



South Texas Project Electric Generating Station, P.O. Box 282, Wadsworth, Texas 77483

March 17, 2014
NOC-AE-14003082
10 CFR 50.12
10 CFR 50.90

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

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Response to NRC Accident Dose Branch Request for Additional Information
Regarding STP Risk-Informed GSI-191 Application
(TAC NOs MF2400 and MF2401)

References:

1. Letter, G. T. Powell, STPNOC, to NRC Document Control Desk, "Supplement 1 to Revised STP Pilot Submittal and Requests for Exemptions and License Amendment for Risk-Informed Approach to Resolving Generic Safety Issue (GSI)-191," November 13, 2013, NOC-AE-13003043, ML13323A183
2. Email, Andrea George, NRC, to Albon Harrison, STPNOC, "RAI's Regarding South Texas Project's Submittal for Risk-Informed Resolution of GS-191", January 14, 2014, ML14015A045

This submittal responds to requests for additional information in Reference 2 with regard to the STP Nuclear Operating Company (STPNOC) risk-informed application for the resolution of GSI-191 (Reference 1).

There are no regulatory commitments in this letter.

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STI33816627.

If there are any questions, please contact Mr. Michael Murray at 361-972-8164.

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

Executed on: March 17, 2014



G. T. Powell
Site Vice President

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Attachments:

1. Response to Accident Dose Branch Request for Additional Information
2. Risk-Informed GSI-191 AADB RAI 3 Response
3. Alternate Source Term Dose Analysis: An Estimate of Risk Attributed to GSI-191
STP-RIGSI191-RAI.1

cc:

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Response to Accident Dose Branch Request for Additional Information

Risk Informed GSI-191 Accident Dose Branch (AADB) RAI 1

To ensure a complete and accurate review of the dose consequence analyses, please provide additional information in tabular form describing, for each design basis accident affected by the proposed Risk Informed GSI-191 submittal, all the basic parameters used in the dose consequence analyses. For each parameter, please indicate the current licensing basis (CLB) value, the revised GSI-191 value where applicable, as well as the basis for any changes to the CLB. An example of the input/assumptions needed is provided in Table 4.3-11 "Dose Analysis Inputs for LOCA" provided in STP's alternate source term submittal [Agencywide Documents Access Management System (ADAMS) Accession No. ML070890474]. The staff requests that the information provided include all of the basic parameters whether or not the individual parameter is being changed for the GSI-191 amendment. The staff also requests that the information be provided in separate tables for each affected accident (i.e., loss-of-coolant accident (LOCA), the fuel handling accident (FHA), the main steam line break accident (MSLB), the steam generator tube rupture accident (SGTR), the control rod ejection accident (CREA), and the locked rotor accident (LRA)).

STP Response:

Other than to add a study calculation for the response to RAI 3 below, STPNOC did not revise the licensing basis dose analyses, including the Alternate Source Term analyses, for the risk-informed GSI-191 licensing application. The analyses and results currently described in the STP UFSAR for the events identified above remain valid.

Risk Informed GSI-191 AADB RAI 2

STP identified the following condition related to the alternative source term (AST) license amendments currently in effect at STP Units 1 and 2. Westinghouse Electric Company Nuclear Safety Advisory Letter (NSAL)-06-15, dated December 13, 2006, advised operators of Westinghouse plants that the single-failure scenario for the SGTR analysis that licensees used in their accident analysis may not be limiting. As stated in the STP AST NRC Safety Evaluation dated March 6, 2008 (ADAMS Accession No. ML080160013), "The licensee has evaluated the applicability of NSAL-06-15 against the accident analysis assumptions and has determined that the current single-failure assumption for the STP SGTR analysis is not limiting. Therefore, the licensee is operating under compensatory measures to meet regulatory dose guidelines. The licensee plans to resolve this condition at the earliest opportunity so that the assumptions, including the limiting single failure, for the SGTR accident analysis described herein are consistent with the plant response to this event. To support the limiting single-failure assumptions in the SGTR analysis, STP will maintain an administrative limit for reactor coolant system (RCS) dose equivalent iodine 131 (DEI) so that the radiological dose reference values for the SGTR analysis remain bounding, and the licensee will continue to comply with GDC 19."

Has this condition been resolved? If so, how? Also, provide justification that GDC 19 continues to be met.

STPNOC Response:

The condition described in the RAI above was resolved by a design change to make the steam valves to the moisture separator reheater fail closed. The design change has been implemented in both STP units. This corrective action restored the original design and licensing basis and eliminated the need for the administrative limit on DEI that had been implemented as a compensatory action. Condition Record 07-2887 details the resolution in accordance with the STPNOC Corrective Action Program.

Restoration of the original design basis as described above maintains the original compliance with GDC 19 without need for compensatory action.

STPNOC also addresses the relation between the risk-informed GSI-191 analyses and the AST analyses with respect to compliance with GDC 19 in Section 2.2 of Enclosure 2-1 of Reference 1 to the cover letter.

Risk Informed GSI-191 AADB RAI 3

The LOCA analysis assumes that iodine will be removed from the containment atmosphere by containment spray and natural diffusion to the containment walls. As a result of these removal mechanisms a large fraction of the released activity will be deposited in the containment sump. The sump water will retain soluble gases and soluble fission products such as iodines and cesium, but not noble gases. The guidance from RG 1.183 specifies that the iodine deposited in the sump water can be assumed to remain in solution as long as the containment sump pH is maintained at or above 7.

The AST application indicates:

"After the first day, the containment sump pH will begin to decrease, reaching 6.8 by the end of the 30-day duration of the radiological consequence analysis for the DBA LOCA, and the impact of that decrease has been reflected in the Control Room and offsite doses."

It is noted that the AST application further indicates:

"The design inputs for calculating the containment sump pool pH were conservatively established by the licensee to maximize the acidic contribution to sump pH and minimize the basic contribution."

The GSI-191 application indicates the possibility that debris generated during a LOCA could clog the containment sump strainers in pressurized-water reactors (PWRs) and result in loss of net positive suction head (NPSH) for the ECCS and CSS pumps, impeding the flow of water from the sump.

Discuss the exemption justification as they relate to the effects on sump water pH, radiological consequences, and loss of the containment spray system.

STPNOC Response:

Enclosure 2-4 "Request for Exemption from General Design Criterion 41" of the license amendment, STPNOC addressed exemption from 10 CFR Part 50 Appendix A, General Design Criteria (GDC) 41, Criterion 41 - Containment atmosphere cleanup. STPNOC did not revise the licensing basis dose analyses, including the Alternate Source Term (AST) analyses, for the risk-informed GSI-191 licensing application except to add a study calculation for the response to this RAI. The analyses and results currently described in the STP UFSAR for the events identified above remain valid.

The licensing application is structured to show that the sumps are sufficiently reliable as a support function for CSS as currently licensed. STP has applied RG 1.174 to assess the effects of debris using a risk-informed approach and shown acceptable results. In order to provide a risk-informed perspective on the sump design, the risk associated with GSI-191 is evaluated to include the failure mechanisms associated with sump blockage affecting Containment Spray System (CSS) recirculation mode.

In the risk-informed application, the sump pH history was investigated over 30 days both analytically and experimentally [1] (attached). The investigation shows the STP sump pH will remain substantially above 7.0 for thirty days.

Any loss of net positive suction head (NPSH) for the Emergency Core Cooling System (ECCS) and Containment Spray System (CSS) pumps, impeding the flow of water from the sump has been analyzed using a risk-informed approach [2] (attached.)

The risk-informed analysis assesses the impact of a GSI-191 related sump failure on the CSS and associated AST acceptance criteria. For breaks that result in sump blockage and which initially have two or more CSS trains available (consistent with single failure of one CSS train, per the deterministic AST analysis), the analysis determines the expected time that the CSS trains would operate before failing due to blockage. The time is then evaluated using the STP AST engineering calculation to determine the control room and Technical Support Center dose. Finally the risk-informed analysis evaluates the fraction of the cases that would result in exceeding the AST acceptance criteria.

As shown in [2], Figure 1, sump clogging doesn't start until about 2.5 hours. As shown in the reference analysis [2], the risk for exceeding dose limits identified in RG 1.183 is acceptably low. Most events (~81%) result in dose within the AST limit, and the largest dose for the relatively small fraction of events (~19%) that do exceed the acceptance criteria is less than 2 rem over the 5 rem limit and the probability is very low (~3.7E-09/yr). The table below is a summary of the AST analysis for dose after loss (CSS Cutoff) of two or more CSS pumps. As can be seen, the dose limits (10 CFR 50.67 limits) at the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) will not be challenged for early losses of CSS (see the tabulated values at 2.185 hours).

Dose at CSS Cutoff Time (sum of results from Tables D3, D4, & D5 LB dose analysis)				
	EAB (REM)*	LPZ (REM)	CR (REM)	TSC (REM)
10CFR50.67 Limit	25	25	5	5
Design Basis	5.68	2.89	3.74	4.40
CSS Cutoff @ 2.185 hours	5.70	4.69	6.70	6.33
CSS Cutoff @ 4 hours	5.68	3.50	4.76	5.04
CSS Cutoff @ 4.25 hours	5.68	3.41	4.62	4.95
CSS Cutoff @ 6.5 hours	5.68	3.03	3.98	4.54
CSS Cutoff @ 7.6 hours	5.68	2.96	3.87	4.47
CSS Cutoff @ 16 hours	5.68	2.89	3.74	4.40

* EAB dose is a worst 2-hour integrated value. All other doses are 30 day integrated values.

Also as described in Enclosure 4-1 to Reference 1 of the cover letter, realizing the source term necessary to produce the doses as calculated in the dose assessment is unlikely based on the Regulatory Guide 1.174 evaluation that shows defense in depth and substantial safety margin.

References (attached)

- [1] Risk-Informed GSI-191 AADB RAI 3 Response (Attachment 2 listed in cover letter)
- [2] Alternate Source Term Dose Analysis: An Estimate of Risk Attributed to GSI-191 STP-RIGSI191-RAI.1 (Attachment 3 listed in cover letter)