UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

December 23, 2009

Mr. Charles Pardee
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: THREE MILE ISLAND, UNIT NO. 1 - REQUEST FOR ADDITIONAL INFORMATION REGARDING REQUEST FOR EXEMPTION FROM THE REQUIREMENTS OF 10 CFR 50, APPENDIX R, "FIRE PROTECTION OF SAFE SHUTDOWN CAPABILITY" (TAC NO. ME0771)

Dear Mr. Pardee:

By letter dated March 3, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090630134), Exelon Generation Company, LLC (Exelon, the licensee), submitted a Request for Exemption for Three Mile Island Nuclear Station, Unit 1 (TMI-1). The submittal seeks exemption from the provisions of Title 10 of *The Code of Federal Regulations*, Part 50 (10 CFR 50), Appendix R, Section III.G, "Fire Protection of Safe Shutdown Capability." The exemption requests the use of operator manual actions in lieu of the circuit separation requirements specified in 10 CFR 50, Appendix R, Section III.G.2.

The Nuclear Regulatory Commission staff has been reviewing the submittal and has determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information. The questions were sent via electronic transmission on December 8, 2009, to Mr. Glenn Stewart of your staff. The draft questions were sent to ensure that the questions were understandable, the regulatory basis for the questions was clear, and to determine if the information was previously docketed. The questions were discussed in a teleconference with your staff on December 17, 2009. It was agreed that a response would be submitted by March 19, 2010.

Please contact me at 301-415-2833, if you have any questions.

Sincerely,

Peter Bamford

Peter Bamford, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-289

Enclosure: As stated

cc: Distribution via Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

REQUEST FOR ADDITIONAL INFORMATION RELATED TO

REQUEST FOR EXEMPTION FROM 10 CFR 50, APPENDIX R, SECTION III.G,

FIRE PROTECTION OF SAFE SHUTDOWN CAPABILITY

THREE MILE ISLAND NUCLEAR STATION, UNIT 1

DOCKET NO. 50-289

By letter dated March 3, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090630134), Exelon Generation Company, LLC (Exelon, the licensee), submitted a Request for Exemption for Three Mile Island Nuclear Station, Unit 1 (TMI-1). The submittal seeks exemption from the provisions of Title 10 of *The Code of Federal Regulations*, Part 50 (10 CFR 50), Appendix R, Section III.G, "Fire Protection of Safe Shutdown Capability." The exemption requests the use of operator manual actions (OMAs) in lieu of the circuit separation requirements specified in 10 CFR 50, Appendix R, Section III.G.2 (III.G.2). The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed Exelon's submittal and determined that additional information, as described in the Request for Additional Information (RAI) below, is needed to complete the review.

RAI-01 Circumstances for Review

Section II of the submittal, Attachment 1, contains background information on the proposed OMAs but does not contain a technical justification for the application of special circumstances in accordance with 10 CFR 50.12. Since, according to Section II, it is the licensee's position that the protective measures prescribed by III.G.2 represent an unwarranted burden on Exelon and are not necessary to meet the underlying purpose of the rule, provide the relevant details to support this position in response to RAI-01.1 and RAI-01.2 below. The response should demonstrate that defense-in-depth is provided such that operators are able to safely and reliably achieve and maintain safe shutdown capability. Note that it is the NRC staff's position that OMAs alone, regardless of their feasibility and reliability, do not meet the underlying purpose of the rule without specific consideration of the overall concept of defense-in-depth that is being applied in a particular fire area.

RAI-01.1: Provide a technical justification of how the proposed arrangement achieves the underlying purpose of the rule.

RAI-01.2: Provide an analysis that substantiates the claim of unwarranted burden and demonstrates that the hardship or other costs associated with the modifications noted as being required to achieve compliance are significantly in excess of those contemplated at the time the regulation was adopted, or are significantly in excess of those incurred by others similarly situated.

RAI-02 Ensuring That One of the Redundant Trains Is Free of Fire Damage

Section II of Attachment 1, asserts that the OMAs discussed in the request provide assurance that one train of systems necessary to achieve and maintain hot shutdown remains available in the event of a fire. Section II.A contains a description of each of the OMAs and the time required to perform them, but does not state whether or how one of the redundant trains in a particular fire area is maintained free of fire damage. Section II.D states that the analysis assumes that fire damage may occur immediately upon first detection of the fire to all components in the fire area.

The method described in the request appears to demonstrate safe shutdown capability independent of the fire area of origin consistent with 10 CFR 50, Appendix R, Section III.G.3, yet the request is for an exemption from the requirements of III.G.2. Section III.G.2 of Appendix R specifically states that measures must be taken to ensure that one of the redundant trains remains free of fire damage within the fire area. Section III.G.3 of Appendix R addresses alternative or dedicated shutdown capability independent of the fire area of origin and establishes a series of requirements to achieve and maintain safe shutdown capability.

RAI-02.1: Confirm and state whether an exemption from III.G.2 requirements is the appropriate request, since safe shutdown capability is provided independent of the fire area of origin.

RAI-02.2: State the specific requirements of III.G.2 that are not met for each of the requested exemptions, e.g., a lack of fire barriers, spatial separation, automatic suppression, etc.

RAI-02.3: Provide a summary of the plant-specific features that compensate for the lack of III.G.2-required features, identified in RAI-02.2, for each of the requested exemptions. For example, note any enhanced defense-in-depth measures such as a lack of ignition sources and/or combustibles, more robust and/or supplemental detection and suppression systems and other physical or administrative controls.

RAI-02.4: Appendix R establishes the concept of defense-in-depth and III.G.2 requires operators be able to safely and reliably achieve and maintain hot shutdown capability from the control room. Provide a technical explanation that justifies how the proposed methods will result in a level of protection that is commensurate with that intended by III.G.2.

RAI-03 Other Evaluations

Fire areas may have other exemptions or engineering evaluations that affect fire protection systems or safe shutdown capabilities.

RAI-03.1: If applicable, provide a discussion of any other exemptions or evaluations, including licensee-developed evaluations, e.g., Generic Letter 86-10 evaluations that impact this request in any way and provide a justification for why such impact should be considered acceptable.

RAI-04 Fire Protection System and Fire Barrier Design Criteria

Section II.B of Attachment 1, notes that several areas are equipped with various fire detection and suppression systems. However, the request does not state whether the systems have been designed and installed in accordance with recognized design standards.

RAI-04.1: Where fire protection features such as detection and suppression systems and fire rated assemblies are installed, describe the technical basis for such installations including the applicable codes, standards and listings.

For example:

Section II.B of Attachment 1, states that Fire Zone CB-FA-2a is equipped with HVAC [Heating, Ventilating and Air Conditioning] duct smoke detectors but does not state whether the detectors have been installed and maintained in accordance with a particular design standard or basis, e.g. National Fire Protection Association (NFPA) 72: National Fire Alarm Code, 1985 Edition.

Section II.B of Attachment 1, states that Fire Zone CB-FA-2b is equipped with an area-wide (incipient) detection system but does not state whether the system has been installed and maintained in accordance with a particular design standard or basis, e.g. NFPA 72: National Fire Alarm Code or NFPA 76: Standard for the Fire Protection of Telecommunication Facilities.

Section II.B of Attachment 1, states that Fire Zone AB-FZ-1 zone boundaries consist of reinforced concrete walls, floor, and ceiling but does not mention what the rating is or whether openings and penetrations in the assembly are protected.

Section II.B of Attachment 1, states that Fire Zone AB-FZ-6 has an automatic pre-action type water curtain actuated by a cross-zone type smoke detection system but does not state how it is activated or whether the water curtain has been installed and maintained in accordance with a particular design standard or basis, e.g. NFPA 13: Standard for the Installation of Sprinkler Systems, 1985 Edition.

RAI-04.2: Provide a technical justification for any deviations from codes, standards and listings by independent testing laboratories in the fire areas that could impact this evaluation.

RAI-04.3: Provide a technical justification for any non-rated fire protection assemblies.

RAI-05 Ignition Sources and Combustible Fuel Load

Section II.B of Attachment 1, includes a description of the combustible fuel load in each of the fire areas in question and rates them as LOW or MEDIUM. Items such as cable insulation, lube oil, battery cases and Class C materials are stated as being present in many of the fire areas.

RAI-05.1: Provide critical details or assumptions regarding the in situ and transient fire hazards that could threaten redundant equipment for each fire area included in the requests. This information may include, but is not limited to:

- The number, type and location of potential ignition sources,
- The number and types of equipment that may exhibit high energy arcing faults, and the relationship between this equipment and any secondary combustibles,
- The quantity of cables and other secondary combustibles and their relationship to potential ignition sources,
- The cable type, e.g., thermoplastic or thermoset. If thermoplastic cables are used, provide a discussion of self-ignited cable fires,
- Ratings for cables, e.g., Institute of Electrical and Electronics Engineers (IEEE)-383, etc. If not rated, justify why fire spread would be assumed to be slow,
- Controls on hot work and transient combustibles in the area, and the proximity of secondary combustibles that could be impacted by a transient fire, and
- Dimensions of the rooms including ceiling heights.

RAI-06 Fire Scenarios

Section II.B of Attachment 1, describes each of the OMA procedures but does not state what fire scenarios have been considered for the postulated events. Also, the request includes discussions of equipment that may be available, but does not include a discussion of whether that equipment would be affected by the postulated events.

RAI-06.1: Provide a description of the proximity of the redundant train equipment to in situ hazards and the spatial relationship between the redundant trains in the fire area such that if they are damaged, manual actions would be necessary. Note that this question is distinct from the RAI-05, which is generally focused on the combustibles in an area, whereas, this RAI addresses the specific relationship between ignition sources and combustibles and the redundant trains.

For example:

For Fire Zone AB-FZ-7, no information is provided to describe the spatial relationship between the combustible materials (i.e. cables, lube oil, etc.) and the safe shutdown equipment located in the fire area. Also, missing is a discussion of the relationship between the two redundant trains in the area and whether they are located such that a single fire event could damage both trains.

RAI-07 Initiation of Procedures

Section II.D.1 of Attachment 1, states that the initial time (T=0) for most actions was the time at which the failure occurred and that failure was assumed to occur simultaneous to the report of the fire. This section also states that operators will be fully aware of the fire location and conditions and will be ready to initiate OMAs very close to the start of the event but does not elaborate on how this will be accomplished.

RAI-07.1: Provide an analysis or technical justification that demonstrates that the ability to detect a fire is sufficient to provide notification of a postulated event before damage to the redundant trains occurs or provide an analysis or technical justification to evaluate scenarios where the redundant components are damaged before a fire has been reported.

RAI-07.2: Describe what systems or procedures will result in notifying operators of a fire location and the conditions at that location as well as a technical justification for why this approach would occur close to the start of the event.

RAI-08 Time and Sequence Assumptions

An action is considered feasible if it is shown that it is possible to be performed within the available time (considering relevant uncertainties in estimating the time available). The timeline graphics provided in the request do not appear to include the four segments (diagnosis time, travel time, action time and confirmation time) discussed in Section II.D.1 of the request.

RAI-08.1: Provide a justification that demonstrates that the proposed OMAs are feasible.

RAI-08.2: If a factor of safety or diagnosis time has been included in the stated times to complete the actions, provide an explanation for how it has been incorporated into the timelines. If not, justify why the stated times are sufficient to assure safety.

RAI-08.3: Describe the relationship between the phrase "confirmation of a fire" noted in Section II.D.1 and the phrase "indication of a fire" noted in Attachment 2 and how any distinction between these two events are addressed in the timelines.

RAI-08.4: Clarify the fire area containing the proposed OMA verses the fire area containing the fire event in Table 1. For instance, OMAs 1 and 4 appear to contain the same fire areas for "OMA Location" and "Fire Areas/Zones Crediting OMA" indicating that operators are required to re-enter the fire area of fire origin to perform an OMA.

RAI-09 Fire Area Proximity and Access

Section II.B of Attachment 1, describes each fire area and includes statements about the nature and rating of the fire area boundaries but does not mention whether openings and penetrations exist or whether they maintain the integrity of the rated barriers. Section II.D.3 notes that many of the fire areas have separate ventilation systems but does not discuss how and when these systems activate and whether they have been designed to transport products of combustion without causing additional damage to equipment or relocating the smoke to other fire areas.

RAI-09.1: Indicate whether the use of Self Contained Breathing Apparatus is necessary for each fire area or zone included in the request.

RAI-09.2: For adjacent fire areas or where operators will pass within close proximity of the fire affected area included in the request, provide a technical justification that demonstrates that a fire in the fire area of fire origin would not impact the performance of the OMA.

RAI-09.3: State whether identified ventilation systems are used for smoke evacuation or fire brigade operations and provide a justification for the systems capabilities.

RAI-10 Fire Area of Origin Re-entry

Section II.B of Attachment 1, states that, depending on the fire scenario, operators may be required to re-enter certain fire areas such as AB-FZ-1, AB-FZ-5 and AB-FZ-6, to perform an action following a fire event. The request also indicates that all unprotected equipment located in a fire affected area or zone is assumed lost or damaged as a result of the fire.

RAI-10.1: Confirm whether reentry is required and whether unprotected equipment is assumed lost or provide a justification for why the assumption that all equipment located in the fire area of origin is lost during a fire does not apply.

RAI-10.2: Provide critical details or assumptions of the analysis that demonstrates that the required safe shut down equipment or component located within the area is maintained free of fire damage and remains accessible and operable following the fire event.

RAI-10.3: Provide a technical justification for why the assumed reentry period is appropriate and an explanation for what is assumed to be included in this time.

RAI-11 Reliability of Actions

Section II.D of Attachment 1, states that adequate margin exists for all the operator manual actions, which demonstrates feasibility and reliability. A "reliable action" is a feasible action that is analyzed and demonstrated as being dependably repeatable within an available time, so as to avoid a defined adverse consequence, while considering varying conditions that could affect the available time or the time to perform the action.

RAI-11.1: Where a particular amount of time has been allocated for diagnosing an event, demonstrate that the additional uncertainties such as recovery from unexpected delays, environmental factors, operator response to stress, etc. are addressed by this time.

RAI-11.2: Provide a clear description of how the time needed to perform potential corrective or reactive actions in the event the action did not accomplish the desired result (i.e., "response not obtained") was factored into the OMA performance time and provide the technical basis for the time allotted for each reactive action.

RAI-12 Required Operator Stations

The request does not specify what has been assumed for the location from which operators are dispatched to perform the OMAs or whether scenarios were evaluated where operators were not at their assumed locations at the beginning of an event.

The location or activities of required plant personnel when the fire starts could delay their participation in executing the operator manual actions (e.g., they may be in a location that is on the opposite side of the plant from the main control room or may need to restore certain equipment before being able to participate or both).

RAI-12.1: Provide a justification for the assumption that operators will be located at an assumed location when the OMA procedure begins. If there isn't assurance that the operators will be at the assumed locations, provide the times required for them to reach the locations and indicate how these times are reflected in the analysis.

RAI-12.2: State whether the assumed times for operators to perform various tasks, such as 3 minutes for Auxiliary Operator (AO)-1 to close MU-V-189 shown in Attachment 2, are reasonable. For instance, provide a justification for assuming that it will take AO-1 3 minutes from the time they are directed to close MU-V-189 to travel to and close the valve and then confirm its closure.

RAI-13 Use of Water Curtains

Section II.B of Attachment 1, states that the fire protection for Fire Zone AB-FZ-6 includes the use of an automatic pre-action sprinkler system to provide a water curtain for the open passageway from Fire Zone AB-FZ-6 to Fire Zone AB-FZ-7.

It is not clear from this statement whether the fire zone is provided with an automatic fire suppression system or whether the water curtain is intended to serve as a suppression system.

RAI-13.1: State what the intended purpose of the water curtain is and how it is credited as part of the defense-in-depth concept, if at all. Also state whether the fire area is provided with an automatic suppression system in areas containing redundant equipment.

RAI-14 Smoke Detection Above Ceiling

Section II.B of Attachment 1, states that Fire Area CB-FA-1 is provided with an automatic ionization fire detection system above the suspended ceiling but does not indicate what the intended purpose of this system is or how it will be used to detect a fire in the fire area.

RAI-14.1: State what the intended purpose of the automatic ionization fire detection system is and explain whether the ceiling is open or how the system will detect a fire below the suspended ceiling.

RAI-15 Active Systems

Section II.B of Attachment 1, describes the fire protection features provided for Fire Zone FH-FZ-5 but it is not clear whether the fire zone is provided with automatic fire detection and suppression. This section states that a combination of area and HVAC duct smoke detectors is provided and 3-hour fire rated barriers are provided for circuits but it is not clear whether this statement only applies to the Instrument Shop and Repair Facilities or to FH-FZ-5 as a whole.

RAI-15.1: State which systems and barriers are provided in or around areas containing redundant equipment in Fire Zone FH-FZ-5.

December 23, 2009

Mr. Charles Pardee
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: THREE MILE ISLAND, UNIT NO. 1 - REQUEST FOR ADDITIONAL INFORMATION REGARDING REQUEST FOR EXEMPTION FROM THE REQUIREMENTS OF 10 CFR 50, APPENDIX R, "FIRE PROTECTION OF SAFE SHUTDOWN CAPABILITY" (TAC NO. ME0771)

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/ra/
Peter Bamford, Project Manager
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Docket No. 50-289

Enclosure: As stated
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