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May 31, 2011

Mr. G. T. Powell
Vice President, Technical Support and Oversight
STP Nuclear Operating Company
P.O. Box 289
Wadsworth, TX 77483

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE SOUTH TEXAS PROJECT, LICENSE RENEWAL APPLICATION

Dear Mr. Powell:

By letter dated October 25, 2010, STP Nuclear Operating Company submitted an application pursuant to Title 10 of the *Code of Federal Regulations* Part 54 (10 CFR Part 54) to renew operating licenses NPF-76 and NPF-80 for South Texas Project, for review by the U.S. Nuclear Regulatory Commission (NRC or the staff). The staff is reviewing the information contained in the license renewal application and has identified, in the enclosure, areas where additional information is needed to complete the review.

These requests for additional information were discussed with Arden Aldridge, and a mutually agreeable date for the response is within 30 days from the date of this letter. I understand some of these requests may require more than 30 days for the response but no more than 60 days. If you have any questions, please contact me at 301-415-3617 or e-mail at Tam.Tran@nrc.gov.

Sincerely,

Tam Tran, Environmental Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosure:
Requests for Additional Information

cc w/encl: Listserv

SOUTH TEXAS PROJECT
LICENSE RENEWAL APPLICATION
REQUESTS FOR ADDITIONAL INFORMATION
REGARDING THE ANALYSIS OF SEVERE
ACCIDENT MITIGATION ALTERNATIVES

1. Provide the following information regarding the Probabilistic Risk Assessment (PRA) used for the Severe Accident Mitigation Alternative (SAMA) analysis:

   a. Environmental Report (ER) Section F.2 states that the current PRA model (STP_REV6) reflects the plant design configuration as of December 31, 2007. Confirm that this applies to the analysis of all initiating events, both internal and external. Describe any significant changes made to plant design or operation since that date and their impact on the SAMA analysis.

   b. The South Texas Project (STP) PRA appears to be a single unit model. Identify any significant design or operating differences between STP, Units 1 and 2, and, if there are shared systems between units, describe how these systems are modeled in the PRA. Provide an assessment of the impact of any significant differences between units or shared systems on the SAMA analysis.

   c. The listing and description of initiators for the external events in ER Table F.2-1 appear to indicate that there are other initiators evaluated but not listed. For example, three control room fire scenarios (i.e., 18, 23 and 10) are listed that address only three fire zones (i.e., 047, 071, and 147). Discuss the initiators not included in the table and their contribution to core damage frequency (CDF), and assess their potential impact on the SAMA assessment.

   d. ER Section F.7.1 states that the CDF of 6.39E-06 per year is a mean value from the RISKMAN Monte Carlo quantification. Confirm that all the CDF and release category frequency values given are also mean values. If so, describe why it appears that the sum of the initiating event contributor's mean values reported in Table F.2-1 equal the mean of the total distribution.

   e. Briefly describe the modeling of the planned and unplanned maintenance conditions assumed for the SAMA analysis. Specifically, indicate if the PRA results used in the SAMA analysis represent the results for the annual average unavailability of systems. If different than this, assess the impact of using the annual average maintenance and testing condition on the SAMA analysis.

   f. Provide a brief summary of the history of the STP Level 1 PRA that includes for each revision: the date released, the CDF contribution for internal events and each of the external event hazards [i.e., seismic, fire, tornado, and main cooling reservoir (MCR) breach], and the major changes in the revision that led to the change in the CDF, including identification of major changes or updates to the modeling for various initiator groups such as internal flooding, fire, and seismic. Also, identify the STP PRA revision reviewed in the 2002 Westinghouse Owners Group (WOG) peer review.

g. STP Nuclear Operating Company (STPNOC) risk managed technical specifications (RMTS) submittal of February 28, 2007, stated that there had been a follow on peer review of the human reliability analysis (HRA) of STP_REV5 PRA which had identified one Level A and nine Level B Facts and Observations (F&Os). Describe these F&Os, their resolution status, and the impact of their resolution on the SAMA analysis.

h. Table F.2-1 does not include any internal flood initiators. Discuss the modeling and disposition of internal flood events and their contribution to the CDF.

i. Provide the contribution to CDF due to station blackout (SBO) and anticipated transients without scram (ATWS) events.

2. Provide the following information relative to the Level 2 analysis:

   a. Provide a summary description of the current Level 2 PRA including: (a) the Level 1 to Level 2 linking, the containment event trees, the binning of Level 2 sequences to the 15 end-states cited in ER Section F.3.6 and (b) the process used to assign the 15 end-states to the four major release categories.

   b. Describe any internal and external reviews of the complete update of the Level 2 model incorporated in STP_REV5. Describe any unresolved F&Os from these reviews, their resolution status, and the impact of their resolution on the SAMA analysis.

   c. Provide a brief history of the Level 2 PRA and the major changes in modeling that impact the release category frequencies.

   d. Identify the version of Modular Accident Analysis Program (MAAP) used to determine the release fractions.

   e. ER Section F.3.6 describes the selection of the representative accident sequence/source terms for the major release categories. The one example discussed was that an accident sequence with a moderate frequency and severe release characteristics would be selected over an accident sequence with a relatively high frequency and a minor radionuclide release. From the information provided, none of the selected representative sequences (for those categories where multiple source term results are provided) follow this conservative example. For major Release Categories II and III, the selected sequences are not those with the most severe release characteristics. While the information provided in ER Table F.3-8 indicates that the representative sequences are appropriate for the base case, this is not necessarily true for a SAMA case where the Level 2 end-state distribution would be different from the base case. For example, if a SAMA primarily impacted sequences which have low reactor pressure vessel (RPV) failure pressure then the frequency of end-states R07SU and R11U would be reduced. Since these end-states have higher release fractions (and most likely, higher dose-risk and offsite economic cost risk per event) than the representative sequence chosen, the benefit could be larger than that assessed using the representative release fractions.

If the source term chosen for a release category is not the most severe of the significantly contributing end-states, the benefit could be underestimated for any SAMA which primarily impacts an end-state with a higher release fraction. For example, SAMA 4 impacts only the end-state VSEQ (interfacing system loss of coolant accident (LOCA)) portion of Release Category I. It is not clear that end-state VSEQ has a less severe release than the ISGTR end-state, which was chosen as representative for Release Category I. Release fractions for Inter-System LOCA (ISLOCA) are usually greater than that given for ISGTR. The STP IPE (Table 4.8.3-4) gives interfacing system Cs and I release fractions from 0.15 to 0.4 depending on the methodology. Similarly for SAMA 10, which impacts steam generator tube rupture (SGTR) sequences, the removal of these sequences from Release Category III will have a more significant impact since the release fractions for SGTR are three orders of magnitude greater than those for the representative sequence.

Provide further support for the selection of the representative sequences and their adequacy for the SAMA analysis.

3. Provide the following information with regard to the treatment and inclusion of external events in the SAMA analysis:

    a. Provide a description of fire scenarios X, B, 18, BC and 23 as included ER Table F.2-1.

    b. In the May 9, 2007, STPNOC response to requests for additional information (RAIs) for RMTS, it was stated that a review of the fire frequency data presented in NUREG/CR-6850 was planned for a future reanalysis of fire hazards at STP. If the results of this review have not been incorporated in STP_REV6, assess the impact the fire frequency data on the SAMA assessment.

    c. Identify the seismic hazard curves used to determine the seismic CDF in STP_REV6. If the seismic CDF is based on the Electric Power Research Institute (EPRI) hazard curve, provide the seismic CDF using the Lawrence Livermore National Laboratory (LLNL) hazard curve or the more recent USGS 2008 assessment and include a description of the dominant seismic CDF sequences. Discuss the impact of these results on the SAMA assessment.

    d. Provide a brief description of the latest fire and other external events models incorporated in the STP PRA.

4. Provide the following information relative to the Level 3 PRA analysis:

    a. ER Section F.3.2 states that two previously identified sector population, land fraction, and economic estimation program (SECPOP) errors were corrected in the SAMA analysis. Clarify whether a third known error for incorrect column formatting of the output file was also corrected.

    b. Provide a table of the sector population breakdown for the SECPOP rosette for the year 2000 and the projected rosette for the year 2050. ER Section 2.6.1 identifies a total population of 255,118 within the 50-mile radius. However, no population is provided for the year 2050. Provide the total population used for the year 2050 (and the year 2000 if different than ER Section 2.6.1, including explanation for the reason for the difference).

c. The Houston-Sugar Land-Baytown metropolitan area is just outside the STP 50-mile radius. However, the projected growth through year 2050 is expected to be high. Briefly explain how/whether the population studies addressed the potential for a step change in population within the 50-mile radius if/whether this metropolitan area expands to the southwest.

d. The evacuation study was performed for the year 2007. Provide the year 2007 transient and total population used in the study.

5. Provide the following information with regard to the selection and screening of Phase I SAMA candidates:

   a. In ER Section F.5.1.3.1, Wolf Creek SAMA 13, which provides for a gravity feed fuel oil supply, was screened from further consideration at STP based on an existing STP capability which requires a pump. The use of a pump has less capability than a gravity system. Provide further justification for the screening of this SAMA.

   b. SAMA 16 involves using a portable engine driven instrument air compressor. This SAMA was based on Prairie Island SAMA 22 which utilized nitrogen bottles rather than a portable compressor. STP SAMA 16 has an estimated implementation cost of $1.2M while Prairie Island SAMA 22 had an estimated implementation cost of $78K ($39K per unit). The cost of nitrogen bottles appears to be considerably less than that of an air compressor. Consider a SAMA that utilizes nitrogen bottles to provide an alternate air source.

   c. At Indian Point the final SAMA evaluation included three cost beneficial SAMAs not evaluated in STP Section F.5.3.1.2. These are: SAMA 9 - create a reactor cavity flooding system to reduce the impact of core-concrete interaction from molten core debris following core damage and vessel failure, SAMA 53 - keep both pressurizer PORV block valves open, and a gagging device for SGTR events that would provide a means of closing a stuck open SG relief valve. At Prairie Island the final SAMA evaluation included three cost beneficial SAMAs not evaluated in STP Section F.5.3.1.5. These are: SAMA 3 – provide alternate flow path from refueling water storage tank (RWST) to charging pump, SAMA 19a – provide a reliable backup water source for replenishing the RWST (for Unit 2), and a gagging device for SGTR events that would provide a means of closing a stuck open SG relief valve. Consider these SAMAs for STP.

   d. ER Section F.5.1 states that the industry based SAMA list from NEI 05-01 was used to identify the types of SAMAs that might address a particular issue. There is no further discussion of the use of this list in the ER. Clarify whether any SAMAs were developed from considering this list.

   e. ER Section F.6 states that site-specific cost estimates were developed for several of the SAMAs. ER Table F.5-3 cites Reference STPNOC 2009a as the source of the site-specific cost estimates. This reference is an e-mail from Engineering and Research Incorporate (ERIN) on High Head Safety Injection (HHSI). Briefly describe the process and level of detail used to develop the cost estimates (i.e., the general cost categories considered). Clarify the level of involvement and expertise of STP staff and ERIN staff in the development of the site-specific cost estimates. Provide the detailed cost estimates for SAMAs 3b and 11.

f. SAMA 17a, "install Westinghouse Reactor Coolant Pump (RCP) Shutdown Seals," has an estimated implementation cost of $7,611,000. This suggests that the single unit cost for this modification is estimated to be about $3.8 million. A recent submittal by Tennessee Valley Authority (TVA) for Watts Bar Unit 2 (TVA letter to NRC of July 23, 2010, ML102100588) estimated the cost to install improved Westinghouse RCP seals to be $1.1M per unit while this modification was estimated to cost $1.05M per unit in the Vogtle license renewal application. Furthermore, the NRC staff is aware that the new seal package technology is being demonstrated at the Farley Nuclear Plant (TVA letter to NRC of January 31, 2011, ML110340040). Describe the difference between the "shutdown seals" assumed in SAMA 17a and the improved seals cited by TVA and Vogtle. Also, provide a more detailed description of the SAMA 17a modification and justification for the estimated cost to install the "shutdown seals" at STP.

g. The cost of $4.5M given in ER Table F.5-3 for SAMA 14 seems very high given that an inter-unit cross-tie is already available. Provide a more detailed description of the modification and justification for the estimated cost. In the response, discuss the possibility of using existing breakers and buses to cross-tie buses in one unit under emergency conditions.

6. Provide the following information with regard to the Phase II cost-benefit evaluations:

a. ER Section F.6.2 describes that SAMA 10 was modeled by reassigning the SGTR CDF contribution for Release Categories I (7.48E-09 per year) and III (1.35E-07 per year) to Release Categories II and IV, respectively. Neither of these contributions corresponds with any frequency values reported in ER Table F.3-5. Provide additional information on the source of each of these release frequency contributions and clarify that they represent a realistic assessment of the potential risk reduction for this SAMA.

b. ER Section F.6.3, 5th paragraph, explains that the evaluation of SAMA 12 did not consider the condition in which non-condensable gases such as hydrogen are present since this condition is not modeled in the PRA, but that this condition is conservatively treated in the PRA. If this SAMA impacts this condition then the estimated risk reduction is potentially underestimated. Also, this same section of the ER states that SBO sequences were excluded in the modeling of this SAMA because AC power is needed to start a reactor coolant pump (RCP). This also potentially underestimates the risk reduction benefit for this SAMA since it does not appear to include SBO scenarios in which AC power is recovered. Discuss these issues and their impact on the SAMA analysis.

c. ER Section F.6.5, for SAMA 15, states that "common cause failures were added, after the common cause data was edited." Explain what is meant by this statement.

7. Provide the following information with regard to the sensitivity and uncertainty analyses:

    a. ER Section F.7.1.1.1 describes the PRA model changes made to evaluate SAMA 3b as deleting macros IZ47BC and IZ047X. Describe these macros.

    b. The ratio of the 95th percentile CDF to the mean value CDF was reported to be 1.6 in Section F.7.1 of the ER. While this is a "typical" result for internal event CDF, it seems quite low for the fire and seismic CDFs which generally have wider uncertainty bands than internal events. Provide support to the adequacy of this distribution result given the expected wider distribution for external events and considering the impact of more current seismic hazard curves such as the USGS 2008 assessment.

8. For certain SAMAs considered in the ER there may be lower-cost alternatives that could achieve much of the risk reduction at a lower cost. In this regard, provide an evaluation of the following SAMAs:

    a. SAMA 1, involving using a portable AC generator for long term auxiliary feedwater (AFW) support and protecting the Technical Support Center (TSC) emergency diesel generator (EDG) from tornado events, is identified as a means of mitigating a large number of important basic events. While the tornado protection is important for HWIND (i.e., Tornado Induced Failure of Switchyard) initiated sequences, many other sequences would be mitigated without the cost of the tornado protection. Consider such a SAMA.

    b. With respect to RAI 8.a, discuss the possibility for the TSC EDG to supply the positive displacement pump (PDP) and support AFW operation. If feasible, consider such a SAMA.

    c. The HWIND initiating event is the largest single contributor to CDF. For mitigating the HWIND sequence, consider a SAMA to provide an alternate intake structure for the essential cooling water (ECW) either in the essential cooling water pond (ECP) or the MCR that would minimize the likelihood of debris preventing ECW cooling and/or the possibility of using a temporary/portable pump with a movable suction that could provide water to the ECW system.

May 31, 2011

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Sincerely,

/RA/

Tam Tran, Environmental Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosure:
Requests for Additional Information

cc w/encl: Listserv

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Letter to G. T. Powell from Tam Tran dated May 31, 2011

SUBJECT: REQUESTS FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE SOUTH TEXAS PROJECT, LICENSE RENEWAL APPLICATION

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