

January 13, 2006

Mr. Christopher M. Crane  
President and CEO  
AmerGen Energy Company, LLC  
200 Exelon Way, KSA 3-E  
Kennett Square, PA 19348

SUBJECT: THREE MILE ISLAND STATION, UNIT 1 - NRC TRIENNIAL FIRE  
PROTECTION INSPECTION REPORT 05000289/2005012

Dear Mr. Crane:

On December 15, 2005, the NRC completed a triennial fire protection team inspection at your Three Mile Island Station, Unit 1. The enclosed report documents the inspection results which were discussed at an exit meeting on December 15, 2005, with Mr. Rusty West and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, the NRC identified one finding of very low safety significance (Green) that was a violation of NRC requirements. However, because of the very low safety significance and because it is entered into your corrective action program, the NRC is treating this finding as a non-cited violation (NCV) consistent with Section VI.A.1 of the NRC Enforcement Policy. If you contest the NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001 with copies to the Regional Administrator Region I, the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001, and the NRC Resident Inspector at the Three Mile Island Station.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the

Mr. Christopher M. Crane

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Sincerely,

*/RA/*

John F. Rogge, Chief  
Engineering Branch 3  
Division of Reactor Safety

Docket No. 50-289  
License No. DPR-50

Enclosure: NRC Inspection Report 05000289/2005012

cc w/encl:

Chief Operating Officer, AmerGen  
Site Vice President - TMI Unit 1, AmerGen  
Plant Manager - TMI, Unit 1, AmerGen  
Regulatory Assurance Manager - TMI, Unit 1, AmerGen  
Senior Vice President - Nuclear Services, AmerGen  
Vice President - Mid-Atlantic Operations, AmerGen  
Vice President - Operations Support, AmerGen  
Vice President - Licensing and Regulatory Affairs, AmerGen  
Director Licensing - AmerGen  
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Vice President - General Counsel and Secretary, AmerGen  
T. O'Neill, Associate General Counsel, Exelon Generation Company  
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Chairman, Board of County Commissioners of Dauphin County  
Chairman, Board of Supervisors of Londonderry Township  
R. Janati, Director, Bureau of Radiation Protection, State of PA  
J. Johnsrud, National Energy Committee  
E. Epstein, TMI-Alert (TMIA)  
D. Allard, PADER

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DATE	01/06/2006	01/01/2006	01/05/2006	01/13/2006	

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U.S. NUCLEAR REGULATORY COMMISSION

REGION I

Docket No. 05000289

License No. DPR-50

Report No. 05000289/2005012

Licensee: AmerGen Energy Company, LLC (AmerGen)

Facility: Three Mile Island Station, Unit 1

Location: P. O. Box 480  
Middletown, PA 17057

Dates: November 28, 2005 - December 16, 2005

Inspectors: L. Cheung, Senior Reactor Inspector, DRS  
K. Young, Senior Reactor Inspector, DRS  
P. Finney, Reactor Inspector, DRS  
S. Lewis, Reactor Inspector, DRS

Approved by: John F. Rogge, Chief  
Engineering Branch 3  
Division of Reactor Safety

## SUMMARY OF FINDINGS

IR 05000289/2005012 on 11/28/2005 - 12/15/2005, Three Mile Island (TMI) Station, Unit 1; Triennial Fire Protection Team Inspection, Fire Protection.

This report covered a two-week triennial fire protection team inspection by four Region I specialist inspectors. One Green NCV was identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

### A. NRC-Identified Findings

Cornerstone: Initiating Events

- Green. The team identified a non-cited violation (NCV) with multi-examples for failure to document fire prevention activities during hot work as required by the administrative control procedures, and for fire watch personnel not being adequately qualified. Specifically: 1) there were numerous cases where hot workers, fire watch personnel, and associated supervisors failed to document, as required, the hot work, fire watching and inspection activities respectively in accordance with OP-MA-201-004, Fire Prevention for Hot Work, and AP-1038, and Administrative Control - Fire Protection Program; and, 2) there were three cases where the fire watchers were not adequately trained as required by the procedures. The licensee generated three condition reports and entered this issue into their corrective action program.

The finding is more than minor because it is associated with the Initiating Events Cornerstone attribute of protection against external factors and affected the cornerstone objective of limiting the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Under Manual Chapter 0609, Significance Determination Process, Appendix F, Fire Protection, the finding was found to represent a low degradation and as such was of very low safety significance in accordance with the Fire Protection Significance Determination Process. The cause of the finding is related to the cross-cutting element of human performance (attention to detail) because hot work personnel repetitively failed to follow procedural instructions in the documentation of their hot work activities. (Section 1R02)

### B. Licensee-Identified Violations

None

## REPORT DETAILS

### Background

This report presents the results of a triennial fire protection inspection conducted in accordance with NRC Inspection Procedure (IP) 71111.05T, "Fire Protection." The objective of the inspection was to assess whether AmerGen Energy Company, LLC, has implemented an adequate fire protection program and that post-fire safe shutdown capabilities have been established and are being properly maintained at the Three Mile Island (TMI) Station, Unit 1. Four plant areas that included the following fire zones (FZs) and fire areas (FAs), were selected for detailed review based on risk insights from the TMI Individual Plant Examination (IPE)/Individual Plant Examination of External Events (IPEEE):

- CFire Area CB-FA-2e
- CFire Area CB-FA-3b
- CFire Area CB-FA-4b
- CFire Zone AB-FZ-2a

The inspection team evaluated the AmerGen Energy's fire protection program (FPP) against applicable requirements which include plant Technical Specifications, Operating License Condition 2.C.4, NRC Safety Evaluations, 10 CFR 50.48 and 10 CFR 50 Appendix R. The team also reviewed related documents that include the Updated Final Safety Analysis Report (UFSAR), Section 9.9, and the Fire Hazards Analysis Report (FHAR).

Specific documents reviewed by the team are listed in the attachment.

## **2. REACTOR SAFETY**

Cornerstones: Initiating Events, Mitigating Systems

### 1R05 Fire Protection

#### .01 Post-Fire Safe Shutdown From Outside Main Control Room (Alternative Shutdown) and Normal Shutdown

##### a. Inspection Scope

##### Methodology

The team reviewed the safe shutdown analysis, operating procedures, piping and instrumentation drawings (P&IDs), electrical drawings, the UFSAR and other supporting documents to verify that hot and cold shutdown could be achieved and maintained from outside the control room for fires that rely on shutdown from outside the control room. This review included verification that shutdown from outside the control room could be performed both with and without the availability of offsite power. Plant walkdowns were also performed to verify that the plant configuration was consistent with that described in

Enclosure

the FHAR. These inspection activities focused on ensuring the adequacy of systems selected for reactivity control, reactor coolant makeup, reactor decay heat removal, process monitoring instrumentation and support systems functions. The team verified that the systems and components credited for use during this shutdown method would remain free from fire damage. The team verified that the transfer of control from the control room to the alternative shutdown location(s) would not be affected by fire-induced circuit faults (e.g., by the provision of separate fuses and power supplies for alternative shutdown control circuits).

Similarly, for fire areas that utilize shutdown from the control room, the team also verified that the shutdown methodology properly identified the components and systems necessary to achieve and maintain safe shutdown conditions.

### Operational Implementation

The team verified that the training program for licensed and non-licensed operators included alternative shutdown capability. The team also verified that personnel required for safe shutdown using the normal or alternative shutdown systems and procedures are trained and available onsite at all times, exclusive of those assigned as fire brigade members.

The team reviewed the adequacy of procedures utilized for post-fire shutdown and performed an independent walk through of procedure steps to ensure the implementation and human factors adequacy of the procedures. The team also verified that the operators could be reasonably expected to perform specific actions within the time required to maintain plant parameters within specified limits. Time critical actions which were verified included restoration of AC electrical power, establishing the remote shutdown panel, and establishing decay heat removal.

Specific procedures reviewed for alternative shutdown, including shutdown from outside the control room included the following:

C	OP-TM-EOP-020,	Cooldown From Outside of Control Room, Rev. 5
C	OP-TM-AOP-001-C2E,	Fire in "B" Inverter Room, Rev. 0
C	OP-TM-AOP-001-C3B,	Fire in 1E 4160V Switchgear Room, Rev. 0
C	1104-45P,	Fire Mitigation, Rev. 20

The team reviewed manual actions to ensure that they had been properly reviewed and approved and that the actions could be implemented in accordance with plant procedures in the time necessary to support the safe shutdown method for each fire area. The team also reviewed the periodic testing of the alternative shutdown transfer capability and instrumentation and control functions to ensure the tests are adequate to ensure the functionality of the alternative shutdown capability.

### b. Findings

No findings of significance were identified.

## .02 Protection of Safe Shutdown Capabilities

### a. Inspection Scope

The team reviewed the fire hazards analysis, safe shutdown analyses and supporting drawings and documentation to verify that safe shutdown capabilities were properly protected. The team ensured that separation requirements of Section III.G of 10 CFR 50, Appendix R were maintained for the credited safe shutdown equipment and their supporting power, control and instrumentation cables. This review included an assessment of the adequacy of the selected systems for reactivity control, reactor coolant makeup, reactor heat removal, process monitoring, and associated support system functions.

The team reviewed AmerGen Energy's procedures and programs for the control of ignition sources and transient combustibles to assess their effectiveness in preventing fires and in controlling combustible loading within limits established in the Fire Hazard Analysis (FHA). A sample of hot work and transient combustible control permits were also reviewed. The team performed plant walkdowns to verify that protective features were being properly maintained and administrative controls were being implemented.

The team also reviewed AmerGen Energy's design control procedures to ensure that the process included appropriate reviews and controls to assess plant changes for any potential adverse impact on the fire protection program and/or post-fire safe shutdown analysis and procedures.

### b. Findings

Introduction. The team identified a Green NCV regarding the documentation of hot work activities and the qualification of fire watch personnel under AmerGen Energy's fire protection program.

Description. The team reviewed a sample of completed hot work permits (HWP) and requested additional samples based on the discovery of issues. Of 33 total HWPs reviewed, the hot work activities for six permits were conducted during full power operation while those for the remaining 27 were conducted during the recent refueling outage. Numerous cases of failures to meet the procedural requirements of OP-MA-201-004, Fire Prevention for Hot Work, were identified. The deficiencies identified for the six HWPs conducted during full power were: three cases where the documented fire watch durations did not envelope the total hot work durations, three cases where the hot worker did not document the hot work duration and one case where the supervisor did not sign the HWP within 24 hours of the hot work activity. The deficiencies identified for the 27 HWPs conducted during the recent plant outage were: 14 cases where the documented fire watch durations did not envelope the total hot work durations, two cases where the hot worker did not document the hot work durations, three cases where the supervisor did not sign the HWP and document the inspection within 24 hours of the hot work activities, one case where the question in Section 2 of the HWP for possible



vertical fire spread should have been answered 'yes' (instead of "no") because the hot work involved possible slag falling to the floor below, causing the hot work supervisor to fail to forward the hot work permit to the Fire Marshal for review and approval, and three cases where the fire watch personnel were not qualified (not adequately trained).

Exelon procedure OP-MA-201-004, Fire Prevention for Hot Work, establishes the responsibilities and tasks to be performed by hot workers, their associated supervisors and fire watch personnel. Paragraph 4.6.6 of the procedure requires the hot worker to complete section IV of the HWP, including recording date and time of each activity, upon completion of the hot work. Paragraph 4.6.5 of the procedure requires the hot work supervisors to complete Section III of the HWP (inspect each hot work site initially and every 24 hours thereafter to ensure that fire prevention precautions are still established and record the date and time of the activities performed). Paragraph 4.6.7 of the procedure requires the fire watch personnel to: 1) complete section V of the HWP prior to starting the activity, whenever the fire watch is suspended then restarted following breaks, and whenever the fire watch duty is turned over to another individual; and, 2) record the starting and ending date and time of the fire watch. If the question in Section 2 of the hot work permit (for possible vertical fire spread) is answered "yes," paragraph 4.6.1.2 of the procedure requires the hot work supervisor to forward the hot work permit to the Fire Marshal for review and approval. Section V of the HWP also requires the fire watchers to be trained to use portable extinguishers. In addition, paragraph 4.15.1 of procedure AP-1038, Administrative Control - Fire Protection Program, requires personnel assigned fire watch duties to complete an annual hot work fire watch training program. Contrary to these requirements, there were numerous cases where hot workers failed to document the hot work duration, supervisors failed to document their hot work area inspections, fire watch personnel failed to properly document the duration of their fire watch activities, and fire watch personnel were not properly trained to perform their duties. These performance deficiencies represent a failure to implement the hot work permit program and its associated hot work record keeping.

Analysis. Hot work fire watches serve as a fire detection mechanism and an effective means of preventing hot work fires. The early detection and suppression of an incipient fire reduces the maximum heat release rate achieved. NFPA 51B-2003, Fire Prevention During Welding, Cutting and Other Hot Work, Annex B states that hot work performed improperly is a major cause of fire.

The finding described above is more than minor because it is associated with the Initiating Events Cornerstone attribute of protection against external factors and affected the cornerstone objective of limiting the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. This finding was determined to be of very low safety significance (Green, as discussed below) because the likelihood that a fire might occur, or that a fire which does occur and might not be promptly suppressed is remote. In Manual Chapter 0609, the Significance Determination Process (SDP) Phase 1 screening worksheet for Initiating Events Cornerstone refers fire prevention degradation to Appendix F, Fire Protection

SDP, which only applies to activities during power operations (involving seven cases of violations associated with hot work record keeping as discussed above). Attachment 2 to Appendix F classifies violations associated with hot work record keeping as low degradation items. According to the guidance provided in the phase 1 qualitative screening (step 1.3.1) of Appendix F, this finding can be screened to Green.

For the cases of violations associated with hot work record keeping that occurred during the plant outage, the finding did not meet the prerequisites for the use of Manual Chapter 0609 Appendix F and therefore falls under regional branch chief review in accordance with Manual Chapter 0612, 05.04.C. Since these cases are similar to those that occurred during power operations, these cases are treated as additional examples to the finding described above. The team also determined that the cause of this finding is related to the personnel aspect of human performance (attention to detail) cross-cutting area because hot work personnel repetitively failed to follow procedural instructions in the documentation of their hot work activities.

Enforcement. License condition 2.C(4) requires that AmerGen implement and maintain in effect all provisions of the Fire Protection Program as described in the Updated Final Safety Analysis Report (UFSAR). Section 9.9.2 of the UFSAR identifies Administrative Procedure AP-1038 as the procedure establishing TMI Unit 1 Fire Protection Program functions. Procedure AP-1038 section 5.19.1 directs fire watch personnel to provide fire protection in support of work involving open flames, welding and grinding in accordance with procedure OP-MA-201-004. Procedure OP-MA-201-004 paragraphs 4.6.5 through 4.6.7 requires the hot workers, hot work supervisors, and fire watch personnel to document the dates and time of the hot work activities on the HWPs. Section V of the HWP also requires the fire watch personnel to be trained to use portable extinguishers. In addition, paragraph 4.15.1 of administrative procedure AP-1038 requires personnel assigned fire watch duties to complete an annual hot work fire watch training program. Contrary to these requirements, there were numerous cases where hot workers failed to document the hot work duration, supervisors failed to document their hot work area inspections, fire watch personnel failed to properly document the duration of their fire watch activities, and fire watch personnel were not properly trained to perform their duties. The licensee issued condition reports ARs 399726, 428991 and 429891 and entered these deficiencies into their corrective action program. This violation is being treated as a Non-Cited Violation (NCV), consistent with Section VI.A.1 of the NRC Enforcement Policy. **(NCV 05000289/2005012-01) Failure to Implement Hot Work Procedural Requirements.**

### .03 Passive Fire Protection

#### a. Inspection Scope

The team walked down accessible portions of the selected fire areas to observe material condition and the adequacy of design of fire area boundaries (including walls, fire doors and fire dampers) to ensure they were appropriate for the fire hazards in the area.

The team reviewed installation/repair and qualification records for a sample of penetration seals to ensure the fill material was of the appropriate fire rating and that the installation met the engineering design.

b. Findings

No findings of significance were identified.

.04 Active Fire Protection

a. Inspection Scope

The team reviewed the design, maintenance, testing and operation of the fire detection and suppression systems in the selected plant fire areas. This included verification that the manual and automatic detection and suppression systems were installed, tested and maintained in accordance with the National Fire Protection Association (NFPA) code of record, or as NRC approved deviations, and that they would control and/or extinguish fires associated with the hazards in the selected areas. A review of the design capability of suppression agent delivery systems was verified to meet the code requirements for the fire hazards involved. The team also performed a walkdown of accessible portions of the detection and suppressions systems in the selected areas as well as a walkdown of major system support equipment in other areas (e.g., fire protection pumps, Carbon Dioxide (CO<sub>2</sub>) storage tanks and supply system) and assess the material condition of the systems and components.

The team reviewed electric and diesel fire pump flow and pressure tests to ensure that the pumps were meeting their design requirements. The team also reviewed the fire main loop flow tests to ensure that the flow distribution circuits were able to meet the design requirements.

The team also assessed the fire brigade capabilities by reviewing training and qualification records, and drill critique records. The team also reviewed pre-fire plans and smoke removal plans for the selected fire areas to determine if appropriate information was provided to fire brigade members and plant operators to identify safe shutdown equipment and instrumentation, and to facilitate suppression of a fire that could impact post-fire safe shutdown. In addition, the team inspected the fire brigade's protective ensembles, self-contained breathing apparatus (SCBA), and various fire brigade equipment (including smoke removal equipment) to determine operational readiness for fire fighting.

b. Findings

No findings of significance were identified. An observation for the review of fire pump tests was discussed in Section 4OA2.01.

.05 Protection From Damage From Fire Suppression Activities

a. Inspection Scope

The team performed document reviews and plant walkdowns to verify that redundant trains of systems required for hot shutdown are not subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems. Specifically, the team verified that:

- C A fire in one of the selected fire areas would not directly, through production of smoke, heat or hot gases, cause activation of suppression systems that could potentially damage all redundant trains.
- C A fire in one of the selected fire areas (or the inadvertent actuation or rupture of a fire suppression system) would not directly cause damage to all redundant trains (e.g., sprinkler caused flooding of other than the locally affected train).
- C Adequate drainage is provided in areas protected by water suppression systems.

b. Findings

No findings of significance were identified.

.06 Alternative Shutdown Capability

a. Inspection Scope

Alternative shutdown capability for the areas selected for inspection utilizes shutdown from outside the control room and is discussed in Section 1R05.01 of this report.

.07 Circuit Analyses

a. Inspection Scope

The team verified that the licensee performed a post-fire safe shutdown analysis for the selected fire areas and that the analysis appropriately identified the structures, systems and components important to achieving and maintaining post-fire safe shutdown. Additionally, the team verified that AmerGen Energy's analysis ensured that necessary electrical circuits were properly protected and that circuits that could adversely impact safe shutdown due to hot shorts, shorts to ground or other failures were identified, evaluated and dispositioned to ensure spurious actuations would not prevent safe shutdown.

The team's review considered fire and cable attributes, potential undesirable consequences and common power supply/bus concerns. Specific items included the

credibility of the fire threat, cable insulation attributes, cable failure modes, spurious actuations, actuations resulting in flow diversion or loss of coolant events.

The team also reviewed wiring diagrams and routing lists for a sample of components required for post-fire safe shutdown to verify that cables were routed as described in the cable routing matrices.

Cable failure modes were reviewed for the following components:

- C MU-P-1B, Make-up Pump "B"
- C MU-P-1C, Make-up Pump "C"
- C MU-V-14A, Make-up Valve
- C MU-V-16A, Make-up Valve
- C LI-777, Pressurizer Level Instrument
- C PI-949, Pressurizer Pressure Instrument
- C LI-776A, OTSG Level Instrument

The team reviewed circuit breaker coordination studies to ensure equipment needed to conduct post-fire safe shutdown activities would not be impacted due to a lack of coordination. The team confirmed that coordination studies had addressed multiple faults due to fire. Additionally, the team reviewed a sample of circuit breaker maintenance and records to verify that circuit breakers for components required for post-fire safe shutdown were properly maintained in accordance with procedural requirements.

b. Findings

No findings of significance were identified.

.08 Communications

a. Inspection Scope

The team reviewed safe shutdown procedures, the post-fire safe shutdown analysis and associated documents to verify an adequate method of communications would be available to plant operators following a fire. During this review, the team considered the effects of ambient noise levels, clarity of reception, reliability and coverage patterns. The team also inspected the designated emergency storage lockers to verify the availability of portable radios for the fire brigade. The team also verified that communications equipment such as repeaters, transmitters, etc. would not be affected by a fire.

b. Findings

No findings of significance were identified.

.09 Emergency Lighting

a. Inspection Scope

The team observed the placement and coverage area of eight-hour emergency lights, and in specified locations permanent essential lighting, throughout the selected fire areas to evaluate their adequacy for illuminating access and egress pathways and any equipment requiring local operation and/or instrumentation monitoring for post-fire safe shutdown. The team also verified that the battery power supplies were rated for at least an 8-hour capacity. Preventive maintenance procedures and various documents, including the vendor manuals and completed surveillance tests were reviewed to ensure adequate surveillance testing and periodic battery replacements were in place to ensure reliable operation of the eight-hour emergency lights and that the emergency lighting units were being maintained consistent with the manufacturer's recommendations and accepted industry practices.

b. Findings

No findings of significance were identified.

.10 Cold Shutdown Repairs

a. Inspection Scope

The team verified that AmerGen Energy had dedicated repair procedures, equipment, and materials to accomplish repairs of components required for cold shutdown, which might be damaged by the fire to ensure cold shutdown could be achieved within the time frames specified in their design and licensing bases. The team verified that the repair equipment, components, tools and materials (e.g., pre-cut cables with prepared attachment lugs) were available and accessible onsite.

b. Findings

No findings of significance were identified.

.11 Compensatory Measures

a. Inspection Scope

The team verified that compensatory measures were in place for out-of-service, degraded or inoperable fire protection and post-fire safe shutdown equipment, systems, or features (e.g., detection and suppression systems and equipment, passive fire barriers, pumps, valves or electrical devices providing safe shutdown functions or capabilities). The team also verified that the short term compensatory measures compensated for the degraded function or feature until appropriate corrective action

could be taken and that AmerGen Energy was effective in returning the equipment to service in a reasonable period of time.

b. Findings

No findings of significance were identified.

**4. OTHER ACTIVITIES**

4OA2 Identification and Resolution of Problems

.01 Corrective Actions for Fire Protection Deficiencies

a. Inspection Scope

The team verified that the licensee was identifying fire protection and post-fire safe shutdown issues at an appropriate threshold and entering them into the corrective action program. The team also reviewed a sample of selected issues to verify that the licensee had taken or planned appropriate corrective actions.

The team reviewed condition report AR 00175664 dated September 14, 2003, which documented an issue that the fire system capability test on September 13, 2003, for the fire pumps failed to meet the acceptance criteria prescribed in Procedure 3303-A2, Fire System Main Header Flush and Loop Test. Specifically, the measured flow was 1800 gpm which is less than the required flow (the acceptance criteria) of 2575 gpm. AmerGen completed an operability evaluation (OPE-03-025) and determined that the degraded condition would not affect the post-fire safe shutdown function of the fire system, because a significant portion of the prescribed 2575 gpm was for a fire in the cooling towers, which was not required for safe shutdown. AmerGen completed another test on September 2, 2004. Again the measured flow (2200 gpm) was less than the required flow. This deficient condition (inadequate flow) was covered by the original operability evaluation. AmerGen completed a third test on October 13, 2005, under an interim procedure change to include a device for more accurate flow measurement, and obtained a flow of 3420 gpm at 96 psig. This flow exceeded the acceptance criteria of 2575 gpm but fell short of the required 100 psig pressure. The licensee was able to provide a basis that 96 psig at the measuring point would not affect the fire system's post-fire safe shutdown capability.

b. Findings

No findings of significance were identified.

While the failure to meet the acceptance criteria for the fire system's tests during the past three years did not affect the system's post-fire safe shutdown function, the system was in non-compliance with the UFSAR. The UFSAR states that the fire suppression water system piping is "sized and arranged to transport 2575 gpm to the most remote

deluge system plus 1000 gpm to hoses with a minimum residual pressure of 100 psi at the most remote deluge system.” Historically, the successful performance of the fire system’s test bounds both the post-fire safe shutdown requirements and those for general property protection. AmerGen generated condition report AR 433847 to resolve this non-compliance issue.

#### 4OA4 Cross-Cutting Aspects of Findings

Section 1R05 described a finding of numerous cases where hot workers failed to document the hot work duration, supervisors failed to document their hot work area inspections, fire watch personnel failed to properly document the duration of their fire watch activities, and fire watch personnel were not properly trained to perform their duties. The cause of this finding was related to the personnel aspect of human performance (attention to detail) cross-cutting area because hot work personnel repetitively failed to follow procedural instructions in the documentation of their hot work activities.

#### 4OA6 Meetings, Including Exit

##### Exit Meeting Summary

The team presented their preliminary inspection results to Mr. Rusty West, Site Vice President, and other members of the site staff at an exit meeting on December 15, 2005. No proprietary information was included in this inspection report.

ATTACHMENT: SUPPLEMENTAL INFORMATION



**SUPPLEMENTAL INFORMATION**

**KEY POINTS OF CONTACT**

AmerGen Energy Personnel

J. Banett, Maintenance  
D. Barry, Systems Engineer  
G. Chick, Plant Manager  
E. Eilola, Director, Engineering  
D Hull, I&C Engineer  
W. McSorley, Operator  
R. Myers, Fire Marshall  
D. Palaferro, System Manager  
C. Pragman, Corporate Fire Protection Program Manager  
S. Queen, Senior Manager, Plant Engineering  
L. Rajkowski, Fire Protection Program Engineering  
W. Reiley, Reactor Operator  
R. Sieglitz, System Engineer  
C. Shorts, Electrical Power & Instrumentation  
L Terrazas, Fire Protection Engineer  
R. West, Site Vice President  
T. Wickel, Senior Manager, Design Engineering

PA Department of Environment Protection

M. Murphy, Engineer

NRC

J. Brand, Resident Inspector, TMI, Unit 1  
D. Kern, Senior Resident Inspector, TMI Unit 1  
J. Rogge, Chief, Engineering Branch 3, Division of Reactor Safety

**LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

Opened

NONE

Open and Closed

05000289/2005012-01	NCV	Failure to Implement Hot Work Procedural Requirements (Section 1R05.02)
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Closed

None

Discussed

None

### LIST OF DOCUMENTS REVIEWED

#### Fire Protection Licensing Documents

990-1745	TMI 1 Fire Hazards Analysis Report, Revision 22
990-2591	Conduit Fire Protection Research Program – Final Report
NFPA 12-1973	Standard on Carbon Dioxide Extinguishing Systems
NFPA 10-1973	Standard for Portable Fire Extinguishers
NFPA 80-1999	Standard for Fire Doors and Fire Windows
NFPA 51B-2003	Standard for Fire Prevention During Welding, Cutting, and Other Hot Work

TMI Technical Specifications, Unit 1 Amendment 219  
Exemption, Fire Protection for TMI-1, December 30, 1986  
Exemption, Fire Protection for TMI-1 March 19, 1987  
Resolution of Various TMI-1 Appendix R Issues, September 7, 1988  
SER, Fire Protection Exemptions and Revised SE of the Safe Alternate Shutdown Capability  
Three Mile Island Nuclear Station Unit No. 1, December 30, 1986

#### Calculations/Engineering Evaluation Reports

C-1101-735-5350-002	TMI 1 120V Vital AC Coordination Study, Revision 2
C-1101-732-5350-005	TMI1 Protective Relay Class 1E Switchgear, Revision 1
C-1101-733-5350-003	TMI1 Class 1E 480 V Unit Substations Setting for Conversion to Solid State Trip Unit, Revision 3
G/C 2734	TMI 1 Review of Associated Circuits for 10CFR50, Appendix R, Revision 0
C-1101-662-5350-045	Full Range OTSG Level Loop Accuracy, Revision 1
C-1101-629-5350-003	TMI 1 Temperature Compensated Pressurizer Level Loop Accuracy, Revision 1
I-5360-212-007	TMI To BWST to RB Sump Draw Down Time, June 23, 1982

#### Procedures

E-63	UPS Diesel Start Battery Inspection/Replacement, Rev. 8
E-75	UPS Inverter Storage Batteries, Rev. 10
E-76	UPS Inverter Storage Batteries, Rev. 10
E-78	Preventive Maintenance Procedure, Rev. 10

A-3

OP-TM-AOP-001	Fire, Rev. 0
OP-TM-AOP-001	
-C3B	Fire in 1E ES 4160V Switchgear Room, Rev. 0
OP-TM-AOP-011	
-C2E	Fire In "B" Inverter Room, Rev. 0
OP-TM-AOP-0011	Fire, Basis Document, Rev. 0
OP-TM-AOP-0011	
-C2E	Fire Area CB-FA-2e Safe Shutdown Basis Document, Rev. 0
OP-TM-AOP-0011	
-C3B	Fire Area CB-FA-3B Safe Shutdown Basis Document, Rev. 0
OP-TM-AOP-028	Loss of Instrument Air, Rev. 1
OP-TM-AOP-041	Loss of Seal Injection, Rev. 0
OP-TM-EOP-001	Reactor Trip, Rev. 6
OP-TM-EOP-009	HPI Cooling, Rev. 3
OP-TM-EOP-010	Emergency Procedure Rules, Guides and Graphs, Rev. 5
OP-TM-EOP-020	Cooldown From Outside of Control Room, Rev. 5
OP-TM-EOP-0201	Cooldown From Outside the Control Rm. Basis Document, Rev. 0
OP-TM-220-901	Emergency Power Supply For Pressurizer, Heaters, Rev. 3
OP-TM-226-101	Start RC-P-1A, Rev. 0
OP-TM-411-451	Manual Control of TBVs/ADVs, Rev. 3
OP-TM-734-902	Energize "B" DC Using DC Panel Cross-tie, Rev. 0
1104-24B	Intake Screen & Pump House Ventilation, Rev. 21
1104-25	Instrument & Control Air System, Rev. 129
1104-45P	Fire Mitigation (Supplement to OP-TM-AOP-001), Rev. 20
1105-3	Safeguards Actuation System, Rev. 47
1105-16	High Band Radio System (Operations), Rev. 19
1105-20	Remote Shutdown System, Rev. 13
1107-4E	Loss of 1E 4160V Bus, Rev. 1
1107-6	UPS Diesel Generator System, Rev. 30
1202-17	Los of Intermediate Cooling System, Rev. 21
1202-38	Nuclear Services River Water Failure, Rev. 40
1203-20	Nuclear Services Closed Cooling System Failure, Rev. 23
1301-15.1	Appendix R Cold Shutdown Repair Material Inventory, Rev. 9
1420-Y-30	Repair of Appendix R Cold Shutdown and Remote Shutdown, Rev. 7
MD-D542-002	Control Building Incipient Fire Detection
OP-AA-201-001	Fire Marshal Tours, Revision 2
OP-AA-201-002	Fire Reports, Revision 1
OP-AA-201-006	Control of Temporary Heat Sources, Revision 0
OP-MA-201-007	Fire Protection System Impairment Control, Revision 3
OP-AA-201-008	Pre-Fire Plans, Revision 1
OP-AA-201-009	Control of Transient Combustible Material, Revision 4
CC-AA-102	Design Input and Configuration Change Impact Screening, Revision 10
CC-AA-103	Configuration Change Control, Revision 9
CC-AA-104	Document Change Requests, Revision 8
CC-AA-209	Fire Protection Program Configuration Change Review, Revision 1
CC-AA-211	Fire Protection Program, Revision 2

OP-MA-201-004	Fire Prevention for Hot Work, Revision 0
MA-AA-716-025	Scaffold Installation, Modification and Removal Request Process, Revision 2
1104-45K	Ionization Detectors, Revision 36
1303-12.8J	IFD Instrumentation Functional Test, Revision 1
1303-12.9	Fire Barrier Seal Inspection, Revision 1
1303-12.20	Fire Door Inspection – Control Building and Diesel, Revision 17
1303-12.21	Fire Door Inspection – Primary Side, Revision 21
1303-12.23	Fire Damper Inspection, Revision 25
1303-12.24	Raceway Fire Barrier Inspection, Revision 13
1303-12.25	Technical Requirements Fire Door Inspection and Maintenance, Revision 2
3303-A2	Fire System Main Header Flush and Loop Test, Revision 36
U-29	Structural Steel Fireproofing Inspection, Revision 4
E-126	Water Intrusion Seal Inspection, Revision 4
AP-1038	Administrative Controls - Fire Protection Program, Revision 65
OP-MA-201-004	Fire Prevention for Hot Work, Revision 0
E-5	Westinghouse 480V DB-25 & DB-50 Circuit Breaker Maintenance and Testing, Revision 35
E-21	Thermal Overload Devices Inspection and Testing, Revision 25
E-62	Molded Case Circuit Breaker Testing, Rev. 27
E-142	Siemens 3AH Vacuum Circuit Breaker Pre-Installation Test, Rev. 2
E-143	4160V Switchgear MOC Switch Operator, Rev. 2
FTP 732.01	4160V Breaker Replacement, Rev. 3
LS-AA-125	Corrective Action Program (CAP) Procedure, Rev. 8
VM-TM-2913 TMI-1	Vendor Manual Big Beam Emergency Systems Inc. NP Series Seismic Condition Industrial Emergency Lights, Rev. 1
1038	Administrative Controls-Fire Protection Program, Rev. 65
1107-2A	Emergency Electrical – 4KV and 480 Volt, Rev. 9
1107-4.1	480V Breakers Overcurrent Tripping Device Setpoints, Rev. 14
1303-13.1	Appendix R Portable Emergency Lights Functional Test, Rev. 18
1303-13.1A	D.C Emergency Lighting Water Level and Function Checks Aux. Bldg - 271' & 281' Elev., Rev. 4
1303-13.1B	D.C Emergency Lighting Water Level and Function Checks Aux. Bldg - 305' & 331' Elev., Rev. 4
1303-13.1C	D.C. Emergency Lighting Water Level and Function Checks Intermediate Building, Rev. 4
1303-13.1D	D.C. Emergency Lighting Water Level and Function Checks Control Bldg.-306', 322', and 355' Elev., Rev. 2
1303-13.1E	D.C. Emergency Lighting Water Level and Function Checks Control Bldg.-322', Elev., Rev. 2
1303-13.1F	D.C. Emergency Lighting Water Level and Function Checks Control Bldg.-338', Elev. And Diesel Generator Building, Rev. 2
1303-13.2B	Inspection/Testing of the D.C. Emergency Lighting Aux. Bldg. 281',

	305', & 331' Elev., Rev. 0
1303-13.2C	Inspection/Testing of the D.C. Emergency Lighting Intermediate Bldg. 295', 305', & 322' Elev., Rev. 4
1303-13.2D	Inspection/Testing of the D.C. Emergency Lighting Control Bldg. 306', 322', & 355' Elev., Rev. 2
1303-13.2E	Inspection/Testing of the D.C. Emergency Lighting Control Bldg. 322' Elev., Rev. 2
1303-13.2F	Inspection/Testing of the D.C. Emergency Lighting Control Building 338' Elev. And Diesel Generator Building, Rev. 2
1303-12.8A	Fire Protection Instrumentation Functional Test (Control Building Elevation 355'), Rev. 22
1303-12.8B	Fire Protection Instrumentation Functional Test (Control Building Elevation 338'), Rev. 23
1303-12.8C	Fire Protection Instrumentation Functional Test (Control Building Elevation 322'), Rev. 15
1303-12.8F	Fire Protection Instrumentation Functional Test (Auxiliary and Fuel Handling Building), Rev. 31
1303-12.8H	Fire Protection Instrumentation Functional Test (Intermediate Building), Rev. 19
3303-A3	Fire Pump Capacity Testing, IC-17393
3303-M1	Fire Pump Periodic Operation, Rev. 35
3301-Q2	Specific Gravity Check-Diesel Fire Pumps, Rev. 26
OP-TM-201-009-1001	Transient Combustible Control, Revision 3
MA-MA-716-010-1008	Work Order (WO) Work Performance, Rev. 2
FASA AT 294468-05	Fire Protection/Fire Safe Shutdown Program

Completed Tests/Surveillances

3303-A2	Fire System Main Header Flush and Loop Tests	09/01/04, 10/21/05
1303-12.8J	IFD Instrumentation Functional Tests	02/06/05, 05/03/05, 10/02/05
1302-5.11	Make-up Tank Level and Pressure calibrations	
1302-6.3	EFW Flow Instrumentation Calibrations	
1302-5.26E	OTSG "B" Full Range Level Calibrations	
1302-6.6	Pressurizer Pressure Calibrations	
1302-6.12	Pressurizer Temperature Calibrations	

Drawings

E-206-022	One Line Diagram, 4160V Engineered Safeguard, Revision 21
E-206-051	250/125 VDC System and 120VAC Vital Instrumentation One Diagram, Revision 30
E-206-011	Electrical Main One Line & Relay Diagram, Revision 49
208-216	Make-up Pump MU-P-1B Electrical Elementary Diagram, Revision 10
208-214	Make-up Pump MU-P-1C Electrical Elementary Diagram, Revision 11

208-562	Make-up Pump C Main Oil Pump MU-P-3C Electrical Elementary Diagram, Revision 0
208-563	Make-up Pump B Main Oil Pump MU-P-3B Electrical Elementary Diagram, Revision 7
208-426	Pressurizer Relief Block Valve RC-V-2 Elementary Diagram, Revision 7
208-354	"C" Nuclear Service Closed Cooling Water Pump (NS-P-1C) Electrical Elementary Diagram, Revision 9
208-341	"B" Decay Heat Closed Cooling Water Pump (DC-P-1B) Electrical Elementary Diagram, Revision 9
208-354	"A" Decay Heat River Water Pump (DR-P-1A) Electrical Elementary Diagram, Revision 8
208-358	"C" Nuclear Service River Water Pump (NR-P-1C) Electrical Elementary Diagram, Revision 14
208-164	G11-02 Diesel Generator 1B Breaker Elementary Diagram, Revision 25
D-226-601	Electrical - Conduit Layout, Revision 16
E-218-082	Electrical - Communications, Revision 10
1D-651-18-1000	Unit 1 Radio Antennas Communications, Revision 9
302-231 Sh.1	Fire Service Water, Revision 98
302-231 Sh.2	Fire Service Water, Revision 12
302-231 Sh.3	Fire Service Water, Revision 11
302-231 Sh.4	Fire Service Water, Revision 6
302-231 Sh.5	Fire Service Water, Revision 1
302-842 Sh.2	Control Building and Machine Shop Ventilation, Revision 7
1-FHA-035	Fire Area Layout - Control Room Tower, Revision 12
1-FHA-036	Fire Area Layout - Control Tower, Revision 14

#### Modifications and Design Changes

ECR 05-00456	Inverter 1B and 1D DC Input Cable Reroute, Revision 1
ECR 02-01042	Replace RB Fire Panel and Detectors, Revision 1
ECR 05-00412	Construct New Outage Facilities Building, Revision 0
ECR 04-00262	Add New Spare Inverter, Revision 3
IC-11968	Interim Change for Procedure 1303-12.8J
TM-04-00200	Install EL-L-292 and EL-L-293 Emergency Lights

#### Piping and Instrumentation Drawings

302-650	Reactor Coolant System Flow Diagram, Revision 54
302-660	Make-up & Purification Flow Diagram, Sheet 1, Revision 41
302-661	Make-up & Purification Flow Diagram, Sheet 2, Revision 55
302-662	Make-up & Purification MU Pump Auxiliary System Flow Diagram, Revision 0
302-201-401	Remote Shutdown Panel "A" Front Panel Layout, Revision 0
302-201-402	Remote Shutdown Panel "B" Front Panel Layout, Revision 1
302-201-404	Auxiliary Remote Shutdown Panel "B" Front Panel Layout, Revision 0
302-845	Industrial Cooler System, Cooling Water Flow Diagram, Revision 48

Pre-Fire Plans

CB-FA-2E Control Building - West Inverter Room  
CB-FA-3B Control Building - 4160V Switchgear 1E Room  
CB-FA-4B Control Building - Control Room  
AB-FZ-2A Auxiliary Building - Make-Up and Purification Pump A  
Smoke Removal Plans - CB-FA-2E, CB-FA-3B, CB-FA-4B

Fire Brigade Documents and Training

OP-AA-201-003 Fire Drill Performance Revision 6  
OP-AA-201-005 Fire Brigade Qualification, Revision 3  
TQ-AA-127 Fire Brigade Training Program, Revision 3  
Fire Reports Dated 9/11/03, 10/25/04, 12/19/03, 4/10/05  
Fire Drills Dated 01/03/05, 10/10/05, 08/03/05, 10/13/05, 10/12/05, 09/20/05

Operator Safe Shutdown Training

OP-TM-AOP-001 Fire (Training Documents)  
OP-TM-EOP-020 Operator Timeline Validation Plan, Completed September 11, 2002  
AOP-001 Fire TMI LOR Requalification Training Program (), dated December 2, 2005  
TQ-AA-210-3203, AOP-001, Fire Operations Training, Revision 2  
Operator Lesson, 11.2.01.532BIG  
Operator Lesson, 11.7.01.127, AOP-001, Fire, LOR Simulator Exercise Guide, September 6, 2005

Hot Work and Ignition Source Permits

OP-MA-201-004 Rev.0 Fire Prevention for Hot Work  
Hot Work Permits listed under Work Orders

Transient Combustible Evaluations

TCP 2005-004 TCP 2005-007 TCP 2005-008 TCP 2005-015

Miscellaneous Documents

VM-TM-2753, Mecatiss Firewrap System  
VM-TM-2758, Cirrus Incipient Fire Detector  
A/R A2020325, A2129867  
KINT Corporation Invoice 02/03/2003  
Letter dated 12/13/05 - SAFE Fire Detection, Inc.  
IFD Inspection Results dated 05/12/99 - SAFE Fire Detection, Inc.  
Loss Control Standards - NEIL September 2004  
Documentation for Fire Damper AH-FD-12, AH-FD-18

Documentation for Penetration Seal #1867, #924, #929, #1131  
 Operator Shift Manning Log, December 2005  
 Letter Dated March 8, 1979, Fire Hazard Analysis Scope Item 12  
 Letter Dated March 11, 1980, Inspection of Door Frames

Condition Reports

IR 00327038	IR 00339253	IR 00339257	IR 00352410	IR 00428689	IR00294468
IR00175664	IR00379076	IR00240035	IR00351590	IR00399726*	IR00428991
IR00429864	IR00388661	IR00390172	IR00390173	IR00298255	IR00434096
IR00433874	IR00433847	IR00433289	IR00388708	IR00294468	IR00175664
IR00429891	IR00429576	IR00429573	AR00369904	AR00348919	AR00363147
AR00363267	AR00363520	AR00351421	AR00357180	AR00334407	AR00428689
AR00429177	AR00427555	AR00305192	AR00361460	AR00266167	AR00164472
AR00310834	AR00266170	AR00118674	AR00128648	AR00375556	AR00386002
AR00294468	AR00166499	AR00352410	AR00162871	AR00316268	AR00197001
AR00378538	AR00361525				

Work Orders (Including Hot Work Permits)

R2055701	R2064544	R2043559	R2041172	R2010921	R2010920
R1802001	C2009483	C2011270	C2007285	C2008267	C2010123
C2009690	R2047825	R2016393	C2010095	C2009906	C2004731
C2009692	C2004912	C2010187	C2010100	C2008577	C2008566
C2008573	C2008576	C2011085	R1837895	R2041778	R1837896
R2042501	R1802454	R2057074	R2041922	C2009223,	C2010008
C2010432	C2011230	R2068533	R2011597	R2013461	R2074616
R2013054	R2069750	R2063847	R2011897	R1802000	R2057702
R2065836	R2061092	R2064545	R2071411	R2059222	R2078155
R1801795	R1829515	R1822538	R1822548	R1822549	R1822569
R2016352	A2117054	A2072158	A2047052	C2004102	C2007691
C2008479	C2009280	C2007232	C2008625	R2073892	R2074666
R2072896	R2074256	R2073242	R2074668	R2073266	R2074664
R2067881	R2069139	R2067125	R2069600	R2054507	R2062145
R2061037	R2054506	R2062508	R2056075	R2047629	R2063488
R2052901	R2060645	R2063917	R2064101	R2065700	R2070010
R2056326	R2064837	R2040248	R2048666	R2040045	R2054270
R2041185	R2044696	R2070719	R1830168	R1830164	R1830098
R2075949	R2075695	R2075415	R2075162	R2056326	
JO 00178958					
JO 149257					
JO 183418					
JO 127313					
GA 206427					



QA Audits & Self Assessments

2003 Oversight Self-Assessment  
 02-3-100 NOS Field Observation  
 NOSA-TMI-04-09 NOS Fire Protection Program Audit - 2004  
 Focus Area Self-Assessment Report - 294468-05  
 Fire Protection Program System Health Reports - 2<sup>nd</sup> Qtr '05, 3<sup>rd</sup> Qtr '05  
 NQA-TMI-02-2Q, Triennial Fire Protection Audit  
 ASSA AT 176875-02, TMI Fire Protection Program 2003 Oversight Self-Assessment

**LIST OF ACRONYMS USED**

AC	Alternating Current
ADAMS	Agency Documents Access & Management System
CFR	Code of Federal Regulations
CO <sub>2</sub>	Carbon Dioxide
DC	Direct Current
DRS	Division of Reactor Safety
FA	Fire Area
FHA	Fire Hazards Analysis
FHAR	Fire Hazards Analysis Report
FPP	Fire Protection Program
FZ	Fire Zone
HWP	Hot Work Permit
IMC	Inspection Manual Chapter
IPEEE	Individual Plant Examination of External Events
IR	Inspection Report
IR	Issue Report
NCV	Non-cited Violation
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
PAR	Publicly Available Records
P&ID	Piping and Instrumentation Drawing
SCBA	Self-Contained Breathing Apparatus
SDP	Significance Determination Process
TMI	Three Mile Island
TRM	Technical Requirements Manual
UFSAR	Updated Final Safety Analysis Report
V	Volt
WO	Work Order