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December 18, 2012

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 264 (6877), 265 (6775), 266 (6898), 267 (6907), AND 268 (6913) FOR SECTIONS 9.4.5, 9.5.4, AND 19

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein the response to Requests for Additional Information (RAIs) 264 (6877), 265 (6775), 266 (6898), 267 (6907), and 268 (6913) for the Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4. The RAIs address fuel oil storage; core damage frequency; heating, ventilation, and air conditioning; averted cost-risks; and use of the probabilistic risk assessment.

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 December 18, 2012.

Sincerely,

Luminant Generation Company LLC

RD [signature] for
Rafael Flores

Attachments:
1. Response to Request for Additional Information 264 (6877)
2. Response to Request for Additional Information 265 (6775)
3. Response to Request for Additional Information 266 (6898)
4. Response to Request for Additional Information 267 (6907)
5. Response to Request for Additional Information 268 (6913)

D090
NRD

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Attachment 1

Response to Request for Additional Information 264 (6877)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 264 (6877)

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

DATE OF RAI ISSUE: 10/18/2012

QUESTION NO.: 19-21

The staff has reviewed the applicant's response to RAI Number 6320 (Question Number 19-19). In this response, to evaluate extreme winds (other than tornado) during full power operation, the applicant used the average US frequency of a loss-of offsite power (LOOP) due to weather-related causes for critical operation as 4.8E-3 per year as referenced in NUREG/CR-6890.

As stated in 10CFR52.79(d)(1), for applicants referencing a DC, "In addition, 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". Therefore, the staff believes that the extreme wind frequency should be site specific and should not be based on average US data. The staff also noted that based on average US data, the core damage frequency (CDF) for extreme winds constitutes approximately 8% of the CDF.

The staff also reviewed the applicant's response to shutdown operations. It appears that the non-safety related alternating current (AC) power system was credited in the extreme winds assessment.

Based on the applicant's response to RAI 19-19, the staff is requesting the applicant to:

(1) Document in Chapter 19 of the FSAR that extreme winds as discussed in Chapter 2 of the COLA FSAR (Table 2.0-1R page 2.0-2), which references a site specific extreme wind speed (other than tornado) of 96mph in 1/100 years, do not contribute more than 10 percent of the full power core damage frequency compared to the US-APWR DC PRA. Please also consider that the switchyard could be damaged resulting in a LOOP event that cannot be recovered within 24 hours. Please provide the updated PRA results (e.g. dominant cutsets) and any risk insights due to the site impacts from the site specific extreme wind speed on non-safety related SSCs.

(2) Document in Chapter 19 of the FSAR that extreme winds as discussed in Chapter 2 of the COLA FSAR (Table 2.0-1R page 2.0-2), which references a site specific extreme wind speed (other than tornado) of 96mph in 1/100 years, do not contribute more than 10 percent of the shutdown core damage frequency compared to the US-APWR DC PRA. Please also consider that the switchyard could be damaged resulting in a LOOP event that cannot be recovered within 24 hours. Please verify whether credit was taken for the non-safety related alternate AC power system, and if so, justify why credit was taken. Please provide the updated PRA results (e.g. dominant cutsets) and any risk insights due to the site impacts from the site specific extreme wind speed on non-safety related structure, system and components (SSCs).

ANSWER:

Category I and II structures for the US-APWR standard plant are designed for a base wind speed of 155 mph (DCD Subsection 3.3.1.1 and FSAR Table 2.0-1R sheet 1) based on hurricane wind speeds. Safety-related equipment, as well as the alternate AC generators and all of their supporting equipment, are located within category I and II structures. Besides offsite power, the only other equipment credited for the at-power PRA that is not located in category I and II structures is the non-safety related structures, systems, and components (SSCs) that support the alternate component cooling water (CCW) functions of the Fire Suppression System and non-Essential Chilled Water System. The design wind speed of the category I and II structures is significantly higher than the site-specific extreme wind speed for the exceedance frequency referenced in FSAR Chapter 2. While the site-specific 96 mph extreme wind speed exceedance frequency referenced in FSAR Chapter 2 is 1E-2/yr, this value is not the frequency of a loss of offsite power (LOOP) initiating event. The occurrence of a wind that exceeds 96 mph does not necessarily result in an initiating event for extreme wind since it does not necessarily disable offsite power supplies or impact SSCs in a manner that will result in core damage.

There are multiple estimates for the frequency for a LOOP due to weather events. One source is the Comanche Peak Units 1 and 2 PRA (R&R-PN-008A, Internal Initiating Events Data Analysis Rev. 4A dated June 2011) and another is NUREG/CR-6890. NUREG/CR-6890 provides generic estimates for the United States and site-specific frequencies for the Comanche Peak site. Both sources analyzed LOOP events and calculated the frequency of such events due to various causes, including weather. The estimated LOOP frequencies from these sources are listed below.

Source	Type	Frequency
Comanche Peak Unit 1 & 2 PRA	Site specific (all weather at-power)	6.113E-3 / rcry
NUREG/CR-6890 (Table ES-1)	US Generic (all weather at-power)	4.83E-3 / rcry
NUREG/CR-6890 (Table D-1)	Site specific (all weather at-power)	3.83E-3 / rcry
NUREG/CR-6890 (Table ES-1)	US Generic (all weather shutdown)	3.52E-2 / rsy
NUREG/CR-6890 (Table D-2)	Site specific (all weather shutdown)	3.39E-2 / rsy

rcry: reactor critical year
rsy: reactor shutdown year

The contribution to CDF for at power and LPSD conditions is evaluated as summarized in the following discussion:

(1) Power Operation

A study was performed to estimate the at-power CDF due to extreme winds for Comanche Peak Units 3 and 4. The study used the most limiting available weather-related LOOP frequency estimate (6.113E-3 / rcry) and the assumption that 25% of weather-related LOOPs are due to extreme winds. This assumption is reasonably conservative since Figure 7-5 of NUREG/CR-6890 Vol. 1 shows that 4 of the 16 at-power weather LOOP events were due to high winds and there were no extreme wind events (winds greater than 125 mph) in the data. The use of a 0.01 per year LOOP frequency for winds is more than two times the mean initiating event frequency for all weather related events. The use of such an overly conservative initiating frequency would adversely impact the quality of PRA results due to consequential masking of risk insights from other events and double counting the initiating event frequency since it is already included in the data used for determining the internal event weather LOOP frequency.

This frequency was applied to the PRA model while maintaining two conservative PRA assumptions: (1) no recovery of offsite power and (2) no credit for systems that are not protected from tornadoes. The first assumption is conservative since all 4 at-power high wind events listed in NUREG/CR-6890 (Table A-4) were recovered within the 24-hour mission time of the PRA model. The second assumption is conservative because the failure of other plant equipment from extreme winds is not a certainty.

A frequency of 1.5E-3 / rcry (= 0.25 * 6.113E-3) was used for the extreme winds initiating event. This frequency was used for a postulated LOOP which would not be recovered within the 24-hour mission time of the PRA. The study assumed that this 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 non-Essential Chilled Water System. The alternate AC system was credited since the alternate AC generators and supporting equipment are located within category I or II structures. The CDF due to extreme winds at power (7.0E-8 per year) is bounded by a CDF of 10^{-7} per year. Since the CDF due to extreme winds is screened by a conservative analysis bounded by a CDF of 10^{-7} per year, no additional information (e.g., cutsets) is required. No new insights were gained from this analysis. The importance of onsite AC power sources for LOOP events is known from the LOOP and tornado analyses, and is one of the reasons why the alternate AC sources and their support systems are protected against extreme wind events.

(2) Low Power and Shutdown

A study was performed to estimate the shutdown CDF due to extreme winds for Comanche Peak Units 3 and 4 using the same approach as described for "at-power." The study used the most limiting shutdown LOOP frequency estimate of 3.52E-2 / rsy from NUREG/CR-6890 Table ES-1 for US generic and the assumption that 25% of weather related LOOPs were attributed to extreme winds. The 25% reduction in LOOP frequency is reasonable since Figure 7-5 of NUREG/CR-6890 Vol. 1 shows that only 4 of the 16 shutdown weather LOOP events were due to high winds. As done for the at-power evaluation, two conservative assumptions were retained: (1) no recovery of offsite power and (2) no credit for systems that are not protected from tornadoes. Also, all shutdown LOOP events were recovered in 24 hours and there were no extreme wind events.

A frequency of 8.8E-3 / rsy (= 0.25 * 3.52E-2) was used for the extreme winds initiating event. This event postulated a LOOP which would not be recovered within the 24-hour mission time of the PRA. The study assumed that this 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 alternate AC system was credited since the alternate AC generators and supporting equipment are located within category I or II structures. The CDF due to extreme winds during shutdown (2.8E-8 per year) is bounded by a CDF of 10^{-7} per year. Since the CDF due to extreme winds is screened by a conservative analysis bounded by a CDF of 10^{-7} per year, no additional information (e.g., cutsets) is required. No new insights were gained from this analysis. The importance of onsite AC power sources for LOOP events is known from the LOOP and tornado analyses, and is one of the reasons why the alternate AC sources and their support systems are protected against extreme wind events. A breakdown of CDF for each of the Plant Operating States (POS) is provided below.

The equation for determining the Low Power Shutdown Core Damage Frequency (LPSD CDF) contribution from each POS is as follows:

LPSD CDF = $IE_{freq}*(t_{LPSD}/8760) * RF_{freq} * CCDP_{POS(i)}$

Where:

IE_{freq}	= Initiating event frequency (per reactor shutdown year)
t_{LPSD}	= Time in POS (hours per refuel outage)
8760	= Number of hours in a year
RF_{freq}	= Refueling outage frequency (outages per year)
$CCDP_{POS(i)}$	= Conditional Core Damage Probability in that POS

Shutdown POS Contribution to CDF Due to Extreme Winds

$POS_{(i)}$	IE_{freq} (per rsy)	t_{LPSD} (hour)	hours/year (hours/year)	RF_{freq} (outage/year)	$CCDP_{POS(i)}$	LPSD CDF (per year)
3	8.8E-03	24	8760	0.50	7.2E-05	8.7E-10
4-1	8.8E-03	24	8760	0.50	7.2E-05	8.7E-10
4-2	8.8E-03	12	8760	0.50	7.0E-05	4.2E-10
4-3	8.8E-03	36	8760	0.50	2.0E-04	3.7E-09
8-1	8.8E-03	60	8760	0.50	4.0E-04	1.2E-08
8-2	8.8E-03	12	8760	0.50	1.5E-04	9.1E-10
8-3	8.8E-03	24	8760	0.50	2.8E-04	3.4E-09
9	8.8E-03	8	8760	0.50	2.8E-04	1.1E-09
11	8.8E-03	33	8760	0.50	2.8E-04	4.7E-09
					sum =	2.8E-08

FSAR Subsection 19.1.5 and Table 19.1-205 have been changed to provide the results of the extreme wind screening assessment.

Impact on R-COLA

See attached marked-up FSAR Revision 3 pages 19.1-10, 19.1-75, and 19.1-76.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None

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_19-22

Transportation and Nearby Facility Accidents

These events consist of the following:

- Hazards associated with nearby industrial activities, such as manufacturing, processing, or storage facilities
- Hazards associated with nearby military activities, such as military bases, training areas, or aircraft flights
- Hazards associated with nearby transportation routes (aircraft routes, highways, railways, navigable waters, and pipelines)

In Subsection 2.2.3.1, design basis events internal and external to the nuclear power plant are defined as those events that have a probability of occurrence on the order of about 10^{-7}/RY or greater and potential consequences serious enough to affect the safety of the plant to the extent that the guidelines in 10 CFR Part 100 could be exceeded. The following categories are considered for the determination of design basis events: explosions, flammable vapor clouds with a delayed ignition, toxic chemicals, fires, collisions with the intake structure, and liquid spills.

CP COL 19.3(4)

Table 19.1-205 (Sheet 25 of 36)
Comanche Peak, Units 3 and 4 External Events Screening and Site Applicability

Category	Event	FSAR Section Disposition	Description	Screening and Applicability		
				Criteria(1)	Freq. (/yr)	Site Appl.
	Extreme Winds	2.3.1.2.11 3.3.1.1	As with all external events, the risk impact of the hazard entails the loss of components based on their fragility with respect to the hazard. Due to the relatively high frequency and wide distribution of wind speeds, a conservative analysis was performed using actual industry failure rate experience with the most fragile component - the off site power grid supplying the plant. Multiple sources for the frequency that a loss of off site power would occur were evaluated. For the analyses, the most conservative available best estimate frequencies for at power and shutdown plant states were used. The analysis then conservatively assumes that off site power is not recovered within the mission time of the PRA analysis, even though industry experience has been recovery of off site power within the mission time of the PRA analysis. The PRA model also conservatively assumed failure of systems not located inside of structures not protected against tornado wind loadings.~~Estimated extreme winds (fastest mile) for the general area based on the Frechet distribution are:~~ ~~Return Period (year) / Wind Speed (mi per hr)~~ ~~2 / 51~~ ~~10 / 61~~ ~~50 / 71~~ ~~100 / 76~~ ~~Fastest mile winds are sustained winds, normalized to 30 ft above ground and include all meteorological phenomena except tornadoes and hurricanes.~~	6~~1, 4Not screened (bounding analysis conducted)~~	None	No

RCOL2_19-19
RCOL2_19-21
RCOL2_19-19
RCOL2_03.3.02-9

CP COL 19.3(4)

Table 19.1-205 (Sheet 26 of 36)
Comanche Peak, Units 3 and 4 External Events Screening and Site Applicability

Category	Event	FSAR Section Disposition	Description	Screening and Applicability		
				Criteria[1]	Freq. (/yr)	Site Appl.
			The design wind has a basic speed of 155 mph, corresponding to a 3-second gust at 33 ft above ground for exposure category C (open terrain). For all seismic category I and II SSCs, the basic wind speed is multiplied by an importance factor of 1.15 correlating to essential facilities in hurricane-prone regions as defined in ASCE/SEI 7-05 Tables 1-1 and 6-1. ~~Site-specific structures, systems, and components (SSCs) are designed using the site-specific basic wind speed of 90 mph, or higher. Therefore, the maximum wind speed by extreme winds is not greater than the F-scale intensity F1 of tornadoes for CPNPP. Also a~~All seismic category I and II SSCs including fire suppression systems are designed for the wind load and are not damaged by the extreme winds. ~~Although o~~Only loss of offsite power is the hazardous potential by extreme winds~~, it is considered as the loss of offsite power (LOOP) event for internal event PRA as weather-related LOOP~~. A bounding assessment determined that the risk from extreme winds is not significant since the CDF due to the hazard is less than 1.0E-7. ~~Thus, extreme winds are insignificant potential hazards bounded by the impact and design criteria for tornadoes (criteria 1 and 4).~~			

RCOL2_19-19

RCOL2_19-19

RCOL2_19-21

RCOL2_19-19

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 264 (6877)

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

DATE OF RAI ISSUE: 10/18/2012

QUESTION NO.: 19-22

Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 2, March 2009 states, "***1.2.5 Screening and Conservative Analysis of Other External Hazards Technical Elements***

Screening methods can often be employed to show that the contribution of many external events to CDF and/or large early release frequency (LERF)/LRF (large release frequency) is insignificant. The fundamental criteria that have been recognized for screening-out events are the following: an event can be screened out either (1) if it meets the criteria in the NRC's 1975 Standard Review Plan (SRP) or a later revision; or (2) if it can be shown using a demonstrably conservative analysis that the mean value of the design-basis hazard used in the plant design is less than 10-5 per year and that the conditional core damage probability is less than 10-1, given the occurrence of the design-basis-hazard event; or (3) if it can be shown using a demonstrably conservative analysis that the CDF is less than 10-6 per year. It is recognized that for those new reactor designs with substantially lower risk profiles (e.g., internal events CDF below 10-6/year), the quantitative screening value should be adjusted according to the relative baseline risk value." Based on RG 1.200, the staff requests the following:

1. Please update the screening discussion described in Section 19.1.5 of the CPNPP FSAR, Revision 3 to be consistent with RG 1.200 Section 1.2.5 (and, if necessary, add RG 1.200 to FSAR Table 1.9-201) or justify your current screening methodology.

2. The overall frequency of a 6-hour, 25-inch PMP event for the U.S is not appropriate for a site-specific analysis. Since section 2.4 of the CPNPP FSAR provides a deterministic evaluation of PMP for the site, has this evaluation in Chapter 2 been applied in Chapter 19, considering Criterion 1 of the screening critieria for other external hazards referenced in RG 1.200 Section 1.2.5?

ANSWER:

1. RG 1.200 Appendix A provides the regulatory position on use of the ASME/ANS RA-Sa-2009 PRA Standard. Section 1.2.5 of RG 1.200 corresponds to Part 6 of the ASME Standard for the technical requirements for screening of external hazards. From Table A-6 of RG 1.200, there were no objections stated to the technical requirements for screening and conservative analysis. These were the criteria used to screen the external events. The use of the ASME/ANS PRA standard for

screening external events is discussed in FSAR Subsection 19.5.1 with results of the screening provided in Table 19.1-205.

The screening process used for the US-APWR was a two-step process of preliminary screening (supporting requirement EXT-B1 of the ASME/ANS RA-Sa-2009 PRA Standard) and failing that, a bounding or demonstrably conservative analysis was performed (supporting requirement EXT-C1 of the ASME/ANS RA-Sa-2009 PRA Standard). Since the screening criteria of the ASME/ANS standard was used, no reference to RG 1.200 is required in FSAR Table 1.9-201.

Table 19.1-205 provides the results of the screening criteria used. The criteria listed in Items 1 through 5 of Note (1) of Table 19.1-205 are the same as the criteria in EXT-B1. Item 6 of Note (1) corresponds to Criterion C of EXT-C1, which was adjusted to be demonstrated less than one order of magnitude less than CDF due to the lower base risk profiles for new plants.

FSAR Subsection 19.1.5 has been revised to be consistent with the ASME/ANS PRA standard and to address the screening criteria regarding flooding. Table 19.1-205 in the FSAR was revised to screen out flooding.

2. Different aspects of the US-APWR design require different analyses and inputs. FSAR Table 19.1-205 provides the results of the screening criteria used. The US-APWR structures were designed for rain loads per ASCE 7-05 which requires assuming that the primary drainage system is blocked. The structures were designed using the 100-year PMP rainfall event for roof loading. Snowfall and ice loading were also evaluated. The 100-year PMP event used is described in FSAR Subsection 2.3.1.2.8 and Table 2.3-217.

   The plant flooding events, river flooding and site flooding, were bounded by the maximum PMP with no return period as described in FSAR Subsection 2.4.2.3 and Table 2.4.2-205. The PMP for flooding is based on theoretical methods to determine the maximum rainfall event that could be supported based on local humidity, temperature, and atmospheric uplift (Hydrometeorological Report No. 51, Reference 2.4-218). The deterministic PMP flood described in FSAR Section 2.4 is screened 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. Also, since the plant is designed in accordance with the Standard Review Plan, plant flooding events would be screened under RG1.200 Section 1.2.5 Item (1).

   FSAR Table 19.1-205 in the FSAR has been updated to reflect that flooding has been screened.

Impact on R-COLA

See attached marked-up FSAR Revision 3 pages 19.1-5, 19.1-6, 19.1-10, 19.1-78, 19.1-79, 19.1-80, 19.1-81, and 19.1-82.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

As is the case of the Level 1 PRA for operations at power (Subsection 19.1.4.1.2), modeling of the site-specific UHS results in small effect on the reliability of the component cooling water system (CCWS) for internal events. There is only small increase of CDF resulting from loss of CCW initiating events, also the contribution of total loss of CCW initiation event to the large release frequency (LRF) for operations at power is considered insignificant. It has been therefore determined that consideration of the site-specific UHS would have no discernible effect on the Level 2 PRA results that are based on the standard US-APWR design. Therefore, the results described below are considered sufficient and applicable.

19.1.5 Safety Insights from the External Events PRA for Operations at Power

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CP COL 19.3(4) Replace the second and third paragraphs in DCD Subsection 19.1.5 with the following.

The last three events listed above receive detailed evaluation in the following subsections. The first four events are subject to the screening criteria consistent with the guidance of ASME/ANS RA-Sa-2009, taking into consideration the features of advanced light water reactors.

The assessment of the other external events is provided below:

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
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, RCOL2_19-22 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.~~

The qualitative and quantitative screenings are performed using the analysis reported in the FSAR Sections 2.2, 2.3 and 2.4, and Section 3.5. The summary of the screenings is described in Table 19.1-205. Only tornado events are not screened because the probability of expected maximum tornado wind speed on the site is close to 10^{-7}/year.

High Winds,~~and~~ Tornad~~oes~~ Winds, and Hurricane Winds RCOL2_03.03.02-9

For high winds,~~and~~ tornado~~es~~ winds and hurricanes, tornadoes are evaluated using level 1 PRA as a bounding analysis from the discussion in Subsection 2.3.1.2.3.

The following sections show the results of the tornado PRA elements (1) tornado hazards, (2) plant vulnerabilities, (3) accident scenario, and (4) quantification.

- Tornado hazard

  A tornado wind speed hazard curve for CPNPP Units 3 and 4 was developed following NUREG/CR-4461 which also forms the basis for NRC Regulatory Guide 1.76. The tornado hazard methodology developed in NUREG/CR-4461 fully meets the requirements of ASME/ANS RA-Sa-2009.

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_19-22

Transportation and Nearby Facility Accidents

These events consist of the following:

- Hazards associated with nearby industrial activities, such as manufacturing, processing, or storage facilities
- Hazards associated with nearby military activities, such as military bases, training areas, or aircraft flights
- Hazards associated with nearby transportation routes (aircraft routes, highways, railways, navigable waters, and pipelines)

In Subsection 2.2.3.1, design basis events internal and external to the nuclear power plant are defined as those events that have a probability of occurrence on the order of about 10^{-7}/RY or greater and potential consequences serious enough to affect the safety of the plant to the extent that the guidelines in 10 CFR Part 100 could be exceeded. The following categories are considered for the determination of design basis events: explosions, flammable vapor clouds with a delayed ignition, toxic chemicals, fires, collisions with the intake structure, and liquid spills.

CP COL 19.3(4)

Table 19.1-205 (Sheet 28 of 36)
Comanche Peak, Units 3 and 4 External Events Screening and Site Applicability

Category	Event	FSAR Section Disposition	Description	Screening and Applicability		
				Criteria(1)	Freq. (/yr)	Site Appl.
Hydrologic Engineering	Floods	2.4.2 2.4.10 3.4	The maximum flood level at CPNPP Units 3 and 4 is elevation 793.66 ft msl. This elevation would result from a probable maximum precipitation (PMP) on the Squaw Creek watershed. Coincident wind waves would create maximum waves of 16.98 ft (trough to crest), resulting in a maximum flood elevation of 810.64 ft msl. CPNPP Units 3 and 4 safety-related plant elevation is 822 ft msl, providing more than 11 ft of freeboard under the worst potential flood considerations. Floods screen on Criterion 1, since the flood elevation evaluated in Chapter 2 is less than the design elevation of the plant. The Probable Maximum Precipitation (PMP) distributions used as input to the determination of the Probable Maximum Flood (PMF) for the CPNPP Units 3 and 4 were developed using Hydrometerological Report (HMR) 51 and HMR 52. The PMP distributions were calculated for the following scenarios: • Overall PMP for storm centers within the Squaw Creek watershed • Overall PMP for storm centers within the Paluxy River watershed • Squaw Creek Reservoir PMP for storm centers within the Squaw Creek watershed.	1~~, 6~~		No

RCOL2_19-22

RCOL2_19-22

CP COL 19.3(4)

Table 19.1-205 (Sheet 29 of 36)
Comanche Peak, Units 3 and 4 External Events Screening and Site Applicability

Category	Event	FSAR Section Disposition	Description	Screening and Applicability		
				Criteria[1]	Freq. (/yr)	Site Appl.
			The critical storm center within the Paluxy River watershed (Basin 4) results in the maximum PMP for the overall watershed (Basins 1, 2, 3 and 4 combined) at the confluence of Paluxy River and Squaw Creek. Additionally, when the storm center was kept in the Squaw Creek watershed (Basin 1) it resulted in a higher PMP for the Squaw Creek watershed. A higher PMP for the Squaw Creek watershed can result in a higher water surface elevation at CPNPP Units 3 and 4. The PMP for the critical storm center for each basin for the above mentioned scenarios was analyzed individually to determine the resulting peak runoff and the water surface elevation. No. of PMP Events ~~The overall frequency of a 6-hour, 25-inch PMP event for the U.S. is determined by dividing the number of events by the duration of the historical record. The areal frequency of a PMP event is calculated by dividing the U.S. PMP frequency by this total area over which a PMP could occur and multiplying this amount by the area of a PMP, 10 mi^2. Thus the PMP frequency is:~~ $\cancel{f_{PMP} = \left(\frac{No.\ of\ PMP\ Events}{Duration\ of\ Historical\ Record}\right)\left(\frac{A_{PMP\ Event}}{A_{Total\ PMP\ Region}}\right)}$ $\cancel{= \left(\frac{3}{177\ yrs}\right)\left(\frac{10\ mi^2}{1{,}211{,}967\ mi^2}\right)}$ $\cancel{= 1.4\times10^{-7}/yr}$			

RCOL2_19-22

CP COL 19.3(4)

Table 19.1-205 (Sheet 30 of 36)
Comanche Peak, Units 3 and 4 External Events Screening and Site Applicability

Category	Event	FSAR Section Disposition	Description	Screening and Applicability		
				Criteria(1)	Freq. (/yr)	Site Appl.
			~~Therefore, the frequency of a PMP of 25 inches over a 10 square mile is estimated to be 1.4 X 10^{-7} per year. This is a conservative estimate of the frequency of the PMP that results in a PMF for CNNPP Units 3 and 4 because additional periods of significant rainfall must also occur in close temporal proximity to the 25 inch 6-hour rainfall event. Given the calculated PMF is not projected to reach the safety-related elevation of the plant (criterion 1) and the estimated PMP and PMF frequency of 1. 4 X 10^{-7}/year, the frequency of a flooding event that would reach the safety-related elevation of the plant is projected to be well below 10^{-7} per year. Note considering that safety related systems will be available during the PMF the Conditional Core Damage Probability (CCDP) given the maximum PMF is < .01. Therefore, the CCDF for PMF is well below the screening criteria of 10^{-7} (criterion 6).~~			

RCOL2_19-22

CP COL 19.3(4)

Table 19.1-205 (Sheet 31 of 36) Comanche Peak, Units 3 and 4 External Events Screening and Site Applicability

Category	Event	FSAR Section Disposition	Description	Screening and Applicability		
				Criteria(1)	Freq. (/yr)	Site Appl.
	Probable Maximum Flood	2.4.3 2.4.10 3.4	The probable maximum flood (PMF) was determined for the Squaw Creek watershed and routed through the Squaw Creek Reservoir (SCR) to determine a water surface elevation of 793.66 ft msl. The CPNPP Units 3 and 4 safety-related facilities are located at elevation 822 ft msl. Therefore, PMF on rivers and streams does not present any potential hazards for CPNPP Units 3 and 4 safety-related facilities. The PMF and maximum coincident wind wave activity results in a flood elevation of 810.64 ft msl. The top elevation of the retaining wall is 795 ft msl. The CPNPP Units 3 and 4 safety-related structures are located at elevation 822 ft msl and are unaffected by flood conditions and coincident wind wave activity. Thus, the probable maximum flood cannot affect the plant because of the insignificance of the potential hazards (criterion 1)~~ and the frequency of the PMF is less than 10⁻⁷ per year (criterion 2)~~.	1~~, 6~~	~~< 10⁻⁷~~	No

RCOL2_19-22

RCOL2_19-22

CP COL 19.3(4)

Table 19.1-205 (Sheet 32 of 36)
Comanche Peak, Units 3 and 4 External Events Screening and Site Applicability

Category	Event	FSAR Section Disposition	Description	Screening and Applicability		
				Criteria(1)	Freq. (/yr)	Site Appl.
			~~The retaining wall is located approximately 555 ft. northeast from the center point of CPNPP Unit 3 on the slopes of the Squaw Creek Reservoir. Above the retaining wall, a 2:1 (horizontal to vertical) slope continues up to elevation 820 ft. The coincident wind wave activity analysis result is based on the run-up on a continuous vertical wall. Comparative analysis for run-up on adjacent slopes concludes it is conservative to assume that run-up above the top elevation of the retaining wall rises vertically, because run-up evaluated for the 2:1 slope would result in a lower elevation. It is assumed that the PMF with coincident wind wave activity elevation of 810.64 ft is applicable to the entire rim of the Squaw Creek Reservoir.~~ ~~The estimated frequency of a PMF capable of reaching the plant grade elevation is estimated to be less than 10-7 per year. Consideration of the maximum coincident wind wave activity along with the PMF would tend to lower the overall frequency. Note that the CDF resulting from an PMF is two orders of magnitude lower for this initiating event (criterion 6). This CDF estimate is derived from the CCDP (conditional damage failure probability) for an event in which all non-safety systems are lost (while only crediting *Safety Related Facilities*).~~			

RCOL2_19-22

Attachment 2

Response to Request for Additional Information 265 (6775)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 265 (6775)

SRP SECTION: 09.05.04 - Emergency Diesel Engine Fuel Oil Storage and Transfer System

DATE OF RAI ISSUE: 11/7/2012

QUESTION NO.: 09.05.04-1

Applicable CFR Regulation: (1) 10 CFR 50 Appendix A, Criterion 4 "Environmental and Dynamic Effects Design Bases," and (2) 10 CFR 50.49 "Environmental Qualification of electric equipment important to safety for nuclear power plants"

Applicable NUREG-0800: (1) Standard Review Plan (SRP) 3.11 "Environmental Qualification of Mechanical and Electrical Equipment," and (2) SRP 9.5.4: "Emergency Diesel Engine Fuel Oil Storage and Transfer System"

SRP 3.11 "Environmental Qualification of Mechanical and Electrical Equipment" reinforces the requirements of GDC 4. Technical Rational 5 of SRP 11 reads:
"Compliance with GDC 4, "Environmental and Dynamic Effects Design Bases," requires that components important to safety be designed to accommodate the effects of, and be compatible with, the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including LOCAs. Components must be protected against dynamic effects, including those of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.
GDC 4 is applicable to this section since it provides the requirement for components important to safety to be designed to accommodate the effects of, and be compatible with, the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including LOCAs.

Meeting GDC 4 ensures that equipment important to safety are environmentally designed and qualified, and provides assurance that the equipment will be able to accommodate the effects of, and be compatible with, the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including LOCAs."

Power Source Fuel Storage Vault (PSFSV)

COL Item 9.5(12) of the US-APWR DCD, Revision 3 requests the applicant to address the following: "The COL Applicant is to address the need for installing unit heaters in the Power Source Fuel Storage Vault during the winter for site locations where extreme cold temperature conditions exist."

Staff requests clarification of the RCOLA applicant's responsibilities pertaining to the following passages from Section 9.5.4 "Gas Turbine Generator Fuel Oil Storage and Transfer System" of the DCD Revision 3:

US-APWR DCD subsection 9.5.4.2.1, page 9.5-33
"The system is safe from flooding (see Subsection 3.4.1.2). The system is protected from the effects of low temperatures in the building. Each of the four GTG fuel oil storage tanks are contained in a separate, reinforced concrete seismic category I, and missile protected compartment. Each fuel oil storage tank compartment also contains the fuel oil transfer pumps, associated piping, valves, instrumentation, and connections for outside fuel oil supply."

DCD subsection 9.5.4.2.2.1, page 9.5-34
"Each power source fuel storage vault (PSFSV) is provided with a vapor and liquid detection system that is equipped with on-site audible and visual warning devices with battery backup.

Each fuel oil storage tank and the transfer pumps are located in a vault identified as the ,PSFSVs and each vault is provided with a manually operated ventilation system for personnel safety to remove any vapors when personnel enter the area. The PSFSV will not have a normally running ventilation system. The ventilation system consists of a supply air opening with a backdraft damper at the ceiling of the vault from the outside, and ducted to the bottom of one side of the vault. This duct will have an in-duct electric heater controlled by a local thermostat in the downstream ductwork. An exhaust fan at the ceiling with a backdraft damper to the outside is ducted to the bottom other side of the vault. This local ventilation system will be turned on locally (or from the MCR) only when personnel are required to enter the area for the performance of surveillances, inspections and maintenance activities.

The in-duct electric heater is provided on the supply air duct so that during the winter, whenever the ventilation system is used the incoming cold outside air is heated and the vault area will be able to be maintained above freezing.

Unit heaters are provided to maintain fuel oil temperature within specification for when the Power Source Fuel Storage Vault temperature may drop below 35°F. The COL Applicant is to address the need for installing unit heaters in the PSFSV."

The staff noted that Revision 3 of RCOLA FSAR section 9.5.4.2.2.1 "Fuel Oil Storage Tanks and Piping" reads:
'"Insulation and heat tracing on the fuel oil piping in the concrete pipe chase and on a portion of the piping running down into the PSFSV area are provided to maintain fuel oil temperature within specification during winter. The concrete pipe chases between each fuel oil tank room and each PS/B are the areas through which the fuel oil piping passes through. Within each concrete pipe chase is a 3-hour fire rated wall that separates each PS/B from the associated PSFSV. The door and penetrations through each wall are all 3-hour fire rated. One side of each concrete pipe chase is part of a PS/B, which is a normally heated building."

The staff has identified two issues requiring additional information:

(1) Are the fuel oil transfer pumps, associated piping, valves, instrumentation, and connections for outside fuel oil supply housed within each fuel oil storage tank compartment (i.e. vault) environmentally qualified (EQ) safety related equipment? Assuming that at least some of this equipment is EQ, how will the temperature and humidity requirements be maintained within the storage vaults to protect the long term integrity of this equipment?

(2) FSAR section 9.5.4.2.2.1 discusses provisions for maintaining temperatures of the fuel oil within the piping within required specifications. However, there is no discussion of provisions for maintaining fuel oil

temperatures within specifications for the fuel oil within the storage tank. In short there is no discussion of the applicant's responsibility for addressing the need for installing unit heaters in the PSFSV.

The staff requests additional information about these issues and that the applicant amend the RCOLA FSAR with this clarifying information.

Essential Service Water Pipe Tunnel (ESWPT)

From DCD Revision 3 Page 9.2-12

"*The ESWS is designed for operation at low water temperature of 32° F during all modes of plant operation. The COL Applicant is to provide protection of the site specific portions of the ESWS [[such as the ESWS blowdown line, FSS supply line, ESWPT piping running between the nuclear island and UHSRS, and any ESWS piping in the UHSRS]] against adverse environmental, operating, and accident conditions that can occur such as freezing, low temperature operation, and thermal overpressurization.*"

The staff finds FSAR information is insufficient with respect to the ESWPT, there is insufficient information in the FSAR for the staff to conclude that the applicant has fulfilled its responsibilities on the above item.

The staff identified three issues requiring additional information:

(1) If there is no EQ equipment within the ESWPT, the FSAR discussion of the pipe tunnel should present this as the basis in Section 3.8.4.1.3.1 for not warranting a safety related HVAC system to maintain temperature and humidity limits within the pipe tunnel.

(2) While the pipe tunnel is cited as being below grade, it is unclear if there are pathways (e.g. doors, hatchways, ventilation systems, etc.) associated with the pipe tunnel that could permit freezing conditions to exist in portions of the tunnel?

(3) FSAR Section 3.8.4.1.3.1 indicates that "*The tunnel is divided into two sections by an interior concrete wall to provide separation of piping trains. Each section contains both ESWS supply and return lines. End walls are also provided where required to maintain train separation.*" If there a drainage system within the tunnel, how is this train separation maintained in the design of the drain system?

The staff requests additional information about these issues and that the applicant amend the RCOLA FSAR with this clarifying information.

ANSWER:

Power Source Fuel Storage Vault (PSFSV)

(1) The PSFSV environmentally qualified safety-related equipment is identified in DCD Table 3D-2 added in response to DCD RAI 805-5915 Question 03.11-41 (ML12255A328).

The limiting temperatures outside the PSFSV are 32°F below ground and 115°F above ground. Equipment in the PSFSV is qualified to withstand this temperature range, which ensures that the ability to perform the required function and the integrity of the equipment is maintained.

Humidity in the PSFSV can be as high as 100% and the PSFSV equipment is qualified to withstand the temperature and humidity range within the PSFSV. Additionally, the fuel oil transfer pump motor contains a heater that is designed to prevent condensation. Therefore, the maximum expected humidity within the PSFSV does not adversely affect the ability of the equipment to perform the required function and the ability to maintain the integrity of the equipment.

(2) The fuel oil storage tank is located below the ground freezing level; therefore, the temperature of the fuel oil does not fall below 32°F. The limiting temperature of concern is the cloud point of No.2 fuel oil in the storage tank, which is 16°F. Since the fuel oil cloud point is below the expected lowest temperature in the PSFSV, the fuel oil will not be adversely affected by the minimum temperature expected within the PSFSV.

FSAR Subsection 9.5.4.2.2.1 has been revised to state that unit heaters are not required in the PSFSV, and heat tracing on fuel piping previously discussed in the FSAR has been removed from the design.

Essential Service Water Pipe Tunnel (ESWPT)

(1) The ESWPT contains safety-related piping and electrical cables that are qualified to withstand the maximum environmental conditions of the ESWPT (32°F – 115°F, 100% humidity). As discussed in the second supplemental response to RAI 254 (6403) (ML12334A026), since the temperature within the ESWPT does not fall below 32°F, the ESW will not freeze. Also, the electrical cables are qualified to withstand the environmental conditions within the ESWPT.

Therefore, a safety-related HVAC system is not required in the ESWPT. The ESWPT is ventilated with a temporary system that is used only when personnel are required to enter the area for surveillance, inspection, and maintenance activities.

FSAR Subsection 3.8.4.1.3.1 has been revised to state that ESW pipes and electrical cables inside the ESWPT are qualified to withstand the environmental conditions and that the ESWPT is ventilated with a temporary system that is used when personnel are required to enter the area.

(2) Access to the ESWPT is through the piping room located on the south side of the ESW pump room. The piping room is provided with unit heaters to maintain temperature above 40°F. Access to the piping room is through an exterior door. This description is part of the changes being made to the UHS associated with the Integrated Seismic Closure Plan. Freeze protection for equipment in the ESWPT is unnecessary as described in the supplemental response to RAI 254 (6403) (ML12334A026).

(3) There is no drainage system in the ESWPT. A leak detection system is provided for early detection of water intrusion as a substitute for a drainage system. Temporary water pumps are available to remove water from the ESWPT if water intrusion is detected by the leak detection system. Train separation is maintained because a separate leak detection system serves each train. The leak detection system and temporary water pumps are non-safety related because no active safety-related components are located inside the ESWPT and cables suitable for submerged conditions are used throughout the ESWPT.

Impact on R-COLA

See attached marked-up FSAR Revision 3 pages 3.8-5 and 9.5-21.

Impact on S-COLA

None, this response is site-specific.

Impact on DCD

There is no impact on DCD.

mat slab as well due to overturning moments and a greater overall weight of this segment versus the other segments.

It is intended that at the interface of two different segments, the interior wall, mat, and slab surfaces line up evenly with the adjacent segments and any difference in slab thicknesses affects only the outer dimensions of the ESWPT segments.

The ESWPT contains safety-related piping and electrical cables that are qualified to withstand the maximum environmental conditions of 32°F - 115°F and 100% humidity. The ESW will not freeze since the temperature in the ESWPT does not fall below 32°F. The ESWPT is ventilated with a temporary system when personnel are required to enter the area for surveillance, inspection, and maintenance activities. RCOL2_09.05.04-1

3.8.4.1.3.2 UHSRS

The UHSRS consists of a cooling tower enclosure; UHS ESW pump house, and UHS basin. All of them are reinforced concrete structures, described below.

UHS Basin - There are four basins for each unit and each reinforced concrete basin has one cooling tower with two cells. Each basin rests on a separate foundation, is square in shape, constructed of reinforced concrete, and separated from the adjacent basin by a minimum 4 inch expansion joint. A site-specific specification for the expansion/separation joint that provides material or system performance requirements will be prepared. Performance requirements for an elastomeric material include requirements bounding the allowable stress-strain properties, durability requirements, and specification for a material testing program. See Section 3.8.4.1.3 for alternate to expansion joints. Each basin serves as a reservoir for the ESWS. There is a cementitious membrane adhered to the interior faces of the reinforced concrete walls of the basins which minimizes long-term seepage of water from the basin. An UHS ESW pump house is located at the south-west corner of each basin. Adjacent to the pump house on the east side of the basin are cooling tower enclosures supported by UHS basin walls. The ESWPT runs east-west along the south exterior wall of the UHS basin, and is separated by a minimum 4 inch expansion joint.

Each basin is divided into two parts, as shown on Figure 3.8-206. The larger section of the basin shares the pump house and one cooling tower cell enclosure. The other cooling tower cell enclosure is in the smaller segment of the basin. A reinforced concrete wall, running east-west, separates the cooling tower enclosure basin area from rest of the basin. This wall is provided with slots to maintain the continuity of the reservoir.

See Figure 3.8-206 for general arrangement, layout, and dimensions of the UHSRS.

UHS ESW pump house - The pump house is an integral part of the UHS basin supported by UHS basin exterior and interior walls. Each pump house contains one ESW pump and one UHS transfer pump with associated auxiliaries. The systems for the OSC also include the public address system / plant page – party system, the plant radio system and the sound powered telephone system.

In addition, provisions for communication with state and local operations centers are provided in the onsite TSC to initiate early notification and recommendations to offsite authorities prior to activation of the EOF. This is in accordance with the requirements of 10 CFR 50 Appendix E, Part IV.E.9.

STD COL 9.5(5)
STD COL 9.5(6)

Replace sixth paragraph in DCD Subsection 9.5.2.2.5.2 with the following.

The emergency offsite communication system serves as an alternate means of communication to notify local authorities of an emergency at the nuclear plant. Radios are provided for communications with the main control room, TSC, EOF, and local authorities.

This emergency radio communications system connects onsite and offsite monitoring teams with the operation support center and EOF respectively.

Data Communications is discussed in Section 7.9. Fire brigade communications is covered in Subsection 9.5.1.

The emergency plan and security plan are described in Sections 13.3 and 13.6, respectively. These plans require testing of offsite communications links.

9.5.4.2.2.1 Fuel Oil Storage Tanks and Piping

CP COL 9.5(12)

Replace tenth paragraph in DCD Subsection 9.5.4.2.2.1 with the following.

~~Insulation and heat tracing on the fuel oil piping in the concrete pipe chase and on a portion of the piping running down into the PSFSV area are provided to maintain fuel oil temperature within specification during winter. The concrete pipe chases between each fuel oil tank room and each PS/B are the areas through which the fuel oil piping passes through.~~The Power Source Fuel Storage Vault (PSFSV) and the fuel pipe/access tunnel between the PSFSV and the Power Source Building (PS/B) are located below the ground freezing level. The lowest temperature expected in these areas is 32°F and the safety-related equipment which is qualified to withstand the environmental conditions is installed in the areas. Additionally, due to the minimum expected temperature within the PSFSV and the fuel pipe/access tunnel, the temperature of the fuel oil is not expected to drop to the fuel oil cloud point. Therefore, unit heaters are not needed to maintain fuel oil temperature within specification. Within each concrete pipe chase is a 3-hour fire rated wall that separates each PS/B from the associated PSFSV. The door and RCOL2_09.05.04-1

Attachment 3

Response to Request for Additional Information 266 (6898)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 266 (6898)

SRP SECTION: 09.04.05 - Engineered Safety Feature Ventilation System

DATE OF RAI ISSUE: 11/7/2012

QUESTION NO.: 09.04.05-26

Following the guidance of SRP 9.4.5 Section III "Review Procedures":

The staff noted that FSAR Revision 3 Table 9.4-201 indicates in-duct heaters to the MCR/Class 1E Electrical HVAC Equipment Room for only Trains B & C. This configuration was represented in Figure 9.4-202 “Class 1E Electrical Room HVAC System Flow Diagram” of FSAR Revision 2. FSAR Revision 3 deleted Figure 9.4-202 from the RCOLA. DCD Revision 3 Figure 9.4.5-2 has been incorporated by reference in RCOLA FSAR Revision 3. However, DCD Revision 3 Figure 9.4.5-2 indicates that all four MCR/Class 1E Electrical HVAC Equipment Rooms (i.e. Trains A, B, C & D) have in-duct heaters which is not entirely consistent with the information presented in FSAR Revision 3 Table 9.4-201. Based on this lack of clarity of a safety related system, the staff requests that the applicant amend the FSAR to ensure a clear and identifiable licensing basis.

ANSWER:

FSAR Table 9.4-201 has been revised to add the site-specific heating coil requirements for MCR Class 1E Electrical Room HVAC System Trains A and D. No in-duct heaters are required for these two trains.

Impact on R-COLA

See attached marked-up FSAR Revision 3 page 9.4-10.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

CP COL 9.4(4)

Table 9.4-201 (Sheet 1 of 2)

Equipment Design Data

Main Control Room Air Handling Unit	
Heating Coil Capacity	40 kW
Auxiliary Building Air Handling Unit	
Cooling Coil Capacity	9,200,000 Btu/hr
Heating Coil Capacity	4,750,000 Btu/hr (Steam)
Non-Class 1E Electrical Room Air Handling Unit	
Cooling Coil Capacity	1,330,000 Btu/hr
Heating Coil Capacity	Non-heating
Main Steam / Feedwater Piping Area Air Handling Unit	
Cooling Coil Capacity	450,000 Btu/hr
Heating Coil Capacity	9 kW
Technical Support Center Air Handling Unit	
Cooling Coil Capacity	550,000 Btu/hr
Heating Coil Capacity	30 kW
Class 1E Electrical Room Air Handling Unit	
Heating Coil Capacity	45 kW - Train A, B 65 kW - Train C, D
Class 1E I&C Room In-duct Heater Capacity	18 kW - Train A, D 16.3 kW - Train B, C
MCR/Class 1E Electrical HVAC Equipment Room In-duct Heater Capacity	2.2 kW - Train B, C Non-heating - Train A, D
Remote Shutdown Console Room In-duct Heater Capacity	10.9 kW
Class 1E Battery Room In-duct Heater Capacity	3.2 kW
Safeguard Component Area Air Handling Unit	
Heating Coil Capacity	27 kW
Emergency Feedwater Pump (M/D) Area Air Handling Unit	
Heating Coil Capacity	2 kW

RCOL2_09.04.05-26

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 266 (6898)

SRP SECTION: 09.04.05 - Engineered Safety Feature Ventilation System

DATE OF RAI ISSUE: 11/7/2012

QUESTION NO.: 09.04.05-27

For FSAR subsection 9.4.3.2.2 "Non-Class 1E Electrical Room HVAC System," according to the application, the second sentence of the second paragraph will be replaced with the words "Each air handling unit consists of, in the direction of airflow, a low efficiency profiler, a high efficiency filter, a chilled water cooling coil, a supply fan, and associated controls."

The staff notes that FSAR subsection 9.4.3.2.2 has been given the left margin annotation as "STD COL 9.4.4". The staff notes that the changes to the second sentence of the second paragraph, as captured in the paragraph above, may involve site specific information since subsequent COLAs may have the need for heating coils to be installed in the air handling units of the Non-Class 1E Electrical Room HVAC System. More specifically, FSAR subsection 9.4.3.2.2 may alternatively be annotated as site specific (e.g. CP COL 9.4(4)).

The staff request confirmation if the annotation should be standard or site specific and request that the FSAR be amended, if appropriate.

ANSWER:

The left margin annotation "STD COL 9.4(4)" is correct for the text in the first part of Subsection 9.4.3.2.2 because the text that refers to Table 9.4-201 is not changed by subsequent COL applicants. The second part of this subsection, as noted in the question, is site-specific, and left margin annotation "CP COL 9.4(4)" has been added. The left margin annotation for Table 9.4-201 is "CP COL 9.4(4)" because the table includes site-specific data.

In addition, the text in this subsection has been revised to specify that either heater units or in-duct heaters will be added as required to maintain temperatures within the design range, and to delete the reference to steam heating which is no longer part of the design.

Impact on R-COLA

See attached marked-up FSAR Revision 3 page 9.4-2.

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

CP COL 9.4(4) Replace the second sentence of the second paragraph in DCD Subsection 9.4.3.2.2 with the following. RCOL2_09.04.05-27

Each air handling unit consists of, in the direction of airflow, a low efficiency prefilter, a high efficiency filter, a chilled water cooling coil, a supply fan, and associated controls.

CP COL 9.4(4) Replace the second and third sentences of the third paragraph of DCD Subsection 9.4.3.2.2 with the following. RCOL2_09.04.05-27

Supplemental heating with unit heaters or in-duct heaters is provided as required to maintain room temperature within the design range (DCD Table 9.4-1).

9.4.3.2.3 Main Steam/Feedwater Piping Area HVAC System

STD COL 9.4(4) Replace the second sentence of the first paragraph in DCD Subsection 9.4.3.2.3 with the following.

The capacity of cooling and heating coils that are affected by site specific conditions is shown in Table 9.4-201.

9.4.3.2.4 Technical Support Center HVAC System

STD COL 9.4(4) Replace the second sentence of the first paragraph in DCD Subsection 9.4.3.2.4 with the following.

The capacity of cooling and heating coils that are affected by site specific conditions is shown in Table 9.4-201.

9.4.3.4.1 Auxiliary Building HVAC System

STD COL 9.4(7) Replace the last sentence in DCD Subsection 9.4.3.4.1 with the following.

The operating and maintenance procedures regarding the frequency of performance of periodic auxiliary building HVAC system ventilation flow balancing

Attachment 4

Response to Request for Additional Information 267 (6907)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 267 (6907)

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

DATE OF RAI ISSUE: 11/7/2012

QUESTION NO.: 19-23

Section 19.2.6.6 ("Cost-Benefit Comparison") of the Comanche Peak COL FSAR, Revision 3, states a maximum averted cost-risk of $305k for a 7 percent discount rate and $787k for a 3 percent discount rate. However, Section 7.3.3 ("Monetization of the Base Case") of the Comanche Peak COL Environmental Report, Revision 3, states a maximum averted cost-risk of $400k for a 7 percent discount rate and $1,055k for a 3 percent discount rate. The staff requests that the applicant clarify or address this discrepancy.

The staff was not able to reproduce the averted cost-risks for internal events with a 7 and 3 percent discount rate (e.g., Tables 7.3-1 and 7.3-2 of the Comanche Peak COL Environmental Report, Revision 3). The staff requests that the applicant clarify how each cost component of the averted cost-risks were determined for internal events with a 7 and 3 percent discount rate. Sufficient details should be provided in this clarification to allow the staff to assess the adequacy of the averted cost calculations. Also, the applicant is requested to include in the environmental report each cost component of the averted cost-risk for a 3 percent discount rate (similar to that of Table 7.3-1, "Monetization of CPNPP Units 3 and 4 US-APWR Base Case, Internal Events Only," of the Environmental Report).

ANSWER:

The results presented in FSAR Revision 3 Subsection 19.2.6.6 are based on Revision 1 of calculation TXUT-001-ER-7.2-CALC-006. Environmental Report (ER) Revision 3 Subsection 7.3.3 is based on Revision 3 of this calculation. The differences between these two calculation revisions are:

- MELCOR Accident Consequence Code System (MACCS2) results for 99.5% and 90% population evacuation cases were added in Revision 2 rather than a 100% population evacuation. This revision also modeled evacuations so that evacuees do not disappear from the model until 50 miles from the site rather than 25 miles.
- The replacement power cost monetization methodology was revised in Revision 3 of the calculation to use 2009 dollar values rather than 1993 dollar values.

FSAR Subsection 19.2.6.6 has been revised to reference the more recent cost-risk values in ER Revision 3 Section 7.3.

The averted cost-risks were determined as shown in Table 1 to this response.

Calculations for the 7% and 3% cases are provided in Table 2 of this response. The costs shown in Table 2 are for at-power internal events. The costs for other events are obtained by use of scaling factors based on the relative core damage frequency (CDF) of the particular event to the at power internal event CDF. The CDFs are from the US-APWR PRA analysis as given below:

Event	CDF (per reactor-year)	Scaling Factor
At-power Internal Events	1.2E-06	1.00
At-power Internal Fire	1.8E-06	1.50
At-power Internal Flood	1.4E-06	1.17
Low Power and Shutdown (LPSD)	2.0E-07	0.167

ER Table 7.3-1 has been revised to include the 3% discount case.

<u>Impact on R-COLA</u>

See attached marked-up FSAR Revision 3 page 19.2-4 and ER Revision 3 page 7.3-5.

<u>Impact on S-COLA</u>

None; this response is site-specific.

<u>Impact on DCD</u>

None.

Table 1 - Monetization Variables Summary

Variable	Description	Value	Unit	Reference
D_{pa}	avoided public dose	1.53E-01 for 2006	person-rem/RY	Population Dose (excluding contribution from RC5)
R	monetary equivalent of unit dose	2000	$/person-rem	NUREG/BR-0184, Section 5.7.1.2
Z_{pha}	monetary value of offsite exposure cost before discounting	-	$/RY	NUREG/BR-0184, Section 5.7.1
t_i	years before facility begins operating	0	years	-
t_f	years remaining until end of facility life	60	years	-
r	real discount rate	.07, .03	(fraction)	-
C	discounting factor	-	-	NUREG/BR-0184, Section 5.7
W_{pha}	monetary value of offsite exposure cost after discounting	-	$/reactor	NUREG/BR-0184, Section 5.7.1.3
D_{IO}	immediate occupational dose	3300	person-rem	NUREG/BR-0184, Section 5.7.3.1
D_{LTO}	long-term occupational dose	20000	person-rem	NUREG/BR-0184, Section 5.7.3.1
ΔF	reduction in accident frequency	1.21E-06	events/RY	sum of release frequencies
Y_{IO}	avoided immediate occupational dose	-	person-rem/RY	NUREG/BR-0184, Section 5.7.3.1
Y_{LTO}	avoided long-term occupational dose	-	person-rem/RY	NUREG/BR-0184, Section 5.7.3.1
Z_{IO}	immediate monetary value of onsite exposure cost before discounting	-	$/RY	NUREG/BR-0184, Section 5.7.3
Z_{LTO}	long-term monetary value of onsite exposure cost before discounting	-	$/RY	NUREG/BR-0184, Section 5.7.3
W_{IO}	immediate monetary value of onsite exposure cost after discounting	-	$/reactor	NUREG/BR-0184, Section 5.7.3.3
W_{LTO}	long-term monetary value of onsite exposure cost after discounting	-	$/reactor	NUREG/BR-0184, Section 5.7.3.3
m	years over which long-term doses accrue	10	years	NUREG/BR-0184, Section 5.9

Table 1 - Monetization Variables Summary (cont'd)

Variable	Description	Value	Unit	Reference
BΔF	monetary value of avoided offsite property damage before discounting	5.19E+02 for 2006	$/RY	Dollar Consequences (excluding contribution from RC5)
W_{FP}	monetary value of avoided offsite property damage after discounting	-	$/reactor	NUREG/BR-0184, Section 5.7.5 (not explicitly stated)
C_{CD}	total undiscounted cost of cleanup and decontamination for single accident in constant year dollars	1.50E+09	$	NUREG/BR-0184, Section 5.7.6.1
PV_{CD}	net present value of cleanup and decontamination costs for single event	-	$	NUREG/BR-0184, Section 5.7.6.1
U_{CD}	net present value of cleanup and decontamination over life of facility	-	$-year	NUREG/BR-0184, Section 5.7.6.1
W_{CD}	monetary value of avoided cleanup and decontamination after discounting	-	$/reactor	NUREG/BR-0184, Section 5.7.6.1 (not explicitly stated)
PV_{RP}	net present value of replacement power for a single event	-	$	NUREG/BR-0184, Section 5.7.6.2
U_{RP}	net present value of replacement power over life of facility	-	$-year	NUREG/BR-0184, Section 5.7.6.2
W_{RP}	monetary value of avoided replacement power after discounting	-	$/reactor	NUREG/BR-0184, Section 5.7.6.2 (not explicitly stated)

Table 2 - Monetization Calculations Summary for 2006 Met Data

Variable	Equation	Solution, 7%	Solution, 3%	Unit
Z_{pha}	$Z_{pha} = RD_{pa}$	3.06E+02	3.06E+02	\$/RY
C	$C = \frac{1 - e^{-rt_f}}{r}$	14.07149176	27.82337039	-
W_{pha} Off-site exposure cost	$W_{pha} = CZ_{pha}$	\$4,306	\$8,514	\$/reactor
Y_{IO}	$Y_{IO} = \Delta FD_{IO}$	3.99E-03	3.99E-03	person-rem/RY
Y_{LTO}	$Y_{LTO} = \Delta FD_{LTO}$	2.42E-02	2.42E-02	person-rem/RY
Z_{IO}	$Z_{IO} = RY_{IO}$	7.99E+00	7.99E+00	\$/RY
Z_{LTO}	$Z_{LTO} = RY_{LTO}$	4.84E+01	4.84E+01	\$/RY
W_{IO} On-site exposure	$W_{IO} = CZ_{IO}$	\$112	\$222	\$/reactor
W_{LTO} On-site exposure	$W_{LTO} = \left[\frac{Z_{LTO}}{mr^2}\right] e^{-rt_i}\left[1 - e^{-r(t_f - t_i)}\right]\left[1 - e^{-rm}\right]$	\$490	\$1,163	\$/reactor
W_{FP} Off-site property damage	$W_{FP} = CB\Delta F$	\$7,303	\$14,440	\$/reactor
PV_{CD}	$PV_{CD} = \left[\frac{C_{CD}}{mr}\right]\left[1 - e^{-rm}\right]$	1078745778	1295908897	\$
U_{CD}	$U_{CD} = \left[\frac{PV_{CD}}{r}\right]\left[1 - e^{-rt_f}\right]$	15179562320	36056553225	\$-year

Table 2 - Monetization Calculations Summary for 2006 Met Data (cont'd)

Variable	Equation	Solution, 7%	Solution, 3%	Unit
W_{CD} Cleanup and decon cost	$W_{CD} = U_{CD} \Delta F$	$18,367	$43,628	$/reactor
PV_{RP}	$PV_{RP,7\%} = \left[\frac{3.17E+8}{r}\right]\left[1-e^{-rt_f}\right]^2$	4393772675	7362070829	$
U_{RP}	$U_{RP} = \left[\frac{PV_{RP}}{r}\right]\left[1-e^{-rt_f}\right]^2$	60899805420	1.70978E+11	$-year
W_{RP} Replacement Power cost	$W_{RP} = U_{RP} \Delta F$	$73,689	$206,884	$/reactor

19.2.6.4 Risk Reduction Potential of Design Improvements

CP COL 19.3(4) Replace the last sentence in DCD Subsection 19.2.6.4 with the following.

The maximum averted cost is ~~$305k~~approximately $400k. RCOL2_19-23

19.2.6.5 Cost Impacts of Candidate Design Improvements

STD COL 19.3(4) Replace the first sentence in the last paragraph in DCD Subsection 19.2.6.5 with the following.

SAMA cost evaluation results are described in Table 19.2-9R.

19.2.6.6 Cost-Benefit Comparison

CP COL 19.3(4) Replace the content of DCD Subsection 19.2.6.6 with the following.

The maximum averted cost-risk of ~~less than $305k~~approximately $400k for a single US-APWR unit at the CPNPP Unit 3 and 4 is so low that there are no design changes over those already incorporated into the US-APWR design that could be determined to be cost-effective. Even with a conservative 3 percent discount rate, the valuation of the averted risk is ~~less than $787k~~approximately $1,055k. RCOL2_19-23 RCOL2_19-23

Accordingly, further evaluation of design-related SAMAs is not warranted. Evaluation of administrative SAMAs would not be appropriate until the plant design is finalized, and plant administrative processes and procedures are developed. At that time, appropriate administrative controls on plant operations would be incorporated into the plant's management systems as part of its baseline.

19.2.7 References

CP COL 19.3(6) Add the following reference document after the last document in DCD Subsection 19.2.7.

TABLE 7.3-1
MONETIZATION OF CPNPP UNITS 3 AND 4 US-APWR BASE CASE
INTERNAL EVENTS ONLY

Cost Component	Internal Events		Internal Fire		Internal Flood		LPSD		Totals for All Events		
	7% Discount	3% Discount	7% Discount	3% Discount	7% Discount	3% Discount	7% Discount	3% Discount	7% Discount	3% Discount	RCOL2_19-23
Off-site exposure cost	$4306	$8,514	$6459	$12,771	$5038	$9,961	$719	$1,422	$16,522	$32,668	
Off-site property damage cost	$7303	$14,440	$10,955	$21,660	$8545	$16,895	$1220	$2,411	$28,022	$55,406	
On-site exposure cost	$602	$1,386	$903	$2,079	$704	$1,622	$101	$231	$2311	$5,318	
Cleanup and decontamination cost	$18,367	$43,628	$27,551	$65,442	$21,489	$51,045	$3067	$7,286	$70,475	$167,401	
Replacement power cost	$73,689	$206,884	$110,534	$310,326	$86,216	$242,054	$12,306	$34,550	$282,744	$793,814	
Total (maximum averted cost)	$104,267	$274,852	$156,401	$412,278	$121,992	$321,577	$17,413	$45,900	$400,073	$1,054,607	

Base case is 7% discount rate.

Attachment 5

Response to Request for Additional Information 268 (6913)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 268 (6913)

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

DATE OF RAI ISSUE: 11/9/2012

QUESTION NO.: 19-24

In accordance with the guidance in Section C.I.1.8 "Site and Plant Design Interfaces and Conceptual Design Information" of RG 1.206, the staff expects that Luminant would address in its FSAR all COL action items identified in the US-APWR DCD. However, since the list of COL action items in US-APWR DCD Chapter 19.3 has not yet been finalized, the staff requests that Luminant describe how the CPNPP Units 3 & 4 FSAR will be revised to fully address all COL action items listed in US-APWR DCD Section 19.3, in light of RAI 967-9790, Question 19-574, issued to Mitsubishi Heavy Industries on 10/09/2012.

ANSWER:

The list of COL action items has been revised and was provided in the response to DCD RAI 967-6790, Question 19-574 (ML12331A339). The FSAR has been revised to reflect the updated COL action items.

Impact on R-COLA

See attached marked-up FSAR Revision 3 pages 1.8-79, 1.8-81, 1.8-83, 19.1-3, 19.1-5, 19.1-6, 19.3-1, and 19.3-2.

Impact on S-COLA

This response is standard.

Impact on DCD

None.

CP COL 1.8(2)

Table 1.8-201 (Sheet 68 of 72)

Resolution of Combined License Items for Chapters 1 - 19

COL Item No.	COL Item	FSAR Location	Resolution Category
COL 18.9(1)	Deleted from the DCD.		
COL 18.10(1)	Deleted from the DCD.		
COL 18.10(2)	Deleted from the DCD.		
COL 18.11(1)	Deleted from the DCD.		
COL 18.11(2)	Deleted from the DCD.		
COL 18.12(1)	Deleted from the DCD.		
COL 19.3(1)	The COL Applicant who intends to implement risk-~~managed technical specifications continues to update Probabilistic Risk Assessment and Severe Accident Evaluation to provide PRA input for risk-managed technical specifications. Peer reviews for the updated PRA will be performed prior to the use of PRA to risk-informed applications.~~informed applications will update and upgrade the information in the design-specific PRA to incorporate site-specific, as-built and as-operated information per 10 CFR 50.71(h)(1) for its intended uses and application. The COL Licensee will perform peer reviews of the site-specific PRA in accordance with requirements in PRA standards endorsed by the NRC prior to the use of the PRA to support risk-informed applications and will verify that the PRA model meets the technical adequacy and detail to support the proposed licensee programs and applications.	19.1.2.3 19.1.7.6	4
COL 19.3(2)	Deleted from the DCD.		
COL 19.3(3)	Deleted from the DCD.		

RCOL2_19-24

CP COL 1.8(2)

Table 1.8-201 (Sheet 70 of 72)

Resolution of Combined License Items for Chapters 1 - 19

COL Item No.	COL Item	FSAR Location	Resolution Category
COL 19.3(6)	The COL Applicant develops or describes an accident management program which includes emergency operating procedures, consideration of risk-significant operator actions listed in DCD Table 19.1-119, training, and human reliability related severe accident guidance programs. Insights gained from the design specific PRA, including insights created by the incorporation of site and plant-specific information available at the COL application phase (for aspects of the design which are not bounded by the Standard Plant PRA), are to be reflected appropriately. The COL Applicant reviews that operator actions remain valid with respect to all applicable events and modes of operation. As detailed design information becomes available and site-specific procedures are developed, the human reliability analysis in the PRA is revised and updated.	19.2.5 Table 19.1-119R	2
COL 19.3(7)	The COL Applicant will provide a milestone for completing the equipment survivability assessment of the as-built equipment required to mitigate severe accidents (electrical penetrations, hydrogen igniters and containment pressure (wide range)) to provide reasonable assurance that they will operate in the environmental conditions resulting from hydrogen burns associated with severe accidents for which they are intended and over the time span for which they are needed.	19.2.3.3.7	3a

RCOL2_19-24

CP COL 1.8(2)

Table 1.8-201 (Sheet 72 of 72)

Resolution of Combined License Items for Chapters 1 - 19

COL Item No.	COL Item	FSAR Location	Resolution Category
COL 19.3(9)	The COL applicant will describe the PRA maintenance and upgrade programs.	19.1.2.4	1b
COL 19.3(10)	The site-specific PRA will be developed when site-specific information becomes available. The COL Applicant will evaluate and address the key sources of uncertainty and key assumptions listed in DCD Table 19.1-38. By conducting walkdowns during construction, the COL Applicant will assess and update as needed (i) key insights and assumptions (identified in DCD Table 19.1-119), (ii) routing and locations of piping and cables assumed in the internal fire and flooding events, and (iii) fragility values used in the seismic margin analysis that are important to the risk profile of the facility; the COL Applicant will confirm that this information is accurately reflected in the as-built design and construction. Differences between the as-built plant and the design used as the basis for the US-APWR PRA will be reviewed to determine whether there is significant impact on PRA results.	19.1.4.1.2	3a

RCOL2_19-24

Note:
The designation of the resolution category indicates the resolution status of each COL item categorized to 1a, 1b, 2, 3a, 3b, 3c, 4, or 5
1. Operational programs
   1a. Applicant item as License Condition for Operational program
   1b. Applicant item as Commitment for Operational program
2. Plant procedures
3. Design information
   3a. Applicant item Design information provided in FSAR
   3b. Applicant item as Commitment for Design information to be provided before COL issuance
   3c. Not used
4. Detailed schedule information
5. The inspections, tests, analyses, and acceptance criteria (ITAAC)
(See Subsection 1.8.1.2 for further discussion.)

19.1.1.4.2 Risk-Informed Applications

CP COL 19.3(8)

Replace the content of DCD Subsection 19.1.1.4.2 with the following.

The PRA will be updated to reflect the risk-informed technical specifications in accordance with RG 1.174 and RG 1.177, including Initiative 4b, RMTS, in accordance with NEI 06-09 (Reference 19.1-11) and Initiative 5b, risk-informed method for control of surveillance frequencies in accordance with NEI-04-10 (Reference 19.1-201), as described in Subsection 16.1.1.2.

19.1.2.3 PRA Technical Adequacy

RCOL2_19-24

CP COL 19.3(1) Replace the content of DCD Subsection 19.1.2.3 with the following.

The quality of the methodologies, processes, analyses, and personnel associated with the site-specific PRA comply with the provisions for nuclear plant quality assurance. Toward this end, the PRA adheres to the recommendations provided in RG 1.200 pertaining to quality and technical adequacy. The US-APWR incorporates the technical elements of an acceptable PRA shown in Table 1 of RG 1.200 (Reference 19.1-9), and is consistent with the technical characteristics and attributes given in Table 2 through Table 10 of RG 1.200.

A peer review against the technical elements of the ASME/ANS RA-Sa-2009 PRA standard and associated addenda as clarified by Regulatory Guide 1.200 will be performed prior to use of the PRA to support risk-informed applications or before initial fuel load.

19.1.2.4 PRA Maintenance and Update

CP COL 19.3(9)

Add the following text after the fifth paragraph in DCD Subsection 19.1.2.4.

Changes to PRA inputs and discovery of new information will be evaluated to determine whether a PRA maintenance or upgrade is warranted. Changes to the PRA impacting risk insights or key assumptions will be prioritized to ensure that the most significant changes are incorporated as soon as practical and associated

- A drain line is provided as an overfill protection from overfilling the basin and failing the pump(s).
- There are adequate low-level and high-level alarms to provide rapid control room annunciation of a level problem and to allow adequate time to confirm the level and take effective action to address it.
- On failure of the fans during normal plant operation, operating status of each fan is indicated in the main control room (MCR).
- Should the plant trip, two basins are effective in removing decay heat for more than 24 hours without replenishment or transferring water from another basin.
- The transfer line is a high integrity line, regularly tested and inspected for corrosion.
- Failure of the transfer line will not drain any CTW basin.
- The basin water is tested regularly and maintained in a condition to preclude corrosion and organic material from plugging strainers.
- Ventilation of the ESWP room is sufficiently reliable that the availability of the ESWP is not degraded.

The internal event core damage frequency (CDF) was found to be numerically the same as reported later in this subsection with an actual increase in the CDF due to the site-specific designs of less than 1 percent. The initiating event frequency for loss of component cooling water (CCW), as reported later in this subsection in Tables 19.1-2 and 19.1-23, increases from 2.4E-05/reactor-year (RY) to 2.6E-05/RY due to the site-specific ESWS designs. The effect of the site-specific ESWS designs on the internal CDF is very small. Therefore, any discrepancy of cutsets, basic event importances of the standard design SSCs and operator actions, and dominant sequences from that documented for the standard US-APWR design is considered negligible. Changes in importance are the basic events related to the site-specific design shown in Table 19.1-204. The results described below are considered sufficient and applicable.

CP COL 19.3(10) Add the following text at the end of the second to last paragraph in DCD Subsection 19.1.4.1.2. RCOL2_19-24

The site-specific PRA will evaluate and address the key sources of uncertainty and key assumptions listed in DCD Table 19.1-38. Walkdowns during construction will be used to assess and update as needed (i) key insights and assumptions (identified in DCD Table 19.1-119), (ii) routing and locations of piping and cables assumed in the internal fire and flooding events, and (iii) fragility values used in the seismic margin analysis that are important to the risk profile of the facility; the site-specific PRA will confirm that this information is accurately reflected in the as-built design and construction. Differences between the as-built plant and the design used as the basis for the US-APWR PRA will be reviewed to determine whether there is significant impact on PRA results. RCOL2_19-24

19.1.4.2.2 Results from the Level 2 PRA for Operations at Power

STD COL 19.3(4) Add the following text after the first sentence in DCD Subsection 19.1.4.2.2.

The only site-specific design that has potential effect on level 2 PRA is the site-specific UHS.

As is the case of the Level 1 PRA for operations at power (Subsection 19.1.4.1.2), modeling of the site-specific UHS results in small effect on the reliability of the component cooling water system (CCWS) for internal events. There is only small increase of CDF resulting from loss of CCW initiating events, also the contribution of total loss of CCW initiation event to the large release frequency (LRF) for operations at power is considered insignificant. It has been therefore determined that consideration of the site-specific UHS would have no discernible effect on the Level 2 PRA results that are based on the standard US-APWR design. Therefore, the results described below are considered sufficient and applicable.

19.1.5 Safety Insights from the External Events PRA for Operations at Power

CP COL 19.3(4) Replace the second and third paragraphs in DCD Subsection 19.1.5 with the following.

The last three events listed above receive detailed evaluation in the following subsections. The first four events are subject to the screening criteria consistent with the guidance of ASME/ANS RA-Sa-2009, taking into consideration the features of advanced light water reactors.

The assessment of the other external events is provided below:

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

19.3 OPEN, CONFIRMATORY, AND COL ACTION ITEMS IDENTIFIED AS UNRESOLVED

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

19.3.3 Resolution of COL Action Items

Replace the content of DCD Subsection 19.3.3 with the following.

CP COL 19.3(1) ***19.3(1)*** *Update of PRA and SA evaluation for input to RMTS and peer review*

This COL item is addressed in Subsections 19.1.2.3 and 19.1.7.6. RCOL2_19-24

19.3(2) *Deleted from the DCD.*

19.3(3) *Deleted from the DCD.*

CP COL 19.3(4)
STD COL 19.3(4) ***19.3(4)*** *Update of PRA and SA evaluation based on site-specific information*

This COL item is addressed in Subsections 19.1.1.2.1, 19.1.4.1.2, 19.1.4.2.2, 19.1.5, 19.1.5.2.2, 19.1.5.3.2, 19.1.6.2, 19.1.7.1, 19.2.6.1, 19.2.6.1.1, 19.2.6.2, 19.2.6.4, 19.2.6.5 and 19.2.6.6, Tables 19.1-201, 19.1-202, 19.1-203, 19.1-204, 19.1-205, 19.1-206 and 19.2-9R, and Figures 19.1-201 and 19.1-2R.

CP COL 19.3(5) ***19.3(5)*** *SSC fragilities*

This COL item is addressed in Subsections 19.1.5.1.1, 19.1.5.1.2 and Table 19.1-206.

STD COL 19.3(6)
CP COL 19.3(6) ***19.3(6)*** *Accident management program*

This COL item is addressed in Subsections 19.2.5 and Table 19.1-119R.

STD COL 19.3(7) ***19.3(7)*** *Equipment survivability assessment*

This COL item is addressed in Subsection 19.2.3.3.7.

CP COL 19.3(8) ***19.3(8)*** *Licensee programs and risk-informed applications*

This COL item is addressed in Subsections 19.1, 19.1.1.2.1, 19.1.1.3.1, 19.1.1.3.2, 19.1.1.4.1, ~~and~~ 19.1.1.4.2, and 19.1.7, and Table 19.1-207. RCOL2_19-25

CP COL 19.3(9) ***19.3(9)*** *PRA Maintenance and upgrade programs*

This COL item is addressed in Subsection 19.1.2.4.

CP COL 19.3(10) ***19.3(10)*** *Confirmation of PRA insights and assumptions* RCOL2_19-24

This COL item is addressed in Subsection 19.1.4.1.2.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 268 (6913)

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

DATE OF RAI ISSUE: 11/9/2012

QUESTION NO.: 19-25

According to the SRP and guidance in Appendix C.I.19-A to RG 1.206, a COL applicant that references the US-APWR design certification should clearly describe the uses of PRA in support of licensee programs, include FSAR cross-references to specific program descriptions, and identify and describe the risk-informed applications being implemented during the COL application phase and construction phase. Thus, please identify and describe the use of PRA and risk-informed applications in accordance to RG 1.206 guidance

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ANSWER:

Cross-references to the specific programs and risk-informed applications are delineated in new FSAR Table 19.1-207. References were added to Table 1.8-201 and to Subsections 19.1, 19.1.1.2.1, 19.1.1.3.1, 19.1.1.3.2, 19.1.1.4.1, and 19.1.7 to delineate which programs and risk-informed applications are implemented in each phase.

Impact on R-COLA

See attached marked-up FSAR Revision 3 pages 1.8-82, 19.1-1, 19.1-2, 19.1-14, 19.1-15, and 19.3-1; and new pages 19.1-91 and 19.1-92.

Impact on S-COLA

None; this response is site specific.

Impact on DCD

None.

CP COL 1.8(2)

Table 1.8-201 (Sheet 71 of 72)

Resolution of Combined License Items for Chapters 1 - 19

COL Item No.	COL Item	FSAR Location	Resolution Category
COL 19.3(8)	The COL applicant will describe the uses of PRA in support of licensee programs and identify and describe risk-informed applications being implemented during the operational phase.	19.1 19.1.1.2.1 19.1.1.3.1 19.1.1.3.2 19.1.1.4.1 19.1.1.4.2 19.1.7 Table 19.1-207	1b

RCOL2_19-25

RCOL2_19-25

19.1 PROBABILISTIC RISK ASSESSMENT

CP COL 19.3(8)

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements. Cross-references between PRA programs, risk-informed applications and FSAR program descriptions are tabulated in Table 19.1-207. RCOL2_19-25

19.1.1.2.1 Uses of Probabilistic Risk Assessment in Support of Licensee Programs

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CP COL 19.3(4)
CP COL 19.3(8)

Replace the second paragraph in DCD Subsection 19.1.1.2.1 with the following. RCOL2_19-25

The probabilistic risk assessment (PRA) is updated to assess site-specific information and associated site-specific external events. A systematic process is used to develop the site-specific PRA from the design certification PRA. This process includes the following activities:

- Identify any design changes or departures from the certified design.
- Map the design changes and departures onto specific PRA elements, recognizing that some design changes and departures may be unrelated to any PRA element.
- Develop screening criteria to determine which of the remaining design changes and departures should be included in the plant-specific PRA model. In cases where it can be shown that assumptions in the certified design PRA (1) bound certain site-specific and plant-specific parameters, and (2) do not have a significant impact on the PRA results and insights, no change to the design certification PRA is necessary. Similarly, certain changes or deviations from the certified design or the certified design PRA need not be reflected in the plant-specific PRA as long as it can be shown that (1) they are not important changes or deviations, and (2) do not have a significant impact on the PRA results and insights.

Site-specific information is reviewed to identify information related to the assumptions used in the PRA and having a potential effect on the PRA insights. Identification of the site-specific design is described in Table 1.8-1R in Section 1.8. These site-specific design issues, except essential service water system (ESWS) and ultimate heat sink (UHS), are considered having no potential influence to the results of the PRA. PRA screening assessment are shown in Subsections 19.1.4 through 19.1.6.

The Licensee programs that could be impacted are described in Subsections 19.1.7.1, 19.1.7.4, 19.1.7.5, 19.2.5 and Chapter 18. RCOL2_19-25

19.1.1.3.1 Uses of Probabilistic Risk Assessment in Support of Licensee Programs

RCOL2_19-25

CP COL 19.3(8) Add the following text to the first paragraph in DCD Subsection 19.1.1.3.1.

The PRA in the construction phase will be updated and upgraded as necessary to support implementation of the Maintenance Rule (Subsection 19.1.7.2) and the Reactor Oversight Process (Subsection 19.1.7.3) prior to fuel load.

19.1.1.3.2 Risk-Informed Applications

CP COL 19.3(8) Replace the content of of DCD 19.1.1.3.2 with the following.

The PRA in the construction phase will be updated and upgraded as necessary to support implementation of risk informed Technical Specifications (Risk Managed Technical Specifications and Surveillance Frequency Control Program) described in Subsection 19.1.7.6 prior to fuel load.

CP COL 19.3(8)

19.1.1.4 Operational Phase

Replace the content of DCD Subsection 19.1.1.4 with the following.

The uses of PRA in support of licensee programs and description of risk-informed applications being implemented during the operational phase are described in the following subsections.

19.1.1.4.1 Uses of Probabilistic Risk Assessment in Support of Licensee Programs

Replace the content of DCD Subsection 19.1.1.4.1 with the following.

CP COL 19.3(8) The PRA will be used in the operational phase to support licensee programs such as the human factors engineering program (Chapter 18), the severe accident management program (Subsection 19.2.5), the maintenance rule (Subsection 19.1.7.2), and the reactor oversight program (Subsection 19.1.7.3). RCOL2_19-25

The PRA models and results provide input to such as the preventive maintenance basis program and other related maintenance and reliability programs including the motor-operated valve and air-operated valve reliability and testing programs.

Four-train separation is maintained in the site-specific UHS design. Modeling of the site-specific UHS shows a small effect on the reliability of CCWS for internal fire events. As was the case with the results of the Level 1 PRA for operations at power (Subsection 19.1.4.1.2), it has been determined that consideration of the site-specific UHS would have no discernible effect on the fire PRA results that are based on the standard US-APWR design. Therefore, the results described below are considered sufficient and applicable.

19.1.5.3.2 Results from the Internal Flooding Risk Evaluation

STD COL 19.3(4) Add the following text at the beginning of DCD Subsection 19.1.5.3.2.

The only site-specific design that has potential effect on internal flooding risk is the site-specific UHS.

Four-train separation is maintained in the site-specific UHS design. Modeling of the site-specific UHS shows a small effect on the reliability of CCWS for internal flooding events. As was the case with the results of the Level 1 PRA for operations at power (Subsection 19.1.4.1.2), it has been determined that consideration of the site-specific UHS would have no discernible effect on the internal flooding PRA results that are based on the standard US-APWR design. Therefore, the results described below are considered sufficient and applicable.

19.1.6.2 Results from the Low-Power and Shutdown Operations PRA

STD COL 19.3(4) Add the following text at the beginning of DCD Subsection 19.1.6.2.

The only site-specific design that has potential effect on low-power and shutdown risk is the site-specific UHS.

As was the case with the Level 1 PRA for operations at power (Subsection 19.1.4.1.2), modeling of the site-specific UHS shows a small effect on the reliability of CCWS for internal events. Considering the small increase of loss of CCW initiating event frequency, it has been determined, that consideration of the site-specific UHS would have no discernible effect on the low-power and shutdown (LPSD) results that are based on the standard US-APWR design. Therefore, the results described below are considered sufficient and applicable.

19.1.7 PRA-Related Input to Other Programs and Processes RCOL2_19-25

CP COL 19.3(8) Add the following sentence to the first paragraph of Subsection 19.1.7. RCOL2_19-25

The implementation of the specific programs and risk informed applications are delineated in Table 19.1-207.

19.1.7.1 PRA Input to Design Programs and Processes

STD COL 19.3(4) Replace the last sentence of DCD Subsection 19.1.7.1 with the following.

Key insights and assumptions are summarized in Table 19.1-119 and specified pages replaced by Table 19.1-119R. Site-specific key assumptions are summarized in Table 19.1-206.

19.1.7.6 PRA Input to the Technical Specification

CP COL 19.3(1) Replace the last paragraph in DCD Subsection 19.1.7.6 with the following.

The PRA needed for implementation of RMTS, SFCP, and peer review will be available one year prior to fuel load.

19.1.9 References

CP COL 19.3(4) Add the following references after the last reference in DCD Subsection 19.1.9.

19.1-201 *Risk-Informed Method for Control of Surveillance Frequencies*, NEI 04-10, Rev. 1, Nuclear Energy Institute, Washington DC, April 2007.

19.1-202 *Climatology Models for Extreme Hurricane Winds Near the United States*, Thomas H. Jagger and James B. Elsner, January 19, 2006.

19.1-203 *A Simple Empirical Model for Predicting the Decay of Tropical Cyclone Winds after Landfall*, John Kaplan and Mark Demaria, JOURNAL OF APPLIED METEOROLOGY, Volume 34, November, 1995.

RCOL2_19-25

Table 19.1-207 (Sheet 1 of 2)

CP COL 19.3(8)

Cross Reference of PRA Programs and Applications

Application / Program	Design Phase FSAR 19.1.1.1	COL Phase FSAR 19.1.1.2	Construction Phase FSAR 19.1.1.3	Operational Phase FSAR 19.1.1.4	FSAR Cross Reference Section
Programs					
Input to design programs and processes	Determine risk / insights associated with design	Maintain assumptions / insights. Evaluate site specific aspects. (External events, SSCs beyond DCD)	Maintain assumptions / insights.	Maintain assumptions / insights.	Section 14.3.3.5, Section 19.1.7.1, Table 19-1-119R, Table 19.1-206, Section 19.2.5
Input to Maintenance Rule (MR) implementation (10CFR50.65)			Implement MR prior to initial fuel load	Provide inputs to MR for program	T.S. 5.5.18, Section 17.6, Section 19.1.7.2
Input to Reactor Oversight Process (ROP)			Implement ROP prior to initial fuel load	Provide inputs to ROP for program	Section 19.1.7.3
Input to Reliability Assurance Program (RAP)	Provide importance measures for RAP	Maintain assumptions / insights. Evaluate site specific aspects. (External events, SSCs beyond DCD)	Maintain assumptions / insights.	Maintain assumptions / insights.	Section 17.1, Section 17.2, Section 17.3, Section 17.4, Table 17.4-1, Table 17.4-201, Section 19.1.7.4

Table 19.1-207 (Sheet 2 of 2)

RCOL2_19-25

CP COL 19.3(8)

Cross Reference of PRA Programs and Applications

Application / Program	Design Phase FSAR 19.1.1.1	COL Phase FSAR 19.1.1.2	Construction Phase FSAR 19.1.1.3	Operational Phase FSAR 19.1.1.4	FSAR Cross Reference Section
Programs					
Input to regulatory treatment of Non-Safety-Related Systems Program	Provide importance measures for program	Maintain assumptions / insights. Evaluate site specific aspects. (External events, SSCs beyond DCD)	Maintain assumptions / insights.	Maintain assumptions / insights.	Section 19.1.7.5
Input to Human Factors Engineering (HFE) Program		Input to procedures and HFE program	Input to procedures and HFE program	Input to procedures and HFE program	Chapter 18
Applications					
Input to Technical Specifications (Risk Managed Technical Specifications, Initiative 4b)			Implement prior to initial fuel load	Provide inputs to Initiative 4b program	TS 5.5.18, Section 16.1.1.2, Section 19.1.7.6
Input to Technical Specifications (Surveillance Frequency Control Program, Initiative 5b)			Implement prior to initial fuel load	Provide inputs to Initiative 5b program	TS 5.5.19, Section 16.1.1.2, Section 19.1.7.6

19.3 OPEN, CONFIRMATORY, AND COL ACTION ITEMS IDENTIFIED AS UNRESOLVED

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

19.3.3 Resolution of COL Action Items

Replace the content of DCD Subsection 19.3.3 with the following.

CP COL 19.3(1) ***19.3(1)*** *Update of PRA and SA evaluation for input to RMTS and peer review*

This COL item is addressed in Subsections 19.1.2.3 and 19.1.7.6. RCOL2_19-24

19.3(2) *Deleted from the DCD.*

19.3(3) *Deleted from the DCD.*

CP COL 19.3(4)
STD COL 19.3(4) ***19.3(4)*** *Update of PRA and SA evaluation based on site-specific information*

This COL item is addressed in Subsections 19.1.1.2.1, 19.1.4.1.2, 19.1.4.2.2, 19.1.5, 19.1.5.2.2, 19.1.5.3.2, 19.1.6.2, 19.1.7.1, 19.2.6.1, 19.2.6.1.1, 19.2.6.2, 19.2.6.4, 19.2.6.5 and 19.2.6.6, Tables 19.1-201, 19.1-202, 19.1-203, 19.1-204, 19.1-205, 19.1-206 and 19.2-9R, and Figures 19.1-201 and 19.1-2R.

CP COL 19.3(5) ***19.3(5)*** *SSC fragilities*

This COL item is addressed in Subsections 19.1.5.1.1, 19.1.5.1.2 and Table 19.1-206.

STD COL 19.3(6)
CP COL 19.3(6) ***19.3(6)*** *Accident management program*

This COL item is addressed in Subsections 19.2.5 and Table 19.1-119R.

STD COL 19.3(7) ***19.3(7)*** *Equipment survivability assessment*

This COL item is addressed in Subsection 19.2.3.3.7.

CP COL 19.3(8) ***19.3(8)*** *Licensee programs and risk-informed applications*

This COL item is addressed in Subsections 19.1, 19.1.1.2.1, 19.1.1.3.1, 19.1.1.4.1, ~~and~~ 19.1.1.4.2, and 19.1.7, and Table 19.1-207. RCOL2_19-25

CP COL 19.3(9) ***19.3(9)*** *PRA Maintenance and upgrade programs*

This COL item is addressed in Subsection 19.1.2.4.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI 268 (6913)

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

DATE OF RAI ISSUE: 11/9/2012

QUESTION NO.: 19-26

The staff review finds that the CPNPP Units 3 and 4 FSAR incorporates Section 19.1.2.3 "PRA Technical Adequacy" of US-APWR DCD by reference. However, US-APWR DCD Section 19.1.2.3 has been developed to only address the quality of US-APWR design-specific PRA in support of the US-APWR design certification. Thus, the staff requests that Luminant revise the supplemental information in its FSAR to address plant-specific PRA technical adequacy including the justification that the PRA is sufficient to support CPNPP Units 3 and 4 COL application.

ANSWER:

The US-APWR DCD outlines the requirements for PRA technical adequacy at the design stage. The requirements for increasing detail and plant specificity through the process of licensing, construction, and operation have been addressed by adding new FSAR Subsection 19.1.2.3 provided in the response to Question 19-24 above.

<u>Impact on R-COLA</u>

None.

<u>Impact on S-COLA</u>

This response is standard.

<u>Impact on DCD</u>

None.