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U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Duke Energy Carolinas, LLC
Oconee Nuclear Station (ONS), Units 1, 2, and 3
Docket Numbers 50-269, 50-270, and 50-287
Renewed Facility Operating License Nos. DPR-38, DPR-47, and DPR-55

Subject: Response to Request for Additional Information Related to Proposed Revisions to the Updated Final Safety Analysis Report Section for the Standby Shutdown Facility; License Amendment Request No. 2017-03, Supplement 2

Duke Energy Carolinas, LLC (Duke Energy) submitted a License Amendment Request (LAR), which proposes to revise the Updated Final Safety Analysis Report (UFSAR) to allow off-nominal success criteria for a Standby Shutdown Facility (SSF) mitigated Turbine Building (TB) flood event occurring when the ONS Unit(s) are not at nominal full power conditions, on October 20, 2017. By email dated September 6, 2018, the NRC requested Duke Energy to respond to a Request for Additional Information (RAI) associated with the LAR. The Enclosure provides the requested information.

As described in the Enclosure of the LAR dated October 20, 2017, modifications to the plant are being made to provide a larger capacity SSF reactor coolant system (RCS) letdown line to allow sufficient RCS letdown capability over the full range of system pressure required for TB flood mitigation. The modifications are being performed under 10 CFR 50.59, and are not a part of this LAR. The combination of these modifications and the proposed change to the licensing basis will resolve existing nonconforming conditions for each ONS unit.

Each ONS unit's SSF RCS letdown line is independent of the normal RCS letdown line. Currently, the SSF RCS letdown line originates off one of the RCS cold legs and discharges to a spent fuel pool fuel transfer tube via an orifice and isolation valve arrangement. At nominal RCS operating pressures, the SSF RCS letdown flow is limited to approximately 41 gpm and is reduced at lower RCS pressures. The SSF RCS letdown line is being replaced with a new line that originates off one of the RCS hot legs. The Enclosure of the LAR dated October 20, 2017, described the discharge as "to a fuel transfer tube via an isolation and throttle valve arrangement. The new SSF RCS letdown line will be capable of providing approximately 300 gpm at nominal RCS operating pressures and is effective at low RCS pressures." During the detailed design phase for this engineering change it was determined that it may be advantageous to return a portion of the flow to a fuel transfer tube (via the low flow throttle valve) as originally planned and change the routing of the high flow throttle valve to the reactor building. The driver for this change is to eliminate machining on the fuel transfer tube flange

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along with the resultant occupational radiation exposure and long-term maintenance impacts. The modifications to the SSF RCS letdown line will continue to be evaluated under 10 CFR 50.59, and are not a part of the subject LAR. The modified SSF RCS letdown line will continue to provide sufficient capacity such that water relief through the pressurizer safety valves is precluded.

Implementation of the SSF RCS letdown line modifications are currently scheduled for the Fall of 2020 for ONS Unit 1, Fall of 2019 for ONS Unit 2, and the Spring of 2020 for ONS Unit 3.

The response to the RAI does not affect the conclusions of the No Significant Hazards Consideration provided in the October 20, 2017 LAR. Inquiries on this proposed license amendment request should be directed to Boyd Shingleton, ONS Regulatory Affairs Group, at (864) 873-4716.

I declare under penalty of perjury that the foregoing is true and correct. Executed on September 21, 2018.

Sincerely,

J. Ed Burchfield, Jr.
Vice President
Oconee Nuclear Station

Enclosure: Duke Energy Response to NRC Request for Additional Information

cc w/enclosure:

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ENCLOSURE

DUKE ENERGY RESPONSE
TO NRC REQUEST FOR ADDITIONAL INFORMATION

NRC RAI Summary Introduction

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. By email dated May 1, 2018 (ML18122A374), the NRC staff requested additional information. By letter dated June 15, 2018, as superseded by letter dated July 20, 2018 (ML18214A364), the licensee responded to the request. In order to complete its review, the staff developed the request for additional information (RAI) below based on the licensee's response dated July 20, 2018. The RAI is numbered sequentially from the APHB RAIs dated May 1, 2018. Per an email dated August 27, 2018, from Mr. Boyd Shingleton of the licensee's staff, the NRC staff requests the licensee to respond to the RAI in this email on or by October 5, 2018.

RAI-7 (APHB)

The Enclosure of the licensee's amendment request dated October 20, 2017, describes operator manual control of a newly installed standby shutdown facility (SSF) letdown throttle valve. Section 2.1.2.2 of the Enclosure describes that current plant operational practice is to maintain the existing SSF letdown throttle valve open and flow through the SSF letdown line is set by an orifice in the piping. Therefore, flow through the line cannot be throttled.

Per the licensee's supplement dated July 20, 2018, the SSF was originally licensed with a letdown line that had a throttling capability. Therefore, the licensee does not consider operator manual control to throttle the new SSF letdown line as a new operator action. The licensee's supplement dated July 20, 2018, states the following in response to RAI-3.B:

> The SSF letdown control valve was designed as, and originally functioned as, a throttle valve, but due to subsequently identified design limitations the valve is now only cycled completely open and closed.

In addition, the response to RAI-6.A of the supplement dated July 20, 2018, states the following:

> No additional operator actions requiring NRC review and approval have been identified. The SSF was originally licensed with a letdown line that had throttling capability. Throttling of the SSF letdown line was previously reviewed and approved (Reference NRC Safety Evaluation for the SSF dated April 28, 1983, Accession Number 8305200103). Manual throttling of the new SSF letdown line is not a new operator action.

The NRC staff reviewed the referenced NRC safety evaluation (SE) dated April 28, 1983 (ADAMS Accession No. ML103370444) and did not find information supporting the statement in the subject SE indicating Oconee was originally licensed to throttle SSF letdown line flow. Section 2.1 of the NRC SE states:

> The letdown valve is powered from the SSF power system and is controlled from the SSF control room.

This statement does not define control of the valve as throttling valve position as opposed to controlling the valve open and closed. Review of Section 9.6, "Standby Shutdown Facility," of the Oconee UFSAR also did not identify any information regarding throttling the SSF letdown line flow.

RAI-7.A

The staff requests the licensee to provide the specific location of the docketed information that supports the licensee's response to RAI-6.A that the SSF was originally licensed with a letdown line that had throttling capability and that throttling of the SSF letdown line was previously reviewed and approved by the NRC staff.

Duke Energy Response

In order to balance RCS inventory during an SSF event, letdown flow must be established. The current nominal SSF reactor coolant letdown capacity is more than SSF reactor coolant makeup capacity. Thus, SSF reactor coolant letdown must either be throttled or periodically secured. The current SSF letdown line valve was designed and intended to be used as a throttle valve. Neither the Oconee SSF design LAR nor the NRC SE explicitly stated how SSF letdown flow would be controlled, only that the SSF letdown line would be used to control pressurizer level. Subsequently, Duke Energy identified a design limitation that made fine control with the throttle valve not possible. This resulted in the need to procedurally control the valve to not throttle, but cycle full open or closed.

No docketed information that addresses how these valves are to be operated to control letdown could be found. As such, Duke Energy will respond to RAI 7.B.

RAI 7.B (1)

Provide the basis and justification regarding the feasibility and reliability for the operator action to manually throttle the SSF letdown line valve for all conditions (nominal and off-nominal) as described in the proposed LAR dated October 20, 2017.

Duke Energy Response

To balance RCS inventory during an SSF event, letdown flow must be established. The current nominal SSF reactor coolant letdown capacity is more than SSF reactor coolant makeup capacity. Thus, SSF reactor coolant letdown must either be throttled or periodically secured. The current SSF letdown line valve was originally designed to be utilized as a throttle valve, but due to identified design limitations, the valve is now only cycled completely open and closed to control letdown flow. The valve is functionally a throttle valve in that the control switch must be continuously maintained in the open position until the valve has travelled fully open and the control switch must be continuously maintained in the closed position until the valve has travelled fully closed.

With a level present in the pressurizer (PZR), the current SSF letdown line valve is cycled fully open and fully closed to maintain PZR level within a 20-inch control band. With the pressurizer level off-scale high and the RCS assumed to be water solid, the valve is operated as previously

described but the controlling parameter is reactor coolant system (RCS) pressure with a control band of 1600 - 2200 psig.

The cycling of the current SSF letdown line valve fully open and closed is essentially a rudimentary form of throttling in that a component is being operated to maintain a plant parameter within a control band. Providing the operator with finer controllability of SSF letdown is an improvement in that it will enable the operator to more precisely maintain PZR level in its control band with fewer manipulations of the valve(s), thereby reducing operator actions.

Throttling a valve to maintain a parameter within a prescribed band is not a new operator skill. Examples include throttling normal RCS letdown from the main control room following nominal and off-nominal events to compensate for changes in RCS inventory, throttling emergency feedwater flow as required to maintain a prescribed steam generator level or RCS temperature, and throttling High Pressure Injection (HPI) to maintain a desired level in the PZR.

The feasibility and reliability of these operator actions will be further maintained in that:

- The SSF Emergency Operating Procedure (EOP) currently provides the proper level of guidance required to ensure that the operator establishes letdown from the SSF at the appropriate time and uses the appropriate control band following an SSF event. As part of installing the new SSF letdown line, the SSF EOP will be revised to enhance this guidance by throttling SSF letdown as required to maintain the appropriate control band following nominal and off-nominal SSF events.
- As part of installing the new SSF letdown line, the new SSF letdown line valves will be modeled on the SSF training simulator and training will be provided to the licensed operators on placing the unit in a safe shutdown condition using the new SSF letdown line valve(s) following nominal and off-nominal SSF events prior to the new SSF letdown line being placed in service.

RAI-7.B (2)

Provide the validation performed regarding the operator action to manually throttle the SSF letdown line valve for all conditions (nominal and off-nominal) as described in the proposed LAR dated October 20, 2017.

Duke Energy Response

Duke Energy has validated the ability to control PZR level during nominal initial conditions on the SSF simulator using the existing SSF letdown line. The formal validation of manually throttling the new SSF letdown line valve(s) following an SSF event that occurs from a nominal or off-nominal operating condition has not yet been performed. Validation of this operator action will be completed prior to the new SSF letdown line being placed in service in accordance with administrative procedures.

Following an SSF event that occurs from nominal operating conditions, the current SSF letdown line valve is cycled fully open and fully closed to maintain PZR level within a 20-inch control band. If the PZR level goes off-scale high and the RCS is assumed to be water solid, the SSF

letdown line valve is operated as previously described, but the controlling parameter is RCS pressure with a control band of 1600 - 2200 psig.

The cycling of the current SSF letdown line valve fully open and closed is essentially a rudimentary form of throttling in that a component is being operated to maintain a plant parameter within a control band.

Throttling a valve to maintain a parameter within a prescribed band is not a new operator skill. Examples include throttling normal RCS letdown from the main control room following nominal and off-nominal events to compensate for changes in RCS inventory, throttling emergency feedwater flow as required to maintain a prescribed steam generator level or RCS temperature and throttling High Pressure Injection (HPI) to maintain a desired level in the PZR.

Providing the operator with finer controllability of SSF letdown is an improvement that will enable the operator to more precisely maintain PZR level in its control band with fewer manipulations of the SSF letdown line valve(s), thereby reducing operator actions. Based on the above discussion, Duke Energy is confident that validation will be successful for the new SSF letdown configuration.

RAI-7.B (3)

Describe any staffing changes required to implement the operator action to manually throttle the SSF letdown line valve for all conditions (nominal and off-nominal) as described in the proposed LAR dated October 20, 2017

Duke Energy Response

No changes in staffing levels are required because of adding the capability to manually throttle letdown from the SSF. Providing the operator with finer controllability of SSF letdown is an improvement in that it will enable the operator to more precisely maintain PZR level or pressure in its control band with fewer manipulations of the SSF letdown line valve(s), thereby reducing operator actions.

RAI-7.B (4)

Provide a description of the potential impacts on the reactor/plant should the operator fail to correctly manually throttle the SSF letdown line valve for all conditions (nominal and off-nominal) as described in the proposed LAR dated October 20, 2017.

Duke Energy Response

The impacts on the reactor/plant should the operator fail to correctly manually throttle the new SSF letdown line valve(s) have not changed from the impacts of failing to correctly manually cycle/throttle the current SSF letdown line valve.

Nominal Operating Conditions

When stabilizing the plant following an SSF event that occurs from nominal operating conditions, RCS pressure, RCS temperature, and PZR level will increase as the inventory in the steam generators boils off. RCS temperature, pressure, and pressurizer level will be continuously monitored by licensed personnel in the SSF control room, in the main control room if available, and in the Technical Support Center (TSC) once it becomes operational. The SSF Control Room Operator will stabilize RCS temperature by supplying the steam generators with SSF Auxiliary Service Water (ASW) and steaming the steam generators via the main steam relief valves (MSRVs). RCS temperature is maintained at the saturation temperature of the MSRVs with the lowest lift setpoint. PZR level and RCS pressure will continue to increase due to the continuous addition of makeup by the SSF RCMU pump. The SSF Control Room Operator will stabilize PZR level by throttling open the SSF letdown line valve(s) until RCS letdown matches RCS makeup. As described in the response to RAI 3A, the operator has adequate time margin to perform this action.

If the SSF Control Room Operator fails to open the SSF letdown line valve(s) enough to match RCS letdown flow to makeup flow, PZR level and RCS pressure will continue to increase. The SSF emergency operating procedure includes "if at any time" steps to maintain PZR level and RCS pressure control bands. The SSF Control Room Operator will recognize the increase in PZR level and RCS pressure via routine control board monitoring and increase RCS letdown flow to stabilize PZR level. If the SSF Control Room Operator fails to recognize the increase in PZR level and RCS pressure, the power operated relief valve (PORV) will lift and control RCS pressure below the pressurizer code safety valve setpoint. If the PORV has been isolated the RCS pressure may increase to the setpoint of the pressurizer code safety valves where pressure is limited by the pressurizer code safety valves.

If the SSF Control Room Operator establishes more RCS letdown flow than RCS makeup, PZR level will decrease. The SSF emergency operating procedure includes "if at any time" steps to maintain PZR level and RCS pressure control bands. The operator will recognize the decrease in PZR level via routine control board monitoring and decrease RCS letdown flow to stabilize PZR level. If the SSF Control Room Operator fails to recognize the decrease in PZR level, the SSF Control Room "Pressurizer Water Level Low" annunciator may actuate and alert the operator to the mismatch in RCS letdown flow versus makeup flow. At that time, the SSF Control Room Operator will decrease or isolate RCS letdown flow until the desired PZR level is achieved.

Off-nominal Operating Conditions

When stabilizing the plant following an SSF event that occurs from a low RCS temperature/high decay heat condition, PZR level and RCS pressure will increase due to the continuous addition of makeup by the SSF RCMU pump and the insurge into the PZR as RCS temperature increases. RCS temperature, pressure, and pressurizer level will be continuously monitored by licensed personnel in the SSF control room, in the main control room if available, and in the Technical Support Center (TSC) once it becomes operational. The SSF Control Room Operator will initiate SSF ASW flow to the steam generators but this may have a minimal effect on stabilizing RCS temperature as the temperature is below the setpoint for the MSRVs. When the SSF Control Room Operator meets the conditions to initiate letdown flow (RCS pressure $\geq$ 1600 psig), the SSF Control Room Operator will stabilize RCS pressure @ 1600 psig by

throttling open the SSF letdown line valve(s) until RCS letdown matches RCS makeup and insurge.

If the SSF Control Room Operator fails to open the SSF letdown line valve(s) enough to match RCS letdown flow with the makeup flow and insurge, PZR level and RCS pressure will continue to increase. The SSF emergency operating procedure includes "if at any time" steps to maintain PZR level and RCS pressure control bands. The SSF Control Room Operator will recognize the increase in PZR level and RCS pressure via routine control board monitoring and increase RCS letdown flow to stabilize PZR level. If the SSF Control Room Operator fails to recognize the increase in PZR level and RCS pressure, the PORV will lift and control RCS pressure below the pressurizer code safety valve setpoint. If the PORV has been isolated the RCS pressure may increase to the setpoint of the pressurizer code safety valves where pressure is limited by the pressurizer code safety valves.

If the SSF Control Room Operator establishes more RCS letdown flow than RCS makeup and insurge, PZR level will decrease. The SSF EOP includes "if at any time" steps to maintain PZR level and RCS pressure control bands. The operator will recognize the decrease in PZR level and/or RCS pressure and decrease RCS letdown flow to stabilize PZR level. If the SSF Control Room Operator fails to recognize the decrease in RCS pressure, RCS pressure may decrease to the point where there is a loss of subcooling outside of the pressurizer.

RAI-7.B (5)

Describe any relevant operating experience related to controlling SSF letdown line flow by manually throttling the SSF letdown line as opposed to maintaining the letdown line valve full open or full closed for all conditions (nominal and off-nominal) as described in the proposed LAR dated October 20, 2017.

Duke Energy Response

Relevant operating experience related to controlling SSF letdown line flow by manually throttling the SSF letdown line is provided by other similar operator throttling experiences such as operator adjustments of normal RCS letdown to compensate for changes in RCS inventory and maintain PZR level, throttling emergency feedwater flow as required to maintain a prescribed steam generator level or RCS temperature, and throttling HPI to maintain a desired level in the PZR from the main control room following nominal and off-nominal events. There is no appreciable difference between the indications and actions required to throttle normal RCS letdown and SSF RCS letdown flow.