



South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

September 27, 2016  
NOC-AE-16003404  
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File No. G25

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555-0001

South Texas Project  
Units 1 and 2  
Docket Nos. STN 50-498, STN 50-499  
Request for Additional Information for the Review of the South Texas Project,  
Units 1 and 2, License Renewal  
Severe Accident Mitigation Alternatives (SAMA) (TAC Nos. ME4936 and ME4937)

References:

1. Letter; G. T. Powell to the NRC Document Control Desk; "License Renewal Application", NOC-AE-10002607; dated October 25, 2010. (ML103010257)
2. Letter; NRC, Tam Tran to South Texas Project, Mr. J Connolly, "Request for Additional Information for the Review of the South Texas Project License Renewal Application", dated July 7, 2016. (ML16187A052)
3. Letter; G. T. Powell to the NRC Document Control Desk; "Response to Request for Additional Information for the South Texas Project, License Renewal Application", NOC-AE-11002687; dated July 5, 2011. (ML11193A016)
4. Letter; D.W. Rencurrel to the NRC Document Control Desk; "Supplemental Response to Request for Additional Information for the South Texas Project, License Renewal Application - SAMA", NOC-AE-11002773; dated January 19, 2012. (ML12030A081)
5. Letter; G. T. Powell to the NRC Document Control Desk; "Response to Request for Additional Information for the South Texas Project License Renewal Application", NOC-AE-11002711; dated August 23, 2011. (ML11250A067)

This correspondence is to respond to a Nuclear Regulatory Commission (NRC) Request for Additional Information (RAI). By Reference 1, STP Nuclear Operating Company (STPNOC) submitted a License Renewal Application (LRA). In Reference 2, the NRC requested STP to provide additional information regarding Severe Accident Mitigation Alternatives (SAMA). References 3 through 5 provide insights to the response contained in the Enclosure to this letter. Enclosure 1 to this letter provides information regarding STPNOC's Severe Accident Mitigation Alternatives (SAMA).

There are no commitments in this letter.

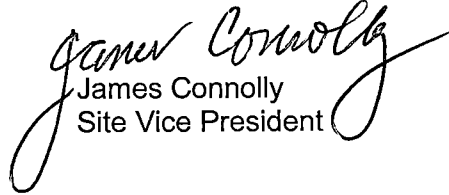
If there are any questions regarding this submittal, please contact Arden Aldridge, STP License Renewal Project Lead, at (361) 972-8243 or Rafael Gonzales, STP License Renewal Project regulatory point-of-contact, at (361) 972-4779.

STI: 34363373

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NRR

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

Executed on 09/27/16  
Date

  
James Connolly  
Site Vice President

rjg

Enclosure:

- 1) STPNOC Response to Request for Additional Information Regarding Severe Accident Mitigation Alternatives (SAMA)

cc:  
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**Enclosure 1**

**STPNOC Response to Request for Additional Information Regarding Severe Accident  
Mitigation Alternatives (SAMA)**

**NRC RAI**

On May 4, 2016, the Commission issued a decision (CLI-16-07) in the Indian Point license renewal proceeding, in which it directed the Staff to supplement the Indian Point Severe Accident Mitigation Alternatives (SAMA) analysis with sensitivity analyses. Specifically, the Commission held that documentation was lacking for two inputs (TIMDEC and CDNFRM) used in the MACCS computer analyses, and that uncertainties in those input values could potentially affect the SAMA analysis cost-benefit conclusions. The Commission therefore directed the Staff to perform additional sensitivity analyses.

The two inputs (TIMDEC and CDNFRM) are commonly used in the SAMA analyses performed for license renewal applications (LRAs). These two input values were generally based on the values provided in NUREG 1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants" and NUREG/CR-3673, "Economic Risks of Nuclear Power Reactor Accidents." The TIMDEC input value defines the time required for completing decontamination to a specified degree. The CDNFRM input parameter defines the cost (on a per person basis) of decontaminating non-farmland by a specified decontamination factor. The CDNFRM values used in NUREG-1150 (\$3,000/person for decontamination factor of 3 and \$8,000/person for decontamination factor of 15) stem from decontamination cost estimates provided in NUREG/CR-3673, the same 1984 economic risk study referenced in support of the decontamination time inputs. These decontamination cost inputs are commonly escalated to account for inflation.

The NRC Staff believes the Commission's decision in CLI-16-07 may be applicable to the SAMA analysis performed for South Texas Project (STP) Units 1 and 2, license renewal, in as much as that analysis may have also relied upon the NUREG-1150 values for TIMDEC and CDNFRM. We therefore request that South Texas Project Nuclear Operating Company (STPNOC) either justifies why CLI-16-07 does not apply to the SAMA analysis performed for STP or supplements the SAMA analysis with sensitivity analyses for the CDNFRM and TIMDEC values.

STPNOC is requested to review the input values specified in CLI-16-07 for the Indian Point LRA, and (a) to apply the maximum values specified by the Commission (one year (365 days) for TIMDEC and \$100,000 for the CDNFRM values for the decontamination factor of 15) or (b) in the alternative, to explain, with sufficient justification, its rationale for choosing any other value(s) for its sensitivity analyses. In any event, STPNOC should execute sensitivity analyses for the release categories modeled that exceed  $10^{15}$  Becquerels of Cs-137 released.

STPNOC is requested to evaluate how these sensitivity analyses may affect its identification of potentially cost-beneficial SAMAs. Finally, upon completing its sensitivity analysis, STPNOC is requested to submit the spreadsheet (or equivalent table if another method is used) that conveys the population dose and off-site economic cost for each release category and integrates the results into a Population Dose Risk and an Offsite Economic Cost Risk for STP.

**STPNOC RESPONSE**

To address this RAI, STPNOC has chosen to use Option (a), and a new "MELCOR Accident Consequences Code System, version 2" (MACCS2) "Decontamination Time Required for each Decontamination Level Specified" (TIMDEC) and "Cost of Non-farm Decontamination per Resident Person for two Levels of Decontamination" (CDNFRM) sensitivity case was developed with the following input changes (as compared to the STP MACCS2 base case documented in South Texas Project's (STP) Environmental Report (Reference 1):

- TIMDEC was escalated to one year (365 days) for Decontamination Factor (DF)=15
- CDNFRM was escalated to \$100,000/person for DF=15
- These changes were applied to all release categories (even those with total releases of Cs-137 below  $10^{15}$  Becquerels).

Both the conditional and frequency weighted MACCS2 results of this sensitivity case are presented. Offsite dose and economic costs are presented in three groupings for comparison purposes:

- Four Release Category (RC) groups using representative release categories for each group (consistent with STP's Environmental Report [Reference 1]).
- Nine RCs encompassing the Level 2 risk model (also included in STP's Environmental Report [Reference 1]).
- Four RC groups updated to represent the bounding RCs for each group (identified in [Reference 3]).
- Four RC groups updated to represent the bounding RCs for each group and revised release frequencies incorporating updated seismic data and fire scenario initiating event frequencies (identified in [Reference 4]).

Table 1 presents the sensitivity results for each of the four base release category groups using representative release categories for each group. These results may be compared to the results of Table F.3-6 of STP's Environmental Report, Attachment F (Reference 1). For the specified TIMDEC and CDNFRM input changes, the MACCS2 Offsite Economic Cost Risk (OECR) increased approximately 69% and the Population Dose Risk (PDR) decreased approximately 6% as compared to the MACCS2 base case results of  $\$1.62\text{E}+03/\text{yr}$  and 1.74 person-rem/yr as presented in Table F.3-6. The changes in the OECR and PDR (both less than 69%) for this TIMDEC CDNFRM sensitivity case are bounded by the 95<sup>th</sup> percentile uncertainty factor of 2.7 which was included as part of the SAMA candidate cost-benefit evaluation via STPNOC RAI response dated August 23, 2011 (Reference 5). Therefore, no new SAMA candidates are identified as potentially cost-beneficial based on this new TIMDEC and CDNFRM sensitivity case.

Table 2 presents the sensitivity results for all nine release categories. These results may be compared to the results of Table F.3-8 of STP's Environmental Report, Attachment F (Reference 1). For the specified TIMDEC and CDNFRM input changes, the MACCS2 OECR increased approximately 69% and the PDR decreased approximately 7% as compared to the MACCS2 results of  $\$1.92\text{E}+03/\text{yr}$  and 1.74 person-rem/yr as presented in Table F.3-8. The changes in the OECR and PDR (both less than 69%) for this TIMDEC and CDNFRM sensitivity

case are bounded by the 95<sup>th</sup> percentile uncertainty factor of 2.7 which was included as part of the SAMA candidate cost-benefit evaluation via Reference 5. Therefore, no new SAMA candidates are identified as potentially cost-beneficial based on this new TIMDEC CDNFRM sensitivity case when applied to the nine individual releases.

Table 3 presents the sensitivity results for each of the four release category groups using the most conservative relevant available release category for each group. These results may be compared to the results presented in Tables 2-9 and 2-10 of Reference 3. For the specified TIMDEC and CDNFRM input changes, the MACCS2 OECR increased approximately 56% and the PDR decreased approximately 12% as compared to the results of \$6.81E+03/yr and 5.32 person-rem/yr, as presented in Tables 2-9 and 2-10 of Reference 3. The changes in the OECR and PDR (both less than 56%) for this TIMDEC and CDNFRM sensitivity case are bounded by the 95<sup>th</sup> percentile uncertainty factor of 2.7 which was included as part of the SAMA candidate cost-benefit evaluation via Reference 5. Therefore, no new SAMA candidates are identified as potentially cost-beneficial based on this new TIMDEC and CDNFRM sensitivity case.

Table 4 presents the sensitivity results for each of the four release category groups using the most conservative relevant available release category for each group and revised release frequencies based on updated seismic data and fire scenario frequencies as presented in Table 7 of Reference 4. For the specified TIMDEC and CDNFRM input changes, the MACCS2 OECR increased approximately 60% and the PDR decreased approximately 12% as compared to MACCS2 results with base case TIMDEC and CDNFRM values<sup>1</sup>. The changes in the OECR and PDR (both less than 60%) for this TIMDEC and CDNFRM sensitivity case are bounded by the 95<sup>th</sup> percentile uncertainty factor of 2.7. Therefore, no new SAMA candidates are identified as potentially cost-beneficial based on this new TIMDEC and CDNFRM sensitivity case.

In summary, no new SAMA candidates are identified as potentially cost-beneficial based on this new TIMDEC and CDNFRM sensitivity case. There are no changes to the conclusions of the SAMA analysis based on the TIMDEC and CDNFRM sensitivity case.

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<sup>1</sup> The "base case" OECR and PDR values of \$1.20E+04/yr and 9.24 person-rem/yr for this comparison are derived from the release category frequencies in Reference 4 and the "conservative" source terms and grouping assignment from the July 5, 2011 RAI 2.e response (Reference 3, Table 2-8).

Table 1

## MACCS2 TIMDEC CDNFRM Sensitivity Results Using Representative Release Categories for Four Groups

Release Category	Frequency (per yr)	Population Dose (p-rem)	Population Dose Risk (p-rem/year)	PDR % of Total	Offsite Economic Cost (\$)	Offsite Economic Cost Risk (\$/yr)	OECR % of Total
Group I (ISGTR)	5.01E-07	1.13E+06	5.66E-01	34.73%	4.50E+09	2.25E+03	82.37%
Group II (R05SU)	1.16E-06	5.08E+05	5.91E-01	36.24%	3.95E+08	4.59E+02	16.78%
Group III (R13U)	1.48E-06	2.85E+05	4.21E-01	25.80%	1.57E+07	2.32E+01	0.85%
Group IV (Intact)	3.10E-06	1.70E+04	5.27E-02	3.23%	4.79E+04	1.48E-01	0.00%
<b>Total</b>	<b>6.24E-06</b>	<b>--</b>	<b>1.63E+00</b>	<b>100%</b>	<b>--</b>	<b>2.74E+03</b>	<b>100%</b>

Table 2

## MACCS2 TIMDEC CDNFRM Sensitivity Results Using All Nine Release Categories

Release Category	Frequency (per yr)	Population Dose (p-rem)	Population Dose Risk (p-rem/year)	PDR % of Total	Offsite Economic Cost (\$)	Offsite Economic Cost Risk (\$/yr)	OECR % of Total
ISGTR	5.01E-07	1.13E+06	5.66E-01	35.15%	4.50E+09	2.25E+03	69.61%
R05SU	7.94E-07	5.08E+05	4.03E-01	25.05%	3.95E+08	3.14E+02	9.68%
CICV	1.78E-07	2.11E+05	3.76E-02	2.33%	9.96E+07	1.77E+01	0.55%
R07SU	1.91E-07	6.96E+05	1.33E-01	8.25%	1.90E+09	3.63E+02	11.21%
R15U	6.88E-07	1.49E+05	1.03E-01	6.37%	7.22E+06	4.97E+00	0.15%
R13U	4.23E-07	2.85E+05	1.21E-01	7.49%	1.57E+07	6.64E+00	0.21%
R11U	3.37E-07	4.20E+05	1.42E-01	8.79%	4.76E+08	1.60E+02	4.95%
BYPASS	2.77E-08	1.92E+06	5.32E-02	3.30%	4.25E+09	1.18E+02	3.63%
INTACT	3.10E-06	1.70E+04	5.27E-02	3.27%	4.79E+04	1.48E-01	0.00%
<b>Total</b>	<b>6.24E-06</b>	<b>--</b>	<b>1.61E+00</b>	<b>100%</b>	<b>--</b>	<b>3.24E+03</b>	<b>100%</b>



Table 3

## MACCS2 TIMDEC CDNFRM Sensitivity Results Using Most Conservative Release Categories for Four Groups

Release Category	Frequency (per yr)	Population Dose (p-rem)	Population Dose Risk (p-rem/year)	PDR % of Total	Offsite Economic Cost (\$)	Offsite Economic Cost Risk (\$/yr)	OECR % of Total
Group I (BYPASS)	5.01E-07	1.92E+06	9.62E-01	20.65%	4.25E+09	2.13E+03	20.07%
Group II (R07SU)	1.16E-06	6.96E+05	8.09E-01	17.38%	1.90E+09	2.21E+03	20.82%
Group III (BYPASS)	1.48E-06	1.92E+06	2.83E+00	60.84%	4.25E+09	6.27E+03	59.11%
Group IV (Intact)	3.10E-06	1.70E+04	5.27E-02	1.13%	4.79E+04	1.48E-01	0.00%
Total	6.24E-06	--	4.66E+00	100%	--	1.06E+04	100%

Table 4

## MACCS2 TIMDEC CDNFRM Sensitivity Results Using Most Conservative Release Categories for Four Groups And Updated Release Frequencies

Release Category	Frequency (per yr)	Population Dose (p-rem)	Population Dose Risk (p-rem/year)	PDR % of Total	Offsite Economic Cost (\$)	Offsite Economic Cost Risk (\$/yr)	OECR % of Total
Group I (BYPASS)	7.29E-07	1.92E+06	1.40E+00	17.14%	4.25E+09	3.10E+03	16.15%
Group II (R07SU)	3.50E-06	6.96E+05	2.44E+00	29.82%	1.90E+09	6.65E+03	34.67%
Group III (BYPASS)	2.22E-06	1.92E+06	4.26E+00	52.19%	4.25E+09	9.44E+03	49.18%
Group IV (Intact)	4.10E-06	1.70E+04	6.97E-02	0.85%	4.79E+04	1.96E-01	0.00%
Total	1.05E-05	--	8.17E+00	100%	--	1.92E+04	100%