



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 145 TO

FACILITY OPERATING LICENSE NO. NPF-38

ENERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

1.0 INTRODUCTION

By application dated September 18, 1998, as superseded by letter dated September 23, 1998, Entergy Operations, Inc. (the licensee), submitted a request for changes to the Waterford Steam Electric Station, Unit 3 (Waterford 3), Technical Specifications (TSs). The requested changes would revise Note "1" in Table 2.2-1, "Reactor Protective Instrumentation Trip Setpoint Limits" and Note "a" in Table 3.3-1, "Reactor Protective Instrumentation (RPI)," both applicable to high logarithmic power (HLP) reactor trip instrumentation. Additionally, the requested changes clarify the terms RATED THERMAL POWER and THERMAL POWER used in Tables 2.2-1, 3.3-1 and 4.3-1. A Bases change is being proposed to support these changes.

2.0 EVALUATION

The HLP trip is provided to trip the reactor when indicated neutron flux power from the excore detectors reaches a preset value in two out of the four instrumentation channels. This trip provides protection against inadvertent withdrawal of control element assembly (CEA) initiated from low power or subcritical conditions. The nominal trip set point of this instrumentation is $\leq 0.257\%$ of rated thermal power (RTP). Waterford 3 RPI design provides a permissive to manually bypass the HLP reactor trip on increasing power (start-up) when reactor thermal power reaches a specific value and automatically remove the bypass on decreasing power (shutdown) when the reactor thermal power reaches another specified value. This automatic removal of the trip bypass ensures that the trip will be available in the event of a CEA withdrawal from low power or subcritical conditions. The HLP trip manual bypass is provided to allow reactor power increase into mode 1 during controlled reactor start-up. Without the bypass in place, a reactor trip is generated when the trip setpoint is reached, preventing further power increase. This manual bypass will occur only during controlled power increase and not if the increase is due to an inadvertent CEA withdrawal.

In the present TSs for Waterford 3, Note "1" of Table 2.2-1 and Note "a" of Table 3.3-1 state that the HLP trip may be manually bypassed above $10^{-4}\%$ of RTP and the bypass shall be automatically removed when reactor thermal power is less than or equal to $10^{-4}\%$ of RTP. To accomplish this TS requirement the associated instrumentation channel bistable provides a

permissive for manual bypass of HLP reactor trip when the reactor power is greater than $10^{-4}\%$ of RTP. When reactor power is equal to $10^{-4}\%$ of RTP and decreasing, the manual bypass is automatically removed and the bistable is armed to provide a reactor trip signal on HLP.

At Waterford 3, the same bistable provides two automatic functions. One is to remove the HLP trip bypass at or below $10^{-4}\%$ of RTP and the second is to remove Core Protection Calculator (CPC) trip bypass (low DNBR and low power density) when reactor thermal power is equal to or greater than $10^{-4}\%$ of RTP. A single bistable can not both energize and de-energize at the same value as required by the TS. The CPC trip bypass automatic removal occurs at the bistable set point which is $10^{-4}\%$ of RTP, but the HLP trip bypass automatic removal occurs at the reset value of the bistable which is slightly below $10^{-4}\%$ of RTP. This is due to an inherent deadband, which causes arming of the bistable to take place at a lower power than $10^{-4}\%$ of RTP. As such, the actual bistable operation is found to be in noncompliance with the TS requirement because the bistable does not satisfy both the CPC and HLP provisions of the TS at the same value. To accommodate the inherent deadband in the bistable, the proposed changes to the TS notes revise the less than or equal to $10^{-4}\%$ of RTP requirement for automatic removal of HLP reactor trip bypass. The changes state that the bypass shall be automatically removed when thermal power is less than or equal to the reset point of the bistable. The reset point is specified to be within $3.0 \times 10^{-5}\%$ of RTP below the bistable set point which is nominally $10^{-4}\%$ of RTP.

The licensee's evaluation of these changes indicates: since the difference between the bistable reset value and its nominal trip set point is small, accounting for the slightly different bypass removal power level caused by the bistable deadband would result in negligible change to the calculated peak power and heat flux for the pertinent CEA withdrawal events. Therefore, the consequences of any accident previously evaluated will not significantly change. Additionally, the safety analysis described in FSAR section 15.4.1.2 assumed that a CEA withdrawal from critical conditions can be initiated from the lowest power level (the most limiting initial condition) at which the HLP trip is not available. In this case, a reactor trip is generated by the CPC variable overpower trip function. The licensee considered a case where initial power level could theoretically be just above the bistable reset value during a shutdown when the power decrease was stopped such that the manual bypass for HLP trip was not yet removed and the trip function would not be armed. The licensee concluded that this condition would be highly improbable. Furthermore, the licensee's standard practice is to trip the reactor between 5% and 10% power during a shutdown, and the power level would decrease logarithmically through the $10^{-4}\%$ setpoint and not hang up above the bistable reset value. The staff agrees with the licensee's conclusions and therefore, finds this change acceptable.

In addition to the above, the licensee proposed clarification to specify that the setpoints for the bistable are based upon output from the logarithmic power channels of the excore nuclear instrumentation. TSs 2.2.1 and 3.3.1 use the terms THERMAL POWER and RATED THERMAL POWER to specify the setpoints of the bistable. THERMAL POWER and RATED THERMAL POWER are defined in TSs 1.34 and 1.24 in terms of the total amount of heat transferred from the core to the reactor coolant system. This includes a contribution from decay heat produced by the core.

Contrary to these definitions, the logarithmic power channels that provide input into the bistable do not include contributions from decay heat. Decay heat contributions would prevent the actual thermal power of the core from reaching the level of the setpoints for the bistable for the duration of a normal shutdown. This contradicts the purpose of the High Local Power Density and Low Departure from Nucleate Boiling trips bypass capability in the bistable. The intent of the original wording is to describe the power level as indicated by the logarithmic power channel. The proposed revisions annotate the references to RATED THERMAL POWER and THERMAL POWER to clarify that the parameter of interest is the power level as indicated by the logarithmic power channel and does not include contribution from decay heat. This change is provided to eliminate any confusion regarding the impact of decay heat on these parameters.

The staff review of the proposed changes to the logarithmic power reactor trip tables notes found that the changes do not significantly affect the safety function of this instrumentation which is to trip the reactor on a rod withdrawal incident at low reactor power or subcritical conditions. It is also determined that the proposed changes will not affect the other functions of the bistable which is to enable the CPC reactor trip. In addition, the proposed clarifications regarding RATED THERMAL POWER and THERMAL POWER provide better definitions of the terms as applied in applicable tables. Therefore, the staff finds the proposed change to be acceptable.

3.0 EMERGENCY CIRCUMSTANCES

On September 11, 1998, a TS Change Request, NPF-38-210, was submitted to amend TS Table 2.2-1 and Table 3.3-1. At that time Waterford 3 was operating in Mode 1 and the proposed changes were not affecting the operation. The licensee concluded that criteria for exigency or emergency were not justified. However, the licensee indicated that if plant status were to change significantly, the emergency criteria would be applicable as this change would be required for plant startup. After the September 11, 1998 submittal, the plant conditions changed such that Waterford 3 was placed in Mode 4 on September 18, 1998. This forced outage was the result of unexpected leakage from a pressurizer safety relief valve. As degradation of this valve could not be anticipated, this was an unplanned outage. The approval of the proposed changes is required for plant restart from this forced outage. Based on this need and the criteria provided in 10 CFR 50.91a, by letter dated September 18, 1998, the licensee superseded the previous request and requested that the proposed request be processed on an emergency basis.

Waterford 3 is preparing to restart following the forced outage. Requiring literal compliance with the present TS will preclude resumption of power operations until the TS change request is approved. This would require several days to allow for the normal public notice period to expire. Accordingly, the Commission finds that an emergency situation exists pursuant to 10 CFR 50.91(a)(5) because failure to act timely would result in prevention of resumption of operation. The staff finds that the licensee did not create the emergency situation and acted promptly once it became aware of the need to act promptly.

Contrary to these definitions, the logarithmic power channels that provide input into the bistable do not include contributions from decay heat. Decay heat contributions would prevent the actual thermal power of the core from reaching the level of the setpoints for the bistable for the duration of a normal shutdown. This contradicts the purpose of the High Local Power Density and Low Departure from Nucleate Boiling trips bypass capability in the bistable. The intent of the original wording is to describe the power level as indicated by the logarithmic power channel. The proposed revisions annotate the references to RATED THERMAL POWER and THERMAL POWER to clarify that the parameter of interest is the power level as indicated by the logarithmic power channel and does not include contribution from decay heat. This change is provided to eliminate any confusion regarding the impact of decay heat on these parameters.

The staff review of the proposed changes to the logarithmic power reactor trip tables notes found that the changes do not significantly affect the safety function of this instrumentation which is to trip the reactor on a rod withdrawal incident at low reactor power or subcritical conditions. It is also determined that the proposed changes will not affect the other functions of the bistable which is to enable the CPC reactor trip. In addition, the proposed clarifications regarding RATED THERMAL POWER and THERMAL POWER provide better definitions of the terms as applied in applicable tables. Therefore, the staff finds the proposed change to be acceptable.

3.0 EMERGENCY CIRCUMSTANCES

On September 11, 1998, a TS Change Request, NPF-38-210, was submitted to amend TS Table 2.2-1 and Table 3.3-1. At that time Waterford 3 was operating in Mode 1 and the proposed changes were not affecting the operation. The licensee concluded that criteria for exigency or emergency were not justified. However, the licensee indicated that if plant status were to change significantly, the emergency criteria would be applicable as this change would be required for plant startup. After the September 11, 1998 submittal, the plant conditions changed such that Waterford 3 was placed in Mode 4 on September 18, 1998. This forced outage was the result of unexpected leakage from a pressurizer safety relief valve. As degradation of this valve could not be anticipated, this was an unplanned outage. The approval of the proposed changes is required for plant restart from this forced outage. Based on this need and the criteria provided in 10 CFR 50.91a, by letter dated September 18, 1998, the licensee superseded the previous request and requested that the proposed request be processed on an emergency basis.

Waterford 3 is preparing to restart following the forced outage. Requiring literal compliance with the present TS will preclude resumption of power operations until the TS change request is approved. This would require several days to allow for the normal public notice period to expire. Accordingly, the Commission finds that an emergency situation exists pursuant to 10 CFR 50.91(a)(5) because failure to act timely would result in prevention of resumption of operation. The staff finds that the licensee did not create the emergency situation and acted promptly once it became aware of the need to act promptly.

4.0 FINAL NO SIGNIFICANT HAZARD CONSIDERATION DETERMINATION

The Commission's regulations in 10 CFR 50.92 state that the Commission may make a final determination that a license amendment involves no significant hazards considerations, if operation of the facility, in accordance with the amendment would not:

- (1) Involve a significant increase in the probability or consequences of any accident previously evaluated; or
- (2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or
- (3) Involve a significant reduction in a margin or safety.

This amendment has been evaluated against the standards in 10 CFR 50.92. The NRC has made a final no significant hazards consideration regarding this amendment because of the following:

The proposed changes modify the table notations for the bistable in TS 2.2.1 and 3.3.1. The proposed changes to these trip bypass removal functions do not adversely impact any system, structure, or component design or operation in a manner that would result in a change in the frequency or occurrence of accident initiation. The reactor trip bypass removal functions are not accident initiators. System connections and the trip setpoints themselves are not affected by trip bypass removal setpoint variations. Since the deadband for the bistable is small, there is a negligible impact on the CEA withdrawal analyses. Revised analyses, accounting for slightly different bypass removal power levels caused by the bistable deadband, would result in negligible changes to the calculated peak power and heat flux for the pertinent CEA withdrawal events. Therefore, the consequences of any accident previously evaluated will not significantly change.

With respect to the clarification proposed for the THERMAL POWER input to the bypass capability of the affected reactor trips for the bistable, the proposed change does not alter the manner of operation of the operating bypasses and automatic bypass removals. This change corrects a discrepancy between the formal definition of this terminology and its use in the context of the applicable TSs.

Therefore, the proposed change will not involve a significant increase in the probability or consequences of any accident previously evaluated.

The trip bypass removal functions in question protect against possible reactivity events. The power, criticality levels, and possible bank withdrawals associated with these trip functions have already been evaluated. Therefore, all pertinent reactivity events have previously been considered. Slight differences in the power level at which the automatic trip bypass removal occurs will not cause a different kind of accident.

The proposed changes to Note "1" of Table 2.2-1 and Note "a" of Table 3.3-1 do not alter any plant system, structure, or component. Furthermore, these changes do not reduce the capability of any safety-related equipment to mitigate anticipated operational occurrences.

In addition, no new or different accidents result from clarifying the THERMAL POWER input to the operating bypasses and automatic bypass removals of the affected reactor trips. The results of previously performed accident analyses remain valid.

Therefore, the proposed change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

The safety function associated with the CPC and HLP trip functions are maintained. Since the deadband for the bistable is small, there is a negligible impact on the CEA withdrawal analyses. Calculated peak power and heat flux are not significantly changed as a result of the bistable deadband. All acceptance criteria are still met for these events.

Clarification of the THERMAL POWER input to the operating bypasses and automatic bypass removals of the bistable does not alter the operation of the operating bypasses and automatic bypass removals of the affected reactor trips. This change corrects a discrepancy between the formal definition of this terminology and its use in the context of the applicable TSs.

Therefore, the proposed change will not involve a significant reduction in a margin of safety.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Louisiana State official was notified of the proposed issuance of the amendment. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has made a final no significant hazards consideration finding with respect to this amendment. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the

Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: I. Ahmed
L. Kopp
C. Patel

Date: September 24, 1998