NORTHEAST UTILITIES

P.O. BOX 270
HARTFORD, CONNECTICUT 06101
(203) 666-6911

February 19, 1981

Docket No. 50-336
A01488

Director of Nuclear Reactor Regulation
Attn: Mr. Robert A. Clark, Chief
Operating Reactors Branch #3
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

References: (1) T. M. Novak letter to W. G. Counsil, dated January 14, 1981.
(2) D. G. Eisenhut letter to W. G. Counsil, dated October 22, 1979.
(3) W. G. Counsil letter to H. R. Denton, dated December 6, 1979.
(4) W. G. Counsil letter to R. A. Clark, dated May 20, 1980.
(5) W. G. Counsil letter to H. R. Denton, dated November 28, 1979.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2
Auxiliary Feedwater System

In Reference (1), the NRC Staff issued Amendment No. 63 to Facility Operating License No. DPR-65 adding operability, trip setpoint and surveillance requirements for automatic initiation of the auxiliary feedwater system. In addition, the Staff documented the results of the review of Northeast Nuclear Energy Company's (NNECO's) responses to the short and long-term recommendations which resulted from the reliability evaluation of the Millstone Unit No. 2 auxiliary feedwater system.

Based on this review, the Staff requested that NNECO complete the following actions within thirty (30) days from receipt of Reference (1):

(1) Complete and document the results of a 48 hour endurance test of the "A" auxiliary feedwater pump.

(2) Document our intentions regarding compliance with the Staff's requirement to automate the steam-driven auxiliary feedwater pump.

In response to these requests, NNECO hereby provides the following information.

Item 1

A forty eight (48) hour endurance test of the "A" auxiliary feedwater pump was initiated at 1045 hours on February 4, 1981, and completed at 1100 hours

8103020399

p

on February 6, 1981, in accordance with the provisions of Reference (2) as supplemented by Reference (1).

The testing was performed during normal operation with the "A" auxiliary feedwater pump providing approximately 90-95 gpm to the Steam Generator No. 1. A flow schematic for the subject test is provided in Figure 1.

Prior to the test, NNECO performed an engineering evaluation of the potential impact of the addition of cold auxiliary feedwater into the main feedwater flow. It was concluded that the auxiliary feedwater pump endurance test would have negligible impact upon the fatigue life of the Steam Generator nozzle-to-pipe weld. This determination is based on the following:

As the main feedwater pipe will be full, addition of cold auxiliary feedwater into the main feedwater flow will not result in thermal stratification.

The injection of auxiliary feedwater into the main feedwater is not expected to lower the main feedwater temperature significantly.

The one time application of this transient will result in negligible impact on the Steam Generator nozzle-to-pipe weld fatigue life.

Pump and motor bearing temperatures were measured by contact with the pump and motor casings near the bearings. The location of the bearing temperature measurements are shown in Figure 2.

A comparison of the "A" auxiliary feedwater pump design operating conditions and the test operating conditions is provided in Table 1.

A plot of the bearing temperatures versus time for the four measurement locations is provided in Figure 3.

A plot of the "A" auxiliary feedwater pump room ambient temperature versus time is provided as Figure 4. Pump room ambient humidity did not vary appreciably during the conduct of the test as the ventilation system maintains the pump room at the same humidity as the ground floor of the turbine building. The pump room humidity was approximately 23% throughout the test.

Following a review of the pump room ambient conditions during the auxiliary feedwater pump endurance test, NNECO has determined that operation of the "A" auxiliary feedwater pump for extended periods of time will not result in the environmental qualification limits for the safety-related equipment in the room to be exceeded.

Data collected during this test confirm that pump vibration did not exceed allowable limits during the conduct of this test.

Item 2

In Reference (3), NNECO provided the NRC Staff with the preliminary design of the control grade automatic initiation scheme for the Millstone Unit No. 2 auxiliary feedwater system. Subsequent to the docketing of Reference (3), NNECO investigated the capability of one electrically driven auxiliary feedwater pump to provide decay heat removal under the most limiting conditions. The investigation determined that one electric auxiliary feedwater pump was capable of providing 100% of the required auxiliary feedwater flow to remove decay heat. Analytical justification was provided in Reference (4).

As such, NNECO revised its automatic initiation scheme for Millstone Unit No. 2. The revised scheme involves automatically starting two electric auxiliary feedwater pumps.

Conversations with the Staff indicated that the proposed scheme to automatically start only the two electric-driven auxiliary feedwater pumps would be unacceptable, however, no basis was given for this determination. These discussions culminated in the issuance of Reference (1) whereby the Staff issued Amendment No. 63 to Facility Operating License DPR-65 which added operability, trip setpoints and surveillance requirements for the automatic initiation of the auxiliary feedwater system.

In response to the Referen ., (1) request to document our intentions regarding compliance with the Staff's stated position requiring automatic start of the turbine driven auxiliary feedwater pump, NNECO maintains that the current design for the Millstone Unit No. 2 automatic auxiliary feedwater system, whereby two electric-driven pumps are started on low Steam Generator water level, is adequate and meets the intent of NUREG-0737. The basis for this determination is provided below.

The capacity of the two electric motor-driven auxiliary feedwater pumps has been demonstrated to be 200% of that required to adequately remove decay heat. Analytical justification has been provided in Reference (4).

Elimination of the steam turbine-driven auxiliary feedwater pump from the automatic initiation scheme will render the redundant electric driven trains fully independant and capable of satisfying the single failure criterion. The steam-driven pump is classified as a manual backup train which will be started from the control room. In addition, as was described in Reference (5), the steam-driven train will be made A.C. independent.

The Staff has documented, in Reference (1), that the turbine-driven auxiliary feedwater pump is required to be automatically started in order to provide reliable flow to the steam generators in the event of a station blackout. This requirement far exceeds present design criteria for other safety-related systems such as the High Pressure Safety Injection (HPSI) or Containment Spray Systems. The precedent which will be set should NNECO be required to design the auxiliary feedwater system to the station blackout criterion has far reaching implications, and has not been substantiated by the Staff in docketed correspondence.

It is NNECO's opinion that a NUREG document is not the appropriate vehicle for the Staff to promulgate a requirement with such ramifications.

In light of the preceding arguments, NNECO has performed best estimate calculations to determine the times to dry-out for the steam generators at Millstone Unit No. 2 under various trip conditions, including a loss of main feedwater as a result of station blackout (loss of off-site and on-site power). The analyses demonstrate that, should a station blackout occur, the operator would have in excess of forty five (45) minutes to manually start the turbine-driven auxiliary feedwater pump from the control room and its associated A.C. independent train prior to dry-out of the steam generators.

Table 2 lists the analyses performed and the calculated dry-out times.

NNECO concludes that the amount of time available to the operator prior to steam generator dry out during a station blackout during which he must manually initiate auxiliary feed with the turbine-driven pump is more than adequate. It is also noted that emergency procedures utilized during a station blackout explicitly direct the operator to initiate auxiliary feedwater flow with the turbine-driven pump. In actual plant transients where auxiliary feedwater has been required to be manually initiated, it has successfully been accomplished within one minute of the start of the transient.

Two additional points of concern exist should the Staff ultimately require NNECO to provide for the automatic initiation of the turbine-driven as well as electric-driven auxiliary feedwater pumps. These are: 1) potential pump cavitation concerns and 2) steam generator overfill conditions.

The potential for pump cavitation with resultant pump damage has been identified during those times when both the electric-driven and turbine-driven auxiliary feedwater pumps are operating. It is inconsistent for the Staff to require a system to automatically start when required because of a lack of confidence in operator action when operator action is required (to throttle flow) to prevent a potential failure of that system, i.e., pump cavitation.

Operation of all three auxiliary feedwater pumps at Millstone Unit No. 2 will potentially result in the delivery of 400% of the required auxiliary feedwater if operator action to throttle feed flow is not assumed. The addition of 400% of the required auxiliary feedwater flow will result in an overfilling of the steam generators unless appropriate action by the operator to throttle flow is assumed.

NNECO understands that the Staff of the Office of Nuclear Reactor Regulation has considered steam generator overfill transients as a candidate for inclusion as part of the proposed new Unresolved Safety Issues (USI) on

"Safety Implications of Control Systems." Overfill of the steam generators will effect the response of the primary system, including pressurizer level shrinkage, potentially over cooling the primary system such that the reactor vessel nil ductility transition temperature (NDTT) limits could be violated, as well as impacting the structural integrity of the steam generator components.

Althought it is realized this is a low probability event, Staff concern is obviously present. It would again be inconsistent for the Staff to require a system to respond in such a way as to increase the potential for consequences detrimental to plant safety.

It is NNECO's conclusion, based on the information presented above, that automatic initiation of the turbine driven auxiliary feedwater pump is neither required for safe mitigation of loss of feedwater transients nor desired for several philosophical and technical reasons. Demonstration of a substantial dry-out time for the loss of main feedwater transient with a concurrent station blackout together with explicit emergency operating procedures ensures appropriate and timely operator action to mitigate the event without an automatic initiation scheme for the turbine-driven auxiliary feedwater pump.

It would be inconsistent for the Staff to continue to require NNECO to automate the turbine driven auxiliary feedwater pump in light of the information provided herein as it has been clearly illustrated that safe plant operation is assured with the current automatic initiation scheme. All prerequisites for NRC acceptance of this position, both written and verbal, have been addressed by the docketing of this submittal. The potential concerns associated with automatic initiation of the turbine-driven auxiliary feedwater pump are not balanced by an increase in safety.

We trust you find this information responsive to the Reference (1) requests.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil

W. G. Counsil
Senior Vice President

MILLSTONE UNIT NO. 2

AUXILIARY FEEDWATER SYSTEM (EXISTING)

FIGURE 1

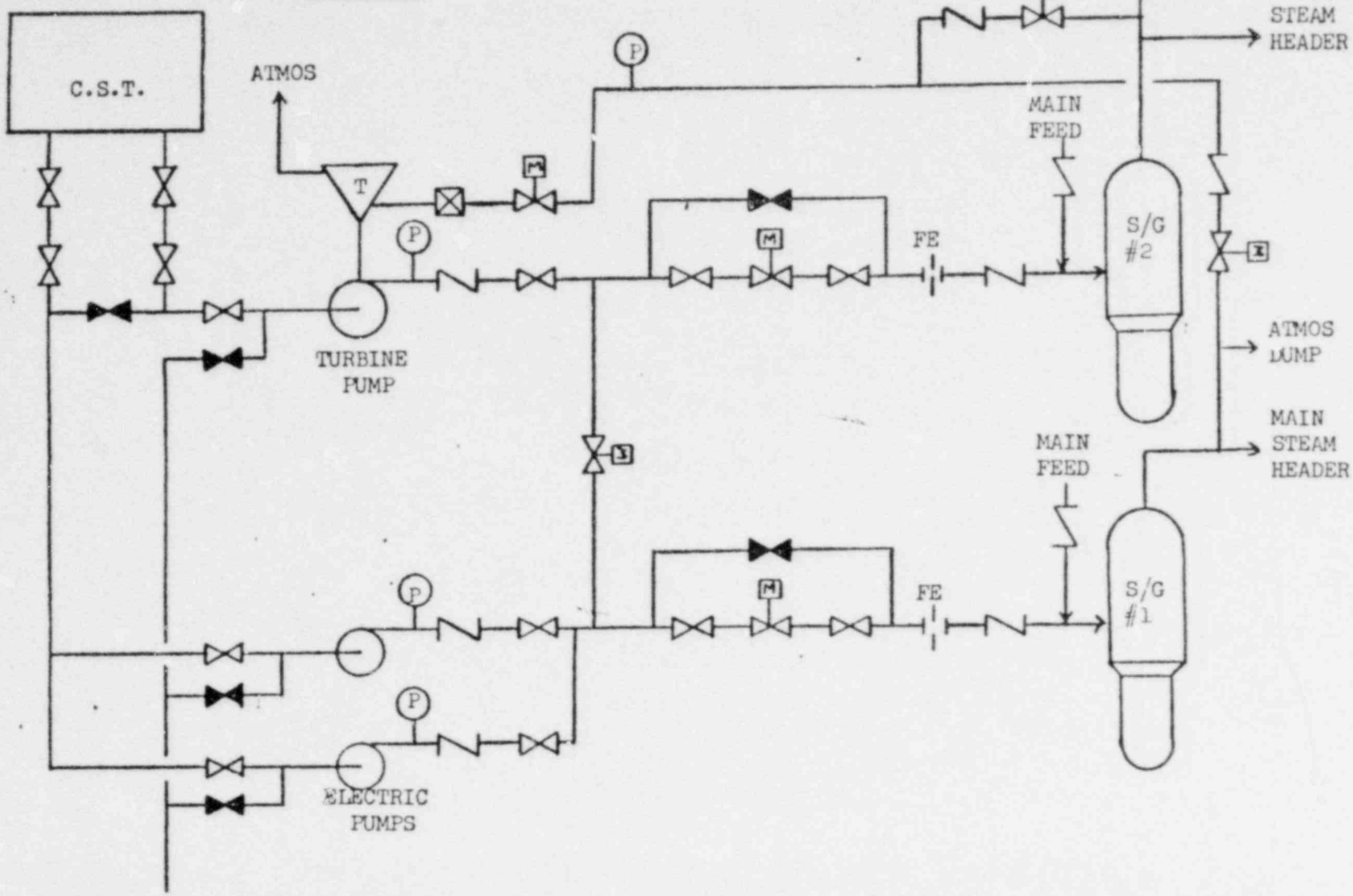

FIGURE 1

Figure 2

Millstone Nuclear Power Station, Unit No. 2

"A" AUXILIARY FEEDWATER PUMP/MOTOR

BEARING TEMPERATURE MEASUREMENT LOCATIONS

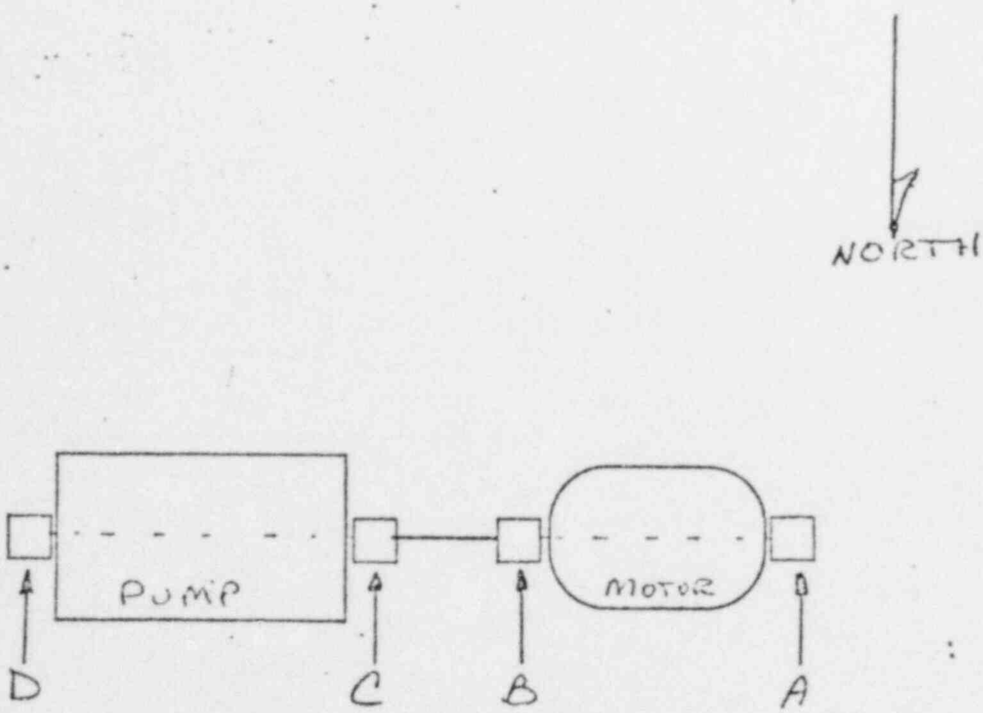

FIGURE 3
'A' AUXILIARY FEEDWATER PUMP/MOTOR
BEARING TEMPERATURES VS. TIME

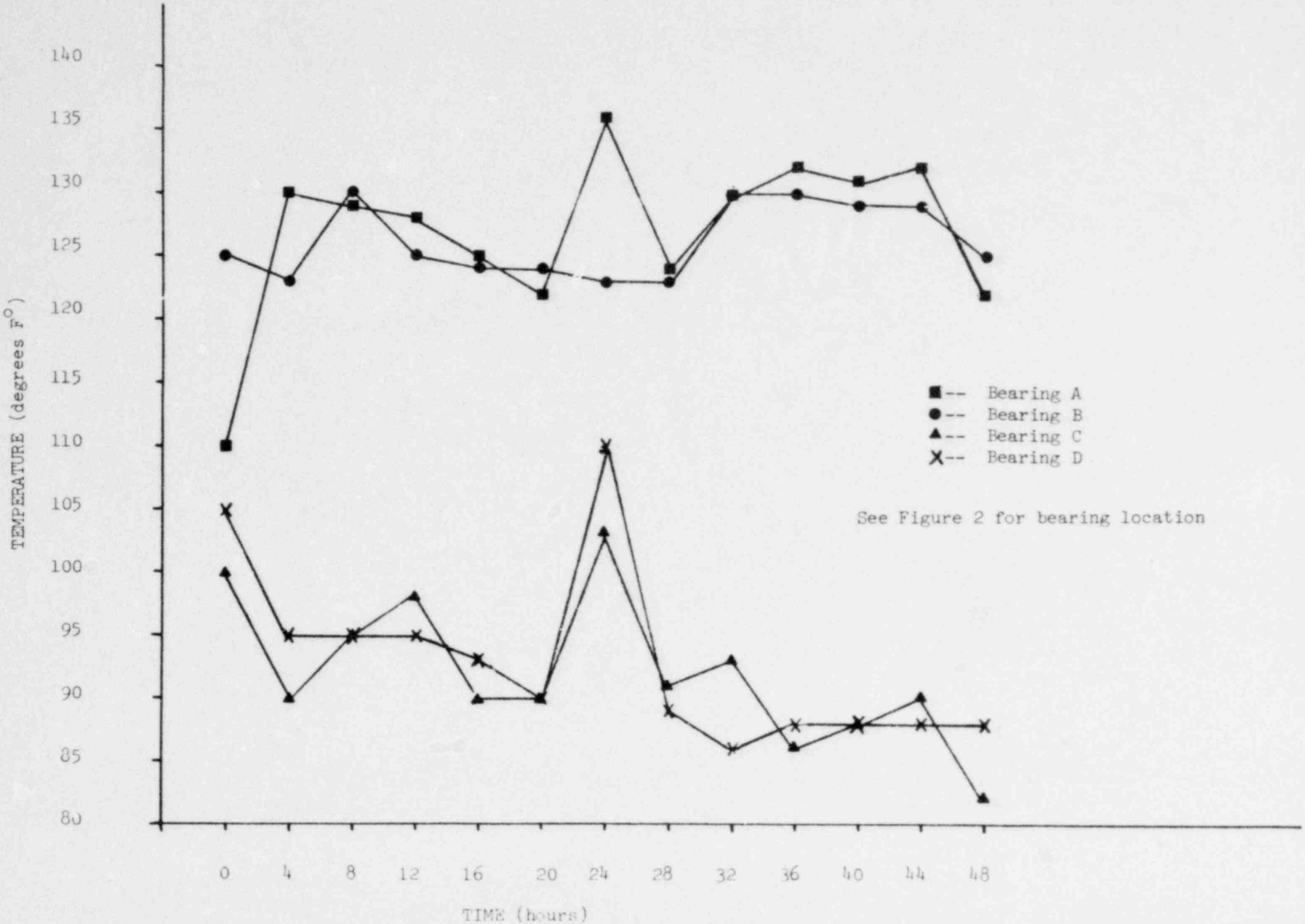

FIGURE 4
'A' AUXILIARY FEEDWATER PUMP ROOM
AMBIENT TEMPERATURE VS. TIME

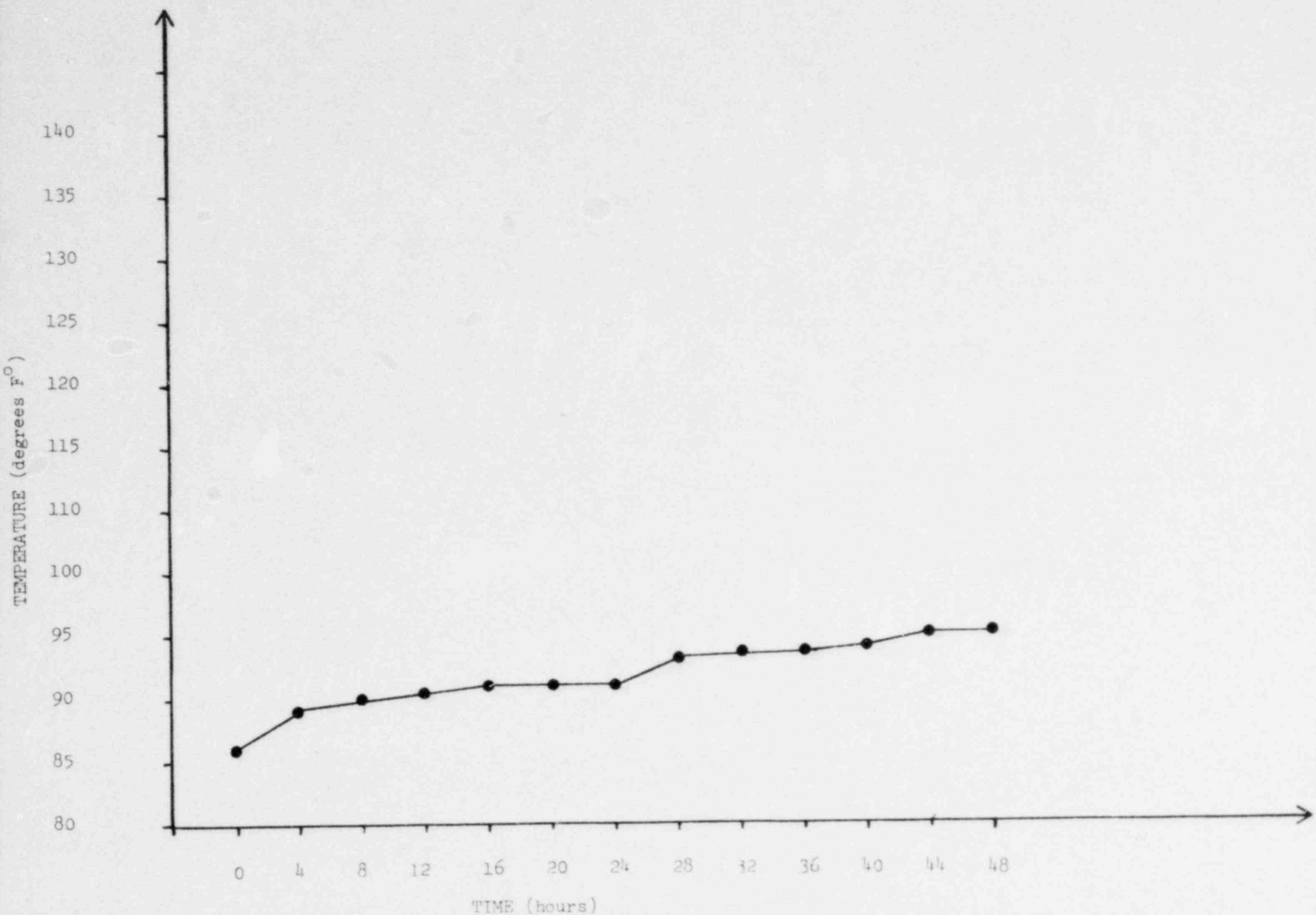

Table 1

"A" AUXILIARY FEEDWATER PUMP

	Design Operating Conditions	Test Operating Conditions
Pump Flow	300 gpm	90-95 gpm
Discharge Pressure	1056 psi	1207-1245 psi
Pump Speed	3560 rpm	3560 rpm

Table 2

BEST ESTIMATE STEAM GENERATOR
DRY OUT TIME CALCULATIONS

Millstone Nuclear Power Station, Unit No. 2

1.	Loss of Main Feedwater off-site power available reactor trip on low steam generator water level	*dry out: 22 minutes
2.	Loss of Main Feedwater reactor trip on low steam generator water level loss of off-site power at time of reactor trip	*dry out: 30 minutes
3.	Loss of Off-site Power reactor trip on loss of off-site power	dry out: >45 minutes

* Approximate Values