

PMSTPCOL NPEmails

From: Raj Anand
Sent: Tuesday, March 11, 2008 11:29 AM
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Cc: Hosung Ahn; Brad Harvey; Belkys Sosa; Mark Tonacci; Seshagiri Tammara; STPCOL; George Wunder
Subject: Preliminary Questions in Chapter 2 of the STP COLA
Attachments: Preliminary list of information needs relative to the STP COLA FSAR Chapter 21.doc

Hi Greg/Bill,

The NRC staff plans to discuss the enclosed Preliminary Questions in Chapter 2 of the STP COLA during a safety audit scheduled for the week of March 24, 2008.

The staff does not expect any written response for these questions from the applicant at this time. However, if these questions are not resolved during the site audit to the staff satisfaction, they may be turned into RAIs.

Geoscience & Geotechnical Engg. Branch is currently working with their contractor USGS to prepare preliminary questions in Section 2.5S "Geology Seismology and Geotech Engg." of the COLA. These questions will not be ready until end of March. We plan to have a separate discussion meeting with you at a later date.

As always, thank you for your assistance.

Regards,
Raj

Hearing Identifier: SouthTexas34NonPublic_EX
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The following table represents a draft list of discussion items that will be discussed during the safety site audit for the STP Units 3 & 4 COLA FSAR Chapter 2. Additional items or changes may be added to the existing list, based on discussion and review.

Preliminary Information Needs for the STP Safety Site Audit

Serial #	FSAR Section	Discipline	Information Needs	Reviewer	Resolved	RAI
1.	2.1S.2	Site Characteristics	On FSAR Figure 2.1S-3, the minimum distance to EAB from unit 4 is incorrect. Clarify and correct as appropriate	R.Tammara		
2.	2.1S.3	Site Characteristics	Make available a copy of the reference cited (2.1S-16) during site audit.	R.Tammara		
3.	2.1S.3	Site Characteristics	Provide the calculated growth rate for each of the nine counties (Brazoria, Calhoun, Colorado, Fort Bend, Jackson, Lavaca, Matagorda, Victoria, Wharton) that comprise within the 50 miles of the STP site.	R.Tammara		
4.	2.2S.3	Site Characteristics	The minimum safe distance shown in Table 2.2S-9 are said to be based on TNT equivalency method using 1.91 methodology. Explain how these values were calculated.	R.Tammara		
5.	2.2S.3	Site Characteristics	Provide sample inputs for ALOHA and DEGADIS models used in determining minimum distance required for an explosion to have less than 1 psi peak incident pressure impact due to flammable vapor cloud, and also inputs for determining toxic vapor concentrations inside control room. Please make available the calculations performed during site audit.	R.Tammara		
6.	2.3S.1 2.3S.2	Meteorology	Discuss the influence of the Gulf of Mexico and the resulting land and seabreezes on regional climatology (FSAR Section 2.3S.1) and local meteorology (FSAR Section 2.3S.2).	Brad Harvey		
7.	2.3S1.1 2.3S1.4 2.3S1.5	Meteorology	Both FSAR Sections 2.3S1.1 and 2.3S.2.1 state that long-term data from Victoria were used to describe the general climatic conditions at the STP	Brad Harvey		

Serial #	FSAR Section	Discipline	Information Needs	Reviewer	Resolved	RAI
	2.3S2.1 2.3S2.2.1 2.3S2.2.5 2.3S2.2.6		<p>site; FSAR Section 2.3S.2.1 also states that Victoria data were used to describe the site extreme climatology. FSAR Section 2.3S.2.1 further states that the monthly mean daily maximum and minimum temperatures are more extreme at Victoria compared to those measured at Palacios; therefore, Victoria data were used to describe the site extreme climatology. However, the staff notes that Victoria is located significantly further from the Gulf of Mexico as compared to either Palacios or the STP site and the climatic data tables associated with Chapter 28 of the 2005 ASHRAE Handbook – Fundamentals show that the Palacios 0.4%, 1%, and 2% exceedance wet-bulb values exceed the corresponding Victoria wet-bulb values by approximately 1 °C.</p> <p>FSAR Section 2.3S.2.1 states that consecutive hourly data are not available at Palacios during the period of March 1959 through December 1999. However, the staff was able to download 1988–2007 Palacios hourly data from the National Climatic Data Center (NCDC) Climate Data website. FSAR Section 2.3S.3.4.1.4 further states that Palacios is considered to be representative of the STP site and data collected at Palacios from 1997 through 2001 were used to predict cooling tower plume impacts resulting from operation of the STP 3 & 4 reactor service water mechanical draft cooling towers.</p> <p>a. Justify not including Palacios data in the selection of the minimum water cooling and maximum water usage conditions for use in evaluating the ultimate heat sink thermal</p>			

Serial #	FSAR Section	Discipline	Information Needs	Reviewer	Resolved	RAI
			<p>performance as discussed in FSAR Section 2.3S.1.4.</p> <p>b. Justify not including Palacios data in the selection of the 0% exceedance coincident and non-coincident wet bulb temperatures and the 100-year return period maximum wet-bulb temperature ambient design temperature site characteristics as discussed in FSAR Section 2.3S.1.5.</p> <p>c. Justify not including Palacios data in the review of average wind direction and wind speed conditions as discussed in FSAR Section 2.3S.2.2.1.</p> <p>d. Justify not including Palacios data in the review of atmospheric water vapor as discussed in FSAR Section 2.3S.2.2.5.</p> <p>e. Justify not including Palacios data in the review of fog as discussed in FSAR Section 2.3S.2.2.6.</p>			
8.	2.3S.1.2	Meteorology	FSAR Section 2.3S.1.2 states that the late spring/early summer predominant precipitation maximum is associated with both tropical cyclones and thunderstorm activity whereas the early to mid autumn secondary precipitation maximum is primarily due to thunderstorms. Don't tropical cyclones occur more frequently in early to mid autumn as compared to late spring/early summer?	Brad Harvey		
9.	2.3S.1.3.2	Meteorology	Provide statistics on the frequency of occurrence of tornadoes in the STP site region.	Brad Harvey		
10.	2.3S.1.3.2	Meteorology	The proposed STP site is located within RG 1.76 tornado intensity Region II but is approximately 22 km from the more conservative tornado intensity Region I. FSAR Section 2.3S.1.3.2 states that the	Brad Harvey		

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			design-basis tornado characteristics for Region II were chosen as the STP tornado site characteristics taking into consideration information presented in Revision 2 to NUREG/CR-4461. Please explain how information presented in NUREG/CR-4461 was used to select the RG 1.76 Region II design-basis tornado characteristics as STP tornado site characteristics.			
11.	2.3S.1.3.3	Meteorology	FSAR Section 2.3S.1.3.3 discusses that NOAA's Coastal Service Center (CSC) historical hurricane track database indicates that a total of 142 tropical cyclone storm tracks have passed within a 100-nautical mile (nm) radius of the STP site from 1851 through 2006. In reviewing the same database, the staff found that 75 (instead of 142) storm tracks passed within a 100-nm radius. The staff believes that a number of these storm tracks are assigned a multiple number of storm intensities as the storms moved through the STP site region which were misclassified as separate storm tracks by the applicant.	Brad Harvey		
12.	2.3S.1.3.3	Meteorology	General Design Criteria (GDC) 2 to Appendix A to 10 CFR Part 50 states that structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as hurricanes without loss of capability to perform their safety functions. GDC 2 further states that the design bases for these structures, systems, and components shall reflect 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.	Brad Harvey		

Serial #	FSAR Section	Discipline	Information Needs	Reviewer	Resolved	RAI
			<p>FSAR Section 2.3S.1.3.3 presents information from the NOAA's Coastal Service Center (CSC) historical hurricane track database on the number of tropical cyclone storm tracks that have passed within a 100-nautical mile (nm) radius of the STP site from 1851 through 2006. Using this same database for this same period of record, the staff identified 11 hurricanes that were classified as major (i.e., Saffir/Simpson hurricane category 3 or higher) at the time they made landfall within 100 nm of the STP site. For each of these 11 major hurricanes, the staff used the sustained wind speeds reported in the NOAA CSS database at landfall along with information presented in Table C6-2 of ASCE/SEI 7-05 to estimate the corresponding 3-second gust wind speed over land at landfall. Because hurricane wind speeds typically decrease as storms move inland and the STP site is located approximately 15 mi (24 km) inland from the Gulf of Mexico, the staff reduced the gust wind speed at landfall by 5 mi/h (8 km/h), based on the 5 mi/h reduction in basic wind speed from the coastline to the inland location of the STP site as shown on Figure 6-1A of ASCE/SEI 7-05.</p> <p>The staff found that a total of 8 out of the 11 major landfall hurricanes had projected gust wind speed values which exceeded the applicant's selected extreme wind basic wind speed site characteristic value of 215 km/h for safety related structures. The strongest of these storms had an estimated inland peak gust wind speed of 298 km/h and the next three strongest storms had estimated inland peak gust wind speeds of 275 km/h. One storm, an unnamed storm occurring on August 27-28,</p>			

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			<p>1945, had a projected storm track directly over the STP site; this storm had an estimated inland peak gust wind speed of 262 km/h.</p> <p>a. Please justify why the extreme wind basic wind speed site characteristic value for safety-related structures is not based on the most severe hurricanes that have been historically reported for the site and surrounding area.</p> <p>b. Because historic hurricane wind speeds for the STP site and surrounding area have been estimated to exceed the basic wind speed used for the ABWR wind loading design for safety-related structures, please discuss the implications of a wind load in excess of the ABWR design value.</p>			
13.	2.3S.1.3.4	Meteorology	<p>General Design Criteria (GDC) 2 to Appendix A to 10 CFR Part 50 states that structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena without loss of capability to perform their safety functions. GDC 2 further states that the design bases for these structures, systems, and components shall reflect 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.</p> <p>The maximum snow load site characteristic value should be included in the evaluation of normal live snow loads on the roofs of safety related structures. A maximum snow load site</p>	Brad Harvey		

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			characteristic value of 0 kPa (0 lbf/ft ²) was chosen for the STP site in accordance with ASCE/SEI 7-02. Please justify why the maximum snow load site characteristic value is not based on the highest snowfall value that has been historically reported for the site and surrounding area.			
14.	2.3S.1.3.4	Meteorology	SRP Section 2.3.1 states that the 48-hour probable maximum winter precipitation (PMWP) site characteristic value should be included in the evaluation of extreme live snow loads on the roofs of safety related structures. FSAR Section 2.3S.1.3.4 states that a 48-hour PMWP site characteristic value was not identified because of the infrequent occurrence of snowfall events and the fact that snowfall events do not appear to persist for any appreciable period of time as ground-level snowpack. Nonetheless, the Climatic Atlas of the United States shows that freezing precipitation does occur on average between 2.5 to 5.4 days per year at the STP site and these events do have the potential to clog roof drains. Please identify a 48-hour PMWP site characteristic value for the STP site and describe the additional resulting weight on the roof if all the roof drains are clogged by snow and/or ice.	Brad Harvey		
15.	2.3S1.4 9.2.5.5	Meteorology	Discuss the methodology used to screen meteorological data in selecting the minimum water cooling and maximum water usage conditions for use in evaluating the UHS thermal performance.	Brad Harvey		
16.	2.3S.1.5	Meteorology	The STP 3 & 4 0% exceedance and 100% exceedance ambient design temperature site characteristics should be based on the more conservative of either 100-year return period values or the all-time maximum and minimum values observed in the site area. For example, the	Brad Harvey		

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			<p>following ambient design temperature 0% exceedance (historical limit) STP 3 & 4 site characteristic values presented in FSAR Table 2.0-2 are exceeded by climatological extreme data presented in FSAR Table 2.3S-3:</p> <p>a. Maximum dry-bulb (43 °C) is exceeded by the Pierce 1E maximum temperature (44.4 °C)</p> <p>b. Minimum dry-bulb (-12.2 °C) is exceeded by the Pierce 1E minimum temperature (-15.6 °C)</p>			
17.	2.3S.2.2.2	Meteorology	<p>FSAR Section 2.3S.2.2.2 states that the longest wind direction persistence period at the 60-m level is 30 hours. However, the staff found two longer persistence periods: a 33-hour period ending at hour 16 on day 55 of 1997 and a 32-hour period ending at hour 0 on day 338 of 2000.</p>	Brad Harvey		
18.	2.3S.2.5.1	Meteorology	<p>a. FSAR Section 2.3S.2.5.1 states that the Metropolitan Houston-Galveston Intrastate Air Quality Control Region (AQCR 216) is in attainment for all criteria pollutions (except for the 8-hour ozone standard in certain counties) where attainment areas are areas where the ambient levels of criteria air pollutants are designated as being “better than,” “unclassifiable/attainment,” or “cannot be classified or better than,” EPA-promulgated National Ambient Air Quality Standards. Note that AQCR 216 attainment status has not been designated for lead (40CFR81.38).</p> <p>b. FSAR Section 2.3S.2.5.1 states that certain counties within AQCR 216 (exclusive of Matagorda County) have been classified as moderate nonattainment for the 8-hour ozone standard. Note that the EPA has proposed to</p>	Brad Harvey		

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			grant a request by the Governor of the State of Texas to voluntarily reclassify the AQCR 216 ozone nonattainment area from a moderate 8-hour ozone nonattainment area to a severe 8-hour ozone nonattainment area (72FR74252, December 31, 2007).			
19.	2.3S.3.2	Meteorology	FSAR Section 2.3S.3.2 states that the 1999 and 2000 onsite meteorological data were chosen because, among other reasons, they are the most defensible; e.g., using validated data with the least data substitution. Please describe in general terms any data substitution used to create the 1997, 1999, and 2000 onsite meteorological database submitted in support of the STP 3 & 4 COL application.	Brad Harvey		
20.	2.3S.3.2.1.2	Meteorology	<p>a. FSAR Section 2.3S. 3.2.1.2 states that dew point temperature was measured on the primary meteorological tower at the 3-meter level as part of the preoperational monitoring program. Please discuss why these data were not (1) discussed in the FSAR Section 2.3S.2.25 on atmospheric water vapor, (2) used in the evaluation of the reactor service water system cooling tower impacts discussed in FSAR Section 2.3S.3.4, or (3) provided as part of the supplemental submittal of hourly onsite meteorological data discussed in FSAR Section 2.3S.3.4.3.</p> <p>b. FSAR Section 2.3S.3.2.1.2 states that precipitation is measured at ground level near the base of the primary tower. Please discuss why these data were not (1) used in the evaluation of the environmental risk for the radiological consequences of a spectrum of</p>	Brad Harvey		

Serial #	FSAR Section	Discipline	Information Needs	Reviewer	Resolved	RAI
			<p>severe accidents as discussed in FSAR Section 2.3S.3.4.1.4 or (2) provided as part of the supplemental submittal of hourly onsite meteorological data as discussed in FSAR Section 2.3S.3.4.3.</p> <p>c. FSAR Section 2.3S.3.2.1.2. states that additional relative humidity/temperature instrumentation were added to the primary meteorological monitoring tower in 2006 to baseline moisture content in the environment for a range of mechanical draft cooling towers to be considered for STP 3 & 4. Please provide a copy of the resulting database once a contiguous year of data has been collected and compare these data to the data used to evaluate cooling tower plume impacts as discussed in FSAR Section 2.3S.3.4.1.4.</p>			
21.	2.3S.3.2.3	Meteorology	Please describe the type of calibration activities performed on the onsite meteorological monitoring program instrumentation.	Brad Harvey		
22.	2.3S.3.3	Meteorology	Please clarify whether the calibration and maintenance procedures described in FSAR Section 2.3S.3.2.3 and the data display, processing, archiving, and analysis described in FSAR Section 2.3S.3.2.5 for the preoperational monitoring program will continue for the operational monitoring program.	Brad Harvey		
23.	2.3S.3.4.1.2	Meteorology	Please explain the 6% increase of onsite A stability class frequency from the original data set (1973-1977) to the current (1997, 1999, and 2000) data set as shown in FSAR Table 2.3S-20 (see Figure 1).	Brad Harvey		
24.	2.3S.4.2.1	Meteorology	FSAR Section 2.3S.4.2.1 appears to be disjointed. For example, the discussion concerning the	Brad Harvey		

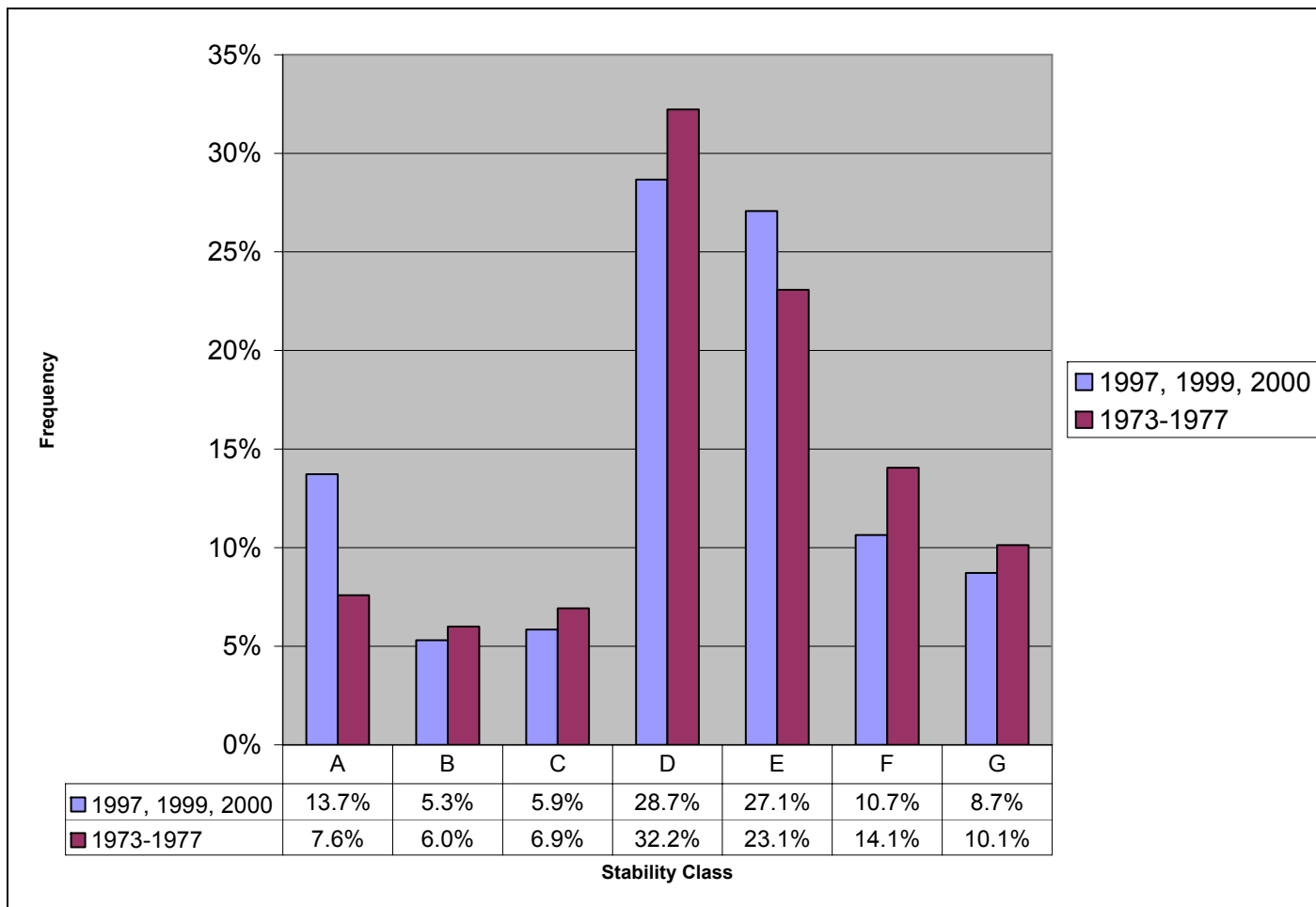
Serial #	FSAR Section	Discipline	Information Needs	Reviewer	Resolved	RAI
			computer program ARCON96 and the resulting control and technical support center χ/Q values could be moved from FSAR Section 2.3S.4.2.1.1 (Offsite Dispersion Estimates) to its own section entitled Onsite Dispersion Estimates. The couple of sentences on hazardous chemical releases scattered throughout FSAR Section 2.3S.4.2.1 (Postulated Accidental Radioactive Releases) could also be moved to FSAR Section 2.3S.4.2.2 (Hazardous Material Releases).			
25.	2.3S.4.2	Meteorology	FSAR Section 2.3S.4.2 states that 10 CFR Part 50, Appendix E, requires an assessment of potential accidental releases of gaseous radioactive material to the atmosphere. Please elucidate this requirement as stated in Appendix E.	Brad Harvey		
26.	2.3S.4.2.1.1	Meteorology	Discuss the influence of the main cooling reservoir on the EAB and LPZ atmospheric dispersion estimates.	Brad Harvey		
27.	2.3S.5	Meteorology	Discuss the influence of (1) the main cooling reservoir and (2) the Gulf of Mexico and the resulting land and seabreezes on the routine release atmospheric dispersion estimates.	Brad Harvey		
28.	Table 2.0	Meteorology	Clarify the definition of the ambient design temperature site parameters listed in ABWR DCD Tier 1 Table 5.0 and Tier 2 Table 2.0-1. For example, do the 1% exceedance values represent annual or seasonal probabilities of occurrence? Do the coincident wet-bulb values represent mean or extreme values?	Brad Harvey		
29.	Table 2.3S-3	Meteorology	The staff reviewed the maximum and minimum temperature statistics provided in FSAR Table 2.3S-3 against the NCDC's Climate Data Online (CDO) Surface Data, Monthly (SDM) and found the following discrepancies:	Brad Harvey		

Serial #	FSAR Section	Discipline	Information Needs	Reviewer	Resolved	RAI
			<ul style="list-style-type: none"> a. For Edna Hwy 59 Bridge maximum temperature, FSAR Table 2.3S-3 reports that measurements were not made whereas the NCDC SDM reports a value of 105 °F for 08/12/1969. b. For Edna Hwy 59 Bridge minimum temperature, FSAR Table 2.3S-3 reports that measurements were not made whereas the NCDC SDM reports a value of 17 °F for 01/12/1973. 			
30.	Table 2.3S-3	Meteorology	<p>The staff reviewed the maximum 24-hour and maximum monthly rainfall statistics provided in FSAR Table 2.3S-3 against the NCDC's Climate Data Online (CDO) Surface Data, Monthly (SDM) and found the following discrepancies:</p> <ul style="list-style-type: none"> a. For the Palacios Muni Airport maximum monthly rainfall, FSAR Table 2.3S-3 reports a value of 24.30 inches for 10/1949 whereas the NCDC SDM reports a value of 24.28 inches for 10/1949. b. For the Bay City Waterworks maximum 24-hour rainfall, FSAR Table 2.3S-3 reports a value of 8.95 inches on 09/12/1961 whereas the NCDC SDM reports a value of 20.85 inches on 10/19/1983. c. For the Bay City Waterworks maximum monthly rainfall, FSAR Table 2.3S-3 reports a value of 23.73 for 10/1984 whereas the NCDC SDM reports a value of 24.02 for 10/1983. d. For the Pierce 1E maximum monthly rainfall, FSAR Table 2.3S-3 reports a value of 17.22 inches for 10/1949 whereas the NCDC SDM reports a value of 23.37 inches for 11/2004. 	Brad Harvey		

Serial #	FSAR Section	Discipline	Information Needs	Reviewer	Resolved	RAI
			<p>e. For the Port O'Connor maximum monthly rainfall, FSAR Table 2.3S-3 reports a value of 34.44 inches for 07/2006 whereas the NCDC SDM reports a value of 24.51 inches for 10/1984.</p> <p>f. For Wharton maximum 24-hour rainfall, FSAR Table 2.3S-3 reports that measurements were not made whereas the NCDC SDM reports a value of 11.58 inches for 10/18/1994.</p> <p>g. For Wharton maximum monthly rainfall, FSAR Table 2.3S-3 reports that measurements were not made whereas the NCDC SDM reports a value of 20.06 inches for 11/2004.</p>			
31.	Table 2.3S-3	Meteorology	<p>The staff reviewed the maximum 24-hour and maximum monthly snowfall statistics provided in FSAR Table 2.3S-3 against the NCDC's Climate Data Online (CDO) Surface Data, Daily (SDD) and found the following discrepancies:</p> <p>a. For the Danevang 1W maximum 24-hour snowfall, FSAR Table 2.3S-3 reports a value of 10.5 inches for 12/23/2004 whereas the NCDC SDD reports a value of 10.5 inches for 12/25/2004.</p> <p>b. For the Victoria Regional Airport maximum 24-hour snowfall, FSAR Table 2.3S-3 reports a value of 2.1 inches for 01/12/1985 whereas the NCDC SDD reports a value of 3.3 inches for 02/12/1958.</p> <p>c. For the Victoria Regional Airport maximum monthly snowfall, FSAR Table 2.3S-3 reports a value of 2.1 inches for 01/1985 whereas the NDCD SSD reports a value of 3.3 inches for</p>	Brad Harvey		

Serial #	FSAR Section	Discipline	Information Needs	Reviewer	Resolved	RAI
			02/1985.			
32.	Table 2.3S-5	Meteorology	<p>The staff reviewed the climatological normals provided in FSAR Table 2.3S-5 and found the following discrepancies:</p> <ul style="list-style-type: none"> a. For Victoria Regional Airport normal annual snowfall, FSAR Table 2.3S-5 reports a value of 0.1 inches whereas the Climatology of the United States, No. 20 reports a value of 0.3 inches. b. For Palacios Muni Airport, daily maximum and daily minimum temperatures of 77.2 °F and 61.1 °F imply a daily range of 16.1 °F whereas FSAR Table 2.3S-5 reports a daily range value of 19.4 °F. c. For Bay City Waterworks, daily maximum and daily minimum temperatures of 80.6 °F and 61.2 °F imply a daily range of 19.4 °F whereas FSAR Table 2.3S-5 reports a daily range value of 16.1 °F 	Brad Harvey		

Figure 1
STP Stability Class Frequency Distributions



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33.	2.3S.2.4 2.3S.3.4.1.4	Meteorology	<p>Please describe the assumptions and provide a copy of the input files used to execute the Seasonal/Annual Cooling Tower Impact (SACTI) computer code for estimating the impacts from fogging, icing, and drift deposition from the operation of the reactor service water (RWS) system mechanical draft cooling towers. In particular:</p> <p>a. Please specify the type of hourly meteorological data used as input (e.g., CD-144, NRC, or TDF-14).</p> <p>b. Please provide a copy of the Hourly Meteorological Data and Mixing Height Data files used.</p> <p>Please provide a copy of the input files to execute the SACTI Preprocessor Model, Plume Model and Tables Output routines.</p>	Brad Harvey		
34.	2.3S4.2	Meteorology	Please provide a copy of the PAVAN output used to generate the EAB and LPZ χ/Q values.	Brad Harvey		
35.	2.3S4.2.1.1 Table 2.3S-24	Meteorology	The staff notes the following discrepancy between the LPZ χ/Q values listed in FSAR Section 2.3S.4.2.1.1 and FSAR Table 2.3S-24: Section 2.3S.4.2.1.1 lists the 0-2 hour LPZ value as 4.76E-5 whereas Table 2.3S-24 lists the highest 0.2-hour LPZ value as 5.05E-5 (WSW sector).	Brad Harvey		
36.	2.3S.5	Meteorology	FSAR Section 2.3S.5 provides estimates of annual average atmospheric dispersion factors (χ/Q values) and relative dry deposition factors (D/Q values) for use in demonstrating compliance with 10 CFR Part 20, Subpart D	Brad Harvey		

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			<p>dose limits for individual members of the public and 10 CFR Part 50, Appendix I numerical guides for design objectives and limiting conditions for operation to meet the requirement that radioactive material in effluents released to unrestricted areas be kept as low as is reasonably achievable. RG 1.111 provides guidance for estimating atmospheric transport and dispersion of gaseous effluents in routine releases from land-based light-water-cooled reactors.</p> <p>RG 1.111 states that appropriate time periods for meteorological data utilization should be based on the constancy of the source term or release rate. Annual data summaries should be used if emissions are continuous. If releases are intermittent, consideration should be given to frequency and duration of the releases; e.g., if emissions are infrequent and of short duration, atmospheric dispersion models and meteorological data applicable to the time of release should be considered. Consequently, please describe the expected frequency and duration of routine releases and justify the use of annual average dispersion conditions.</p>			
37.	2.3S.5.1	Meteorology	FSAR Section 2.3S.5.1 states that distances from the STP 1 & 2 reactors to various receptors of interest (e.g., nearest resident) as provided in the STP 1 & 2 Offsite Dose	Brad Harvey		

Serial #	FSAR Section	Discipline	Information Needs	Reviewer	Resolved	RAI
			<p>Calculation Manual (ODCM) (Rev. 13 effective 01/01/2006) were used to calculate distances to these same receptors from the proposed STP 3 & 4 reactors. In comparing the assumed distances from the STP 1 & 2 reactors to the receptors of interest presented in FSAR Table 2.3S-26 with the Land Use Census results presented in the STP 1 & 2 2006 Radiological Environmental Operating Report, the staff notes the following discrepancies:</p> <p>a. FSAR Table 2.3S-26 states that the distance to the receptors of interest in the ENE sector is 8000 meters whereas the 2006 Land Use Census states that the distance to this receptor is approximately 4.5 miles (7242 meters).</p> <p>FSAR Table 2.3S-26 states that the distance to the receptors of interest in the WNW sector is 6400 meters whereas the 2006 Land Use Census states that the distance to this receptor is approximately 4.5 miles (7242 meters).</p>			
38.	2.3S.5.2	Meteorology	<p>The numbers at the beginning of the three bullets in this section need to be clarified:</p> <p>a. Should "6.2 10⁻⁷" read "6.2E⁻⁷"?</p> <p>b. Should "6.2 10⁻⁷" read "6.2x10⁻⁷"?</p> <p>c. Should "1.3 10⁻⁵" read "1.3x10⁻⁵"?</p>	Brad Harvey		
39.	Table 2.3-27	Meteorology	Please explain the purpose for listing in FSAR Table 2.3-27 X/Q and D/Q values at the Unit 4 Reactor location. What assumptions were used	Brad Harvey		

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			to derive these values? What are they used for?			
40.	Table 2.3-29	Meteorology	The title to FSAR Table 2.3-29 needs to be clarified; e.g., should "ΔQ at Various Distances" and "ΔQ at Various Segments" read "D/Q at Various Distances" and "D/Q at Various Segments"?	Brad Harvey		
41.	12.2.2.1	Meteorology	The FSAR Section 12.2.21 reference to the source of χ/Q values should be clarified; e.g., should "Table 2.3S.5-2" read "Table 2.3S-27"?	Brad Harvey		
42.	General	Hydrology	Provide electronic or hard copies of the references that are non-publicly available (e.g, Refs. 2.4S.3-26, 2.4.S, 4-6, etc).	Rajiv Prasad		
43.	2.4S.1	Hydrology	Provide GIS coverage for existing topography data obtained from aerial survey (FSAR Figure 2.4S.1-3).	Rajiv Prasad		
44.	2.4S.1	Hydrology	Provide GIS coverage for the layout of major structures of all four STP units.	Rajiv Prasad		
45	2.4S.1	Hydrology	Summarize in this section (a) plant water demands in accordance with SRP 2.4.1 (p.2), and (b) the geo-referencing datum used through Chapter 2.4S.	Nebiyu Tiruneh		
46	2.4S.2	Hydrology	Provide Information on any dams or water impoundment structures planned for future construction upstream of the STP site	Nebiyu Tiruneh		
47	2.4S.2	Hydrology	Provide information regarding where the Main Drainage Channel (MDC) drains into Little Robbins Slough (LRS)	Rajiv Prasad		
48	2.4S.2	Hydrology	Where is the link channel that connects Little Robbins Slough with the Main Drainage Channel? What is the effect of	Rajiv Prasad		

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			this linkage on drainage patterns during the flood event caused by the local PMP?			
49	2.4S.2	Hydrology	Do the MDC and LRS cross the West Access Road via separate or compined pipe culverts?	Rajiv Prasad		
50	2.4S.2	Hydrology	<p>If FM 521 were not to act like a barrier and flood runoff from North 1 and 2 subbasins were not lagged significantly, provide a discussion of</p> <p>a. flood magnitude and timing,</p> <p>b. the effect on water levels in the power block area, and</p> <p>c. the effect of the 34 ft MSL constant water level boundary condition in HEC-RAS simulation.</p>	Rajiv Prasad		
51	2.4S.2	Hydrology	Provide the HEC-HMS input files used for local PMF computations.	Rajiv Prasad		
52	2.4S.2	Hydrology	Provide the HEC-RAS input files used for water level computations in the power block area.	Rajiv Prasad		
53	2.4S.2	Hydrology	Provide elaboration of the statements: "The peak discharge obtained for a subbasin in HEC-HMS was first distributed to the most upstream cross section of a stream reach in HEC-RAS in proportion to the area contributing to that cross section and the total area of the subbasin. The	Rajiv Prasad		

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			remaining portion of the peak discharge is then distributed equally among the remaining cross sections within the receiving channel reach.” (FSAR Section 2.4S.2.3.4, page 2.4S.2-8)			
54	2.4S.2	Hydrology	Provide an explanation of the assertion “Because the power block area would be inundated during a local PMP storm event, flooding of the safety-related SSCs due to sheet flow from roof and surface runoff is not relevant.” (FSAR Section 2.4S.2.3.5, page 2.4S.2-10)	Rajiv Prasad		
55	2.4S.2	Hydrology	FSAR Table 2.0-2 shows that the precipitation site characteristic at the STP site as defined by the PMP rate is 50.3 cm/hr (19.8 in/hr), which exceeds the ABWR DCD value of 49.3 cm/hr (19.4 in/hr). Provide a discussion of the additional load on safety-related SSC as a result of this exceedance to demonstrate that sufficient safety margins exist in the design of these SSC.	Rajiv Prasad		
56	2.4S.3	Hydrology	Provide a map, preferably a GIS coverage, of the Colorado River Basin including both the upper and lower basins’ boundaries with annotations for the six highland lakes and their impounding dams.	Rajiv Prasad		
57	2.4S.3	Hydrology	What are the spillway discharge capacities of the dam impounding Lake O.H. Ivie and the Mansfield dam?	Nebiyu Tiruneh		

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58	2.4S.3	Hydrology	Describe the linear extrapolation used to extend the channel rating curves between Mansfield Dam and Matagorda Bay. (FSAR Section 2.4S.3.3)	Nebiyu Tiruneh		
59	2.4S.3	Hydrology	What is the status of Columbus Bend dam in relation to the proposed licensed life of STP Units 3 and 4? (FSAR Section 2.4S.3.4.1.1)	Rajiv Prasad		
60	2.4S.3	Hydrology	Is the runoff and stream course model used in this Halff study the same as the one described in 2.4S.3.3? If not, model setup, input files, and calibration details are needed. 9FSAR Section 2.4S.3.4.1.4)	Rajiv Prasad		
61	2.4S.3	Hydrology	Please clarify the following statement: "These initially calibrated model parameters were further adjusted to match the peaks of historic flood frequencies estimated at various stream gauging stations located within the study area." (FSAR Section 2.4.S.3.4.1.4)	Rajiv Prasad		
62	2.4S.3	Hydrology	Why were the nine dams not included in the HEC-HMS modeling of PMF Scenario 1? (FSAR Section 2.4S.3.4.2.1)	Rajiv Prasad		
63	2.4S.3	Hydrology	Why was the antecedent storm event (40% of PMP) modeled separately from the full PMP storm? (FSAR Section 2.4S.3.4.2.1)	Rajiv Prasad		
64	2.4S.3	Hydrology	Explain why the water level in the Colorado River at the downstream most cross-section used in the HEC-RAS model is unaffected by tidal conditions. (FSAR	Rajiv Prasad		

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			Section 2.4S.3.5.3.1)			
65	2.4S.3	Hydrology	<p>FSAR Section 2.4S.3: Please provide a discussion supporting the assumption that "... the major hydrologic features (including dams and reservoirs) in the river basin have not changed since 1985."</p> <p>FSAR Section 2.4S.3.1: Please provide details on how the following conclusion was reached: "... snow melt and antecedent snow pack are not a factor in the production of floods at the STP 3 & 4 site."</p> <p>FSAR Section 2.4S.3.4.2.1: Please provide a discussion of how the constant precipitation loss rate of 0.05 in/hr, adopted for the PMF study, is conservative.</p> <p>FSAR Section 2.4S.3.5.3.1: Please provide a discussion regarding the appropriateness of the boundary conditions used in the HEC-RAS modeling. Please also discuss the appropriateness of Manning's n values used in the study.</p>	Nebiyu Tiruneh		
66	2.4S.3	Hydrology	<p>In FSAR Section 2.4S.3.5.3.1 "Model Boundary Conditions", the normal depth of water at the downstream boundary of the site (RS 383+64.5) is estimated using NAVD88 which is different from what was used in the previous section (NGVD29). Please clarify the mismatch of the datum.</p>	Nebiyu Tiruneh		

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67	2.4S.4	Hydrology	Please explain the following statement: "This section addresses the SRP Section 2.4.4 Acceptance Criteria Limits from the reference Table 2.1-1, which states that the flood level from failure of existing and potential upstream or downstream water control structures will not exceed 30.5 cm (1.0 ft) below grade." (FSAR Section 2.4S.4, page 2.4S.4-1)	Rajiv Prasad		
68	2.4S.4	Hydrology	MCR Breach/Delft3D-FLOW: Please explain if other safety metrics in addition to the level of inundation need to be considered while performing the safety analysis. Explain why the duration of inundation and flow velocity effect on buildings were not considered as the site safety parameters.	Lyle Hibler		
69	2.4S.4	Hydrology	Discuss the composition of the flood wave with respect to the sediment (generated from the breach of the MCR embankment) carried with the flow including dynamic and impact forces.	Rajiv Prasad		
70	2.4S.4	Hydrology	MCR Breach/Delft3D-FLOW: Discuss the validity and conservativeness of the hydrostatic and hydrodynamic pressure assumptions.	Lyle Hibler		
71	2.4S.4	Hydrology	MCR Breach/Delft3D-FLOW: Explain how the structures specifically used in the STP modeling analysis were handled.	Lyle Hibler		
72	2.4S.4	Hydrology	MCR Breach/Delft3D-FLOW: Explain the	Lyle Hibler		

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			validity of the mesh resolution, and justify why more complex mesh options were not considered.			
73	2.4S.4	Hydrology	MCR Breach/Delft3D-FLOW: Explain how was MCR bottom level selected? What water volume is stored between 20 and 27-29 ft MSL?	Lyle Hibler		
74	2.4S.4	Hydrology	MCR Breach/Delft3D-FLOW: Explain the process of sensitivity analysis undertaken to establish the basis for selecting a uniform Manning's n.	Lyle Hibler		
75	2.4S.4	Hydrology	MCR Breach/Delft3D-FLOW: Describe any mass or volume balance check that was performed.	Lyle Hibler		
76	2.4S.4	Hydrology	Provide Delft3D-FLOW input and output files including any calibration datasets of all MCR breach simulations.	Rajiv Prasad		
77	2.4S.4	Hydrology	Discuss the composition of the flood wave with respect to the sediment (generated from the breach of the MCR embankment) carried with the flow including dynamic and impact forces.	Rajiv Prasad		
78	2.4S.4	Hydrology	Discuss the subsequent deposition of the sediment carried by the MCR breach flood wave in the vicinity of the safety-related SSC. How is the inundation depth affected by this deposition? Discuss the effect of sediment deposition on the functioning of safety-related SSC.	Rajiv Prasad		
79	2.4S.4	Hydrology	A failure of the MCR embankment breach	Hosung Ahn		

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			could result in an accumulation of a large amount of bank material at the plant site. Therefore, the COL applicant needs to address the effect of mudflow caused by a potential on-site MCR reservoir failure on estimating levee breach flooding. Further, the applicant should address the impact of the settlement of these bank materials on the safety-related structures and the operation of the plant after the postulated MCR failure.			
80	2.4S.5	Hydrology	Describe how the initial sea level rise of 2.4 ft was estimated based on tide gauge data from the Freeport, TX station.	Rajiv Prasad		
81	2.4S.5	Hydrology	Describe how the 10% exceedance high tide of 2.2 ft was estimated based on tide gauge data from the Freeport, TX station.	Rajiv Prasad		
82	2.4S.5	Hydrology	Provide input files used during simulation of the four hurricane scenarios with the SURGE model.	Rajiv Prasad		
83	2.4S.5	Hydrology	Provide calibration details of the SURGE bottom friction factor. How was the goodness of the calibration determined?	Rajiv Prasad		
84	2.4S.5	Hydrology	Provide an explanation of why a wind stress correction factor of 1.1 was used when "the stresses introduced into the air by the drops can be 10-20% of the wind stress." (FSAR Section 2.4S.5.2.3.1, page 2.4S.5-4). Explain why the HEC-RAS storm surge analysis was done on the	Rajiv Prasad Hosung Ahn		

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			Colorado River side but not on the Little Robins Slough through the Palacios Bay.			
85	2.4S.5	Hydrology	Explain how the SLOSH MOM water level predictions were extrapolated to account for the PMH conditions. Is the PMH used in this extrapolation same as the one used in SURGE modeling? How was it verified that the extrapolation is valid?	Rajiv Prasad		
86	2.4S.5	Hydrology	Why was the PMH determined from NOAA NWS 23 not used as input to run SLOSH to estimate water surface elevations for Units 3 and 4?	Rajiv Prasad		
87	2.4S.5	Hydrology	NOAA NWS 23 did not use hurricane data from approximately the last 30 years. Was any effort made to adjust PMH parameters in light of more recent hurricanes that have occurred since NOAA NWS 23 was published?	Rajiv Prasad		
88	2.4S.6	Hydrology	Provide available high-resolution topography and bathymetry near the proposed site for independent confirmatory tsunami modeling.	Eric Geist		
89	2.4S.6	Hydrology	Provide parameters of the source for the Veracruz scenario. In Figure 2.4S.6.2 (bottom) no source location is provided. The location of source 3 states that it is off Northern Panama in the text, yet in the figure (Figure 2.4S.6-2) it is located off Venezuela. These discrepancies need to be addressed and rectified.	Eric Geist		

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90	2.4S.6	Hydrology	<p>Provide justification for dismissing the paper by Trabant et al. (2001), who suggest the wave at the source could have been 7.5 m high. There are several publications in the refereed literature on the East Breaks landslide⁽¹⁾. Although none of the additional references predict tsunami wave heights, they do provide information on the extent and thickness of the deposit which would be helpful to confirm or disprove the contention of Trabant et al. (2001). A few references that should be looked at are listed below.</p> <p>(1) Selected references: Coleman, J.M., Prior, D.B., and Lindsay, J.F., 1983, Deltaic influences on shelfedge instability processes, in Stanley, D.J., and Moore G.T., eds., The shelfbreak: Critical interface on continent margins: Society of Economic Paleontologists and Mineralogists Special Publication 33, p. 121-137. McGregor, B.A., Rothwell, R.G., Kenyon, N.H., and Twichell, D.C., 1993, Salt tectonics and slope failure in an area of salt domes in the northwestern Gulf of Mexico, in Schwab, W.C., Lee, H.J., and Twichell, D.C., eds., Submarine Landslides: Selected Studies in the U.S. Exclusive Economic Zone: U.S. Geological Survey Bulletin, 2002, p. 92-96. Mullins, H.T., Gardulski, A.F., and Hine, A.C., 1986, Catastrophic collapse of the West Florida carbonate platform margin: Geology, v. 14, p. 167-170. Rothwell, R.G., Kenyon, N.H., and McGregor, B.A., 1991, Sedimentary features of the south Texas</p>	Eric Geist		

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			<p>continental slope as revealed by side-scan sonar and high-resolution seismic data: American Association of Petroleum Geologists Bulletin, v. 75, p. 298-312.</p> <p>Twichell, D.C., Valentine, P.C., and Parson, L.M., 1993, Slope failure of carbonate sediment on the West Florida Slope, in, Schwab, W.C., Lee, H.J., and Twichell, D.C., eds., Submarine landslides: Selected studies in the U.S. Exclusive Economic Zone, U. S. Geological Survey Bulletin 2002, p. 69-78.</p> <p>Walker, J.R., and Massingill, J.V., 1970, Slump features on the Mississippi Fan, northeastern Gulf of Mexico: Geological Society of America Bulletin, v. 81, p. 3101-3108.</p>			
91	2.4S.6	Hydrology	Provide any evidence of paleotsunami deposits from evaluation of site geology, including borings, collected as part of FSAR Section 2.5.	Eric Geist		
92	2.4S.6	Hydrology	As in Section 2.4S.5, describe how the 10% exceedance high tide of 2.2 ft was estimated based on tide gauge data from the Freeport, TX station.	Eric Geist		
93	2.4S.9	Hydrology	<p>FSAR Section 2.4S.9.5.1 states:</p> <p>During the flood of 1935, the major flow of the Colorado River was almost diverted into Tres Palacios Creek and Tres Palacios Bay, one of the arms of Matagorda Bay.” Reference 2.4S.9-3 (p. 103) states “the last major flood occurred in 1935, when considerable water from the Colorado River found its way into the head</p>	Rajiv Prasad		

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			<p>waters of Tres Palacios Creek in Wharton County. If left alone, the Colorado River would have diverted itself again and Tres Palacios Creek might be now the main channel of the Colorado River.” Further, “concurrent dam building and flood control measures in the upper Colorado watershed greatly reduced the danger of flooding in the Colorado lowlands.”</p> <p>Provide an evaluation of the flood of 1935 and a flood that may be expected in the Colorado River without a major breach/failure of upstream dam or dams. Also evaluate the possibility of the Colorado River diversion towards the Tres Palacios Creek (River?) during this flood. (Are Tres Palacios River and Tres Palacios Creek two different watercourses? If not, the two names should be reconciled for consistency.)</p>			
94	2.4S.9	Hydrology	When and how was the “log raft” in the Colorado River removed?	Rajiv Prasad		
95	2.4S.10	Hydrology	Provide a map, preferably a GIS coverage, showing all safety-related SSC for STP Units 3 and 4.	Rajiv Prasad		
96	2.4S.10	Hydrology	Provide the existing ground elevations at the locations of all safety-related SSC.	Rajiv Prasad		
97	2.4S.10	Hydrology	Please reconcile the following statements in the FSAR Section 2.4S.13.2:	Rajiv Prasad		

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			<p>“Because there are no outdoor tanks in the LWMS that could release radioactive effluent, no accident scenario could result in the release of effluent directly to the surface water.”</p> <p>“A flood, such as that caused by an MCR dike breach, could flood the Radwaste Building and potentially release radioactive materials into the environment. A flood of this magnitude would disperse and dilute the radionuclide concentration of a surface water spill.”</p>			
98	2.4S.10	Hydrology	<p>FSAR Section 2.4S.13.2, Direct Release to Surface Waters, states:</p> <p>“A flood, such as that caused by an MCR dike breach, could flood the Radwaste Building and potentially release radioactive materials to the environment. A flood of this magnitude would disperse and dilution the radionuclide concentration of a surface water spill. ... there are no known ... surface water users downstream of the STP site, and, therefore, no surface water user would be affected by a diluted surface water release due to an unlikely event of a flood of this magnitude.”</p>	Rajiv Prasad		

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			<p>Is the Radwaste Building considered safety-related? If not, why?</p> <p>Describe the location and design of the Radwaste Building including all openings and their respective elevations where any potential flood water can enter. Also describe the functioning of the Radwaste Building.</p> <p>Describe the effects of floods other than that caused by the breach of the MCR on the Radwaste Building.</p> <p>Describe the inventory of radioactive material in the Radwaste Building.</p>			
99	2.4S.10	Hydrology	<p>FSAR Section 2.4S.13.2, Direct Release to Surface Waters, states:</p> <p>“In case of flooding, the building structure serves as a large sump which can collect and hold any leakage within the building.”</p> <p>What flooding mechanism is referred to above?</p>	Rajiv Prasad		
100	2.4S.11	Hydrology	What is the post-shutdown 30-day cooling water requirement for Units 3 and 4?	Rajiv Prasad		
101	2.4S.11	Hydrology	Would there be any useable water left in the MCR following a breach of its embankment?	Rajiv Prasad		

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102	2.4S.11	Hydrology	Provide design details of the UHS basin to support the following statement in FSAR Section 2.4S.11.6: “There will be sufficient pump submergence water depth and net positive suction head (NPSH) to ensure proper operation of the pump station inside the UHS basin for the entire 30-day period following an accident.”	Rajiv Prasad		
103	2.4S.11	Hydrology	Provide details to support the following statement in FSAR Section 2.4S.11.6: “The potential effects of all site-related proximity, seismic, and non-seismic information on the postulated worst-case low-flow scenario for the proposed plant site have been considered in establishing the design basis.”	Rajiv Prasad		
104	2.4S.12	Hydrology	FSAR Section 2.4.12: Provide a summary of <u>the process followed</u> to develop the site hydrogeologic conceptual model so staff can better understand the alternate conceptual models that have been considered and rejected. The site hydrogeologic conceptual model provides the background for all to understand (a) the maximum groundwater elevation possible at the site, (b) potential alteration of groundwater gradients, (c) the	Charley Kincaid		

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			relationship between the MCR and surrounding relief, observation and production wells, and (d) alternate pathways and points of exposure.			
105	2.4S.12	Hydrology	FSAR Section 2.4S.12.2.1: Historical and Projected Groundwater Use. In 1985 the Texas Water Development Board (TWDB) made projections cited in the SSAR that groundwater resource use would drop 48% in Matagorda County by 2030. We're about midway through the projection period. Are there data to suggest this is a relevant forecast today? Data in Table 2.4S.12-5 would suggest groundwater usage is as high now as ever.	Charley Kincaid		
106	2.4S.12	Hydrology	FSAR Section 2.4S.12.2.1: Historical and Projected Groundwater Use. The year 2030 does not cover the expected life of the proposed facility. Groundwater use projections are needed through the period of other original license and a relicensing as well. While it would not address the full period of interest, perhaps the data in Table 2.4S.12-6 could be divided between surface water and groundwater projected water need.	Charley Kincaid		
107	2.4S.12	Hydrology	FSAR Section 2.4S.12.2.3: Temporal Groundwater Trends. Is the recovery seen in data from Well 8015402 typical of the groundwater resource in the region or is a	Charley Kincaid		

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			local phenomenon? Does this reflect a regional trend toward lower groundwater resource usage? How does this align with the forecast by the TWDB in 1985 that groundwater resource use in Matagorda County would drop by 48% by 2030? How does this align with the annual data on groundwater use in the county reported in Table 2.4S.12-5?			
108	2.4S.12	Hydrology	FSAR Section 2.4S.12.2.3: Temporal Groundwater Trends. As acknowledge by the applicant, the groundwater field observations do not span a full year and are therefore, incomplete in this application (Rev.0).	Charley Kincaid		
109	2.4S.12	Hydrology	FSAR Section 2.4S.12.2.3: Temporal Groundwater Trends. Safety related structures for the ABWR will be constructed on engineered backfill. The excavation will remove the overlying clay and silt deposit that confines or semi-confines the Upper Shallow Aquifer. The backfill will be more permeable than the clay and silt deposit, and the hydraulic head in the vicinity of safety related structures can be expected to be as high as 27 ft MSL simply based on the observed present-day maximum. This is 3 ft below the pre-construction grade of 30 ft MSL, and would be 5 ft below the planed	Charley Kincaid		

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			finished plant grade for Unit 3 of 32 ft MSL. However, this more permeable material will also be more likely to allow infiltration from storm events; thus, following storm runoff and infiltration events, one might expect a somewhat higher water table elevation local to safety related structures. Would water table elevations local to the facilities be monitored? Would the applicant be prepared to react and ensure the maximum 2 ft below ground surface water level is not violated? Or, are engineered systems going to be in place to remove all possibility of infiltration into the disturbed environment?			
110	2.4S.12	Hydrology	FSAR Section 2.4S.12.2.4.1: Hydrogeological Parameters. How far could the suggested paleochannel extend to the northwest and south? Could this longer but higher conductivity pathway release to the Colorado River sooner than the projected pathway through less conductive material? What process was used to eliminate this alternate conceptual model and pathway from consideration for the analysis in 2.4.13?	Charley Kincaid		
111	2.4S.12	Hydrology	FSAR Section 2.4S.12.3.1: Exposure Point and Pathway Evaluation. This section is the first to discuss and lay the foundation for alternate pathways	Charley Kincaid		

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			considered in Section 2.4.13. In Section 2.4S.13.1.2 Conceptual Model the applicant states “the downward hydraulic gradient between the Upper and Lower Shallow Aquifer indicates that there is no mechanism to lift the liquid effluent up into the Upper Shallow Aquifer.” In this foundational section on pathways, please describe the process followed to consider and eliminate alternate conceptual models and pathways. When doing so, describe and consider the effect the released liquid could have on the natural system, including thermal buoyancy effects.			
112	2.4S.12	Hydrology	FSAR Section 2.4S.12.3.1: Exposure Point and Pathway Evaluation. Why is emphasis placed on the present day well being a “livestock” well? During the period of licensing being considered, could this not be a domestic well?	Charley Kincaid		
113	2.4S.12	Hydrology	FSAR Section 2.4S.12.3.1: Exposure Point and Pathway Evaluation. Why the emphasis placed on present day well location? During the period of licensing being considered, what prevents a domestic groundwater well from being located at the site boundary?	Charley Kincaid		
114	2.4S.12	Hydrology	FSAR Section 2.4S.12.3.3: Plant Groundwater Use and Effects. The statement “Based on these estimates,	Charley Kincaid		

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			additional groundwater wells will be required to satisfy site demands.” appears to conflict with statements in the ER where adherence with the existing groundwater use permit and use of existing wells is stressed. Will there be new additional wells or not? The statement “As part of the detailed engineering for the STP 3 & 4, the impact of groundwater pumping in the Deep Aquifer will be evaluated ...” makes it appear the future use of a greater groundwater resource is undecided and will remain undecided during the COL review process. The last sentence of Section 2.4S.12.5 begins “The groundwater supply wells to be installed for STP 3 & 4 ...” would imply a decision has been made. Can one expect decisions on groundwater usage and new wells in the near term, and will they be reflected in a revision to this application?			
115	2.4S.12	Hydrology	FSAR Section 2.4S.12.4: Monitoring or Safeguard Requirements. The purpose of groundwater monitoring systems is described in some detail. Why wouldn't one declared purpose of groundwater level measurements in the vicinity of safety related structures be to ensure that groundwater was greater than 2 ft below the plant grade at all times, or is this	Charley Kincaid Hosung Ahn		

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			implicit in the statement "... would track temporal trends in groundwater levels that might impact structural stability"? Discuss current STP groundwater monitoring programs in detail. RG 1.206 Subsection C.I.2.4.12.5 specifies that the applicant should provide and discuss ...monitoring program ..."			
116	2.4S.12	Hydrology	FSAR Section 2.4S.12.5: Site Characteristics for Subsurface Hydrostatic Loading. Figure 2.4S.12-32 presents a graph of maximum allowed hydrostatic pressure, and the hydrostatic pressure associated with the maximum observed hydraulic head. What guarantees that the past maximum will not be exceeded after construction of the new units? Will the water table elevation be monitored and a program be in place to ensure that the water table is always below the 2 ft below grade requirement?	Charley Kincaid		
117	2.4S.12	Hydrology	<p><u>FSAR Figures 2.4S.12-17 and 2.4S.12-19:</u></p> <p>(a) While the groundwater head maps presented in these figures were used to determine contamination pathways, the staff recognize the following weaknesses on the presented information: (i) The groundwater head contours were drawn based on very limited observation data</p>	Hosung Ahn		

Serial #	FSAR Section	Discipline	Information Needs	Reviewer	Resolved	RAI
			<p>points, especially on the northeast side of MCR; (ii) While the applicant states that MCR water recharges into the Shallow aquifer, the pattern of groundwater head distribution in and surrounding the MCR is not clearly defined; and (iii) The projected pathways near the existing and new units are not clearly defined. Please describe a plan to improve the quality of the potentiometric surface maps and the corresponding assessment of pathways and travel times.</p> <p>(b) Discuss how the patterns of groundwater flow and pathways will be changed after the construction of the proposed units.</p> <p>(c) Describe potential changes of the potentiometric surfaces of the Upper and Lower Shallow Aquifer in cases of prolonged periods of wet and dry climate.</p>			
117	2.4S.12	Hydrology	The FSAR (page 2.4S.12-9, 3rd para.) states that the Upper Shallow Aquifer groundwater level is influenced by the seepage from the MCR as well as the duck pond/marsh located the northeast of the Unit 3&4. Explain the technical basis of this statement and how the connection impacts the peozometric heads at the Shallow aquifer below the MCR.	Hosung Ahn		
119	2.4S.12	Hydrology	(a) Clarify that the hydraulic conductivity	Hosung Ahn		

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			<p>data in the Units 1 and 2 FSAR are fully used to construct the maps in Figure 2.4S.12-26. If not, why?</p> <p>(b) Provide detailed surface maps for top and bottom elevations of both Upper and Lower Shallow Aquifers as they are needed to predict on-site groundwater flow and pathways.</p> <p>(c) Figure 2.4S.12-10 shows many piezometric wells around Units 1 and 2, but it is not clear whether the water level data from these wells were used for the water level contour maps in Figure 2.4S.12-19 or not. Clarify this.</p>			
120	2.4S.13	Hydrology	FSAR Section 2.4S.13.1: Direct Release to Groundwater. The applicant states that this section provides a conservative analysis of accidental release and migration. The process followed to consider and eliminate physical and chemical processes is not clear. For example, when during the process followed were non-isothermal or buoyancy effects considered in the analysis of contaminant migration?	Charley Kincaid		
121	2.4S.13	Hydrology	FSAR Section 2.4S.13.1.1: Accident Scenario. Why are radionuclides like Tc-99 and I-129 not included in the inventories evaluated? These are classic fission products found to be of greatest potential	Charley Kincaid		

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			health impact at low-level waste, high-level waste, and Department of Energy sites. Are they included in prior analyses of the waste streams and shown to be removed through treatment systems prior to the Low Conductivity Waste collector tank or the Reactor Coolant collection point?			
122	2.4S.13	Hydrology	FSAR Section 2.4S.13.1.2: Conceptual Model. Is the exposure described as indirect and through animals (livestock) especially germane? Earlier in the section it is noted that the Shallow Aquifer is used for livestock watering and occasional domestic supply. During the period for which the license being sought would apply, the off-site well could easily be a domestic well with direct exposure. How would this alter the analysis presented and the conclusion?	Charley Kincaid		
123	2.4S.13	Hydrology	FSAR Section 2.4S.13.1.2: Conceptual Model. The last material in this section beginning with "Other pathways that were considered and then rejected..." needs to be coordinated with the discussion of pathways in Section 2.4.12.	Charley Kincaid		
124	2.4S.13	Hydrology	FSAR Section 2.4S.13.1.2: Conceptual Model. This discussion of alternate pathways needs elaboration: a. Under item (1), were thermal	Charley Kincaid		

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			<p>phenomena and buoyancy of heated water considered when making the statement "... there is no mechanism to lift the liquid ..."</p> <p>While data are not included, the waste waters may be at elevated temperature relative to the ambient groundwater setting, and buoyancy may be a factor to be considered.</p> <p>b. Under item (2), it is not clear that the schematic diagram in Figure 2.4S.12-21 represents actual data. In which tables do the data appear? Also, the real world is three-dimensional. The potentiometric surfaces of the Upper Shallow Aquifer are incomplete, i.e., fail to show contours underlying the MCL. However, the potentiometric surfaces of the Lower Shallow Aquifer indicate groundwater flow toward and <u>under</u> the MCL rather than <u>around</u> it. Why would the Upper Shallow Aquifer not also present an <u>under</u> rather than <u>around</u> pathway?</p> <p>c. Under item (4), the issue of <u>under</u> versus <u>around</u> appears again. In addition, was the concept of the paleochannel raised in Section 2.4S.12.2.4.1 incorporated into the rationale when discarding this pathway?</p>			

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125	2.4S.13	Hydrology	FSAR Section 2.4S.13.1.3: Analysis of Accidental Releases to Groundwater, and 2.4S.13.4: Compliance with 10 CFR 20. Are the effluent concentration limits identified and used in this analysis for indirect exposure through animals (i.e., livestock)?	Charley Kincaid		
126	2.4S.13	Hydrology	<p>FSAR Section 2.4S.13.1.3.2: Transport Considering Advection, Radioactive Decay, and Retardation and 2.4S.13.4: Compliance with 10 CFR 20. These two sections describe the K_d values selected for use differently:</p> <p>a. “The K_d values from the reference are assumed to be lognormally distributed, and, for conservatism, the selected K_d values were taken as the lowest 10 percentile probability in the data distribution.”</p> <p>b. “...incorporated the minimum laboratory K_d values (or 10 percent of the literature value for those isotopes without site-specific laboratory tests).”</p> <p><u>Ten percent of the literature value versus the lowest 10th percentile probability in a lognormal distribution</u> – these aren’t equivalent statements.</p>	Charley Kincaid		

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127	2.4S.14	Hydrology	Please discuss the following statement: “Appropriate emergency operating procedures (EOPs) will include applicable provisions for the MCR, similar to those provided for STP 1 & 2, prior to fuel load (COM 2.4S-1).”	Rajiv Prasad		
128	2.4S.14	Hydrology	Describe scenarios of events that may lead to water level in the UHS basin dropping below 44.5 ft MSL.	Rajiv Prasad		