which lists assumptions from the probabilistic risk assessment (PRA). Footnote 2 to the table states that these assumptions will be reevaluated as part of the PRA maintenance and upgrade process and that combined license (COL) item 19.1-9 is provided to confirm that assumptions used in the PRA remain valid for the as-to-be-operated plant. Neither the proposed license condition related to COL item 19.1-9 nor the description of the maintenance and upgrade process in Section 19.1.2.4.1 of the CCNPP Unit 3 FSAR refers to this table in the U.S. EPR FSAR. Discuss how this table will be used to ensure that the CCNPP Unit 3 PRA reflects the as-to-be-built, as-to-be-operated plant. Revise the FSAR and license condition as appropriate.

Response

COL Item 19.1-9 is addressed in Calvert Cliffs Unit 3 FSAR Section 19.1.2.2 and in COLA Part 10, Appendix A, Proposed License Conditions. These descriptions will be revised to include a reference to the design certification assumptions found in U.S. EPR FSAR Table 19.1-109.

COLA Impact

The COLA will be revised to summarize the response to this question. The changes are shown below.

19.1.2.2 PRA Level of Detail

The U.S. EPR FSAR includes the following COL Item in Section 19.1.2.2:

> A COL applicant that references the U.S. EPR design certification will review as-designed and as-built information and conduct walk-downs as necessary to confirm that the assumptions used in the PRA, including PRA inputs to RAP and severe accident mitigation design alternatives (SAMDA), remain valid with respect to internal events, internal flooding and fire events (routings and locations of pipe, cable and conduit), and human reliability analyses (HRA) (i.e., development of operating procedures, emergency operating procedures and severe accident management guidelines and training), external events including PRA-based seismic margins, high confidence, low probability of failure (HCLPF) fragilities, and low power shutdown (LPSD) procedures.

This COL Item is addressed as follows:

As-designed and as-built information will be reviewed, and walk-downs will be performed, as necessary, to confirm that the assumptions used in the PRA, including <u>design certification related PRA assumptions found in U.S. EPR FSAR Table 19.1-109 and</u> PRA inputs to RAP and SAMDA, remain valid with respect to internal events, internal flooding and fire events (routings and locations of pipe, cable and conduit), and HRA (i.e., development of operating procedures, emergency operating procedures and severe accident management guidelines and training),

external events including PRA-based seismic margins, HCLPF fragilities, and LPSD procedures. This shall be performed prior to fuel load.

Part 10 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) and ITAAC Closure

Appendix A - Proposed Combined Licensing Conditions
2. COL Items:

Proposed Licensing Condition:

COL Item 19.1-9 in Section 19.1.2.2
As-designed and as-built information will be reviewed, and walk-downs will be performed, as necessary, to confirm that the assumptions used in the Probabilistic Risk Assessment (PRA), including design certification related PRA assumptions found in U.S. EPR FSAR Table 19.1-109 and PRA inputs to Reliability Assurance Program and Severe Accident Mitigation Design Alternatives, remain valid with respect to internal events, internal flooding and fire events (routings and locations of pipe, cable and conduit), and Human Reliability Assurance (i.e., development of operating procedures, emergency operating procedures and severe accident management guidelines and training), external events including PRA-based seismic margins, high confidence, low probability of failure fragilities, and low power shutdown procedures. This shall be performed prior to initial fuel load.

Question 19-10

The evaluation of site-specific items in Section 19.1.4.1 of the CCNPP Unit 3 FSAR concludes that "the U.S. EPR FSAR [probabilistic risk assessment] PRA for Level 1 internal events at power is applicable and bounding for the CCNPP Unit 3 site." However, no discussion of the applicability of the U.S. EPR shutdown PRA to the CCNPP Unit 3 site is provided in Section 19.1.6.1 of the CCNPP Unit 3 FSAR. For each site-specific item evaluated in Section 19.1.4.1, as well as any additional site-specific items applicable only to the shutdown PRA, revise Section 19.1.6.1 to discuss how the U.S. EPR shutdown PRA is applicable and bounding.

Response

The following site-specific items were evaluated in Section 19.1.4.1, as revised per RAI 17, Question 19-1[1]:

- LOOP frequency and nonrecovery probabilities
- Consequential LOOP frequencies (with nonrecovery probabilities)
- The Circulating Water System (CWS) and Normal Heat Sink (NHS)
- The Closed Cooling Water System (CLCWS)
- The Auxiliary Cooling Water System (ACWS)

The applicability of the site-specific LOOP frequency and nonrecovery probabilities during shutdown were evaluated and provided in FSAR Section 19.1.4.1 as part of the response to RAI 17, Question 19-1.

The consequential LOOP and site-specific items related to a loss of balance of the plant, which are evaluated in FSAR Section 19.1.4.1, are not applicable and not included in the U.S. EPR shutdown PRA.

There are items that were included in the model as applicable only to the shutdown PRA, but none were site-specific. Therefore, no additional site-specific items applicable only to the shutdown PRA were identified.

COLA Impact

FSAR Section 19.1.6.1 will be supplemented to include the evaluation of the LOOP frequency and nonrecovery probabilities and to make a statement as to the overall evaluation of the applicability and bounding nature of the U.S. EPR PRA. The changes are summarized below.

19.1.6 Safety Insights from the PRA for Other Modes of Operation
~~{No departures or supplements.~~ {One CCNPP Unit 3 site-specific item has been identified as having the potential to affect the low power shutdown (LPSD) PRA model:

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[1] UN#08-090, UniStar Nuclear Energy, NRC Docket No. 52-016, Submittal of Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3, RAI No. 17, Revision 2 – Probabilistic Risk Assessment and Severe Accident Evaluation, dated December 19, 2008.

- Loss of Offsite Power (LOOP) frequency and duration

This item has been evaluated in Section 19.1.4.1 for potential deviations from the U.S. EPR FSAR.

It is concluded that the U.S. EPR FSAR PRA for low power shutdown is applicable and bounding for the CCNPP Unit 3 site. The site and plant-specific parameters do not have a significant impact on the PRA results and insights. Therefore, no changes to the U.S. EPR LPSD PRA are necessary when considering specific CCNPP Unit 3 site and plant parameters.}

Question 19-11

(Follow-up to Question 19-2) The response to Question 19-2 provides additional information on the derivation of the failure frequency and probability for the circulating water system (CWS) and normal heat sink (NHS), represented by the undeveloped event "SUP UHS NS." The undeveloped event has a failure frequency of 1E-2 per year (/yr) and a failure probability of 2.8E-5 over a 24-hour mission time. However, it is unclear that these values bound all failure modes of the CWS and NHS. For example, the staff observes that the CWS has four 25-percent trains, and NUREG/CR-6928 indicates that the probability of a motor-driven pump failing to run over a 24-hour mission time may be as high as 1E-4. Provide additional information (e.g., system design, success criteria for both initiating events and mitigating functions, failure probabilities) to demonstrate that the plant-specific CWS and NHS are bounded by the undeveloped event "SUP UHS NS."

Response

As described in the response to RAI 17, Question 19-2[2], the undeveloped event "SUP UHS NS" failure frequency of 1E-02 per year is based on generic industry data from NUREG/CR-6928 and NUREG/CR-5750. This data provides the contribution of "problems related to the circulating water system: Loss of Non-Safety-Related Cooling Water" to the Total Loss of Condenser Heat Sink initiating event.

The motor-driven pump failure to run probability stated in the question is not inconsistent with the failure probability for "SUP UHS NS" used in the CCNPP Unit 3 Probabilistic Risk Assessment (PRA). This is because a loss of one Circulating Water System (CWS) pump does not necessarily result in an initiating event, especially during the non-summer months. Also, a loss of one CWS pump does not prevent the CWS from being able to remove post-trip heat loads.

Additional information, including system design, success criteria for initiating events and mitigating functions, and more detailed failure probabilities than those provided in response to RAI 17, Question 19-2 are not available at this time. The CWS pumps are significantly different from any of the motor-driven pump types included in NUREG/CR-6928, Table A.2.27.5. FSAR Section 10.4.5 states that each CWS pump is approximately 200,000 gpm, and driven by a motor rated at approximately 11,000 horsepower. Also, data for the advanced plants are not yet available. The failure probability used for "SUP UHS NS" is generic and therefore assumed to be applicable to Calvert Cliffs Unit 3.

As stated in the response to RAI 17, Question 19-2, the Fussell-Vesely of the "SUP UHS NS" undeveloped event is 1.6E-05. This shows that, even if the basic event "SUP UHS NS" failure probability during 24 hours mission time is to be increased 10 times, the total increase in the CDF will be smaller than 0.1%

COLA Impact

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[2] UN#08-090, UniStar Nuclear Energy, NRC Docket No. 52-016, Submittal of Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3, RAI No. 17, Revision 2 – Probabilistic Risk Assessment and Severe Accident Evaluation. Dated December 19, 2008.

The COLA will not be revised in response to this question.