



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

May 11, 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 - RE: FEBRUARY 23-25, 2016,
REGULATORY AUDIT SUMMARY FOR THE THERMAL-HYDRAULIC REVIEW
ASSOCIATED WITH A RISK-INFORMED SOLUTION TO GENERIC SAFETY
ISSUE 191 (CAC NOS. MF2400 THROUGH MF2409)

Dear Mr. Koehl:

By letter dated June 19, 2013 (Agencywide Documents Access and Management System (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, and July 15, 2014; March 10, March 25, and August 20, 2015, and April 13, 2016 (ADAMS Accession Nos. ML13295A222, ML13323A673, ML13323A128, ML13338A165, ML14015A312, ML14015A311, ML14029A533, ML14052A110, ML14072A075, ML14086A383, ML14087A126, ML14149A353, ML14149A354, ML14149A439, ML14178A467, ML14202A045, ML15072A092, ML15091A440, ML15246A125, and ML16111B204, respectively), STP Nuclear Operating Company (STPNOC) submitted exemption requests accompanied by a license amendment request (LAR) 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.

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a regulatory audit at Texas A&M University in College Station, Texas, on February 23-25, 2016, 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*. This was a continuation of an audit conducted in November 2015,¹ as part of STPNOC's resolution of GSI-191. Specifically, the NRC staff audited STPNOC's RELAP5-3D detailed analyses, accounting for debris, of long-term core cooling following a design basis loss-of-coolant accident. The enclosure to this letter describes the results of the NRC staff's audit and some of the key technical issues highlighted by the NRC staff during the audit.

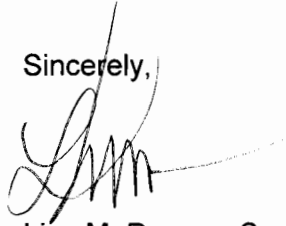
¹ The audit summary, dated April 13, 2016, is available at ADAMS Accession No. ML16095A010.

D. Koehl

- 2 -

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

Sincerely,

A handwritten signature in black ink, appearing to read 'L. 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 Summary

cc w/encl: Distribution via Listserv

AUDIT REPORT – FEBRUARY 23-25, 2016

REVIEW OF RELAP5-3D THERMAL-HYDRAULIC CALCULATIONS ASSOCIATED

WITH THE RISK-INFORMED SOLUTION TO GENERIC SAFETY ISSUE 191

STP NUCLEAR OPERATING COMPANY

SOUTH TEXAS PROJECT, UNITS 1 AND 2

DOCKET NOS. 50-498 AND 50-499

1.0 BACKGROUND

By letter dated June 19, 2013 (Agencywide Documents Access and Management System (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, and July 15, 2014; March 10, March 25, and August 20, 2015, and April 13, 2016 (ADAMS Accession Nos. ML13295A222, ML13323A673, ML13323A128, ML13338A165, ML14015A312, ML14015A311, ML14029A533, ML14052A110, ML14072A075, ML14086A383, ML14087A126, ML14149A353, ML14149A354, ML14149A439, ML14178A467, ML14202A045, ML15072A092, ML15091A440, ML15246A125, and ML16111B204, respectively), STP Nuclear Operating Company (STPNOC) submitted exemption requests accompanied by a license amendment request (LAR) 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).

In order to complete its review, the NRC staff needed a better understanding of the licensee's analysis of the effects of debris on the long-term core cooling of the core following a design-basis loss-of-coolant accident (LOCA). The NRC staff provided requests for additional information (RAIs) in draft documents dated October 21 and December 11, 2015, and February 4 and March 18, 2016 (ADAMS Accession Nos. ML16022A177, ML16022A176, ML16040A069, and ML16081A004, respectively).¹ Due to the complexity of this analysis, to more efficiently complete its review of this subject, the NRC staff determined that a regulatory audit was necessary.

2.0 SCOPE AND PURPOSE

On February 23-25, 2016, the NRC staff audited STPNOC's analyses for long-term cooling of the core following a LOCA considering the effects of debris in containment, at the Texas A&M University in College Station, Texas. The NRC staff conducted the audit in accordance with the draft audit plan e-mailed to STPNOC staff on January 21, 2016 (ADAMS Accession No. ML16085A006).

¹ These RAI questions were consolidated, several were eliminated and modified, and then subsequently formally transmitted by letter dated April 11, 2016 (ADAMS Accession No. ML16082A507).

The purpose of the audit was for the NRC staff to gain a better understanding of STPNOC's simulations of long-term core cooling following a LOCA. Specifically, the NRC staff reviewed the following analyses:

- Small break LOCA – cold leg and hot leg
- Medium break LOCA – hot leg
- Large break LOCA – hot leg

Additionally, the NRC staff reviewed the steps taken by STPNOC staff to perform this analysis under the Quality Assurance (QA) program in accordance with Title 10 of the *Code of Federal Regulations*, Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." The staff reviewed documents that demonstrated how the RELAP5-3D simulations were performed under STP's QA program.

The following NRC staff members participated in the audit:

- Lisa Regner – Team Lead, Project Manager
- Joshua Kaizer – Technical Lead, Reactor Systems Engineer
- Reed Anzalone – Technical Reviewer, General Engineer

The following STPNOC staff members participated in the audit:

- Rob Engen – STPNOC
- Ernie Kee – STPNOC
- Wayne Harrison – STPNOC
- Drew Richards – STPNOC
- Rodolfo Vaghetto – Texas A&M University (TAMU)
- Yassin Hassan – TAMU
- Alessandro Vanni – TAMU

3.0 AUDIT REPORT

The STPNOC team provided the NRC audit team with a detailed analysis from its RELAP5-3D calculations for the long-term core cooling event. There was open and constructive communication throughout the audit. There were no deviations from the draft audit plan.

This was a continuation of the audit held at Texas A&M University in November 2015,² and focused on the following:

- Changes to the RELAP5-3D model since the last audit;
- The phenomena predicted by RELAP5-3D to occur during long-term core cooling;

² The audit summary, dated April 13, 2016, is available at ADAMS Accession No. ML16095A010.

- The QA activities completed to date on the RELAP5-3D analyses and those planned for the immediate future;
- The modeling of specific phenomena in RELAP5-3D, the code's limitations, and modeling inputs used to ensure those limitations did not impact the final analysis;
- The concept of an 'evaluation model,' and how it applies to the RELAP5-3D long-term core cooling analysis;
- The advantages and disadvantages of allowing bypass flow in the barrel-baffle region of the reactor vessel;
- Which LOCA break sizes could be treated using risk, and which would be treated deterministically through RELAP5-3D analysis; and
- A detailed discussion of the NRC's Standard Review Plan,³ Chapter 15.0.2 "Review of Transient and Accident Analysis Method," and how the RAI questions were created from this document.

4.0 CONCLUSION

The NRC staff found that the audit provided a better understanding of the licensee's assumptions, modeling, and QA activities associated with the deterministic analysis of long-term core cooling. 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 clarified several of the NRC staff concerns and questions.

³ NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Chapter 15.0.2, Revision 0, 3/2007, is available at ADAMS Accession No. ML070820123.

D. Koehl

- 2 -

If you have any questions, please contact me at 301-415-1906 or via e-mail at 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 Summary

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. ML16127A400

* by email

| | | | |
|--------|----------------------------|--------------------|------------------|
| OFFICE | NRR/DORL/LPL4-1/PM | NRR/DORL/LPL4-1/LA | NRR/DSS/SNPB/BC* |
| NAME | LRegner | JBurkhardt | JDean |
| DATE | 5/10/16 | 5/10/16 | 4/29/16 |
| OFFICE | NRR/DORL/LPL4-1/BC | NRR/DORL/LPL4-1/PM | |
| NAME | RPascarelli (SLingman) for | LRegner | |
| DATE | 5/10/16 | 5/11/16 | |

OFFICIAL RECORD COPY