

NRR-DMPSPEm Resource

From: Klett, Audrey
Sent: Tuesday, May 1, 2018 2:41 PM
To: Wasik, Christopher J
Cc: Shingleton, Boyd
Subject: Request for Additional Information for Oconee LAR 2017-03 (L-2017-LLA-0365)
Attachments: RAIs for Oconee LAR 2017-03 (L-2017-LLA-0365).docx

Hi Chris,

By letter ONS-2017-074 dated October 20, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17299A114), Duke Energy Carolinas, LLC (the licensee) applied for license amendments to Renewed Facility Operating Licenses DPR-38, DPR-47, and DPR 55, for the Oconee Nuclear Station, Units 1, 2, and 3 (Oconee), respectively. In License Amendment Request (LAR) No. 2017-03, the licensee requested that the Updated Final Safety Analysis Report be revised to allow (1) off nominal success criteria for a Standby Shutdown Facility (SSF)-mitigated Turbine Building flood event occurring when the Oconee units are not at nominal full power conditions and (2) use of the Main Steam Atmospheric Dump Valves to enhance SSF mitigation capabilities. In March 2018, the NRC staff completed a regulatory audit using an internet-based portal from the NRC Headquarters office in Rockville, MD. The audit plan is available in ADAMS at Accession No. ML18032A461, and the audit summary is available at ADAMS Accession No. ML18117A270.

In order to complete its review, the staff developed the attached requests for additional information (RAIs). On April 23, 2018, the staff and licensee held a clarification call. Based on that call, the staff clarified the basis for asking RAI-7. Based on the discussions with you and your staff on the clarification call, the staff expects the licensee to respond to the RAIs on or by June 15, 2018. Please contact me if you have any questions.

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**Request for Additional Information
Oconee Nuclear Station, Unit Nos. 1, 2, and 3
License Amendment Request No. 2017-03**

By letter ONS-2017-074 dated October 20, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17299A114), Duke Energy Carolinas, LLC (the licensee) applied for license amendments to Renewed Facility Operating Licenses DPR-38, DPR-47, and DPR 55, for the Oconee Nuclear Station, Units 1, 2, and 3 (Oconee), respectively. In its License Amendment Request (LAR) No. 2017-03, the licensee requested that the Updated Final Safety Analysis Report (UFSAR) be revised to allow (1) off nominal success criteria for a Standby Shutdown Facility (SSF)-mitigated Turbine Building flood (TBF) event occurring when the Oconee units are not at nominal full power conditions and (2) use of the Main Steam (MS) Atmospheric Dump Valves (ADVs) to enhance SSF mitigation capabilities. In March 2018, the NRC staff completed a regulatory audit using an internet-based portal from the NRC Headquarters office in Rockville, MD. The audit plan is available in ADAMS at Accession No. ML18032A461. In order to complete its review, the staff developed the following requests for additional information (RAIs).

RAI-1 (Reactor Systems Branch (SRXB))

The following RAIs are related to the licensee's RETRAN analysis (e.g., methods, modelling assumptions, model modifications, etc.) and are needed to give the staff confidence that the proposed UFSAR acceptance criteria are met for maintaining the reactor in a safe shutdown condition when using the SSF to mitigate a TBF event.

RAI-1.A

Page 2 of the Enclosure to LAR 2017-03 states, "As the flood height in the turbine building increases, the flooding results in a reactor/turbine trip and a loss of both main and emergency feedwater systems." However, on page 11, it states, "For example, an overheating case may assume maximum decay heat, a delayed reactor trip from the Reactor Protection System, minimum EFW flow rates, and neglect modeling secondary system steam loads and RCS [Reactor Coolant System] ambient heat losses to minimize primary-to-secondary heat transfer and maximize the post-trip RCS overheating response." The staff requests the licensee to explain why Emergency Feedwater (EFW) flow is credited (which the staff understands to be a non-conservative assumption for an overheating event) when the initiating event is a loss of both main and EFW systems. In addition, the staff requests the licensee to provide sequence-of-events tables for the limiting cases (i.e., nominal full power, low decay heat, and high decay heat with low initial temperature), including items such as operator actions and availability of systems (e.g., EFW, SSF letdown line, SSF auxiliary service water, etc.).

RAI-1.B

The model modifications needed for the RCS and pressurizer ambient heat losses resulted in the use of an extremely large heat transfer coefficient on the inside pipe wall surfaces, with the actual heat transfer to the environment being controlled on the outside surfaces. The use of a large heat transfer coefficient will result in the inside wall surface temperature and fluid/saturation temperature being very close together and will affect the condensation rate (and resulting RCS pressure), as condensation is based on the temperature difference (ΔT). The staff requests the licensee to explain why this is an acceptable modelling method for both

overheating and overcooling events and how the results would be different if the inside wall heat transfer coefficient was calculated by RETRAN.

RAI-1.C

Item 31 of the conditions of use in the safety evaluation report (SER) for Electric Power Research Institute (EPRI) Topical Report NP-7450(P), Revision 4, "RETRAN-3D - A Program for Transient Thermal-hydraulic Analysis of Complex Fluid Flow Systems," states, "The pressurizer model requires model qualification work for the situations where the pressurizer either goes solid or completely empties," and Item 37 states, "For PWR [pressurized water reactor] transients where the pressurizer goes solid or completely drains, the pressurizer behavior will require comparison against real plant or appropriate experimental data." The staff requests the licensee to describe what plant/experimental data was used to qualify code response for thermal stratification. The staff also requests the licensee explain how the updated modelling (i.e., regular nodes below the pressurizer heaters) is applicable to the qualification work.

RAI-1.D

The staff position for Item 18 of the RETRAN SER states, "While the model does not directly account for thermal stratification, its effects can be included by use of normal nodes below the pressurizer volume." The staff requests the licensee provide the basis for the choice of both the number of normal nodes used as well as the choice to only use them below the pressurizer heaters. Given that in the updated RETRAN model, the normal nodes make up only a small portion of the volume of the pressurizer, the staff requests the licensee to describe what was done to assure this was an acceptable modelling approach for both cases where the pressurizer completely empties as well as fills solid.

RAI-1.E

While 1-D codes such as RETRAN can simulate thermal stratification with appropriate nodding, they generally have little to no heat transfer between adjacent nodes when there is little to no flow (as would be the case in the pressurizer during the majority of the three day TBF event). The staff requests the licensee to provide RETRAN results showing the axial temperature distribution, and to explain how the lack of mixing between adjacent nodes in the lower pressurizer region is acceptable for both overcooling and overheating events.

RAI-1.F

As stated in the Enclosure to LAR 2017-03, the SSF auxiliary service water (ASW) pump suction supply is lake water from the embedded Unit 2 Condenser Circulating Water (CCW) supply piping and the limiting turbine building internal flooding event occurs as the result of failure of a CCW piping expansion joint. In addition, during the TBF, procedures would have operators trip the CCW pumps to stop/reduce the break flow. Given the failure in the CCW piping and tripped pumps, the staff requests the licensee to describe what is the resulting effect on the ASW flowrate to the steam generators and whether this effect (if any) was included in the RETRAN analysis.

RAI-2 (SRXB)

The following RAIs are related to the proposed acceptance criteria for off-nominal conditions and are needed in order for the staff to determine if water-solid operation is an acceptable configuration for maintaining safe shutdown during an SSF TBF event.

RAI-2.A

Page 5 of the Enclosure to LAR 2017-03 states, “operators maintain RCS pressure in a band of approximately 1950 to 2250 psig [pounds per square inch gauge].” Then, on Page 14, it states, “Results from the T-H [thermal-hydraulic] analyses show RCS pressure remains more than 700 psi below the Pressurizer Safety Valve (PSV) lift setting with a water-solid pressurizer condition for the duration of the event.” Given the lowest allowable PSV setpoint is 2,425 psig (per Technical Specification 3.4.10), then 700 psig below the setpoint would be 1,725 psig, which is significantly below the ~1,950 to 2,250 psig stated previously. The staff requests the licensee to explain this discrepancy and clarify the margin to passing liquid through a PSV.

RAI-2.B

Page 14 of the Enclosure to LAR 2017-03 states, “Changes to the SSF letdown line control valve position is a manual action from the SSF, and the operator is required to maintain a very high awareness of the plant status for RCS pressure.” In cases where the pressurizer level goes off-scale high and becomes water solid, the staff requests the licensee to describe whether the operators can increase the new SSF letdown line flow, or whether it is at its maximum in the analysis. The staff also requests the licensee to describe what other options the operators have to reduce pressure and to reduce the chance of water passing through the PSVs if the pressurizer is water solid. The staff requests the licensee to describe whether the pressurizer would still become water solid if the operators were to open the new letdown to its maximum.

RAI-2.C

Regarding meeting the success criteria for the TBF event, page 6 of the Enclosure to LAR 2017-03 states, “This condition was reported as an unanalyzed condition that significantly degraded plant safety.” Then, on page 7, it states that the four days with low decay heat and 10 hours in high decay heat/low RCS temperature “does not result in an appreciable contribution to overall plant risk.” The staff requests the licensee to clarify this apparent inconsistency.

RAI-3 (PRA Operations and Human Factors Branch (APHB))

The following RAIs pertain to Section 2.3.3 of the LAR 2017-03 Enclosure, which states, in part:

Although the RCS may become water-solid, the modifications to the SSF RC [reactor coolant] Makeup System described in Section 2.1.2.2 will eliminate the potential for water relief through the pressurizer safety valves by providing the ability to significantly increase SSF reactor coolant letdown flow.

RAI-3.A

The staff requests the licensee to describe what the operator action time margin is associated with the time required for the operator to take control of the SSF throttle valve and manipulating it to prevent water relief through the pressurizer safety valves.

RAI-3.B

The staff requests the licensee to provide the basis and justification regarding the feasibility and validation for the operator to manually throttle the SSF letdown line valve to prevent water relief through the pressurizer safety valves.

RAI-3.C

The staff requests the licensee to provide a description of the potential impacts on the reactor/plant should the operator fail to manually throttle the SSF letdown line valve to prevent water relief through the pressurizer safety valves.

RAI-4 (APHB)

The following RAIs pertain to Section 3.1 of the LAR Enclosure, which states, in part:

Although the RCS [reactor coolant system] may become water-solid, the modifications to the SSF RC [reactor coolant] Makeup System described in Section 2.1.2.2 will eliminate the potential for water relief through the pressurizer safety valves by providing the ability to significantly increase SSF reactor coolant letdown flow.

Changes to the SSF letdown line control valve position is a manual action from the SSF, and the operator is required to maintain a very high awareness of the plant status for RCS pressure.

RAI-4.A

The staff requests the licensee to describe the procedures being implemented to direct operator manual throttling of the SSF letdown line valve to prevent water relief through the pressurizer safety valves.

RAI-4.B

The staff requests the licensee to describe the training that is being provided initially and periodically regarding operator manual throttling of the SSF letdown line valve to prevent water relief through the pressurizer safety valves.

RAI-4.C

The staff requests the licensee to describe the specific controls that facilitate the operator maintaining the necessary high alertness of plant status while controlling SSF letdown via the new throttle valve.

RAI-4.D

The staff requests the licensee to describe any operating experience from Oconee or other plants associated with RCS pressure/temperature control with a water-solid pressurizer condition.

RAI-4.E

The staff requests the licensee to describe the impact on plant operational/design margins associated with RCS pressure/temperature control with a water-solid pressurizer condition.

RAI-5 (APHB)

The following RAIs pertain to Section 2.4 of the Enclosure of LAR 2017-03, which identifies manual control of the MS ADVs as a new manual operator action requiring NRC review and approval.

RAI-5.A

The staff requests the licensee to describe the impact on plant operational/design margins associated with operator manual control of the ADVs to achieve plant cooldown as compared to the automatic functioning of the main steam relief valves.

RAI-5.B

The staff requests the licensee to describe any operating experience from Oconee or other plants associated with achieving plant cooldown via manual control of the ADVs as compared to the automatic functioning of the main steam relief valves.

RAI-5.C

The staff requests the licensee to provide a description and disposition of the potential impacts on the reactor/plant resulting from miss-operation of the ADVs.

RAI-5.D

The staff requests the licensee to describe the procedures being implemented to direct operator manual operation of the ADVs for plant cooldown.

RAI-5.E

The staff requests the licensee to describe the training provided regarding operator manual operation of the ADVs for plant cooldown.

RAI-5.F

The staff requests the licensee to describe the specific controls that facilitate the operator coordinating effectively with the SSF control room regarding RCS pressure/temperature while manual operating the ADVs to achieve plant cooldown.

RAI-5.G

The staff requests the licensee to provide the basis and justification regarding the feasibility and validation for the operator to manually operate the ADVs to achieve plant cooldown.

RAI-6 (APHB)

The staff interprets the throttling of the SSF letdown valve as a new manual operator action; however, the licensee did not explicitly identify this as a new operator action in its LAR. Therefore, the staff has developed the following RAIs.

RAI-6.A

The staff requests the licensee to describe any operator actions in addition to manual operation of the MS ADVs and manual throttling of the SSF letdown line that are associated with the proposed LAR and have not been previously reviewed and approved by the NRC.

RAI-6.B

The staff requests the licensee to provide the basis and justification regarding the feasibility and validation for any operator actions in addition to manual operation of the MS ADVs and manual throttling of the SSF letdown line that are associated with the proposed LAR and have not been previously reviewed and approved by the NRC.

RAI-7 (Plant Licensing Branch II-1)

Section 50.92, "Issuance of amendment," of 10 CFR states that in determining whether an amendment to a license will be issued to the applicant, the Commission will be guided by the considerations which govern the issuance of initial licenses to the extent applicable and appropriate. Section 50.57, "Issuance of operating licenses," of 10 CFR states that an operating license may be issued by the Commission upon finding that the facility will operate in conformity with the application as amended. LAR 2017-03, Enclosure, Page 1 states:

Modifications to the plant are also being made to provide a larger capacity SSF reactor coolant letdown line and an improved pulsation dampener for the positive displacement SSF reactor coolant makeup pump that will allow sufficient reactor coolant system letdown and makeup capability over the full range of system pressure required for TB flood mitigation. These modifications are being performed under 10 CFR 50.59; their approval is not a part of this LAR. The combination of these modifications and the proposed change to the licensing basis will resolve the existing nonconforming conditions for each Oconee unit.

Page 13 states, "Implementation of these modifications is scheduled for the fall of 2018 for Oconee Unit 1, fall of 2019 for Oconee Unit 2, and the spring of 2018 for Oconee Unit 3." In the cover letter for LAR 2017-03, the licensee requested the NRC to approve the amendment request by December 31, 2018, and stated that once approved, the licensee would implement the amendment within 90 days. The schedule for modifications for Unit 2 (i.e., the fall of 2019) would result in the requested approval and implementation dates not enabling the staff to make the 10 CFR 50.57 finding because Unit 2 would not be able to be operated in conformity with the amendments until its modifications are complete, assuming the staff can approve the amendments by December 31, 2018. Therefore, the staff requests the licensee to propose

changes to the requested implementation dates or application that would enable the staff to make a finding per 10 CFR 50.57.

RAI-8 (Environmental and NEPA Branch (MENB))

Section 5 of the LAR 2017-03 Enclosure, page 19, states, in part, "The proposed change will not change the types or amounts of any effluents that may be released offsite." Given that the licensee has requested the approval to use the MS ADVs, when available, to enhance SSF mitigation capabilities, the staff requests the licensee to address whether a situation involving a miss-operated or stuck open ADV would cause this statement to change.