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

MAR 14 1984

MEMORANDUM FOR: Olan D. Parr, Chief
Auxiliary Systems Branch
Division of Systems Integration

FROM: Vincent S. Noonan, Chief
Equipment Qualification Branch
Division of Engineering

SUBJECT: DIABLO CANYON UNIT 1 SSER 20, FOLLOWUP ITEM 5

Reference: PG and E Letter No: DCL-84- , J. O. Schuyler to G. W. Knighton dated January 20, 1984, "DRAFT".

During an environmental qualification audit of Diablo Canyon electrical equipment, conducted August 21 to September 4, 1981, the staff identified a motor capacitor in an Electro-Hydraulic Actuator, manufactured by ITT General Controls, as an item of concern because of insufficient documentation to support aging qualification. This is the same item identified in SSER 20 as followup Item 5. The applicant has submitted several documents to support its claim of qualification. However based on our review of that documentation, the Equipment Qualification Branch has not been able to conclude that this equipment has been demonstrated to be environmentally qualified for the postulated high energy line break environment. In the attached referenced letter and notes for table 3.11-1A in amendment 69 of the Diablo Canyon FSAR, the applicant stated that the actuators in question are not required to operate in a harsh environment since they are not needed to mitigate the consequences of a high energy line break.

The staff reviewed, and found acceptable, information supporting the applicant's determination that this equipment is not required to operate following a high energy line break. The staff's evaluation, attached, is documented in SSER No. 9.

We request that you reaffirm the staff's previous evaluation by reviewing the attachments to this memo, and determine whether or not the actuators in question are required to mitigate either the consequences of a high energy line break or a loss-of-coolant accident. Please provide us with a written evaluation of your findings by March 23, 1984.

Vincent S. Noonan, Chief
Equipment Qualification Branch
Division of Engineering

cc: See next page

8/7

8403280330 +A
19PP.

cc: J. P. Knight
L. Rubenstein
T. Novak
G. Knighton
R. LaGrange
J. Wermiel
H. Scherling
H. Walker

ATTACHMENT 1 DES DRAFT

January 20, 1984

PGandE Letter No: DCL-84-

Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Re: Docket No. 50-275, OL-DPR-76
Diablo Canyon Units 1 and 2
SSER 20 Followup Item 5 - HISTORY

Dear Mr. Knighton:

As requested by the Staff, the enclosure to this letter provides a complete history and chronology of environmental qualification developments related to the motor/capacitor set used in the auxiliary feedwater level control valves for Units 1 and 2.

Kindly acknowledge receipt of this material on the enclosed copy of this letter and return it in the enclosed addressed envelope.

Sincerely,

J. O. Schuyler

TNCrawford/GCW/JOS:naw
Enclosure

cc: D. G. Eisenhut
H. E. Schierling
Service List

bcc: Diablo Distribution

0045d/0002D

ENCLOSURE

A HISTORY OF THE ELECTRO-HYDRAULIC ACTUATORS ON THE AUXILIARY FEEDWATER CONTROL VALVES

Original Design

The auxiliary feedwater control valves were originally designed to have strictly manual control. They had air actuators and failed to the open position. Steam generator level control was included to minimize operator involvement during plant startup. The level control was a nonsafety-related function of the valves.

During system design review, it was noted that runout protection was needed for the 500 hp pumps at low steam generator pressures. A safety-related pressure override control was added to the control loop to satisfy this requirement.

System Changes

Later design reviews (1974) showed that on loss of offsite power, the air actuators could not provide runout protection; therefore, they were replaced with electro-hydraulic actuators.

When the original high energy line break (HELB) analysis outside of containment was performed, an evaluation was conducted to demonstrate that the plant could be brought to a safe shutdown condition under HELB environmental conditions without the use of auxiliary feedwater level control valves. The

basic argument was that the valves, when subject to the HELB harsh environment, would be feeding the faulted steam generator (in addition to one other steam generator), and the correct operator action to mitigate the break involved stopping the pump, thus negating the need for runout protection.

This scenario was discussed with the NRC Staff in meetings from July 31, 1978 to August 11, 1978. As a result of those meetings, Amendment 69 to the FSAR, dated September 1978, included a "Notes for Table 3.11-1A" which resolved Staff concerns. These notes are included as Attachment 1.

In 1979, for reasons unrelated to this issue, PGandE replaced the original electro-hydraulic actuators with the ITT General Controls actuators.

In 1980, Memorandum and Order CLI-80-21 was issued by the NRC directing PGandE and other utilities to review the environmental qualification of all safety-related electrical equipment using NUREG-0588 as a guideline. This directive was transmitted to PGandE in a letter from John F. Stolz to John C. Morrissey dated March 3, 1980. PGandE approached this qualification effort using two approaches that impact the valves under discussion.

First, if PGandE could demonstrate that a device was qualified for a harsh environment, the qualification would be documented, whether or not that device was required to function in the harsh environment. Equipment was only reviewed for justification of functional exemption if it could not be qualified.

Second, Diablo Canyon is a Category II plant as defined in NUREG-0588 and is only required to address the effects due to aging as opposed to aging qualification. PGandE decided to include qualification for aging in its program, as is required for Category I plants. The basis for this decision was the knowledge that most of the equipment could be qualified to these requirements. Wyle Laboratories had a contract with PGandE to qualify the remainder of the equipment by using existing test data from other applications and correlating them to the Diablo Canyon equipment. PGandE had been assured by Wyle that this program of aging qualification would be successful.

When the details of the various ITT General Controls environmental qualification reports were evaluated for applicability to the Diablo Canyon actuators, PGandE discovered that the critical testing involved a three-phase motor and Diablo Canyon had a single-phase motor. ITT informed PGandE that the only significant difference, from a qualification point of view, was that the single-phase motor had a capacitor and the three-phase motor did not. ITT stated that the capacitor had been qualified for radiation by test and cited a report not in PGandE's possession. ITT stated that the PGandE motor had the standard capacitor, as opposed to the high radiation resistant capacitor, but that the qualification test showed the standard capacitor was acceptable for Diablo Canyon's postulated radiation levels.

Lacking a copy of the report, PGandE allowed the qualification of the capacitor to remain an open item and provided a justification for interim operation in the September 1981 report to the NRC. PGandE also stated that the thermal aging portion of the qualification would be included in the Wyle aging program.

In early 1982, the Wyle aging program was abandoned because the results could not be applied by PGandE to qualify the equipment for aging. PGandE then investigated other alternatives. For the actuators, this included additional discussions with ITT. These discussions resulted in more qualification reports, including one which showed the qualification of an actuator with the single-phase motor. (It should be understood that the capacitor is merely a component of the single-phase motor design. Consequently, most of the reports never mention a capacitor, but discuss only single-phase or three-phase motors.)

In mid-1982, while this qualification information was being integrated into PGandE files, the IDVP chose to review the file for these actuators. In accordance with the scope of the IDVP, PGandE provided copies of this file as it existed in November 1981. The IDVP found the statement in the file that the capacitor was not qualified. EOI 8058 was issued stating that the actuators were not qualified. PGandE's response to the IDVP to resolve this EOI was that this issue was known to the NRC and the justification for interim

operation had been reviewed and found to be adequate by the NRC. The EOI was subsequently closed.

Separately, in response to EOI 8001, PGandE reanalyzed the environment in the auxiliary building resulting from a high energy line break. The resulting peak temperature for the auxiliary feedwater control valves increased from approximately 209°F to 325°F (See Attachments 2 and 3). Since the ITT General Controls actuator is only qualified for 212°F as indicated in Attachment 4, PGandE decided to provide an exemption for this actuator which had already been justified in FSAR Table 3.11-1A. Although the environmental temperatures are changed, the justifications for exemption are still valid.

On December 20, 1983, the NRC Staff and its consultant, EG&G, audited the valve actuator files for the revised temperatures outside containment. The Diablo Canyon Project explained to the NRC representatives that the actuators would be documented in the qualification file to be exempt from the requirement to operate during an HELB, and they agreed that this was a legitimate approach to the qualification issue. The Project decided to consider this approach separately from the capacitor qualification issue so that the capacitor issue could be closed.

Revision 2 of the qualification file for the actuator was issued on December 30, 1983, to reflect this positon. (Revision 0 was the original file, and Revision 1 was the mid-1982 update to include qualification with the capacitor.) This file is currently being maintained to document the qualification to post-LOCA radiation environments which PGandE has selected not to exempt at this time. The valve actuators are now considered to be qualified for the environments in which they must operate as defined in NUREG-0588.

The following information provides a brief chronology of the events related to environmental qualification of the auxiliary feedwater control valves.

July - August 1978	Meetings with NRC to justify exclusion from qualification.
September 1978	FSAR Amendment 69 to document exclusion from qualification
March 3, 1980	Letter from Stolz to Morrissey to meet NUREG-0588 requirements
Spring, 1980	New ITT General Controls actuators installed
September, 1981	Final Environmental Qualification Report issued - NRC audit of files; SSER 15 issued by NRC approving PGandE's EQ program
November, 1981	EQ documents provided to IDVP for review
Spring, 1982	Cancellation of Wyle program
June, 1982	Revision 1 of actuator File IH-14 issued
October, 1982	EOI 8058 issued - Environmental qualification of actuator
March, 1983	EOI 8058 closed
November 18, 1983	Design Criteria Memorandum M-73 issued - New temperature and pressure environments
Early December, 1983	Decision made to exempt actuators for HELB environment

December 20, 1983	NRC auditor informed of decision to exempt actuator for HELB, but not post-LOCA environment
December 22, 1983	PGandE letter to NRC on SSER 20 Followup Item 5
December 30, 1983	Revision 2 to File IH-14 issued exempting valve actuators from HELB environment
December 30, 1983	Equipment deemed qualified for all environments in which it was required to operate.

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Attachment 1 to the Enclosure

NOTES FOR TABLE 3.11-1A
(Provided in Response to Informal Staff Request
During July 31 - August 11, 1978 Meetings)

Justification for the Exclusion
of the Auxiliary Feedwater Level Control Valves
From the Severe Environment Exposure List

Auxiliary feedwater is supplied to the steam generators by one turbine driven and two motor driven auxiliary feedwater pumps. The turbine driven pump has sufficient capacity to supply emergency feedwater to four steam generators. Each motor driven pump has sufficient capacity to supply emergency feedwater to two steam generators.

The turbine driven pump isolation valves are manually positioned motor operated valves (MOV). The motor driven pump's steam generator level control valves are automatic, electro-hydraulically operated valves (E-H) with manual override.

Two turbine driven pump level control valves and the two E-H level control valves for one motor driven pump are located in plant area F pipeway near the main steam and main feedwater containment penetrations for steam generators 1 and 2. The other two turbine driven pump level control valves and the two E-H level control valves for the second motor driven pump are located in plant area GE, elevation 115'-0", near the main steam and main feedwater containment penetrations for steam generators 3 and 4. Plant areas F and GE are diametrically opposite on the containment structure. Plant area F is outdoors and area GE is inside the Auxiliary Building. 69

If a main steam line break were to occur in either plant area, two MOV isolation valves and two E-H control valves would be subjected to an environmental temperature that rises to a maximum of 212°F for 300 seconds and stabilizes at 200°F. The MOV's are environmentally qualified and are shown on the severe environment list. The E-H's have not been tested for this type of environment.

If this condition ~~caused a~~ failure of the E-H actuators, the motor driven pump to these valves could be shut off. Since they feed the steam generator which would be feeding the break, this is not only acceptable, it is desirable. The MOV to the affected steam generator could be closed, and the turbine driven pump could supply the 3 unaffected steam generators. As a backup, the motor driven pump to the unaffected E-H valves could supply the two unaffected steam generators on the other side.

Therefore, the auxiliary feedwater level control valves are not required to be qualified for a severe environment.

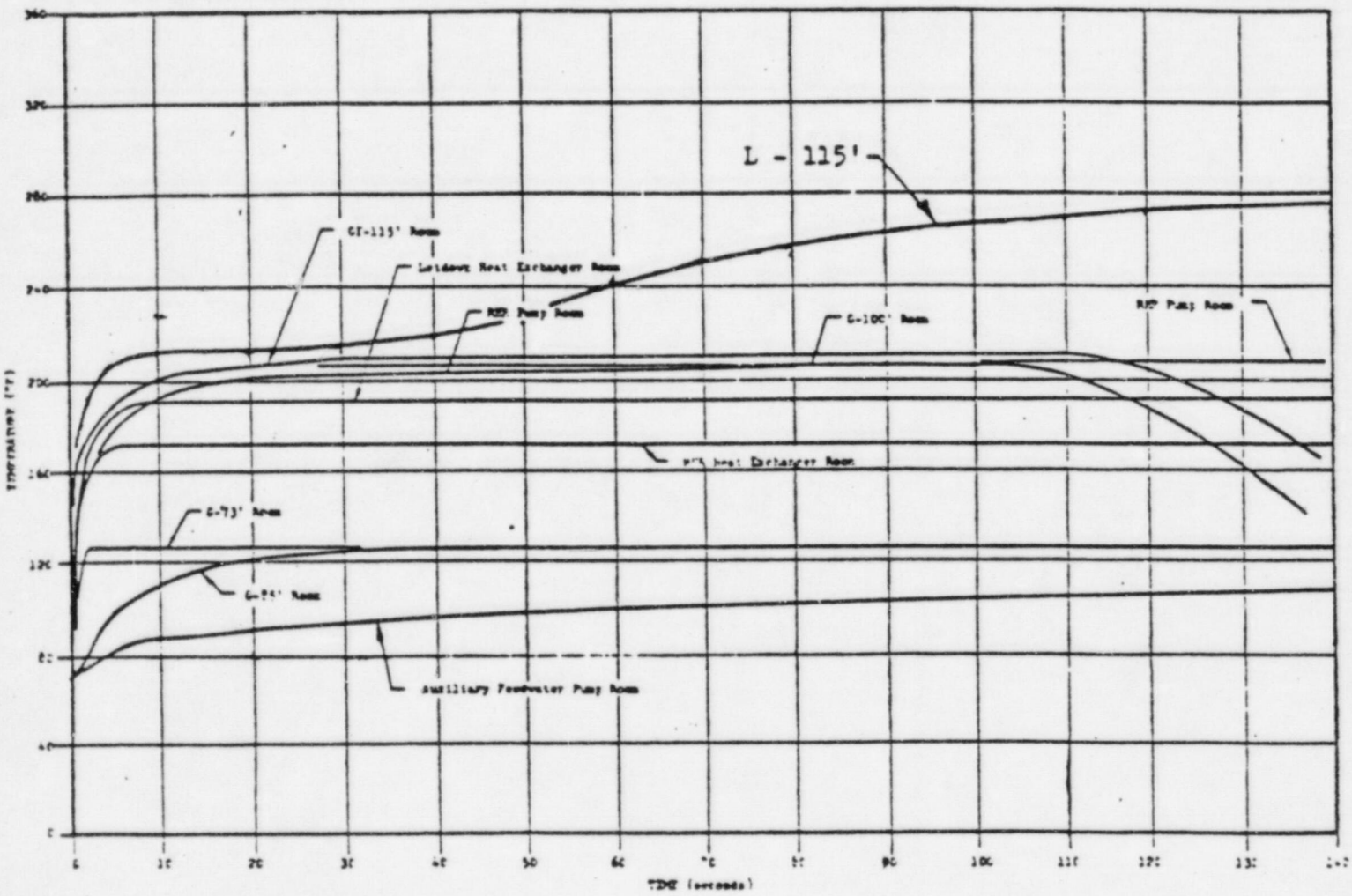

FIGURE 4-12 DIABLO CANYON UNIT 1
PREDICTED VAPOR TEMPERATURE HISTORY
FOR OTHER HIGH ENERGY LINES

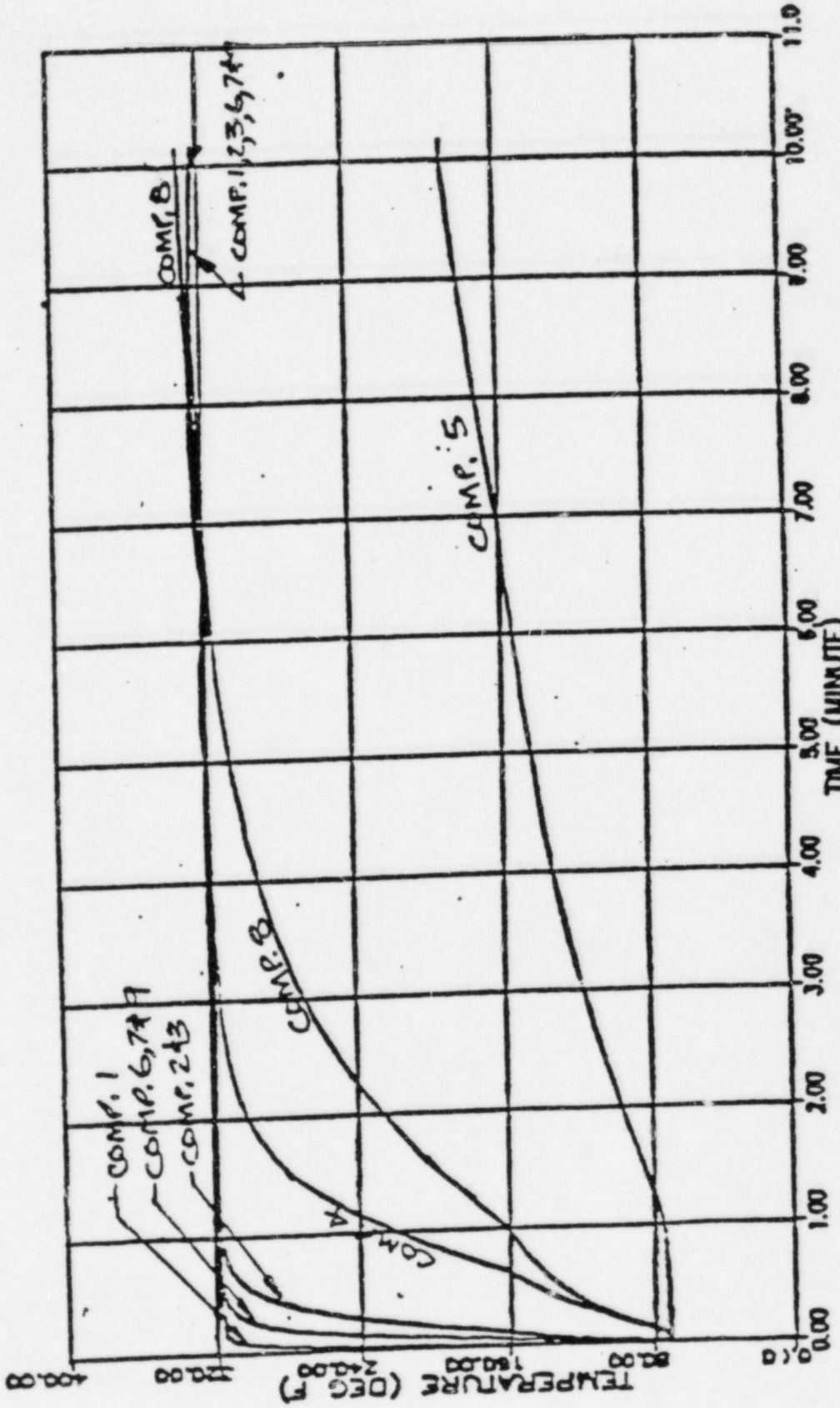

Figure 5-4 Area GE/GH, Temperature vs. Time Response, MSLB at

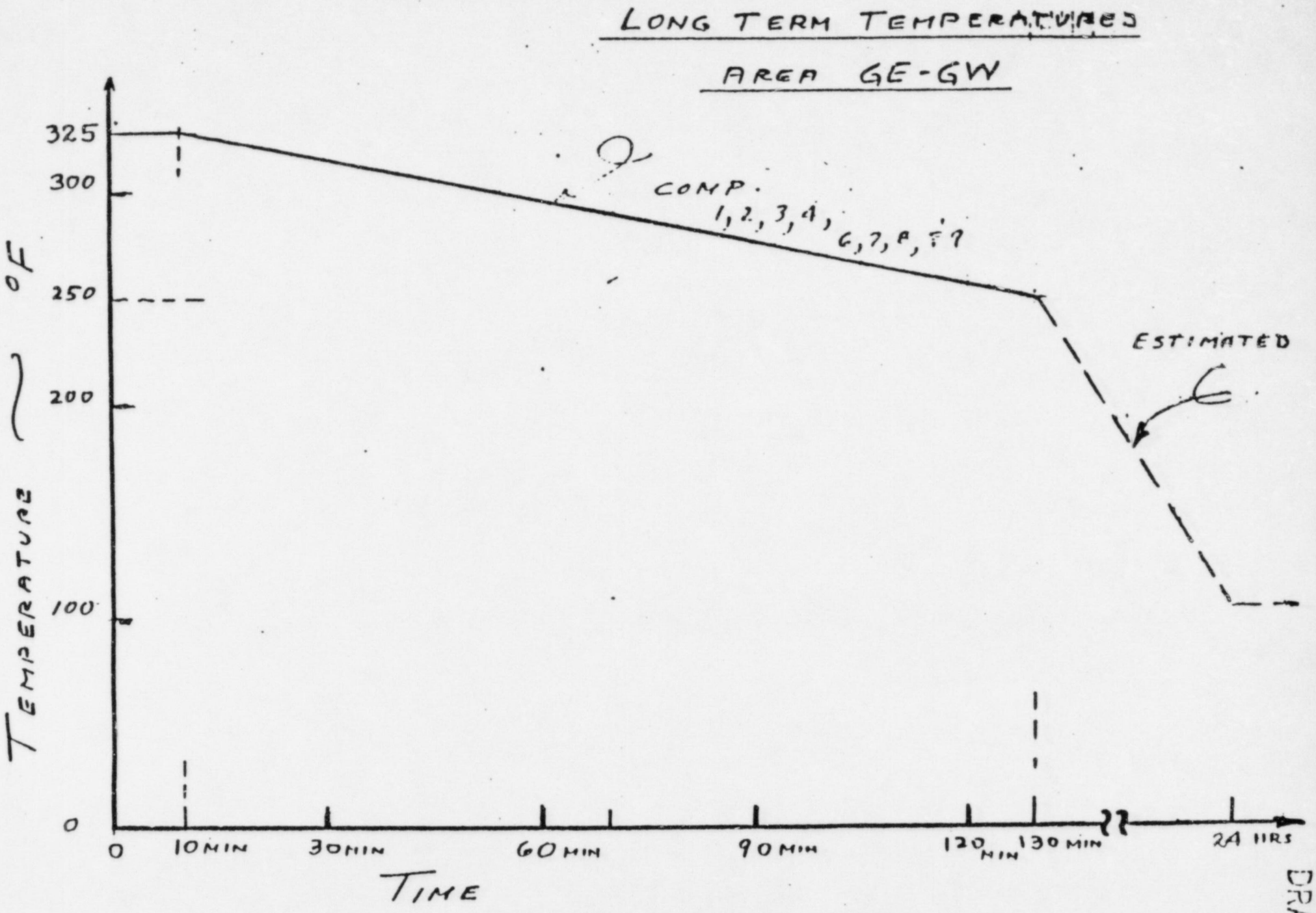

Figure 5-5 Area GE/GW, Long Term Temperature vs. Time Response.

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NORMAL LIFE SIMULATION (AGING)

Environmental (temperature & wear)	Radiation	Seismic
1	2	
Start		
140 deg. F saturated steam for 2000 hrs. at 100% stroke, 2000 cycles. at 20% stroke, 100,000 cycles	25 Mrads (air)	Bi-axial (vertical & horizontal) to 33 Hz to 3.0 g ZPA random excitation.
ITTGC, Glendale	IRT, San Diego	Wyle Labs, Norco

DESIGN BASIS EVENT CONDITION

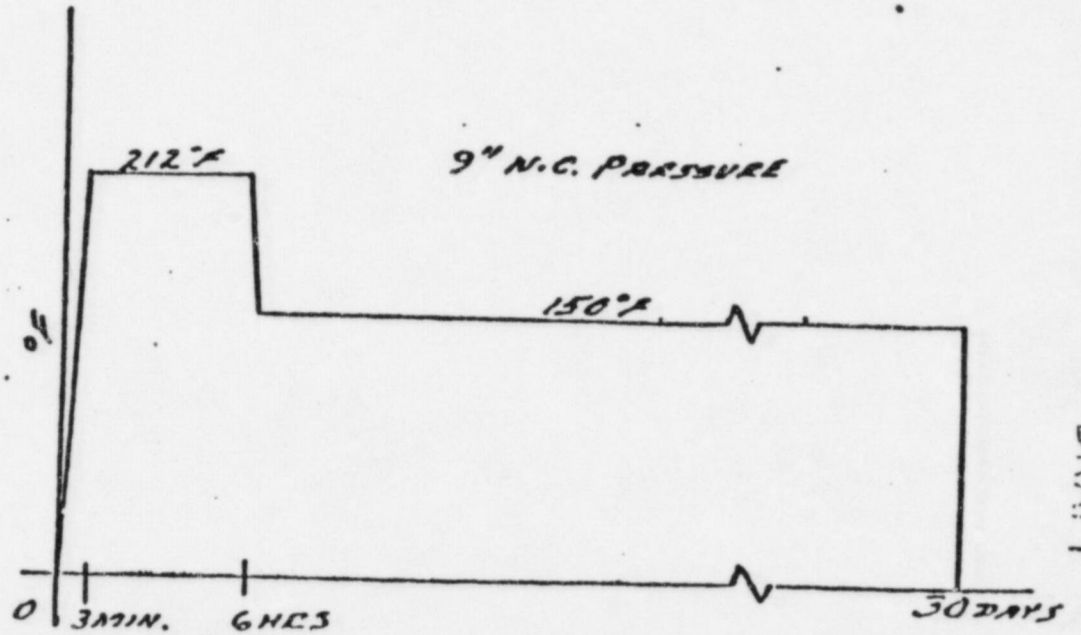
Radiation	Temperature and Pressure
1	
05 Mrads (air)	
IRT, San Diego	ITTGC, Glendale

FIG. #1

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ATTACHMENT 2

NOTES FOR TABLE 3.11-1A
(Provided in Response to Informal Staff Request
During July 31 - August 11, 1978 Meetings)

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of the Auxiliary Feedwater Level Control Valves
From the Severe Environment Exposure List

Auxiliary feedwater is supplied to the steam generators by one turbine driven and two motor driven auxiliary feedwater pumps. The turbine driven pump has sufficient capacity to supply emergency feedwater to four steam generators. Each motor driven pump has sufficient capacity to supply emergency feedwater to two steam generators.

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Two turbine driven pump level control valves and the two E-H level control valves for one motor driven pump are located in plant area F pipeway near the main steam and main feedwater containment penetrations for steam generators 1 and 2. The other two turbine driven pump level control valves and the two E-H level control valves for the second motor driven pump are located in plant area GE, elevation 115'-0", near the main steam and main feedwater containment penetrations for steam generators 3 and 4. Plant areas F and GE are diametrically opposite on the containment structure. Plant area F is outdoors and area GE is inside the Auxiliary Building. 69

If a main steam line break were to occur in either plant area, two MOV isolation valves and two E-H control valves would be subjected to an environmental temperature that rises to a maximum of 212°F for 300 seconds and stabilizes at 200°F. The MOV's are environmentally qualified and are shown on the severe environment list. The E-H's have not been tested for this type of environment.

If this condition caused a failure of the E-H actuators, the motor driven pump to these valves could be shut off. Since they feed the steam generator which would be feeding the break, this is not only acceptable, it is desirable. The MOV to the affected steam generator could be closed, and the turbine driven pump could supply the 3 unaffected steam generators. As a backup, the motor driven pump to the unaffected E-H valves could supply the two unaffected steam generators on the other side.

Therefore, the auxiliary feedwater level control valves are not required to be qualified for a severe environment.

ENVIRONMENTAL QUALIFICATION
OF
CLASS IEEQUIPMENT
WITH
POTENTIAL FOR EXPLOSURE TO A SEVERE ENVIRONMENT

Class IE Equipment Inside Containment - Subject to LOCA

Equipment	Manufacturer	Type (Model No.)	Qualification Citation
1. Pressure and Differential Transmitters			
a. Pressurizer Pressure*	Rosemount	1152	Rosemount Report #117415
b. Pressurizer Level	ITT Barton	764	FSAR Paragraph 3.11.3-7
c. Containment Sump Level	ITT Barton	764	FSAR Paragraph 3.11.3-7
d. Reactor Coolant System Wide Range Pressure	ITT Barton	763	FSAR Paragraph 3.11.3-7
e. Narrow Range Steam Generator Level	ITT Barton	764	FSAR Paragraph 3.11.3-7
f. Steam Flow*	Rosemount	1152	Rosemount Report #117415
g. Sensor for Containment Pressure	Barton	351	PGandE Letter to NRC, 9-21-78.
2. Resistance Temperature Detector			
a. Reactor Coolant System Temperature	Sostman	11834B-1	PGandE Letter to NRC, 9-21-78.
3. Valve Motor Operators	Limitorque	SMB-0, 00, 000	FSAR Paragraph 3.11.3-7
4. Containment Fan Cooler	Westinghouse	300/100 h.p.	FSAR Paragraph 3.11.3 WCAP 7829 - Fan Cooler Motor Test PG&E letters to NRC 2-10-78 and 1/19/78

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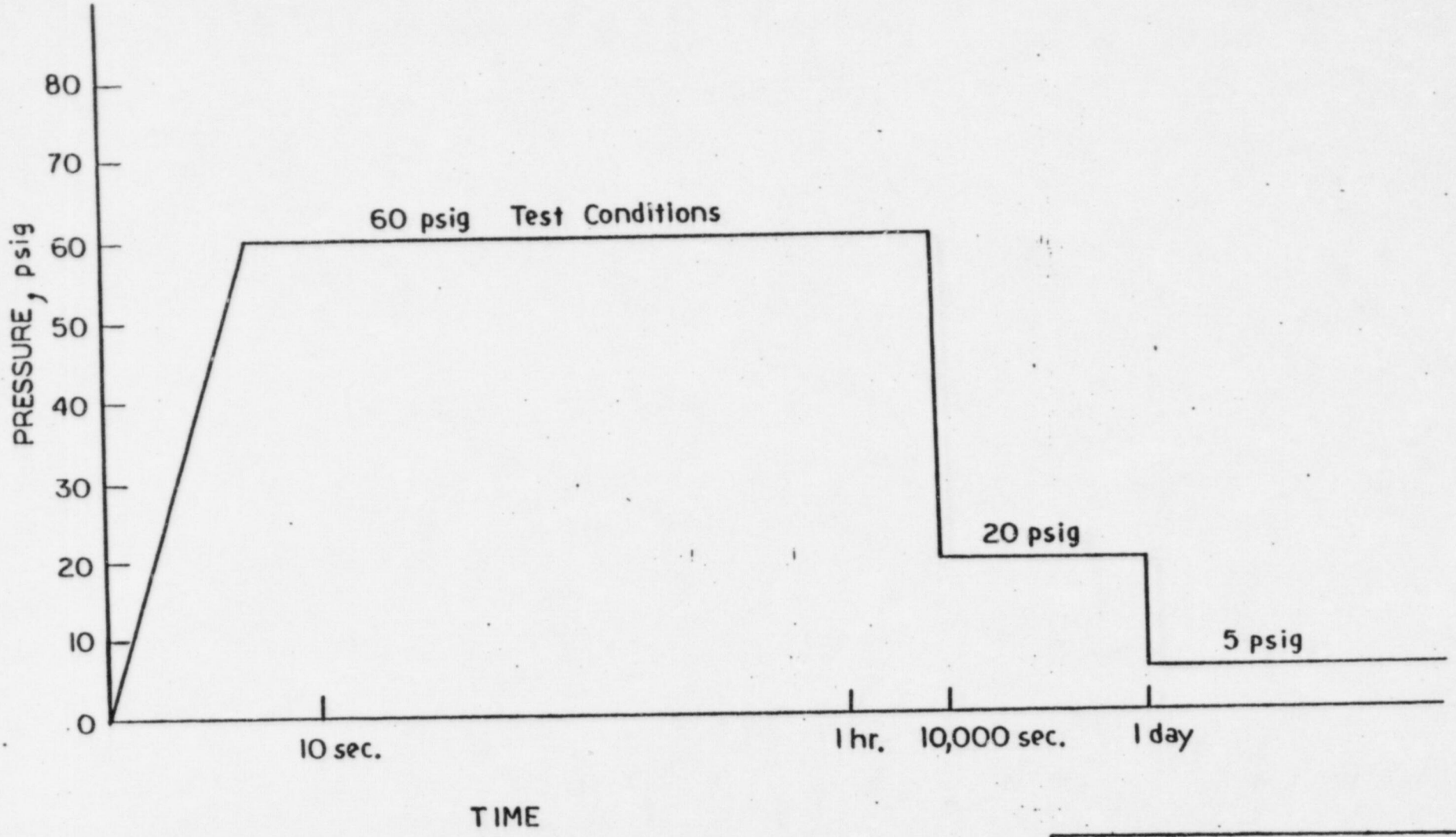
*Required for Initiation Only

(September 1978)

Equipment	Manufacturer	Type (Model No.)	Qualification Citation
5. Electrical Penetrations	General Electric	NS02/03/04	Record Numbers 663081-18, 19 & 20 FSAR Paragraph 3.11.3-6
6. Electrical Cables			
	Continental	Silicon/Silicon	Continental Test Report CC-2193S (3/71)
	Boston	Silicon/Hypalon	Record Number 663359-20
	Raychem	Stilan	Raychem memo on LOCA Testing at Franklin Institute Labs (2/10/75)
	Okonite	Tefzel	Record Number 663359-69
	Boston	Silicon Glass Briad/ Kapton/Hypalon	PG&E Engineering Research Test Report LSS-1586 (3/5/71)
7. Electrical Terminations	Raychem	Sealed Splice	Franklin Institute Report #F-C 4033-3 (1/75) FSAR Paragraph 3.11.3-5
8. Stem Mounted Limit Switches	Namco	EA180	Acme Cleveland Report (3/3/78)
9. Containment Isolation Solenoid Valves	ASCO	8300 8302 8316* 8321*	FSAR Paragraph 3.11.3-3
Class IE Equipment Outside Containment - Subject to High energy Line Break			
1. Electrical Cables	Raychem	Flamtrol	Raychem Test Report EM 1030 (9/24/74)
	Okonite	EPR/Okolan (Hypalon)	Okonite Test Report (10/14/74)
2. Feedwater Flow Sensors	Fischer and Porter	10B2496PBBA	7410-L
3. Main Steam Line Pressure	Fischer and Porter	50EP1041BCX	WCAP 7410-L
4. Aux. Feedwater Isolation Valve Motor Operators	Limitorque	SMC-04	

*Special valves with all plastic parts replaced with stainless steel or brass parts to withstand higher temperatures.



UNITS 1 AND 2
DIABLO CANYON SITE

FIGURE 3.11-1
ENVIRONMENTAL CONDITIONS FOR
EQUIPMENT TESTING - PRESSURE
AS A FUNCTION OF TIME

ATTACHMENT 3

The following quotation is contained in Safety Evaluation Report, Supplement No. 9, dated June 13, 1980 (page 7-1).

"Environmental Qualification - Class IE Equipment Exposed to Severe Environments

In SER Supplement 7 we required the applicant to furnish a listing of all BOP and NSSS safety-realted equipment that may be required to function under severe environmental conditions. This list was to identify the equipment, its manufacturer, its model number, its location, and a specific reference to its qualification report. We reviewed FSAR Table 3.11-1A which lists this equipment and provides the requested information. We find this response acceptable."