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

June 4, 2019

Site Vice President
Entergy Operations, Inc.
Waterford Steam Electric Station, Unit 3
17265 River Road
Killona, LA 70057-3093

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 – SECOND ROUND REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST FOR USE OF THE TRANFLOW CODE FOR DETERMINING PRESSURE DROPS ACROSS THE STEAM GENERATOR SECONDARY SIDE INTERNAL COMPONENTS (EPID L-2018-LLA-0112)

Dear Sir or Madam:

By letter dated April 12, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18106A074), Entergy Operations Inc. (the licensee) submitted a license amendment request to revise the Waterford Steam Electric Station, Unit 3 Updated Final Safety Analysis Report (UFSAR) Section 3.9, "Mechanical Systems and Components," to incorporate the TRANFLOW computer code. By letter dated June 1, 2018 (ADAMS Accession No. ML18145A265), the U.S. Nuclear Regulatory Commission (NRC) staff requested supplemental information to the application in order to complete its acceptance review. A response to the request for supplemental information was provided by letter dated June 13, 2018 (ADAMS Accession No. ML18169A275).

Specifically, the license amendment would delete Subsection 3.9.1.2.2.1.28 of the UFSAR, which describes that the computer code CEFLASH-4A is used to calculate internal loadings following a postulated main steam line break. The deletion of this subsection would clarify that the pressure drops across the steam generator secondary side, due to a steam line break accident, are calculated by the TRANFLOW code.

By letter dated November 26, 2018 (ADAMS Accession No. ML18320A090), the NRC staff issued the first round of requests for additional information (RAIs). By letter dated January 19, 2019 (ADAMS Accession No. ML19019A025), the licensee provided a response to the first round RAIs. After reviewing the response to the first round RAIs, the staff has determined that additional information, that is, a second round of RAIs, is required to complete its review. The additional information needed to complete the review is delineated in the enclosure to this letter.

Enclosure 1 to this letter contains Proprietary information. When separated from Enclosure 1, this document is DECONTROLLED.

The NRC's RAI is enclosed. The NRC staff has determined that the RAI contains proprietary information pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 2.390, Public inspections, exemptions, requests for withholding." Proprietary information (Enclosure 1) is indicated by **bold** text enclosed within **[[double brackets]]**. Accordingly, the NRC staff has prepared a redacted publicly available non-proprietary version of the RAI (Enclosure 2).

During a teleconference, which was held with Maria Zamber and others of your staff on May 29, 2019, it was agreed that a response would be provided within 45 days after the date of this letter. Please note that, if you do not respond to this letter by the agreed-upon date or provide an acceptable alternate date in writing, we may deny your application for amendment under the provisions of 10 CFR 2.108, "Denial of application for failure to supply information."

If you have any questions, please contact me at 301-415-1390 or via e-mail at April.Pulvirenti@nrc.gov.

Sincerely,

***/RA/***

April L. Pulvirenti, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosures:
1. RAI (Proprietary)
2. RAI (Non-Proprietary)

cc w/o Enclosure 1: Listserv

# ENCLOSURE 2

**(NONPROPRIETARY)**

NON-PROPRIETARY REQUEST FOR ADDITIONAL INFORMATION

LICENSE AMENDMENT REQUEST REGARDING THE

REVISION OF UFSAR SECTION 3.9

ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

REQUEST FOR ADDITIONAL INFORMATION

LICENSE AMENDMENT REQUEST REGARDING THE

REVISION OF UFSAR SECTION 3.9

ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

By letter dated April 12, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18106A074), Entergy Operations Inc. (the licensee) submitted a license amendment request to revise the Waterford Steam Electric Station, Unit 3 (Waterford 3) Updated Final Safety Analysis Report (UFSAR) Section 3.9, "Mechanical Systems and Components," to incorporate the TRANFLOW computer code. By letter dated June 1, 2018 (ADAMS Accession No. ML18145A265), the U.S. Nuclear Regulatory Commission (NRC) staff requested supplemental information to the application in order to complete its acceptance review. A response to the request for supplemental information was provided by letter dated June 13, 2018 (ADAMS Accession No. ML18169A275).

Specifically, the license amendment would delete Subsection 3.9.1.2.2.1.28 of the UFSAR, which describes that the computer code CEFLASH-4A is used to calculate internal loadings following a postulated main steam line break (MSLB). The deletion of this subsection would clarify that the pressure drops across the steam generator (SG) secondary side, due to a steam line break accident, are calculated by the TRANFLOW code.

By letter dated November 26, 2018 (ADAMS Accession No. ML18320A090), the NRC staff issued the first round of requests for additional information (RAIs). By letter dated January 19, 2019 (ADAMS Accession No. ML19019A025), the licensee provided a response to the first round RAIs. After reviewing the response to the first round RAIs, the staff has determined that additional information, that is, a second round of RAIs, is required to complete its review. The additional information needed to complete the review is delineated in the enclosure to this letter.

Background

The licensee stated in the first-round RAI that TRANFLOW was used during the evaluation of the Waterford 3 replacement SGs, which were placed into service in 2013. However, the licensee's UFSAR incorrectly stated that CEFLASH-4A was used in the calculation of the pressure drops across the replacement SG secondary side internal components. This issue was documented in Problem Identification and Resolution Inspection Report 05000382/2016008, dated January 26, 2017 (ADAMS Accession No. ML17026A338), as a Severity Level IV non-cited violation, and was entered into the licensee's corrective action program. The request for review and approval of TRANFLOW's use in this particular application is the licensee's intended resolution of this matter.

As discussed in Section 3.9.1, Revision 4, "Special Topics for Mechnaical Components," of NUREG-0800, "Standard Review Plan for the Review of Safety analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition," dated December 2016 (ADAMS Accession No. ML16088A068), most of the requirements that are pertinent to this review are contained in Title 10 of the *Code of Federal Regulations* Part 50, Appendix A, "General Design Criteria [GDC] for Nuclear Power Plants," specifically:

- Criterion 1, "Quality standards and records,"
- Criterion 2, "Design bases for protection against natural phenomena,"
- Criterion 14, "Reactor coolant pressure boundary," and
- Criterion 15, "Reactor coolant system design."

To demonstrate that the applicable GDC are met, the SG secondary side internal components are analyzed to the standard of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section III. To reach the conclusion that the TRANFLOW code is acceptable for the intended application, the NRC staff needs to find that it is capable of adequately or conservatively determining the instantaneous pressure drop across the SG secondary side internal components following a break of the MSLB.

The licensee's response to first round RAI 1 provided additional details on the drift flux model that was implemented in TRANFLOW following its original NRC approval in 1983. The key equations for the void modeling in the drift flux model were included on pages 5 and 6 of 34 in the RAI response dated January 19, 2019, and the reference provided for the derivation of the model was listed as MPR-663, Revision 0, "TRANFLO: A Computer Program for Transient Thermal Hydraulic Analysis with Drift Flux." The NRC staff also reviewed this document and found that two assumptions were made in the development of TRANFLOW that may not be acceptable.

Second Round RAI 1

The void correlation chosen for TRANFLOW and provided on page 5 of the RAI response is discussed in more detail in MPR-663, which references [[

]] as the source for the correlation. [[

]][1] This paper indicates that the void correlation selected for use in TRANFLOW is only applicable up to superficial steam velocities of 2 meters per second.

The NRC staff expects the superficial steam velocities experienced during a MSLB to be greater than this value. Please provide a justification for why the chosen void correlation is applicable to the conditions seen in a SG following an MSLB and results in an accurate or conservative prediction of SG component pressure drop. Support this justification with sensitivity studies and/or other data as necessary.

[1] [[

]]

Second Round RAI 2

MPR-663 makes the following assumption in the derivation of the [[ ]]:

[[ ]]

It is not clear to the NRC staff why this assumption is appropriate, given that it does not appear to be consistent with typical definitions of the [[ ]]. In the reference for the void correlation, [[ ]], the following relationship appears to have been assumed in the development of Equation 5.12:

[[ ]]

This is more consistent with the NRC staff's expectation.

Please provide and support a justification for the assumption made in TRANFLOW. Demonstrate that the assumptions are sufficiently realistic and provide conservative or accurate results for the prediction of steam generator component pressure drop.

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**DISTRIBUTION**:
PUBLIC (**w/o Enclosure 1**)
RidsACRS_MailCTR Resource
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RidsNrrPMWaterford Resource
RidsNrrLAPBlechman Resource
RAnzalone, NRR
MBreach, NRR

**ADAMS Accession Nos.**
**Proprietary: ML19151A603**
**Non-Proprietary: ML19151A610**

***by e-mail dated**

| OFFICE | NRR/DORL/LPL4/PM | NRR/DORL/LPL4/LA | NRR/DSS/SRXB/BC(A)* |
|---|---|---|---|
| NAME | APulvirenti | PBlechman | JBorromeo |
| DATE | 6 / 3 / 2019 | 6 / 3 / 2019 | 6 / 4 / 2019 |
| OFFICE | NRR/DORL/LPL4/BC | NRR/DORL/LPL4/PM | |
| NAME | RPascarelli (BSingal for) | APulvirenti | |
| DATE | 6 / 4 / 2019 | 6 / 4 / 2019 | |

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