July 20, 1988

Docket No. 50-293

Mr. Ralph Bird
Senior Vice President - Nuclear
Pilgrim Nuclear Power Station
Boston Edison Company
RFD #1, Rocky Hill Road
Plymouth, Massachusetts 02360

Dear Mr. Bird:

SUBJECT: EXEMPTION FROM CERTAIN TECHNICAL REQUIREMENTS OF 10 CFR 50, APPENDIX R, SECTION III.G - PILGRIM NUCLEAR POWER STATION

REFERENCE: TAC NO. 65962

The Commission has issued the enclosed exemption from certain requirements of 10 CFR Part 50, Appendix R, Section III.G. The licensee's requests (Exemption Request Nos. 15, 18 and 22) covered several different areas of the Pilgrim plant. The requests included exemptions from: the requirement to install full area fire detection and automatic suppression in specific areas of the Radwaste and Control Building which have redundant safe shutdown cables; the requirement that no intervening combustible be present between two redundant safe shutdown systems located in the same fire area (specific areas); and the requirement for fire detection and automatic fire suppression for torus water level indication instruments and cable located in the Reactor Building. This exemption is in response to your request dated August 10, 1987.

A Notice of Environmental Assessment and Finding of No Significant Impact was published in the Federal Register on July 20, 1988 (53 FR 27415).

Based on the staff's evaluation contained in the exemption, the Commission has granted your exemption request pursuant to 10 CFR Part 50.12. The exemption is being forwarded to the Office of the Federal Register for publication. This completes our action related to the above-referenced TAC number.

Sincerely,

/s/
Daniel G. McDonald, Senior Project Manager
Project Directorate I-3
Division of Reactor Projects I/II

Enclosure:
Exemption

cc w/enclosure:
See next page

*See previous concurrence

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OFC	:PDI-3	:PDI-3	:OGC	:PDI-3/DIR	:ADR-1	:D/DRPI/II	:
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subject to noted changes & addressing noted questions

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

July 20, 1988

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Senior Vice President - Nuclear
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Sincerely,

Daniel G. McDonald, Senior Project Manager
Project Directorate I-3
Division of Reactor Projects I/II

Enclosure:
Exemption

cc w/enclosure:
See next page

cc:

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EXEMPTION - PILGRIM

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the matter of BOSTON EDISON COMPANY	)	Docket No. 50-293
(PILGRIM NUCLEAR POWER STATION)	)	

EXEMPTION

I.

The Boston Edison Company (BECo), the licensee, is the holder of Operating License No. DPR-35 which authorizes operation of the Pilgrim Nuclear Power Station. The license provides, among other things, that the Pilgrim Nuclear Power Station is subject to all rules, regulations, and Orders of the Commission now or hereafter in effect.

The plant is a boiling water reactor at the licensee's site located in Plymouth County, Massachusetts.

II.

On November 19, 1980, the Commission published a revised Section 50.48 and a new Appendix R to 10 CFR Part 50 regarding fire protection features of nuclear power plants (45FR76602). The revised Section 50.48 and Appendix R became effective on February 17, 1981. Section III of Appendix R contains 15 subsections, lettered A through O, each of which specifies requirements for a particular aspect of the fire protection features at a nuclear power plant. The technical requirements of Section III.G of Appendix R, is the subject of the licensee's exemption requests.

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Section III.G.1 of Appendix R requires fire protection features to be provided for structures, systems, and components important to safe shutdown and capable of limiting fire damage so that:

a. One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage; and

b. Systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hours.

Section III.G.2 of Appendix R requires that one train of cables and equipment necessary to achieve and maintain safe shutdown be maintained free of fire damage by one of the following means:

a. Separation of cables and equipment and associated nonsafety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier.

b. Separation of cables and equipment and associated nonsafety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

c. Enclosure of cable and equipment and associated nonsafety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.

If the above conditions are not met, Section III.G.3 requires that there be alternative or dedicated shutdown capability independent of the fire area of concern. It also requires that fire detection and a fixed suppression system be installed in the fire area of concern. These alternative requirements are not deemed to be equivalent; however, they provide equivalent protection for those configurations in which they are accepted.

Because it is not possible to predict the specific conditions under which fires may occur and propagate, design basis protective features rather than the design basis fire are specified in the rule. Plant-specific features may require protection different from the measures specified in Section III.G. In such a case, the licensee must demonstrate, by means of a detailed fire hazard analysis, that existing protection or existing protection in conjunction with proposed modification will provide a level of safety equivalent to the technical requirements of Section III.G of Appendix R.

In summary, Section III.G is related to fire protection features for ensuring that systems and associated circuits used to achieve and maintain safe shutdown are free of fire damage. Fire protection configurations must meet the specific requirements of Section III.G or an alternative fire protection configuration must be justified by a fire

hazards analysis. Generally, the staff will accept an alternative fire protection configuration if the following criteria, to the extent applicable to the requested exemption, are satisfied:

- The alternative ensures that one train of equipment necessary to achieve hot shutdown from either the control room or emergency control station(s) is free of fire damage,

- The alternative ensures that fire damage to at least one train of equipment necessary to achieve cold shutdown is limited so that it can be repaired within a reasonable time (minor repairs using components stored on the site),

- Fire-retardant coatings are not used as fire barriers, and

- Modifications required to meet Section III.G would not significantly enhance fire protection safety levels above that provided by either existing or proposed alternatives, or modifications required to meet Section III.G would be detrimental to overall facility safety.

III.

By letter dated August 10, 1987 (BECo 87-135) the licensee, Boston Edison Company, requested three exemptions (Nos. 15, 18 and 22) from the technical provisions of Section III.G of Appendix R to 10 CFR Part 50.

Request No. 15 is for an exemption from the requirement to install full area fire detection and automatic suppression in the Radwaste and Control Building between Corridor #137 on elevation 23 feet and Corridor #49 on elevation (-) 1 foot containing, respectively, redundant Division A and Division B, safe shutdown cables. Request No. 15 also requests an exemption from the provisions of III.G.2.b to the extent that full area fire detection and automatic fire suppresion would be required for the area between Corridor #137 (containing Division A safe shutdown circuits) on elevation 23 feet and Corridor #49 (containing redundant Division B safe shutdown circuits) on elevation (-) 1 foot.

Request No. 18 is for an exemption from the requirement that no intervening combustible be present between two redundant safe shutdown systems located in the same fire area. In this instance a single cable tray is located between redundant trains of the Reactor Building Closed Water System (RBCCW) and the Salt Service Water System (SSW) in the water treatment area of the Reactor Building.

Request No. 22 is for an exemption from the requirement for fire detection and automatic fire suppression for torus water level indication instrumentation cable located in the Reactor Building.

The licensee has identified a condition where redundant safe shutdown conduits are not separated by a 3-hour fire rated barrier but are separated by more than 20 feet horizontally, but without area wide fire detection and automatic fire suppression provided. Another consideration, in addition to simple spatial separation, is that the redundant safe shutdown conduits are located on different levels in the Radwaste and Control Building.

Train A conduits are located in Corridor No. 137 on Elevation 23 feet. Redundant Train B conduits are located in Corridor No. 49 on Elevation (-) 1 foot. The floor on Elevation 23 feet, separating the two elevations and the redundant safe shutdown conduits, is of reinforced concrete construction that exceeds the 3-hour fire rating. However, an open stairway (Stairwell No. 6) communicates between Elevations (-) 1 foot and 23 feet. Thus the potential exists for a single fire on either elevation to damage the cables in both of these safe shutdown conduits. The licensee has evaluated the potential for fire to spread either way between Corridor Nos. 49 and 137 and has concluded that the risk is not sufficiently great to require the installation of automatic fire detection or suppression capability in this general area. In order for fire to spread from Corridor No. 49 on Elevation (-) 1 foot to Corridor No. 137 on Elevation 23 feet, it would have to travel by one of two paths. One path is up the open Stairwell No. 6 to Elevation 23 feet, across the Health Physics access area, which is protected by smoke detectors and full automatic sprinkler coverage, through Corridor No. 138 and into Corridor No. 137.

The second potential pathway for fire from Corridor No. 49 is up through the open Stairwell No. 6 past Elevation 23 feet into Elevation 51 feet. At Elevation 51 feet, the fire would have to traverse approximately 30 feet of open area into Fan Room No. 2 and then proceed down through the ventilation duct space into Elevation 23 feet to Corridor No. 137.

The reverse of these two pathways would be necessary for fire to travel from Corridor No. 137 on Elevation 23 feet to Corridor No. 49 on Elevation (-) 1 foot. Three mechanisms exist for fire growth and propagation to other combustible materials.

The first mechanism, conductive heat transfer (including direct flame impingement) is unlikely for either of the above pathways because there is no continuity of combustibles.

Radiant heat transfer (the second mechanism for fire growth) depends on direct, line-of-sight geometry which does not exist for either of the above described pathways. Therefore, this method of fire propagation is not of concern.

The third method, convection heat transfer, is theoretically possible but as a practical matter is of little concern. In the first pathway, the fire would have to heat up the air volume in Corridor No. 49 (Elevation (-) 1 foot), rise through open Stairwell No. 6, travel east across the health

physics access area (Elevation 23 feet) which is protected by smoke detectors and automatic sprinklers, and travel south into Corridor No. 137. Similarly in the second pathway, the fire would have to heat up the air volume in Corridor No. 49 (Elevation (-) 1 foot), rise through open Stairwell No. 6 past Elevation 23 feet to Elevation 51 feet. From there, the heated air would have to travel east across the 30 feet of open space, raise the temperature of the room volume sufficiently to be able to breach the ventilation duct in Fan Room No. 2, then travel back down to Elevation 23 feet and proceed south into Corridor No. 137 to damage the redundant train of safe shutdown conduits. Again, for fire to originate in Corridor No. 137 on Elevation 23 feet and travel to Corridor 49 on Elevation (-) 1 foot so as to damage redundant safe shutdown cables located in conduits in the two corridors it would have to travel the same routes described above but in the reverse directions. These two paths, considering the lack of continuity of combustibles and the presence of automatic detection and suppression capability in the Health Physics access area on Elevation 23 feet, argue against convective heat transfer as a viable means of fire propagation between these two corridors.

Based on the above evaluation the staff concludes that the existing physical arrangement consisting of (1) redundant safe shutdown conduits located on two different levels (Elevation (-) 1 foot and 23 feet), (2) separated by more than 20 feet in horizontal distances, (3) lack of continuity of combustibles between the redundant safe shutdown conduits, and (4) the

presence of automatic detection and suppression protection in the Health Physics access area on Elevation 23 feet, make unlikely a single fire damaging redundant safe shutdown cables contained in conduits located in Corridor Nos. 49 and 137 located respectively on Elevations (-) 1 foot and 23 feet.

Therefore, it is unnecessary to install area wide detection and automatic suppression between Corridor Nos. 49 and 137 and the licensee's request for an exemption from the provisions of III.G.2.b should be granted for this area.

Exemption Request No. 18 requests an exemption from the provisions of III.G.2.b to the extent that no combustibles or fire hazards are to be located between two redundant safe shutdown systems located in the same fire area. The subject of this exemption request is a single cable tray located 13 feet above the floor on Elevation 23 feet that is located between the Train A and Train B Reactor Building Closed Cooling Water (RBCCW) rooms.

The Train A RBCCW room is located in Fire Zone (FZ) 1.21 and the Train B RBCCW room is located in FZ 1.22. Both are located on Elevation 3 feet, are adjacent to each other, and are separated by a two-foot thick unrated wall running east-west between column lines 2.5 and 5 about midway between column lines L and M. The wall is full height between the floors on Elevations 3 feet and 23 feet and is constructed of solid concrete blocks. The other 10 feet of the wall is supported on a reinforced concrete beam and the blocks are fully grouted. The lower 10 feet of the wall is constructed without grout

(the blocks are simply set in the wall) so as to be easily removable if open access is required into FZ 1.21 which is located south of the wall from FZ 1.2 which is located north of the wall. A rolling fire door, which is supported independently from the lower part of the wall is installed in the east end of the wall to provide normal access between the two fire zones. An equipment hatchway is located just north of the wall and provides access from FZ 1.29 on Elevation 23 feet into FZ 1.22. The redundant systems located in FZs 1.21 and 1.22 include the RBCCW, Salt Service Water (SSW) and the Diesel Generator Fuel Oil Transfer system.

The redundant trains of these sytems are separated by (1) horizontal distances greater than 20 feet, (2) the above described 2-foot thick wall (which is unrated because the blocks in the lower 10 feet are not grouted) constructed of solid concrete blocks, and (3) the floor at Elevation 23 feet which is constructed of 12-inch concrete slab on metal deck.

Penetrations through this concrete floor from FZ 1.29 consist of a manhole access (equipped with steel cover) into the Acid Neutralizing Sump in FZ 1.21 and an equipment hatch (equipped with 12-inch thick concrete plug) into FZ 1.22. Fire protection in FZ 1.29 consists of area wide automatic detection and automatic sprinkler suppression. In addition, hand held extinguishers and manual hose stations are available for use by the plant fire brigade. The only intervening combustibles between the two redundant trains that are separated as described above is a single cable tray running east to west, approximately 13 feet above the floor in FZ 1.29 (Elevation 23 feet).

There are three possible methods, as sequences, whereby a single fire can damage both redundant trains of safe shutdown equipment in FZs 1.21 and 1.22.

In the first sequence, a fire starts in FZ 1.29 (water treatment are Elevation 23 feet), in either the cable tray which is located 13 feet above the floor, or in the waste oil station located approximately eight feet west of the equipment hatch into FZ 1.22 and approximately 22 feet north of the manhole into FZ 1.21. The waste oil station tanks are enclosed in a 3-foot high dike capable of containing the entire contents of the tanks. The fire would have to go undetected by the automatic detection system and exceed the capability of the automatic sprinkler system, and then spread down through the openings in the Elevation 23 feet concrete floor into both FZs 1.21 and 1.22 with sufficient intensity to damage both redundant trains.

In the second sequence a fire starts in FZ 1.21 (the acid neutralizing sump in Elevation 13 feet), and forces up through the manhole access into and across FZ 1.29 and then down through the equipment hatchway into FZ 1.22. Such a fire is unlikely since no combustible materials are located in the sump except for safe shutdown cables in question, and these are all run in conduits. In addition, FZ 1.29 is protected by area wide detection and automatic sprinkler suppression, and the equipment hatchway into FZ 1.22 is closed with a removable concrete plug when not in actual use for moving equipment into or out of these rooms.

The third sequence is the opposite of the second one, i.e., fire starts in FZ 1.22 on Elevation 13 feet, forces up through the sealed equipment hatchway into and across FZ 1.29 on Elevation 23 feet and then down through the manhole access into the acid neutralizing sump to damage the safe shutdown cables that are located in conduits.

All three of these sequences are considered unlikely because: 1) there is no continuity of combustible fuels between FZs 1.21 and 1.22; 2) FZ 1.29 is protected with area wide detection and automatic sprinkler suppression and; 3) a concrete plug seals the equipment hatchway into FZ 1.22 except when equipment is actually being moved through it.

Based upon the above evaluation the staff concludes that a single fire capable of simultaneously damaging both redundant safe shutdown trains of RBCCW, SSW and emergency diesel fuel oil transfer pump systems located in FZs 1.21 and 1.22 is unlikely, and that removing the only intervening combustible (a single cable tray located 13 feet above the floor on Elevation 23 feet in FZ 1.29) would not enhance fire safety.

Therefore, it is unnecessary to remove this cable tray and the licensee's request for an exemption from the provisions of III.G.2.b should be granted for this cable tray.

Exemption Request No. 22 requests an exemption from the provisions of III.G.3 that requires fire detection and automatic suppression for redundant safe shutdown equipment (in this case the normal torus water level indication cables) located in the same fire area when alternative safe shutdown capability is provided.

All of the torus water level indication circuits leave the torus in fire zone 1.30A and all are run in metal conduits. Train A cables leave the torus in the southeast quadrant, Train B leaves the torus about 120° away in the northwest quadrant and the alternative cables leave the torus in the southwest quadrant about 85° from Train B and 155° from Train A. The alternative train cables are fully protected by a 1 hour rated fire wrap (the torus instrumentation cables were the subject of Exemption Request No. 5, which was granted partly on the basis of separation with over 100 feet between Train A and Train B cables and the alternative instrumentation cables). After leaving the torus, the Train A water level cables rise directly into Fire Zone 1.9 (Elevation 23 feet). The Train B cables rise into Fire Zone 1.10 (Elevation 23 feet), turn east and cross into Fire Zone 1.9 then turn south to the vicinity of the Train A cables. From there on both Train A and Train B travel together through Fire Zone 1.9 into Fire Zone 1.11 (Elevation 51 feet), turn east through the fire wall at column line 17 across a small portion of Fire Zone 1.23 and through another fire wall at column line 18.5 into Fire Zone 3.4 still on Elevation 51 feet. From there these cables turn down through the floor into Fire Zone 3.11 on Elevation 37 feet and then turn south through the fire wall into the Control Room.

After leaving the southwest quadrant of the torus, the alternative train cables run north along the wall on column line 5 and then turn up through the ceiling into an alternative safe shutdown station located in Fire Zone 1.10 on Elevation 23 feet in the Reactor Building. Automatic detection and suppression is not provided in Fire Zones 1.23, 3.4 and 3.11 where both Train A and Train B cables are located. Although these zones are part of Fire Area 1.10, which also includes the alternative torus water level cables, they are located on the opposite side of the torus and separated by reinforced concrete floor (Elevation 51 feet) and walls. Because of the lack of continuous combustibles, spatial separation and the above mentioned reinforced concrete barriers between the redundant normal torus level indicator systems and the redundant systems, automatic fire detection and suppression in Fire Zones 1.23, 3.4 and 3.11 would not enhance safe shutdown of the plant.

Based upon the above evaluation, the staff concludes that it is not necessary to install area wide detection and automatic suppression capability in the vicinity of the redundant normal Torus Water Level Indication cables where they are located in Fire Zones 1.23, 3.4 and 3.11.

Therefore the licensee's request for an exemption from the provisions of III.G.3 for these cables should be granted.

IV.

Accordingly, the Commission has determined, pursuant to 10 CFR 50.12(a), that (1) the exemption as described in Section III 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 and (2) in this case, special circumstances are present in that application of the regulation is not necessary to achieve the underlying purpose of Appendix R to 10 CFP Part 50 and literal compliance would not significantly enhance fire protection safety levels. Therefore, the Commission hereby grants the exemption from the requirements of Section III.G of Appendix R to 10 CFR Part 50 regarding:

1) The lack of fire detection and automatic fire suppression in the area between Corridor Nos. 49 and 137 containing redundant safe shutdown circuits in fire zones 3.4, 3.7 and 3.9 (subsection III.G.2.b); 2) the presence of a single cable tray (combustible material) that is located between two redundant safe shutdown trains that are separated by a horizontal distance greater than 20 feet in fire zones 1.21, 1.22 and 1.29 (subsection 3.2.b) and 3) the lack of fire detection and automatic fire suppression in areas containing both redundant normal safe shutdown trains when an alternative safe shutdown train is provided in fire zones 1.23, 3.4 and 3.11 (subsection III.G.3).

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will not result in any significant environmental impact. A copy of the licensee's request for exemption dated August 10, 1987 is available for public inspection at the Commission's Public Document Room, 1717 H Street, NW, Washington, D.C. and at the Plymouth Public Library, 11 North Street, Plymouth, Massachusetts 02360. Copies may be obtained upon written request addressed to the U.S. Nuclear Regulatory Commission, Washington, D.C 20555, Attention: Director, Division of Reactor Projects I/II.

This Exemption is effective upon issuance.

Dated at Rockville, Maryland, this 20th day of July 1988.

FOR THE NUCLEAR REGULATORY COMMISSION

Steven A. Varga, Director
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will not result in any significant environmental impact. A copy of the licensee's request for exemption dated August 10, 1987 is available for public inspection at the Commission's Public Document Room, 1717 H Street, NW, Washington, D.C. and at the Plymouth Public Library, 11 North Street, Plymouth, Massachusetts 02360. Copies may be obtained upon written request addressed to the U.S. Nuclear Regulatory Commission, Washington, D.C 20555, Attention: Director, Division of Reactor Projects I/II.

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Dated at Rockville, Maryland, this 20th day of July 1988.

FOR THE NUCLEAR REGULATORY COMMISSION

/S/

Steven A. Varga, Director
Division of Reactor Projects I/II
Office of Nuclear Reactor Regulation

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DATE	:6/27/88	:6/24/88	:6/13/88	:7/14/88	:7/14/88	:6/30/88	:

OK subject to noted changes and addressing questions on p. 4