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Ref. # 10 CFR 52

June 7, 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. 4579, 4606, 4608, AND 4609

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein the response to Request for Additional Information (RAI) No. 4579, 4606, 4608, and 4609 for the Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4. RAI No. 4579 involves emergency planning while the other RAIs involve meteorology questions.

Should you have any questions regarding these responses, 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 June 7, 2010.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

Attachments:
1. Response to Request for Additional Information No. 4579 (CP RAI #159)
2. Response to Request for Additional Information No. 4606 (CP RAI #155)
3. Response to Request for Additional Information No. 4608 (CP RAI #157)
4. Response to Request for Additional Information No. 4609 (CP RAI #160)

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NRO

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# Attachment 1

## Response to Request for Additional Information No. 4579 (CP RAI #159)

# 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.: 4579 (CP RAI #159)**

**SRP SECTION: 13.03 - Emergency Planning**

**QUESTIONS for USAPWR Projects Branch (NMIP)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 13.03-38**

**Open Item 13.03-08:** On-site Emergency Response Organization (ERO)
[Basis: 10 CFR 50, Appendix E.IV.A: 1, 2, 4, 5; NUREG-0654/FEMA-REP-1, Evaluation Criterion B1 through 9]
Acceptance Criteria: (NUREG-0800, section 13.3): Requirements A and B; Acceptance Criteria 1 and 2.

In **RAI 13.03-3.B-2,** the NRC staff requested information regarding other employees and non-employees in supporting organizations and their special qualifications by position and function to be performed that may be called upon for assistance for emergencies. In response, the applicant stated that individuals who are not members of the ERO, but who may be called on for assistance are many and varied, and are considered outside the Emergency Plan. However, 10 CFR 50, Appendix E.IV.A.5 states, that the applicant shall identify employees with special qualifications for coping with emergency conditions by position and function to be performed during an emergency. Staff requests that the Emergency Plan identify, by position and function to be performed, other employees of the licensee with special qualifications for coping with emergency conditions that may arise as required under 10 CFR 50, Appendix E.IV.A.5.

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**ANSWER:**

As described in the Luminant response to RAI # 78, Question No. 13.03-03.B-1 (ML093240321), the Emergency Plan provides a discussion of the staffing and functions of the Emergency Response Organization (ERO). Sections II.B.1, II.B.2, and II.B.5 of the Emergency Plan identify the positions by title and the responsibilities of the ERO positions. The responsibilities of ERO Support Staff are discussed in Section II.B.5. Luminant maintains sufficient management and personnel resources to effectively staff the ERO and its intended emergency mitigation functions. The ERO does not include other employees with special qualifications outside of those described in the Emergency Plan.

Section II.B.7 of the Emergency Plan discusses additional resources that may be called upon for additional support in a protracted event. As described in Luminant's response to RAI # 78, Question No. 13.03-03.B-1, the types of support envisioned do not require a formal Corporate Emergency

Support Organization and are typical of functions necessary for the normal conduct of business for a nuclear utility. These services include public information, materials procurement, contract manpower and construction, and legal and insurance support. These support functions are those functions that are performed routinely by the personnel and departments involved and are not specific to the Emergency Plan.

Section II.B.5 of the Emergency Plan has been revised to clarify that these support personnel are not members of the ERO.

Impact on R-COLA

See attached marked-up Section II.B.5 of the Emergency Plan, Revision 1 page II-19.

Impact on S-COLA

None.

Impact on DCD

None.

- authorizing personnel exposures in excess of 10 CFR Part 20 limits
- making PARs to off-site authorities
- notification of Texas and Somervell and Hood County authorities responsible for off-site emergency response

The Emergency Coordinator has the authority to request assistance from any organization which the Emergency Coordinator deems necessary to mitigate the conditions causing the emergency. In addition, the Emergency Coordinator may request off-site assistance in firefighting, rescue services, law enforcement, and medical support prior to activation of the on-site emergency response organization (see Figure II-1).

Should the Emergency Coordinator determine that additional emergency response personnel are needed at NOUE or the emergency classification is upgraded to Alert or higher, the Emergency Coordinator shall initiate activation of the EOF and Joint Information Center (JIC) EROs and notification of additional on-site personnel, as necessary. The goal for activation of the full on-site ERO is 70 minutes following the decision to activate.

### *5. Plant Emergency Response Positions*

Luminant maintains emergency response staffing capability consistent with Table II-2 of this Plan, which is based on the guidance provided in Table B-1 of NUREG-0654 and the provisions of the Emergency Plans of currently-licensed Luminant nuclear facilities.

The ERO, when fully activated, includes the positions described in Table II-2. Depending on the specific event, site management or the EOF Manager may determine that additional Corporate (off-site) support would be beneficial. On an ad hoc basis, additional support may be called upon to perform functions similar to those they routinely perform at CPNPP. ~~Additional personnel may be designated by site management or the EOF Manager as emergency responders providing special expertise deemed beneficial, but not mandatory, to the planned response. The individuals assigned as emergency response personnel are designated by site management or the EOF Manager based on the technical requirements of the position.~~Support personnel that may be called upon to assist in a protracted event are discussed in Section II.B.7 and below under the heading "Emergency Response Organization Support Staff." RCOL2_13.03-38

~~The ERO positions and principal responsibilities not previously discussed in Section II.B.1 and II.B.2 are discussed below.~~The ERO consists of those positions and associated responsibilities described in Section II.B.1 and II.B.2 as well as the positions discussed further in this subsection. Further information regarding the duties and responsibilities of ERO positions are RCOL2_13.03-38 RCOL2_13.03-03

## 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.: 4579 (CP RAI #159)**

**SRP SECTION: 13.03 - Emergency Planning**

**QUESTIONS for USAPWR Projects Branch (NMIP)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 13.03-39**

**Open Item 13.03-09**: Recovery and Reentry Planning and Post-Accident Operations
[Basis: 10 CFR 50.47(b)(13), Planning Standard M; 10 CFR 50, Appendix E.IV.H; NUREG-0654/FEMA-REP-1, Evaluation Criterion M.1 through M.4]
ACCEPTANCE CRITERIA (NUREG-0800, section 13.3): Requirements A; Acceptance Criteria 1

**In RAI 13.03-11.M-1,** the NRC staff requested the applicant identify the position/title and authorities of key positions of the Operations Support staff and Technical Support staff that have the responsibility for analyzing and developing plans and procedures to support restoration of the site to operational status. In its response, the applicant provided information for the Recovery Manager; however, the position titles and authorities are needed for the Technical Support and Operations Support positions. Staff requests information regarding the position title and authorities of key positions of the Operations Support and Technical Support staff be identified in the Emergency Plan.

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**ANSWER:**

Luminant's response to RAI #78, Question No. 13.03-11.M-1 (ML093510531) included a revision to Section II.M.2 of the Emergency Plan to indicate that the structure of the CPNPP Recovery Organization is discussed in the Emergency Plan Procedure (EPP) addressing "Reentry, Recovery, and Closeout." The response also stated that a procedure with content similar to Units 1 and 2 Procedure EPP-121 "Reentry, Recovery and Closeout" will be developed for Units 3 and 4 as indicated in Appendix 5 of the Emergency Plan.

As discussed in Procedure EPP-121, the initial Recovery Organization includes the following ERO positions:

- Emergency Coordinator (Recovery Manager)
- EOF Radiation Protection Coordinator
- TSC Onsite Radiological Assessment Coordinator

- OSC Radiation Protection Coordinator
- TSC or EOF Communications Coordinator

Section II.M.2 of the Emergency Plan has been further revised to clarify that, once established, the Recovery Organization absorbs the members of the ERO and that during the recovery phase, ERO personnel continue to perform their functional assignments and responsibilities outlined in Sections II.B.1, II.B.2, and II.B.5 of the Emergency Plan.

Impact on R-COLA

See attached marked-up Section II.M.2 of the Emergency Plan Revision 1 pages II-80, II-81, II-82, and II-83.

Impact on S-COLA

None.

Impact on DCD

None.

## M. Recovery and Re-Entry

This section of the Plan discusses general plans for recovery and re-entry.

### *1. Recovery Plans and Procedures*

Once the emergency has terminated and the situation is no longer considered a threat to on-site personnel or the general public, efforts are initiated to restore the affected unit(s) to full operation or place the affected unit(s) in a long-term safe shutdown condition. The scope of these efforts is dependent on the severity of the emergency, ranging from a simple close-out to a full-scale mobilization of personnel and resources to support a long-term recovery effort. If a recovery effort is deemed necessary, the CPNPP Units 3 and 4 Recovery Organization is established to provide personnel and resources to that effort.

Luminant does not expect a recovery organization to be necessary following a NOUE or Alert.

Luminant implements recovery plans and procedures that provide guidance for a range of recovery and re-entry activities, including:

- Recovery/re-entry organization;
- Responsibilities for recovery/re-entry decision-making, including decisions for relaxing protective measures based on existing and potential hazardous conditions;
- Means for informing members of the ERO that recovery operations are to be initiated and related changes in the organizational structure; and
- Methods for periodically updating estimates of total population exposure and recommending relaxation of public protective measures.

Reentry into environs of the site by selected personnel is an important source of information available to the Recovery Organization. These activities should aid in ascertaining the resources, manpower and recovery actions necessary to restore the site to operational status.

Appendix 8 of this Plan provides a cross-reference to these provisions in State and local Plans, as applicable.

### *2. Recovery Organization*

If established, overall technical direction and control of the Recovery Organization is assumed by the Recovery Manager. ~~The Recovery Organization absorbs the existing CPNPP ERO.~~ The initial Recovery Organization consists of the existing CPNPP ERO. During the recovery phase, ERO personnel continue to perform their functional assignments RCOL2_13.03-39 and responsibilities outlined in Sections II.B.1, II.B.2 and II.B.5. Management of activities conducted from the EOF, as well as direction and control of the CPNPP ERO, is assumed by the Recovery Manager. ~~During the recovery phase, Emergency Organization personnel continue their functional assignments.~~ RCOL2_13.03-39

The Recovery Organization is composed of CPNPP Units 3 and 4 personnel; Luminant resources are available as necessary. Contract personnel are used as needed to expand the capabilities of Luminant personnel. Because the magnitude of any recovery effort is dependent on the scope of the event, Recovery Organization staffing requirements are difficult to predict in advance; therefore, this Plan only predesignates certain management level positions in the Recovery Organization. Managers form their respective groups as appropriate to deal with recovery. The structure of the CPNPP Recovery Organization is discussed in the EPP addressing "Reentry, Recovery, and Closeout." RCOL2_13.03-11

The primary positions in the Recovery Organization are described below:

Recovery Manager

A member of Luminant senior management is designated as the Recovery Manager and is responsible for directing actions of the Recovery Organization.

Responsibilities and authorities assigned to the Emergency Coordinator are transferred to the Recovery Manager when the Recovery Organization is formed, thus assuring continuity of resources, communications and other activities initiated by the ERO. This information is provided in the EPP addressing "Duties of the Emergency Coordinator/Recovery Manager." RCOL2_13.03-11

~~Operations Support~~ RCOL2_13.03-39

Operations Support personnel are responsible for analyzing and developing plans and procedures directly supporting operations with the objective of restoring the site to operational status. Their primary responsibilities include:

- Providing direct support to shift operations
- Analyzing instrument and control problems and developing modification and repair plans
- Analyzing conditions and developing guidance for shift operations personnel regarding core protection
- Developing out-of-normal and emergency procedures for operations support

~~Technical Support~~ RCOL2_13.03-39

Technical Support personnel are responsible for:

- Determining need for and providing engineering and technical specialists to support other managers as required
- Assuring design activities are adequately staffed and equipped to provide timely support
- Providing direct interface between CPNPP Units 3 and 4 personnel and others on administrative matters
- Directing, coordinating and approving engineering and design activities conducted on-site during recovery
- Developing any required modifications for radwaste systems in support of recovery operations
- Providing technical expertise for repair and modification activities in support of the resolution of mechanical and electrical problems
- Providing qualified personnel to augment emergency repair and damage control items

***3. Corporate Support*** RCOL2_13.03-39

Luminant resources and personnel are available upon request by the Recovery Manager. These resources are discussed in Section II.B.7 of this Plan.

The basic organization may be modified, as required, to address the needs of the given situation. The Recovery Manager assumes control and direction of the recovery operation with the authority and responsibilities set forth in the EPPs.

The following conditions are considered appropriate for the recommendation to relax protection measures:

- Site operational parameters no longer indicate a potential or actual emergency exists
- The release of radioactivity from the site is controllable, no longer exceeds permissible levels and does not present a credible danger to the public
- The site is capable of sustaining itself in a long term shutdown condition

Depending on plant conditions and the scope of required activities, the recovery organization may perform its activities from one or more designated ERFs or from other locations as specified by the responsible recovery organization managers. As recovery operations progress, the recovery organization may be augmented or reduced as needed to meet ongoing operational needs.

#### *4. Notification of Initiation and Changes in Organizational Structure* RCOL2_13.03-39

The recovery process is implemented when the ERO managers, with concurrence of State and Federal agencies, have determined the site to be in a stable and controlled condition. Upon the determination, the EOF Manager notifies the NRC Operations Center, the State EOC, and the local EOCs that the emergency has been terminated and any required recovery has commenced. As appropriate, the TSC or EOF Communications Coordinator directs communication to the supporting EROs detailing the change in site status and of the organizational transition. EPPs delineate requirements and actions to be taken for recovery phase activities, including transition to the Recovery Organization.

Appendix 8 of this Plan provides a cross-reference to these provisions in State Plans, as applicable.

#### *5. Updating Total Population Exposure During Recovery Operations* RCOL2_13.03-39

CPNPP Units 3 and 4 personnel periodically estimate total population doses in the affected sectors and zones utilizing population distribution data from within the EPZs. The State oversees this activity. It is conducted in accordance with Appendix 7 of the Texas Radiological Emergency Management Plan.

Appendix 8 of this Plan provides a cross-reference to these provisions in State Plans, as applicable.

## 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.: 4579 (CP RAI #159)**

**SRP SECTION: 13.03 - Emergency Planning**

**QUESTIONS for USAPWR Projects Branch (NMIP)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 13.03-40**

**Open Item 13.03-10**: Radiological Emergency Training
[Basis: 10 CFR 50.47(b)(15), Planning Standard O; 10 CFR 50, Appendix E.IV.F.1, Appendix E.IV.F.2.g; NUREG-0654/FEMA-REP-1, Evaluation Criterion O.1 through O.5]
ACCEPTANCE CRITERIA (NUREG-0800, section 13.3): Requirements A and B; Acceptance Criteria 1 and 2

**In RAI 13.03-13.O-1,** the NRC staff requested the applicant discuss whether the training provided to the first-aid team is equivalent to the Red Cross "first responder" training. In its response, the applicant stated that the NRC will assure that training for the First Aid Team is appropriate. Staff requests that the applicant discuss whether the training provided to the first aid team is equivalent to the Red Cross "first responder" training, as provided in NUREG 0654/FEMA-REP-1; Evaluation Criterion O.3. Include this information in the Emergency Plan.

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**ANSWER:**

Luminant's response to RAI #78, Question No. 13.03-13.O-1 (ML093510531) included a revision to Section II.O.3 of the Emergency Plan to indicate that first aid training provided to First Aid Team Members is discussed in the EPP addressing "Emergency Preparedness Training."

The American Red Cross does not offer a course related to "first responders." NUREG-0654/FEMA-REP-1, Revision 1, Evaluation Criterion II.O.3 states, "Training for individuals assigned to licensee first aid teams shall included courses equivalent to Red Cross Multi-Media." After NUREG-0654 was published in 1980, the American Red Cross discontinued and no longer offers the Multi-Media course.

As described in Section II.L.2 of the Emergency Plan, selected CPNPP Units 3 and 4 personnel are trained to provide basic first aid and patient preparation of on-site personnel who become injured or ill. In addition, First Aid Team members receive annual instruction in handling contaminated injured individuals. Luminant maintains a trained First Aid Team at the site to provide 24-hour-per-day first aid support. Based on Luminant's understanding of the content of Multi-Media training, the first aid training provided to First Aid Team Members meets or exceeds the content of the original Multi-Media Training course.

Section II.O.3 of the Emergency Plan has been revised to clarify that first aid training provided to First Aid Team Members meets or exceeds that training formerly known as Red Cross Multi-Media Training.

Impact on R-COLA

See attached marked-up Section II.O.3 of the Emergency Plan Revision 1 page II-90.

Impact on S-COLA

None.

Impact on DCD

None.

b. Mutual Aid Agreements

The State of Texas and Somervell and Hood County response organizations participate in and receive training. Appendix 8 of this Plan provides a cross-reference to these provisions in State and local Plans, as applicable.

### *2. On-site Emergency Response Training*

Instructions for personnel who are accredited for unescorted access to the site are provided in site access training.

Emergency response training program is provided to Luminant personnel who may be called upon to respond to an emergency. The training program includes practical drills, consistent with Section II.N of this Plan; during which each individual demonstrates the ability to discharge their assigned emergency response function. The instructor/evaluator immediately corrects any erroneous performance noted during these practical drills and, as appropriate, demonstrates proper performance consistent with approved procedures and accepted standards.

Training is also provided to the CPNPP Units 3 and 4 Fire Brigade. This training is coordinated by the Nuclear Training Manager, and addresses methods and equipment used for fighting various types of fires that could occur on-site. Appropriate emphasis is placed on radiological aspects of firefighting in accordance with section 9.5.1 of the FSAR.

Security training is conducted by the CPNPP Units 3 and 4 Security Organization and is coordinated by the Security Manager. Training is provided to security personnel based on each person's specific tasks. Appropriate emphasis is placed on emergency response required within radiologically controlled environments in accordance with the Security Plan.

Personnel not assigned to CPNPP Units 3 and 4 ERO receive information on reporting emergencies and expected actions in case of an emergency.

### *3. First Aid Team Training*

Luminant provides first aid training to First Aid Team Members in accordance with ~~approved procedures.~~the EPP addressing "Emergency Preparedness Training." Training of first aid personnel is also discussed in Section II.L.2. This training meets or exceeds the training formerly known as Red Cross Multimedia Training mentioned in Evaluation Criterion II.O.3 in NUREG-0654. RCOL2_13.03-13 RCOL2_13.03-40

## 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.: 4579 (CP RAI #159)**

**SRP SECTION: 13.03 - Emergency Planning**

**QUESTIONS for USAPWR Projects Branch (NMIP)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 13.03-41**

**Open Item 13.03-11:** Subject: Hostile Action Considerations
[Basis: 10 CFR 50.47; Appendix E to 10 CFR 50; Regulatory Guide 1.206, Section C.I.13.3.1]
NUREG-0800, Chapter 13.3, SRP Acceptance Criteria: 1, 2, and 30

Regulatory Guide 1.206 requests that applicants for a combined license address the NRC orders issued February 25, 2002, as well as any subsequent NRC guidance, to determine what security-related aspects of emergency planning and preparedness are addressed in the emergency plan. NRC Bulletin 2005-02, "Emergency Preparedness and Response Actions for Security-Based Events," provides guidance for identifying alternative facilities to support emergency response organization augmentation during hostile-action events. Describe in the emergency plan, or provide reference to where this information is contained, an alternative facility to support rapid response to a hostile-action event, or provide justification as to why this information is not necessary. As stated in BL 2005-02, the alternative facility should include the following characteristics:

- Accessibility even if the site is under threat or attack;
- Communication links with the emergency operations facility, control room, and security;
- Capability to notify offsite response organizations if the emergency operations facility is not performing this action;
- Capability for engineering and damage control teams to begin planning mitigative actions (e.g., general drawings and system information)

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**ANSWER:**

Luminant has revised Section II.H of the Emergency Plan to address the alternative facility characteristics described in Bulletin 2005-02 and to state that details regarding the activation and characteristics of alternate facilities during hostile-action events are described in EPPs addressing "Activation and Operation of the Technical Support Center (TSC)", "Activation and Operation of the

Operations Support Center (OSC)", and "Activation and Operation of the Emergency Operations Facility (EOF)."

Impact on R-COLA

See attached marked-up Section II.H of the Emergency Plan Revision 1 page II-51.

Impact on S-COLA

None.

Impact on DCD

None.

## H. Emergency Facilities and Equipment

This section of the Plan describes emergency response facilities and equipment used by the CPNPP ERO in the event an emergency is declared at CPNPP Units 3 and 4.

Facility activation is dependent on the emergency classification; however, the Emergency Coordinator has the option of activating one or all of the ERFs at an emergency classification less severe than that described in the EPPs. Details regarding activation of each ERF are provided in EPPs.

The facilities required in the implementation of the Plan consist of the:

- CRs
- OSC
- TSCs
- EOF

These facilities are designed consistent with the guidance provided in NUREG-0696 (Reference 13) and the clarification in NUREG-0737, Supplement 1 (Reference 14), as applicable.

Upon activation, security-based events may warrant deployment of the ERO to an alternate near-site facility. Characteristics of the alternate facilities include: RCOL2_13.0 3-41

- Accessibility even if CPNPP is under threat or attack
- Communication links with the EOF, CR, and Security
- Capability to notify offsite response organizations
- Capability for emergency repair and damage control teams to begin planning actions to mitigate the consequences of the event

The EPPs addressing "Activation and Operation of the Technical Support Center (TSC)", "Activation and Operation of the Operations Support Center (OSC)", and "Activation and Operation of the Emergency Operations Facility (EOF)." detail the activation and characteristics of the alternative facilities.

### *1. On-Site Emergency Response Facilities*

Control Rooms

## 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.: 4579 (CP RAI #159)**

**SRP SECTION: 13.03 - Emergency Planning**

**QUESTIONS for USAPWR Projects Branch (NMIP)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 13.03-42**

**Open Item 13.03-12:** Subject: Hostile Action Considerations
[Basis: 10 CFR 50.47; Appendix E to 10 CFR 50; Regulatory Guide 1.206, Section C.I.13.3.1]
NUREG-0800, Chapter 13.3, SRP Acceptance Criteria: 1, 2, and 30

Regulatory Guide 1.206 requests that applicants for a combined license address the NRC orders issued February 25, 2002, as well as any subsequent NRC guidance, to determine what security-related aspects of emergency planning and preparedness are addressed in the emergency plan. NRC Bulletin 2005-02, "Emergency Preparedness and Response Actions for Security-Based Events," provides guidance for onsite protective measures for site workers during hostile-action events. Describe in the emergency plan, or provide reference to where this information is contained, specific provisions to protect onsite emergency responders and personnel, in emergencies resulting from hostile-action events, or provide justification as to why this information is not necessary. As stated in BL 2005-02, these provisions may include:

- Evacuation of personnel from target buildings (including security personnel);
- Site evacuation by opening security gates (while continuing to defend);
- Dispersal of licensed operators;
- Sheltering of personnel in structures away from potential site targets;
- Arrangements for accounting for personnel after the attack

---

**ANSWER:**

Section II.J.5 of the Emergency Plan addresses protective actions for on-site emergency responders and personnel, including emergencies resulting from hostile-action events. The section has been revised to clarify that NRC Bulletin 2005-02 is properly addressed and that details regarding the protective measures for site workers during hostile-action events are described in an EPP addressing "Security Events."

Impact on R-COLA

See attached marked-up Section II.J.5 of the Emergency Plan Revision 1 page II-67.

Impact on S-COLA

None.

Impact on DCD

None.

accountability and evacuation. The Emergency Coordinator makes decisions regarding appropriate protective measures based on evaluation of site conditions, including input from the Security Organization. If, based on the judgment of the Emergency Coordinator, personnel assembly, accountability, and evacuation may result in undue hazards to site personnel, the Emergency Coordinator may direct other protective measures, including:

- Evacuation of personnel from areas and buildings perceived as "high-value" targets(including security personnel) RCOL2_13.03-42
- Site evacuation by opening, while continuing to defend, security gates
- Dispersal of ~~key personnel~~licensed operators RCOL2_13.03-42
- On-site sheltering away from potential site targets
- Staging of ERO personnel in alternate locations pending restoration of safe conditions
- Implementation of accountability measures following restoration of safe conditions
- The EPP addressing "Security Events" addresses each of these items and provides guidance for onsite protective measures of site workers during hostile-action events. RCOL2_13.03-42

### 6. *Protective Measures*

Luminant distributes protective equipment and supplies to on-site emergency response personnel, as necessary, to control radiological exposures or contamination. Protective measures utilized include the following:

a. Respiratory Protection and Engineering Controls:

- Protective measures are utilized to minimize the ingestion and/or inhalation of radionuclides and to maintain internal exposure below the limits specified in 10 CFR Part 20, Appendix B.
- Ventilation controls are utilized in the TSC and CR to control concentrations of radioactive material in air. Otherwise, when not practical to apply engineering controls to limit intakes of radioactive material in air, one or more of the following protective measures is utilized:
    - Control of Access
    - Limitation of exposure times

# Attachment 2

## Response to Request for Additional Information No. 4606 (CP RAI #155)

## 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.: 4606 (CP RAI #155)**

**SRP SECTION: 02.03.01 - Regional Climatology**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 02.03.01-6**

NUREG-0800, Standard Review Plan (SRP), Chapter 2.3.1, Regional Climatology,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

> 10 CFR 52.79(a)(1)(iii) states, in part, that the COL application must contain the meteorological characteristics of the proposed site with appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area and with sufficient margin for the limited accuracy, quantity, and time in which the historical data have been accumulated.
>
> The staff considers temperatures based on a 100-year return period to provide sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated as required by the regulation. This is why SRP 2.3.1 states that 100-year return period ambient temperature and humidity statistics should be identified as site characteristics. Thus, the staff believes the higher of either the maximum recorded dry-bulb value or the maximum 100-year dry-bulb value should be listed as the 0 percent exceedance maximum dry-bulb site characteristic value. Similarly, the lower of either the minimum recorded dry-bulb value or the minimum 100-year dry-bulb value should be listed as the 0 percent exceedance minimum dry-bulb site characteristic value.

- The staff has found, through the use of the 2005 ASHRAE Handbook – Fundamentals for Dallas, TX, the 100-year return period maximum dry-bulb temperature to be higher than that provided in FSAR Table 2.0-1R and FSAR Table 2.3-202. Please either update the appropriate FSAR Sections with a revised 100-year return period maximum dry bulb temperature, or justify the use of the current temperature.

- The staff has found, through the use of the 2005 ASHRAE Handbook – Fundamentals for Dallas, TX, the 100-year return period minimum dry-bulb temperature to be lower than that provided in FSAR Table 2.0-1R and FSAR Table 2.3-202. Please either update the appropriate FSAR Sections with a revised 100-year return period minimum dry bulb temperature, or justify the use of the current temperature.

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**ANSWER:**

Luminant (in the COLA application) and MHI (in the US-APWR DCD application) do not use the staff's suggestion that the higher of either the maximum recorded dry-bulb value or the maximum 100-year dry-bulb value given in the 2005 ASHRAE Handbook – Fundamentals for Dallas, Texas, should be listed as the 0 percent exceedance maximum dry-bulb site characteristic value. The Luminant COLA and the US-APWR DCD use the definition given in the Advanced Light Water Reactor Utility Requirements Document (URD), EPRI TR-016780. As specified in the US-APWR DCD, the 0 percent exceedance maximum design dry-bulb temperature is defined as the historical limit, excluding peaks of less than two hours, combined with the maximum wet-bulb temperature that exists in that population of dry-bulb temperatures.

The selection of the parameters was based upon their usage. The maximum (non-coincident) wet-bulb temperature values are used in the design of devices that are more affected by the moisture content in the air rather than the dry temperature (i.e., cooling towers or cooling reservoirs). On the other hand, if the devices are impacted by both dry temperature and moisture content (i.e., HVAC system cooling design), then both dry-bulb and simultaneous (coincident) wet-bulb values are used.

The CPNPP ambient design temperatures required for the site envelope parameters are based on the guidance given in URD Table 1.2-6. Thirty years of raw climatological data (from 1977 to 2006) was obtained from the NOAA/NCDC for Dallas/Fort Worth, Texas International Airport (DFW), National Weather Service Station (WMO# 722590). From this data, the maximum dry-bulb temperature that existed for 2 hours or more combined with the maximum wet-bulb temperature that exists in that population of dry-bulb temperatures was selected as the site parameter.

The 0 percent exceedance minimum historical temperature limit was also based on review of the 30-year DFW hourly temperature records with the minimum dry bulb temperature existing for at least two consecutive hours identified as the site parameter.

The 0 percent exceedance temperatures determined in this manner comply with the guidance provided in both the DCD and URD.

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.: 4606 (CP RAI #155)**

**SRP SECTION: 02.03.01 - Regional Climatology**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 02.03.01-7**

NUREG-0800, Standard Review Plan (SRP), Chapter 2.3.1, Regional Climatology,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

In RAI 2.3.1-5, the staff requested that Luminant update combined license (COL) FSAR Section 2.3.1.2.8 to address the extreme frozen winter precipitation event and extreme liquid winter precipitation event in accordance with the Interim Staff Guidance (ISG) DC/COL-ISG-07, "Interim Staff Guidance on Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category 1 Structures" (ML081990438)". Based on a review of the updated COL FSAR Section 2.3.1.2.8, provided by Luminant in response to RAI 2.3.1-5, it is unclear whether this ISG was used. Please clarify.

In the updated COL FSAR Section 2.3.1.2.8, Luminant addresses the normal winter precipitation roof load, the extreme winter precipitation roof load (100-year snowpack maximum snow weight including contributing portion of extreme frozen winter precipitation), and the 48-hour probable maximum winter precipitation (PMWP). The results provided in the updated COL FSAR Section 2.3.1.2.8 all indicate values within the bounding values of DCD Rev.2, Table 2.0-1. The staff has also confirmed these values. DCD Rev. 2, Table 2.0-1, further indicates that the extreme winter precipitation roof load should also consider the 100-year snowpack maximum snow weight including the contributing portion of extreme liquid winter precipitation event. Please clarify how this analysis was conducted, along with the results.

---

**ANSWER:**

ISG-07 was used in addressing the extreme frozen winter precipitation event and the extreme liquid winter precipitation event in FSAR Subsection 2.3.1.2.8. The guidance provided in ISG-07 states:

...The extreme frozen winter precipitation event is assumed to accumulate on the roof on top of the antecedent normal winter precipitation event whereas the extreme liquid winter precipitation event may or may not accumulate on the roof, depending on the geometry of the roof and the type of drainage provided...

US-APWR DCD Rev. 2, Table 2.0-1 states that the extreme winter precipitation roof load is to be based on the 100-year snowpack maximum snow weight including the contributing portion of either the extreme frozen winter precipitation event or the extreme liquid winter precipitation event. As stated in DCD Subsection 3.4.1.2 and FSAR Section 2.3.1.2.8, US-APWR seismic category I structures have sloped roofs designed to preclude ponding of precipitation on the roof. This is accomplished by channeling rainfall expeditiously off the roof. As a result, the contributing portion of the maximum winter precipitation event to the extreme winter precipitation roof load is negligible. The extreme winter precipitation roof load is therefore the combination of the 100-year snowpack maximum snow weight plus the extreme frozen winter precipitation event. As stated in FSAR Subsection 2.3.1.2.8, the 100-year return snow load is 11.7 $lb/ft^2$ which is added to the 100-year return ice load of 26.1 $lb/ft^2$ giving a total roof loading of 37.8 $lb/ft^2$.

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.: 4606 (CP RAI #155)**

**SRP SECTION: 02.03.01 - Regional Climatology**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 02.03.01-8**

NUREG-0800, Standard Review Plan (SRP), Chapter 2.3.1, Regional Climatology,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

Regulatory Guide (RG) 1.27, "Ultimate Heat Sink for Nuclear Power Plants," Revision 2 states that the FSAR should include information pertaining to the following:

- The meteorological conditions resulting in maximum evaporation.
- A description on how the worst 30-day average wet-bulb temperature correlates to maximum evaporation potential.

Please update FSAR Section 2.3.1.2.10 to include this information, or provide justification as to why this information should not be included as requested in RG 1.27.

---

**ANSWER:**

According to RG 1.27, the meteorological conditions resulting in maximum evaporation and drift losses should be the worst 30-day average combination of controlling parameters. The major controlling parameters of the UHS cooling tower evaporation losses are the UHS heat loads, ambient wet-bulb temperature, relative humidity, and wind conditions. FSAR Subsection 2.3.1.2.10 was revised in response to RAI No. 3555 (CP RAI # 51) Question 02.03.01-1 (ML092990275) to discuss the meteorological design basis as required by RG 1.27.

The evaporation rates (including drift losses) used to calculate the accumulated 30-day water losses and the UHS cooling capacity were based on heat loads, ESW flow rates, ESW temperature rise, and cooling tower evaporation design factor, as described in FSAR Subsection 9.2.5.

As stated in FSAR Subsection 2.3.1.2.10, the design of the UHS cooling towers is based on worst 30-day period climatological average data with wet-bulb temperature of 78°F plus a 2°F margin added for tower recirculation penalty.

Based on a typical cooling tower vendor evaporation curve with peak safe shutdown heat load of $196 \times 10^6$ Btu/hr, wet-bulb temperature of 78°F, and relative humidity of 50 percent, the evaporation rate is approximately 350 gpm. The relative humidity for 78°F wet-bulb and 92.4°F dry-bulb temperatures (this is the coincident dry-bulb temperature during the 30-day period of interest) is calculated to be approximately 52%. The evaporation rate increases with heat load and wet-bulb temperature for a specific relative humidity. The evaporation rate decreases with increasing relative humidity. Therefore, maximum evaporation rate for worst 30-day meteorological conditions is less than 350 gpm.

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

None.

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

None.

<u>Impact on DCD</u>

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.: 4606 (CP RAI #155)**

**SRP SECTION: 02.03.01 - Regional Climatology**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 02.03.01-9**

NUREG-0800, Standard Review Plan (SRP), Chapter 2.3.1, Regional Climatology,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

> Revision 2 to the US-APWR DCD Table 2.0-1 states that the site parameter “Extreme wind speed (other than a tornado),” should be based on 3-second gusts at 33 ft above ground level based on the 100-year return period, with an importance factor of 1.15 for seismic category I/II structures.
>
> Combined License (COL), Part 2, FSAR Table 2.0-1R presents this site characteristic value at 90 mph. However, FSAR 2.3.1.2.11 states that the 3-second gust wind speed for a 100-year return period is 96 mph. The FSAR further states that this value is based on an importance factor of 1.15 and the exposure category is C.
>
> Please update COL, Part 2, FSAR Table 2.0-1R to include the 3-second gust wind speed for a 100-year return period with an importance factor of 1.15 as stated in the US-APWR DCD, or justify the current site characteristic.

---

**ANSWER:**

The staff comment is correct. The 3-second gust wind speed for a 100-yr return period is 96 mph instead of the 90 mph value listed in Table 2.0-1R. As stated in FSAR Subsection 2.3.1.2.11, the 100-year return 3-second gust wind speed of 96 mph is based on an importance factor of 1.15 and a C exposure category. Table 2.0-1R has been revised to provide an extreme wind speed site parameter of 96 mph.

Impact on R-COLA

See attached marked-up FSAR Revision 1 page 2.0-3.

Impact on S-COLA

None.

Impact on DCD

None.

**Table 2.0-1R (Sheet 2 of 12)**
**Key Site Parameters**

| | | | | |
|---|---|---|---|---|
| | Extreme wind speed (other than in tornado) | 155 mph for 3-second gusts at 33 ft aboveground level based on 100-year return period, with importance factor of 1.15 for seismic category I/II structures | ~~90~~96 mph for-3-second gust wind speed at 33-ft aboveground | RCOL2_02 .03.01-9 |
| | Ambient design air temperature (1% exceedance maximum) | 100°F dry bulb,<br>77°F coincident wet bulb,<br>81°F non-coincident wet bulb | 99°F dry bulb,<br>75°F coincident wet bulb,<br>78°F non-coincident wet bulb | |
| CP COL 2.1(1)<br>CP COL 2.2(1)<br>CP COL 2.3(1)<br>CP COL 2.3(2) | Ambient design air temperature (0% exceedance maximum) | 115°F dry bulb,<br>80°F coincident wet bulb,<br>86°F non-coincident wet bulb,<br>historical limit excluding peaks <2 hr | 112°F dry bulb,<br>78°F coincident wet bulb,<br>83°F non-coincident wet bulb,<br>historical limit excluding peaks <2 hr | |
| CP COL 2.3(3)<br>CP COL 2.4(1) | Ambient design air temperature (1% exceedance minimum) | -10°F dry bulb | 25°F dry bulb | |
| CP COL 2.5(1) | Ambient design air temperature (0% exceedance minimum) | -40°F dry bulb,<br>historical limit excluding peaks <2 hr | -0.5°F dry bulb,<br>historical limit excluding peaks <2 hr | |
| | *Atmospheric dispersion factors ($\chi$/Q values) for on-site locations:* | | | |
| | Exclusion area boundary (EAB)<br>0-2 hrs | $5.0\times10^{-4}$ s/m$^3$ | $3.70\times10^{-4}$ s/m$^3$ | |
| | EAB annual average | $1.6\times10^{-5}$ s/m$^3$ | $5.5\times10^{-6}$ s/m$^3$ | |
| | *Atmospheric dispersion factors ($\chi$/Q values) for off-site locations:* | | | |
| | Low-population zone (LPZ) boundary | | | |
| | 0-8 hrs | $2.1\times10^{-4}$ s/m$^3$ | $2.29\times10^{-5}$ s/m$^3$ | |
| | 8-24 hrs | $1.3\times10^{-4}$ s/m$^3$ | $1.49\times10^{-5}$ s/m$^3$ | |
| | 1-4 days | $6.9\times10^{-5}$ s/m$^3$ | $6.34\times10^{-6}$ s/m$^3$ | |
| | 4-30 days | $2.8\times10^{-5}$ s/m$^3$ | $2.01\times10^{-6}$ s/m$^3$ | |

## 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.: 4606 (CP RAI #155)**

**SRP SECTION: 02.03.01 - Regional Climatology**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 02.03.01-10**

NUREG-0800, Standard Review Plan (SRP), Chapter 2.3.1, Regional Climatology,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

> SRP 2.3.1 Acceptance Criteria #2 states, in part, the applicability of severe weather phenomena data to represent site conditions during the expected period of reactor operation should be substantiated. SRP 2.3.1 Review Procedure #3 states, in part, that current literature on possible changes in the weather in the site region should be reviewed to be confident that the methods used to predict weather extremes are reasonable.
>
> Please include in FSAR Section 2.3.1, a discussion on the potential effects of global climate change on the future regional conditions near the site. Include in the discussion any proposed site characteristics that may be altered or affected due to the potential of climate change.

---

**ANSWER:**

General Design Criterion (GDC) 2 in Appendix A to 10 CFR Part 50 requires

> ...Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated...

Extreme weather calculations for CPNPP were conducted over the maximum data span available. Certified climatological data obtained from the U.S. National Climatic Data Center was used for the severe weather phenomena evaluations. This data selection supports accurate severe weather phenomena projections for the area in the vicinity of CPNPP site. This extensive historic data record provides the historical climatic trends and severe natural phenomena to be included in the site characterization.

Dry-bulb, coincident wet-bulb, and non-coincident wet-bulb temperatures represent significant site characteristics because this data is used in demonstrating that the US-APWR DCD site parameters are bounding (i.e., more conservative). The CPNPP site characteristic temperatures were developed by considering both 100-year return temperatures and 0 percent exceedance temperatures. These values were calculated using a 30-year sequential hourly meteorological data set for the Dallas/Fort Worth Airport National Weather Service station. The difference between the CPNPP site characteristics and the DCD site parameters used for design, provide additional margin to the selected CPNPP site characteristics. This margin accounts for variations due to limitations in the accuracy, quantity, and period of time in which the historical data have been accumulated.

General predictions on global or U.S. climatic changes expected during the period of reactor operation are uncertain and are currently only applicable on a macroclimatic scale. Because the maximum data span available (i.e., representative of the microclimate near the CPNPP site) was used in the severe weather analysis, accurate severe weather phenomena projections are provided based on historic data. Projection of future climatological conditions at the CPNPP site are speculative at best, based on current understanding and modeling of global climate change.

Global trends in various meteorological and geophysical parameters are currently the subject of much discussion in both the scientific community and in the media. While it may be evident (and expected) that changes in the averages of certain meteorological parameters are occurring over time (i.e., such as temperature and precipitation), it is also evident and generally acknowledged that such changes are difficult to predict reliably. Even the most reliable climate change models are not capable of accurately predicting design basis extremes in weather patterns.

A discussion of speculations about climate change would not resolve current metrological and geophysical modeling inadequacies. Discussion of changes in average global trends will not result in data that can be reviewed on a site-specific basis with any degree of accuracy or reliability. It is relatively easy to demonstrate that an increase in the average value of temperature (or precipitation) at a given location is much more likely to be a result of numerous increases in temperatures (or precipitation) in the "normal range" rather than increases in extreme values, because a change in a select number of extreme values will essentially have no measurable effect on longer term average values. Therefore, the information presented in this subsection of the FSAR is focused on the extreme meteorological conditions that will facilitate a plant design that will operate within these safety margins throughout the projected plant life of 40 to 60 years. This is accomplished by identifying historical extremes and projecting, in a scientifically defensible manner, the potential effects weather will have on the safety and operation of CPNPP Units 3 and 4.

Impact on R-COLA

See attached marked-up FSAR Revision 1 pages 2.3-10 and 2.3-11.

Impact on S-COLA

None.

Impact on DCD

None.

pollution, and ice storms. Also presented are the meteorological data used for evaluating the performance of the ultimate heat sink and design basis tornado parameters.

The interplay between synoptic scale phenomena and topography is small in the region surrounding the site. The effect of terrain features on synoptic scale flow can readily be ascertained when a larger area, which takes in the high country of West Texas and Eastern New Mexico, is included; i.e., the principal effect is that the high country forms a natural barrier to the flow of air. Consequently, moist tropical air from the Gulf of Mexico and air from the arctic or polar sources, which flows uninhibited through the site region, is effectively blocked from the areas to the west of the mountains. The net result is wide fluctuations in rainfall, humidity, and annual sunshine over the larger area. Severe weather in the region is usually associated with heavy thunderstorms (including tornadoes) and tropical cyclones. Property damage occurs from flooding and high winds. Damaging hail also occasionally occurs in the site region (Reference 2.3-205).

Extreme weather calculations for CPNPP were conducted over the maximum data span available. Certified climatological data obtained from the U.S. National Climatic Data Center was used for the severe weather phenomena evaluations. This data selection supports accurate severe weather phenomena projections for the area in the vicinity of CPNPP site. This extensive historic data record provides the historical climatic trends and severe natural phenomena to be included in the site characterization. RCOL2_02.03.01-10

Dry-bulb, coincident wet-bulb, and non-coincident wet-bulb temperatures represent significant site characteristics because this data is used in demonstrating that the US-APWR DCD site parameters are bounding (i.e., more conservative). The CPNPP site characteristic temperatures were developed by considering both 100-year return temperatures and 0 percent exceedance temperatures. These values were calculated using a 30-year sequential hourly meteorological data set for the Dallas/Fort Worth Airport National Weather Service station. The difference between the CPNPP site characteristics and the DCD site parameters, used for design, provide additional margin to the selected CPNPP site characteristics. This margin accounts for variations due to limitations in the accuracy, quantity, and period of time in which the historical data have been accumulated.

General predictions on global or U.S. climatic changes expected during the period of reactor operation are uncertain and are currently only applicable on a macroclimatic scale. Because the maximum data span available (i. e., representative of the microclimate near the CPNPP site) was used in the severe weather analysis, accurate severe weather phenomena projections are provided based on historic data. Projection of future climatological conditions at the CPNPP site are speculative at best, based on current understanding and modeling of global climate change.

Global trends in various meteorological and geophysical parameters are currently the subject of much discussion in both the scientific community and in the media. While it may be evident (and expected) that changes in the averages of certain meteorological parameters are occurring over time (i.e., such as temperature and precipitation), it is also evident and generally acknowledged that such changes are difficult to predict reliably. Even the most reliable climate change models are not capable of accurately predicting design basis extremes in weather patterns. RCOL2_02.0 3.01-10

A discussion of speculations about climate change would not resolve current metrological and geophysical modeling inadequacies. Discussion of changes in average global trends will not result in data that can be reviewed on a site-specific basis with any degree of accuracy or reliability. It is relatively easy to demonstrate that an increase in the average value of temperature (or precipitation) at a given location is much more likely to be a result of numerous increases in temperatures (or precipitation) in the "normal range" rather than increases in extreme values, because a change in a select number of extreme values will essentially have no measurable effect on longer term average values. Therefore, the information presented in this subsection of the FSAR is focused on the extreme meteorological conditions that will facilitate a plant design that will operate within these safety margins throughout the projected plant life of 40 to 60 years. This is accomplished by identifying historical extremes and projecting, in a scientifically defensible manner, the potential effects weather will have on the safety and operation of CPNPP Units 3 and 4.

#### 2.3.1.2.2 Hurricanes

Hurricanes and tropical storms are among the most devastating naturally occurring hazards in the United States. A tropical cyclone is defined as a low-pressure area of closed circulation winds that originates over tropical waters. A tropical cyclone begins as a tropical depression with wind speeds below 39 mph. As it intensifies, a tropical cyclone may develop into a tropical storm with wind speeds between 39 mph and 74 mph. When wind speeds go beyond 74 mph, the tropical storm is known as a hurricane. The Gulf of Mexico and the Atlantic Coast areas are the most susceptible to tropical cyclones (Reference 2.3-224).

Based on data from NOAA Technical Memorandum NWS SR-206 (Reference 2.3-206) and data for 2004 – 2006 from the National Hurricane Center (Reference 2.3-234), the number of tropical storms and hurricanes affecting Texas from the period of 1899 through 2006 was 39. The storms that have affected Texas are listed in Table 2.3-206 along with the date and storm category. Based on these data, the storm return period is 2.8 yr as shown in Table 2.3-207. This table also provides the Saffir/Simpson storm category definitions and gives a breakdown of storms by month and storm category. There have been no category five storms and only six category four storms affecting Texas. August and September have the most storms with approximately 60 percent of the storms occurring in these months. Figure 2.3-211 gives the tropical cyclone frequency and intensity along the U.S. coastline based on data from 1871 through 1998. This figure shows a

## 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.: 4608 (CP RAI #157)**

**SRP SECTION: 02.03.03 - Onsite Meteorological Measurements Programs**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 02.03.03-10**

NUREG-0800, Standard Review Plan (SRP), Chapter 2.3.3, 'Onsite Meteorological Measurements Programs,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

> In response to RAI 2.3.3-3, Luminant provided information regarding the onsite moisture measurements collected from June 12, 2008 to September 23, 2008. The updated FSAR Section 2.3.3.1 states that "the pre-operational onsite data was used to demonstrate that the actual onsite conditions correlated well with longer term data from local weather stations which were used for the official calculations". The staff requests that the comparison of onsite data with first order weather stations be provided, along with the correlation demonstration of the data.
>
> Further, the updated FSAR Section 2.3.3.1 states "the instrument was located on top of the Project Records Center Building". Please provide clarification that demonstrates the moisture data collected was obtained without interference from manmade objects and was not skewed because of the building's roof or surface materials.

---

**ANSWER:**

The comparison of the pre-operational onsite data with data from local weather stations has been added to FSAR Subsection 2.3.3.1.

The relative humidity instrument was located above the single story Project Records Center Building. The sensor was at an approximate elevation of 860 ft msl. The relative humidity sensors were Climatronics capacitive relative humidity sensors (Model 102273), which had a wide operating temperature range (-40° to +60°C) with an accuracy of < ± 1% relative humidity over a relative humidity range of 0 - 100 percent. The instrument was mounted inside a multi-plate, naturally aspirated shield (Climatronics P/N 101956). The shield provided high reflectivity, low thermal conductivity, low heat retention, and positive blockage of direct and reflected solar radiation. Wind tunnel tests performed on the shield with maximum artificial radiation indicate that under conditions of low air movement (1m/s) the temperature sensor is maintained within 2.7°F (1.5°C) of ambient. This improves to 0.7°F (0.4°C) or less at wind speed greater than 3 m/s. The location of the relative humidity sensor and the surrounding shield is depicted in the attached photographs (Figures 1 through 3). The photographs show that the instrument was sufficiently removed from manmade objects so that the data was not skewed because of the building's roof or surface materials.

Impact on R-COLA

See attached marked-up FSAR Revision 1 pages 2.3-38, 2.3-39, 2.3-300, and Figures 2.3-383, 2.3-384, 2.3-385, and 2.3-386.

Impact on S-COLA

None.

Impact on DCD

None.

Attachments

Figure 1: Relative Humidity Instrument Location Perspective 1

Figure 2: Relative Humidity Instrument Location Perspective 2

Figure 3: Relative Humidity Instrument Location Close-up

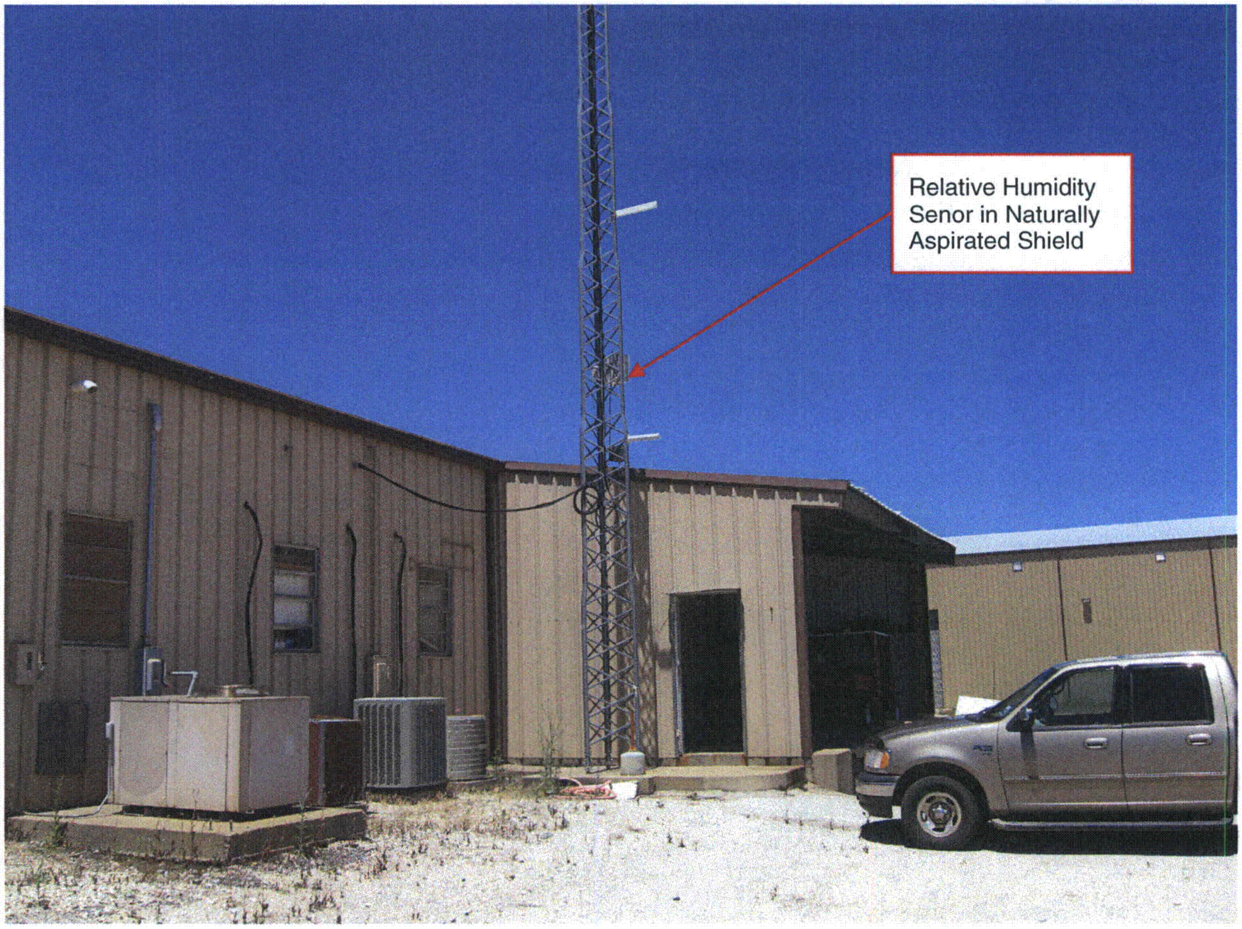


**Figure 1: Relative Humidity Instrument Location Perspective 1**

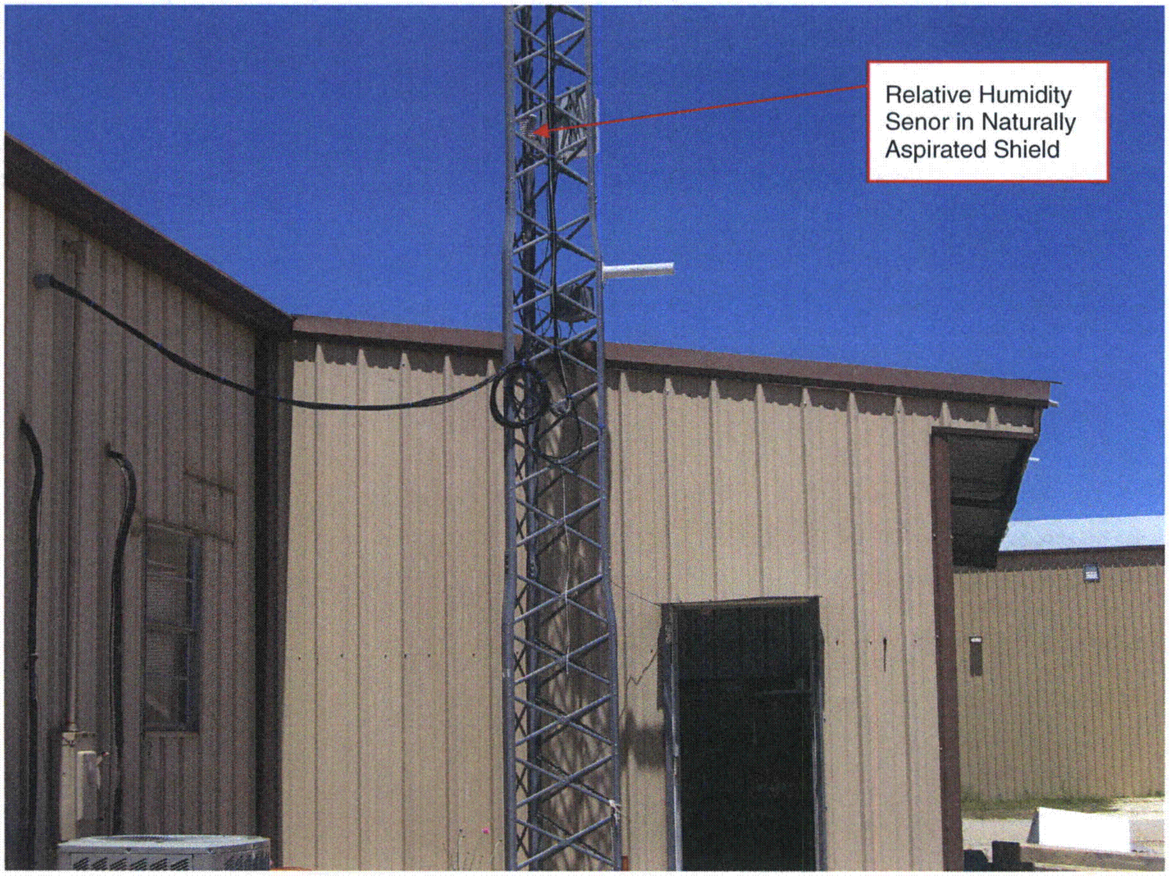


**Figure 2: Relative Humidity Instrument Location Perspective 2**

**Figure 3: Relative Humidity Instrument Location Close-up**

- Wind speed at 10 m.
- Wind direction at 10 m.
- Ambient temperature at 10 m.
- Sigma theta at 10 m.

All the towers and instrumentation described above are located in an area surrounded by a fence and maintained free of obstructions that could interfere with data collection and accuracy. The environmentally controlled Meteorological Instrumentation Building that supports the electronic components associated with the instrumentation on the towers is located within the fenced area. (Reference 2.3-205)

Pre-operational atmospheric moisture monitoring was conducted from June 12, 2008 through September 23, 2008. The instrumentation used to collect this data was a Climatronics capacitive relative humidity sensor. This instrument had the following characteristics: RCOL2_02.03.03-3 RCOL2_02.03.03-5 RCOL2_02.03.03-7

- Accuracy: <+/- 1% RH from 0 - 100%
- Repeatability: +/- 0.3% RH
- Operating Range: 0 - 100%

This instrument was located on top of the Project Records Center Building approximately 30 feet above grade (grade elevation ~830 feet). The pre-operational onsite data was used to demonstrate that the actual onsite conditions correlated well with the longer term data from local weather stations which were used for the official calculations.

The CPNPP site humidity data was compared with data from the closest first order National Weather Service stations located at the Mineral Wells Airport (MWL) and the Dallas Fort Worth (DFW) Airport. Data from MWL and DFW was obtained from the National Weather Service spanning June 12, 2008, through September 23, 2008. The CPNPP site humidity data covered an identical time span. RCOL2_02.03.01-10

A comparison of the monthly humidity averages is provided in Table 2.3-351 and Figures 2.3-383 through 2.3-386. As shown in Table 2.3-351, average humidity measurements at CPNPP fall directly between humidity measurements taken at DFW and MWL. The measurements taken at DFW underestimate the CPNPP humidity and measurements taken at MWL overestimate the CPNPP humidity. Likewise, measurements taken at DFW are often substantially lower than both CPNPP and MWL during peak humidity occurrences. For example, on September 9, 2008 the daily humidity average at CPNPP and MWL was 91 percent and 90 percent, respectively, while the daily humidity average at DFW was 78 percent.

The comparison of four months of data from the CPNPP site with offsite data sources indicates that the CPNPP site relative humidity data correlates very well with data from MWL. As a result of this close correlation, recording additional humidity data at the CPNPP site was not necessary. Due to relative humidity measurements at DFW being consistently below CPNPP, both on average and during peak events, MWL is selected as a better representation of CPNPP site humidity conditions. This conclusion is reasonable due to the rural setting at CPNPP and MWL compared to the urban DFW location. In addition, the proximity of MWL to CPNPP (37 miles) compared to the distance to DFW airport (61 miles) makes the MWL data more representative. The relative humidity recorded at the MWL National Weather Service station is representative of the relative humidity at the CPNPP site for the reasons discussed above and serves as the data of record for support calculations, such as cooling tower plume analysis. RCOL2_02.03.01-10

### 2.3.3.2 Instrumentation

An overview of the instrumentation used in the meteorological monitoring system is provided below. The CPNPP Units 1 and 2 UFSAR and other plant documents contain specific data about sensors and requirements for replacement of sensors. Wind speeds at the 10-m and 60-m levels are measured with a 3-cup anemometer with a threshold of 0.45 m/s and a range of 0-100 mph. Wind directions at the 10-m and 60-m levels are detected by a wind vane with a threshold of 0.45 m/s and a range of 0 to 360 degrees. Temperatures at the 10-m and 60-m levels are measured with a platinum temperature sensor with a range of -20°F to +120°F. Delta temperature between the 10-m and 60-m levels uses the temperature sensors at each level and has a range of -5°F to +15°F. Precipitation is measured at the surface with a tipping bucket gauge with a threshold of 0.01-in and a range of 0-in to 1.0-in.

### 2.3.3.3 System Accuracy

System accuracies are specified in Tables 2.3-332 and 2.3-333. All system accuracies meet or exceed regulatory requirements (Reference 2.3-205). Calibration and maintenance procedures ensure the accuracy of the instrumentation. All calibrations are performed semi-annually and in accordance with the ODCM. Calibration of metrological tower instrumentation is performed in accordance with the Quality Related CPNPP common unit Instrument and Control Manual. Calibration is applied to the individual instruments and the entire channel (through the plant computer points in the control rooms). The surveillance requirements provided in the ODCM require that the wind speed, wind direction, and temperature instrumentation channels at both measurement levels be operable at all times. In addition, channel checks are performed at least once per 24 hours in accordance with the ODCM. An annual inspection of the tower structure is also performed. The guyed wires and anchors are inspected every five years in accordance with the CPNPP Units 1 and 2 inspection program. The Unit 1 and 2 meteorological program complies with the requirements of the Second Proposed Revision 1 to Regulatory Guide 1.23 (April, 1986), as discussed in Unit 1 and 2 FSAR Section 2.3.3.2. RCOL2_02.03.03-3 RCOL2_02.03.03-5 RCOL2_02.03.03-7 RCOL2_02.03.03-6 RCOL2_02.03.03-12

RCOL2_02.0
3.03-10

## Table 2.3-351
## Monthly Average Humidity Comparison (6/12/2008 - 9/23/2008)

| Month | CPNPP | DFW | MWL |
|---|---|---|---|
| June | 52.9 | 52.1 | 54.7 |
| July | 50.4 | 46.7 | 51.7 |
| August | 59.6 | 56.3 | 64.0 |
| September | 64.7 | 59.3 | 67.6 |
| Average | 56.7 | 53.3 | 59.4 |
| Std. Dev from CPNPP | | 7.80 | 8.07 |

DFW - Dallas Fort Worth

MWL - Mineral Wells Airport

RCOL2_02.03.03-10

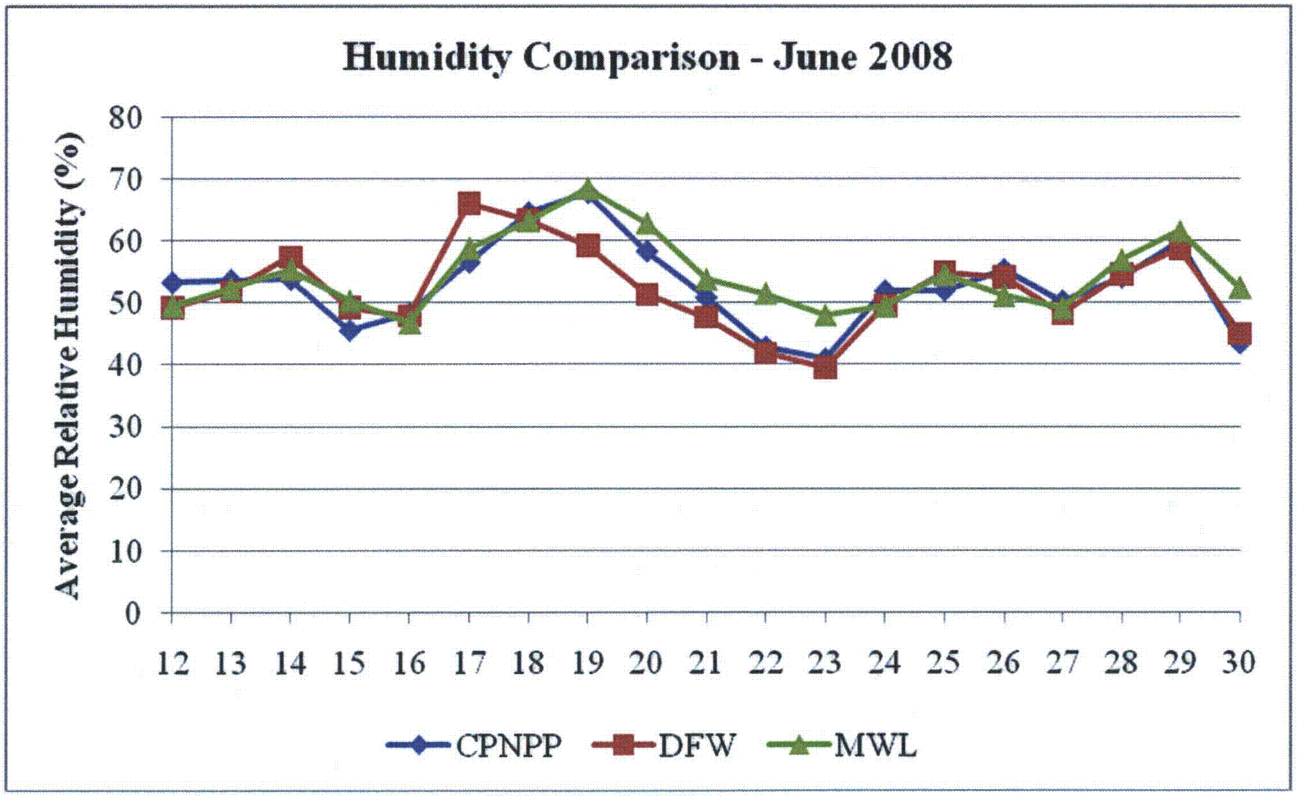


Figure 2.3-383 Humidity Comparison - June 2008

RCOL2_02.03.03-10

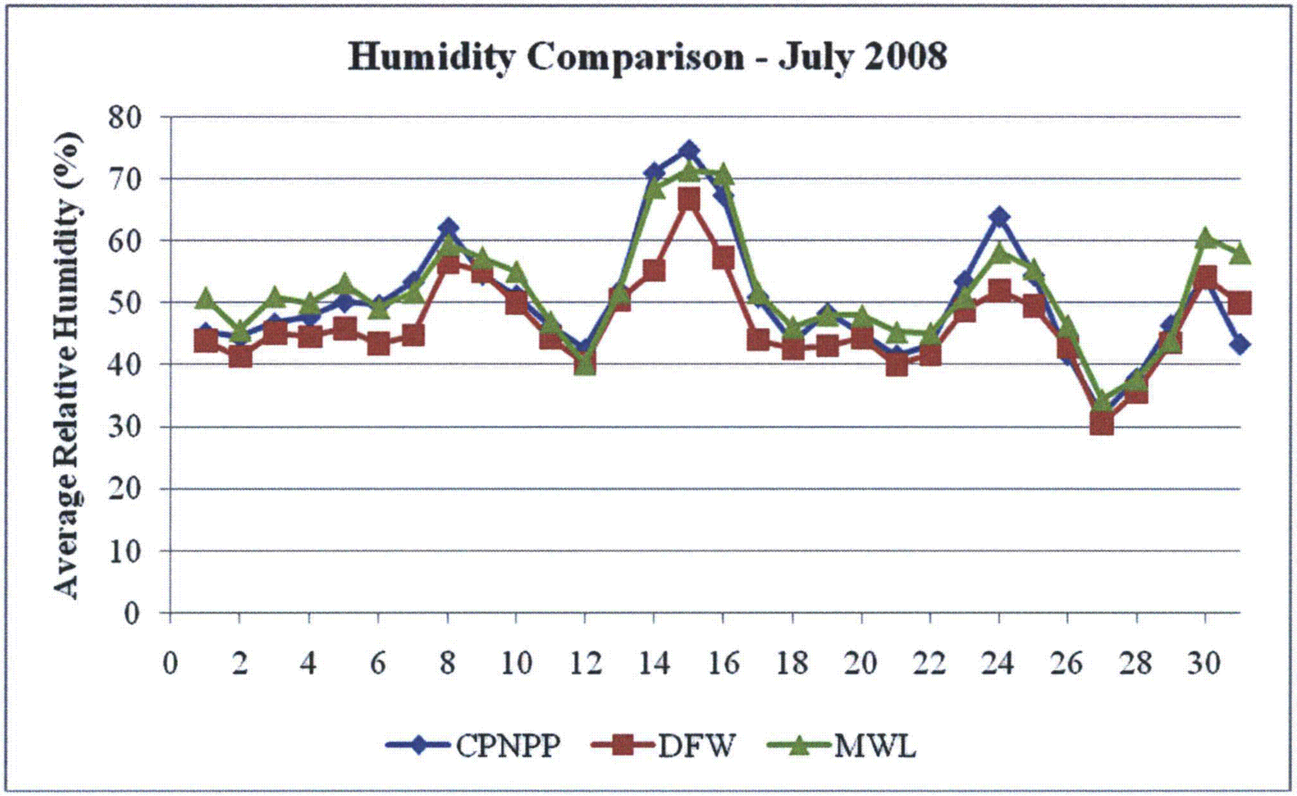


Figure 2.3-384 Humidity Comparison - July 2008

RCOL2_02.03.03-10

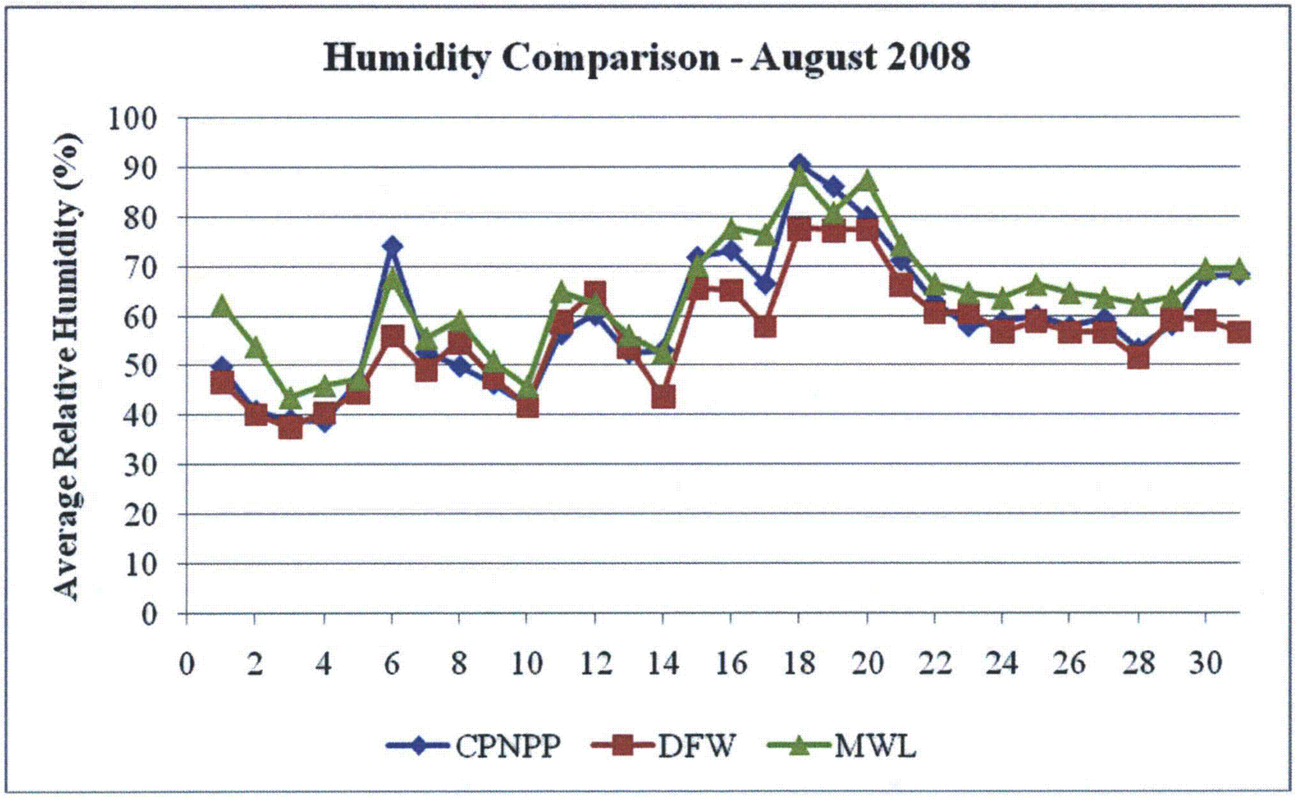


Figure 2.3-385 Humidity Comparison - August 2008

RCOL2_02.03.03-10

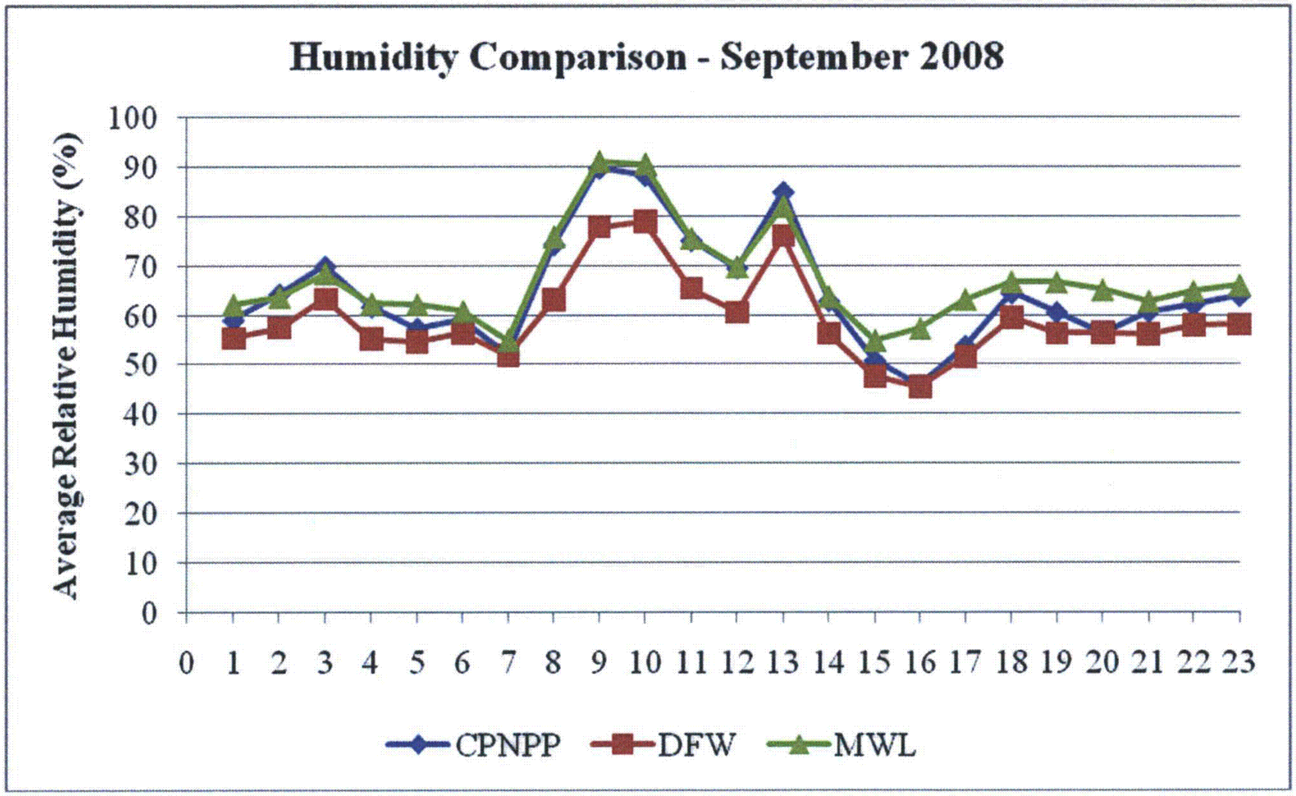


Figure 2.3-386 Humidity Comparison - September 2008

## 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.: 4608 (CP RAI #157)**

**SRP SECTION: 02.03.03 - Onsite Meteorological Measurements Programs**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

---

**QUESTION NO.: 02.03.03-11**

Please correct the following typographical error in updated FSAR Table 2.3-332 in the RAI 2.3.3-5 response. The resolution for wind direction should be given as 1 degree instead of 1 degree Fahrenheit.

---

**ANSWER:**

FSAR Table 2.3-332 has been revised to give the wind direction resolution as "1 degree" instead of "1 degree Fahrenheit."

Impact on R-COLA

See attached marked-up FSAR Revision 1 page 2.3-245.

Impact on S-COLA

None.

Impact on DCD

None.

CP COL 2.3(1)

## Table 2.3-332
## CPNPP Meteorological System Accuracies

| Parameter | Recording Type | System Accuracy (ANSI/ANS-2.5-1984)[1] | Actual System Accuracy[2] | Resolution | |
|---|---|---|---|---|---|
| | | | | | RCOL2_02.03.03-5 |
| Wind Speed | Digital | ±0.5 mph, WS<5mph<br>±10%, otherwise | ±0.39mph, WS<25mph<br>±1.10%, otherwise | 0.1 mph | RCOL2_02.03.03-5 |
| | Paperless Digital | ±0.75mph, WS<5mph<br>±15%, otherwise | ±0.58mph, WS<25mph<br>±1.18%, otherwise | | |
| Wind Direction | Digital | ±5° | ±3.4° | 1° | RCOL2_02.03.03-5<br>RCOL2_02.03.03-11 |
| | Paperless Digital | ±7.5° | ±4.5° | | |
| Temperature | Digital | ±0.9°F | ±0.6°F | 0.1°F | RCOL2_02.03.03-5 |
| | Paperless Digital | ±0.9°F | ±0.9°F | | |
| Delta Temperature | Digital | ±0.27°F | ±0.17°F | 0.01°F | RCOL2_02.03.03-5 |
| | Paperless Digital | ±0.27°F | ±0.19°F | | |
| Precipitation | Digital | Rain gauge with ±0.01 in resolution ±10% measured value for total accumulated catch greater than 0.2 in | Rain gauge with ±0.01 resolution ±0.011 in or ±1.1% | 0.01 in | RCOL2_02.03.03-5 |
| | Paperless Digital | Rain gauge with ±0.01 in resolution +10% measured value for total accumulated catch greater than 0.2 in | Rain gauge with ±0.01 resolution ±0.013 in or ±1.3% | | |

Notes:

1. Endorsed by Reg. Guide 1.23, Second Proposed Revision 1, April 1986.

2. Accuracy values shown were calculated for the original system. Calculations made for subsequent equipment upgrades computed uncertainties equal to or less than those stated. All uncertainties computed are within acceptance criteria.

## 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.: 4608 (CP RAI #157)**

**SRP SECTION: 02.03.03 - Onsite Meteorological Measurements Programs**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 02.03.03-12**

Luminant stated in response to RAI 2.3.3-6 that the meteorological tower's guyed wires and tower anchors are inspected every five years. Regulatory Guide 1.23, 'Meteorological Monitoring Programs for Nuclear Power Plants,' Rev. 1 (March 2007), indicates guyed wires should be inspected annually and anchors should be inspected once every three years in accordance with industry standards (pp. 10). Please explain in FSAR Section 2.3.3 why the inspection schedule used for the meteorological tower is different than the guidance provided in Regulatory Guide 1.23, Rev. 1 (March 2007).

---

**ANSWER:**

As stated in CPNPP Units 1 and 2 FSAR Section 2.3.3.2,

> The meteorological monitoring program at CPSES complies with the requirements and those applicable recommendations of the Second Proposed Revision 1 to Regulatory Guide 1.23 (April, 1986).

Because the meteorological system and tower used to support the CPNPP Units 3 and 4 COL is the same system used for operating CPNPP Units 1 and 2, it has not been changed to meet the new requirements of RG 1.23 Rev. 1 (March 2007).

As stated in the response to Question 2.3.3-6, Luminant has the guyed wires and tower anchors inspected every five years by an outside contractor. The contractor's work scope includes a below grade anchor inspection, an evaluation of anchor and guyed wires condition, and performance of any maintenance that is needed on the guyed tower, anchors, and associated parts.

The last inspection was performed on July 18, 2006. The inspection results indicated that the anchors were all in good condition with no visible corrosion. The 2006 inspection also evaluated the tower structure, tower foundation, guy anchors and guy wires. All were found to be in good condition.

Future evidence of tower degradation will be considered in determining if more frequent inspection intervals are necessary. However, at present, there is no indication that more frequent inspection is warranted.

Impact on R-COLA

See attached marked-up FSAR Revision 1 page 2.3-39.

Impact on S-COLA

None.

Impact on DCD

None.

The comparison of four months of data from the CPNPP site with offsite data sources indicates that the CPNPP site relative humidity data correlates very well with data from MWL. As a result of this close correlation, recording additional humidity data at the CPNPP site was not necessary. Due to relative humidity measurements at DFW being consistently below CPNPP, both on average and during peak events, MWL is selected as a better representation of CPNPP site humidity conditions. This conclusion is reasonable due to the rural setting at CPNPP and MWL compared to the urban DFW location. In addition, the proximity of MWL to CPNPP (37 miles) compared to the distance to DFW airport (61 miles) makes the MWL data more representative. The relative humidity recorded at the MWL National Weather Service station is representative of the relative humidity at the CPNPP site for the reasons discussed above and serves as the data of record for support calculations, such as cooling tower plume analysis. RCOL2_02.03.01-10

### 2.3.3.2 Instrumentation

An overview of the instrumentation used in the meteorological monitoring system is provided below. The CPNPP Units 1 and 2 UFSAR and other plant documents contain specific data about sensors and requirements for replacement of sensors. Wind speeds at the 10-m and 60-m levels are measured with a 3-cup anemometer with a threshold of 0.45 m/s and a range of 0-100 mph. Wind directions at the 10-m and 60-m levels are detected by a wind vane with a threshold of 0.45 m/s and a range of 0 to 360 degrees. Temperatures at the 10-m and 60-m levels are measured with a platinum temperature sensor with a range of -20°F to +120°F. Delta temperature between the 10-m and 60-m levels uses the temperature sensors at each level and has a range of -5°F to +15°F. Precipitation is measured at the surface with a tipping bucket gauge with a threshold of 0.01-in and a range of 0-in to 1.0-in.

### 2.3.3.3 System Accuracy

System accuracies are specified in Tables 2.3-332 and 2.3-333. All system accuracies meet or exceed regulatory requirements (Reference 2.3-205). Calibration and maintenance procedures ensure the accuracy of the instrumentation. All calibrations are performed semi-annually and in accordance with the ODCM. Calibration of metrological tower instrumentation is performed in accordance with the Quality Related CPNPP common unit Instrument and Control Manual. Calibration is applied to the individual instruments and the entire channel (through the plant computer points in the control rooms). The surveillance requirements provided in the ODCM require that the wind speed, wind direction, and temperature instrumentation channels at both measurement levels be operable at all times. In addition, channel checks are performed at least once per 24 hours in accordance with the ODCM. An annual inspection of the tower structure is also performed. The guyed wires and anchors are inspected every five years in accordance with the CPNPP Units 1 and 2 inspection program. The Unit 1 and 2 meteorological program complies with the requirements of the Second Proposed Revision 1 to Regulatory Guide 1.23 (April, 1986), as discussed in Unit 1 and 2 FSAR Section 2.3.3.2. RCOL2_02.03.03-3 RCOL2_02.03.03-5 RCOL2_02.03.03-7 RCOL2_02.03.03-6 RCOL2_02.03.03-12

## 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.: 4608 (CP RAI #157)**

**SRP SECTION: 02.03.03 - Onsite Meteorological Measurements Programs**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

---

**QUESTION NO.: 02.03.03-13**

Regulatory Guide 1.23 requests that the FSAR include a statement describing the length of the booms that support the meteorological instrumentation. Include this information, along with justification explaining that the lengths of the booms sufficiently reduce airflow modification and turbulence induced by the supporting structure itself, or provide justification as to why this information is not necessary in the FSAR.

---

**ANSWER:**

Regulatory Guide (RG) 1.23, Revision 1, in Section 3, "Siting of Meteorological Instruments," states in part:

> Because the tower structure can affect downwind measurements, wind sensors on the side of a tower should be mounted at a distance equal to at least twice the longest horizontal dimension of the tower (e.g., the side of a triangular tower).. The sensors should be on the upwind side of the mounting object in areas with a dominant prevailing wind direction...

The CPNPP primary metrological tower is a 60-meter, guyed, open-lattice tower with an instrument elevator and instrumentation booms located at the 10-meter and 60-meter levels. Due to the prevailing winds from the south and south-southeast, the booms are located on the west side of the tower in order to minimize tower interference. The instrument booms are approximately 8 feet in length and the tower base is approximately 44 inches on a side at the base. Therefore, the boom exceeds the length recommended in RG 1.23, Revision 1 to minimize airflow modification and turbulence induced by the supporting structure itself.

Impact on R-COLA

See attached marked-up FSAR Revision 1 page 2.3-37.

Impact on S-COLA

None.

Impact on DCD

None.

### 2.3.3.1 Meteorological Measurement System

The Unit 1 and 2 Reactor Complex is located approximately 450m west-northwest of the meteorological tower. The top of the dome is 69 meters above the level of the base of the meteorological tower. Prior to construction of Unit 1 and 2, wind was recorded from the west-northwest sector approximately 2.1 percent of all recordings; thus, any effect of the Unit 1 and 2 Reactor Complex on the overall meteorological measurements program is minimal. Current data (2001 – 2006) show that the wind is from the northwest approximately 2.4 percent of the time at the upper instrument level (60m) and approximately 1.4 percent of the time at the lower (10m) instrument level. In addition, no other structures are in such proximity to the tower that will cause a significant alteration of the meteorological data.

The meteorological measurements system consists of a primary meteorological tower, a backup tower, and a computer system with condition and limit code checks. The location of the meteorological towers relative to other significant site structures is shown in Figure 2.3-380.

The primary tower is located east of the Unit 1 and 2 reactor complex at an elevation of 838 ft - 9 in above sea level. The primary tower structure is a 60-m, guyed, open lattice tower with an instrument elevator and instrumentation booms at the 10-m and 60-m levels. Due to the prevailing winds, the booms are located on the west side of the tower in order to minimize tower interference. The instrument booms are approximately 8 feet in length and the tower base is approximately 44 inches on a side. This boom length exceeds the length recommended in Regulatory Guide 1.23, Revision 1 to minimize airflow modification and turbulence induced by the supporting structure itself. The aspirator motors and shields for the temperature sensors are oriented north/south. The primary meteorological tower directly monitors or provides information to determine the following meteorological parameters: RCOL2_02.03.03-13

- Wind speed at 10 m and 60 m.
- Wind direction at 10 m and 60 m.
- Ambient temperature at 10 m.
- Delta-temperature between 10 m and 60 m (redundant channels).
- Sigma theta at 10 m.
- Precipitation near ground level.

An additional 10-m backup tower is located 75 ft east-northeast from the primary tower. This tower is an open lattice tower with a stationary instrumentation boom located on top of the tower. The aspirator motor and shield for the backup temperature sensor are also oriented north/south. The backup tower monitors or provides information to determine the following meteorological parameters:

# Attachment 4

# Response to Request for Additional Information No. 4609 (CP RAI #160)

## 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.: 4609 (CP RAI #160)**

**SRP SECTION: 02.03.05 - Long-Term Atmospheric Dispersion Estimates for Routine Releases**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 02.03.05-3**

Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases From Light-Water-Cooled Reactors," Revision 1 (July 1977) states that if a constant mean wind direction model (such as XOQDOQ) is used, airflow characteristics in the vicinity of the site should be examined to determine the spatial and temporal variations of atmospheric transport and diffusion conditions and the applicability of single station meteorological data to represent conditions between the site and the nearest receptors and conditions out to a distance of 50 miles from the site.

Please update FSAR Section 2.3.5 to include a discussion as to why the XOQDOQ straight-line trajectory model is appropriate to use, for the Comanche Peak Nuclear Power Plant, Units 3 and 4 site, out to a distance of 50 miles to estimate the $\chi/Q$ and D/Q values, or provide justification as to why this information is not necessary to be included in the FSAR.

---

**ANSWER:**

The CPNPP normal effluent release atmospheric dispersion evaluations used the XOQDOQ[1] program, which is based on the theory that material released to the atmosphere will be normally distributed (Gaussian) about the plume centerline. In predicting concentrations for longer time periods, the Gaussian distribution is assumed to be evenly distributed within each directional sector. A straight-line trajectory is assumed between the point of release and all receptors. The program implements the assumptions outlined in Section C (excluding Sections C.1.a and C.1.b) of Regulatory Guide (RG) 1.111.

As stated in the Staff comment, RG 1.111 cautions that if a constant mean wind direction model (such as XOQDOQ) is used, airflow characteristics in the vicinity of the site should be examined to determine the spatial and temporal variations of atmospheric transport and diffusion conditions and the applicability of single station meteorological data to represent conditions between the site and the nearest receptors and conditions out to a distance of 50 miles from the site.

Variable terrain, along with other possible spatial and temporal variations of atmospheric transport and diffusion conditions, has the potential to influence local diffusion characteristics. The discussion presented in FSAR Subsection 2.3.2.2.3 concluded that terrain has no impact on atmospheric dispersion within 5 miles of the site. In addition, the CPNPP site is not in a pronounced river valley nor is it near the coast of any large body of water and is not subject to periods of prolonged atmospheric stagnation.

FSAR Section 2.3 provides extensive evaluations of wind speed, wind direction, atmospheric stability, mixing height, and precipitation for the CPNPP site and surrounding meteorological stations, which demonstrates that the CPNPP meteorological data is sufficient to represent conditions between the site and the nearest receptors and conditions out to a distance of 50 miles from the site. There is no evidence of any spatial or temporal variations in atmospheric transport and diffusion conditions that would invalidate the use of a constant mean wind direction model (such as XOQDOQ). There is no evidence that the CPNPP site meteorological data is insufficient to represent conditions between the site and the nearest receptors and conditions out to a distance of 50 miles from the site.

The use of a constant mean wind direction model is consistent with the modeling used in the CPNPP Unit 1 and 2 FSAR. CPNPP Units 1 and 2 FSAR Subsection 2.3.5.2 uses a straight-line trajectory model (Equation 2.3-10) as defined in RG 1.111 assuming a ground-level release mode. As stated in Subsection 2.3.5.2, the T factor in Equation 2.3-10 is the open terrain correction factor given in RG 1.111, because the site is basically in open terrain with gently rolling hills.

The use of a straight line trajectory model for long-term releases from the CPNPP site is supported by the discussion in the NRC CPNPP SER (NUREG-0797[2]). Section 2.3.5, Long-Term (Routine) Diffusion Estimates, states that,

> Estimates of diffusion of routine releases resulting from normal plant operations were made according to the guidance In Regulatory Guide 1.111, Revision 1, for a constant mean wind direction model. A ground-level release with a building wake correction factor of 1600 $m^2$ was assumed, and open terrain recirculation factors were used. The applicant calculated the same numerical values for the long-term diffusion. The X/Q values were used in evaluating the applicant's proposed gaseous releases and compliance with 10 CFR Part 50, Appendix I design objectives discussed in Section 11.2 of this report.

<u>References</u>

[1] NUREG/CR-2919, "XOQDOQ: Computer Program for the Meteorological Evaluation of Routine Effluent Releases at Nuclear Power Stations", September 1982

[2] NUREG-0797, “Safety Evaluation Report Related to the Operation of Comanche Peak Steam Electric Station, Units 1 and 2,” Supplement No. 16, U.S. Nuclear Regulatory Commission, Washington, DC, July 1988.

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

See attached marked-up FSAR Revision 1 page 2.3-47 and 2.3-48.

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

None.

<u>Impact on DCD</u>

None.

CP COL 2.3(3) Replace the content of DCD Subsection 2.3.5 with the following. CTS-01120

### 2.3.5.1 Objective

~~CP COL 2.3(3) Replace the content of DCD Subsection 2.3.5.1 with the following.~~ CTS-01120

The on-site meteorological record is used to provide realistic estimates of annual average atmospheric dilution factors to a distance of 50 mi from the plant for use in calculating the dispersion through air pathways of radionuclides released in routine plant operations.

### 2.3.5.2 Calculations

~~CP COL 2.3(3) Add the following subsection after DCD Subsection 2.3.5.2~~. CTS-01120

#### 2.3.5.2.1 Plant Vent

The average annual dilution factors which are applicable to routine venting or other routine gaseous-effluent releases have been evaluated from the data record using the technique presented in Regulatory Guide 1.111.

For a routine release, the concentration of radioactive material in the surrounding region depends on the amount of effluent released, the height of the release, the momentum and buoyancy of the emitted plume, the wind speed, atmospheric stability, airflow patterns of the site, and various effluents removal mechanisms. Annual average relative concentration, $\chi$/Q, and annual average relative deposition, D/Q, for gaseous effluent routine releases were, therefore, calculated.

The XOQDOQ Computer Program (NUREG/CR-2919), which implements the assumptions outlined in Regulatory Guide 1.111 developed by the USNRC, was used to generate the annual average relative concentration, $\chi$/Q, and annual average relative deposition, D/Q. Values of $\chi$/Q and D/Q were determined at points of maximum potential concentration outside the site boundary, at points of maximum individual exposure and at points within a radial grid of sixteen 22-1/2° sectors and extending to a distance of 50 mi. Radioactive decay and dry deposition were considered.

The CPNPP normal effluent release atmospheric dispersion evaluations used the XOQDOQ program which is based on the theory that material released to the atmosphere will be normally distributed (Gaussian) about the plume centerline. In predicting concentrations for longer time periods, the Gaussian distribution is assumed to be evenly distributed within each directional sector. A straight-line trajectory is assumed between the point of release and all receptors. The program implements the assumptions outlined in Section C (excluding Sections C.1.a and C.1.b) of NRC Regulatory Guide (RG) 1.111. FSAR Section 2.3 provides extensive evaluations of wind speed, wind direction, "atmospheric stability, mixing height, and precipitation for the CPNPP site and surrounding meteorological stations, which demonstrates that the CPNPP meteorological data is sufficient to RCOL2_02.03.05-3 represent conditions between the site and the nearest receptors and conditions out to a distance of 50 miles from the site. There is no evidence of any spatial or temporal variations in atmospheric transport and diffusion conditions that would invalidate the use of a constant mean wind direction model (such as XOQDOQ). RCOL2_02.03.05-3

Meteorological data for the period from 2001 through 2004 and 2006 were used, and receptor locations were determined from the locations given in the current land-use census (Reference 2.3-223). An assumed release point located at the center point between Units 3 and 4 was used to calculate $\chi/Q$ and D/Q values beyond the EAB. For $\chi/Q$ and D/Q values calculated at the EAB, the distance is measured from an assumed release boundary, with a 670 ft radius from the containment centerline, to the EAB. Hourly meteorological data were used in the development of joint frequency distributions, in hours, of wind direction and wind speed by atmospheric stability class. The wind speed categories used were consistent with the CPNPP short-term (accident) diffusion $\chi/Q$ calculation discussed above. Calms were distributed as the first wind speed class.

Joint frequency distribution tables were developed from the hourly meteorological data with the assumption that if data required as input to the XOQDOQ program (i.e., lower level wind direction and wind speed, and temperature differential as opposed to upper level wind direction and wind speed) were missing from the hourly data record, all data for that hour would be discarded. This assumption maximizes the data being included in the calculation of the $\chi/Q$ and D/Q values because hourly data are not discarded if only upper data is missing.

The analysis assumed a combined vent located at the center of the proposed facility location. At ground level locations beyond several miles from the plant, the annual average concentration of effluents are essentially independent of release mode; however, for ground level concentrations within a few miles, the release mode is very important. Gaseous effluents released from tall stacks generally produce peak ground-level air concentrations near or beyond the site boundary. Near ground level releases usually produce concentrations that decrease from the release point to all locations downwind. Guidance for selection of the release mode is provided in Regulatory Guide 1.111. In general, in order for an elevated release to be assumed, either the release height must be at least twice the height of adjacent buildings or detailed information must be known about the wind speed at the height of the release. For this analysis, the proposed new facility's routine releases were conservatively modeled as ground level releases.

Building cross-sectional area and building height are used in calculation of building wake effects. Regulatory Guide 1.111 identifies the tallest adjacent building, in many cases the reactor building, as appropriate for use. A conservative building area of 2500 $m^2$ and a building height of 69.9 m were used in the calculation of building wake effects.

Consistent with Regulatory Guide 1.111 guidance regarding radiological impact evaluations, radioactive decay and deposition were considered. For conservative estimates of radioactive decay, an overall half-life of 2.26 days is acceptable for

## 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.: 4609 (CP RAI #160)**

**SRP SECTION: 02.03.05 - Long-Term Atmospheric Dispersion Estimates for Routine Releases**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 02.03.05-4**

NUREG-0800, Standard Review Plan (SRP), Chapter 2.3.5, 'Long-Term Atmospheric Dispersion Estimates for Routine Releases,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

> FSAR Section 2.3.5.2.2 states that the maximum $\chi/Q$ and D/Q values for the evaporation pool are not bounded by the exclusion area boundary (EAB) (annual average) values of 1.6E-05 $s/m^3$ and 4.0E-08 $m^{-2}$, respectively.
>
> Justify in FSAR Section 2.3.5 why these values are acceptable to be used as site characteristics.

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**ANSWER:**

As stated in FSAR Subsection 2.3.5.2.2, the highest evaporation pond $\chi/Q$ value ($5.2 \times 10^{-5}$ $s/m^3$) at the EAB occurs in the south sector. This $\chi/Q$ value is not bounded by the EAB (annual average) value of $1.6 \times 10^{-5}$ $s/m^3$ given in Table 2.0-1 of the US-APWR DCD. This has no impact on the acceptability of the calculated evaporation pond $\chi/Q$ values as site characteristics.

The $\chi/Q$ values at the EAB for releases from the evaporation pond have no relationship to the DCD values because an evaporation pond is not part of the standard US-APWR plant design, as described in the US-APWR DCD. The existence of an evaporation pond at the CPNPP site necessitates a site-specific dose assessment based on site-specific $\chi/Q$ and D/Q values. This dose evaluation is provided in FSAR Subsection 11.3.3.1. Incidentally, the evaporation pond $\chi/Q$ values are not listed in FSAR Table 2.0-1R because there are no DCD site parameters to compare with these CPNPP site characteristics.

Because a comparison of the evaporation pond $\chi/Q$ and D/Q values with the DCD EAB site parameters is not appropriate or necessary, the FSAR has been revised to remove the statements: *"The maximum X/Q value is not bounded by the EAB (annual average) value of $1.6x10^{-5}$ s/$m^3$ given in Table 2.0-1 of the US-APWR DCD. Table 2.0-1 also gives an EAB (annual average) D/Q value of $4.0x10^{-8}$ $m^{-2}$. The maximum site D/Q value is also not bounded by the DCD value."*

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

See attached marked-up FSAR Revision 1 page 2.3-51.

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

None.

<u>Impact on DCD</u>

None.

given in Table 2.3-350. The XOQDOQ software (NUREG/CR-2919) was used to determine the EP atmospheric dispersion values.

From Table 2.3-348, the highest $\chi$/Q and D/Q values for the EAB occur in the south sector and are $5.2 \times 10^{-5}$ s/$m^3$ and $2.3 \times 10^{-7}$ $m^{-2}$, respectively. The maximum $\chi$/Q value is not bounded by the EAB (annual average) value of $1.6 \times 10^{-5}$ s/$m^3$ given in Table 2.0-1 of the US-APWR DCD. Table 2.0-1 also gives an EAB (annual average) D/Q value of $4.0 \times 10^{-8}$ $m^{-2}$. The maximum site D/Q value is also not bounded by the DCD value. Table 2.3-348 gives the annual average $\chi$/Qand D/Q values for no decay, undepleted, as well as 2.26 day decay, undepleted and 8.00 day decay, depleted. RCOL2_02.03.05-4

There are no meat animals identified in the area surrounding the CPNPP site. Therefore, it is assumed that the $\chi$/Q and D/Q values at any location of meat animals within five miles of the plant would be bounded by values determined at other receptors, and no specific $\chi$/Q or D/Q values are provided.

### 2.3.6 Combined License Information

CP COL 2.3(1) ***2.3(1)*** *Site Meteorology*

*This COL item is addressed in* Subsections 2.3.1 *and* 2.3.2 *and associated tables.*

CP COL 2.3(2) ***2.3(2)*** *Short term atmospheric transport and diffusion*

*This COL item is addressed in* Subsection 2.3.4 *and associated tables.*

CP COL 2.3(3) ***2.3(3)*** *Long term atmospheric transport and diffusion*

*This COL item is resolved in* Subsection 2.3.5 *and associated tables.*

### 2.3.7 References

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CP SUP 2.3(1) Add the following references after the last reference in DCD Subsection 2.3.7.

2.3-201 Texas Water Development Board, 2007 State Water Plan, Chapter 5, “Climate of Texas”, s.v. ","
http://www.twdb.state.tx.us/publications/reports/State_Water_Plan/2007/2007StateWaterPlan/2007StateWaterPlan.htm) (accessed January 6, 2008 7:06 PM). (NOTE: "s.v." stands for sub verbo, "under the word.")

2.3-202 Texas State Historical Association, Handbook of Texas Online, s.v. ","

## 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.: 4609 (CP RAI #160)**

**SRP SECTION: 02.03.05 - Long-Term Atmospheric Dispersion Estimates for Routine Releases**

**QUESTIONS for Siting and Accident Conseq Branch (RSAC)**

**DATE OF RAI ISSUE: 4/27/2010**

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**QUESTION NO.: 02.03.05-5**

NUREG-0800, Standard Review Plan (SRP), Chapter 2.3.5, 'Long-Term Atmospheric Dispersion Estimates for Routine Releases,' establishes criteria that the NRC staff intends to use to evaluate whether an applicant meets the NRC's regulations.

> FSAR Table 2.0-1R (sheet 3 of 12) presents the annual average D/Q values for the EAB. This table shows that the site characteristic D/Q value of 5.5E-08 $m^{-2}$ exceeds the US-APWR site parameter value of 4.0E-08 $m^{-2}$.
>
> Justify in FSAR Section 2.3.5 why these values are acceptable to be used as site characteristics.

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**ANSWER:**

The purpose of comparing site characteristics with DCD site parameters is to determine if the DCD values are bounding, thereby allowing credit for the DCD evaluations and analyses. Implicit in this approach is the understanding that exceeding the DCD site parameters will require a site-specific evaluation. Comparing site characteristic annual average atmospheric dispersion values for normal releases with the corresponding DCD site parameters is not particularly useful because differences in population distribution, land use, and crop production would necessitate a site-specific dose analysis anyway. The comparison with the DCD values in FSAR Table 2.0-1R is provided only because the annual average parameters were given in the DCD. The additional site-specific dose analyses provided in FSAR Subsection 11.3.3.1 demonstrate that the regulatory limits of 10 CFR 50, Appendix I are met. Because the Appendix I limits are met, the CPNPP X/Q and D/Q site characteristics are acceptable.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.