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Pilgrim Station  
600 Rocky Hill Road  
Plymouth, MA 02360

March 6, 2009

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, D.C. 20555

SUBJECT: Entergy Nuclear Operations, Inc.  
Pilgrim Nuclear Power Station  
Docket No.: 50-293  
License No.: DPR-35

Request for Exemption from 10 CFR 50 Appendix R Section III.G.2 to  
Allow Hot Shutdown Manual Operator Actions

Reference: NRC Regulatory Issue Summary 2006-10, "Regulatory Expectations  
with Appendix R Paragraph III.G.2 Operator Manual Actions" June 30,  
2006

LETTER NUMBER: 2.09.012

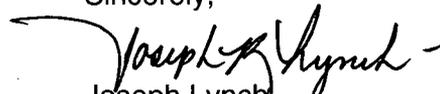
Dear Sir or Madam:

In response to NRC Regulatory Issue Summary 2006-10, the Pilgrim Nuclear Power Station (PNPS) reviewed cases where operator manual actions were credited for safe shutdown of the plant during an Appendix R fire. Based on this review, it was determined that an exemption from 10 CFR 50, Appendix R Section III.G.2 requirements is necessary for specific fire zone locations which rely on manual operator actions outside the Control Room to align redundant train hot shutdown systems to achieve safe shutdown. This letter submits a PNPS request for exemption in accordance with 50.12(a)(2)(ii) which states, "application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule."

This letter contains no new commitments.

Please do not hesitate to contact Mr. Joseph R. Lynch, (508) 830-8403, if there are any questions regarding this submittal.

Sincerely,

  
Joseph Lynch  
Licensing Manager

FXM  
Enclosure  
cc: next page

ADD  
NRR

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**Enclosure 1 to PNPS Letter 02.09.012**

**Request for Exemption from 10 CFR 50 Section III.G.2 for Hot Shutdown Manual  
Operator Actions in Fire Zones 2.1, 2.2, 2.10 and 2.16**

**18 Total pages**

## **Request for Exemption from 10 CFR 50 Section III.G.2 for Hot Shutdown Manual Operator Actions in Fire Zones 2.1, 2.2, 2.10 and 2.16**

### **1.0 EXEMPTION REQUESTED**

In accordance with the requirements of 10 CFR 50.12, "Specific Exemptions," the Pilgrim Nuclear Power Station (PNPS) requests an exemption from the requirements of 10 CFR 50, Appendix R, Section III.G.2 to the extent that manual operator actions located outside the Main Control Room (MCR) will be utilized to ensure proper alignment of one train of redundant hot shutdown systems necessary to ensure safe shutdown in Fire Zones 2.1, 2.2, 2.10, and 2.16.

### **2.0 BACKGROUND**

The initial PNPS response to 10 CFR 50, Appendix R was submitted for NRC review in 1982 (Reference 1). In this submittal, PNPS clearly identified that specific fire zones were not in compliance with III.G.2 and that either cable reroutes or preparation of procedures (operator actions) would be necessary to address the non-compliance concerns. The submittal identified the list of cables whose loss due to fire would be handled by procedure (operator action) and that final procedures would be developed based on NRC staff approval of the recommended actions. The NRC reviewed the submittal and issued a Safety Evaluation Report (SER) in 1983 to approve the proposed conceptual design (Reference 2). This SER specifically identified that safe shutdown systems including Core Spray (CS), Residual Heat Removal (RHR), Reactor Building Closed Cooling Water (RBCCW) and associated support systems such as the Emergency Diesel Generators (EDG) and Salt Service Water (SSW) would be monitored and controlled from either the Main Control Room (MCR) or remote shutdown panels or local control stations. Based on the approved SER, PNPS implemented modifications and developed safe shutdown procedures to address required manual operator actions.

Regulatory Issue Summary (RIS) 2006-10 (Reference 3) documents the NRC position relative to the use of operator manual actions as part of a compliance strategy to meet the requirements of 10 CFR 50, Appendix R, Section III.G.2. The NRC requires plants which credit hot shutdown manual actions for Section III.G.2 compliance obtain specific NRC approval via the exemption process in accordance with the requirements of 10 CFR 50.12. The RIS also identifies that for pre-1979 licensees, a staff decision in an SER that approves the use of operator manual actions, in lieu of one of the means to specified in III.G.2, does not eliminate the need for an exemption.

In response to RIS 2006-10, PNPS performed a review of all manual operator actions credited in the current Appendix R safe shutdown analysis (Reference 4). This review revealed that hot shutdown manual actions are required to align redundant train systems in Fire Zones 2.1, 2.2, 2.10, and 2.16 and that an exemption from 10 CFR 50, Appendix R, Section III.G.2 is necessary. The following information confirms the safety bases for the hot shutdown manual actions initially approved in the 1983 SER and provides bases which identify that the criteria of 10 CFR 50.12.(a)(ii) is satisfied in that application of the regulation in these circumstances is not necessary to achieve the underlying purpose of the rule.

The criteria for granting specific exemptions from 10 CFR 50 regulations are specified in 10 CFR 50.12. In accordance with 10 CFR 50.12(a)(1), the NRC is authorized to grant an exemption upon determining that the exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security.

### **3.0 EXEMPTION BASES**

#### **3.1 Fire Zone 2.1 – “B” Switchgear and Load Center Room (Turbine Bldg - 23' Elv.)**

##### **Description**

Fire Zone 2.1 is the “B” Train Switchgear Room and is part of Fire Area 1.10. This room is located at grade elevation 23'-0” on the east side of the Turbine Building. The room contains cable trays, 4KV switchgear, air cooled transformers, 480V Motor Control Center (MCCs) and electrical equipment.

##### **Fire Protection Features**

This room is separated from the following plant areas by rated fire barriers:

North-Cable Spreading Room, Fire Area 3.2/ Zone 3.2

North- Plant Computer Room, Fire Area 3.3/ Zone 3.3

North-Corridor, Fire Area 3.3/ Zone 3.9A

North-Stairway #8, Fire Area 1.9/ Zone 2.16

West-“B” Battery Room, Fire Area 1.10/ Zone 2.4

West-Generator Auxiliaries Area, Fire Area 1.10/ Zone 2.6

South-Generator Auxiliaries and Turbine Crane Bay, Fire Area 1.10/ Zone 2.6

East- Turbine Crane Bay, Fire Area 1.10 /Zone 2.6

East- Exterior Wall & New Red Line Building

Ceiling- Turbine/Generator Operating Floor, Fire Area 2.10/ Zone 2.12A

Ceiling- “A” Switchgear Room, Fire Area 1.9/ Zone 2.2

Floor- Radwaste Corridor/ Water Tank Room, Fire Area 1.10/ Fire Zones 3.10 & 3.10A

The Switchgear Room is equipped throughout with ionization or photoelectric smoke detectors that report to the MCR Fire Alarm panel. For manual fire suppression, the area has adequate fire protection including extinguishers and hose stations in the room and in adjoining areas.

Pilgrim's Fire Hazards Analysis for this room considers the fire loading to be medium consisting primarily of cable insulation. The equivalent fire severity is approximately 47 minutes. Anticipated fire development is moderate.

##### **Post Fire Shutdown**

Fire Zone 2.1 contains the “B” train switchgear and load centers that provide power to “B” train safe shutdown systems. As such, “A” train power is credited to support operation of “A” train safe shutdown systems that are relied to achieve safe shutdown.

Fire Zone 2.1 is a subset of Fire Area 1.10. This fire area contains multiple fire zones located in the Reactor Building, Turbine Building, Radwaste Building, and Diesel Generator Rooms.

Procedure 2.4.143.2 was written to provide instructions for shutdown and decay heat removal in the event of a fire in Fire Area 1.10. This procedure makes provision for a worst case fire affecting all of the fire zones that are grouped into Fire Area 1.10. This procedure credits MCR operation of the "A" train CS system and local operation of the "A" train RHR- Torus Cooling (RHR-TC) and RBCCW systems to accomplish safe shutdown.

A separate evaluation was performed to assess required manual actions resulting from a fire in Fire Zone 2.1. This fire zone specific review is consistent with the original 1982 safe shutdown submittal and the current Appendix R analysis report. This zone specific manual action review identified that the following local manual operator actions are needed to support proper operation of the redundant train hot shutdown systems necessary to achieve safe shutdown:

- Align power feed to 480 V AC Bus B6 from Bus B1.

Bus B6 is normally supplied power by 480V Bus B1 a (located in Fire Zone 2.2 – "A" Train Swgr Rm 37' Elv.) and has an alternate supply from 480 V Bus B2 (located in Fire Zone 2.1 – "B" Train Swgr Rm 23' Elv.). Bus B6 normally auto-transfers to Bus 2 on a loss of power to Bus B1. A fire in Fire Zone 2.1 could cause damage to Bus B2 and the control circuitry which performs this transfer. Therefore, in the event of fire in zone 2.1, local operator actions are credited to defeat the auto-transfer function and to align Bus B6 to Bus B1. Attachment 5 to Procedure 2.4.143.2 addresses these required local manual operator actions.

Bus B6 provides power to MCC B10 and B20. MCC B20 provides power to redundant train RHR Low Pressure Coolant Injection (RHR-LCPI) valves (MO1001-28A&B; and 29A&B).

The local manual operator actions are performed in the Cable Spreading Room (CSR - Fire Zone 3.2) where Bus B6 is located and in the upper switchgear room (Fire Zone 2.2) where Bus B1 is located. The CSR fire zone is associated with Fire Area 3.2, and the upper switchgear room is associated with Fire Area 1.9. These fire zones are separated by fire barriers from the lower switchgear room (Fire Zone 2.1/Fire Area 1.10). The CSR is located directly below the MCR (Fire Zone 3.1) and the upper switch gear room is directly adjacent to the MCR.

The manual actions needed to restore power to Bus B6 and MCC B20 are only needed for alignment of "A" train RHR-TC and only if the RHR system was operating in the RHR-Low Pressure Coolant Injection (LPCI) mode with the MO1001-28A and 29A valves open prior to requiring RHR-TC valve alignment. Since safe shutdown for this area relies on two relief valves in the Automatic Depressurization System (ADS), the "A" train CS system, and the "A" train RHR-TC system, the manual actions to restore power to Bus B6 are only needed to support RHR-TC to facilitate decay heat removal. An evaluation of design basis events for containment heat removal (Reference 8) identifies that for the Appendix R conditions described above, initiating decay heat removal within two (2) hours after fire initiation will ensure that containment acceptance criteria are satisfied for CS and RHR pump net positive suction head and containment design limits.

The manual actions to restore power to Bus B6 in Fire Zone 2.1 were addressed in the original 1982 Appendix R submittal and were incorporated into safe shutdown

procedures. Plant operators have been trained on the procedures and the manual actions necessary can be performed within the time constraint established for initiating containment heat removal.

#### **Inspection Procedure 71111.05T Feasibility Criteria**

The manual operator action discussed above has been reviewed against the evaluation criteria contained in NRC Fire Protection (Triennial) Inspection Procedure (Reference 9) to demonstrate feasibility.

#### **Diagnostic Instrumentation**

Indicator lights and mechanical indication is provided on Bus B6 and B1.

#### **Environmental considerations**

Radiation Level: Bus B6 is located in the CSR and Bus B1 is located in the upper switchgear room, both are located in the Turbine Building. The CSR and the upper switchgear room are not radiological control areas and radiation would not adversely impact the ability of operators to perform the manual action.

Emergency Lighting: Emergency lights are installed in both the CSR in the vicinity of Bus B6 and in the upper switchgear room in the vicinity of Bus B1. Emergency lights are also located in the access and egress routes thereto. The manual operator actions necessary to power B6 are identified as required Appendix R manual actions and as such emergency lights have been installed and verified to demonstrate compliance to Appendix R Section III.J.

Temperature and Humidity Considerations: The CSR and upper switchgear room contain electrical equipment and cables. No steam or significant heat sources which could impact required actions are located in the room.

Smoke and Toxic Gasses: Smoke and toxic gasses from a fire in the lower switchgear room are not expected to enter the CSR or the upper switchgear room. The CSR and the upper switchgear rooms are designated as separate fire areas, and both are enclosed by Appendix R fire barriers. These fire barriers are adequate to prevent the spread of fire and smoke from a fire in the upper switchgear room.

#### **Staffing**

Minimum shift staffing consisting of five (5) operators separate from the five man fire brigade is available to support Appendix R safe shutdown actions. One (1) operator can perform the manual actions needed.

#### **Communications**

Communication in the form of walkie talkies, cell phones or giatronics will be used as needed. The walkie-talkies are stored in Alternate Shutdown Toolboxes located in both the upper and lower switchgear rooms.

#### **Special Tools**

No specific tools are required for these manual actions; however the Alternate Shutdown Tools boxes contain all tools necessary to perform post fire manual actions.

#### **Training**

Operators are trained on the Appendix R safe shutdown procedures during initial training. Periodic requalification is also provided as part of Licensed Operator Requalification Training (LORT).

**Accessibility**

Access to the CSR is provided from two door locations, on the west side from Stairway #8 (Fire Zone 2.16 – directly adjacent to the MCR and CSR) and on the east side from the plant access corridor (Fire Zone 3.9A) adjacent to the former HP Access Control Area (Fire Zone 3.9B). Access to the upper switchgear room is provided from Stairway #8. Operator travel through the lower switchgear room is not required.

**Safe Shutdown Procedures**

Procedure 2.4.143.2 Attachment 5 provides instructions to perform the required local manual operator actions.

**Verification and Validation**

Operators have verified and validated Procedure 2.4.143.2 Attachment 5.

**Defense-in-Depth**

The nuclear power industry applies the concept of defense-in-depth in order to protect areas important to safety from the potential adverse effects of fire. This concept applies the following objectives to achieve its goal:

- Prevent fires from starting.
- Detect rapidly, control, and extinguish promptly those fires that do occur.
- Provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by fire suppression activities will not prevent the safe shutdown of the plant.

In order to prevent fires from starting, Pilgrim has administrative controls to limit the introduction of combustible material into the plant and to control ignition sources such as welding or the use of open flames. These concepts are applied during the development of plant design changes as well.

In order to detect, control and extinguish a fire in the “B” Switchgear Room, Pilgrim has provided:

- Automatic fire detection throughout the room. The system sounds an alarm in the MCR. In the event that the fire detection system is impaired, Pilgrim establishes fire watch patrols in accordance with the Final Safety Analysis Report (FSAR) requirements.
- An organized and formally trained station fire brigade. The brigade conducts fire drills on a regular basis in various areas of the plant involving many different drill scenarios. Live burn training is conducted yearly at a fire fighting academy used to train full time structural fire fighters. The station has pre-fire plans/procedures for all plant areas. The plans identify equipment location, ventilation, fire protection equipment, and fire fighting strategies.

In order to provide protection for structures, systems, and components needed to safely shutdown the plant, Pilgrim conducted a detailed safe shutdown analysis and has approved station safe shutdown procedures in place to respond to a fire in any plant area. Fire barriers are used to separate areas with redundant trains of safe shutdown equipment.

Should a fire occur in this room, the automatic fire alarm system would sound an alarm and the fire brigade would respond. The room is located down one flight of stairs from the MCR and a very prompt response to the fire is expected. The combustible loading consists primarily of slow burning cable insulation and fire control and extinguishment is expected to be accomplished in a relatively short period of time. While fires involving high voltage faults can be very damaging, once the fault has been cleared, effective fire fighting can take place.

### **Conclusion**

The defense-in-depth strategy minimizes the likelihood of a fire occurring and causing significant equipment or cable damage. The Appendix R analysis assumes all equipment can be lost in Fire Zone 2.1 and redundant systems will be available to safely shut down the plant. This exemption requests approval from Appendix R Section III.G.2 compliance to allow the use of local operator actions outside the MCR to align redundant train hot shutdown systems to achieve safe shutdown in Fire Zone 2.1. The manual operator actions required are identified in safe shutdown procedures and will be performed by trained operators. The required actions will be performed within the time constraints established for system actuation. The manual actions allow redundant train systems to be operated from the MCR, free from fire damage consistent with the underlying intent of the regulation.

## **3.2 Fire Zone 2.2 - "A" Switchgear and Load Center Room (Turbine Bldg - 37' Elv.)**

### **Description**

Fire Zone 2.2 is the "A" Train Switchgear Room and is part of Fire Area 1.9. This room is located at elevation 37'-0" on the East side of the Turbine Building. The room contains cable trays, 4KV switchgear, air cooled transformers, 480V MCCs and electrical equipment.

### **Fire Protection Features**

This room is separated from the following plant areas by rated fire barriers:

North-Control Room, Fire Area 3.1/ Zone 3.1

North-Stairway #8, Fire Area 1.9/ Zone 2.16

West-"A" Battery Room, Fire Area 1.9/ Zone 2.3

West-Upper Generator Auxiliaries Area, Fire Area 1.10/ Zone 2.6

South-Generator Auxiliaries and Turbine Crane Bay, Fire Area 1.10/ Zone 2.6

South-"B" Switchgear Room- Fire Area 1.10/ Fire Zone 2.1

East- Exterior

Ceiling- Turbine/Generator Operating Floor, Fire Area 1.10/ Zone 2.12A

Floor-"B" Switchgear Room- Fire Area 1.10/ Fire Zone 2.1

The switchgear room is equipped throughout with ionization smoke detectors that report to the MCR Fire Alarm panel. For manual fire suppression, the area has adequate fire protection including extinguishers and hose stations in the room and in adjoining areas.

Pilgrim's Fire Hazards Analysis for this room considers the fire loading to be medium consisting primarily of cable insulation. The equivalent fire severity is approximately 47 minutes. Anticipated fire development is moderate which is conservative since the combustibles are primarily slow burning cables in horizontal tray runs.

**Post Fire Shutdown**

Fire Zone 2.2 contains the "A" train switchgear and load centers that provide power to "A" train safe shutdown systems. As such, "B" train power is credited to support operation of "B" train safe shutdown systems that are relied to achieve safe shutdown.

Fire Zone 2.2 is a subset of Fire Area 1.9. This fire area contains multiple fire zones located in the Reactor Building, Turbine Building, Radwaste Building, and Diesel Generator Rooms.

Procedure 2.4.143.1 was written to provide instructions for shutdown and decay heat removal in the event of a fire in Fire Area 1.9. This procedure makes provision for a worst case fire affecting all of the fire zones that are grouped into Fire Area 1.9. This procedure credits MCR operation of the "B" train CS system and local operation of the "B" train RHR-TC and RBCCW systems to accomplish safe shutdown.

A separate evaluation was performed to assess required manual actions resulting from a fire in Fire Zone 2.2. This fire zone specific review is consistent with the original 1982 safe shutdown submittal and the current Appendix R analysis report. This zone specific manual action review identified that the following local manual operator actions are needed to support proper operation of the redundant train hot shutdown systems necessary to achieve safe shutdown:

- Align power feed to 480 V AC Bus B6 from Bus B2.

Bus B6 is normally supplied power by 480 V Bus B1 (located in Fire Zone 2.2 – "A" Train Swgr Rm 37' Elv.) and has an alternate supply from 480 V Bus B2 (located in Fire Zone 2.1 – "B" Train Swgr Rm 23' Elv.). Bus B6 normally auto-transfers to Bus 2 on a loss of power to Bus B1. A fire in Fire Zone 2.2 could cause damage to Bus B1 and the control circuitry which performs this transfer. Therefore, in the event of fire in Fire Zone 2.2, local operator actions are credited to defeat the auto-transfer function and to align Bus B6 to Bus B2. Attachment 6 to Procedure 2.4.143.1 addresses these required local manual operator actions.

Bus B6 provides power to MCC B10 and B20. MCC B20 provides power to redundant train RHR-LCPI valves (MO1001-28A&B; and 29A&B).

These local manual operator actions are performed in the CSR (Fire Zone 3.2) where Bus B6 is located and in the lower switchgear room (Fire Zone 2.2) where Bus B2 is located. The CSR fire zone is associated with Fire Area 3.2 and the lower switchgear room is associated with Fire Area 1.10. These fire zones are separated by fire barriers from the upper switchgear room (Fire Zone 2.2 and Fire Area 1.9). The CSR is located directly below the MCR (Fire Zone 3.1) and the lower switch gear room is directly adjacent to the CSR.

The manual actions needed to restore power to Bus B6 and MCC B20 are only needed for alignment of "B" train RHR-TC and only if the RHR system was operating in the RHR-LPCI mode with the MO1001-28B and 29B valves open prior to requiring RHR-TC alignment. Since safe shutdown for this area relies on two relief valves in the ADS system, the "B" train CS system, and the "B" train RHR-TC system, the manual actions to restore power to Bus B6 are only needed to support RHR-TC to facilitate decay heat removal. An evaluation of design basis events for containment heat removal identifies

that for the Appendix R conditions described above, initiating decay heat removal within two (2) hours after fire initiation will ensure that containment acceptance criteria are satisfied for CS and RHR pump net positive suction head and containment design limits.

The manual actions to restore power to Bus B6 were addressed in the original 1982 Appendix R submittal and were incorporated into safe shutdown procedures. Plant operators have been trained on the procedures and the manual actions necessary can be performed within the time constraint established for initiating containment heat removal.

#### **Inspection Procedure 71111.05T Feasibility Criteria**

The manual operator action discussed above has been reviewed against the evaluation criteria contained in NRC Fire Protection (Triennial) Inspection Procedure to demonstrate feasibility.

#### **Diagnostic Instrumentation**

Indicator lights and mechanical indication is provided on Bus B6 and B2.

#### **Environmental considerations**

Radiation Level: Bus B6 is located in the CSR and Bus B2 is located in the lower switchgear room, both are located in the Turbine Building. The CSR and the lower switchgear room are not radiological control areas and radiation would not adversely impact the ability of operators to perform the manual action.

Emergency Lighting: Emergency lights are installed in both the CSR in the vicinity of Bus B6 and in the lower switchgear room in the vicinity of Bus B2. Emergency lights are also located in the access and egress routes thereto. The manual operator actions necessary to power B6 are identified as required Appendix R manual actions and as such emergency lights have been installed and verified to demonstrate compliance to Appendix R Section III.J.

Temperature and Humidity Considerations: The CSR and lower switchgear room contain electrical equipment and cables. No steam or significant heat sources which could impact required actions are located in the room.

Smoke and Toxic Gasses: Smoke and toxic gasses from a fire in the upper switchgear room are not expected to enter the CSR or the lower switchgear room. The CSR and the lower switchgear rooms are designated as a separate fire areas, and both are enclosed by Appendix R fire barriers. These fire barriers are adequate to prevent the spread of fire and smoke from a fire in the upper switchgear room.

#### **Staffing**

Minimum shift staffing consisting of five (5) operators separate from the five man fire brigade is available to support Appendix R safe shutdown actions. One (1) operator can perform the manual actions needed.

#### **Communications**

Communication in the form of walkie talkies, cell phones, or giatronics will be used as needed. The walkie-talkies are stored in Alternate Shutdown Toolboxes located in both the upper and lower switchgear rooms.

#### **Special Tools**

No specific tools are required for these manual actions; however the Alternate Shutdown Tools boxes contain all tools necessary to perform post fire manual actions.

**Training**

Operators are trained on the Appendix R safe shutdown procedures during initial training. Periodic requalification is also provided as part of Licensed Operator Requalification Training (LORT).

**Accessibility**

Access to the CSR is provided from two door locations, on the west side from Stairway #8 (Fire Zone 2.16 – directly adjacent to the MCR and CSR) and on the east side from the plant access corridor (Fire Zone 3.9A) adjacent to the former HP Access Control Area (Fire Zone 3.9B). Access to the lower switchgear room is provided from Stairway #8. Operator travel through the upper switchgear room is not required.

**Safe Shutdown Procedures**

Procedure 2.4.143.1 Attachment 6 addresses the required local manual operator actions.

**Verification and Validation**

Operators have verified and validated Procedure 2.4.143.1 Attachment 6.

**Defense-in-Depth**

The nuclear power industry applies the concept of defense-in-depth in order to protect areas important to safety from the potential adverse effects of fire. This concept applies the following objectives to achieve its goal:

- Prevent fires from starting.
- Detect rapidly, control, and extinguish promptly those fires that do occur.
- Provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by fire suppression activities will not prevent the safe shutdown of the plant.

In order to prevent fires from starting, Pilgrim has administrative controls to limit the introduction of combustible material into the plant and to control ignition sources such as welding or the use of open flames. These concepts are applied during the development of plant design changes as well.

In order to detect, control and extinguish a fire in the "B" Switchgear Room, Pilgrim has provided:

- Automatic fire detection throughout the room. The system sounds an alarm in the MCR. In the event that the fire detection system is impaired, Pilgrim establishes fire watch patrols in accordance with the Final Safety Analysis Report (FSAR) requirements.
- An organized and formally trained station fire brigade. The brigade conducts fire drills on a regular basis in various areas of the plant involving many different drill scenarios. Live burn training is conducted yearly at a fire fighting academy used to train full time structural fire fighters. The station has pre-fire plans/procedures for all plant areas. The plans identify equipment location, ventilation, fire protection equipment, and fire fighting strategies.

In order to provide protection for structures, systems, and components needed to safely shutdown the plant, Pilgrim conducted a detailed safe shutdown analysis and has approved station safe shutdown procedures in place to respond to a fire in any plant area. Fire barriers are used to separate areas with redundant trains of safe shutdown equipment.

Should a fire occur in this room, the automatic fire alarm system would sound an alarm and the fire brigade would respond. The room is adjacent to the MCR and a very prompt response to the fire is expected. The combustible loading consists primarily of slow burning cable insulation and fire control and extinguishment is expected to be accomplished in a relatively short period of time. While fires involving high voltage faults can be very damaging, once the fault has been cleared, effective fire fighting can take place.

### **Conclusion**

The defense-in-depth strategy minimizes the likelihood of a fire occurring and causing significant equipment or cable damage. The Appendix R Analysis assumes all equipment can be lost and redundant systems are available to safely shut down the plant. This exemption requests approval from Appendix R Section III.G.2 compliance to allow the use of local operator actions outside the MCR to align redundant train hot shutdown systems to achieve safe shutdown in Fire Zone 2.2. The manual operator actions required are identified in safe shutdown procedures and will be performed by trained operators. The required actions will be performed within the time constraints established for system actuation. The manual actions allow redundant train systems to be operated from the MCR, free from fire damage consistent with the underlying intent of the regulation.

### **3.3 Fire Zone 2.10 – “B” Train Feedwater Heater Bay (Turbine Bldg – 6’ Elv.)**

#### **Description**

Fire Zone 2.10 is the west side of the heater bay below the Turbine Operating Floor. This zone is normally a locked high radiation area. It contains feed water heaters, piping, and some cable trays.

#### **Fire Protection Features**

This zone is separated from the following plant areas by rated fire barriers:

El. 6’, East-Radwaste Corridor Fire Area (FA) 1.10/ Fire Zone (FZ) 3.7

El. 6’, North -Torus Rm. FA 1.10/ FZ1.30A and RHR Pump Rm. FA 1.9/ FZ 1.1

El. 23’, North-Steam Tunnel FA 1.9/ FZ 1.32 and Rx Building FA 1.9/FZ 1.9

El. 23’, East-Vital MG Set Rm. FA 1.9/ FZ 3.5 and Stairway #8 FA 1.9/ FZ 2.16

El. 37’, North- Steam Tunnel FA 1.9/ FZ 1.32 and Rx Building FA 1.9/FZ 1.9

El. 37’, East- CR FA 3.1/ FZ 3.1 and Stairway #8 FA 1.9/ FZ 2.16

There are no barriers to the West or to the South to adjacent zones in the same fire area  
Ceiling-, Feedwater Pump C area FA 1.10/ FZ 2.12

Floor-Ground

Pilgrim’s Fire Hazards Analysis for this zone considers the fire loading to be medium consisting primarily of cable insulation. The equivalent fire severity is approximately 50 minutes. Anticipated fire development is slow.

**Post Fire Shutdown**

Fire Zone 2.10 contains "B" train Salt Service Water (SSW) and RBCCW system cables and a single control cable associated with the "A" train diesel generator. A loss of these cables due to a fire would result in a loss of redundant trains of the SSW and RBCCW systems.

Fire Zone 2.10 is a subset of Fire Area 1.10. This fire area contains multiple fire zones located in the Reactor Building, Turbine Building, Radwaste Building, and Diesel Generator Rooms.

Procedure 2.4.143.2 was written to provide instructions for shutdown and decay heat removal in the event of a fire in Fire Area 1.10. This procedure makes provision for a worst case fire affecting all of the fire zones that are grouped into Fire Area 1.10. This procedure credits MCR operation of the "A" train CS system and local operation of the "A" train RHR-TC and RBCCW systems to accomplish safe shutdown.

A separate evaluation was performed to assess required manual actions resulting from a fire in Fire Zone 2.10. This fire zone specific review is consistent with the original 1982 safe shutdown submittal and the current Appendix R analysis report. This zone specific manual action review identified that the following local manual operator actions are needed to support proper operation of the redundant train hot shutdown systems necessary to achieve safe shutdown:

- Locally start the "A" train diesel generator from the "A" Diesel Generator Room.

The "A" train diesel generator provides the on-site AC power source for 4.16 kV Bus A5, which feeds 480 V Bus B1, and MCCs B15 and B17. The "A" train power feeds supply power to the "A" train CS, RHR, and RBCCW systems. A fire in Fire Zone 2.10 could cause damage to circuits allowing "A" train diesel generator start from the MCR. Since the "A" train diesel generator is credited to operate for a fire in Fire Zone 2.10, a local operator action is necessary in order to start the "A" train diesel. Attachment 1 to Procedure 2.4.143.2 addresses the required local manual operator actions.

The local manual operator actions are performed in the "A" Diesel Generator Room (Fire Zone 4.3) where Alternate Shutdown Panel (ASP) C160 is located. The "A" Diesel Generator Room is located north of the Reactor Building and is associated with Fire Area 4.3.

The manual actions needed to start the "A" train diesel are relied on ensure power to the "A" train CS, RHR, and RBCCW systems. Since safe shutdown for this zone relies on two relief valves in the ADS, and "A" train CS, RHR-TC, RBCCW, and SSW, the manual action to start the "A" train diesel is needed to align the core spray valves. An evaluation of design basis events for containment heat removal identifies that for the Appendix R conditions described above, vessel blow down will be initiated within 24 minutes of occurrence of fire and vessel injection will commence when reactor pressure is reduced to below the operating pressure of the CS pumps. Therefore, CS system alignment and restoration of "A" train power is needed 24 minutes after the onset of the Appendix R fire event (assuming loss of offsite power and failure of all safe shutdown cables in the fire zone).

The local manual operator actions needed to start the "A" train diesel are incorporated into safe shutdown procedures. Plant operators have been trained on the procedures and job performance measures evaluate performance using a conservative fifteen (15) minute expected completion time. The manual actions necessary can be performed within the time constraint established for initiating blow down and CS system alignment and pump start.

#### **Inspection Procedure 71111.05T Feasibility Criteria**

The manual operator actions discussed above has been reviewed against the evaluation criteria contained in NRC Fire Protection (Triennial) Inspection Procedure to demonstrate feasibility.

#### **Diagnostic Instrumentation**

Switch position indicators and indicator lights are provided on Panel C160. In addition local control indication on Panel C101, C103A provide necessary indication to start and monitor diesel operation.

#### **Environmental considerations**

Radiation Level: Panel C160 is located in the "A" diesel generator room. The diesel generator room is not a radiological control area and radiation would not adversely impact the ability of operators to perform the required manual actions.

Emergency Lighting: Emergency lights are installed in the "A" diesel generator room in the vicinity of panel C160 and local control panels. Emergency lights are also installed in the access and egress routes thereto. The "A" diesel generator local operator actions are identified as required Appendix R manual actions and as such emergency lights have been installed and verified to demonstrate compliance to Appendix R Section III.J. or the approved exemption for provision of exterior lighting.

Temperature and Humidity Considerations: The "A" diesel generator room contains electrical equipment, cables, fuel lines and lube oil lines. The room has a separate ventilation system which will automatically start when the diesel is running. Heat and humidity concerns will not prevent operators from performing local isolation and start of the diesel in response to a Turbine Building fire.

Smoke and Toxic Gasses: Smoke and toxic gasses from a Turbine Building fire (Fire Zone 2.10) are not expected to affect the diesel generator rooms because the diesel room is located separated from the Turbine Building by the Reactor Building. The "A" diesel room is also designated as a separate fire area, and is enclosed by Appendix R fire barriers. These fire barriers and spatial separation are adequate to prevent the spread of fire and smoke from a Turbine Building fire.

#### **Staffing**

Minimum shift staffing consisting of five (5) operators separate from the five man fire brigade is available to support Appendix R safe shutdown actions. One (1) operator can perform the manual actions needed.

#### **Communications**

Communication in the form of walkie talkies, cell phones, and giatronics will be used as necessary. The walkie-talkies are stored in Alternate Shutdown Toolboxes located in both the upper and lower switchgear rooms.

**Special Tools**

Keys for Alternate Shutdown Panel C160 are required. Also a screw driver may be needed to open the C150 panel. The keys and required tools are located in the Alternate Shutdown Tool Boxes in both the upper and lower switchgear rooms.

**Training**

Operators are trained on the Appendix R safe shutdown procedures during initial training. Periodic requalification is also provided as part of Licensed Operator Requalification Training (LORT).

**Accessibility**

The "A" diesel room can be accessed via exterior yard area located on the North side of the plant or through the Radwaste Trucklock. Operator travel through the Turbine Building is not required.

**Procedures**

Procedure 2.4.143.2 Attachment 1 addresses the required local manual operator actions.

**Verification and Validation**

Operators have verified and validated Procedure 2.4.143.2 Attachment 1.

**Defense-in-Depth**

The nuclear power industry applies the concept of defense-in-depth in order to protect areas important to safety from the potential adverse effects of fire. This concept applies the following objectives to achieve its goal:

- Prevent fires from starting.
- Detect rapidly, control, and extinguish promptly those fires that do occur
- Provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by fire suppression activities will not prevent the safe shutdown of the plant

In order to prevent fires from starting, Pilgrim has administrative controls to limit the introduction of combustible material into the plant and to control ignition sources such as welding or the use of open flames. These concepts are applied during the development of plant design changes as well. In the case of the Turbine/Generator (T/G) lube oil fire, prevention is not specifically a classic fire prevention effort. Rather, the T/G is designed, maintained, and operated in a manner to absolutely minimize the sort of failures that could result in a fire.

In order to detect, control and extinguish a fire in the heater bay, Pilgrim has provided:

- The Heater Bay and adjacent fire zones are protected throughout with automatic a wet pipe sprinkler system. This system is hydraulically designed to protect the condenser bay and heater bay from a T/G lube oil fire, which is considered to be the worst case fire. A lube oil fire from a T/G fire is unlikely to spread to this area of the heater bay, but it is difficult to predict the extent of such an event. The system is designed to provide water flow alarms should the heat from a fire open one of the sprinklers. In this respect, the sprinkler system functions as both automatic fire protection and detection. The alarm sounds in the MCR and will result in a prompt fire brigade

response. In addition, the T/G lube oil hazards are protected above the operating floor with an automatic sprinkler/water spray system.

- An organized and formally trained station fire brigade. The brigade conducts fire drills on a regular basis in various areas of the plant involving many different drill scenarios. Live burn training is conducted yearly at a fire fighting academy used to train full time structural fire fighters. The station has pre-fire plans/procedures for all plant areas. The plans identify equipment location, ventilation, fire protection equipment, and fire fighting strategies.

In order to provide protection for structures, systems, and components needed to safely shutdown the plant, Pilgrim conducted a detailed safe shutdown analysis and has approved station safe shutdown procedures in place to respond to a fire in any plant area. Fire barriers are used to separate areas with redundant trains of safe shutdown equipment.

### **Conclusion**

This defense-in-depth strategy minimizes the likelihood of a fire occurring and causing significant equipment or cable damage. However, as indicated above and in industry operating experience, serious fires involving T/G equipment have taken place and can occur and result in significant damage. This exemption requests approval from Appendix R Section III.G.2 compliance to allow the use of local operator actions outside the MCR to align redundant train hot shutdown systems to achieve safe shutdown in Fire Zone 2.10. The manual operator actions required are identified in safe shutdown procedures and will be performed by trained operators. The required actions will be performed within the time constraints established for system actuation. The "A" diesel generator will be controlled from the diesel room. The manual actions allow redundant train CS, RHR, RBCCW and SSW systems to be operated from the MCR, free from fire damage consistent with the underlying intent of the regulation.

### **3.4 Fire Zone 2.16 – Stairway # 8 and Time Tunnel Corridor**

#### **Description**

Fire Zone 2.16 is Stairway #8 and it runs from the Radwaste basement up to outside of the Switchgear Rooms, Cable Spreading Room (CSR), Main Control Room (MCR), Vital MG Set Room, and to the passageway at the T/G Operating Floor level.

#### **Fire Protection Features**

This zone is separated from the following plant areas by rated fire barriers:

- El. -1', North/East-Radwaste Corridor Fire Area (FA) 1.10, Fire Zone (FZ) 3.7
- El. -1', South-Compressor Room FA 1.10/ FZ 3.10B
- El. -1', West-Heater Bay FA 1.10/ F Z 2.10
- El. 23', North-Vital MG Set Room FA1.9/ Fire Zone 3.5
- El. 23', North-CRS FA 3.2/FZ 3/2 and Rx Building FA 1.9/FZ 1.9
- El. 23', East-CRS FA 3.2/FZ 3/2
- El. 23', South-"B" Swgr. Rm. FA 1.10/ FZ 2.1 and "B" Battery Rm. FA 1.10/ FZ2.4
- El. 23', West-Heater Bay FA 1.10/ F Z 2.10
- El. 37', North/ East-CR, FA 3.1/ FZ 3.1
- EL.37', South-"B" Swgr. Rm. FA 1.10/ FZ 2.1 and "B" Battery Rm. FA 1.10/ FZ2.4
- El. 37', West- Heater Bay FA 1.10/ F Z 2.10
- El. 51', East/South/West-Feed Pump "C" Area, FA1.10/FZ 2.12

El. 51', North-FA 1.10/FZ1.23B Fan Room #1  
Ceiling-, Feed Pump "C" Area, Fire Area 1.10/ Zone 2.12A  
Floor-Ground or at EL. 51' Heater Bay FA 1.10/ F Z 2.10

The fire zone is a stairway with no combustibles except for a few very short runs of cable trays at El. 23'. The fire zone also includes a corridor on the EL. 51' that contains fire brigade lockers and self contained breathing apparatus (SCBA). Pilgrim's Fire Hazards Analysis for this zone considers the fire loading to be low consisting primarily of cable insulation. The equivalent fire severity is less than 20 minutes and that is very conservative since the combustibles in the zone at EL. 51' are separated from the stairway area where safe shutdown cables are routed. Anticipated fire development is slow.

#### **Post Fire Shutdown**

Fire Zone 2.16 contains the "A" train power cables to 480 V MCC B17 and control circuit cables associated with "B" train RBCCW pumps. As a result, fire has the potential to impact the redundant trains of the RBCCW system. Since MCC B17 provides power to the "A" train diesel, CS, RHR, and RBCCW systems, the "B" train systems will be used to accomplish safe shutdown.

Fire Zone 2.16 is a subset of Fire Area 1.9. This fire area contains multiple fire zones located in the Reactor Building, Turbine Building, Radwaste Building, and Diesel Generator Rooms.

Procedure 2.4.143.1 was written to provide instructions for shutdown and decay heat removal in the event of a fire in Fire Area 1.9. This procedure makes provision for a worst case fire affecting all of the fire zones that are grouped into Fire Area 1.9. This procedure credits MCR operation of the "B" train CS system and local operation of the "B" train RHR-TC and RBCCW systems to accomplish safe shutdown.

A separate evaluation was performed to assess required manual actions resulting from a Fire Zone 2.16 fire. This fire zone specific review is consistent with the original 1982 safe shutdown submittal and the current Appendix R analysis report. This manual action review identified that the following local manual operator actions are needed to support proper operation of the redundant train hot shutdown systems necessary to achieve safe shutdown:

- Manually start RBCCW Pumps P202D and E from panel C150.

The automatic RBCCW pump start circuit associated with PS-4008 will start all "B" train RBCCW pumps on low pressure. This circuit is tied into the same circuit as the individual pump start control switches. A cable failure to PS-4008 may blow the control power fuse and prevent a capability to start the RBCCW pumps from the MCR. Therefore, in the event of a fire in zone 2.16, a local manual operator action on panel C150 is credited to start the "B" train RBCCW pumps P202D and E. Attachment 3 to procedure 2.4.143.1 provides instruction for starting the RBCCW pumps locally from the "B" train RBCCW pump room (Fire Zone 1.22), which is located in the Reactor Building Auxiliary Bay on the west side of the Reactor Building. Fire Zone 1.22 is associated with Fire Area 1.10 and is separated from Fire Area 1.9 fire zones.

The manual actions required to restore start the "B" train RBCCW pumps are needed prior to initiating "B" train RHR torus cooling (RHR-TC). Since safe shutdown for this area relies on two relief valves in the ADS system, the "B" train CS system, and the "B" train RHR-TC system, the manual actions to start the "B" train RBCCW pumps are needed to facilitate decay heat removal. An evaluation of design basis events for containment heat removal identifies that for the Appendix R conditions described above, initiating decay heat removal within two (2) hours will ensure that containment acceptance criteria are satisfied for CS and RHR pump net positive suction head and containment design limits.

The local manual operator actions to start the "B" train RBCCW pumps were addressed in the original Appendix R submittal and were incorporated into safe shutdown procedures. Plant operators have been trained on the procedures and the manual actions necessary can be performed within the time constraint established for initiating containment heat removal.

#### **Inspection Procedure 71111.05T Feasibility Criteria**

The manual operator action discussed above has been reviewed against the evaluation criteria contained in NRC Fire Protection (Triennial) Inspection Procedure to demonstrate feasibility.

#### **Diagnostic Instrumentation**

Switch position indicators and indicator lights are provided on Panel C150.

#### **Environmental considerations**

Radiation Level: Panel C150 is located in "B" train RBCCW pump room located west of the Reactor Building in the Reactor Building Auxiliary Bay. The "B" RBCCW pump room is in a radiological control area, however, no significant radiation sources exist in the room.

Emergency Lighting: Emergency lights are installed in the "B" train RBCCW pump room in the vicinity of panel C150 and in the access and egress routes thereto. The panel C150 local operator actions are identified as required Appendix R manual actions and as such emergency lights have been installed and verified to demonstrate compliance to Appendix R Section III.J.

Temperature and Humidity Considerations: The "B" RBCCW pump room contains cooling water piping and electrical equipment. No steam or significant heat sources are located in the room.

Smoke and Toxic Gasses: Smoke and toxic gasses from a fire in Fire Zone 2.16 will not affect the "B" RBCCW pump room. The room is separated from the zone 2.16 stairway by the Reactor Building and the Turbine Building. Zone 2.16 is located in a separate fire area from the "B" RBCCW pump room and the surrounding fire barriers are adequate to prevent spread of fire and smoke from the stairway.

#### **Staffing**

Minimum shift staffing consisting of five (5) operators separate from the five man fire brigade is available to support Appendix R safe shutdown actions. One (1) operator can perform the manual actions needed.

**Communications**

Communication in the form of walkie talkies, cell phones, and giatronics will be used as needed. The walkie-talkies are stored in Alternate Shutdown Toolboxes located in both the upper and lower switchgear rooms.

**Special Tools**

Keys for Alternate Shutdown Panel C150 are required. The keys are located in the Alternate Shutdown Tool Boxes in both the upper and lower switchgear rooms.

**Training**

Operators are trained on the Appendix R safe shutdown procedures during initial training. Periodic requalification is also provided as part of Licensed Operator Requalification Training (LORT).

**Accessibility**

The "B" RBCCW Room in the Reactor Building Auxiliary Bay can be accessed via the Turbine Building, or Auxiliary Boiler Room. Operator travel through Stairway #8 on east side of the plant is not required.

**Procedures**

Procedure 2.4.143.1 Attachment 3 addresses the required local manual operator actions.

**Verification and Validation**

Operators have verified and validated Procedure 2.4.143.1 Attachment 3.

**Defense-in-Depth**

The nuclear power industry applies the concept of defense-in-depth in order to protect areas important to safety from the potential adverse effects of fire. This concept applies the following objectives to achieve its goal:

- Prevent fires from starting.
- Detect rapidly, control, and extinguish promptly those fires that do occur.
- Provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by fire suppression activities will not prevent the safe shutdown of the plant

In order to prevent fires from starting, Pilgrim has administrative controls to limit the introduction of combustible material into the plant and to control ignition sources such as welding or the use of open flames. These concepts are applied during the development of plant design changes as well.

In order to detect, control and extinguish a fire in Stairway#8, Pilgrim has provided:

- Due to the minimal combustibles and lack of ignition sources, no fire detection has been provided for this stairway. However, this is a heavily traveled area of the plant even during back shifts when Operations personnel frequently use the rear door of the CR to get access to various areas of the plant, including the "A" Switchgear Room, Vital MG Set Room, or CSR. Security personnel also frequently use this stairway.
- An organized and formally trained station fire brigade. The brigade conducts fire drills on a regular basis in various areas of the plant involving many different drill scenarios.

Live burn training is conducted yearly at a fire fighting academy used to train full time structural fire fighters. The station has pre-fire plans/procedures for all plant areas. The plans identify equipment location, ventilation, fire protection equipment, and fire fighting strategies.

In order to provide protection for structures, systems, and components needed to safely shutdown the plant, Pilgrim conducted a detailed safe shutdown analysis and has approved station safe shutdown procedures in place to respond to a fire in any plant area. Fire barriers are used to separate areas with redundant trains of safe shutdown equipment.

It is very unlikely that a fire would occur in this stairway, if one did, station personnel would alert the CR and the fire brigade would respond. The stairway is adjacent to the MCR and a very prompt response to the fire is expected. Due to the very limited combustible material, the fire would be extinguished very promptly.

### **Conclusion**

This defense-in-depth strategy minimizes the likelihood of a fire occurring and causing significant equipment or cable damage. This exemption requests approval from Appendix R Section III.G.2 compliance to allow the use of local operator actions outside the MCR to align redundant train hot shutdown systems to achieve safe shutdown in Fire Zone 2.16. The manual operator actions required are identified in safe shutdown procedures and will be performed by trained operators. The required actions will be performed within the time constraints established for system actuation. The "B" train RBCCW pumps will be started from the RBCCW room. The manual actions allow redundant train CS, RHR, and SSW systems to be operated from the MCR, free from fire damage consistent with the underlying intent of the regulation.

### **References**

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3. NRC Regulatory Issue Summary 2006-10, "Regulatory Expectations with Appendix R Paragraph III.G.2 Operator Manual Actions" June 30, 2006.
4. Pilgrim Station Power Systems Calculation No. PS-32, "Appendix R Safe Shutdown Analysis Report", Revision 5
5. Pilgrim Station Updated Fire Hazards Analysis, Report 89XM-1-ER-Q, Revision E5.
6. Pilgrim Procedure 2.4.143.1, "Shutdown with fire in the Reactor Building East (Fire Area 1.9)", R15
7. Pilgrim Procedure 2.4.143.2, "Shutdown with fire in the Reactor Building West (Fire Area 1.10)", Rev. 15.
8. General Electric Company Report, GE-NE-T23-00749-01, December 1997 (PNPS SUDDS/RF 97-96).
9. NRC Inspection Procedure, Attachment 71111.05T, "Fire Protection (Triennial)", April 21, 2006
10. EN-DC-127, "Control of Hot Work and Ignition Sources", Revision 5
11. EN-DC-161, "Control of Combustibles", Revision 3
12. Pilgrim Station Operator Training