



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

June 1, 2018

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 – SUPPLEMENTAL INFORMATION NEEDED FOR ACCEPTANCE OF REQUESTED LICENSING ACTION RE: USE OF TRANFLOW CODE FOR DETERMINING PRESSURE DROPS ACROSS 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. (Entergy) submitted a license amendment request for Waterford Steam Electric Station, Unit 3 (Waterford 3). The proposed amendment would permit the use of the TRANFLOW code to determine the pressure drops across main steam generator secondary side internal components.

The purpose of this letter is to provide the results of the U.S. Nuclear Regulatory Commission (NRC) staff's acceptance review of this amendment request. The acceptance review was performed to determine if there is sufficient technical information in scope and depth to allow the NRC staff to complete its detailed technical review. The acceptance review is also intended to identify whether the application has any readily apparent information insufficiencies in its characterization of the regulatory requirements or the licensing basis of the plant.

Consistent with Section 50.90 of Title 10 of the *Code of Federal Regulations* (10 CFR), an amendment to the license (including the TSs) must fully describe changes requested, and following as far as applicable, the form prescribed for original applications. Section 50.34 of 10 CFR addresses the content of technical information required. This section stipulates that the submittal address the design and operating characteristics, unusual or novel design features, and principal safety consideration.

The NRC staff has reviewed your application and concluded that the information delineated in the enclosure to this letter is necessary to enable the staff to make an independent assessment regarding the acceptability of the proposed amendment in terms of regulatory requirements and the protection of public health and safety and the environment.

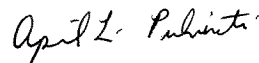
In order to make the application complete, the NRC staff requests that Entergy supplement the application to address the information requested in the enclosure by June 13, 2018. If the information responsive to the NRC staff's request is not received by the above date, the application will not be accepted for review pursuant to 10 CFR 2.101, and the NRC will cease its review activities associated with the application. If the application is subsequently accepted for

review, you will be advised of any further information needed to support the staff's detailed technical review by separate correspondence.

The information requested and associated timeframe in the letter were discussed with Ms. Maria Zamber of your staff on May 24, 2018.

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

Sincerely,



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

Docket No. 50-382

Enclosure:  
Supplemental Information Needed

cc: Listserv

SUPPLEMENTAL INFORMATION NEEDED  
LICENSE AMENDMENT REQUEST REGARDING  
USE OF TRANFLOW CODE FOR DETERMINING PRESSURE DROPS ACROSS THE  
STEAM GENERATOR SECONDARY SIDE INTERNAL COMPONENTS  
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. (Entergy, the licensee) submitted a license amendment request for U.S. Nuclear Regulatory Commission (NRC) review and approval for use of the TRANFLOW code to determine the pressure drops across main steam generator secondary side internal components for the Waterford Steam Electric Station, Unit 3 (Waterford 3). The NRC staff has concluded that supplemental information is required in order to make the application complete, as discussed below.

Background

The licensee's evaluation stated that TRANFLOW was used during the evaluation of the Waterford replacement steam generators (RSGs), which were placed in service in 2013. However, the Updated Final Safety Analysis Report (UFSAR) incorrectly stated that CEFLASH-4A, rather than TRANFLOW, was used to determine the pressure drops across the RSG secondary side internal components. This issue was documented in 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. To resolve this matter, the licensee submitted the request for NRC review and approval of TRANFLOW's use in this particular application.

In its submittal dated April 12, 2018, the licensee identified TRANFLOW as the workstation version of TRANFLO (ADAMS Accession No. ML17191A282; not publicly available, proprietary information), which is a Westinghouse thermal-hydraulic code that has been used in blowdown calculations for steam generators. It solves the mass, energy, and momentum conservation equations for a system of control volumes and connecting junctions.

Acceptance Review Issues

TRANFLO has been previously reviewed and approved by the NRC staff, but only for a very specific purpose. In the TRANFLO safety analysis report (ADAMS Accession No. ML012340064; not publicly available, proprietary information), the NRC staff states, in part:

Our review of the TRANFLO code has been confined to the acceptability of the model to provide input for long term containment analysis and did not include considerations for use of the code for other purposes.

Enclosure

The use of TRANFLO to determine steam generator secondary component dynamic pressure loadings and steam generator shell temperature profiles, as proposed by the licensee, is therefore not encompassed by the NRC staff's approval of the code. However, per the guidance in the Office of Nuclear Reactor Regulation (NRR) Office Instruction (OI) LIC-109, Revision 2, "Acceptance Review Procedures" (ADAMS Accession No. ML16144A521), use of codes and topical reports outside the limitations imposed by the NRC staff may be acceptable "... if the licensee or applicant has provided a full analysis to justify that the proposed use satisfies NRC regulations and is appropriately conservative."

Such an analysis was not provided with the licensee's submittal. Section 3 of the licensee's evaluation describes the TRANFLO code at a very high level and describes the results of comparisons that were performed between TRANFLO and the RELAP5 code, the CEFLASH-4A and CEFLASH-4B codes, the NOTRUMP code, and the CATHARE 2 code. These code-to-code benchmarks are not discussed in sufficient detail in the application to be evaluated by the NRC staff. As such, the staff concludes that the licensee has not provided sufficient information in its application to justify that the proposed use of TRANFLOW satisfies NRC regulations and is appropriately conservative.

Additionally, the analyses that provide the pressure drop results in Table 1 of the application are not discussed in detail. TRANFLO provides a very simplistic representation of the conditions within the steam generator secondary side, and absent a discussion of the details of the analysis performed by the licensee, it may be inadequate to model the pressure forces on steam generator components. For example, because the pressure drop across a junction is reliant on input form loss coefficients, the calculated pressure load on a component would be highly dependent on a static input parameter. The two-phase models in TRANFLO are also relatively crude and, therefore, may be inadequate for determining fine details of the forces on the components.

#### Supplemental Information Needed

The NRC staff evaluated the licensee's submittal dated April 12, 2018, relative to the acceptance review criteria provided in Section 3.1.2 of NRR OI LIC-109, Revision 2. The NRC staff concluded that: (a) the request used an NRC-approved topical report outside of the limitations imposed by the NRC staff without adequate justification, and (b) the licensee did not provide sufficient information for the NRC staff to complete its detailed technical review.

Provide supplemental information/justification supporting the use of TRANFLOW for performing steam generator secondary side internal component pressure drop calculations. The information should include, at a minimum, the following:

1. For the TRANFLOW code:
  - Additional details on the code-to-code benchmarks discussed in Section 3.1 of the submittal, including for each benchmark:
    - a discussion of the event modeled,
    - a comparison of input parameters and nodalizations, and
    - a discussion of how the benchmark analysis is relevant for determining blowdown loads.

- A discussion concerning whether the experimental validation performed in the TRANFLO topical report is relevant to the blowdown loads calculation. If the validation performed in the topical report is relevant, the justification should describe how. If the validation performed in the topical report is not relevant, a comparison of the code to appropriate experiments should be provided and the results discussed and justified to be conservative.
  - A discussion detailing any differences between the NRC-approved version of TRANFLO and the TRANFLOW code used in the calculation.
2. For the Waterford plant-specific steam generator blowdown load analysis:
- A detailed discussion of the nodalization used in the steam generator secondary side, steam generator u-tubes, and any components modeled on the primary side of the reactor coolant system that were found to be important to the transient response.
  - A discussion of the form loss coefficients applied in the calculation and the basis by which they were developed.
  - A discussion of how inputs were biased to ensure that the pressure loading on the internal components was conservative, and how these biases were different from the biases used in the approved application of TRANFLO to determine the flow quality at the break for a main steam line break.
  - A discussion of how the results of the TRANFLOW blowdown loads analysis are used in downstream mechanical/structural analyses, including a justification for why a simple component pressure drop, such as that provided in Table 1 of the licensee's submittal, is adequate rather than a more detailed distribution of the pressure around each component.