



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

April 13, 2016

Mr. Dennis L. Koehl  
President and CEO/CNO  
STP Nuclear Operating Company  
South Texas Project  
P.O. Box 289  
Wadsworth, TX 77483

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2 – NOVEMBER 17-19, 2015,  
REGULATORY AUDIT REPORT ASSOCIATED WITH A RISK-INFORMED  
SOLUTION TO GENERIC SAFETY ISSUE 191 (CAC NOS. MF2400, MF2401,  
MF2402, MF2403, MF2404, MF2405, MF2406, MF2407, MF2408 AND MF2409)

Dear Mr. Koehl:

By letter dated June 19, 2013 (ADAMS Accession No. ML131750250), as supplemented by letters dated October 3, October 31, November 13, November 21 and December 23, 2013 (two letters); and January 9, February 13, February 27, March 17, March 18, May 15 (two letters), May 22, June 25, July 15, 2014; and March 10, March 25, and August 20, 2015 (ADAMS Accession Nos. ML13295A222, ML13323A673, ML13323A128, ML13338A165, ML14015A312, ML14015A311, ML14029A533, ML14052A110, ML14072A075, ML14086A383, ML14087A126, ML14149A353, ML14149A354, ML14149A439, ML14178A467, ML14202A045, ML15072A092, ML15091A440, and ML15246A125, respectively), STP Nuclear Operating Company (STPNOC) submitted exemption requests accompanied by license amendment requests for a risk-informed approach to resolve Generic Safety Issue (GSI)-191, "Assessment of Debris Accumulation on PWR [Pressurized-Water Reactor] Sump Performance," at South Texas Project, Units 1 and 2 (STP).

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a regulatory audit at Texas A&M University in College Station, Texas, on November 17-19, 2015, in order to gain a better understanding of the licensee's deterministic analysis to ensure long-term core cooling in accordance with paragraph 50.46(b)(5) of Title 10 of the *Code of Federal Regulations* as part of STPNOC's resolution of GSI-191. Specifically, the staff reviewed the licensee's use of the RELAP5-3D evaluation model for the thermo-hydraulic analysis of in-vessel effects during accidents. RELAP5-3D is used by STP in its GSI-191 resolution approach, but the NRC staff has not generically approved its use by the industry.

Conducting the audit improved the NRC staff's knowledge and understanding of STP's use of RELAP5-3D. The enclosure to this letter describes the observations, questions, and results of the NRC staff's audit.

D. Koehl

- 2 -

If you have any questions, please contact me at 301-415-1906 or via e-mail at [Lisa.Regner@nrc.gov](mailto:Lisa.Regner@nrc.gov).

Sincerely,

A handwritten signature in black ink, appearing to read 'L.M. Regner', with a long horizontal flourish extending to the right.

Lisa M. Regner, Senior Project Manager  
Plant Licensing Branch IV-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosure:  
Audit Report

cc w/encl: Distribution via Listserv

AUDIT REPORT – NOVEMBER 17-19, 2015

REVIEW OF RELAP5-3D FOR THE THERMAL-HYDRAULIC ANALYSIS

REQUEST FOR RISK-INFORMED SOLUTION TO GENERIC SAFETY ISSUE 191

STP NUCLEAR OPERATING COMPANY

SOUTH TEXAS PROJECT UNITS 1 AND 2

1.0 SCOPE AND PURPOSE

By letter dated June 19, 2013 (ADAMS Accession No. ML131750250), as supplemented by letters dated October 3, October 31, November 13, November 21 and December 23, 2013 (two letters); and January 9, February 13, February 27, March 17, March 18, May 15 (two letters), May 22, June 25, July 15, 2014; and March 10, March 25, and August 20, 2015 (ADAMS Accession Nos. ML13295A222, ML13323A673, ML13323A128, ML13338A165, ML14015A312, ML14015A311, ML14029A533, ML14052A110, ML14072A075, ML14086A383, ML14087A126, ML14149A353, ML14149A354, ML14149A439, ML14178A467, ML14202A045, ML15072A092, ML15091A440, and ML15246A125, respectively), STP Nuclear Operating Company (STPNOC) submitted exemption requests accompanied by license amendment requests for a risk-informed approach to resolve Generic Safety Issue (GSI)-191, "Assessment of Debris Accumulation on PWR [Pressurized-Water Reactor] Sump Performance," at South Texas Project, Units 1 and 2 (STP).

The U.S. Nuclear Regulatory Commission (NRC) staff performed an on-site audit on November 17-19, 2015, at the Texas A&M University in College Station, Texas, related to the risk-informed resolution of GSI-191. The purpose of the audit was to gain a better understanding of the licensee's use of the RELAP5-3D evaluation platform referenced in the STPNOC submittals to improve efficiency during the safety review and development of the safety evaluation for STP.

The NRC staff provided the attached draft questions to the licensee by e-mail dated November 3, 2015 (ADAMS Accession No. ML16092A169). The audit was attended by members of the NRC staff and STPNOC staff including:

NRC

Lisa Regner

Jeremy Dean

Josh Kaiser

Reed Anzalone

STP

Michael Murray

Ernie Kee

Wayne Harrison

Drew Richards

2.0 AUDIT ACTIVITIES

The STPNOC team provided the NRC audit team an overview of the long-term core cooling modeling platform employed by STP contractors at Texas A&M University to address the plant response to debris expected during several types of loss-of-coolant accidents

Enclosure

(e.g., small break on the hot-leg coolant loop piping, large break on the cold-leg coolant loop piping, etc.). The NRC staff was also given an overview of the modeling of the thermal-hydraulic in-core effects of debris.

The NRC staff discussed the RELAP5-3D evaluation model and analysis with STP engineers including:

- The definition boundaries of the RELAP5-3D evaluation model
- The scenarios being simulated in the evaluation model
- The event progression for each scenario
- The verification, validation, and uncertainty performed for the model
- The review standard being applied (NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition" (SRP), Section 15.0.2, "Review of Transient and Accident Analysis Method"; ADAMS Accession No. ML070820123)
- The required level of quality assurance
- The phenomena occurring during the double-ended hot-leg break
- The decision to block the core bypass in light of recent test data
- The documentation required for the evaluation model

### 3.0 CONCLUSIONS

The NRC staff found that the audit helped the staff to better understand the licensee's use of the RELAP5-3D evaluation model for the effects of debris on long-term core cooling and in-core effects of debris. These audit activities helped the audit team members understand better the impacts of debris on long-term core cooling at STP and will inform decisions regarding the risk-informed submittal for GSI-191. The audit also answered several of the NRC staff concerns and questions. There was open communication throughout the audit and it was conducted in accordance with the audit plan with no known deviations.

The NRC staff expects to conduct another audit to answer the remaining open items. These items will be provided to the licensee by e-mail in the first quarter of 2016.

Attachment:  
Audit Report Draft Questions

AUDIT REPORT DRAFT QUESTIONS  
STP NUCLEAR OPERATING COMPANY  
SOUTH TEXAS PROJECT, UNITS 1 AND 2  
DOCKET NOS. 50-498 AND 50-499

Thermal-Hydraulic Analysis:

*Note: these request for additional information (RAI) questions were provided by e-mail from the Division of Operating Reactor Licensing project manager to STP Nuclear Operating Company (STPNOC, the licensee) on December 11, 2015 (Agencywide Documents Access and Management System Accession No. ML16022A176).*

*New SNPB RAI 1* - During the November 2015 audit at Texas A&M, STP was considering performing the long term core cooling analysis with the core bypass open to allow flow in the axial direction. Does STP intend to make this change and allow flow axially through the bypass or will STP continue with the bypass completely blocked? If STP is crediting the use of the bypass, they should provide analysis to demonstrate that the bypass will not block during the scenarios. If they are not crediting the bypass, they should inform the NRC that they plan to continue with their current model.

*New SNPB RAI 2* - During the audit, the NRC staff identified a number of sensitivity studies which would be important for the review of the proposed long term core cooling evaluation methodology. STP should perform the following sensitivity studies and submit plots of the relevant figures of merit and important timings for long term core cooling analysis:

- a) Appendix K decay heat load with single worst failure and steam generator tube plugging
- b) Axial power shape
- c) Small break sensitivity study with appropriate break size resolution

D. Koehl

- 2 -

If you have any questions, please contact me at 301-415-1906 or via e-mail at [Lisa.Regner@nrc.gov](mailto:Lisa.Regner@nrc.gov).

Sincerely,

**/RA/**

Lisa M. Regner, Senior Project Manager  
Plant Licensing Branch IV-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosure:  
Audit Report

cc w/encl: Distribution via Listserv

**DISTRIBUTION:**

PUBLIC  
LPL4-1 Reading  
RidsACRS\_MailCTR Resource  
RidsNrrDorlLpl4-1 Resource  
RidsNrrDssSnpb Resource  
RidsNrrLAJBurkhardt Resource  
RidsNrrPMSouthTexas Resource  
RidsRgn4MailCenter Resource

**ADAMS Accession No. ML16095A010**

\*via email

OFFICE	NRR/DORL/LPL4-1/PM	NRR/DORL/LPL4-1/LA	NRR/DSS/SNPB/BC*	NRR/DORL/LPL4-1/BC	NRR/DORL/LPL4-1/PM
NAME	LRegner	JBurkhardt	JDean	RPascarelli	LRegner
DATE	04/06/16	04/04/16	04/11/16	04/12/16	04/13/16

**OFFICIAL RECORD COPY**