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UniStar
NUCLEAR ENERGY

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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
Submittal of Response to Requests for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3 –
Control Room Habitability System

Reference: John Rycyna (NRC) to G. Wrobel (UniStar), "RAI No.12 RSAC 1016.doc," email and attachment dated September 10, 2008

The purpose of this letter is to respond to requests for additional information (RAIs) identified in the NRC e-mail correspondence to UniStar Nuclear, dated September 10, 2008 (Reference). These RAIs address the Control Room Habitability System as addressed in Section 6.4.4 of the Final Safety Analysis Report (FSAR) as submitted in the Calvert Cliffs Nuclear Power Plant (CCNPP), Unit 3 Combined License Application (COLA).

The enclosure provide responses to the RAIs.

If there are any questions regarding this transmittal, please contact me or Mr. George Wrobel at (585) 771-3535.

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NRO

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

Executed on October 10, 2008

Greg Gibson

Enclosure: Response to RAI Set Number 12 RSAC 1016

cc: U.S. NRC Region I
U.S. NRC Resident Inspector, Calvert Cliffs Nuclear Power Plant, Units 1 and 2
NRC Environmental Project Manager, U.S. EPR Combined License Application
NRC Project Manager, U.S. EPR Combined License Application
NRC Project Manager, U.S. EPR Design Certification Application (w/o enclosure)

Enclosure

Response to RAI Set Number 12 RSAC 1016

RAI Item Number 06.04-1 **FSAR Section 6.4.4**

FSAR subsection 6.4.4 addresses a COL item on confirming that radiation exposure in the main control room resulting from a DBA at a nearby unit on a multi-unit site is bounded by the analyses in the EPR FSAR or that the limits of GDC 19 are met. The discussion states that the main control room dose to CCNPP Units 1 and 2 from a CCNPP Unit 3 LOCA is less than 2.0 rem TEDE. Provide a discussion of the dose analysis for the CCNPP Units 1 and 2 control room from a CCNPP Unit 3 LOCA, including dose analysis and atmospheric dispersion factor calculation methods, inputs and assumptions.

Response:

The dose analysis for the CCNPP, Units 1/2 main control room (MCR) from a CCNPP, Unit 3 LOCA followed the same models, design input and assumptions used in the analysis for the CCNPP, Unit 3 MCR resulting dose from a CCNPP, Unit 3 LOCA, with the only differences being in the atmospheric dispersion factors and the MCR characteristics.

The atmospheric dispersion factors from the post-LOCA CCNPP, Unit 3 release points to the CCNPP, Units 1/2 MCR were based on 7 years' worth of hourly meteorological data (2000-2006) collected on site and calculated in accordance with Regulatory Guide (RG) 1.145. The direction from the CCNPP, Unit 3 stack to the CCNPP, Units 1/2 buildings is NW; the critical sector within three 22.5-degree sectors is NNW, and was, therefore, chosen as the sector for the χ/Qs used in the analysis. The closest distance from the CCNPP, Unit 3 stack to the CCNPP, Units 1/2 buildings is 2206 ft (0.4 mile, 673 m), and was assumed to represent the distance to the CCNPP, Units 1/2 MCR intakes. Time-shifting of the χ/Qs to meet the requirements of RG 1.194 was also implemented. The applicable atmospheric dispersion factors are as follows:

Time Period	Atmospheric Dispersion Factor (sec/m^3)
0 to 1.4	1.917E-04
1.4 to 3.4 hr	3.291E-04
3.4 to 8 hr	1.917E-04
8 to 24 hr	1.183E-04
1 to 4 days	5.645E-05
4 to 30 days	1.951E-05

The CCNPP, Units 1/2 MCR characteristics, as modeled in the radiological evaluation, are as follows:

Description	Value
MCR free air volume	289,194 ft^3
Control room unfiltered intake flow	3,500 cfm
Control room filtered recirculation flow	10,000 cfm
Recirculation filter efficiency for elemental and organic iodine	90%
Recirculation filter efficiency for particulates	99%
Actuation delay time for Emergency Ventilation System (filtered recirculation)	20 minutes

FSAR Impact:

No FSAR change is required.

RAI Item Number 06.04-2 FSAR Section 6.4.4

Discuss how the main control room dose at CCNPP Units 1 and 2 from a LOCA at CCNPP Unit 3 was determined to be bounding for all DBAs at CCNPP Unit 3.

Response:

Based on the doses at offsite receptors presented in Table 15.0-12 of the U.S. EPR FSAR, the bounding DBA leading to the worst-case radioactivity release to the environment is the LOCA, with the LOCA doses being at least twice as high as those for any other DBA. Since the location of the CCNPP, Units 1/2 main control room (MCR) is equivalent to an offsite receptor (at a distance of 0.4 miles from CCNPP, Unit 3 compared to the 0.5-mile Exclusion Area Boundary), it is evident that the LOCA would also be the bounding DBA for the CCNPP, Units 1/2 MCR resulting dose.

As a point of clarification, it should be noted that the bounding DBA for the CCNPP, Unit 3 MCR habitability is the Main Steam Line Break (MSLB), yielding a Total Effective Dose Equivalent (TEDE) dose of 4.5 rem (about 13% higher than the 4 rem for the LOCA). It could be inferred that the MSLB is also the bounding DBA for the CCNPP, Units 1/2 MCR dose, however, this is not the case. The MSLB is the bounding DBA for the CCNPP, Unit 3 MCR due simply to the closer proximity of the MSLB critical release point (Canopy Pt 1) to the MCR intakes, versus the base of the main stack for the LOCA. From the U.S. EPR FSAR Table 2.1-1, it is seen that the atmospheric dispersion factors for releases via Canopy Pt 1 are at least 3 times higher than the corresponding dispersion factors for releases at the base of the main stack, thus making the MSLB the bounding DBA for the CCNPP, Unit 3 MCR. However, the MSLB is not bounding for offsite receptors since the distance variation from the various release points is negligible.

FSAR Impact:

No FSAR change is required.

RAI Item Number 06.04-3 FSRA Section 6.4.4

Describe in more detail the factors and assumptions used to determine that the calculated dose in the CCNPP Unit 3 main control room from DBAs at either CCNPP Unit 1 or 2 would be less than the dose calculated in the control room for DBAs at CCNPP Units 1 and 2, and therefore meets GDC 19. Describe how the dose in the CCNPP Unit 3 main control room from DBAs at CCNPP Unit 1 or 2 compares to the dose calculated for the dose in the CCNPP Unit 3 main control room from a DBA at CCNPP Unit 3.

Response:

Part 1: CCNPP, Unit 3 MCR Dose from CCNPP, Units 1/2 LOCA

Analyses were carried out to compare the main control room (MCR) characteristics between CCNPP, Unit 3 and CCNPP, Units 1/2, and it was determined, as discussed below, that the CCNPP, Unit 3 MCR design provides more robust protection for radiation exposure. Thus, since the CCNPP, Unit 1/2 MCR dose is within the acceptance criteria for a CCNPP, Unit 1/2 LOCA, the same accident would result in a lower, and therefore, acceptable dose to the CCNPP, Unit 3 MCR.

The table below provides a comparison of the control room characteristics between CCNPP, Unit 3 and CCNPP Units 1/2. This comparison shows significant differences between the control room designs. Note in particular that the Unit 3 MCR is equipped with safety-related radiation monitors in the HVAC intake ducts designed to automatically isolate the MCR and actuate the emergency ventilation system.

Comparison of CCNPP, Unit 3 to CCNPP, Units 1/2 Control Room Characteristics

Parameter	CCNPP, Unit 3 Control Room	CCNPP, Units 1 and 2 Control Room
Control room free air volume	200,000 ft^3	289,194 ft^3
Charcoal filtration system actuation	automatic	manual
Charcoal filtration system actuation time	1 min	20 min
Pre-isolation unfiltered intake flow	1500 cfm	3500 cfm
Post-isolation intake flow	1000 cfm filtered 50 cfm inleakage	N/A – no intake filtration
Intake filtration efficiency	99% (all halogens and particulates)	N/A – no intake filtration
Recirc. filtration efficiency	99% (all halogens and particulates)	90% for elemental and organic iodine 99% for particulates
Post isolation filtered recirc. flow	3000 cfm	10,000 cfm

To assess the difference in control room characteristics on a quantitative basis, an analysis was performed using the model described in Response to RAI Item Number 06.04-01 above for the CCNPP, Units 1/2 MCR resulting dose from a CCNPP, Unit 3 LOCA, but with the CCNPP, Unit 3 control room characteristics assigned to the CCNPP, Units 1/2 control room. The resulting Total Effective Dose Equivalent (TEDE) dose from this analysis was determined to be less than 0.5 rem, compared to a dose of about 2 rem using the CCNPP, Unit 1/2 control room characteristics. Therefore, since the CCNPP, Unit 1/2 MCR dose is within the acceptance criteria for a CCNPP, Unit 1/2 LOCA, it is concluded that the CCNPP, Unit 3 control room dose from a CCNPP, Unit 1/2 LOCA will also be within the acceptance criteria. Due to the automatic-isolation feature of the CCNPP, Unit 3 MCR described above, the same conclusion applies to all DBAs.

Part 2: Comparison of CCNPP, Unit 3 MCR doses – CCNPP, Units 1/2 DBAs vs. CCNPP, Unit 3 DBAs

No specific calculations were carried out to address the CCNPP, Unit 3 MCR resulting dose from a CCNPP, Units 1/2 LOCA. However, from ADAMS Accession No. ML072130521, the CCNPP, Units 1/2 MCR bounding dose from a CCNPP, Units 1/2 DBA (an MSLB) is 4.76 rem TEDE. Therefore, based on the discussion under Part 1 above, the CCNPP Unit 3 MCR resulting dose from the bounding CCNPP, Units 1/2 DBA would be significantly less than 4.76 rem TEDE; this would be the result of both the more robust design of the CCNPP, Unit 3 MCR for radiation protection, and of the distance-reduction in the atmospheric dispersion factors.

From Table 15.0-12 of the U.S. EPR FSAR, the CCNPP, Unit 3 MCR resulting dose from the bounding DBA (an MSLB) is 4.5 rem TEDE.

FSAR Impact:

No FSAR change is required.