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May 18, 2010

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 NO. 4538

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein the response to Request for Additional Information (RAI) No. 4538 for the Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4. This RAI involves the offsite power system, the ratings of plant electrical equipment, and monitoring underground cables.

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

The only commitment made in this letter is captured on page 2.

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

Executed on May 18, 2010.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

Attachment: Response to Request for Additional Information No. 4538 (CP RAI #152)

D090
NRO

Regulatory Commitments in this Letter

This communication contains the following new or revised commitment which will be completed or incorporated into the CPNPP licensing basis as noted. The Commitment Number is used by Luminant for internal tracking.

Number	Commitment	Due Date/Event
7431	Periodic testing of cable insulation for underground (including medium-voltage) cable within the scope of the maintenance rule (10 CFR 50.65) is conducted in accordance with established industry guidance to detect potential cable degradation from moisture intrusion. A cable monitoring program that includes methods for cable selection, test methods, and test frequencies will be implemented prior to fuel load authorization.	Fuel Load Authorization

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RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 4538 (CP RAI #152)

SRP SECTION: 08.02 - Offsite Power System

QUESTIONS for Electrical Engineering Branch (EEB)

DATE OF RAI ISSUE: 4/13/2010

QUESTION NO.: 08.02-26

The regulatory basis for this question is discussed in NUREG-0800, Standard Review Plan, Chapter 8.2 "Offsite Power System."

In **RAI 2577 (CP RAI No. 24) Question 08.02-05** the NRC staff requested that the applicant discuss the continuous ampere rating of the main buses and their short circuit rating, both symmetrical and asymmetrical. Additionally, the staff requested that the applicant provide details about the maximum anticipated loads on each bus and the calculated short circuit current available to demonstrate the current carrying capability of the buses.

In their response to the RAI, dated September 8, 2009, the applicant stated that the main busses in the plant switching station have a continuous current rating of 5000A rms sym. The applicant also stated that the transmission plan to connect Comanche Peak Nuclear Power Plant (CPNPP), Units 3 and 4 uses the "n-1 criteria" for determining the number of lines needed to reliably handle the full output of the plant. Therefore, assuming a worst case situation of a DeCordova line fault and subsequent bus side breaker failure at CPNPP Units 3 and 4 that strips the West bus, the net flow on East bus is 4774A and the maximum net flow on the West bus is 3268A.

Based on Figure 8.2-205 of the COL, Part 2, FSAR, if both the DeCordova and Parker lines are isolated from the Units 3 and 4 input, for any reason, then the entire flow of both plants would be connected to the East bus. In this case, potentially the current on the East bus would be approximately 5800A and, therefore, exceed the rating of the East bus. Discuss why this scenario is not reasonable, the action that could be taken in this event, and the ability to perform these actions in a timely manner, without damaging the main buses.

(RAI 08.02-26)

ANSWER:

Scenario Reasonability

The Oncor transient stability study includes a series of contingencies consistent with the Electric Reliability Council of Texas (ERCOT) Planning Criteria, including contingencies identified by loss of single-circuit transmission lines, loss of double-circuit transmission lines, and loss of single-circuit transmission lines concurrent with a stuck breaker which ultimately clears an entire bus in a breaker-and-a-half switchyard. All contingencies studied are considered N-1 contingency conditions or special contingencies. N-2 contingency conditions were not studied or included in the report because such contingencies are not required by the Planning Criteria.

The lateral separation of the DeCordova and Parker transmission towers and lines is such that a physical failure of one line will not affect the other line. A fault on either the DeCordova or the Parker transmission line would be cleared by opening the breakers at either end of the faulted line. In the event of a bus side breaker failure for the faulted transmission line, the remaining bus side breakers for the affected bus would open to clear the fault. This scenario is described in the response to RAI No. 2577 (CP RAI #24) Question 08.02-05 in letter TXNB-09040 (ML092530470). Under this scenario, all three of the other transmission lines connected to the CPNPP Units 3 and 4 plant switching station would be unaffected and the current flow in the East bus would be as described in the response to Question 08.02-05. Due to the design of the transmission lines and the controls, it is not necessary to postulate that the DeCordova and Parker lines would be isolated from the CPNPP Units 3 and 4 input at the same time.

Actions that could be taken

The proposed scenario (i.e., isolation of both the DeCordova and Parker transmission lines from the Units 3 and 4 input) would represent a contingency beyond the ERCOT Planning Criteria. As with any severe deviation from normal operations of the grid, the interface between the main control room operators and ERCOT/Oncor is described in FSAR Subsection 8.2.1.2.3:

> Communication links exist between the main control room operators and ERCOT/Oncor as a means to obtain timely information on power grid operating conditions and status to verify the operability of the offsite power grid in accordance with the requirements of the technical specifications.

An event such as the loss of two 345kV transmission lines would be responded to by ERCOT/Oncor who would take necessary and timely actions to respond to and restore the grid. Actions would include communication with the main control room operators. If necessary, actions may include a CPNPP Unit 3 or 4 power decrease in accordance with operating procedures.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 4538 (CP RAI #152)

SRP SECTION: 08.02 - Offsite Power System

QUESTIONS for Electrical Engineering Branch (EEB)

DATE OF RAI ISSUE: 4/13/2010

QUESTION NO.: 08.02-27

The regulatory basis for this question is described in NUREG-0800, Standard Review Plan, Chapter 8.2, "Offsite Power System."

In **RAI 2577 (CP RAI No. 24), Question 08.02-08** the NRC staff requested that the applicant specify the rating of each bus duct section and confirm the capability of each section to carry maximum full load currents. In their response to the RAI, the applicant stated that the main section of isolated phase bus between the generator and the tap to the main transformer has a design rating of 44.4 kA, if force-cooled. The applicant also stated that generator peak load is also 44.4kA. Given that no margin exists between the generator peak load and the force-cooled rating of the isolated phase bus section, discuss why no margin is necessary. Additionally, provide the self cooled rating of the bus and the anticipated normal summer load on the main generator. Also, 44.4 kA at the output of the main generator (at 26kV) correspond to 3346A at 345kV. This value appears to conflict with the transformer output (2289A) stated in the response to RAI 2577 (CP RAI #24), Question08.02-5. Provide appropriate clarifications.

(RAI 08.02-27)

ANSWER:

Margin between Generator and Isolated Phase Bus

The generator is rated 1900 MVA at 26 kV, with a continuous current rating of 42.2 kA. The force-cooled continuous-current rating of the iso-phase bus duct is 44.4 kA. The force-cooled rating of the iso-phase bus duct provides a design margin of 5% over the continuous current rating of the generator.

A 5% design margin is provided to account for the operating voltage range of the generator, which is $\pm$5% as dictated by IEEE and IEC standards. At 95% operating voltage, the peak generator current of 44.4 kA may be seen by the generating system. Additional margin above 44.4 kA is not required because the generator is not rated for additional output. In addition, the generator and iso-phase bus

are protected from current and temperature overload by appropriate temperature monitoring and protective relaying.

Isolated-Phase Bus Self-Cooled Rating

The self-cooled continuous-current rating of the iso-phase bus duct is 22.2 kA. The self-cooled rating is 50% of the force-cooled rating in accordance with the manufacturer's standard practice.

Anticipated Normal Summer Load on Main Generator

The anticipated normal summer load on the main generator is limited to the maximum capability of the generator under summer ambient temperature design conditions. The maximum summer generator output is 1625 MW or 40.1 kA at 0.9 pf and 26 kV.

Transformer vs. Generator Output

The Interconnection Agreement for CPNPP Units 3 and 4 is based on a net 3280 MW plant or 1640 MW per unit. As noted in Luminant's response to Question 08.02-5, this equates to 2889 A at 0.95 pf and 345 kV per unit.

The output of the main transformer (2889 A) reflects the net output of a unit (i.e. unit auxiliary loads are excluded), whereas 3346 A reflects the maximum output of the main generator at rated MVA (44.4 kA on the 26 kV system or 3346 A on the 345 kV system).

Impact on R-COLA

See attached marked-up FSAR Revision 1 page 8.2-3.

Impact on S-COLA

None.

Impact on DCD

None.

transmission lines. During unit startup, shutdown, maintenance, and during all postulated accident conditions, offsite electric power can be supplied to each unit site from the plant switching station through two physically independent transmission tie lines. One of these two transmission tie lines connects to the high-voltage side of the MT via a 345 kV circuit breaker. The other transmission tie line connects to two 345 kV circuit breakers at the unit switchyard, one circuit breaker is for RAT1 and RAT3, and the other circuit breaker is for RAT2 and RAT4. Both of any two outgoing transmission lines between the plant switching station and the remote offsite switching stations adequately maintain the voltage within ±5 percent of 345 kV at the high voltage side terminals of the MTs and RATs, while supplying full auxiliary loads of both units for all normal, abnormal and postulated accident conditions.

CP COL 8.2(4)
CP COL 8.2(5)

Add the following information after the last sentence of the second paragraph in DCD Subsection 8.2.1.2.

Neither the grid stability analysis in Subsection 8.2.2.2 nor the failure modes and effects analysis (FMEA) in Subsection 8.2.1.2.1.1 identified the non-safety related offsite power system as risk-significant during all modes of plant operation.

RCOL2_08.02-27

Add the following information after the last sentence of the eleventh paragraph in DCD Subsection 8.2.1.2.

The force-cooled continuous-current rating of the iso-phase bus duct section between the main generator and the main transformer is 44.4 kA, which provides 5% margin with respect to the 42.2 kA continuous current rating of the main generator.

CP COL 8.2(10)

Replace the last sentence of the fifteenth paragraph in DCD Subsection 8.2.1.2 with the following.

In case of a sudden pressure relay operation, the transformer is isolated.

CP COL 8.2(4)
CP COL 8.2(5)

Replace the second sentence of the eighteenth paragraph in DCD Subsection 8.2.1.2 with the following.

Minimum one-hour rated fire barriers are provided between all transformers. Figures 8.2-207 and 8.2-208 show physical layout of equipment in the Unit 3 and

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Docket Nos. 52-034 and 52-035

RAI NO.: 4538 (CP RAI #152)

SRP SECTION: 08.02 - Offsite Power System

QUESTIONS for Electrical Engineering Branch (EEB)

DATE OF RAI ISSUE: 4/13/2010

QUESTION NO.: 08.02-28

The regulatory basis for this question is described in NUREG-0800, Standard Review Plan, Chapter 8.2, "Offsite Power System."

In RAI 2577 (CP RAI #24), Question 08.02-11, the NRC staff requested the applicant to describe the monitoring program, including periodic testing, inspections, and corrective actions that will be implemented to avoid or arrest the degradation of cable insulation from the effects of moisture for all underground cables, dc and ac at all voltage levels. In their response to the RAI, the applicant stated that the cables are waterproof and rated to be installed in underground duct banks. In order to prevent the cables from being exposed to standing water for extended time periods, inspection of underground duct banks for cable in the scope of the maintenance rule (10 CFR 50.65) is performed. The initial periodic inspection frequency is six months. Increased inspection frequency would be initiated if accumulated water is found, with any additional corrective actions to be determined via implementation of the CPNPP maintenance rule and corrective action program.

The NRC staff's review of the applicant's response indicates that the program for underground cables does not appear to include inspection and testing to verify periodically the health of underground cables within the scope of 10 CFR 50.65. Operating experience has shown that cross-linked polyethylene (XLPE) or high-molecular-weight polyethylene insulation materials are most susceptible to water tree formation. The formation and growth of water trees vary directly with operating voltage. Cable failures have a variety of causes, including exposure to electrical transients or aging effects caused by moisture intrusion and water treeing due to adverse abnormal environmental conditions during operation. Contributing causes, such as splicing, manufacturing defects or damage caused by shipping and installation, could initiate the aging effects. The likelihood of failure from any of these causes increase over time as the cable insulation degrades. Therefore, periodic testing is necessary to determine the health of the cable. During the license renewal process, the industry agreed to use the guidance in Generic Aging Lessons Learned (GALL) Aging Management Program (AMP) XI.E3, "Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program". The above guidance specifies both testing and inspection of water accumulation. The staff, therefore, requests that the applicant justify why a testing program for underground power cables within

the scope of 10 CFR 50.65, particularly for cables in the medium voltage range, is not required. Additionally, the applicant is requested to address the frequency of such testing.

(RAI 08.02-28)

ANSWER:

Operating experience has shown that cables, especially medium voltage cables, in wet environments are susceptible to accelerated aging, water treeing and insulation degradation. In response to RAI No. 2577 (CP RAI #24), Question 08.02-11, a monitoring program was identified to inspect for accumulated water in underground cable installations within the scope of the Maintenance Rule, and for taking the necessary corrective actions. That response is not intended to imply that testing is not required. In addition to inspection, the monitoring program includes testing for cables exposed to a significant adverse moisture environment. Periodic testing of cable insulation for underground (including medium-voltage) cable within the scope of the maintenance rule (10 CFR 50.65) is conducted in accordance with established industry guidance to detect potential cable degradation from moisture intrusion. A cable monitoring program that includes methods for cable selection, test methods, and test frequencies will be implemented prior to fuel load authorization.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.