



Luminant

Rafael Flores
Senior Vice President &
Chief Nuclear Officer
rafael.flores@luminant.com

Luminant Power
P O Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.5590
F 254.897.6652
C 817.559.0403

CP-201001348
Log # TXNB-10069

Ref. # 10 CFR 52

October 6, 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. 4678

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein the response to Request for Additional Information (RAI) No. 4678 (CP RAI #172) for the Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4. The RAI involves the design of the safety-related ventilation systems.

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

There are no commitments in this letter.

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

Executed on October 6, 2010.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

Attachment: Response to Request for Additional Information No. 4678 (CP RAI #172)

1090
NRO

Electronic distribution w/attachment:

Rafael.Flores@luminant.com
mlucas3@luminant.com
jeff.simmons@energyfutureholdings.com
Bill.Moore@luminant.com
Brock.Degeyter@energyfutureholdings.com
rbird1@luminant.com
Allan.Koenig@luminant.com
Timothy.Clouser@luminant.com
Ronald.Carver@luminant.com
David.Volkening@luminant.com
Bruce.Turner@luminant.com
Eric.Evans@luminant.com
Robert.Reible@luminant.com
donald.woodlan@luminant.com
John.Only@luminant.com
JCaldwell@luminant.com
David.Beshear@txu.com
Ashley.Monts@luminant.com
Fred.Madden@luminant.com
Dennis.Buschbaum@luminant.com
Carolyn.Cosentino@luminant.com
NuBuild Licensing files

shinji_kawanago@mnes-us.com
masanori_onozuka@mnes-us.com
ck_paulson@mnes-us.com
joseph_tapia@mnes-us.com
russell_bywater@mnes-us.com
diane_yeager@mnes-us.com
mutsumi_ishida@mnes-us.com
nan_sirirat@mnes-us.com
nicolas_kellenberger@mnes-us.com
rjb@nei.org
kak@nei.org
michael.takacs@nrc.gov
cp34update@certrec.com
michael.johnson@nrc.gov
David.Matthews@nrc.gov
Balwant.Singal@nrc.gov
Hossein.Hamzehee@nrc.gov
Stephen.Monarque@nrc.gov
jeff.ciocco@nrc.gov
michael.willingham@nrc.gov
john.kramer@nrc.gov
Brian.Tindell@nrc.gov
Alicia.Williamson@nrc.gov
Elmo.Collins@nrc.gov
Loren.Plisco@nrc.com
Laura.Goldin@nrc.gov
James.Biggin@nrc.gov
Susan.Vrahoretis@nrc.gov
ComanchePeakCOL.Resource@nrc.gov
sfrantz@morganlewis.com
jrund@morganlewis.com
tmatthews@morganlewis.com
regina.borsh@dom.com
diane.aitken@dom.com

Luminant Records Management (.pdf files only)

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.: 4678 (CP RAI #172)

SRP SECTION: 06.04 – Control Room Habitability System

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

DATE OF RAI ISSUE: 7/28/2010

QUESTION NO.: 06.04-8

This is a follow-up to RAI 3451 (RAI No 77) Question No. 06.04-6.

Part I

The NRC staff requested that in responding to Question No. 06.04-6 and revising the FSAR, that the applicant establishes a consistency with the following regulatory positions:

Regulatory Position C.5 "Emergency Planning" of Regulatory Guide 1.78;
Regulatory Position 2.5 "Hazardous Chemicals" of Regulatory Guide 1.196;
Regulatory Position 2.2.1 "Comparison of System Design, Configuration, and
Operation with the Licensing Bases" of Regulatory Guide 1.196; and
Regulatory Position 2.7.1 Periodic Evaluations and Maintenance of Regulatory Guide 1.196.

In its response, the applicant stated:

“...The FSAR 6.4 commitment to RG 1.196 and RG 1.78 includes commitments to all applicable regulatory positions contained therein, including regulatory positions 2.5, 2.2.1, 2.7.1 of RG 1.196 and C.5 of RG 1.78 and any periodic survey recommendations.

As such, these positions will be addressed by Operating and Emergency Operating Procedures, as appropriate, per COLA FSAR 13.5.2.1.”

The level of detail provided is not sufficient to make a safety finding. For example, the reference to RG 1.196 is not invoked in any other part of the US-APWR DCD, Revision 2. A short description is needed in the COLA FSAR explaining how the procedures and training will address the noted regulatory positions. The staff requests that the COL applicant amend the FSAR to provide a short description of how the training and procedure will address these regulatory positions.

Part II

The staff closed RAI 3451 (RAI No. 77) Question No. 06.04-6 with the following request for additional information: *"Please include a discussion any arrangements that will be in place for notification of the control room when a release has occurred."*

The applicant did not respond to this part of the staff's request for additional information in its RAI response. The staff again requests that the COL applicant provide this information.

ANSWER:

Part I

Procedures and training will be developed consistent with the following regulatory positions of RG 1.78 and 1.196 as follows:

RG 1.78, Revision 1 (12/2001) Regulatory Position C.5

Position C.5 states:

The licensee should have written emergency procedures to be initiated in the event of a hazardous chemical release within or near the plant. These procedures should address both maximum concentration accidents and maximum concentration-duration accidents and should identify the most probable chemical releases at the station. Methods of detecting the event by station personnel, both during normal workday operation and during minimum staffing periods (late night and weekend shift staffing), should be discussed. Special instrumentation that has been provided for the detection of hazardous chemical releases should be described; the description should include the action initiated by the detecting instrument and the level at which this action is initiated. The emergency procedures should describe the isolation of the control room, the use of protective breathing apparatus or other protective measures, and maintenance of the plant in a safe condition, including the capability for an orderly shut down or scram. Criteria and procedures for evacuating nonessential personnel from the station should also be described.

The emergency planning should include training emergency planning personnel on the use of instruments. It should also include periodic drills on the procedure.

Arrangements should be made with Federal, State, and local agencies or other cognizant organizations for the prompt notification of the nuclear power plant when accidents involving hazardous chemicals have occurred within 5 miles of the plant.

How the CPNPP procedures and training will address the noted regulatory position:

In the response to RAI No. 3451 (CP RAI #77) Question 06.04-5 (ML093510531), FSAR page 6.4-3 was revised to state that all control room concentrations are shown to be below the IDLH limits, such that no procedures are required for operator action to don respirators or isolate the control room to address any of the hazardous chemical releases analyzed for the FSAR. Likewise, FSAR Subsection 6.4.6 states that no special instrumentation is required to detect the release of hazardous chemicals in the vicinity of CPNPP Units 3 and 4 because releases are below the IDLH. However, FSAR Subsection 13.2.1.1.3 has been revised to require operator training for toxic gas releases.

Procedures to address abnormal plant conditions and to implement Emergency Action Levels are developed as described in FSAR Subsection 13.5.2 and address the range of actions necessary to address the event of concern. The Emergency Plan is developed per NEI 99-01, which includes Emergency Action Levels to address a toxic gas release (e.g., see EAL HU3 and HA3 in NEI 99-01 Revision 5). A toxic gas release is within the scope of procedures addressed by FSAR Subsection 13.5.2. Training is addressed in the CPNPP Emergency Plan and in FSAR Section 13.2. FSAR page 6.4-3 has been revised to identify where these procedure and training are addressed in the FSAR.

Both Hood County and Somervell County have requirements that CPNPP be notified when accidents involving hazardous chemicals have occurred within 5 miles of the plant.

RG 1.196, Revision 1 (1/2007) Regulatory Position 2.2.1

Position 2.2.1 states:

Licensees should compare the design, configuration, and operation of their CRHSs and the systems that are in adjacent areas and could interact with the CRE to their licensing bases to ensure consistency.

How the CPNPP procedures and training will address the noted regulatory position:

Tier 1 Section 2.7.5.1.2 (Table 2.7.5.1-3) has ITAAC that address CRE integrity and verify the functional arrangement of the MCR HVAC equipment and systems in adjacent areas with the design description. Additional FSAR changes are not required because Tier 1 has been incorporated by reference. Verification of systems in adjacent areas is achieved through confirmation of air in-leakage rates, as discussed for RG 1.196 Position 2.2.2 below.

RG 1.196, Revision 1 (1/2007) Regulatory Position 2.2.2

Position 2.2.2 states:

The conditions that exist in the areas adjacent to the CRE influence the performance of the CRHSs. Although these systems might not be expected to operate during an emergency, during a loss of offsite power (LOOP), or with a single failure, in-leakage may be increased if they do operate. Potential interactions between the CRHSs and adjacent areas that may increase the transfer of contaminants into the CRE should be identified.

How the CPNPP procedures and training will address the noted regulatory position:

The CRE is potentially impacted by the HVAC equipment and systems in areas adjacent to the MCR. This potential impact would take the form of an unacceptable value of in-leakage into the MCR during or after a plant event. DCD Tier 2 Subsection 14.2.12.1.101 describes the pre-operational test for the MCR HVAC system. This test includes verifying air in-leakage per RG 1.196 and ASTM E-741-00 (Section C, Item 6). This testing confirms the functional arrangement of the HVAC equipment and systems in the areas adjacent to the MCR. FSAR page 6.4-3 has been revised to reference the ITAAC and test procedure that addresses these positions.

RG 1.196, Revision 1 (1/2007) Regulatory Position 2.5

Position 2.5 states:

The NRC Staff recommends periodic surveys of stationary and mobile sources of hazardous chemicals in the vicinity of the plant site at least once every 3 years and an annual onsite survey of hazardous chemical sources.

How the CPNPP procedures and training will address the noted regulatory position:

FSAR Subsection 6.4.4.2 has been revised to address this requirement.

RG 1.196, Revision 1 (1/2007) Regulatory Position 2.7.1

Position 2.7.1 states:

Periodic assessments of the CRHS's material condition, configuration controls, safety analyses, and operating and maintenance procedures should be performed. CRHS programs should assess the system and material conditions as described in Section 9.3.1, "System Material Condition," of NEI 99-03 (Ref. 1).

How the CPNPP procedures and training will address the noted regulatory position:

FSAR Subsection 13.5.2.2 has been revised to address periodic assessment of the CRHS material condition, configuration controls, safety analyses and operating and maintenance procedures in accordance with the guidance in RG 1.196.

Part II

The local emergency plans, which are included in Part 5 of the COLA, include provisions to notify the public, and especially those members of the public that would be directly affected, of abnormal conditions in the community. Luminant has worked with the local communities in the development of these local plans, and conditions such as a release of hazardous material would be within the scope of the plans. Within the plant, it is part of the training provided to all plant employees to inform the control room of any abnormal or adverse condition that occurs.

Both Hood County and Somervell County require prompt notification of CPNPP of any accidents involving hazardous chemicals that have occurred within five miles of the plant. The Unit 3 and 4 control rooms interface with the Unit 1 and 2 control room as described in FSAR Subsection 13.3.2 via the Emergency Plans and would keep each other informed if a toxic gas event were to occur.

Impact on R-COLA

See attached marked-up FSAR Revision 1 pages 6.4-3, 13.2-2, and 13.5-7.

Impact on DCD

None.

Comanche Peak Nuclear Power Plant, Units 3 & 4
COL Application
Part 2, FSAR

will exceed the IDLH (10 ppm) at about 2.5 minutes, remain elevated until approximately 7 minutes, and then start decreasing slowly on a scale based on the volume and ventilation rates in the MCR.

For Class F stability and the worst case sensitivity analysis conditions of an intake height of 0 m, solar radiation of 1150 W/m², a wind speed of 6 m/s, air and ground temperature of 115 °F, and cloud cover of 0 tenths, the concentration in the MCR reaches the human detection threshold for chlorine (0.08 ppm) at approximately 0.25 minutes and reaches the maximum concentration (8.0 ppm) in approximately 16 minutes.

RCOL2_06.0
4-9

RG 1.78 states that it is expected that a control room operator will don a respirator and protective clothing, or take other mitigating action within two minutes after detection. ~~The concentration in the MCR reaches the human detection threshold for chlorine (3.5 ppm) at approximately 9 minutes and reaches the maximum concentration (5.7 ppm) in approximately 13 minutes.~~ Also during a toxic gas emergency, the control room operators have the option of manually actuating the emergency isolation mode of the MCR HVAC System.

RCOL2_06.0
4-9

All of the FSAR Table 2.2-214 assumed chemical releases were analyzed with the HABIT code, and produce maximum control room concentration values well below the IDLH. Therefore, there will be no procedure requiring operator action, either donning respirators and protective clothing or manually isolating the control room HVAC System. Both of these response actions will be considered at the discretion of the operators in the event of a toxic gas release. The CPNPP Units 3 and 4 Emergency Plan includes provisions for maintaining self-contained breathing apparatuses (SCBAs) in the control room. A toxic gas release is within the scope of procedures addressed by FSAR Subsection 13.5.2. Training is addressed in the CPNPP Emergency Plan and in Subsection 13.2 of the FSAR.

RCOL2_06.0
4-5

Periodic surveys are conducted for onsite chemicals annually and for offsite at least once every three years for stationary and mobile sources of hazardous chemicals within a five mile radius of the plant in accordance with Regulatory Guide 1.196 Regulatory Position 2.5. In addition, prior to use, chemicals and chemicals of potential impact (halogenated gas or liquid products to be purchased in quantities of 100 pounds or greater) require a Control Room Habitability assessment. Procedures to implement these periodic surveys and chemical evaluations are developed per Subsection 13.5.2.2.

RCOL2_06.0
4-1

RCOL2_06.0
4-8

ITAAC (Tier 1 Section 2.7.5.1.2) and pre-operational tests (Tier 2 Subsection 14.2.12.1.101) address CRE integrity and verify the functional arrangement of MCR HVAC equipment and systems in adjacent areas with the design description, in accordance with RG 1.196. Operating and maintenance procedures as mentioned in FSAR Section 13.5 address periodic assessment of the CRHS's material condition, configuration controls, safety analyses and operating and maintenance procedures in accordance with the guidance in RG 1.196.

Comanche Peak Nuclear Power Plant, Units 3 & 4
COL Application
Part 2, FSAR

provided by ACAD 08-001, "The Process for Initial Accreditation of Training in the Nuclear Power Industry." FSAR Figure 13.1-205 depicts anticipated milestone dates to support initial fuel load.

RCOL2_13.0
1.01-3

13.2.1.1.1 Licensed Plant Staff Training Program

Replace the content of DCD Subsection 13.2.1.1.1 with the following.

The content of this subsection is discussed above.

13.2.1.1.2 Non-Licensed Plant Staff Training Program (to be verified during construction)

Replace the content of DCD Subsection 13.2.1.1.2 with the following.

The content of this subsection is discussed above.

Add the following Subsection after DCD Subsection 13.2.1.1.2.

13.2.1.1.3 Hazards Awareness Training

Workers and operators will receive initial and annual refresher training for protection from chemical hazards and confined space entry in accordance with 29 CFR 1910. As part of this training, operators receive training for response to toxic gas release events.

RCOL2_06.0
4.-8

13.2.1.2 Coordination with Preoperational Tests and Fuel Loading

Replace the content of DCD Subsection 13.2.1.2 with the following.

The content of this subsection is discussed above.

13.2.2 Applicable Nuclear Regulatory Commission Documents

Replace the content of DCD Subsection 13.2.2 with the following.

The content of this subsection is discussed above.

13.2.3 Combined License Information

Replace the content of DCD Subsection 13.2.3 with the following.

STD COL 13.2(1) **13.2(1) Training program**
This COL item is addressed in Section 13.2.

STD COL 13.2(2) **13.2(2) Training programs for reactor operators.**
This COL item is addressed in Section 13.2.

STD COL 13.2(3) **13.2(3) Training programs for non-licensed plant staff**
This COL item is addressed in Section 13.2.

Comanche Peak Nuclear Power Plant, Units 3 & 4
COL Application
Part 2, FSAR

as appropriate, to vital areas within the station. Information concerning specific design features and administrative provisions of the security plan is accorded limited distribution on a need-to-know basis.

- Procedures address periodic assessment of the Control Room Habitability System's material condition, configuration controls, safety analyses and operating and maintenance procedures in accordance with the guidance in RG 1.196. RCOL2_06.0
4-8

13.5.3 Combined License Information

Replace the content of DCD Subsection 13.5.3 with the following.

- STD COL 13.5(1) **13.5(1)** *Administrative procedures*
This COL item is addressed in Subsection 13.5 through 13.5.1.2.
- 13.5(2)** *Deleted from the DCD.*
- STD COL 13.5(3) **13.5(3)** *Procedures performed by licensed operators in the control room*
This COL item is addressed in Subsection 13.5.2 and 13.5.2.1.
- STD COL 13.5(4) **13.5(4)** *Different classifications of procedures*
This COL item is addressed in Subsection 13.5.2 and 13.5.2.1.
- STD COL 13.5(5) **13.5(5)** *Program for developing operating procedures*
This COL item is addressed in Subsection 13.5.2 and 13.5.2.1.
- STD COL 13.5(6) **13.5(6)** *Program for developing and implementing emergency operating procedures*
This COL item is addressed in Subsection 13.5.2 and 13.5.2.1.
- STD COL 13.5(7) **13.5(7)** *Classifications of maintenance and other operating procedures*
This COL item is addressed in Subsection 13.5.2.2.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4
Luminant Generation Company LLC
Docket Nos. 52-034 and 52-035

RAI NO.: 4678 (CP RAI #172)

SRP SECTION: 06.04 – Control Room Habitability System

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

DATE OF RAI ISSUE: 7/28/2010

QUESTION NO.: 06.04-9

- 1. Credit being taken for the chemical hazard calculation to support the statement as described in Sec. 6.4.4.2 of COLA Part 2. FSAR**

Do any of the calculations credit design features, such as an elevated control room intake, to keep the chemical concentration in the control room below the IDLH (Immediately Dangerous to Life and Health) levels? If so, provide a description in the FSAR of design features credited in the design basis analysis.

- 2. Justification of HABIT input data – solar radiation and air and ground temperatures**

Justify the data used in HABIT analysis, specifically, the solar radiation that will represent the site, while air and ground temperatures, to be consistent with the temperature as shown in the site characteristics table (FSAR Table 2.0-1R).

- 3. Demonstration of conservatism for the selection of Pasquill stability class and wind speed in the HABIT analysis**

FSAR Sec. 6.4.4.2 states that the meteorological condition assumed for the analysis is conservatively set at G stability and 2.5 m/s wind speed. Provide HABIT run results to demonstrate that the selected data set is conservative.

- 4. Demonstration of peak chemical concentration in main control room obtained from HABIT run for all chemical release hazards under analysis.**

FSAR Sec. 6.4.6 concludes that no instrumentation to detect and alarm is required. This conclusion is based on the HABIT run that no hazardous chemical concentrations will exceed the IDLH. To demonstrate that the IDLH has not been exceeded, it is important to verify that the HABIT calculation has not terminated before the peak concentration has occurred. Please verify that the HABIT calculations show the concentration has peaked and is decreasing (or has leveled-off) before the calculation has terminated. Provide the numeric output of the portion of HABIT run that demonstrates the peak chemical concentration in main control room has been calculated.

ANSWER:

Introduction

A sensitivity analysis was performed to justify and show the effects of changes to the original most-limiting analysis described in FSAR Subsection 6.4.4.2. The sensitivity analysis considered changes in control room intake height (14.3 m vs. 0 m), solar radiation values (600 W/m² vs. 1150 W/m²), stability class (E, F, or G), wind speed (1 m/s to 6 m/s, with 6 m/s used as a conservatively higher wind speed than the RG 1.78 95% worst meteorology value based on the joint frequency distribution), air and ground temperatures (77°F, 100°F, 115°F); and cloud cover (0 – 10, in tenths). These sensitivity analysis HABIT runs were performed changing one variable at a time.

As shown in Table 06.04-9-1, Class F stability corresponds to the RG 1.78 95% worst-case meteorology. Accordingly, new HABIT code runs were developed to show the cumulative effect of the worst case variables. The worst-case variables utilized in this analysis for the stability Class F were an intake height of 0 m, solar radiation of 1150 W/m², wind speed of 6 m/s, air and ground temperature of 115°F, and cloud cover of 0 tenths. All results were below the applicable IDLH.

The original HABIT analysis results outlined in FSAR Subsection 6.4.4.2 have been revised to reflect the new HABIT analysis results with Class F stability (per RG 1.78 as discussed in Item 3 below) and the most conservative parameters identified from the sensitivity analysis.

Specific Responses

1. The only design feature used in the original analyses described in FSAR Subsection 6.4.4.2 was a control room intake height of 14.3 m. The control room concentration with this intake height was below its limiting values (IDLH). A HABIT sensitivity analysis comparison was performed with a change in intake height from 14.3 m to 0 m (the same as the assumed release height). The results showed that there is a small increase in concentration, but the concentrations are still well below the limiting values (IDLH). Therefore, the original analyses do not rely on any design features to meet a value less than the limit.
2. The original HABIT analyses in the FSAR used a solar radiation value of 600 W/m² for the CPNPP site. The sensitivity analysis comparison referred to above was performed using solar radiation values ranging from 600 W/m² to 1150 W/m² and showed no significant deviation from the original analyses results. The HABIT sensitivity analysis utilized the DCD 0% exceedance maximum dry bulb temperature of 115°F as a worst-case temperature scenario. The temperature of 115°F is shown in DCD Table 2.0-1 Sheet 1 and in FSAR Table 2.0-1R Sheet 2.
3. The HABIT sensitivity analysis compared results at Classes E, F and G stability and demonstrated that the use of Class G stability is the most conservative. However, as Class G stability occurs less than 5% of the time at the CPNPP site (see Table 06.04-9-1 below), Class F stability is utilized in the HABIT sensitivity analysis per Appendix A of RG 1.78. HABIT sensitivity analyses for Class F stability and a range of wind speeds from 1 m/s to 6 m/s was performed to determine the worst wind speed. A summary of these results are located in Figure 06.04-9-1, which are the results from CHEM (a determination of the chemical concentration inside the control room) and Figure 06.04-9-2, which are the results from EXTRAN (a calculation of the chemical concentration outside the control room at the air intake). The worst-case wind speed was 6 m/s as shown in Figures 06.04-9-1 and 06.04-9-2, below.
4. The new HABIT CHEM analysis results demonstrate that the calculation is asymptotically approaching a maximum for the worst case 6 m/s wind speed (see Figure 06.04-9-1). For lower wind speeds with lower calculated control room concentration curves that have not peaked, the

results are analyzed in terms of the 0.08 ppm odor threshold (from NUREG/CR-6624) for chlorine. In each case, the time between the 0.08 ppm odor threshold limit and the calculated highest concentration is well in excess of the RG 1.78 value of 2 minutes to don SCBAs. As the IDLH value for chlorine is 10 ppm, there is no threat to CRH.

All results of the original and new sensitivity analyses were acceptable. FSAR Subsection 6.4.4.2 has been revised to reflect the new analysis results with Class F stability and the most conservative parameters identified from the sensitivity analyses.

Impact on R-COLA

See attached marked-up FSAR Revision 1 pages 6.4-2 and 6.4-3.

Impact on DCD

None.

Table 06.04-9-1. Total Hours in Each Stability Class

Year	Class A	Class B	Class C	Class D	Class E	Class F	Class G
2001 - 2006	657	576	660	4088	2023	490	261
Percent in Class	7.5	6.6	7.5	46.7	23.1	5.6	3.0

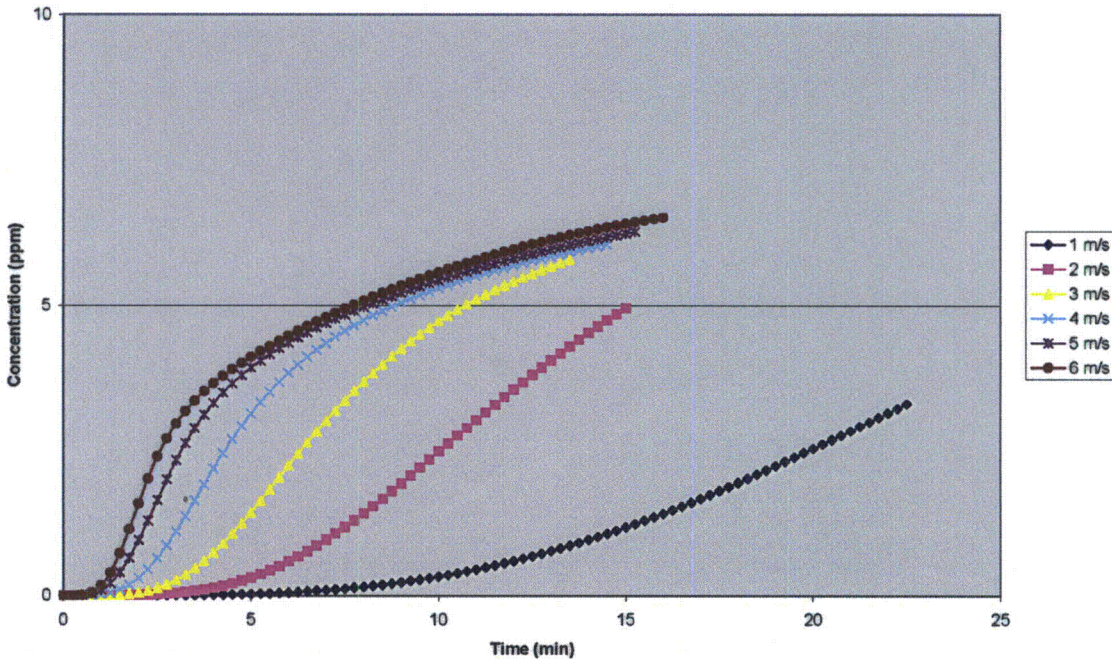


Figure 06.04-9-1. Chlorine Release - CHEM Results (Concentration inside Control Room)

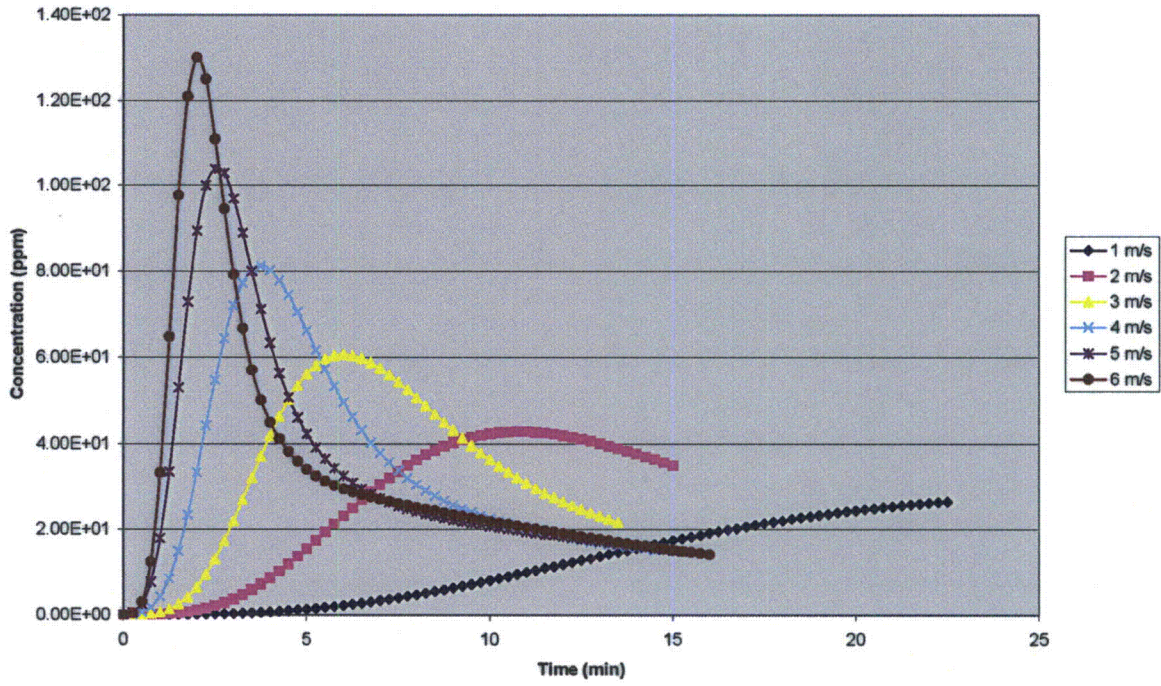


Figure 06.04-9-2. Chlorine Release - EXTRAN Results
(Concentration outside Control Room at Air Intake)

Comanche Peak Nuclear Power Plant, Units 3 & 4
COL Application
Part 2, FSAR

requirements of RG 1.78. Chemicals, including chemicals in Comanche Peak Nuclear Power Plant (CPNPP) Units 1 and 2, are identified and screened as described in Subsection 2.2.3.1.3.

Several hazardous chemicals exceed the screening criteria provided in RG 1.78 and an analysis is required to determine control room concentrations. Toxic chemicals that do not meet RG 1.78 screening criteria are identified in Table 2.2-214, and calculated ~~maximum~~maximum control room concentrations of each chemical are also described in Table 2.2-214. Using conservative assumptions and input data for chemical source term, CPNPP Units 3 and 4 control room parameters, site characteristics, and meteorology inputs, postulated chemical releases are analyzed for maximum value concentration to the MCR using the HABIT code, version 1.1. RG 1.78 specifies the use of HABIT 1.1 software for evaluating control room habitability. HABIT software includes modules that evaluate radiological and toxic chemical transport and exposure. For this analysis of chemical release concentrations, EXTRAN, and CHEM modules are utilized in the code. EXTRAN models toxic chemical transport from the selected release point to the heating, ventilation, and air conditioning (HVAC) intake for the MCR. CHEM is then applied by HABIT to model chemical exposure to control room personnel, based on EXTRAN output and MCR design parameters.

RCOL2_06.0
4-9

The meteorological conditions assumed for these cases ~~are conservatively~~were initially set at G stability and 2.5 m/s wind speed, ~~or slightly which is~~ more extreme than 95th percentile for the CPNPP site. The 2.5 m/s wind speed is higher than would be expected for G stability but is conservative in that it introduces the chemical gas into the intakes faster than at lower speeds. The analyses are thus bounding. Lower concentrations are calculated on average using F stability and ~~4 m/s wind speed~~results for a range of wind speeds and worst case conditions are also presented below as a sensitivity analysis.

RCOL2_06.0
4-9

RCOL2_06.0
4-9

The HABIT-based analysis determines the peak concentration in the MCR and compares this level to the RG 1.78 criterion, the specific chemical listed immediately dangerous to life and health (IDLH). In the cases that were analyzed, all postulated releases led to concentrations that are well below the IDLH level. Values of IDLH for various chemicals are found in NUREG/CR-6624 (Reference 6.4-201).

The most limiting case, or the one that leads to the highest control room concentration relative to the IDLH, is the tanker truck release of chlorine on Highway FM 56, at a distance of closest approach to CPNPP Units 3 and 4 MCR intake of 1.4 miles. Chlorine is used for this case because it is one of the most hazardous Department of Transportation approved chemicals, and bounds other chemicals by toxicity, dispersibility, and quantity that may use public transportation such as Highway FM 56. Using the methodology prescribed by RG 1.78, the HABIT initial analysis for G stability and 2.5 m/s wind speed showed MCR concentration remains below 5.7 ppm at equilibrium in the MCR. This concentration (5.7ppm) is less than the IDLH concentration for chlorine (10 ppm). The concentration at the MCR HVAC intakes, that is the concentration of outside,

RCOL2_06.0
4-9

Comanche Peak Nuclear Power Plant, Units 3 & 4
COL Application
Part 2, FSAR

will exceed the IDLH (10 ppm) at about 2.5 minutes, remain elevated until approximately 7 minutes, and then start decreasing slowly on a scale based on the volume and ventilation rates in the MCR.

For Class F stability and the worst case sensitivity analysis conditions of an intake height of 0 m, solar radiation of 1150 W/m², a wind speed of 6 m/s, air and ground temperature of 115 °F, and cloud cover of 0 tenths, the concentration in the MCR reaches the human detection threshold for chlorine (0.08 ppm) at approximately 0.25 minutes and reaches the maximum concentration (8.0 ppm) in approximately 16 minutes.

RCOL2_06.0
4-9

RG 1.78 states that it is expected that a control room operator will don a respirator and protective clothing, or take other mitigating action within two minutes after detection. ~~The concentration in the MCR reaches the human detection threshold for chlorine (3.5 ppm) at approximately 9 minutes and reaches the maximum concentration (5.7 ppm) in approximately 13 minutes.~~ Also during a toxic gas emergency, the control room operators have the option of manually actuating the emergency isolation mode of the MCR HVAC System.

RCOL2_06.0
4-9

All of the FSAR Table 2.2-214 assumed chemical releases were analyzed with the HABIT code, and produce maximum control room concentration values well below the IDLH. Therefore, there will be no procedure requiring operator action, either donning respirators and protective clothing or manually isolating the control room HVAC System. Both of these response actions will be considered at the discretion of the operators in the event of a toxic gas release. The CPNPP Units 3 and 4 Emergency Plan includes provisions for maintaining self-contained breathing apparatuses (SCBAs) in the control room. A toxic gas release is within the scope of procedures addressed by FSAR Subsection 13.5.2. Training is addressed in the CPNPP Emergency Plan and in Subsection 13.2 of the FSAR.

RCOL2_06.0
4-5

Periodic surveys are conducted for onsite chemicals annually and for offsite at least once every three years for stationary and mobile sources of hazardous chemicals within a five mile radius of the plant in accordance with Regulatory Guide 1.196 Regulatory Position 2.5. In addition, prior to use, chemicals and chemicals of potential impact (halogenated gas or liquid products to be purchased in quantities of 100 pounds or greater) require a Control Room Habitability assessment. Procedures to implement these periodic surveys and chemical evaluations are developed per Subsection 13.5.2.2.

RCOL2_06.0
4-8

RCOL2_06.0
4-1

RCOL2_06.0
4-8

ITAAC (Tier 1 Section 2.7.5.1.2) and pre-operational tests (Tier 2 Subsection 14.2.12.1.101) address CRE integrity and verify the functional arrangement of MCR HVAC equipment and systems in adjacent areas with the design description, in accordance with RG 1.196. Operating and maintenance procedures as mentioned in FSAR Section 13.5 address periodic assessment of the CRHS's material condition, configuration controls, safety analyses and operating and maintenance procedures in accordance with the guidance in RG 1.196.

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.: 4678 (CP RAI #172)

SRP SECTION: 06.04 – Control Room Habitability System

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

DATE OF RAI ISSUE: 7/28/2010

QUESTION NO.: 06.04-10

New follow-up RAI

This is a follow-up RAI to RAI 3451 (RAI Number 77) Question No. 06.04-4 and consists of three Parts:

Part I

The EXTRAN inputs cite a MCR height of 14.3 meters (i.e. 46.9 feet). The staff's review of US-APWR DCD Revision 2 Figure 6.4-5 and Figure 6.4-6 indicates that the Main Control Room fresh air intakes are at an elevation of between 50'2" and 65'0". The staff requests additional information that explains this apparent mismatch of EXTRAN input from information contained in the DCD. Either the DCD should be amended or the information used in the EXTRAN analysis should be amended to correct this perceived mismatch.

Part II

The staff notes that the applicant used an EXTRAN input parameter of 25°C for the Storage and Air Temperature. The regulatory position of 3.3 "Atmospheric Dispersion" from Regulatory Guide 1.78 Revision 1 reads that

"Irrespective of the dispersion model or the analysis tool used, the value of the atmospheric dilution factor between the release point and the control room that is used in the analysis should be that value that is exceeded only 5% of the time."

The staff's review of Revision 1 of the applicant's COLA FSAR Chapter 2 does not support the applicant's decision to use 25°C (77°F) as the value for the Storage and Air Temperature. Please verify that 25 C is the 5% exceedance value.

Part III

The staff notes that the applicant's answer to RAI 3451 (RAI No. 77) Question No. 06.04-4 includes two different flow rates into the control room envelope (CRE).

Intake Flow rate: 1,800 cfm (0.8495 m³/second)
Additional Infiltration Rate: 120 cfm (0.05663 m³/second).

The staff notes that the 120 cfm flow rate value corresponds to a pressurized CRE in response to radiological control event. Explain why this in-leakage value would correct or be conservative for use in a toxic gas accident response and justify the values selected. If you are crediting of assuming some sort of operator action, please explain what would direct the operators to take such action.

ANSWER:

Part I

The value of 46.9 feet was utilized as a bounding value and does not directly correspond to any physical property.

DCD Figure 6.4-6 indicates the position of the MCR fresh air intake duct penetrating the reactor building wall at an elevation between 50'-2" and 65'-0". The MCR fresh air intakes are equipped with missile shields to protect them from tornado missiles. The bottom of the missile shield is located at an elevation of 48.3 ft. The elevation of the MCR fresh air intake specified as an input of the EXTRAN and CHEM is 46.9 ft including an additional conservatism because the lower the elevation of the MCR fresh air intake, the more conservative the EXTRAN and CHEM analysis are. The new sensitivity analyses referred to in the response to Question 06.04-9 above was performed for the most conservative height of 0 ft. The results show that the small changes are still well within the IDLH threshold. The sensitivity analysis representing the most conservative set of conditions, as described in the response to Question 06.04-9, has been included in the amended calculation.

Part II

The value of 25°C (77°F), used in the original HABIT calculation, is the US-APWR 1% exceedance coincident wet bulb temperature (DCD Table 2.0-1, Sheet 1). The new sensitivity analyses referred to in the response to Question 06.04-9 utilized a higher ground temperature of 115°F, which is the DCD 0% exceedance dry bulb temperature, to calculate the most conservative concentrations for CPNPP Units 3 and 4. The sensitivity analysis comparison results obtained with 0% exceedance dry bulb temperature yield slightly higher concentrations inside the control room compared with the other temperatures. Hence, the 0% exceedance dry bulb value is the most conservative value for the air and ground temperature. The results of this sensitivity analysis demonstrate that the resulting MCR concentrations are acceptable.

Part III

The in-leakage flow rate of 120 cfm was utilized as the worst case additional in-leakage flow rate and was added to the unfiltered bypass flow. Thus, the worst-case condition of maximum intake airflow (1800 cfm intake airflow rate plus 120 cfm infiltration rate) as in-leakage (for any mode) was utilized. These values are consistent with the worst case accident flow rates in DCD Chapter 15, Table 15.6.5-5. No operator action is credited.

Impact on R-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 4678 (CP RAI #172)

SRP SECTION: 06.04 – Control Room Habitability System

QUESTIONS for Containment and Ventilation Branch 1 (AP1000/EPR Projects) (SPCV)

DATE OF RAI ISSUE: 7/28/2010

QUESTION NO.: 06.04-11

This is a follow-up RAI to RAI No. 3968 (RAI No. 25) Question 06.04-7 and consists of two Parts:

Part I

The staff found that the applicant's response to Question 06.04-7 includes an analysis of the CRE asphyxiation hazard (i.e. toxic gas) from the refrigerant charge only. However, the potential for toxic chemicals in the refrigerant oil was not addressed. The staff requests that the COL applicant amend its response to reflect this threat to the CRE habitability from the aspect of a toxic gas hazard to the Control Room operators.

Part II

The staff notes that the applicant's response implies that the US-APWR DCD design will include; (1) a dedicated ventilation purge exhaust system to remove a massive freon/refrigerant oil dump directly to the room from the housed chiller; and (2) pressure relief device to safely relieve pressure buildup due to a fire or other abnormal conditions and the relief discharge is piped outside the system. The applicant implies that both the non-essential chillers in the Auxiliary Building and the essential chillers in the Power Source Building will have these dedicated systems. However in US-APWR DCD RAI No. 338-2325 Question No. 06.04-6, the DCD applicant, MHI, only commits to add these plant design enhancements for the non-essential chillers of the Auxiliary Building. As such, the COL applicant's response is in error with this implication. The staff requests that the COL applicant provide an amended response to correct this error and address the staff's concerns about public health and safety from a massive refrigerant release laced with refrigerant oil.

The staff notes that Revision 2 of the US-APWR DCD failed to include the committed to changes of DCD RAI No. 338-2325 Question No. 06.04-6.

ANSWER:

Part I

The typically-used refrigerant (R-134a) uses R-134a PAG (Polyalkylene Glycol) Oil Charge. The MSDS shows "None Known" for any hazardous exposure limits and "Not Determined" for vapor pressure for this chemical. Hence it was screened out for the control room habitability analysis and the response does not require amendment.

Part II

The inconsistency between the COLA response regarding both non-essential and essential chillers and the DCD response regarding only non-essential chillers was resolved by the response to DCD RAI No. 559-4387 Question 06.04-13 (ML101450208), which addresses the essential chillers.

The response to DCD RAI No. 338-2325 Question 06.04-6 (ML091700682) was revised in the response to DCD RAI No. 559-4387 Question 06.04-13 (ML101450208). The response to Question 06.04-13 states that the equipment rooms in the Power Source Building (containing the essential chiller units) and in the Auxiliary Building (containing the non-essential chiller units) are serviced by the Auxiliary Building HVAC system, which is a once-through system. The response also states that the essential chilled water system and non-essential chilled water system are protected by a pressure-relief device to safely relieve pressure buildup. In the response, the DCD applicant committed to revise DCD Subsections 9.2.7.2.1 and 9.2.7.2.2 to reflect the response to Question 06.04-13.

Luminant hereby amends the response to RAI No. 3968 (RAI CP #125) Question 06.04-7 (ML100550345) to be consistent with the response to DCD Question 06.04-13, in order to address public health and safety concerns from a massive refrigerant release laced with refrigerant oil. The last paragraph of the response to Question 06.04-7 is replaced by the following:

The refrigerant sources nearest the control room envelope of sufficient quantity to be considered a potential personnel safety concern are in the Power Source Buildings where the essential chillers are located and in the Auxiliary Building where the non-essential chillers are located. Both the essential and non-essential chillers are remote from the Main Control Room. There are also several structural barriers between the chiller units and the Main Control Room which would impede any refrigerant flow toward the Main Control Room Envelope and its supply air inlets. Tight-fitting doors are provided in the chiller unit rooms to minimize the possibility of released refrigerant to pass through the door and reach the MCR or other safety-related facilities. The rooms containing the chiller units are designed in accordance with ANSI/ASHRAE Standard 15, "Safety Standard for Refrigeration Systems." The auxiliary building HVAC system is a once-through system and serves these rooms to exhaust any accumulation of refrigerant due to leaks or a line rupture of the system. Each chiller room has a refrigerant detector that actuates an alarm in the MCR. The chillers are also designed in accordance with ANSI/ASHRAE Standard 15. The refrigeration system is protected by a pressure-relief device to safely relieve pressure buildup due to a fire or other abnormal conditions and the relief discharge is piped to the outside of the building. The pressure relief for the chiller rooms and the exterior fresh air intake are designed to prevent refrigerant re-entry into any building, especially the Main Control Room, thereby eliminating an asphyxiation hazard associated with the refrigerant. The typically-used refrigerant (R-134a) uses R-134a PAG (Polyalkylene Glycol) Oil Charge. The MSDS shows "None Known" for any hazardous exposure limits and "Not Determined" for vapor pressure for this chemical. Therefore, the refrigerant oil is not considered hazardous because it is screened out in the control room habitability analysis. As above, these systems are designed to ensure public health and safety from a massive refrigerant release laced with refrigerant oil.

Impact on R-COLA

None.

Impact on DCD

None.