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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. 93, Probabilistic Risk Assessment and Severe Accident Evaluation

Reference: John Rycyna (NRC) to Robert Poche (UniStar Nuclear Energy), "RAI No 93 SPLA 1917.doc (PUBLIC)," email dated March 31, 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 31, 2009 (Reference). This RAI addresses the Probabilistic Risk Assessment (PRA) 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. 93, Questions 19-13, 19-14, 19-16, 19-17, and 19-18. COLA impacts associated with these RAI responses are noted with the question responses. A Licensing Basis Document Change Request has been initiated to incorporate these changes into a future revision of the COLA.

Our responses to RAI No. 93, Questions 19-13, 19-14, 19-16, 19-17, and 19-18 do not include any new regulatory commitments.

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UniStar requires additional time to respond to RAI 93, Questions 19-12, and 19-15. A response to RAI 93, Questions 19-12, and 19-15 will be provided by June 4, 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 30, 2009

Christian Clement
for Greg Gibson

Greg Gibson

Enclosure: Response to NRC Request for Additional Information RAI No. 93, Probabilistic Risk Assessment and Severe Evaluation Application 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
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Enclosure

Response to NRC Request for Additional Information
RAI No. 93, Probabilistic Risk Assessment and Severe Evaluation Application
Calvert Cliffs Nuclear Power Plant, Unit 3

Question 19-13:

The risks posed by external events should be assessed from a probabilistic risk assessment (PRA) perspective and should be screened against the SRP Chapter 19 screening criteria. The Draft Regulatory Guide DG-1200, dated June 2008, Pages 14 and 17 state that "It is recognized that for those new reactor designs with substantially lower risk profiles (e.g., internal events [core damage frequency] CDF below 1E-6/yr) that the quantitative screening value should be adjusted according to the relative baseline risk value."

With the baseline U.S. EPR internal events CDF and large release frequency (LRF) known to be 5E-7/yr and 3E-8/yr, it is not practical to screen out the external events using the quantitative screening criteria (e.g., LRF = 1E-7/yr) that are higher than the baseline risk values, thus, please reassess the external events using an appropriate PRA screening value, or justify an alternative.

Response:

As presented in the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 FSAR Chapter 19, the risks posed by external events are assessed by PRA evaluation and screened against the SRP (NUREG-0800) screening criteria. The first paragraph of the question quotes a sentence that appears in the internal initiating event section of Regulatory Guide (RG) 1.200, Rev. 2. The CCNPP Unit 3 PRA does not use the quantitative screening values discussed in the question for internal initiating events.

For external events, RG 1.200, Section 1.2.5 (Screening and Conservative Analysis of Other External Hazards Technical Elements) explicitly states that "Screening methods can often be employed to show that the contribution of many external events to CDF and/or LERF/LRF is insignificant. The fundamental criteria that have been recognized for screening-out events are the following : ...(3) if it can be shown using a demonstrably conservative analysis that the CDF is less than 1E-6 per year." The same CDF threshold is used as one of the SRP screening criteria.

As stated in RG 1.200, screening of external events is performed by applying a demonstrably conservative analysis. A screening evaluation differs from a detailed analysis, and is likely to produce significantly higher values than a detailed analysis. This is because in order to show that the contribution of the specific external event to the overall risk is not significant, the screening process uses very conservative assumptions. Some of the major conservatisms in the CCNPP Unit 3 external events evaluations are summarized below:

<u>Airplane Crash Hazard:</u>

- The crash frequency of all aircraft was used in combination with the higher consequence of large commercial aircraft and military jets. (The frequency of the large commercial aircraft and military jets is less than 1/3 of total frequency.)
- Aircraft crash frequencies used are inherently conservative

  - A generic non-airport (in flight) crash frequency from DOE-STD-3014-2006, Department of Energy Standard Accident Analysis for Aircraft Crashes into Hazardous Facilities, applicable to the entire continental U.S, is used for a site-specific in-flight crash frequency.
  - The definition of accidents used to count aircraft crashes into hazardous facilities is broad and includes non-crash incidents (such as damage to aircraft while landing and in-flight turbulence injuries).
- Complete destruction is assumed for non-hardened buildings, and no credit is given for non-hardened buildings shielding other buildings.

<u>Tornado Hazard:</u>

- Tornados with top wind speeds greater than the non-safety design rating wind speed are assumed to result in complete destruction of non-safety buildings.
- No credit is given for separation of buildings.

When all conservatisms are removed, the risk measure values that would be produced in a more detailed analysis are likely to be significantly lower than the screening values. Therefore, the screening values should not be compared with the current risk metrics.

Based on the above, the screening values used in the CCNPP Unit 3 FSAR are applicable, and satisfy all the current regulatory requirements.

COLA Impact

The CCNPP Unit 3 FSAR will not be changed as a result of this question.

Question 19-14:

COLA FSAR Section 19.1.5.2 states that "The internal flooding frequency in the Turbine Building in the U.S. EPR FSAR PRA is based on a generic conservative frequency; therefore, it is considered conservative for CCNPP Unit 3." Please demonstrate that the U.S. EPR FSAR flooding frequency for turbine building remains bounding for CCNPP Unit 3 turbine building flooding.

Response:

The U.S. EPR internal flooding PRA utilizes a generic flooding frequency for the turbine building of 3.3E-02/year, obtained from NUREG/CR-2300, Table 11-9. The frequency is applied to a flooding scenario which disables all equipment located within the turbine building. The generic flooding frequency was selected because the detailed piping layout of the fluid-carrying systems housed in the turbine building has not been established and was not necessary for design certification. If applied to the current fleet, this frequency would correspond to more than 3 expected major turbine building flooding events each year. Based on industry experience, this generic frequency is judged to be bounding for any modern plant.

The detailed piping layout in the turbine building has not been developed for CCNPP Unit 3 and is not required for a COL application. Site-specific differences in piping layout would not change the conclusion that the use of this generic frequency is conservative for a modern nuclear plant. Therefore, the generic turbine building flooding frequency used for the US EPR plant is conservative for CCNPP Unit 3 turbine building flooding.

COLA Impact

The CCNPP Unit 3 FSAR will not be changed as a result of this question.

Question 19-16:

COLA FSAR section 19.1.5.4.5, on page 19-16 states that an external event can be screened if its initiating event frequency is less than 1.0E-6/yr and it does not adversely affect the operation of the plant. The "Nearby Facilities Hazards" on Page 19-17 are screened out, since the initiating event frequencies are less than 1.0E-6/yr. Please address how these hazards do not adversely affect the operation of the plant.

Response:

The intention of the COL FSAR Section 19.1.5.4.5 was to state that an external event can be screened from the PRA if it does not adversely affect the operation of the plant, or if its frequency, and therefore its contribution to core damage frequency, is less than 1.0E-06 per year. This is consistent with the External Events PRA Methodology in ANSI/ANS-58.21-2007 and in Regulatory Guide 1.200 Revision 2 Section 1.2.5.

COLA Impact

FSAR Section 19.1.5.4.5 will be updated as follows in a future COLA revision.

19.1.5.4.5 Industrial and Transportation Accidents Risk Evaluation

This section is added as a supplement to the U.S. EPR FSAR.

The risks posed by potential industrial and transportation accidents to CCNPP Unit 3 are evaluated against the ANSI/ANS-58.21-2007 and SRP screening criteria as defined in NUREG-0800, Section 2.2.3. ANSI/ANS-58.21-2007 allows quantitative screening if the core damage frequency, calculated using a bounding or demonstrably conservative analysis, has a mean ~~The following approach is used: if the postulated event does not adversely affect the operation of the plant, the event can be screened if its~~ frequency ~~is~~ less than 1.E-06/yr.

The following types of hazards are evaluated: highway hazards, waterway hazards, pipeline hazards, railroad hazards, and nearby facilities hazards:

Question 19-17:

According to the external events assessment, both tornado core damage frequency (CDF) and large release frequency (LRF) are estimated to be 5.4E-8/yr and the aircraft crash CDF and LRF are estimated to be 1E-7/yr and 3E-8/yr, respectively. Thus, the total CDF from internal and external events is calculated to be 5.3E-7/yr + 5.4E-8/yr + 1E-7/yr = 6.8E-7/yr. Similarly, the total internal and external events LRF is calculated to be 2.6E-8/yr + 5.4E-8/yr + 3E-8/yr = 1.1E-7/yr. These values yield a conditional core failure probability (CCFP) of 1.1E-7/yr / 6.8E-7/yr = 0.16, which is higher than the Commission's goal of less than 0.1 CCFP.

Please justify the acceptability of exceeding the Commission's CCFP goal.

Response:

The external events described in this question were screened using the requirements for screening and conservative analysis from the ANS External Events PRA Methodology (ANSI/ANS-58.21-2007) and Regulatory Guide 1.200, Revision 2, Section 1.2.5 (RG 1.200). RG 1.200 states that "screening methods can often be employed to show that the contribution of many external events to CDF and/or LERF/LRF is insignificant."

As described in the response to Question 19-13, it is not appropriate to combine the results of the internal-events PRA with the results of screening and conservative analysis due to the highly conservative assumptions that are applied to screening analysis. In addition, the values presented in the question identify a tornado LRF value of 5.4E-8/yr, which is not correct . No LRF value was calculated for tornados as they were screened based on the CDF value. Similarly, 3E-8/yr for the aircraft crash does not represent a LRF value, but instead represents the sum of all releases from the containment.

U.S. EPR FSAR Section 19.1.8.1 calculates the CCFP and demonstrates that it meets the Commission's CCFP goal.

COLA Impact

The CCNPP Unit 3 FSAR will not be revised in response to this question.

Question 19-18:

CCNPP Unit 3 FSAR, Section 19.1.5.4.1, "High Winds and Tornado Risk Evaluation" does not address the probabilistic risk assessment (PRA) impact and risk insights posed by high winds on the non-safety-related structures that contain systems and components modeled in the PRA. In accordance with guidance provided in NUREG-0800, Rev.2, Section 19.1.5.N (page 19.0-24) "Results and Insights from Other External Event PRA" and Part C.III.1 Section C.I.19 to RG 1.206 "Combined License Applications for Nuclear Power Plants", please describe the PRA impact and insights mentioned above.

Response:

The bounding PRA scenario used to quantitatively screen tornado high winds models an unrecoverable loss of offsite power (LOOP) with the loss of all non-safety related structures and the systems and components modeled in the PRA that are contained within those structures. Results and risk insights of the effect of tornadoes on non-safety structures are obtained from this quantitative screening and are provided in CCNPP Unit 3 FSAR Section 19.1.5.4.1. High winds other than tornadoes are qualitatively screened per NUREG-0800 (Section 3.3.1).

As discussed in CCNPP Unit 3 FSAR Section 19.1.5.4.1, the SRP acceptance criteria for high winds specify that the design velocity pressure for safety-related structures must be greater than or equal to the velocity pressure corresponding to the speed of the 100-year return period 3-second wind gust. As explained in CCNPP Unit 3 FSAR Section 2.3.1.2.2.15, the 100-year return period 3-second wind gust for CCNPP Unit 3 is 102 mph. Structures which are part of the U.S. EPR standard design are designed for 145 mph. Per ASCE 7-05 "Minimum Design Loads for Buildings and Other Structures", CCNPP Unit 3 structures shall be designed to 102 mph. Thus, by definition the NUREG-0800 Section 3.3.1 screening criteria for high winds (other than tornado) is met. Therefore there are no quantitative results or insights from the evaluation of high winds other than tornadoes.

For the CCNPP Unit 3 site, it is reasonable to assume that tornadoes are the limiting high winds phenomenon (in terms of consequences). Non-tornado high winds are expected to be more frequent but also much less damaging than a tornado strike. The impact of non-tornado high winds is already included in the PRA LOOP initiating event frequency: NUREG/CR-6890 data used to calculate the LOOP frequency and the offsite power non-recovery probabilities includes weather-related LOOP.

COLA Impact

FSAR Section 19.1.5.4.1 will be updated as follows in a future COLA revision.

<u>High Wind Load</u>

The U.S. EPR safety related structures are designed to withstand high wind load characteristics as specified in NUREG-0800, Section 3.3.1. The SRP acceptance criteria for high winds specify that the design velocity pressure for safety-related structures must be greater than or equal to the velocity pressure corresponding to the speed of the 100-year return period 3-second wind gust. The design basis wind speed is 145 mph (233 kph) in open terrain with a 50-year mean recurrence interval. For the safety-related structures, the design wind speed is increased by an importance factor of 1.15 to obtain a 100-year mean recurrence interval.

As documented in Section 2.3.1.2.2.15, the 100 year return period 3-second wind gust for the CCNPP Unit 3 site is 102 mph (164 kph). This is significantly less than the design basis wind speed. Site-specific structures will be designed in compliance with ASCE 7-05, "Minimum Design Loads for Buildings and Other Structures," (ASCE, 2006), therefore the design wind speed for those structures will be no less than 102 mph. Therefore the NUREG-0800, Section 3.3.1 screening criteria are met for high winds (other than tornadoes).