September 7, 1988

Docket No. 50-289

DISTRIBUTION
Docket File
NRC & Local PDRs
Gray File
SVarga
BBoger
SNorris
RHernan
OGC
EJordan
BGrimes
ACRS(10)

Mr. Henry D. Hukill, Vice President
and Director - TMI-1
GPU Nuclear Corporation
P. O. Box 480
Middletown, Pennsylvania 17057

Dear Mr. Hukill:

SUBJECT: RESOLUTION OF VARIOUS TMI-1 APPENDIX R ISSUES (TAC NOs. 64951 AND 68331)

This letter transmits the NRC staff's Safety Evaluation regarding a number of outstanding issues relating to compliance with 10 CFR Part 50, Appendix R at your facility. The evaluation concludes that a) Revision 9 to the TMI-1 Fire Hazards Analysis Report is acceptable to the staff, b) the Exemption issued by the staff on March 19, 1987 requiring fire watches in case of loss of HVAC is no longer necessary and the fire watches may be secured, c) GPU Nuclear has provided sufficient information to justify a new Appendix R exemption on letdown valve circuits, and d) additional information is needed for the staff to complete its review of safe shutdown methodology.

The staff will shortly issue an exemption to Section III.G.2 of Appendix R with regard to physical separation of circuitry associated with certain valves in the reactor coolant letdown system.

Your expeditious response to our enclosed request for additional information will assist the staff's timely closeout of remaining appendix R issues.

The reporting and/or recordkeeping requirements contained in this letter affect fewer than 10 respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

original signed by

Ronald W. Hernan, Senior Project Manager
Project Directorate I-4
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

Enclosures:
1. Safety Evaluation Report
2. Technical Evaluation Report dated July 19, 1988
3. Technical Evaluation Report dated August 24, 1988
4. Request for Additional Information

cc w/enclosures:
See next page

LA:PDI-4	PM:PDI-4	D:PDI-4
SNorris	RHernan:cb	JStolz for
09/7/88	09/07/88	09/7/88

8809150222 880907
PDR ADOCK 05000289
F PNU

DF01

Mr. Henry D. Hukill
GPU Nuclear Corporation

Three Mile Island Nuclear Station,
Unit No. 1

cc:

G. Broughton
O&M Director, TMI-1
GPU Nuclear Corporation
Post Office Box 480
Middletown, Pennsylvania 17057

Richard J. McGoey
Manager, PWR Licensing
GPU Nuclear Corporation
100 Interpace Parkway
Parsippany, New Jersey 70754

C. W. Smyth
TMI-1 Licensing Manager
GPU Nuclear Corporation
Post Office Box 480
Middletown, Pennsylvania 17057

Ernest L. Blake, Jr., Esq.
Shaw, Pittman, Potts & Trowbridge
2300 N Street, N.W.
Washington, D.C. 20037

Larry Hochendoner
Dauphin County Commissioner
Dauphin County Courthouse
Front and Market Streets
Harrisburg, Pennsylvania 17120

David D. Maxwell, Chairman
Board of Supervisors
Londonderry Township
RFD#1 - Geyers Church Road
Middletown, Pennsylvania 17057

Richard Conte
Senior Resident Inspector (TMI-1)
U.S.N.R.C.
Post Office Box 311
Middletown, Pennsylvania 17057

Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, Pennsylvania 19406

Robert B. Borsum
Babcock & Wilcox
Nuclear Power Generation Division
Suite 525
1700 Rockville Pike
Rockville, Maryland 20852

Governor's Office of State Planning
and Development
ATTN: Coordinator, Pennsylvania
State Clearinghouse
Post Office Box 1323
Harrisburg, Pennsylvania 17120

Thomas M. Gerusky, Director
Bureau of Radiation Protection
Pennsylvania Department of
Environmental Resources
Post Office Box 2063
Harrisburg, Pennsylvania 17120

Docketing and Service Section
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

METROPOLITAN EDISON COMPANY

JERSEY CENTRAL POWER & LIGHT COMPANY

PENNSYLVANIA ELECTRIC COMPANY

GPU NUCLEAR CORPORATION

THREE MILE ISLAND NUCLEAR STATION, UNIT NO. 1

DOCKET NO. 50-289

1.0 INTRODUCTION

The following safety evaluation provides documentation of the staff's acceptance of information provided by GPU Nuclear regarding various Appendix R issues at Three Mile Island Unit 1 (TMI-1) and approval to discontinue a previously-established fire watch program dealing with loss of ventilation concerns.

2.0 EVALUATION

2.1 FIRE HAZARDS ANALYSIS REPORT REVISION 9

By letter dated October 27, 1987, GPU Nuclear, the licensee, submitted Revision 9 to the Fire Hazards Analysis Report (FHAR) for Three Mile Island Nuclear Station, Unit 1. This Revision includes a number of modifications which have resulted from an extensive design verification effort by the licensee. As stated by the licensee, Revision 9 represents the "as built condition of TMI-1." Also, Revision 9 includes a number of modifications involving the addition of references to GPUN and NRC correspondence concerning the justification and subsequent acceptance of exemptions to 10 CFR Part 50 Appendix R and deviations from Appendix A to APCSB 9.5-1. In addition, the FHAR has been modified to specify where certain fire barriers may not be completely rated or contain some non-rated feature but have been analyzed to provide adequate protection. This type of analysis is allowed by Generic Letter 86-10 and the non-rated features included in Revision 9 have generally been evaluated in previous NRC Safety Evaluation Reports.

The FHAR revision has been reviewed by Science Applications International Corporation (SAIC), under contract to the NRC, and has been found to be in compliance with NRC guidelines. The details of the review are discussed in Enclosure 2, which is the Technical Evaluation Report (TER) prepared by SAIC. The staff concurs with the TER findings and concludes that the changes to the fire protection program identified by the licensee in Revision 9 are acceptable.

2.2 FIRE-RELATED LOSS OF HEATING, VENTILATION AND AIR CONDITIONING (HVAC)

In February 1987, the licensee requested approval of an exemption to the technical requirements of Section III.G. of Appendix R to 10 CFR Part 50 to the extent that HVAC may be lost during a fire in several plant areas. The staff granted this exemption by letter dated March 19, 1987. By

8809150224 880907
PDR ADOCK 05000289
F PNU

letter dated May 5, 1988 the licensee stated that the exemption is no longer needed on the basis that the loss of ventilation would not adversely affect safe shutdown systems. This letter included test data to support the licensee's conclusion. The staff reviewed this letter and expressed concern that the licensee's justification may not be sufficiently conservative. The licensee responded to these concerns by letters dated August 5 and 17, 1988 and during a meeting held in Rockville, Maryland on July 14, 1988.

The licensee's submittals included calculations using the TSAP code consistent with the NRC-approved NUMARC 8700 approach and actual TMI-1 test data for 18 different fire areas. Most of these areas were within the control building complex, which includes the control room. The analyses were made on an area-by-area basis and compared to the temperature limitations for the electrical or electronic equipment actually located in each area. The control room, for example, contains electronic equipment with a maximum temperature rating of 104°F whereas other areas contain only electrical switchgear (117°F rating), inverters (120°F rating) or station batteries (rated in excess of 130°F). The licensee has also made the point that exceeding these temperature ratings on a short-term basis would not be expected to cause immediate degradation or failure of the equipment contained in those areas. Finally, the licensee has in place procedures and equipment for providing temporary ventilation to areas affected by loss of HVAC although credit was not taken for these measures to demonstrate that temperature ratings would not be exceeded.

The details of the staff's review are contained in Sections 2.0 and 3.0 of the enclosed TER (Enclosure 3). The TER concludes that the provision of a roving fire watch in areas where ventilation may be lost due to a fire are no longer necessary. This conclusion is based upon the evaluations provided by the licensee that, with some manual actions, the maximum temperatures achieved in areas where ventilation may be lost will not exceed the maximum rated operating temperature of components required for safe shutdown. The staff agrees with this conclusion. Therefore, Section III.2 of the Exemption to 10 CFR Part 50, Appendix R, Section III.G.2 issued by the staff on March 19, 1987 is hereby cancelled and the fire watches required by that exemption are no longer needed.

2.3. Appendix R Exemption for Letdown Valve Circuits

By Letter dated May 21, 1988, the licensee requested approval of an exemption from the technical requirements of Section III.G. of Appendix R to the extent that it requires that redundant shutdown-related systems be separated by a distance of at least 20 feet, free of intervening combustibles in an area protected by automatic fire detection and suppression systems. The subject of this exemption request is the ability to isolate flow (and pressure) from the reactor coolant system to the low-pressure portion of the reactor coolant letdown system. Flow can be isolated by remote operation of valves MU-V-2A and MU-V-2B, MU-V-3 , or MU-V-4 and MU-V-5. If all three series valves or combinations of two valves were inoperable because of fire damage in fire areas AB-FZ-4 or FH-FZ-1, overpressurization of the low-pressure letdown piping could

result. Although the separation between the wiring for these three combinations of valves is much greater than 20 feet, there is fixed intervening combustibles in the form of cables in trays.

The details of the staff's review of this request as contained in Section 4.0 of the enclosed TER (Enclosure 3). The TER concludes that the level of protection provided in Fire Zones AB-FZ-4 and FH-FZ-1 has been found to be equivalent to that called for in Section III.G.2 of Appendix R. Specifically, the intervening combustibles between redundant Letdown Isolation Valve circuits have been found not to present a level of safety less than that called for in Appendix R. The staff agrees with this conclusion and will issue a formal exemption as a separate licensing action.

2.4 Remaining Review of TMI-I Appendix R Issues

The licensee submitted a detailed letter (Letter No. 5211-87-2028 dated February 10, 1987) in response to Generic Letter 81-12 dealing largely with revised safe shutdown methodology. SAIC, under contract to the NRC, has nearly completed the review of this submittal. During the intervening time period, revisions to the on-site fire emergency procedures and the FHAR have been made. In order to complete its review, SAIC has submitted a number of additional questions which the staff is hereby submitting to the licensee. Timely response to these questions (Enclosure 4) will enable the staff and its contractor to complete its Appendix R review for TMI-1 in a relatively short period.

3.0 Conclusions

Based on the above, the staff has made the following conclusions:

1. Revision 9 to the TMI-1 FHAR is acceptable.

2. The fire watches required by Section III.2 of the staff's March 19, 1987, Appendix R Exemption are no longer necessary.

3. The staff will issue an Appendix R exemption as requested by the licensee regarding letdown valves.

4. Additional information is necessary from the licensee in order to complete our review of the TMI-1 safe shutdown methodology and the remaining Appendix R issues.

Dated: September 7, 1988

Principal Contributor: Ronald W. Hernan

ENCLOSURE 2

SAIC-88/3013

TECHNICAL EVALUATION REPORT
REVIEW OF FIRE HAZARDS ANALYSIS REPORT, REVISION 9
THREE MILE ISLAND NUCLEAR STATION, UNIT 1

TAC No. 64951

July 19, 1988

Science Applications International Corporation

Prepared for:

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Contract NRC-03-87-029
Task Order No. 3

Post Office Box 1303, 1710 Goodridge Drive, McLean, Virginia 22102, (703) 821-4300

8807270214 4pp

TECHNICAL EVALUATION REPORT

REVIEW OF FIRE HAZARDS ANALYSIS REPORT, REVISION 9
THREE MILE ISLAND NUCLEAR STATION, UNIT 1

By letter dated October 27, 1987, GPU Nuclear, the licensee, submitted Revision 9 to the Fire Hazards Analysis Report (FHAR) for Three Mile Island Nuclear Station, Unit 1. This Revision includes a number of modifications which have resulted from an extensive design verification effort by the licensee. As stated by the licensee, Revision 9 represents the "as built condition of TMI-1." Also, Revision 9 includes a number of modifications involving the addition of references to GPU and NRC correspondence concerning the justification and subsequent acceptance of exemptions to 10CFR50 Appendix R and deviations from Appendix A to APCSB 9.5-1. In addition, the FHAR has been modified to specify where certain fire barriers may not be completely rated or contain some non-rated feature but have been analyzed to provide adequate protection. This type of analysis is allowed by Generic Letter 86-10 and the non-rated features included in this revision have generally been evaluated in previous NRC Safety Evaluation Reports.

The bulk of the changes in Revision 9 of the FHAR represent deletions of information which was redundant within the report. These deletions were significant enough to represent a substantial reduction in the volume of the FHAR. However, changes in technical information or technical approach were made which primarily relate to either general safe shutdown methodology or clarify and/or correct specific information such as time required for manual actions. A change relating to methodology is the addition of HPI as a method for decay heat removal. Another inclusion is the reference to a study of associated circuits by Gilbert Commonwealth dated March 17, 1987. This study was submitted to the NRC on March 20, 1987 to address unresolved issues dealing with associated circuits and is still under review by the NRC.

The number of areas where alternate shutdown is required was increased from three to four. This was the result of the addition of area CB-FA-1, Health Physics and Lab Area, as an area where the requirements of Section III.G.2 of Appendix R cannot be achieved and in the case of CB-FA-1, it only applies

to valve operations associated with reactor coolant pump seal cooling restoration.

Revision 9, Section 3.13 was revised to include additional information relating to plant design modifications which were necessary to prevent spurious operations of equipment in the event of a fire. Section 3.14 of the FHAR is a discussion of all exemption requests from the requirements of 10CFR50 Appendix R. This section has been modified in Revision 9 to include the disposition by the NRC in a letter dated March 19, 1987.

Section 4 of the FHAR is an area by area analysis of the plant. Changes to this section include the reference to applicable exemptions and addition of manual actions within the area. Some area analyses include changes to fire barrier ratings such as the identification of non-rated hatches within a rated barrier. These changes have been reviewed and been found not to affect any previous conclusions in NRC SERs and are therefore acceptable.

Section 4a of the FHAR is a tabular report of combustible loadings within each area. These numbers are used to establish combustible loadings within an area as "low," "moderate" or "high." Revision 9 incorporates changes in combustible loading since the last revision. These changes would then be reflected in the area by area analyses if applicable. Section 4 has been reviewed to ensure that no changes in combustible loading have been made which would effect previous conclusions made by the NRC in previous SERs.

Attachment 3 to the FSAR contains extensive tables identifying safe and alternate shutdown equipment, necessary manual actions and time to perform these actions. This attachment has a number of modifications in Revision 9, primarily to reflect results of plant walkdowns and design verifications. These changes include such items as changes in valve numbers and type. A significant number of changes concern manual actions such as time for the action and clarification of the action. Although these changes appear to be acceptable, no evaluation relating to the effect of these changes on the previous safe shutdown methodology has been performed by this review and no review has been made to assure that these modifications have been incorporated into current plant procedures.

With the exception of the items mentioned which have not been reviewed, the modifications made in Revision 9 to the FHAR have been evaluated and found to be in compliance with NRC Staff Guidelines and are therefore acceptable.

ENCLOSURE 3

SAIC-88/1810

TECHNICAL EVALUATION REPORT
THREE MILE ISLAND 1
EVALUATION OF FIRE-RELATED LOSS OF HVAC AND EXEMPTION REQUEST FROM 10CFR50 APPENDIX R

TAC No. 64951

August 24, 1988

SAIC
Science Applications International Corporation

Prepared for:

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Contract NRC-03-87-029
Task Order No. 3

Post Office Box 1303, 1710 Goodridge Drive, McLean, Virginia 22102, (703) 821-4300

8809020073 19 pp

TABLE OF CONTENTS

Section			Page
1.0	INTRODUCTION		1
2.0	FIRE-RELATED LOSS OF HVAC		1
	2.1	General	1
	2.2	Intermediate Building	3
		2.2.1 Discussion	3
		2.2.2 Evaluation	5
		2.2.3 Conclusion	6
	2.3	Diesel Generator Building	7
		2.3.1 Discussion	7
		2.3.2 Evaluation	8
		2.3.3 Conclusion	9
	2.4	Nuclear Services and Decay Heat Closed Cycle Cooling Water Pump Room	9
		2.4.1 Discussion	9
		2.4.2 Evaluation	10
		2.4.3 Conclusion	10
	2.5	Control Building	11
		2.5.1 Discussion	11
		2.5.2 Evaluation	12
		2.5.3 Conclusion	13
3.0	CONCLUSIONS		14
4.0	EXEMPTION REQUEST FROM 10CFR50 APPENDIX R		15
	4.1	Exemption Requested	15
		4.1.1 Discussion	15
		4.1.2 Evaluation	16
		4.1.3 Conclusion	16

TECHNICAL EVALUATION REPORT
THREE MILE ISLAND 1
EVALUATION OF FIRE-RELATED LOSS OF HVAC AND EXEMPTION REQUEST FROM 10CFR50 APPENDIX R

1.0 INTRODUCTION

By letters dated February 28, 1987 and October 16, 1987 GPU Nuclear Corporation, the licensee for Three Mile Island Generating Station, Unit 1 (TMI-1) submitted a request for exemption from Appendix R to 10CFR50 to the extent that HVAC may be lost during a fire for the Control Building, Emergency Feedwater Pump Rooms, Diesel Generator Building and Nuclear Services and Decay Heat Closed Cycle Cooling Pump Room. The NRC accepted this exemption based on the establishment of a twenty minute roving fire watch in areas where HVAC could be lost. By letter dated May 5, 1988 GPU withdrew the request for exemption on the basis that loss of ventilation would not affect safe shutdown systems. The May 5, letter contained an evaluation including test data to support the Licensee's conclusions. Based on a preliminary evaluation of this information, a meeting was held with the Licensee on July 14, 1988 to discuss issues of concern. The Licensee responded by letter dated August 5, 1988 to issues of concern remaining at the end of the July 14 meeting.

This evaluation provides a review of the original submittal and of documentation submitted in the August 5, 1988 response to issues of concern. Additionally, this evaluation provides a review of a request for exemption from 10CFR50 Appendix R, submitted by the licensee on May 21, 1988.

2.0 FIRE-RELATED LOSS OF HVAC

2.1 General

The submittal provided by GPUN concluded that for two of the areas of concern; Emergency Feedwater Pump Room and Nuclear Service Pump Room, the maximum temperature reached after loss of ventilation, remained below the maximum operating temperature of safe shutdown required components in the area. For the other two areas of concern; Diesel Generator Building and

Control Building, GPUN concluded that with several manual actions, the temperature could be maintained below the maximum allowable temperature given a fire caused loss of HVAC. These conclusions were based on a combination of analysis and actual test data.

The analysis was performed using a computer program called Transient System Analysis Program (TSAP). This program is designed to address heat transfer problems by solving a series of simultaneous differential equations for a model developed by the user. The model is comprised of inputs representing thermal capacitances of heat sources, heat sinks and surrounding air. Heat transfer mechanisms primarily include conduction and convection, although, radiation was considered in some cases. Heat sinks such as steel were represented in the model as single slabs. Steel coated with fire proofing was represented as two slabs to depict the insulating effect. Concrete was represented as a two slab system to better model the thermal gradient effect in thick concrete walls and floor/ceiling assemblies. An assumption was made that room air was well mixed thus producing a uniform temperature throughout the area being analyzed.

Heat sources for each area were obtained from vendor data, calculation and engineering estimates of heat output. Mass information needed to calculate heat sinks was estimated for duct work, cable trays, equipment supports and structural beams. Mass data from concrete was calculated using dimension data from layout drawings. The mass of equipment in the area was not considered with respect to heat absorption.

After the computer analysis was used to produce a temperature profile for each area of concern, a series of field tests were performed to validate the analysis. These tests consisted of shutting off the ventilation for a subject area and recording the temperature rise using from 10 to 24 thermocouples. The test durations varied from 1 1/2 hours for the Control Building , 2 hours each for the Intermediate Building and Diesel Generator Building, and 21 hours for the Nuclear Service Pump Room. Data for each of the areas was then compared with the analytical temperature profiles. In all cases, the analytical profiles produced higher maximum temperatures than that represented by tests. The Licensee concluded that for two areas, the Intermediate Building and the Nuclear Service and Decay Heat Closed Cycle Cooling Pump Room, the actual temperature response curve of the areas was

represented by test data. For the Control Building temperature response, the License concluded that the test data validated the computer analysis and therefore the test data was extrapolated out to 72 hours to achieve an endpoint temperature. The Licensee performed a "best fit" comparison for the Diesel Generator Building and then extrapolated that curve out to 72 hours.

Based on this analysis, the Licensee concluded that several manual actions were required to maintain the area temperatures below that which is required. For the Diesel Generator Building, opening several doors allowed for the introduction of outside air sufficient enough to maintain the necessary temperature. Opening a door to an inverter room in the Control Building would maintain that room at an acceptable temperature. For the Control Room, it was concluded that shutting off a portion of the normal lighting would reduce the heat load sufficiently to maintain the allowable temperature without effecting operator ability to perform Control Room Functions.

The overall conclusion by the Licensee is that with the implementation of several manual actions, the loss of ventilation did not effect the ability of the plant to achieve shutdown as the result of a fire.

2.2 Emergency Feedwater Pump Rooms (Intermediate Building)

2.2.1 Discussion

A fire in one of Zones CB-FA-1, CB-FA-2d, CB-FA-2f, CB-FA-3d, CB-FA-4b and IB-FZ-3 may cause the loss of air handling units AH-E-24A and 24B located in Zone IB-FZ-3. One unit normally provides heating and cooling to the Emergency Feedwater Pump Rooms, IB-FZ-2 and IB-FZ-3. Each unit is designed to maintain the rooms at or below 115^{0} F. Fire Zone IB-FZ-3 contains motor driven emergency feedwater pumps, instrument air compressors, backup air storage tanks and related valves and instrumentation. Steam driven pump room, Fire Zone IB-FZ-2, contains the steam driven emergency feedwater pump, atmospheric steam dump valves, backup air storage tanks and related valves and instrumentation.

The steam-driven pump is not required for two hours after a fire in IB-FZ-3 due to the reliance on HPI for initial heat removal. For a fire in IB-FZ-3, all other emergency feedwater and main steam components would be required outside of that zone. Instrument air provided by the compressors is not required for safe shutdown because local air bottles are provide at necessary safe shutdown components. (This was submitted as an exemption request and accepted by the NRC in a separate evaluation.) Manual actions associated with Zones IB-FZ-2 and IB-FZ-3 consist of manually starting the steam driven pump, manipulating the atmospheric steam dump valves and emergency feedwater valves.

The emergency feedwater pump motors are rated for full load at 122° F. Associated valves have a maximum rated temperature of 150° F. Flow transmitters are rated for continuous operation at 250° F. The steam driven pump is rated for 115° F continuous operation, although, it was stated in the July 16 meeting that this was a "design basis temperature" for the steam driven pump and that there was no actual upper limit temperature rating for the pump.

The computer analysis discussed previously produced a maximum temperature for the emergency feedwater rooms of 125° F. The Licensee performed a loss of ventilation test with all three emergency feedwater pumps operating in recirculation mode and with the instrument air compressor in operation. The test was performed for two hours with temperatures recorded every five minutes. The maximum temperature recorded during the test at the floor level was 111.8° F. The ceiling in the steam driven pump room produced a maximum ceiling temperature of 119.1° F. The maximum temperature at the end of 72 hours, at floor level, was predicted by the Licensee to be 113° F. The Licensee concluded that outside ambient air temperature does not effect inside air temperature for this area and therefore no adjustment is needed. It was also stated in the submittal that since all three emergency feedwater pumps in the area, in addition to the air compressor, were in operation, the heat load for the test was higher than an actual Appendix R shutdown condition in which at least one of the pumps and the air compressor would not be needed. Since the high temperature of 119° F was near the ceiling the Licensee concluded that this was not near any necessary components and therefore did not present a problem. The Licensee also concluded that the temperatures at the end of the two hour test represented maximum or peak

temperatures since the temperature had "stabilized". Temperature exposure limits for plant personnel performing the required manual actions were reviewed and found to be acceptable based on existing plant heat stress procedures. The Licensee concluded for this area that equipment design limitations would not be exceeded nor access by plant personnel be prevented.

2.2.2 Evaluation

The Licensee's evaluation for this area was found to be conservative with respect to heat load, since the actual equipment required operating during an emergency shutdown would be less than that analyzed for. However, there were several concerns with the conclusions made by the Licensee in the submittal. First, there was a concern with the assumption made that outside ambient air had no effect on inside air temperature. Outside air may effect the rate of heat transfer through the walls and may also cause a higher initial temperature, since river water used as the heat sink for air handler heat exchangers could possibly be much higher than on test day, thereby causing the air handlers to be less efficient. Second, there was a concern with the conclusion that the temperatures had stabilized at the end of the two hour period without ventilation and it was also not readily apparent from the submittal how the test data produced a maximum predicted temperature of 113° F. These concerns were discussed with the Licensee during a meeting on July 16, 1988.

The Licensee responded to the Staff concerns by letter dated August 5, 1988. The Licensee stated that the air handler units were designed to maintain acceptable room temperatures with emergency feedwater pumps in an operational mode resulting from an emergency condition. Thus, with pumps normally not running the air handlers would have excess capacity and would be capable of maintaining the area cool even with high outside temperatures and high river water temperatures. This would provide for initial room temperatures which would not be significantly different than test day start temperatures. The Licensee also stated that a large portion of the surrounding walls of the emergency feedwater rooms are in contact with the earth, specifically, The floor slab and a minimum of ten vertical feet of wall area on three sides. Since the temperature of the earth is relatively constant, the heat sink provided by heat transfer through the concrete to

the earth, would be relatively constant year round. Based on this additional information, there is agreement with the Licensee's conclusion that higher outside air temperatures would have little effect on the temperature profiles for loss of ventilation produced for this area.

With respect with the conclusion that the temperatures at the end of the test had stabilized and that the peak temperature would be 113° F, the Licensee performed a re-analysis of their calculations. In their August 5, 1988 letter, the Licensee agreed that the use of the word "stabilized" did not represent an accurate characterization of the temperature profile. The Licensee stated that although floor temperatures had leveled off at the end of the test, ceiling temperatures were continuing to rise but at a decreasing rate. The Licensee provided additional analyses accounting for the heat output of the pumps. Since flow rates would be continually decreasing after five minutes into an event, the heat output of the motors would be decreasing as a result of decreasing motor horsepower. The Licensee also provided additional analyses to account for natural convective heat transfer resulting from airflow in, through open doorways, and out, through openings to higher elevations. In the new analyses, the Licensee stated that the peak temperature for the area would be 117° F with a final 72 hour temperature of 114° F. These revised conclusions were reviewed and found to provide reasonable assurance that room temperatures would not be significantly higher than predicted. Since there is approximately 5° F between the maximum predicted temperature and the lowest continuously operating rated temperature, there is room for some margin of error, providing additional assurance that temperature limits would not be exceeded. It is also recognized that while maximum continuous temperature ratings are being used for evaluation purposes, it is unlikely components fail when temperatures rise slightly above rated limits. This would provide for additional conservatism for the Licensee's analysis.

2.2.3 Conclusion

Based on the evaluation above, the Licensee's conclusions that fire related loss of ventilation for the emergency feedwater rooms, would not cause the areas to exceed temperature limits of safe shutdown components and therefore not effect safe shutdown capability, are found to be acceptable. Providing roving firewatches for this area is therefore not found to be necessary in

order to achieve a level of safety equivalent with that provided through compliance with 10CFR50 Appendix R.

2.3 Diesel Generator Building

2.3.1 Discussion

Ventilation to the Diesel Generator Buildings would be interrupted as a result of loss of air handling units AH-E-29A and 29B. These units may fail due to a fire in Fire Areas CB-FA-1, CB-FA-2d, CB-FA-2f, CB-FA-3d, CB-FA-4b, IB-FZ-3, IB-FZ-5, and DG-FA-2. The Diesel Generator Building contains Diesel Generators A and B, the Instrument Air System and the Two Hour Backup Instrument Air System (2HBUIA). One diesel generator is required for shutdown during a loss of offsite power condition. Air System 2HBUIA is required for operation of control valves for emergency shutdown. The Instrument Air System is not required for safe shutdown.

The Electrical Equipment Rooms in the Diesel Generator Building contain relay cabinets associated with the generators. The cabinet are designed in accordance with IEEE 313-1971 and are designed to withstand an ambient air temperature of 131° F. The Licensee has verified that all components in the cabinet have temperature limits in excess of 131° F. These cabinets are forced ventilated with ambient air and therefore would not be significantly effected by loss of ventilation in the area.

The Licensee stated in the submittal that discussions with the diesel generator manufacturer have provided assurance that the diesel generators would operate satisfactorily with room temperatures at or below 120° F. The Licensee also states that all other shutdown components in the diesel generator rooms have operability limits at or above 120° F.

The computer analysis of the Diesel Generator Building identified a maximum temperature of 158° F if the air handling units are lost. The Licensee performed an actual loss of ventilation test for each of the diesel generator rooms. For each test, the diesel generator was started and fully loaded to 3 MW. The test was run for two hours with temperature recordings every fifteen minutes. The test results were then adjusted to account for an ambient air temperature of 95° F to correspond to a "design day". After

this adjustment was made the profiles were extrapolated out to 72 hours. The resulting peak temperatures were 123° F for Diesel Generator Room A and 140° F for Diesel Generator Room B. The Licensee accounts for the discrepancies in the analysis temperature, and the predicted temperature based on test data, due to the additional ventilation resulting from the radiator fans drawing in cooling air from areas outside of the Diesel Generator Building. The Licensee stated that the predicted maximum temperature for Room B was higher than room A as a result of restricted air flow into the room. In order to maintain the room temperatures at an acceptable level, the Licensee proposes to manually open doors to the Diesel Generator Rooms including an outside roll-up door in the adjacent shop area and a outside walk through door to the Diesel Generator Building. This would have the effect of increasing air flow through the diesel rooms and thus reducing the maximum predicted temperatures. The Licensee included calculations which conclude that the increased air flow would maintain the maximum temperatures for both diesel rooms below 120° F.

2.3.2 Evaluation

The Licensee concluded that with the manual actions of opening doors into the Diesel Generator Building, maximum component temperature limits would not be exceeded. The submittal states that performing these manual actions within one hour would be sufficient to provide the necessary added cooling. Based on the calculations provided, these actions are found to be reasonable and would provide a significant amount of cooling. Since plant personnel would monitor diesel generator performance locally if they were operating, initiating the manual actions of opening several doors to the diesels or immediately adjacent to the diesel rooms, should not provide an additional burden on operations personnel in an emergency. The location of the doors with respect to a fire necessitating opening of doors was reviewed during the July 14, 1988 meeting with the Licensee. No fire which would cause loss of the air handling units in question, would also require the subject doors for protection of redundant safe shutdown components. The Licensee also performed the test with the diesels fully loaded. Since the diesels would operate at less than fully loading during an Appendix R shutdown scenario, based on information provided in the submittal, the additional heat generated during the test would provide for conservative results. A concern was raised during the meeting that a maximum temperature of 95° F was used

for analysis purposes and that actual ambient temperatures could be as much as 7 or 8 degrees higher. Based on discussions with the Licensee, it is agreed that conservatism included in the analysis coupled with the increased air flow resulting from opening doors, would account for higher than design day temperatures.

2.3.3 Conclusion

Based on the evaluation above, there is reasonable assurance that with the manual actions of opening selected doors, the maximum peak temperature reached in the Diesel Generator Building after loss of ventilation, will not exceed the maximum rated temperatures of safe shutdown components in the area. Therefore, roving firewatches would not be required to achieve a level of protection equivalent to that achieved by compliance with Appendix R to 10CFR50.

2.4 Nuclear Services and Decay Heat Closed Cycle Cooling Water Pump Room

2.4.1 Discussion

The loss of air handling units AH-E-15A and AH-E-15B would effect the ventilation for the Nuclear Service Closed Cycle Cooling Water Pumps, NS-P-1A, 1B and 1C; Intermediate Cooling Pumps IC-P-1A and 1B: Intermediate cooling Valve IC-V-4; and Decay Heat Closed Cycle Cooling Water Pumps DC-P-1A and DC-P-1B. The Fire Area Zones where both air handling units may fail due to fire damage are AB-FZ-7, CB-FA-1, CB-FA-2d, CB-FA-2f, CB-FA-3b, CB-FA-3c, CB-FA-3d and CB-FA-4b.

The limiting temperature for components in the areas of concern is 104^{0} F for the pump motors. This temperature limit is based on a continuously operating rating and is the temperature, above which, the life of the motor insulation begins to be reduced.

The Licensee performed a loss of ventilation test for the pump room for a period of 21 hours. The test was performed with the plant in normal operation with two Nuclear Service Pumps and one Intermediate Cooling Pump in operation. An Appendix R shutdown requires one Nuclear Services Pump or Decay Heat Pump, and one Intermediate Cooling Pump in operation.

The test showed that the the maximum increase between the beginning of the test and the end of the test was 7.8° F with the highest temperature rise being 13.6° F in the Intermediate Cooling Pump Area. This produced a peak temperature of 99° F. The Licensee concluded in the submittal that outside ambient air temperatures did not effect the inside air temperature profiles under loss off ventilation.

2.4.2 Evaluation

The test data is considered to provide conservative results with respect to heat load since one additional pump was running compared to a safe shutdown condition. A concern was raised during the July 14, 1988 meeting regarding the conclusion that outside air temperatures would not effect inside temperature profiles. The Licensee responded by letter dated August 5, 1988 and included information related to this issue. The Licensee agreed that the outside air temperature during the test was below normal for that time. However, the Licensee stated that recent inside temperatures were recorded in the area of concern of 90° F, when the outside air was 100° F. This inside temperature corresponds to initial temperatures on test day. Since no outside air is introduced into the room during a loss of ventilation condition, it is agreed that outside temperatures would not significantly effect inside temperature profiles. The Licensee's submittal provides reasonable assurance that loss of ventilation would not cause inside temperatures to exceed the maximum rated temperatures of safe shutdown components.

2.4.3 Conclusion

Based on the evaluation above, it is concluded that loss off ventilation for the Nuclear Services and Decay Heat Closed Cycle Cooling Pump Room would not jeopardize the operability of safe shutdown components. Therefore, the assignment of roving firewatches is no longer necessary to achieve a level of safety provided by compliance with Appendix R to 10CFR50.

2.5 Control Building

2.5.1 Discussion

The Control Building contains a number of components required to achieve safe shutdown including both trains of the class 1E electrical system and redundant vital instrumentation. The Control Building contains redundant air handling components, however air is distributed throughout the building in common ductwork. Fires in certain locations may actuate fire dampers in the ductwork and/or may cause the inoperability of control dampers. The Licensee's submittal contains a matrix identifying which location of fires, effects specific safe shutdown components. Fourteen rooms containing safe shutdown components could be subject to loss of ventilation under different fire scenarios. The lowest temperature limit for vital components is 104° F for switchgear and related electrical components. Temperature limits vary from this low to a high of 158° F for certain lighting panels. The maximum limit for the Control Room is 104° F based on the rating of the Control Switchboard.

The Licensee performed a loss of ventilation test for the fourteen rooms in question for a period of 1 1/2 hours. Although the computer generated profiles predicted higher temperatures than the test data, the profiles essentially paralleled each other. Based on this, the Licensee used the computer profiles to extrapolate the test data out to 72 hours. The Licensee revised the maximum predicted temperatures given in the May 5, 1988 submittal, by letter dated August 5, 1988. The Licensee stated that the initial computer analysis used constant concrete thicknesses which may vary from actual dimensions. The result would be a slightly less conservative heat transfer profile. The revised analysis accounted for actual concrete dimensions and revised temperatures were provided.

Based on this analysis, the Licensee predicted that the maximum peak temperatures for two areas, Control Room and Room CB-FA-2d which contains inverters and electrical distribution equipment, exceed the temperature limits of components in the area. For these areas the Licensee proposes manual actions to maintain the temperature at acceptable levels. For the Control Room, deenergizing half of the normal Control Room lighting is proposed. The Licensee states that this action will reduce the heat load

sufficiently to maintain the temperature below 102° F and will not impair the ability of Control Room Operators to perform their function. For the inverter room, the Licensee proposes opening a door to increase convective heat transfer.

The Licensee's analysis also predicts that several rooms containing switchgear will achieve temperatures equivalent to the continuous rated temperature of the switchgear. The Licensee concludes that this is acceptable since the analysis is conservative and that it is unlikely that switchgear would fail when the air temperature slightly exceeded the continuous operating rating. The Licensee included a discussion of the ANSI allowance for operating electrical components above their rated temperatures under unusual circumstances.

2.5.2 Evaluation

Review of the Licensee's analysis of Control Building rooms generated several issues of concern. Specifically, since fires within this area could cause loss of ventilation within the same fire areas, the Licensee did not appear to account for the heat produced by the fire itself. Also, the conclusion that a reduction in 1/2 the Control Room lighting would reduce the temperatures to acceptable levels was questioned. Finally, a concern was raised regarding the maximum temperatures in some levels being the same as the maximum component ratings and whether this provided for a "margin of safety".

By letter dated August 5, 1988 the Licensee provided an analysis which accounted for the heat transfer to areas adjacent to areas where a fire caused loss of ventilation may occur, and also for the effect of heat transfer between two areas which are not separated by 3-hr. fire rated barriers. The Licensee concluded that in both cases the temperature profiles would not be significantly affected. This analysis was reviewed in detail and was found to provide reasonable assurance that the heat output of a fire would would not significantly change the temperatures as predicted in the original submittal. This letter also contained further explanation of the calculations used to obtain the heat input of the Control Room lighting and subsequent reduction in temperature. This information was reviewed and found to provide reasonable assurance that the values used for Control Room

heat inputs were conservative and that predicted temperatures would likely bound actual conditions.

During the meeting of July 14,1988 the Licensee was informed that the Control Building temperature analyses did not appear to have a margin of safety included since some rooms achieved temperatures equivalent to the temperature ratings of components within the room. At this meeting, the Licensee identified the existing capability of ensuring the operation of the Control Building Ventilation System with portable ventilation equipment including fans and flexible ductwork. A concern was expressed that this stand-by equipment may not be monitored, therefore, no assurance of its availability or reliability existed nor was there assurance that plant personnel would be capable of operating the system. By letter dated August 17, 1988, the Licensee stated that procedures existed covering the implementation of the portable Control Building Ventilation System and that equipment was provided in the Fire Equipment Locker in the Turbine Building and in the Operations Pump Cage. With this additional information, it is concluded that the capability to provide an alternate means of Control Building ventilation provides assurance that component temperature ratings would not be exceeded and that temperatures could be maintained below that which are predicted for a loss of ventilation with no back-up.

2.5.3 Conclusion

Based on the evaluation above, and with the manual actions identified, it is concluded that maximum temperatures achieved in the Control Building would not exceed component operating limits. Additionally, it is concluded that the provisions for portable ventilation capabilities for the Control Building provide an adequate margin of safety and ensure that safe shutdown components will remain operable. Therefore, the requirement of a roving fire watch in the Control Building is not necessary to provide a level of safety equivalent to that achieved by compliance with Appendix R to 10CFR50.

3.0 CONCLUSIONS

Based on the evaluations in the report, the provision of a roving fire watch in areas where ventilation may be lost due to a fire, identified below, are no longer necessary. This conclusion is based on the evaluations provided by the Licensee which adequately demonstrate that with some manual actions, the maximum temperatures achieved in areas where ventilation may be lost, will not exceed the maximum rated operating temperature of components required for safe shutdown.

Emergency Feedwater Pump Rooms (Intermediate Building)
Diesel Generator Building
Nuclear Services and Decay Heat Closed Cycle Cooling Pump Room
Control Building

4.0 EXEMPTION REQUEST FROM 10CFR50 APPENDIX R

4.1 Exemption Requested

An exemption is requested from the requirements of Section III.G.2 of 10CFR50 Appendix R to the extent that it requires redundant safe shutdown components to be separated by 20 feet with no intervening combustibles.

4.1.1 Discussion

Fire Zones AB-FZ-4 and FH-FZ-1 contain circuits which if damaged by fire, could prevent letdown isolation from the control room. Valves MU-V-2A and 2B, or MU-V-4 and 5, or MU-V-3 can be used to isolate letdown. Although redundant valves exist which allow for letdown isolation, a situation can be postulated in which spurious opening of valve MU-V-5 concurrent with the loss of intermediate cooling to the letdown coolers could result in damage to the low pressure portion of the letdown system.

Fire Zone AB-FZ-4 is on elevation 281' of the Auxiliary building. Fire Zone FH-FZ-1 is on elevation 281' of the Fuel Handling Building. Both zones contain redundant circuitry for letdown isolation valves. In Fire Zone AB-FZ-4, circuits associated with valve MU-V-5 are approximately 40 ft. from cable trays containing MU-V-2A and MU-V-2B. In Fire Zone FH-FZ-1, circuits associated with valve MU-V-3 are 36 ft. from the trays containing MU-V-2A and 2B circuits. The space between the redundant valve combinations contains intervening combustibles in the form of cable trays in both fire zones.

Both fire zones contain area wide smoke detection which alarms in the Control Room. Both zones are provided with area wide suppression covering the floor area and cable trays. Portable fire extinguishers and hose reels are provided throughout both zones. The combustible loading in both zones is less than one hour in equivalent time as compared with the ASTM E119 Time-Temperature Curve.

4.1.2 Evaluation

Fire Zones AB-FZ-4 and FH-FZ-1 are not in compliance with Section III.G.2 of Appendix R to 10CFR50 since redundant Letdown Isolation circuits are not separated by a distance of 20 feet or greater which is free of intervening combustibles.

However, both areas are provided with detection and suppression in accordance with Section III.G.2 of Appendix R. The intervening combustibles between the redundant circuits are in the form of cables, which if ignited, would be expected to initially burn slowly with limited heat release. The detection provided in both zones would be expected to notify the Control Room of any fire in the zones. Control Room Operators would dispatch the plant fire brigade which would use available extinguishers and hose reels to control the fire. In addition, the automatic suppression provided in both zones gives reasonable assurance that a fire could not travel between redundant letdown isolation valve circuits. Therefore, the current configuration of Fire Zones AB-FZ-4 and FH-FZ-1, including the installed fire protection features, provides a level of protection equivalent to that of Section III.G.2 of Appendix R.

4.1.3 Conclusion

Based on the evaluation above, the level of protection provided in Fire Zones AB-FZ-4 and FH-FZ-1 has been found to be equivalent to that called for in Section III.G.2 of Appendix R. Specifically, the intervening combustibles between redundant Letdown Isolation Valve circuits have been found not to present a level of safety less than that called for in Appendix R. This exemption should therefore be granted.

ENCLOSURE 4

REQUEST FOR ADDITIONAL INFORMATION (RAI) FROM REVIEW OF TMI-1 10CFR 50 APPENDIX R SUBMITTAL LETTERS 5211-87-2028 AND 5211-87-2034 FEBRUARY 10, 1987

1. This submittal refers to Revision 26 of procedure EP 1202-31 and Revision 7 of the TMI-1 FHAR. GPUN has since submitted Revision 27 of EP 1202-31 and Revision 9 of the TMI-1 FHAR. Discuss the effect that these latest revisions has on this submittal on Generic Letter 81-12 and alternate safe shutdown.

2. In TMI-1 EP 1202-37 Revision 28 page 5.0 item 9d, quantitatively define a "sustained loss of seal injection" in terms of actual time. Who will make the decision to trip the RCPs ? Also, on page 6.0 of this procedure item 11m, what is the physical indication that RC-V-1 has failed open ?

3. In your submittal 5211-87-2028 dated February 10, 1987 (page 7 in your response to item 8G) provide a schedule for performing adequate acceptance tests of alternate shutdown capability.

4. In Table 3 of 5211-87-2028, for fire area CB-FA-3c, two manual actions are identified as required within 30 and 45 minutes. These are open IC-V-3 in area CB-FA-2d and close DH-V-5A in area AB-FZ-5. These two areas are the Control Building 322' East Inverter Room and the Auxiliary Building 281' General Area. Provide a manpower-time study to show that sufficient manpower is available to perform these two manual valve actions within the required time limit for a fire in CB-FA-3c.

5. On Page 11 of 5211-87-2028, item 1d refers to three GPUN letters to the NRC. The following questions apply to these letters.

   GPUN letter 5211-87-2013 states that an overcurrent protection study of the B train of the 1E buses is applicable to the A train "because both trains were designed, installed, and maintained to the same standards for identical loads." In comparing these two trains, was the identical equipment (i.e. model, manufacturer, response characteristics,etc.) used for the same functions. If not, evaluate any effects on train similarity of such differences.