



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 119 AND 107 TO

FACILITY OPERATING LICENSE NOS. NPF-76 AND NPF-80

STP NUCLEAR OPERATING COMPANY, ET AL.

SOUTH TEXAS PROJECT, UNITS 1 AND 2

DOCKET NOS. 50-498 AND 50-499

1.0 INTRODUCTION

By application dated July 28, 1998, as supplemented by letters dated May 31 and October 21 (2 letters), 1999, STP Nuclear Operating Company (STPNOC, the licensee) requested changes to the licenses for South Texas Project, Units 1 and 2 (STP), to authorize changes to the Updated Final Safety Analysis Report (UFSAR). The proposed changes would allow the use of operator action to reduce the steam generator (SG) power-operated relief valve (PORV) setpoint consistent with the revised small-break loss-of-coolant accident (SBLOCA) analysis for the replacement Delta 94 SGs.

The May 31 and October 21 (2 letters), 1999, supplements provided additional clarifying information. One of the October 21, 1999, supplements also provided a revised UFSAR page. This information was within the scope of the original application and *Federal Register* notice and did not change the staff's initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

STPNOC intends to replace the original Westinghouse Model E SGs in STP with Westinghouse Delta 94 SGs. Unit 1 SGs are scheduled to be replaced at the end of Cycle 9, currently planned for spring 2000. Unit 2 SGs are scheduled for replacement at the end of Cycle 9, 2002.

Design and performance differences between the Delta 94 and Model E SGs have required the licensee to perform a reanalysis of the SBLOCA analysis using the NOTRUMP SBLOCA evaluation model. The reanalysis credits operator action to reduce the setpoints of the safety-grade SG PORVs at least to 1000 psig to provide a more rapid cooldown of the primary system by depressurizing the secondary system. Operator action must be completed within 45 minutes of accident initiation to satisfy 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors." STPNOC proposes to amend the STP Operating Licenses, Nos. NPF-76 and NPF-80, to address this operator action that will be used in the event of an SBLOCA. The licensee has identified (page 2 of 4 in its letter dated July 28, 1998) that crediting operator action constitutes an unreviewed safety question

(USQ), in accordance with 10 CFR 50.59, "Changes, Test, and Experiments," and submitted, as part of its license amendment request, a safety evaluation that addresses the method of analysis, design basis, and results; and an assessment of the issues raised in NRC Information Notice (IN) 97-78, "Crediting of Operator Actions in Place of Automatic Actions and Modifications of Operator Actions, Including Response Times."

### 3.0 EVALUATION

#### 3.1 IN 97-78

##### 3.1.1 Scope

The staff used the following guidance relevant to manual operator actions and response times to complete its evaluation of the licensee's submittal: 10 CFR 50.59 and IN 97-78. The staff's review focused on the use of operator actions as described in the licensee's July 28, 1998, submittal, particularly Attachment 2, Section 3.3.2, "Operator Action Assumptions," and Attachment 3, "IN 97-78 Assessment," and its May 31, 1999, response to the staff's questions.

##### 3.1.2 Findings

As previously mentioned, the licensee, in its July 28, 1998, letter indicated that "modeling of this proposed operator action in the small break LOCA analysis is deemed an unreviewed safety question in accordance with 10 CFR 50.59." From its review of the licensee's submittal, the staff also determined that a USQ exists because there is the possibility for an accident or malfunction of a different type than any previously evaluated in the safety analysis report. Specifically, crediting operator action may create a failure mode of a different type than the types previously evaluated. Therefore, the failure results from a malfunction of a different type, though the accident may be the same and, hence, a USQ exists. Relying on operator action for satisfactory equipment performance (i.e., operator action to reduce safety-related SG PORV setpoints) where previously the equipment performed independent of operator intervention constitutes a different failure mode (i.e., operator errors of commission or omission are possible).

The staff determined that the licensee addressed the nine criteria contained in IN 97-78 as follows (the nine criteria are identified in italics):

- (1) *the specific operator actions required* -- Attachment 3 of the licensee's July 28, 1998, submittal identifies that the operator action being credited in the SBLOCA re-analysis and proposed license amendment is, "to lower the SG PORV setpoints within 45 minutes after accident initiation."

In response to the staff's April 16, 1999, request for additional information, the licensee provided further explanation of the specific operator actions required to lower the SG PORV setpoints within 45 minutes of accident initiation. In a May 31, 1999, submittal, the licensee provided a copy of its draft emergency operating procedure (EOP) titled, "Loss of Reactor or Secondary Coolant," which includes steps the operator is required to take for lowering the SG PORV setpoints. The licensee further provided excerpts from training materials used in initial licensed operator training that describe the process control function of the SG PORV together with a graphical representation of the SG

PORV control in the main control room and in the auxiliary shutdown panel. A description of how operators use the SG PORV control and the associated Qualified Display Processing System (QDPS) data screen information when adjusting SG PORV setpoints was also provided, as well as graphics of the control room depicting the relative location and association of control room personnel and necessary instrumentation (i.e., SG PORV control and QDPS display) during an SBLOCA.

Based on the licensee's submittals, the staff finds this response acceptable and this criterion satisfied.

- (2) *the potentially harsh or inhospitable environmental conditions --* Attachment 3 of the licensee's July 28, 1998, submittal identifies that the operator action being credited in the SBLOCA reanalysis and proposed license amendment is completed from the control room and hence, in accordance with 10 CFR Part 50, Appendix A, General Design Criterion 19, the control room permits safe occupancy.

The staff finds this response acceptable and this criterion satisfied.

- (3) *a general discussion of the ingress/egress paths taken by the operators to accomplish their functions --* Attachment 3 of the licensee's July 28, 1998, submittal identifies that the operator action being credited in the SBLOCA reanalysis and proposed license amendment is completed from the control room and, therefore, ingress/egress paths are not of concern.

The staff finds this response acceptable and this criterion satisfied.

- (4) *the procedural guidance for required actions --* Attachment 3 of the licensee's July 28, 1998, submittal identifies that the "operator action to lower the safety-grade SG PORV setpoints will be added to the STP Emergency Operating Procedures."

See response to Item (1). Based on the licensee's submittals, the staff finds this response acceptable and this criterion satisfied.

- (5) *the specific operator training necessary to carry out actions, including any operator qualifications required to carry out actions --* Attachment 3 of the licensee's July 28, 1998, submittal identifies that "Operator training on the purpose and required sequence will be conducted prior to steam generator replacement. The training will consist of classroom training for all licensed operators followed by simulator training using a small break LOCA scenario. All requalification crews will receive this training, and completion of the operator action within the required time will be evaluated as a critical task. If any crew fails to perform the task within the required time, it will be a basis for crew failure. The training will also become a part of the initial license operator training."

The staff finds this response acceptable and this criterion satisfied.

- (6) *any additional support personnel and/or equipment required by the operator to carry out actions* -- Attachment 3 of the licensee's July 28, 1998, submittal identifies that, "No additional support personnel and/or equipment is required by the operators to perform this action."

The staff finds this response acceptable and this criterion satisfied.

- (7) *a description of information required by the control room staff to determine whether such operator action is required, including qualified instrumentation used to diagnose the situation and to verify that the required action has successfully been taken* -- Attachment 3 of the licensee's July 28, 1998, submittal identifies that the current STP EOPs have an operator action for addressing an SG tube rupture that is "similar to" the operator action for the SBLOCA being addressed by the proposed license amendment. "The same indications to verify the operator action was taken successfully would be used in either accident, which is steam line pressure. These indications conform to RG [Regulatory Guide] 1.97 ["Instrumentation for Light-Water-Cooled Nuclear Power Plants To Assess Plant and Environs Conditions During and Following an Accident"] as described in the STP UFSAR, Table 7.5-1."

The staff finds this response acceptable and this criterion satisfied.

- (8) *the ability to recover from credible errors in performance of manual actions, and the expected time required to make such a recovery* -- Attachment 3 of the licensee's July 28, 1998, submittal identifies that, "operators at STP are highly trained and proficient in their duties... Recent simulator exercises have demonstrated the ability of the STP operators to complete the required operator actions as written in the EOPs and to diagnose system responses." The licensee continues by stating that "The proposed operator action is required to be completed at or prior to 45 minutes after the accident. Consequently, STPNOC believes that sufficient time is available for operators to complete the required actions,..."

In response to the staff's April 16, 1999, request for additional information, the licensee provided further explanation of the simulator exercises used to demonstrate the operators' ability to complete the required actions within the time limits. In a May 31, 1999, submittal, the licensee provided copies of two licensed operator requalification examination scenarios related to manual SG PORV setpoint control. The licensee indicated that for the year's annual simulator exams, all operators were distributed among 10 operating crews and 7 staff crews. Nine of the seventeen crews were evaluated using a scenario containing the manual action to increase the PORV setpoint (a manual action similar to the required action being assessed in this review) and there were no failures.

In its May 31, 1999, submittal, the licensee addresses the question of the occurrence of credible operator errors by stating that the operators' ability to use EOPs, which includes the specific EOP requiring the manual action of reducing the SG PORV setpoints, is

evaluated annually and thus, the likelihood of operators failing to take the required action is considered as small. However, the licensee does assess the failure of the operator to take the required action, with the failure going unnoticed, as a condition that would eventually cause the loss of sufficient coolant inventory. The inventory loss would result in a core exit thermocouple reaching 708 degrees F which would in turn cause the QDPS "C" display to turn yellow. This indication will require entry into an EOP, "Response to Inadequate Core Cooling," which will result in depressurization of all SGs by manually opening SG PORVs.

Based on the licensee's submittals, the staff finds this response acceptable and this criterion satisfied.

- (9) *consideration of the risk significance of the proposed operator actions --* Attachment 3 of the licensee's submittal identifies that STPNOC submitted a Level 2 Probabilistic Risk Assessment (PRA) and Individual Plant Examination (IPE) on August 28, 1992. The licensee stated that the PRA "models the operator action to depressurize the RCS [reactor coolant system] for a small break LOCA, including depressurizing the secondary side using the SG PORVs if the steam dumps are not available...The frequency of failure is based on sequence specific operator interviews and is  $4.4 \times 10^{-2}$  on demand. Since the operator action is currently modeled, the risk to core damage is unchanged."

In its April 16, 1999, request for additional information, the staff requested further information that describes the modeling of operator actions, specifically, is the model that was used in the 1992 examination still applicable (i.e., does it exist now?); is the operator action required in the licensee's amendment request modeled in the 1992 PRA or IPE; and, does the PRA model both operator success and failure in the performance of the required action and, what are the results from modeling the success and failure of the operator actions?

In its May 31, 1999, submittal, the licensee indicated that the model currently exists. The operator action required in the licensee's amendment request was not modeled in the 1992 PRA or IPE. However, the licensee states that the current PRA model is for an operator action in the SG tube rupture event tree to depressurize the RCS using SG PORVs if the steam dumps are not available, and action that is "sufficiently similar to serve as the basis for general conclusions regarding the proposed operator action." The licensee further indicates that the PRA analyzed both the success and failure of the required action and that the failure frequency, based on operator interviews, is  $4.4 \times 10^{-2}$  on demand. The interviews were conducted several years ago, according to the licensee, "prior to the intense training level now considered standard for the industry. An update is planned, and it is expected that the operator confidence will be significantly higher. Thus,  $4.4 \times 10^{-2}$  is quite conservative."

An independent evaluation performed by the staff confirmed that the operator action to change SG PORV setpoints is an action that is easily accomplished from the control room. Using a comparative probabilistic safety assessment from the Surry plant, the staff concluded that the STPNOC human error probability of 0.044 for failure to

depressurize in 45 minutes using the SG PORVs (if the steam dumps are not available) following an SBLOCA appears reasonable.

Based on the licensee's submittals and the staff's confirmatory review of the licensee's risk modeling, the staff finds this response acceptable and this criterion satisfied.

### 3.1.3 Summary

Based on the staff's evaluation of the licensee's July 28, 1998, and May 31, 1999, submittals, the staff concludes that the licensee has provided sufficient information to demonstrate that the proposed operator action to reduce the setpoints of the safety-grade SG PORVs to at least 1000 psig to provide a more rapid cooldown of the primary side by depressurizing the secondary side, within 45 minutes of an SBLOCA using Westinghouse Model Delta 94 SGs, is acceptable.

## 3.2 SG PORV Features, Credit in SBLOCA Analyses, and SBLOCA Analyses

### 3.2.1 SG PORV Features

In previous submittals, the licensee provided information describing the SG PORVs and their operation. The licensee identified that the SG PORVs, their construction, motive power, and controls are all safety-grade. Each SG PORV has a self-contained motive operator with its own reservoir of fluid, such that the valve can be cycled indefinitely without exhausting the motive fluid supply. Electrical devices associated with the SG PORV motive power and controls are supplied with Class 1E power. The SG PORVs open and close at pressure setpoints programmed into their controllers from the control room. The valves can be opened or closed from the control room. In its previous review (License Amendments Nos. 114 and 102, and related safety evaluation, issued August 19, 1999), the staff concluded that the SG PORVs and their functional controls, both manual and automatic, are safety-grade.

### 3.2.2 Credit in SBLOCA Analyses

Westinghouse-generically approved SBLOCA analysis methodologies may be used in conjunction with input parameter values appropriate to STP to form acceptable STP-specific SBLOCA models. In its October 21, 1999, letter, the licensee stated that it would select values for input values for peak cladding temperature-sensitive parameters which would bound the as-operated plant values for those parameters. Based on this, the staff concludes that the STP plant-specific models are acceptable. However, the assumption of manual action to operate the SG PORVs in SBLOCA analyses has not been previously approved.

In the previous safety evaluation, the staff found that the licensee may acceptably assume the performance of the valves in STP SBLOCA licensing analyses for Modes 1 and 2. This is based on the safety-grade design of the STP SG PORVs, as governed by the STP Technical Specifications (TSs) and their Bases, and the stated consistency of the valves and their controls with the uncertainties assumed in the STP licensing safety analyses.

In its submittal, the licensee proposed to assume manual action to operate the valves in STP SBLOCA analyses. While the previous staff review found that the valve hardware was acceptable for this purpose, the present review considers the operator actions and their

timeliness. The staff position for this event is that an assumption of operator action is permitted for actions that are initiated 10-minutes after the receipt of an alarm from a safety-grade system, in this case the reactor protection system on reactor trip. The completion time input into the analysis must bound the actual as-tested completion time. The information that the staff reviewed showed that more than 10 minutes, after the alarm, was taken to initiate the manual actions; therefore the "10-minute minimum" limit does not apply. A value bounding the as-tested time may be used instead. As discussed above in Section 3.1, the licensee demonstrated that the operator could complete the necessary actions within 45 minutes of event initiation, as assumed in the present analysis. Therefore, the operator action time is acceptable for that analysis.

To justify that the analysis operator times assumed in the analysis and to provide criteria for future operator action time assumptions using the same SBLOCA model, the licensee provided a breakdown of the operator times it had demonstrated in SBLOCA simulations. The time it took to initiate operator action, after the alarm, was greater than the 10-minute criterion, but it was justified based on the information from the simulator exercises discussed in Section 3.1. The operator action time from initiation to completion was also justified based on information from the exercises discussed in Section 3.1. The sum of the times from event initiation to alarm, from alarm to initial operator action (analyses must assume at least 10 minutes), and from initiation of operator actions to their completion in the tests is less than the time assumed in the analyses. Therefore, the time assumed in the analysis is acceptable. For future analyses, the licensee may use the same times for operator action from alarm to completion, as justified by the licensee's simulator tests. The total time from alarm to completion of manual operation of the valves assumed in future reanalyses may be reduced provided that (a) the operator action times (initiation and completion times) assumed in the analyses remain greater than those demonstrated in the tests, and (b) no EOPs or other plant changes take place, such that the timing of operator actions discussed above are affected. Our review and approval is limited to analyses in which these two provisions apply. Analyses for which the two provisions do not apply are outside the scope of this review.

### 3.2.3 SBLOCA Analyses

Submittals by the licensee have included SBLOCA analyses discussions and results. The staff referred to SBLOCA analyses discussions and results in evaluating the timeliness of operator actions because case-specific event times, such as alarm time, will vary between SBLOCA event analyses. These case-specific times affect the time available for needed operator actions. The staff concluded that operator action times input to future SBLOCA analyses may be treated within the allowance of the reanalysis process, applying the criteria discussed above in Section 3.2.2.

### 3.2.4 Summary

Based on the safety-grade design of the STP SG PORVs, as governed by the STP TSs and their Bases, and the stated consistency of the valves and their controls with the uncertainties assumed in the STP licensing safety analyses, the staff finds that the licensee may acceptably credit the performance of the valves in STP SBLOCA licensing analyses. For future SBLOCA analyses, the timing of manual operation of the SG PORVs input to the analyses may be determined as discussed in Section 3.2.2 without staff review, subject to limitations discussed in Section 3.2.2.

The staff finds that the UFSAR change dated July 28, 1998, as supplemented by letters dated May 31 and October 21, 1999, describing the SBLOCA scenario, methods, assumptions, and analyses, which include the operator actions discussed above are acceptable. The staff finds that the actions to manually operate the SG PORVs assumed in the SBLOCA analyses are acceptable because they bound the times allowed by regulation and the times demonstrated in the simulator exercises discussed in Section 3.1.

#### 4.0 STATE CONSULTATION

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

#### 5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve 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 previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (63 FR 48268). Accordingly, the amendments meet 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 amendments.

#### 6.0 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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: J. Bongarra  
D. O'Neal  
F. Orr

Date: December 14, 1999