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UniStar
NUCLEAR ENERGY

10 CFR 50.4
10 CFR 52.79

October 23, 2009

UN#09-443

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. 136, Aircraft Hazards

References: 1) John Rycyna (NRC) to Robert Poche (UniStar Nuclear Energy), "RAI No 136 RSAC 3368.doc" email dated August 7, 2009

2) UniStar Nuclear Energy Letter UN#09-374, from Greg Gibson to Document Control Desk, U.S. NRC, "Submittal of Response to RAI No. 136, Aircraft Hazards," dated September 8, 2009

The purpose of this letter is to supplement the response to the request for additional information (RAI) identified in the NRC e-mail correspondence to UniStar Nuclear Energy, dated August 7, 2009 (Reference 1). This RAI addresses Aircraft Hazards, as discussed in Section 3.5.1.6 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 6.

Reference 2 provided the technical response to RAI No. 136, Question 03.05.01.06-2 and staetd the COLA impact would be provided by October 23, 2009. The enclosure provides the revised COLA content for RAI No. 136, Question 03.05.01.06-2. A Licensing Basis Document Change Request has been initiated to incorporate these changes into a future revision of the COLA.

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NRO

Our response to RAI No. 136, Question 03.05.01.06-2 does not include any new regulatory commitments or contain any sensitive or proprietary information.

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 October 23, 2009

Greg Gibson

Enclosure: COLA Impact for Response to NRC Request for Additional Information RAI No. 136, Question 03.05.01.06-2, Aircraft Hazards, Calvert Cliffs Nuclear Power Plant, Unit 3

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch
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

GTG/SFW/mdf

Enclosure

COLA Impact for Response to NRC Request for Additional Information
RAI No. 136, Question 03.05.01.06-2, Aircraft Hazards,
Calvert Cliffs Nuclear Power Plant, Unit 3

RAI No. 136

Question 03.05.01.06-2

Regulatory Guide (RG) 1.206 provides guidance regarding the information that is needed to ensure potential hazards in the site vicinity are identified and evaluated to meet the siting criteria in 10 CFR 100.20 and 10 CFR 100.21. The Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 FSAR Section 2.2 describes the site-specific aircraft and airway hazard evaluations with impact probability determination. In response to RAI 10 RSAC 945, Question 02.02.01-02.02.02-2 (letter UN#08-044, October 6, 2008, page 3 of 7), the applicant provided the Four Factor Formula for the determination of annual aircraft crash impact frequency for the facility (F) per year, using estimated number of operations (N); aircraft crash rate (P), per take off/landing or per in-flight; aircraft crash location conditional probability (f), per square mile; and the site-specific effective area (A), square miles .

In response to RAI 48 RSAC 1604, Question 03.05.01.06-1 (letter UN#09-16, February 26,2009, page 2), the applicant provided aircraft crash rate (P) by aircraft type for a take off and landing.

In order to complete the review and perform independent confirmatory analysis, the staff requires the following information:

a) an explanation for the airport operations impact frequency and non-airport operations impact frequency and why the calculated airport operations impact frequency for general aviation and commercial aviation (air carrier) is zero (letter UN#08-044, October 6, 2008, page 6 of 7)

b) the data for aircraft crash location conditional probability (per square mile), f_{ijk} (x,y), for each aircraft type, each flight phase, and each flight source (letter UN#08-044, October 6, 2008, page 4 of 7)

c) a sample calculation using the aircraft crash location conditional probability data, the supplied aircraft crash rate (provided in letter UN#09-116) and the other data to calculate the total aircraft Impact Frequency, per year with the Four Factor Formula (provided in letter UN#08-044, October 6, 2008, page 3 of 7)

Response

The technical response to this RAI was provided in UniStar Nuclear Energy correspondence[1] to the NRC on September 8, 2009. The following information supplements that response with the COLA Impact.

1 UniStar Nuclear Energy Letter UN#09-374, from Greg Gibson to Document Control Desk, U.S. NRC, Submittal of Response to RAI No. 136, Aircraft Hazards," dated September 8, 2009

COLA Impact

FSAR Section 2.2.2.7.2 will be revised as follows in a future COLA revision:

2.2.2.7.2 Aircraft and Airways

Due to the close proximity of the airways V31 and V93 to the CCNPP site, the acceptance criteria identified in Section 3.5.1.6 of NUREG-0800, requiring the plant to be at least 2 statute mi beyond the nearest edge of a federal airway is not met. A calculation to determine the probability of aircraft accidents which could potentially result in radiological consequences for the U.S. EPR at the CCNPP site was conducted following the methodology presented in DOE Standard, DOE-STD-3014-2006 (DOE, 2006a). The analysis provided an estimate of the total aircraft impact frequency for the facility of ~~6.13E-6/yr~~ 6.79E-6/yr.

FSAR Section 3.5.1.6 will be revised as follows in a future COLA revision:

3.5.1.6 Aircraft Hazards

Section 2.2 describes the site-specific aircraft and airway hazard evaluations. {Due to the number of annual aircraft operations at two airports and close proximity of airways V31 and V93, a probabilistic risk assessment (PRA) was performed to assess the core damage frequency (CDF) effect from these hazards. Results of the PRA ~~state~~ show the total CDF from the site airplane crash scenarios ~~was calculated to be 1.5E-07 per year;~~ and the resulting containment release frequency ~~was calculated to be approximately 3E-08 per year. Therefore, the aircraft hazard~~ meet~~s~~ the NUREG-0800 Section 3.5.1.6 acceptance criteria (refer to Section 19.1.5.4.4).

FSAR Section 19.1.5.4.4 will be revised as follows in a future COLA revision:

19.1.5.4.4 Aircraft Crash Hazard Risk Evaluation

The following information is specific to the CCNPP Unit 3 site:

- The CCNPP Unit 3 site lies just within 10 statute miles (16 km) from the Patuxent Naval Air Station. The distances from the CCNPP Unit 3 site to various runways at Patuxent NAS vary from 43,100 ft to 52,736 ft (13,136 to 16,074 m). The Captain Walter Duke Regional Airport is also located just within 10 statute miles from the CCNPP Unit 3 site.

- According to 2005 data, the ~~The~~ number of annual operations at Patuxent NAS is 52,626 and the number of annual operations at Captain Walter Duke Regional Airport is 52,618.

FSAR Section 19.1.5.4.4 will be revised as follows in a future COLA revision:

19.1.5.4.4 Aircraft Crash Hazard Risk Evaluation

Detailed Airplane Crash Assessment

~~Because of the arrangement of structures on the U.S. EPR Site, there are several possible damage scenarios, depending on the direction of the impacting aircraft. The following three bounding and conservative scenarios were modeled:~~

- ~~Airplane crash into Safeguards Building 1 or 4 - The frequency of impact was derived by combining the building dimensions of Safeguards Building 1 and 4.~~
- ~~Airplane crash into the Turbine Building - This scenario disables all the equipment within the Turbine Building. In addition, Essential Service Water Cooling Towers 3 and 4 are located east of the Turbine Building and are assumed to fail in this scenario.~~
- ~~Airplane crash into the Hardened Structures (Reactor Building, Fuel Building, and Building 2 and 3) - The hardened buildings, along with the Nuclear Auxiliary Building were combined into one group. It is assumed that no systems within the hardened buildings would be disabled directly from the crash. Also, because no safety-related systems are located in the Nuclear Auxiliary Building, the results would be essentially the same (reactor trip with no direct failures of safety-related equipment).~~

~~The bounding scenario was an airplane crash into Safeguards Building 1 or Safeguards Building 4. It results in a core damage frequency of 1.1E-07. This core damage frequency does not allow screening aircraft crash events based on the NUREG-0800 acceptance criteria, i.e., a frequency of 1.0E-7 to exceed the guidelines of 10 CFR 100 (CFR, 2007b). Therefore, an assessment of the containment release frequency associated with this event was performed. To that effect, the bounding airplane crash scenario was assessed using the U.S. EPR FSAR Level 2 PRA model. As previously identified in Section 19.1.4.2, the U.S. EPR FSAR Level 2 PRA model is applicable to CCNPP Unit 3 without modification. All systems and equipment affected by the crash, including the Severe Accident Heat Removal System, are assumed to be unavailable for the Level 2 analysis. The results of this conservative assessment show that the frequency of any release (large or small) is approximately 3E-08/yr. Therefore, the frequency of a release resulting in a dose exceeding the guidelines of 10 CFR 100 (CFR, 2007b) is judged to be less than or equal to 3E-08/yr.~~

~~NUREG-0800, Section 3.5.1.6's acceptance criteria for airplane crash hazard requires that the frequency of an event causing radiological consequences greater than the 10 CFR 100 exposure guidelines should be less than 1E-07. Therefore, the risk posed by airplane crash hazard to CCNPP Unit 3 meets the SRP acceptance criteria.~~

Target sets were screened when it was judged that one of the following conditions applies:

- A crash into the target set would not result in damages to SSCs modeled in the probabilistic risk assessment (PRA) (e.g., shielded buildings).

- The consequences of a crash into the target set would be enveloped by an initiating event already modeled in the PRA, and the frequency of this initiating event is several orders of magnitude higher than the postulated airplane crash frequency.

Target sets that were retained for the analysis are: (a) Safeguard Building 1 (or 4) and (b) Turbine and Switchgear Building. Aircraft crash frequencies into these two target sets are estimated using the methodology of Department of Energy (DOE) Standard 3014-2006 (DOE, 2006). Bounding aircraft crash scenarios are developed for the two target sets defined. The most limiting failures of all the components in the affected building are assumed. This is a demonstrably conservative approach since:

- Bounding consequence assumptions were applied, including that PRA models used for the defined scenarios conservatively estimate the crash impacts based on a limiting direction of movement and then conservatively apply that scenario to all impacts, and the emergency feedwater (EFW) suction cross-connect valves are conservatively assumed to be open.

- Aircraft crash frequencies used are inherently conservative, including conservative damage assessments for damage incurred from a general aviation aircraft impact onto safeguards building 1 or 4.

The assessment is judged to provide a conservative and bounding approach for screening purposes to satisfy Section 3.5.1.6 of NUREG-0800. The core damage frequency was estimated as 1.3E-7 per year for airplane impacts into Safeguards Buildings 1 or 4 and 8E-09 per year for airplane strikes into the Turbine and/or Switchgear Buildings. Since core damage frequency from airplane impacts into Safeguards Building 1 or 4 is greater than 1E-7 per year, an assessment of the containment release frequency associated with this event is performed. To that effect, the bounding airplane crash scenario was assessed using the U.S. EPR FSAR Level 2 PRA model. As identified in Section 19.1.4.2, the U.S. EPR FSAR Level 2 PRA model is applicable to CCNPP Unit 3, without departure or supplement. Systems and equipment affected by the crash, including the Severe Accident Heat Removal System, are assumed to be unavailable for the Level 2 analysis. Based on this analysis, the frequency of a release from airplane strikes onto Safeguards Buildings 1 or 4, resulting in a dose exceeding the guidelines of 10 CFR 100, is estimated to be less than 3E-08/yr.

Conclusion for Detailed Airplane Crash Hazard Assessment

The NUREG-0800 screening criteria are met if the frequency of a release exceeding 10 CFR 100 limits is less than 1E-07 per year. The frequency of an aircraft crash initiating event that results in a release in excess of 10 CFR 100 guidelines was estimated for the two bounding scenarios as:

- A core damage frequency of 1.3E-07 per year and a radiological release frequency of less than 3E-08 per year for scenarios involving airplane impact onto Safeguards Building 1 and 4.

- A core damage frequency of less than 8E-09 per year for scenarios involving airplane impact into the turbine building and\or switchgear buildings.

Therefore, the total frequency of a release in excess of 10 CFR 100 guidelines is determined to be less than 1E-07 per year and it is therefore concluded that the CCNPP Unit 3 design meets the SRP acceptance criteria.

FSAR Section 19.1.9 will be supplemented as follows in a future COLA revision:

19.1.9 References

CFR, 2007b. Reactor Site Criteria, Title 10, Code of Federal Regulations, Part 100, U.S. Nuclear Regulatory Commission, 2007.

DOE, 2006. DOE-STD-3014-2006 DOE Standard, Accident Analysis for Aircraft Crash into Hazardous Facilities, October 1996, Reaffirmed May 2006.