4.10 AUXILIARY FEEDWATER SYSTEM

Applicability: Applies to periodic testing requirements of the auxiliary feedwater system.

Objective: To verify the operability of the auxiliary feedwater system and its ability to respond properly when required.

Specifications:

1. Each turbine-driven auxiliary feedwater pump shall be started at intervals not greater than one month, run for 15 minutes and a flow rate of 373* gpm established to the steam generators. The monthly frequency is not intended to require the test while at cold shutdown. The testing requirement is met by performing this test during startup subsequent to cold shtudown.

2. The auxiliary feedwater discharge valves shall be tested by operator action during pump tests.

3. Steam supply and turbine pressure valves shall be tested during pump tests.

4. These tests shall be considered satisfactory if control panel indication and visual observation of the equipment demonstrate that all components have operated properly.

5. At least once per 18 months:

   a. Verify that each automatic valve in the flow path actuates to its correct position upon receipt of each auxiliary feedwater actuation test signal.

   b. Verify that each auxiliary feedwater pump receives a start signal as designed automatically upon receipt of each axuliary feedwater actuation test signal.

N.A. during cold or refueling shutdowns (only for the Unit at cold or refueling shutdown). The specified tests, however shall be performed within one surveillance interval prior to starting the turbine.

*600 gpm flow rate remains applicable to Turkey Point Unit 4 until steam generator replacement.

B3.8 BASES FOR LIMITING CONDITIONS FOR OPERATION, STEAM AND POWER CONVERSION SYSTEMS

In the unlikely event of complete loss of electrical power to the nuclear units, decay heat removal will be assured by the availability of the steam-driven auxiliary feedwater pumps and steam discharge to the atmosphere via the steam generator safety valves and power relief valves.(1) The operability of the auxiliary feedwater system ensures that the Reactor Coolant System can be cooled down to less than 350°F from normal operating conditions in the event of a total loss of offsite power. Each steam driven auxiliary feedwater pump is capable of delivering a total feedwater flow of 373* gpm to the entrance of the steam generators. This capacity is sufficient to ensure that adequate feedwater flow is available to remove decay heat and reduce the Reactor Coolant System temperature to less than 350°F when the Residual Heat Removal System may be placed into operation. The minimum amount of water in the condensate storage tanks is established from FSAR Figure 9.11-1, and meets safe shutdown requirements. (2)

The limit on secondary coolant iodine-131 specific activity is based on a postulated release of secondary coolant equivalent to the contents of three steam generators to the atmosphere due to a net load rejection. The limiting dose for this case would result from radioactive iodine in the secondary coolant. I-131 is the dominant isotope because of its low MPC in air and because the other shorter lived iodine isotopes cannot build up to significant concentrations in the secondary coolant under the limits of primary system leak rate and activity. One tenth of the iodine in the secondary coolant is assumed to reach the site boundary making allowance for plate-out and retention in water droplets. The inhalation thyroid dose at the site boundary is then;

$$\text{Dose (Rem)} = C \cdot V \cdot B \cdot DCF \cdot X/Q \cdot 0.1$$

Where:
- C = secondary coolant I-131 specific activity
  = 1.34 curies/m^3 (uCi/cc) or 0.67 Ci/m^3, each unit
- V = equivalent secondary coolant volume released = 214 m^3
- B = breathing rate = 3.47×10^{-4} m^3 sec.
- X/Q = atmospheric dispersion parameter = 1.54×10^{-4} sec/m^3
- 0.1 = equivalent fraction of activity released
- DCF = dose conversion factor, Rem/ci

The resultant thyroid dose is less than 1.5 Rem.

References

(1) FSAR - Section 10.3
(2) FSAR - Section 14.2.5

*600 gpm flow rate remains applicable to Turkey Point Unit 4 until steam generator replacement.

SAFETY EVALUATION

Re: Turkey Point Units 3 & 4
Docket Nos. 50-250 and 50-251
Proposed Technical Specification Change
Auxiliary Feedwater Flow Requirements

Ref: (a) Westinghouse letter G.J. Murray to C.O. Woody, June 3, 1982 (attached)

(b) Westinghouse letter G.J. Murray to C.O. Woody, July 15, 1982 (attached)

I. Introduction

This evaluation supports a Technical Specification change for Turkey Point Units 3 and 4 to reduce the auxiliary feedwater flow requirements from 600 gpm in 3 minutes to 373 gpm in 3 minutes. The proposed change to Technical Specification 4.10.1 and B 3.8 is to comply with recommendations made by Westinghouse (Ref. A) as described in the following evaluation.

II. Evaluation

Westinghouse Electric Corp. was requested to perform analyses to establish the minimum required auxiliary feedwater flow.

Westinghouse has completed the analyses and provided results via referenced (a). Reference (b) indicates that the analysis is also applicable for a power level of 2300 MWT. These results indicate that the minimum required auxiliary feedwater flow to the steam generators is 373 gpm (based on 3 minute delay for initiation flow). Our Power Plant Engineering Department's evaluation of the Westinghouse analyses follows:

1. The transient analyzed is loss of main feedwater. It was previously established that this transient was the limiting event for sizing of the auxiliary feedwater pumps at Turkey Point. This is also consistent with FSAR Section 14.1.11.

2. The acceptance criteria is to preclude filling of the pressurizer. This is identical to previous work and FSAR Section 14.1.11.

3. Initial power level was 2307.4 MWT plus an additional calorimetric error. Previous analyses (FSAR 14.1.11) were performed with an initial power level of 102% of 2300 MWT. This indicates that the minimum required auxiliary feedwater flow of 373 gpm is based on conservative power assumptions.

4. The computer code used was LOFTRAN. This code is of recent vintage and has been accepted by NRC in connection with transient analysis performed by Westinghouse.

5. The analyses are applicable to a plant configuration using model 44 F steam generators.

It is our conclusion that the work performed by Westinghouse can be used in support of an operating license amendment for Turkey Point Units 3 and 4 to reduce the auxiliary feedwater flow requirements from 600 gpm in 3 minutes to 373 gpm in 3 minutes."

III. Conclusion

We have concluded, based on the referenced Westinghouse Analyses and our Power Plant Engineering Department's evaluation as discussed above, that: (1) because this Technical Specification change does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the change does not involve a significant hazard consideration; (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in this proposed manner; and (3) such activities will be conducted in compliance with the Commision's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

ATT. (a)

W-PIP-62

AEA-TPN-336

Westinghouse Electric Corporation
Water Reactor Divisions

Nuclear Commercial Operations Division
Box 355
Pittsburgh Pennsylvania 15230

Mr. C. O. Woody, Manager
Power Resources, Nuclear
Florida Power and Light Company
P.O. Box 529100
Miami, FL 33152

June 3, 1982

Ref: JPT-82-048
P.O. 93000-85525
DWA 93421
GO MI-28460, CN 003

Dear Mr. Woody:

FLORIDA POWER AND LIGHT COMPANY
TURKEY POINT UNITS 3 AND 4
Auxiliary Feedwater Flow Requirements

The attached Auxiliary Feedwater Analysis is provided in fulfillment of the requirements of the referenced order. Specifically, the Analysis addresses:

1. Minimum required auxiliary feedwater flow as a function of a 1 to 3 minute delay in startup for a loss of main feedwater event.

2. Minimum required auxiliary feedwater flow for a 3-minute delay in start-up under station blackout conditions.

The analyses are plant specific, applicable to Turkey Point Unit 3 and will also be applicable to Turkey Point Unit 4 after replacement of the steam generators. These analyses were performed according to accepted Westinghouse Quality Assurance procedures.

Thank you for the opportunity to provide this engineering service. Should you have any questions or require any clarification on this transmittal, please contact the Westinghouse Project Office.

Very truly yours,

WESTINGHOUSE ELECTRIC CORPORATION

G. J. Murray, Project Engineer
Florida Power & Light Project

GJM:rst
Attachment

cc: C. O. Woody, 3L, 3A
H. N. Paduano, 1L, 1A
R. J. Acosta, 1L, 1A
H. E. Yaeger, 1L, 1A
R. L. Whitney, 1L, 1A
E. V. Rutledge, 1L

AUXILIARY FEEDWATER FLOW REQUIREMENTS

FLORIDA POWER & LIGHT TURKEY POINT UNITS 3 AND 4

The requirements for auxiliary feedwater flow, which had been previously set when the original FSAR analyses were done, have been re-evaluated using up-to-date analytical methodology in an attempt to reduce those requirements. The licensing basis for the Turkey point Units requires that auxiliary feedwater flow requirements for long-term heat removal be determined by evaluating the loss of main feedwater transient to preclude pressurizer fill up. In support of this evaluation, Westinghouse was asked to determine the minimum required auxiliary feedwater flow to all three steam generators as a function of a start-up delay between 1 and 3 minutes for a loss of main feedwater event (more limiting than a station blackout due to the addition of pump heat). Additionally, a request was made for the minimum required auxiliary feedwater flow for a startup delay of 3 minutes for a station blackout event for informative purposes.

A loss of main feedwater/station blackout is initiated by a loss of feedwater flow to all steam generators. The level in the steam generator drops since the turbine still draws off steam and within one minute the level will have dropped to the lo-lo steam generator reactor trip setpoint which will initiate a reactor trip and an auxiliary feedwater system actuation signal. Because of the generation of decay heat and the turbine trip which follows a reactor trip, the secondary temperature increases until the steam generator safety valves are opened to become the heat sink for the plant. Primary temperature and pressurizer level will increase until the point at which core decay heat and/or reactor coolant pump heat decreases to the auxiliary feedwater system heat removal capacity. The difference between the loss of main feedwater and station blackout transients is the addition of reactor coolant pump heat for the loss of main feedwater mandating higher minimum required auxiliary feedwater flow rates.

Plant specific loss of main feedwater/station blackout analyses were performed assuming the current plant configuration of 2208 MWT with model 44F SG's. The assumptions used in these analyses are consistent with those used in current safety analysis methodology, including the use of the LOFTRAN computer code. Table 1 is a detailed time sequence of the transient events for the cases analyzed. Figures 1 and 2 are plots of the transient parameters of pressurizer pressure, pressurizer water volume, primary side temperature, and steam generator pressure for case 1 in Table 1. All cases in Table 1 meet the applicable criteria of precluding pressurizer fill up and having adequate long-term heat removal for the given auxiliary feedwater flow. Figure 3 is the recommended minimum required auxiliary feedwater flow as a function of startup time based on those cases depicted in Table 1 for the loss of main feedwater transient. For the case of station blackout, an analysis was done to determine that for an auxiliary feedwater delay of 3 minutes, an auxiliary feedwater flow rate of 286 gpm to 3 steam generators is adequate to preclude the filling of the pressurizer.

The analysis was performed according to accepted Westinghouse Quality Assurance procedures. This is also to confirm that the analysis is applicable to both Turkey Point Units 3 and 4 with replaced steam generators.

TABLE 1

TIME SEQUENCE OF EVENTS FOR LOSS OF MAIN FEEDWATER/STATION BLACKOUT ANALYSES PERFORMED AT THE ENGINEERED SAFEGUARDS DESIGN POWER RATING

Case	1	2	3	4	5	6	7	8	9*
Auxiliary Feedwater Flow (gpm)	356.0	357.0	361.0	366.0	373.0	420.0	473.0	502.0	286.0
Auxiliary Feedwater System Actuation Time Delay (sec)	60.0	90.0	120.0	150.0	180.0	340.0	450.0	500.0	180.0
Event	**Time (sec)**								
Main Feedwater Flow Stop	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Low-Low SG Water Level Reactor Trip	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1	66.1
Rod Begins to Drop	68.1	68.1	68.1	68.1	68.1	68.1	68.1	68.1	68.1
SG Begins to Receive Auxiliary Feedwater	126.1	156.1	186.1	216.1	246.1	406.1	516.1	566.1	246.1
Core Decay Heat and/or Pump Heat Decrease to Auxiliary Feedwater Heat Removal Capacity	2808.0	2744.0	2588.0	2488.0	2212.0	1248.0	852.0	872.0	2192.0
Peak Pressurizer Water Level Occurs	2848.0	2748.0	2632.0	2504.0	2276.0	1324.0	868.0	904.0	2312.0

*Station Blackout

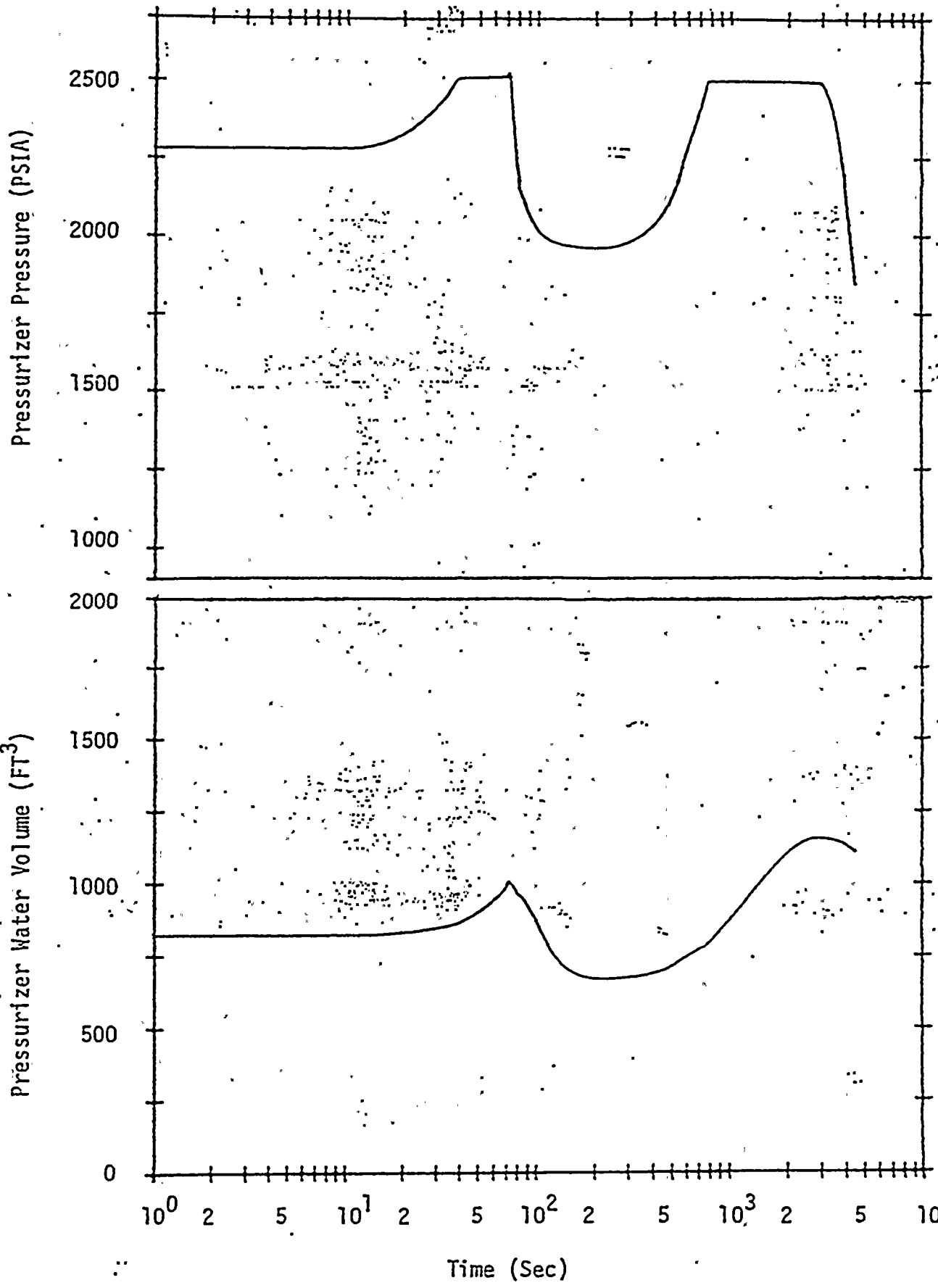

FIGURE 1 PRESSURIZER PRESSURE AND WATER VOLUME

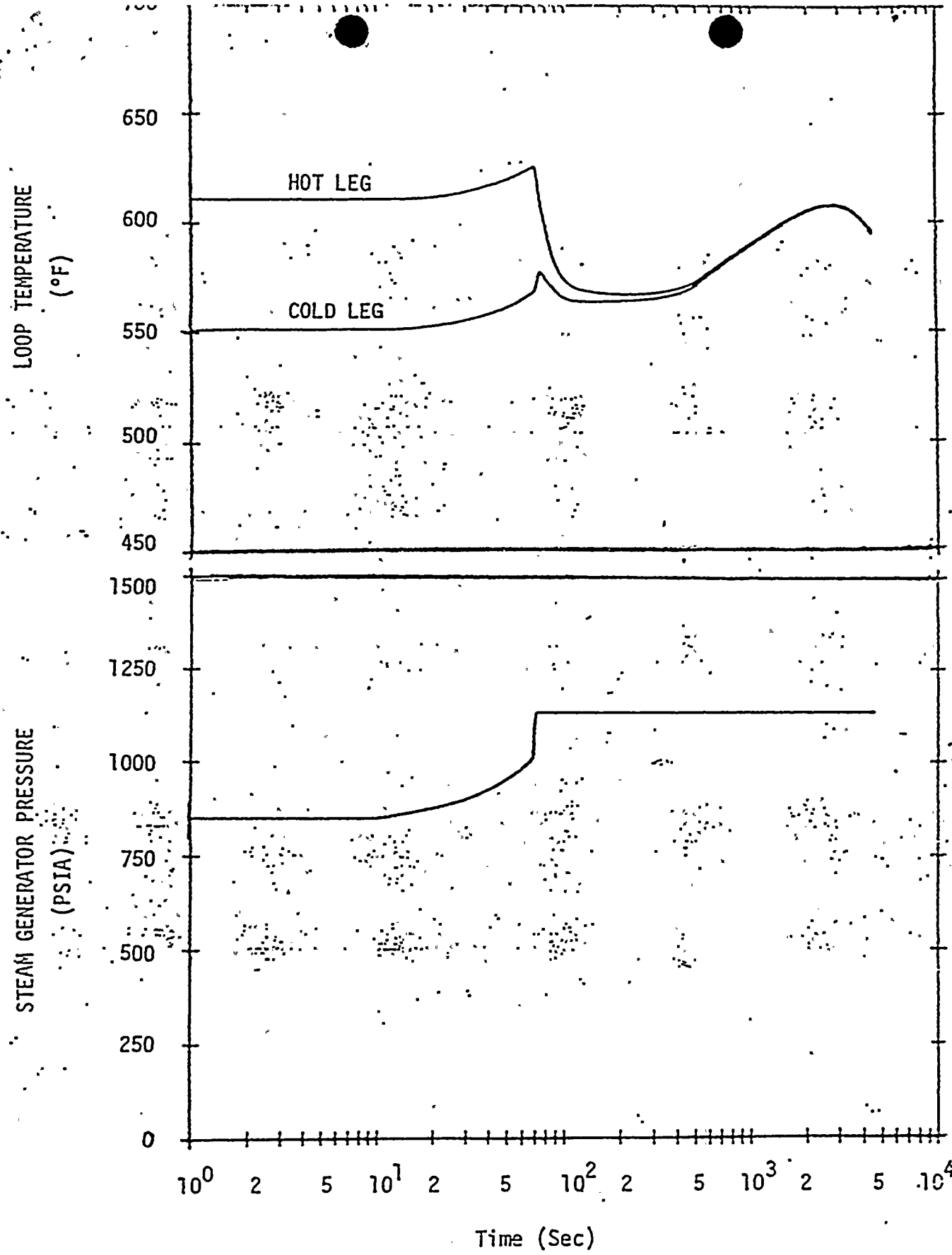

FIGURE 2 LOOP COLD AND HOT TEMPERATURES AND STEAM GENERATOR PRESSURE

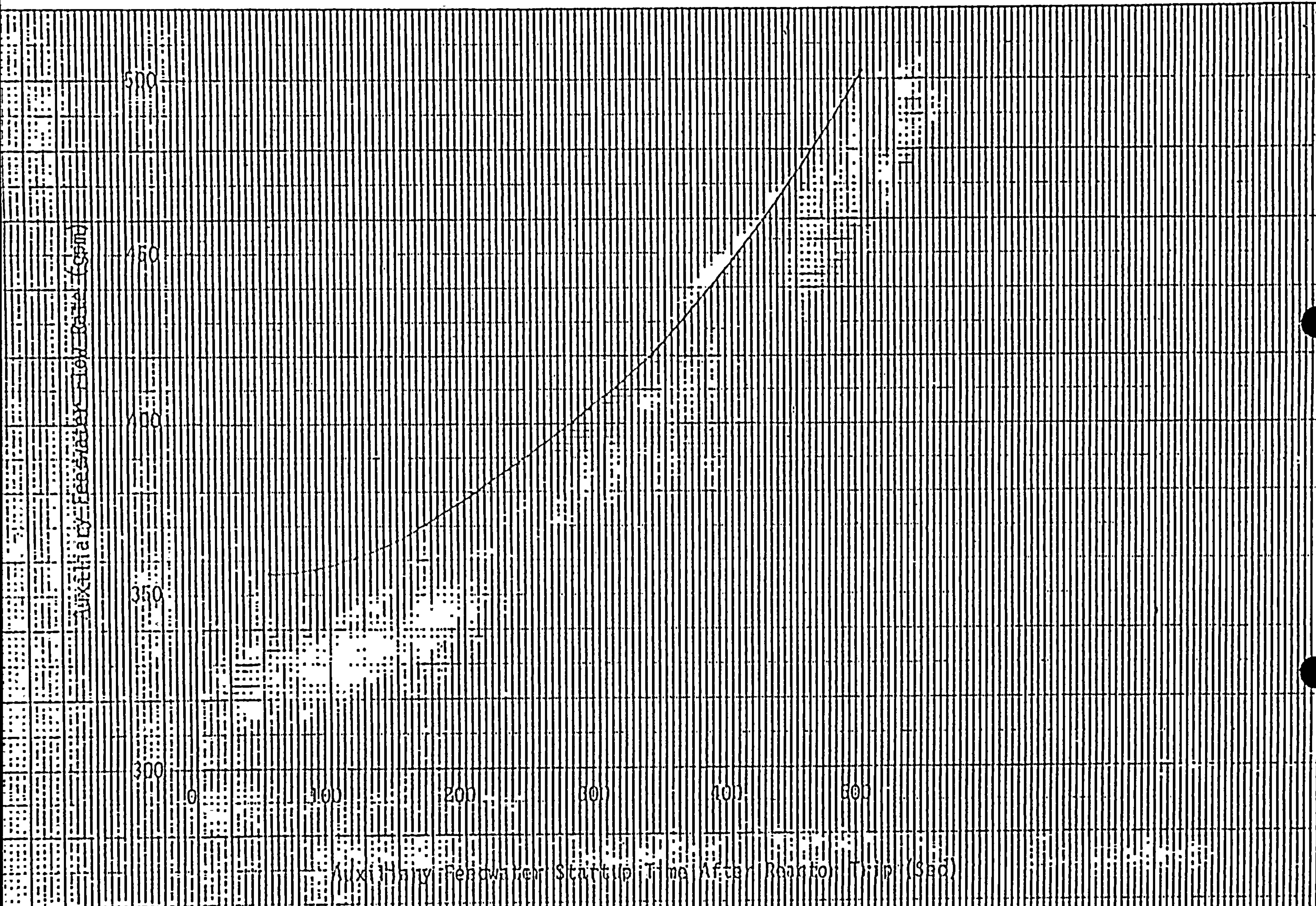

FIGURE 3 MINIMUM REQUIRED AUXILIARY FEEDWATER FLOW

ATT (b)

W-PTP-68

Westinghouse Electric Corporation
Water Reactor Divisions

Nuclear Commercial Operations Division
Box 355
Pittsburgh Pennsylvania 15230

Mr. C. O. Woody, Manager
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Florida Power & Light Company
P.O. Box 529100
Miami, FL 33152

July 15, 1982

Ref: JPT-82-048
P.O. 93000-85525
DWA 93421
GO MI-28460, CN3
W-PTP-62

Dear Mr. Woody:

FLORIDA POWER & LIGHT COMPANY
TURKEY POINT UNITS 3 AND 4
Auxiliary Feedwater Flow Requirements

In response to a question by Mr. Donis, of Florida Power & Light, on the Analysis transmitted by W-PTP-62, Westinghouse offers the following response:

Per normal analytical methodology for the loss of normal feedwater transient, Westinghouse used a power level corresponding to the engineered safeguards design rating (2307.4 MW_t) in the subject analysis. An additional 2% calorimetric error was assumed. The 2208 MW_t value was used in the report to avoid confusion with uprating.

Should you have any additional questions on this report, please contact the Westinghouse Project Office.

Very truly yours,

WESTINGHOUSE ELECTRIC CORPORATION

G. J. Murray, Project Engineer
Florida Power & Light Project

GJM:rst

cc: C. O. Woody, 1L
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JUL 20 1982