DSER/ FOIA
2008-0096

3 of 4

November 7, 2007

MEMORANDUM TO: Michael R. Gartman, Chief
ESBWR/ABWR Projects Branch 2
Division of New Reactor Licensing
Office of New Reactors

FROM: Rebecca L. Karas, Chief ***/RA/***
Geosciences and Geotechnical Engineering Branch 1
Division of Site and Environmental Reviews
Office of New Reactors

SUBJECT: ACCEPTANCE REVIEW RESULTS FOR THE SOUTH TEXAS COMBINED LICENSE APPLICATION

The staff of the Geosciences and Geotechnical Engineering Branches 1 and 2 (RGS1 and RGS2) has completed its acceptance review of the South Texas Combined License application (COLA) submitted by NRG Energy. This review covered the following COLA FSAR Sections for which RGS1 and RGS2 has primary review responsibilities.

- FSAR Section 2.5S;
- FSAR Section 3.7.4

Completeness and Sufficiency

Based on this review, I conclude that the application contains the information required by regulations. However, there are significant gaps in the submitted information that preclude the conduct of an effective and efficient technical review and, therefore, preclude the development of a specific review schedule at this time. RGS1 and RGS2 cannot commence the South Texas COLA detailed technical review without the information identified in Enclosure 1.

The significant technical deficiencies are as follows:

- Limited soil dynamic testing data were presented, but not used as part of the soil amplification calculation. The limited data deviate from the generic soil degradation curves for soil modulus reduction and damping ratio used in the calculation. The applicant did not follow either RG 1.206 or the limited sampling option, (endorsed with comments through "NRC Staff Draft Interim Staff Guidance on Seismic Issues" dated August 15, 2007). When the remaining testing data become available in 3Q08, there is a significant possibility that NRG Energy will need to re-analyze several calculations including soil liquefaction and dynamic slope stability, as well as re-define the Ground Motion Response Spectrum, which would require the staff to re-review all of the

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geotechnical and seismic analyses. This issue impacts the staff's ability to complete the technical review within a predictable timeframe, and the staff is unable to estimate schedule impacts.

- No subsurface exploration (borings) was conducted at the Radwaste Building for STP Unit 4 or within the footprint of either of the UHS pump houses, which are all Category 1 structures, and are required to have subsurface exploration completed and submitted in the COL application (RG 1.206).
- No boring logs or lab test data related to foundation interfaces were provided and no profiles of safety related piping were included in the application as required by SRP 2.5.4.3 (Appendix 2.5A not provided either as an appendix or in another transmittal, although applicant has indicated plans to submit it in the near future).
- Dewatering plans for the excavation were not provided as required by RG 1.206.

RGS1 and RGS2 believe the above identified items can be used to support several options. The COL application could be accepted now so the staff can begin work in the areas that are complete, with a statement that a review schedule will not be provided until the receipt of the above items. Alternately, the COL application could be accepted with only a partial schedule (through the first RAI round and receipt of responses) provided, along with a statement that the staff will issue the remainder of the schedule after evaluating the responses for completeness and resolution of the significant issues/gaps. Finally, the above items could be used in part (with supporting items from other branches) to justify not beginning the COL review at this time.

RGS1 and RGS2 do not recommend acceptance of the application with a full schedule provided, as the above items represent significant risk and uncertainty in the review schedule that is very difficult to quantify.

Further, there are items for which the applicant has included the information necessary for the staff to begin its review. However, the information submitted indicates significant issues exist regarding site suitability that could become significant open items or barriers to approval. RGS1 and RGS2 anticipate that substantial additional information will be submitted by the applicant at a later date in response to critical RAIs that will require a much larger staff effort to evaluate than allowed for in the baseline schedule.

- Shear wave velocity profiles of less than 1000 ft/s exist at the site below the foundation of Category I structures. This was not identified by the applicant as a Tier 1 departure, and does not meet the ABWR DCD site design parameter requirement for the minimum shear wave velocity of 1000 ft/s. An amendment to the ABWR DCD may be required.
- Settlement and differential settlement of Category 1 structures greatly exceed settlement criteria for this class of structure.
- Single data points of critical soil testing data exist in layers at depth. The scarcity may need to be supplemented with additional field and laboratory tests to confirm site suitability.
- Bearing Capacity of several Category 1 structures does not appear to meet the minimum required 15 KSF in the ABWR DCD Tier 1 (Unit 3 is 8.9 KSF with clay soil, or 14.3 KSF for sand). An amendment to the ABWR DCD may be required.

Schedule

The estimated effort for the detailed technical review of the following South Texas COLA SRP Sections by RGS1 and RGS2 is generally consistent with the current pre-baseline EPM model. The resource plan that currently exists in the EPM for these sections may be retained.

The SRP sections in this category are:

- FSAR Section 2.5S.1;
- FSAR Section 2.5S.3;
- FSAR Section 3.7.4

The estimated effort for the detailed technical review of the following South Texas COLA SRP Sections by RGS1 and RGS2 varies materially from the pre-baseline model in the EPM. For each section, I have provided an updated resource plan for these tasks in Enclosure 2. The resource plan includes the new estimated level of effort, the resources assigned, and the expected start date that can be best estimated at this time. However, as discussed above, RGS1 and RGS2 cannot estimate the impact to several of the review sections at this time due to significant gaps and uncertainty related to several of the issues, above. Therefore, Enclosure 2 provides only an initial estimate of the impact, which could be significantly higher depending on how the applicant chooses to resolve the issues. The initial estimate is provided so that EPM can be loaded with better data, but Enclosure 2 does not represent a reliable estimate at this time. The actual impact will need to be updated at the time a full schedule is issued to the applicant, at which time a more reliable estimate should be possible. Revisions to the resource plans have been submitted for the following FSAR Section reviews:

- FSAR Section 2.5S.2;
- FSAR Section 2.5S.4;
- FSAR Section 2.5S.5

Review Dependencies

RGS1 and RGS2's detailed technical review of the South Texas COLA is independent of other ongoing application reviews by the staff.

Enclosure:
1. Table 1 of the Safety Analysis report review Guide
2. Table 2 RGS1 and RGS2 Resource Plan Revisions for South Texas ABWR COLA

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ADAMS ACCESSION NUMBER: ML073110088

OFFICE	NRO/DSER/RGS2	NRO/DSER/RGS2	NRO/DSER/RGS2:QTR	NRO/DSER/RGS1
NAME	Laurel Bauer	Wayne Bieganousky	Yong Li	Rebecca Karas
DATE	11/06/2007	11/06/2007	11/06/2007	11/07/2007

OFFICIAL RECORD COPY

Memo to Michael R. Gartman from Rebecca Karas dated: November 7, 2007

SUBJECT: ACCEPTANCE REVIEW RESULTS FOR THE SOUTH TEXAS COMBINED LICENSE APPLICATION

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Table 1: Safety Analysis Report Acceptance Review Results for NRG Energy's South Texas Project ABWR COLA

SER Section: S2.5, 3.7.4 **Technical Branch:** RGS1 and RGS2 **Technical Reviewers** Out of Scope
Branch Chief: Rebecca Karas **SRP Section:** 2.5, 3.7.4 **Date:** 11/02/20
Does the section address the applicable regulations: **YES**
Are there any technical deficiencies, changes in planning assumptions, or dependencies on concurrent reviews? **YES**, identify specific review area/topic in table below.

	Completeness and Technical Sufficiency Which Form Basis for Acceptability for Docketing					Changes to Planning Assumptions to be Considered in Development of Baseline Review Schedule			Review Dependencies Among Concurrent Reviews	
1. Review Area/Topic*	2. Does COL section address the items required by regulation (refer to RG 1.206, Section C.IV.1)? (Yes/No)	3. Is COL section technically sufficient for this review area/ topic? (yes/no)**	4. Can the technical deficiency be resolved through the RAI process? (yes/no)***	5. If no, for either completeness or technical sufficiency, identify deficiency (ies). This information will be needed for technical review.	6. Is the identified technical deficiency related to a risk-significant SSC)? (yes/no)****	7. Are the pre-baseline review schedule and estimated staff-hours appropriate? (yes/no)	8. For each no, identify the change (or basis for change).	9. Identify the total review time in staff-hours*****	10. Can the review of the area/topic be completed without the completion of a concurrent review? (yes/no)	11. For each no, identify which application (DCD or COLA) and section.
SRP 2.5.1 Basic Geologic and Seismic Information	Yes	Yes	Yes			Yes		See Table 2 for all Review Time Impacts	Yes	
SRP 2.5.2 Vibratory Ground Motion/ SRP 2.5.4.7 Response of Soil to Dynamic Loading/ SRP 2.5.4.8 Liquefaction Potential	Yes	No	No	Limited soil dynamic testing data were presented, but not used as part of the soil amplification calculation. The limited data deviate from the generic soil degradation curves for soil modulus reduction and damping ratio used in the calculation. The applicant did not follow either RG 1.206 or the limited sampling option, (endorsed with comments through "NRC Staff Draft Interim Staff Guidance on Seismic Issues" dated August 15, 2007).	Yes	No	See Column 5 and cover memo: staff is unable to estimate schedule impacts at this time, and does not recommend issuance of a complete schedule. Applicant has identified a late (3Q08) submittal for this information. Staff will need to evaluate the information at that time, and significant resources will need to be expended. Attachment 2 includes additional resources to accomplish this		Yes	

				When the remaining testing data become available in 3Q08, there is a significant possibility that NRG Energy will need to re-analyze several calculations including soil liquefaction and dynamic slope stability, as well as re-define the Ground Motion Response Spectrum, which would require the staff to re-review all of the geotechnical and seismic analyses. This issue impacts the staff's ability to complete the technical review within a predictable timeframe, and the staff is unable to estimate schedule impacts.			as a first estimate, as well as a description of the schedule uncertainty, but does not recommend issuance of a complete schedule, as determination of a schedule at this time is highly uncertain.			
SRP 2.5.2 Vibratory Ground Motion/ SRP 2.5.4.9 Earthquake Site Characteristics	Yes	No	Yes	FSAR did not have sufficient description of the method used to calculate surface ground motion (Site Response).	Yes	No	An additional round of RAIs is necessary due to the low level of detail presented in the application. The additional round of RAIs should be equivalent in schedule time to the first round of RAIs.		Yes	
SRP 2.5.3 Surface Faulting	Yes	Yes	Yes			Yes			Yes	
SRP 2.5.4.2 Properties of Subsurface Materials	Yes	No	No	No subsurface exploration at the Radwaste Building for STP Unit 4 or within the footprint of either of the UHS pump houses, which are all Category 1 structures, and are, required to have subsurface exploration completed and submitted in the COL application.	Yes	No	This information is required to support the start of the review of this section. Schedule impacts will be known upon receipt of this information.		Yes	
SRP 2.5.4.2 Properties of Subsurface Materials	Yes	No	Yes	Single data points of critical soil testing data exist in layers at depth. The scarcity may need to be supplemented with additional field and laboratory tests to confirm site suitability. Sampling was not continuous; some layers had inadequate field data to evaluate soil properties, and additional field exploration and lab testing may be required of the applicant.	Yes	No	This is a significant issue regarding site suitability that could become a significant open item. Substantial additional information is likely to be submitted by the applicant at a later date in response to this critical RAI that will require a much larger staff effort to evaluate than allowed for in the baseline schedule. Resolution will require an additional round of RAIs, as		Yes	

							well as a substantial increase in resources (see Table 2). If required, this additional data may need an extended period of time for the applicant to collect and submit in response to an RAI, which may delay beginning the next phase of review. The amount of time is dependent on the applicant and cannot be reliably quantified now in terms of a schedule delay. When submitted, the next RAI round will require an extended staff review (the same amount of time as is allowed for the Phase 1 review).			
SRP 2.5.4.3 Foundation Interfaces/ SRP 2.5.5.3 Logs of Borings	Yes	No	No	No boring logs or lab test data provided as required in SRP Section 2.5.4.3. SPT borings, UD borings, CPT soundings, lab and field testing not submitted. This information was referenced to be included in Appendix 2.5A, but this appendix was not provided either as an appendix or in another transmittal, although NRG Energy has indicated it plans to submit such information in the future.	Yes	No	This information is required to begin the review of this section. The applicant has preliminarily indicated this information will be transmitted at some later date as an attachment to a letter (not as an appendix). The review cannot begin until this data is delivered, and the schedule can only be determined after receipt of a commitment date from NRG Energy for submittal of the information.		Yes	
SRP 2.5.4.4 *Geophysical* Surveys	Yes	No	Yes	CPT and suspension P-S test methods were used to obtain the Compression and Shear wave velocities, but one method only is available down to 100 feet, leaving only the P-S data for points below 100 feet. It may be necessary for the *applicant to collect and submit* cross-hole seismic data.	Yes	No	*If additional confirmatory* data is required, then the amount of time is dependent on the applicant and cannot be reliably quantified now in *terms of a schedule delay.* When submitted, the next RAI round will require an extended staff review (the same amount of time as is allowed for the Phase 1 review.		Yes	
SRP 2.5.4.5 Excavation and Backfill/ SRP 2.5.5.4	Yes	No	Yes	Sources of backfill not yet determined – the applicant's proposed ITAAC, which is an *alternative to providing the exact*	Yes	Yes			Yes	

Compacted Fill				source and quantity of backfill listed in RG 1.206, does not appear to completely include all critical parameters related to pertinent soil properties of the backfill.						
SRP 2.5.4.5 Excavation and Backfill/ SRP 2.5.5.1 Slope Characteristics/ SRP 2.5.5.2 Design Criteria and Analyses	Yes	No	Yes	The applicant did not provide any description of the effect of the 35' retaining wall between the control building and the turbine building on the potential for increase in lateral pressure on the control building wall. Applicant has not provided slope stability analysis of deep temporary excavation. Staff needs to review the monitoring plan (not yet provided) for wall movements during construction.	Yes	No	Increased resource requirement to review this item once information is submitted. Impact provided on Table 2.		Yes	
SRP 2.5.4.5 Excavation and Backfill	Yes	No	Yes	Monitoring program for ensuring safety of Category I structure foundations and monitoring dewatering system not provided in the application.	Yes	Yes	This could likely be looked at by the staff during its audit, which is allowed for in the baseline schedule.		Yes	
SRP 2.5.4.6 Ground Water Conditions	Yes	No	No	Dewatering plans not provided as required by RG 1.206; detailed design not complete.	Yes	No	Submittal of the dewatering plans required to begin review. The complicated excavation plan will require more detailed review of the dewatering plan than for a baseline COL, so the effort for this task is increased.		Yes	
SRP 2.5.4.8 Liquefaction Potential	Yes	No	Yes	The applicant did not provide any information regarding the liquefaction potential under Category 1 piping between the intake structure and the reactor building.	Yes	No	This could become a significant open item. Substantial additional staff effort will be necessary to evaluate than allowed for in the baseline schedule. Resolution will require an additional round of RAIs (see Table 2).		Yes	
SRP 2.5.4.10 Static Stability	Yes	No	Yes	Settlement and differential settlement of Category 1 structures greatly exceed settlement criteria for this class of structure. Predicted settlements are very large and data is scarce. Some layers had no data. Confirmation tests may be required to confirm assumptions. No plan was	Yes	No	This is a significant issue regarding site suitability that could become a significant open item or barrier to approval. Substantial additional information is likely to be submitted by the applicant at a later date in response to this critical RAI that will require a much		Yes	

				provided for monitoring heave during excavation or settlement during and after construction.			larger staff effort to evaluate than allowed for in the baseline schedule. Resolution will require an additional round of RAIs, as well as a substantial increase in resources (see Table 2). The monitoring plan (last sentence in column 5) could be audited during the normal audit provided for in the baseline schedule.			
SRP 2.5.4.11 Design Criteria	Yes	No	Yes	Shear wave velocity profiles of less than 1000 ft/s exist at the site below the base of Category I structures. This was not identified by the applicant as a Tier 1 departure, and does not meet the ABWR DCD site design parameter requirement for the minimum shear wave velocity of 1000 ft/s.	Yes	No	This is a significant issue regarding site suitability that could become a significant open item or barrier to approval. Substantial additional information is likely to be submitted by the applicant at a later date in response to this critical RAI that will require a much larger staff effort to evaluate than allowed for in the baseline schedule. Resolution will require an additional round of RAIs, as well as a substantial increase in resources (see Table 2). An amendment to the ABWR DCD may be required.		Yes	
SRP 2.5.4.11 Design Criteria	Yes	No	Yes	Bearing Capacity of several Category 1 structures does not appear to meet the minimum required 15 KSF in the ABWR DCD Tier 1 (Unit 3 is 8.9 KSF with clay soil, or 14.3 KSF for sand). An amendment to the ABWR DCD may be required.	Yes	No	This is a significant issue regarding site suitability that could become a significant open item or barrier to approval. Substantial additional information is likely to be submitted by the applicant at a later date in response to this critical RAI that will require a much larger staff effort to evaluate than allowed for in the baseline schedule. Resolution will require an additional round of RAIs, as well as a substantial increase in resources (see Table 2). An amendment to		Yes	

							the ABWR DCD may be required.			
3.7.4 Seismic Instrumentation	Yes	Yes	Yes			Yes			Yes	
*Review Area/Topic: Item identified in RG 1.206 or the regulations; for a COLA referencing a DC, this includes COL information items and departures from the design certification.										
**Technical Sufficiency: The application is compared against the SRP acceptance criteria. Note: New safety features, alternate regulatory compliance approaches, and/or deviations from DCs, should not be treated as deficiencies and factored into the basis for rejecting the application, unless staff determines that there is insufficient technical information associated with the respective item. These items are factored into confirmation of planning assumptions.										
***Significant deficiencies are those review areas/topics which impact the staff's ability to begin the detailed technical review or complete its review within a predictable timeframe.										
****DSRA will provide risk significance information at time of review, if available.										
*****Identification of new review time is on a FSAR section basis and consistent with the review phases within the EPM. Changes from the pre-baseline review schedule and estimated hours should be on that basis.										

Table 2: RGS1 and RGS2 Resource Plan Revisions for NRG Energy – South Texas ABWR COLA Review

Task Changes						Resource Changes		
SER Section No.	SER Section Title	Task *	Concurrent Dependent Review Activity **	Revised Start Date	Revised Finish Date	Name of Resource	Change Type ***	Revised Hours
2.5.2	Vibratory Ground Motion	PSER and RAIs prepared (Phase 1)					Revised	
2.5.4	Stability of Subsurface Materials and Foundations	PSER and RAIs prepared (Phase 1)					Revised	
2.5.5	Stability of Slopes	PSER and RAIs prepared (Phase 1)					Revised	
2.5.2	Vibratory Ground Motion	RAI Phase 1a (New Task)		**	**		New	
2.5.4	Stability of Subsurface Materials and Foundations	RAI Phase 1a (New Task)		**	**		New	
2.5.5	Stability of Slopes	RAI Phase 1a (New Task)		**	**		New	
2.5.2	Vibratory Ground Motion	Evaluation Completed (Phase 2)		*	*		Revised	
2.5.4	Stability of Subsurface Materials and Foundations	Evaluation Completed (Phase 2)		*	*		Revised	
2.5.5	Stability of Slopes	Evaluation Completed (Phase 2)		*	*		Revised	
2.5.2	Vibratory Ground Motion	OI Resolution (Phase 4)		*	*		Revised	
2.5.4	Stability of Subsurface Materials and Foundations	OI Resolution (Phase 4)		*	*		Revised	
2.5.5	Stability of Slopes	OI Resolution (Phase 4)		*	*		Revised	

Out of Scope

* Due to the significant issues identified in the cover memo, a revised start and finish date estimate is not possible at this time.

** The amount of time allowed for RAI Phase 1a should be the same as the standard schedule for the PSER and RAIs prepared (Phase 1). So, effectively, another full RAI phase 1 is required.

*** The Phase 1a and Phase 2 revised hours may be larger or smaller for each phase, depending on the timing of the applicant's submittal of the revised information, or the point when revised analyses resulting from the information are provided.

This template is to be used to facilitate management of revised planning data resulting from application acceptance reviews. Changes in planning data resulting from acceptance reviews may include identifying dependencies to concurrent activities in other projects, new or deleted tasks, or revisions to task durations, staffing, labor estimates, or start/finish dates.

* Specify the task being revised:	SER Phase 1 – PSER and RAIs Prepared SER Phase 2 – Evaluation Completed Other – Give task name Indicate if this task or SER section is new (not yet in the schedule).
** Concurrent Dependent Review Activity:	Identify, if any, the project and activity that precedes the affected task in this schedule (e.g., Task in a design certification review that precedes a COL review).
*** Change Type indicates how the resource is being changed:	Revised – For an existing task, if a currently assigned resource is staying the same, but the hours or dates are being changed. New – For an existing task or a new task, if a new resource is being added to the task. Deleted – For an existing task and a currently assigned resource, if the resource is being removed from the task.