

**The Light  
company**

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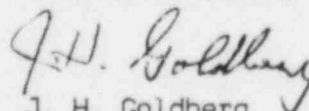
South Texas Project  
Units 1 & 2  
Docket Nos. STN 50-498, STN 50-499 *EL*  
Final Report Concerning  
Auxiliary Feedwater Requirements

Dear Mr. Martin:

On February 7, 1986 Houston Lighting & Power (HL&P) notified your office, pursuant to 10CFR50.55(e), of an item regarding auxiliary feedwater requirements during transient conditions. This item, which was originally described as an error in the initial amount of feedwater in the steam generators utilized in calculations, has been determined to be not reportable. Enclosed is our final report.

If you should have any questions on this matter, please contact Mr. M. E. Powell at (713) 993-1328.

Very truly yours,



J. H. Goldberg  
Group Vice President, Nuclear

JSP/yd

Attachment: Final Report Concerning Auxiliary Feedwater  
Requirements

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South Texas Project  
Units 1 & 2  
Docket Nos. STN 50-498, STN 50-499  
Final Report Concerning  
Auxiliary Feedwater Requirements

I. Summary

On February 7, 1986 Houston Lighting & Power (HL&P) notified your office, pursuant to 10CFR50.55(e), of an item regarding auxiliary feedwater (AFW) system requirements during the Loss of Main Feedwater (LMFW), the Loss of Offsite Power (LOOP) and the Feedwater Line Break (FWLB) events. (This item was originally described as an error in the initial amount of feedwater in the steam generators utilized in calculations.) Recent startup data from other plants indicates that actual natural circulation flow rates and STP-specific reactor coolant pump coastdowns are both less than predicted for design purposes. Subsequent analyses have confirmed the adequacy of the existing AFW design to mitigate the events noted above. Standard Review Plan (SRP) criteria are met by the current design.

II. Description of Condition

Based on previous W analysis performed in 1985 (prior to LOFTRAN revisions as described below), HL&P submitted, in letter form, a revision to the FSAR which stated that one AFW pump feeding one SG was sufficient to mitigate the consequences of a LMFW event. (For STP, the LMFW event with subsequent reactor trip which is described in FSAR section 15.2.7 is considered to be more limiting than the LOOP event in section 15.2.6.) This submittal further stated that the assumption of one AFW pump feeding one SG was more severe than the normal single failure required for the analysis. Subsequent to this submittal, HL&P was informed by W that using the revised computer model, one AFW pump feeding one SG was not sufficient without early operator action.

The STP specific modeling input assumptions to the LOFTRAN computer program have been reviewed and verified. Plant specific as-built reactor coolant pump coastdown data and refinements to the natural circulation modeling were included based on recent test results of another Westinghouse PWR. In addition, for the loss of normal feedwater event, the initial mass of feedwater in the steam generator assumed in the FSAR analysis was revised to reflect a more conservative value than that assumed for previous analyses.

Results of further analysis performed by W which utilized appropriate assumptions and safety criteria have been reviewed by HL&P and Bechtel.

The results indicate that STP Chapter 15 analysis meet the SRP Criteria for the following events:

- o For the LMFV case, the use of two AFW pumps feeding two SGs is sufficient to mitigate the consequences of the transient with no operator action required. The limiting single failure is "Train A actuation" which disables one of the three motor drive AFW pumps as well as the turbine driven AFW pump.
- o For the LOOP case, the use of two AFW pumps feeding two SGs is sufficient to mitigate the consequences of the transient with no operator action required. The limiting single failure is "Train A actuation" which disables one of the three motor drive AFW pumps as well as the turbine driven AFW pump.
- o For the FWLB case it was assumed that only one AFW pump to one SG is available. In this situation the operator has greater than 30 minutes to take actions to remove heat from the plant. The limiting single failure is "Train A actuation".

The diversity requirements of SRP Branch Technical Position ASB 10-1 are also met for these events as follows:

- o For the LMFV case, one AFW pump feeding one SG with operator action within 20 minutes is sufficient to mitigate the consequences of the transient.
- o For the LOOP case, one AFW pump feeding one SG with operator action within 2 hours is sufficient to mitigate the consequences of the transient.
- o For the FWLB case, one AFW pump feeding one SG with operator action (greater than 30 minutes is available for operator action) is sufficient to mitigate the consequences of the event.

The attached table shows the licensing basis and requirements regarding the AFW system for each analysis.

### III. Corrective Action

As stated in Part II above, W has completed a review of analysis assumptions, safety criteria and STP plant-specific design information and has performed additional analyses. Results demonstrate that the current STP AFW system design is adequate to mitigate the consequences of the LMFV, LOOP and FWLB events. No hardware modifications are required to meet SRP criteria. The attached table shows the licensing bases and requirements for the AFW system pursuant to the SRP. This table reflects the use of appropriate analysis assumptions and safety criteria.

Although the current STP FSAR (Amendment 52) indicates that two AFW pumps feeding two SGs are assumed for the LMFV event, HL&P submitted a letter to the NRC (ST-HL-AE-1460 dated October 24, 1985) which revised the assumption to one AFW pump to one SG. The FSAR will be updated with appropriate AFW system requirements and will address transient analysis as well as the AFW system reliability study.

The STP Emergency Operating Procedures (EOPs) will be based on the W Owners Group generic Emergency Response Guidelines (ERGs) which already contain the necessary operator actions called for in addressing the above events.

#### IV. Recurrence Control

The differences in the previous analyses and the existing analysis were created by introducing updated information. Incorporation of actual RCP coastdown data and benchmarked natural circulation flow resulted from the normal design and verification process for transient analyses. Operating plant information that can impact FSAR analyses is routinely evaluated.

Since the revisions in assumptions are a result of the normal design and verification process, no recurrence control is considered to be necessary.

#### V. Safety Analysis

No hardware modifications are required as a result of the revised assumptions, however, some areas of the FSAR will require updates. This review involves essentially three areas: FSAR Chapter 15 analyses (15.2.6, 15.2.7 and 15.2.8), FSAR Appendix 10A (AFW Reliability Study submitted in letter ST-HL-AE-1413 dated October 21, 1985) and conformance to NUREG-0800 (Section 10.4.9 and BTP ASB 10-1). Also, the response to NRC question 410.18 will be revised. A summary of each area is provided below.

##### A. FSAR Chapter 15 Analysis

For FSAR Chapter 15 Analyses, the affected bases are as follows:

- Auxiliary Feedwater Configuration (condition II events): 2 AFW Pumps to 2 Steam Generators (single active failure - Train A AFW actuation logic)
- ANS 1979 Decay Heat
- As-built RCP Coastdown Modeling (Including Natural Circulation Model Upgrade)
- LOFTRAN Computer Code



The analysis for section 15.2.6 (LOOP case) is bounded by section 15.2.7 analysis (LMFW). For both cases, STP conforms to SRP criteria.

Section 15.2.8 (FWLB) analysis shows that all licensing criteria are met with more than 30 minutes available for operator action to open the atmospheric dump valve (safety-related valve at STP that is operable from the control room) on the one SG receiving AFW flow from one pump. The pressurizer does not fill during the transient. All licensing criteria are satisfied with FSAR assumptions/bases without changes to technical specifications, methodology, or plant hardware. Operator action is consistent with Westinghouse Owners Group generic ERGs.

B. NUREG-0800 (10.4.9, BTP 10-1)

The requirements of BTP 10-1 are summarized by the following:

- o Two full-capacity independent systems with diverse power sources
- o AFW system must be designed with suitable redundancy to offset the consequences of a single active component failure

As stated earlier, section 15.2.7 analysis bounds the section 15.2.6 transient. Results of the conservative FSAR analysis demonstrate that one AFW pump to one SG is sufficient to mitigate the transient's consequences assuming operator action is taken within 20 minutes to open the SG atmospheric dump valve in the SG receiving AFW flow. Pressurizer overfill does not occur and all licensing criteria are met.

As discussed earlier in Part A of this section, one AFW pump feeding one SG is sufficient in the event of a FWLB assuming operator action is taken to open the SG atmospheric dump valve. Greater than thirty minutes is available for operator action.

For all events affected by the revised analysis, system diversity is shown.

C. AFW Reliability Study

FSAR Appendix 10A will contain the STP Auxiliary Feedwater Reliability Evaluation. The FSAR Chapter 15 initiating events (LMFW, LOOP) are analyzed to assess the auxiliary feedwater system's reliability. The analysis methodology, results and conclusions reported in the current analysis have been reviewed with respect to the assumptions discussed previously. This review indicates that all previous results remain conservative and that the conclusions remain valid. The analysis is being updated and will be submitted with the Chapter 15 revisions.

The incorporation of the actual RCP coastdown model (with natural circulation model upgrade) is considered to be part of the normal design and verification process. W systematically reviews operating plant information which can affect existing analyses. Therefore, this item is considered not reportable pursuant to 10CFR50.55(e).

Auxiliary Feedwater Licensing Basis

<u>EVENT</u>	<u>CHAPTER 15 ANALYSIS</u>	<u>DIVERSITY BTP 10-1</u>	<u>RELIABILITY STUDY</u>
1. Loss of Main Feedwater	Single failure "A" Actuation - 2 AFW pumps feed to 2 Steam Generators	1-Pump feeds to 1 Steam Generator, Operator action less than 20 minutes	1-Pump feeds to 1 Steam Generator
2. Loss of Offsite Power	Single failure "A" Actuation - 2 AFW pumps feed to 2 Generators	1-Pump feeds to 1 Steam Generator, Operator action greater than 30 minutes	1-Pump feeds to 1 Steam Generator
3. Main Feedwater line break	Single failure "A" Actuation. 1-Pump feeds 1 Steam Generator. Operator action greater than 30 minutes	1-Pump feeds to 1 Steam Generator. Operator action greater than 30 minutes	N/A