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October 8, 2013

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555
ATTN: David B. Matthews, Director
Division of New Reactor Licensing

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 3 AND 4
DOCKET NUMBERS 52-034 AND 52-035
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION 277 (7091)
(SECTION 19)

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein the response to Request for Additional Information (RAI) 277 (7091) for the Comanche Peak Nuclear Power Plant Units 3 and 4 Combined License Application. The RAI response addresses extreme wind core damage frequency and consistency with ASME/ANS RA-Sa-2009.

Should you have any questions regarding the response, please contact Don Woodlan (254-897-6887, Donald.Woodlan@luminant.com) or me.

There are no commitments in this letter.

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

Executed on October 8, 2013.

Sincerely,

Luminant Generation Company LLC

Donald R. Woodlan for

Rafael Flores

Attachment: Response to Request for Additional Information 277 (7091)

D090
NRO

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RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 277 (7091)

SRP SECTION: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation

DATE OF RAI ISSUE: 8/1/2013

QUESTION NO.: 19-29

The staff has reviewed the applicant's response to RAI 6877, Question 19-21. The applicant states that, "the occurrence of a wind that exceeds 96 mph (the hundred year site specific extreme wind speed) does not necessarily result in an initiating event for extreme wind since it does not necessarily disable offsite power supplies or impact structures, systems, and components (SSCs) in a manner that will result in core damage." Also, the applicant stated that the only equipment credited for the at power PRA that are not located in Category I or II structures are the non-safety related SSCs that support the alternate component cooling water (CCW) functions of the fire suppression system and the non-essential chilled water system. The Alternate AC system is located within Category I or II structures. The Category I and II structures for the US-APWR standard plant are designed for a base wind speed of 155 mph.

1. The staff reviewed the applicant's full power severe wind core damage frequency estimate based on the Comanche Peak Units 1 and 2 PRA. The severe weather loss of offsite power (LOOP) frequency was reported as 6.11E-3 per year. The staff then reviewed Comanche Peak Units 3 and 4 FSAR, Section 3.3.1.1 which states that, "Site-specific structures, systems, and components (SSCs) are designed using the site-specific basic wind speed of 96 mph or higher." Therefore, at wind speeds beyond 96 mph, the applicant has not provided sufficient engineering-based justification to assume that offsite power, the Alternate CCW system, and the non-essential chilled water system will remain functional. Therefore, the staff requests the applicant to perform a full power sensitivity study using the one in 125 year wind speed assuming: (1) a LOOP that would not be recoverable within 24 hours, (2) failure of the Alternate CCW function, and (3) failure of the non-essential chilled water system, or provide a wind-induced fragility assessment for the offsite power system, the Alternate CCW system and the non-essential chilled Water system.

2. The staff reviewed the applicant's severe wind shutdown core damage frequency (CDF) estimate. The applicant used a shutdown severe weather LOOP frequency of 8.8E-3/year based on NUREG-6980 which is not site specific. The estimate also assumed that a LOOP event is coincident with the loss of the non-safety related SSCs that support the alternate CCW functions of the fire suppression system and makeup function of the Refueling Water Storage Auxiliary Tank. The CDF due to extreme winds during shutdown was estimated to be 2.8E-8 per year which is more than 10% of the USAPWR Shutdown internal LPSD CDF of 1.8E-7.

10 CFR 52.79(d)(1) states that if the combined license application references a standard design certification, then "the plant specific PRA information must use the PRA information for the design certification and must be updated to account for site-specific design information and any design changes or departures". Based on Interim Staff Guidance (DC/COL-ISG-3), "the applicant should also address (1) differences between assumptions made in the certified design PRA and site-specific or plant-specific information, (2) the impact of these differences on the plant-specific PRA results and

insights, and (3) how the plant-specific PRA information is used to conclude the requirements related to the site, construction, testing, inspection, and operation of the plant are met prior to initial fuel load" given that the wind-induced shutdown CDF is greater than 10% of the US APWR shutdown internal LPSD of 1.8E-7. Therefore, the FSAR should be updated to include this information.

ANSWER:

1. Mitsubishi Heavy Industries (MHI) has performed the requested at-power, high winds sensitivity study for Luminant. The study is similar to that presented in the response to RAI 264 (6877) Question 19-21 (ML12355A029) in which the same equipment is assumed to be unavailable; thus, no engineering justification is provided to demonstrate that the referenced equipment could remain functional. However, the study differs from that presented in the response to Question 19-21 due to the assumed initiating event frequency. The US-APWR PRA generally accounts for the impact of high winds by including the hazard contribution in the LOOP initiating frequency. As an external event, the high wind initiating event could affect the function of equipment not protected from the initiator. Using conservative assumptions, this sensitivity study reaffirms that the high wind hazard is not significant in the US-APWR risk profile. (Note that hurricane winds/missiles and tornado winds/missiles are separately addressed in the FSAR.)

   The following points provide perspective on the significance of this sensitivity study:

   - The PRA (FSAR Table 19.1-205) demonstrated that the extreme winds event (i.e., winds exceeding the 125 mph 3-second gust, which is selected to ensure that the LOOP frequency from NUREG/CR-6890 and data correspond) screens from the PRA model based on a conservative bounding analysis. As stated in the response to Question 19-21, the following failures were assumed: (1) the LOOP is not recoverable within 24 hours, (2) the Alternate CCW function fails, and (3) the non-essential chilled water system fails. These failures are conservative assumptions for wind speeds that only marginally exceed the design wind speed of a 96-mph, 3-second gust. That is, the sensitivity study assumes that fragility is based only on the wind speed, failure would result in the total loss of function, and there is no credit for any factor of safety that is inherent in all designs by code requirement.

   - The 125-year return interval LOOP frequency (0.008 per year) is very conservative with respect to data provided in NUREG/CR-6890; as indicated in the response to Question 19-21, this frequency exceeds the LOOP frequency from all external weather-related events. The 0.008 per year value for the wind LOOP initiating event frequency is more than twice the site-specific best estimate value (3.83E-3 per year) for all weather-related events for the existing units at the Comanche Peak site, per Table D1 of NUREG/CR-6890. Further, the contribution of high winds (up to 125 mph) to the LOOP frequency is already accounted for in the base PRA model, so the high wind contribution would be doubled counted if the values from this sensitivity study were summed with the CDF high wind contribution in the base model due to LOOP events.

   Using these conservative parameters, a bounding value for an at-power CDF due to high wind would be 3.7E-7 per year. Combining this at-power contribution with the conservative LPSD sensitivity values yields a bounding high wind CDF of 4.0E-7 per year. This value results from conservatively rounding the sum of 3.7E-7 for the at-power contribution to CDF and 2.8E-8 for the LPSD contribution to CDF from the response to RAI 264-6877 for LPSD[1]. This sensitivity value conservatively bounds the high wind contribution to CDF; however, even this bounding value is still only approximately 10% of the total CDF of 3.1E-6 per year. Thus, the high wind initiating event does not warrant special consideration.

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[1] The value 2.8E-8 per year was used for conservatism. If the same assumptions were used to perform a sensitivity study for LPSD, the recalculated value would be 2.5E-8 per year.

2. The initiating event frequency of 8.8E-3 per year that was provided in the response to Question 19-21 was based on U.S. generic data because that value was slightly more conservative than the site-specific value. The PRA-based analysis referenced in Item 2 of the response provided a bounding estimate of CDF for extreme winds that was based on frequency data for high winds (i.e., winds that cause a LOOP, but do not necessarily result in failure of the specified non-safety related SSCs). Comparing the total CDF due to extreme winds, 9.8E-8 per year (= 7.0E-8 for at-power + 2.8E-8 for LPSD for wind-related CDF stated in the response) with the total CDF of 3.1E-6 per year, illustrates that the extreme wind CDF is less than 3% of total CDF. Thus, the portion of CDF due to the extreme wind hazard is less than 10% of total CDF and, consistent with the guidance of Item 2.e of DC/COL-ISG-3, does not warrant further consideration.

Impact on R-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 277 (7091)

SRP SECTION: 19 - Probabilistic Risk Assessment and Severe Accident Evaluation

DATE OF RAI ISSUE: 8/1/2013

QUESTION NO.: 19-30

The staff has reviewed the applicant's response to RAI 6877, Question 19-22. Overall, the staff agrees with the applicant's response. However, the staff identified the following inconsistencies in the proposed FSAR mark-up.

1. To be consistent with ASME/ANS RA-Sa-2009, Table 6-2-3(b) Supporting Requirement for HLR-EXT-B, Criterion 1 should be modified to state that: "The event is of **equal or lower damage potential than a design basis event"**

2. Please eliminate the statement on page 19.1-10, "Based on the discussions in this section, the contribution of such events to the total CDF is considered insignificant as described in Table 19.1-205" or please provide the site-specific probabilistic external flood hazard analysis that supports this statement. Please note that screening of external floods based on Criterion 1 is sufficient.

ANSWER:

1. FSAR Subsection 19.1.5 has been revised to match the wording of the ASME PRA standard as shown in the attached marked-up pages. FSAR Table 19.1-205, Note 1 already matches the wording in the ASME PRA standard, which refers to an event of equal or "lesser" damage potential.

2. FSAR Subsection 19.1.5 has been revised as shown in the attached marked-up pages.

Impact on R-COLA

See attached marked-up FSAR Revision 3 pages 19.1-7 and 19.1-11.

Impact on DCD

None.

The screenings for other external events are performed using the following steps taking into consideration the features of advanced light water reactors. At first, qualitative screenings are performed using the analysis reported in Chapter 2 in accordance with the guidelines of ASME/ANS RA-Sa-2009. Section 6-2 of the standard defined the initial preliminary screening criteria as supporting technical requirement EXT-B1. The five qualitative screening criteria are:

1. ~~Lower damage potential than a design basis event~~Equal or lesser damage potential than the events for which the plant has been designed. RCOL2_19-30
2. Lower event frequency of occurrence than another event
3. Cannot occur close enough to the plant to have an affect
4. Included in the definition of another event
5. Sufficient time to eliminate the source of threat or to provide an adequate response

~~Following the qualitative screenings~~If the external event cannot be screened on the qualitative screening criteria, quantitative screenings are performed. The supporting technical requirement EXT-C1 of ASME/ANS RA-Sa-2009, Criterion C, for conservative analysis allows for the use of a bounding or demonstrably conservative analysis with a mean frequency < 10^{-6}/year. RCOL2_19-22

To support the goal that new reactor designs would have a substantially lower risk profile, Comanche Peak Units 3 and 4 use a value of <10^{-7}/year for the CDF determined by bounding or conservative analysis to quantitatively screen external events if the external event cannot be screened qualitatively.~~The supporting technical requirement EXT-B2 of ASME/ANS RA-Sa-2009 states that the criteria provided in the 1975 Standard Review Plan can be used as an acceptable basis for the screening criteria of external events. The criteria are:~~

i. ~~the contribution to core damage frequency (CDF) is less than 10^{-6}/year, or~~

ii. ~~the design basis event at annual frequencies of occurrence is between 10^{-7} and 10^{-6}.~~

~~For Comanche Peak Units 3 and 4, a value of 10^{-7} for the annual frequency of occurrence is used as a more conservative quantitative screening criterion. If an event frequency is greater than 10^{-7}/year, perform bounding analysis or PRA to confirm that the risk is sufficient lower for advanced light water reactors such as less than 1% of total CDF. The remaining external events which do not meet the above screening criteria are assessed using a bounding analysis.~~

accident (LOCA) occurs, which results in the core damage. The CDF for this scenario is 2.9E-08/RY.

- Enhanced F-scale intensity of F3, F4 and F5 tornado strike-induced LOOP and T/B damage combined with failure of all four emergency gas turbine generators.

The plant switchyard and the T/B are assumed to be damaged by the tornado strike with wind speed between 136 mph and 230 mph. A LOOP occurs and the emergency gas turbine generators fail to operate due to common cause failure. The alternative power source is unavailable since the T/B is damaged and total loss of ac power occurs. Offsite power cannot be recovered due to damage of the T/B. RCP seal LOCA occurs and eventually the core is damaged. The CDF for this scenario is 2.3E-08/RY.

- Failure of all safety systems by a beyond design basis tornado. This event leads directly to core damage. This CDF for this scenario is 2.5E-08/RY.

The total CDF caused by a tornado strike during at-power operation is less than 8E-08/RY. Tornado induced CDF is one order of magnitude lower than the total CDF for internal events and internal flood and internal fire events. A bounding screening assessment for extreme winds has been performed. The results show that the ~~extreme wind~~ CDF due to extreme winds is less than 1.0E-7 per year~~10% of the internal events CDF at power operation~~. RCOL2_19-21 RCOL2_19-19

The CDF from tornadoes during LPSD does not contribute more than ten percent of the total shutdown CDF and total shutdown LRF compared to the US-APWR DCD PRA. Tornado events during LPSD do~~es~~ not have significant contribution to risk. A bounding screening assessment for extreme winds has been performed. The results show that the ~~extreme wind~~ CDF due to extreme winds ~~and LRF values are~~ is less than ~~10% of the LPSD CDF~~1.0E-7 per year. RCOL2_19-19 RCOL2_19-21

External Flooding

Subsection 2.4.2 systematically considers the various factors that can contribute to the incident of external flooding. ~~Based on the discussions in this section, the contribution of such events to the total CDF is considered insignificant as described in Table 19.1-205. Bounding analysis show that the CDF from probable maximum flood is below the quantitative screening criterion of 10^{-7}/year.~~The deterministic PMP flood described in Section 2.4 of the CPNPP FSAR, screens under Criterion #1 of EXT-B1 of ASME/ANS RA-Sa-2009 since the event is of equal or lesser damage potential than the events for which the plant has been designed. RCOL2_19-30 RCOL2_19-22