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Nuclear

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U.S. Nuclear Regulatory Commission
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Peach Bottom Atomic Power Station, Units 2 and 3
Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Subject: Response to Request for Additional Information
License Amendment Request
Proposed Change to the Fire Protection Program Concerning Carbon Dioxide Fire Suppression Systems Actuation

References: (1) Letter from M. P. Gallagher, Exelon Generation Company, LLC, to U. S. Nuclear Regulatory Commission, dated September 26, 2003.

(2) Letter from G. F. Wunder, U. S. Nuclear Regulatory Commission, to C. M. Crane, Exelon Generation Company, LLC, dated November 9, 2004.

In Reference 1, Exelon Generation Company, LLC (Exelon), requested an amendment to Facility Operating License (FOL) Nos. DPR-44 and DPR-56 for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, respectively. Exelon submitted this request to obtain NRC approval to implement a change to the PBAPS Fire Protection Program (FPP). Specifically, the proposed change to the FPP involves converting the existing carbon dioxide (CO_2) fire suppression systems, located in the Cable Spreading Room (CSR) and each of the four Emergency Diesel Generator (EDG) Rooms, from automatic to manual actuation systems.

In Reference 2, the NRC requested additional information concerning the Reference 1 submittal. The attachment to this letter restates the NRC questions and provides Exelon's response to each question.

Exelon has concluded that the information provided in this response does not impact the conclusions of the: (1) Technical Analysis, (2) No Significant Hazards Consideration under the standards set forth in 10 CFR 50.92(c), or (3) Environmental Consideration as provided in the original submittal (Reference 1).

The Reference 1 submittal letter contained two (2) regulatory commitments. One involved upgrading existing one-hour rated fire barriers in the CSR to three-hour rated barriers. The other commitment involved inclusion of the existing fire barriers around each EDG day tank

room into the fire barrier surveillance program. These commitments remain unchanged by the information presented in the attached responses.

If you have any questions or require additional information, please contact Glenn Stewart at 610-765-5529.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 8th day of December, 2004.

Respectfully,

Robert C. Braun
Site Vice President
Peach Bottom Atomic Power Station
Exelon Generation Company, LLC

Attachment: Response to Request for Additional Information

cc: Administrator, Region I, USNRC w/ attachment
USNRC Senior Resident Inspector, PBAPS "
Senior Project Manager, USNRC "
Director, Bureau of Radiation Protection - Pennsylvania Department of Environmental Protection "

CCN# 04-14100

Attachment

License Amendment Request

Peach Bottom Atomic Power Station, Units 2 and 3
Docket Nos. 50-277 and 50-278

Proposed Change to the Fire Protection Program Concerning
Carbon Dioxide Fire Suppression Systems Actuation

Response to Request for Additional Information

ATTACHMENT

Response to Request for Additional Information

By letter dated September 26, 2003, from M. P. Gallagher, Exelon Generation Company, LLC (Exelon), to U. S. Nuclear Regulatory Commission, Exelon requested an amendment to Facility Operating License (FOL) Nos. DPR-44 and DPR-56 for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3, respectively. Exelon submitted this request to obtain NRC approval to implement a change to the PBAPS Fire Protection Program (FPP). Specifically, the proposed change to the FPP involves converting the existing carbon dioxide (CO_2) fire suppression systems, located in the Cable Spreading Room (CSR) and each of the four Emergency Diesel Generator (EDG) rooms, from automatic to manual actuation systems.

By letter dated November 9, 2004, from G. F. Wunder, U. S. Nuclear Regulatory Commission, to C. M. Crane, Exelon, the NRC requested additional information concerning Exelon's submittal. Each NRC question is restated below followed by our response.

(1) Title 10 of the Code of Federal Regulations (10 CFR) 50.48(a) requires that each operating nuclear power plant have a fire protection plan which satisfies Criterion (GDC) 3 of Appendix A to Part 50. Criterion 3 of Appendix A to 10 CFR Part 50 requires that structures, systems, and components (SSCs) important to safety be designed and located to minimize the probability and effect of fires and explosions. It further requires that fire fighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the capability of these SSCs.

The NRC has provided specific criteria, information, recommendations, and guidance acceptable to the staff that may be used to meet the requirements of 10 CFR 50.48 and GDC 3. This information is provided in NUREG 0800, Standard Review Plan (SRP), Section 9.5.1, "Fire Protection Program," Regulatory Guide (RG) 1.189, and Branch Technical Position (BTP).

Appendix A to Branch Technical Position Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1, specified that licensees that have installed a gaseous fire suppression system in the CSR as a primary fire suppression system install a backup water spray system and hose stations.

- Are the automatic CO_2 fire extinguishing systems installed in the CSR and EDG rooms in compliance with the Appendix A to BTP APCSB 9.5-1?

  Response: Guidance provided in BTP APCSB 9.5-1, states, "alternatives may be provided by applicants and licensees. These alternatives will be evaluated by the NRC staff on a case-by-case basis where such departures are suitably justified." The CO_2 systems in the EDG rooms and the CSR were installed as part of original plant construction and pre-date Appendix A to BTP APCSB 9.5-1. These systems were described to the NRC in the Peach Bottom Fire Protection Program Report submitted to the NRC in March 1977. At that time, the EDG CO_2 fire suppression systems were automatic and the CSR CO_2 fire suppression system was manual. The CSR does not have a back-up water spray system, but hose stations are installed directly outside the CSR that provide coverage to the CSR. In subsequent submittals, PBAPS committed to making the CSR CO_2 fire suppression system automatic. The CO_2 fire suppression systems for the EDG rooms and the CSR were accepted in Fire Protection Safety Evaluation Reports by the NRC.

- Does Exelon plan to install a fixed water spray to back up the proposed manual CO_2 fire extinguishing system?

  Response: There are no plans to install a fixed water spray system in the CSR. This feature was determined not to be warranted due to the ability to extinguish a fire manually and the potential adverse impact of the water spray on safety related equipment not affected by the fire.

- What is (are) the code(s) of record (COR) for the CO_2 fire extinguishing system? Describe any deviation from the COR.

  Response: Both the EDG and CSR CO_2 fire suppression systems were designed and installed as part of the original plant design. The COR is National Fire Protection Association (NFPA) 12, "Standard on Carbon Dioxide Extinguishing Systems," 1968 Edition. There are no significant deviations from the COR for either the EDG or CSR CO_2 fire suppression systems that would impact system performance. The installations are consistent with the code requirements. Personnel safety considerations include pre-discharge alarms, warning signs, and safety information provided in General Employee Training. Both areas have fire detection, which alarms in the main control room. Major system components are listed for fire protection service. Ventilation fans that supply/exhaust air from the room are shutdown as part of the discharge logic. The design concentration for the EDG rooms was 50% which is above the recommended 34% of the COR and the CSR used a design concentration of 50% which matches the recommended 50% concentration in the COR.

- What types of systems will be provided in the CSR and EDG rooms? See National Fire Protection Association (NFPA) 12, "Standard on Carbon Dioxide Extinguishing Systems," 2000 Edition, Section 1-8.1 for types of manual systems.

  Response: NFPA 12-2000, Section 1.8-1, provides three options: a) an automatic system, b) Normal Manual Operation, and c) Emergency Manual Operation. The modification to make the existing CO_2 system manual in the CSR and each EDG room most closely matches "normal manual operation." The only significant difference is that a manual lever must be operated by hand to initiate discharge. The manual lever will be installed outside of the room being protected and will be easily accessible.

- On page 11 you note that, "the manual CO_2 system will permit rapid manual action using hand held fire extinguishers by the fire brigade. The manual CO_2 system provides a back-up in the unlikely event of a significant fire in the CSR."

  – Discuss how PBAPS Units 2 and 3 meet the BTP APCSB 9.5-1 requirements.

    Response: The purpose of submitting the LAR was that the manual CO_2 system would not meet the guidance of Appendix A to BTP APCSB 9.5-1 as accepted by the NRC staff in Fire Protection Safety Evaluation Reports as it relates to the CSR. The LAR provides technical justification as to why a manual CO_2 fire suppression system will meet the intent of guidance in Appendix A to BTP APCSB 9.5-1, which is to minimize the effects of a fire and to ensure that safe

shutdown can be achieved and maintained in the event of a fire in the CSR. A summary of how the manual CO_2 system will permit rapid manual action using hand held fire extinguishers in the CSR is provided below.

To understand the benefits of a manual CO_2 system vs. an automatic CO_2 system in the CSR, the likely fire scenarios within the CSR must be considered. The CSR contains low voltage electrical cabinets (120 VAC or 125 VDC). The exposed cable in the room has fire retardant insulation and is limited to instrumentation and control applications. There are no oil filled components in the room, and transient combustibles are typically computers being used to monitor an instrument cabinet. Therefore, the most likely fire scenario is a small fire that is quickly detected by one of the 25 smoke detectors in the room. The smoke detector provides an alarm in the control room. With the CO_2 system in the automatic mode, once a second smoke detector alarms, the discharge logic for the CO_2 system initiates and CO_2 discharge will occur following a 105 second discharge delay. The threat of the CO_2 discharge hinders prompt action by the fire brigade such as the immediate use of a hand held portable fire extinguisher. Thus, a small fire can result in an unnecessary CO_2 discharge. At PBAPS, a CO_2 discharge invokes a procedural requirement to immediately shutdown both units.

When the CO_2 system is in the manual mode, the smoke detector alarm will initiate the fire brigade response that includes the fire brigade leader reporting directly to the scene. The fire brigade leader can safely enter the room, assess the situation, provide a report to the control room and use a portable fire extinguisher. If the fire is large, the fire brigade leader has the option to initiate the CO_2 system manually. However, this discharge will be anticipated by the control room and allow for a more orderly shutdown of both units.

(2) Your letter dated September 26, 2003, states that, "this letter contains two (2) regulatory commitments. One involves upgrading existing one-hour rated fire barrier in the Cable Spreading Room to three-hour rated barriers. The purpose of the fire barrier upgrades is to eliminate the Appendix R, Section III.G.2.c requirement for automatic suppression in the fire area. The installation of three-hour rated fire barriers meets the requirements of Appendix R, Section III.G.2.a..."

- Please explain your basis to conclude that this fire area fall under Section III.G.2 of Appendix R to 10 CFR Part 50 rather than Section III.G.3.

  Response: Appendix R, Sections III.G.2 and III.G.3, pertain to the protection of systems whose function is required to achieve safe shutdown, and do not directly result in classifying fire areas as "III.G.2" or "III.G.3." Section III.G.2 of Appendix R provides options for protecting circuits that are necessary to achieve post-fire safe shutdown. Appendix R, Section III.G.3, requires alternative or dedicated shutdown capability where the protection of systems whose function is required for hot shutdown does not satisfy the requirements of Section III.G.2.

  Certain cables have been protected, as permitted, to satisfy the requirements of Section III.G.2. Alternative shutdown capability has been provided for the remaining functions that are necessary to achieve safe shutdown. This is permissible under Section III.G.3.a. Appendix R does not limit compliance options to Section III.G.2 or

Section III.G.3 to the extent that only one option or the other must be used exclusively. In this case, Alternative Shutdown capability is provided for those functions required for hot shutdown that do not satisfy Section III.G.2. Section III.G.2.a protection (3-hour rated fire barriers) is provided for certain circuits associated with the alternative shutdown capability that must traverse the CSR since there is no other practical routing path available.

The encapsulated circuits are protected as part of the original compliance strategy for Appendix R for PBAPS. The NRC has previously found this configuration to be in compliance with Appendix R. The presence of this encapsulation is discussed in Section 5.3.19 of the PBAPS FPP which describes fire protection and safe shutdown features for Fire Area 25. These circuits were originally encapsulated with 3-hour rated fire barriers. The NRC reviewed this encapsulation during mid-1980's compliance inspections and found it acceptable. The presence of encapsulation in the CSR is discussed in Section 2.4.7 of the NRC's Safety Evaluation Report dated September 16, 1993, which approved the PBAPS FPP. Since that time, in response to Generic Letter 92-08, "Thermo-Lag 330-1 Fire Barriers," the encapsulation was downgraded from a 3-hour to 1-hour rating, at which time, the automatic suppression in the CSR was credited in order to satisfy Appendix R, Section III.G.2.c, for the protected raceway. As part of the conversion of the CO_2 from automatic to manual, Exelon plans to restore the encapsulation to its original 3-hour rating.

- Describe how CSR being divided as two separated fire areas? i.e., III.G.2 and III.G.3.

  Response: The CSR is not being divided. See the response above regarding Section III.G.2 vs. Section III.G.3. We understand that Figure 2 provided in the original License Amendment Request (LAR) may have caused this confusion by giving the impression that the CSR north and south "wing room" areas were separate fire zones. The "wing room" areas are not treated as separate fire zones**.** The photograph below shows the location of the raceway encapsulation in one of the "wing rooms" which is within the CSR, Unit 2 side (Unit 3 side is similar).

(3) BTP APCSB 9.5-1, Section IV.C.5(f) states that, "possibility and probability of CO_2 systems being out-of service due to personnel safety consideration. CO_2 systems are disarmed whenever people are present in an area so protected. Areas entered

frequently (even though duration time for any visit is short) have often been found with CO_2 systems shut off."

If the automatic CO_2 fire extinguishing systems in CSR and EDG rooms was installed to meet the above guidelines (i.e., system disarmed whenever people are present in CO_2 protected areas to prevent inadvertent operation), describe why proposed change is requested to the PBAPS Units 2 and 3 approved fire protection program.

Response: BTP APCSB 9.5-1, Section E.5, starts off by stating, "Particular consideration should also be given to:" followed by a list of several items, including item (f) which is stated above. Each of the EDG rooms and the CSR are provided with disarm switches at each door. In the past, PBAPS had experienced similar concerns regarding installed disarm switches being left in the system "shut-off" position. As a result, these disarm switches are no longer used by plant personnel entering the CSR or EDG rooms. Currently, by plant procedure, any activity within these rooms that has the potential to hinder immediate egress from the rooms requires the CO_2 system to be tagged out of service using the clearance and tagging process. Normal entry into these areas does not require the CO_2 system to be disabled and only operations personnel applying the clearance are permitted to touch the disarm switches.

To address the specific question as to why PBAPS is pursuing this change, it is for personnel safety. While PBAPS has a process in place to protect workers in the area who are performing work activities that could delay egress, the CO_2 system remains operable during normal access. These rooms are accessed many times during the day. Information Notice 99-05, "Inadvertent Discharge of Carbon Dioxide Fire Protection System and Gas Migration," provides industry experience in which a CO_2 system that was disarmed, had an inadvertent actuation resulting in a fatality.

In the case of the EDG rooms, the EDGs are most vulnerable to a fire while they are operating, which means that an equipment operator is typically in the room. Tagging shut the CO_2 systems during EDG operation effectively makes the CO_2 system a manual system. When a system is in the automatic mode, there is always a potential for an inadvertent discharge.

(4) The principle combustibles in EDG rooms consists of a large amount of lubricating and fuel oil. Rapid detection and actuation of the CO_2 fire extinguishing system should arrest a fire in the early stages. Due to the delayed actuation, since EDG area is unmanned it is unlikely that a manually actuated CO_2 system will extinguish a fast growing oil fire in its early stage in the EDG rooms. Converting the CO_2 fire extinguishing system from automatic to manual actuation could potentially compromise a second element of the defense-in-depth (DID) in this fire area, resulting in reduction of the DID required by the regulation. Section II of Appendix R to 10 CFR Part 50, "General Requirements," states that the fire protection program shall extend the concept of defense-in-depth to fire protection in fires areas that are important to safety, with the following objectives:

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

Provide a technical justification that a manually actuated CO_2 system installed in the EDG rooms will rapidly control and extinguish a flammable liquid (lube oil) fast growing fire.

Response: In the event of a fire in a EDG room involving a combustible liquid (either lube oil or diesel fuel), an automatic CO_2 system will extinguish the fire in less time than a manual system in most situations assuming the "clock" is started when the fire first starts. However, the objective to consider regarding this question, is the status of the EDG and the impact of the loss of the EDG on the ability to achieve safe shutdown. A fire in an EDG room of the magnitude to cause an automatic CO_2 initiation involving either lube or fuel oil would have resulted in the loss of the EDG due to the loss of fuel or lube oil. In addition, since the air intake for each EDG at PBAPS is located within the individual EDG room, the EDG would be inoperable due to the lack of combustion air. So regardless of automatic or manual CO_2 initiation, the EDG in the fire affected room is rendered unavailable.

The next part of this response is to consider the impact of a delay in fire extinguishment resulting from a manual CO_2 discharge and the impact on safe shutdown. A fire in a single EDG room will not affect the ability of the other EDGs to operate. In addition, off-site power is not impacted by a fire in a single EDG room as is demonstrated by the post-fire safe shutdown analysis. Three-hour fire barriers are provided between each of the EDG rooms. Fire doors and penetrations seals provided with a fire rating commensurate with the fire rating of the barriers are provided. A delay of initiating the manual suppression system will not impact the adjacent EDGs.

Once the CO_2 system is discharged (either manually or automatically), the CO_2 system will be effective in extinguishing the fire (even with a longer pre-burn time inherent with a manual system). This statement is based on two key aspects. First, a combustible liquids fire will primarily involve a floor based pool fire. CO_2 is heavier than air and will settle out at the floor resulting in a high concentration of CO_2 at the floor. Second, NFPA 12-1968 recommended the use of a 34% design concentration for use on combustible liquids such as oil or kerosene. The CO_2 system was designed to provide a 50% concentration. This additional agent will provide for rapid fire extinguishment and maintain an extinguishing concentration for a long period of time, allowing surfaces that became hot during the pre-burn to cool down and not reignite oil.

Therefore, regardless of the actuation type, the affected EDG will be unavailable, but the remaining EDGs will remain free of fire damage as will the off-site power capability. This is consistent with the recent fire Probabilistic Risk Assessment (PRA) that was able to screen out each EDG room without consideration of the fire detection or suppression systems.

- Are EDG rooms have dike (curb) to retain lube oil spill? If yes, provide the dimension of dike (curb).

  Response: Yes, 2-inch curbs are provided at the doorways between the adjacent EDG rooms.

- Describe how the fire brigade plans to fight a lube oil fire in EDG rooms.

Response: There are actually two oil hazards within each EDG room, lube oil and diesel fuel oil. Both fuel oil and lube oil meet the definition of a combustible liquid, so from a fire fighting standpoint, the fire fighting plans would be the same. For a minor fire, fire extinguishers are provided within each EDG room and equipment operators, who are normally in the area when the EDGs are operating, are trained in the use of fire extinguishers. For a major oil fire within an EDG room, the fire brigade is provided with three options.

First, is the use of the manual CO_2 system. The manual CO_2 system can be initiated for an individual EDG room outside of the EDG room, and instructions for performing this action are provided in the pre-fire plans. The pre-fire plans are provided near the manual discharge station. As noted in a previous response, the CO_2 system will be effective on an oil fire.

Second, is the use of foam. Foam supplies (foam concentrate, foam eductors and foam nozzles) are available in hose houses located both on the east and west sides of the EDG building. Each hose house is adjacent to a fire hydrant and has sufficient hose to supply multiple 2-1/2 inch supply lines to the affected EDG room door. The EDG room is arranged such that foam can be applied from an exterior door so that entry into the room to apply the agent would not be required.

Third, is use of fog lines. Water, applied as a fog can be used to extinguish combustible liquid fires. Hydrants and hose houses are located on both the east and west sides of the EDG building. The arrangement of the EDG building permits access from an exterior door above which will permit suppression of the fire without entry into the building.

The fire brigade receives training/drills on all three methods of fire fighting noted above.

- Does the fire brigade have a readily available supply of specialized fire fighting equipment and training to effectively deal with large hydrocarbon fires inside a structure?

  Response: PBAPS maintains an inventory in excess of 200 gallons of foam concentrate on site. Hose houses located on the east side and the west side of the EDG building have foam making supplies (specifically, foam concentrate, foam eductors and foam nozzles). The hose houses also contain adequate fire hose to provide a water supply directly to the EDG building.

  The fire brigade receives training on fighting hydrocarbon fires, primarily using outdoor pits and transformer mockups. Interior hydrocarbon fire fighting training is limited in the size of fires. Region 1 NRC fire inspectors have observed fire fighting training at the facility used by the PBAPS fire brigade. The configuration of the EDG rooms will permit access to the room from an exterior door. Foam can be effectively applied from the doorway without entry to the room being required. Moreover, the exterior doorway is approximately 18 inches above the normal floor level, prior to the steps to the lower section. The potential oil pool associated with the fire will be separated from the door, permitting a higher degree of safety for the fire fighters at the exterior doorway. Therefore, fire fighting can essentially be done from the exterior of the structure.

- Describe critical components that have been identified in the manual actuation mode that their failure could lead to either no CO_2 delivered to the CSR and EDG rooms or to a reduced CO_2 concentration that would prevent successful fire extinguishment.

  Response: The manual systems will be similar to the automatic systems with the exception that a manual action will be required to open a valve to initiate CO_2 flow. This valve is similar to an electro-mechanical pilot control (EMPC) valve. No new failure modes are introduced as a result of the modification to make the system manual.

(5) Upon receipt of a fire alarm in the main control room (MCR), what actions are taken to verify that a fire exists in the CSR or EDG rooms?

Response: For fire detection alarms in the CSR or the EDG rooms, the fire brigade will be dispatched immediately. The alarm response cards (ARCs) are being modified to ensure that the entire fire brigade is dispatched upon receipt of a detection alarm for either the CSR or EDG rooms. The fire brigade leader reports directly to the reported fire location to assess the situation and report to the control room. Meanwhile, the remaining fire brigade members report to the fire brigade locker to don their fire fighting personal protective equipment (PPE). In the case of the EDG rooms, there is normally an operator at the EDG while it is running, who would immediately report a fire condition if observed.

- Are these actions proceduralized? How much time will be required to verify the alarm, locate the requisite response procedure, and manually initiate the CO_2 fire extinguishing system?

  Response: Response to fire alarms received in the main control room are addressed by the ARCs that are provided for each alarm that is received. In addition, procedure FF-01, "Fire Brigade" and ON-114, "Actual Fire Reported in the Power Block, Diesel Generator Building, Inner Screen or Emergency Cooling Tower Structures," provide guidance on dispatch of the fire brigade and actions to take in the event of a fire. These procedures are available for review at PBAPS. There are pre-fire strategy plans available for the CSR and for the EDG building. The pre-fire strategy plans for the CSR and EDG rooms have been laminated and posted at the location where a manual discharge of the CO_2 system will be performed.

  A fire alarm generated by a smoke detector in the CSR or a set of heat detectors in the EDG room will result in an immediate dispatch of the fire brigade. Therefore, there will be no time delay associated with verification of the fire. It will be assumed, upon receipt of a fire alarm in the control room from either the CSR or EDG rooms, that a real fire condition exists. At PBAPS, the fire brigade leader reports directly to the fire location upon dispatch (while the remainder of the fire brigade reports to the fire brigade dress-out area). Based on previous drills, the response time for the fire brigade leader to arrive at the CSR has been approximately 3 minutes. Response to the EDG rooms for the fire brigade leader is longer since the EDG building is separate from the power block buildings. Response time has been on the order of 5 to 7 minutes for the fire brigade leader. However, when an EDG is operating, (which is when a fire is most likely) an operator (who is a qualified fire brigade member) is in

or near the EDG room. Since the pre-fire plan is posted at the EDG building, the attending operator can discharge the CO_2 manually if warranted.

- Upon verification that a fire exists in the CSR or in EDG rooms, do procedures direct the operators to manually initiate the CO_2 fire extinguishing system? Provide copies of the actual procedures directing the manual initiation of the CO_2 fire extinguishing system in CSR and EDG rooms.

  Response: The pre-fire strategy plans for the CSR and the EDG building provide step-by-step instructions on how to initiate the CO_2 systems manually. The pre-fire strategy plans do not mandate that the CO_2 system be initiated. The fire brigade leader is expected to consider the as-found fire conditions prior to deciding to actuate the CO_2 system in the respective room.

- For a fire in the CSR, what measures have you taken to assure that sufficient number of personnel are available to suppress the fire while shutting down the reactor?

  Response: The PBAPS Technical Requirements Manual and implementing procedures ensure that adequate numbers of operators are available to provide for both fire fighting (fire brigade members) and safe shutdown. Currently, PBAPS assumes the loss of the CSR or the loss of an EDG as part of the Appendix R post-fire safe shutdown analysis. The staffing to fight a fire and shutdown the plant is available regardless of the CO_2 system being automatic or manual.

- Provide a copy of the fire brigade pre-fire plan for the CSR and EDG rooms for manual fire fighting.

  Response: The pre-fire strategy plans are available for inspection at PBAPS. The pre-fire plans provide a sketch of the room, a list of hazards in the room, a summary of critical equipment in the room, ventilation, fire protection systems, hose stations, fire extinguisher locations and potential exposures. The CSR and EDG pre-fire plans also include step-by-step instructions for manually operating the CO_2 systems in the respective rooms.

- Describe operator and fire brigade response to a fire alarm in the CSR and EDG rooms. Describe operator response upon receipt of a fire alarm signal; how manual fire fighting response is planned considering the distance from the main power block; and how manual fire fighting protective gear (bunker gear, SCBA, extra air supply, etc.) is ensured at the scene.

  Response: This response will address the CSR and EDG rooms separately.

  CSR: In the event of an alarm in the CSR, the fire brigade will be dispatched immediately upon receipt. The fire brigade leader will report directly to the CSR. The CSR is located on the 150 ft elevation of the Turbine building (common area to both units), directly below the control room. The response to the CSR by the fire brigade leader (or closest operator) would be rapid.

The fire brigade leader will enter the CSR, identify the source of the smoke, provide immediate notification to the control room and extinguish the fire (if necessary) using one of the handheld fire extinguishers located within the CSR.

If the fire in the CSR is larger than can be extinguished by a portable fire extinguisher, the fire brigade leader has the option to manually discharge the CO_2 system or to use a manual hose line to fight the fire upon the arrival of the remainder of the fire brigade. Hose stations are located outside of each CSR door. The pre-fire plan provides step-by-step instructions on how to manually discharge the CO_2 system.

The fire brigade equipment storage area is located on the 165 ft elevation of the turbine building on the common turbine operating floor. The fire brigade equipment area houses each fire brigade member's turnout gear, self-contained breathing apparatus (SCBA) and extra breathing air cylinders. The travel time from the fire brigade equipment area to the CSR is less than one minute.

EDG Room: In the event of an alarm in an EDG room, the fire brigade will be dispatched immediately upon receipt of the alarm in the control room. The fire brigade leader (and the closest operator) will report directly to the EDG building. Note that the most likely circumstance in which a fire will occur in an EDG room is while an EDG is running. When an EDG is running, an operator will be at the EDG building to monitor the running EDG. The operator (who is fire brigade qualified) at the EDG building can investigate the fire alarm, notify the control room and manually initiate the CO_2 system in the affected EDG room.

The pre-fire plan, which is available at the EDG building, provides fire fighting options available to the fire brigade leader, including step-by-step instructions for manually discharging the CO_2 system. Locations of fire hydrants, fire hose and fire fighting foam is also provided in the pre-fire plan.

The fire brigade will respond to the EDG building from the power block. Fire fighting gear for locations outside the power block is stored outside the power block. This location includes SCBA. Extra fire fighting gear equipment including turnout gear, hose, foam, SCBA and spare breathing air cylinders are provided in a fire response vehicle that can be driven directly to the EDG building.

- What is the fire brigade response time (time when the fire brigade is fully assembled at the CSR and EDG rooms)? Has the security interface been considered?

  Response: The response times provided are approximate based on historical drill performance. The fire brigade should be able to respond in full turnout gear to the CSR in 10 to 12 minutes from the time the plant alarm sounds. Note that the fire brigade leader responds immediately to the scene and should be at the CSR in 2 to 3 minutes after alarm.

  The response to the EDG building for the complete fire brigade in full turnout gear is 15 to 20 minutes since the EDG building is not part of the power block. Note that the fire brigade leader and the closest operator will respond immediately to the EDG building and should arrive in 3 to 5 minutes. Since an operator is typically at the EDG while running, in most cases an operator will be at the EDG immediately.

There are no security issues in accessing either the CSR or EDG since both are within the protected area fence.

(6) Your letter dated September 26, 2003, states that, "The CSR contains two runs of one-hour fire rated Thermo-Lag raceway encapsulation barriers. One section is located on the Unit 2 side and other is on the Unit 3 side (refer Figure 2). Three-hour rated fire barriers will be installed in conjunction with changing the CO_2 system to a manually actuated system."

- Clarify exactly which raceway and their locations will be protected with three-hour rated electrical raceway fire barrier systems (ERFBS). Provide description of the function (e.g., reactor control, heat removal, makeup, monitoring etc.) of the ERFBS protected cabling.

  Response: Unit 2 fire barrier designated FBS-78H-02 protects conduits ZA2S676 and ZA2S684. Unit 3 fire barrier designated FBS-78H-01 protects conduits ZA3D619 and ZA3M270. Cables within these conduits support the operation of Automatic Depressurization System (ADS)/Safety Relief Valves (SRVs) RV-2-02-071A and RV-2-02-071B for Unit 2 and RV-3-02-071A and RV-3-02-071B for Unit 3 when operated from their respective Unit 2 and Unit 3 alternative shutdown control stations. The hot shutdown function of these valves is to remain closed. These valves are used to support the transition to cold shutdown by depressurizing the reactor when hot shutdown with the High Pressure Coolant Injection (HPCI) system is no longer required. These valves are also used to maintain cold shutdown by providing a flow path for Residual Heat Removal (RHR) Alternative Shutdown Cooling to return to the torus.

  These raceways also include cables for other components; however, the encapsulation is not credited for these other components.

Unit	Fire Barrier System	Protected Conduit	Protected Cables	Related Components	Alt Control Station
2	FBS-78H-02	ZA2S676, ZA2S684	ZA2Q2075B ZA2Q2075E ZA2Q2076B ZA2Q2076E	RV-2-02-071A, RV-2-02-071B	20C04BX
3	FBS-78H-01	ZA3D619, ZA3M270	ZA3Q2075B ZA3Q2075E ZA3Q2076B ZA3Q2076E	RV-3-02-071A, RV-3-02-071B	30C04BX

The protected raceways enter the cable spreading room thru the floor, in the south-west (Col J-2) and north-west (Col. J-23) regions of the main room. The raceways then continue north-south into their respective wing rooms, running along the west (J-Line) wall. Finally, the raceways exit the cable spreading room thru the west (J-Line) wall, into the respective reactor buildings.

(7) Your submittal states that, "In June 2002, the E-2 EDG CO_2 system inadvertently discharged CO_2 into the E-2 EDG room while the EDG was running and two personnel were in the room."

- Have you performed a root cause investigation to determine the probable causes of inadvertent discharged of CO_2 into the E-2 EDG room?

  Response: Yes. A root cause analysis identified that the design of the automatic CO2 system installed in the EDG bays was not robust enough to prevent an inadvertent discharge. The June 2, 2002 discharge was initiated by foreign material-induced short-circuiting of a control panel circuit card.

- Since the purpose of your modification is to minimize or eliminate risk to personnel, explain how the manual trip logic prevent inadvertent discharge of CO_2 in EDG rooms and CSR.

  Response: The manual system we have designed will require a physical mechanical manipulation in order to initiate a discharge. The system cannot discharge CO_2 without this mechanical manipulation. Industry experience (e.g., Information Notice 99-05) has shown that electrically disabling the systems can still leave the systems vulnerable to inadvertent actuation. This is why mechanical blocking has been chosen is an integral aspect of the proposed manual system design.

(8) In your submittal you note that, "The second method of compliance is by protection of several raceways located in the CSR. The cables in the raceway need to be operable in the event of a fire in the CSR. Currently, these raceways are provided with a one-hour rated fire barrier encapsulation to meet Appendix R, Section III.G.2.c (one-hour fire barrier with automatic fire suppression and fire detection). A three-hour rated fire barrier will be installed in conjunction with making the CO_2 system manually initiated. A three-hour rated fire barrier will comply with Appendix R, Section III.G.2.a, which does not require automatic suppression capability."

This may be true if the remaining, exposed cables are only for a single train. The remaining, exposed cables are for both trains; the CRS is a III G.3 area; and "fixed suppression" is required and supercedes the no suppression of III G.2.a.

- Describe how CSR being divided as two separated fire areas?

  Response: The CSR is one fire area. The small area within the three-hour fire raceway encapsulation is not considered a separate fire area. See responses to question 2 above.

In your submittal you note that, "A fire in the CSR that is capable of ignition and sustaining a fire in the fire resistive cable insulation is difficult to postulate." You did not provide information to substantiate this statement.

- Provide cable construction information (i.e., insulation and jacket material, such as XLPE/PVC) for all cables installed in cable trays or exposed (such as air drops) including vendor and/or manufacturer.

Response: Section 4.2 of the original LAR provides details regarding why a fire in the fire resistive cable insulation is difficult to postulate. Cable construction information was provided to the NRC in the March 1977 Fire Protection Program Report (response to Appendix A to APCSB BTP 9.5-1) and is summarized in the Peach Bottom FPP document which is part of the Updated Final Safety Analysis Report (UFSAR). Exposed cable in the CSR is qualified to IEEE-383-1974, "IEEE Standard for Type Test of Class 1E Electrical Cables, Field Splices and Connections for Nuclear Power Generating Stations," or equivalent. Cable Specifications for 300V and 600V twisted pair instrument cable and single and multiple conductor power and control cable (Specifications 125-P-8 and 125-P-7, respectively) required that cable insulation be fire retardant per IEEE-383-1974 and that insulation be cross-linked polyethylene. Due to the age of PBAPS, original cables pre-dated IEEE-383-1974. However, these cables were tested using a flame test that was similar to that adopted for IEEE-383-1974. The original cables had a neoprene jacket. There is a small number of cables (less than 0.3% in all plant cable trays) that have a PVC jacket. These cables are limited to use on low power signal carrying cables only. Therefore, virtually all of the exposed cables in the CSR are thermoset. Plant specifications ensure that any new cables installed in the CSR will continue to be fire retardant cables.

There have been several industry and NRC sponsored tests that involved fire retardant (IEEE-383 or equivalent) cables that demonstrate the fire exposure duration involved in developing a sustaining fire within fire resistive cable insulation. One example is NUREG/CR-3656, "Evaluation of Suppression Methods for Electrical Cable Fires." While this test actually considered extinguishment time for various suppression agents, information regarding ignition of cables was provided in Tables 2 and 3. Constant exposure for 10 minutes by a propane burner (with flames as wide as the tray) was required to establish a self-sustained fire. In a five-stack tray arrangement, the time to achieve a fully developed fire was 17 to 19.5 minutes. There are no ignition sources in the CSR that will recreate an exposure fire equal to a propane burner as wide as the cable tray.

(9) Describe the physical location of the remote or alternate shutdown panel(s) with regard to the CO_2 areas (above, below, next room, etc.). Are remote shutdown rooms adjacent such that also be effected by the CO_2 discharge? During acceptance tests were CO_2 levels measured in the alternate shutdown panel rooms and control room? If yes, what were the levels?

Response: The EDG building is separate from the main plant structure, does not provide any fire or CO_2 exposure to the alternate shutdown panels or control room, and does not need to be addressed.

The CSR is located on the 150 ft elevation of the turbine building in a common area (i.e., shared between both Units 2 and 3). The CSR is part of the same fire area as the control room; therefore, a fire in the CSR is considered to impact the control room. As part of the 10CFR 50, Appendix R, shutdown analysis, a fire in the CSR (which is common to both units) is considered to require a shutdown outside the control room at the alternate shutdown panel. The Unit 2 alternate shutdown panel is located in the Unit 2 MG set room (located on elevation 135 ft of the Radwaste building). The Unit 3 alternate shutdown panel is located in the Unit 3 MG set room (located on elevation 135 ft Radwaste building). The potential for a fire to spread between the CSR and the

alternate shutdown panels is considered low. The rooms are separated from each other by several fire areas, each having fire rated barriers and are actually in separate but contiguous buildings. In addition, the fire areas that most directly separate the CSR from the alternate shutdown panels have sprinkler protection.

CO_2 levels in the MG set rooms were not measured during the CO_2 concentration test for the CSR. However, CO_2 migration between the CSR and the alternate shutdown panel rooms is unlikely for several reasons. First, the Radwaste building and the CSR have separate ventilation systems. Second, the natural ventilation paths (due to the pressure relief openings and the CSR doors) are located on the turbine building side of the CSR. This will ensure that CO_2 is vented through the turbine building away from the Radwaste building. The large volume of the turbine building and the ventilation rate will quickly dilute any CO_2 that might migrate into the turbine building.

There are shutdown actions in the 4 kV switchgear rooms in the event of a shutdown outside of the control room. The CSR is located over the 4kV switchgear rooms. While the floor/ceiling barrier between the CSR and the Switchgear rooms is fire rated for three hours with sealed penetrations, migration of CO_2 (which is heavier than air) from the CSR to the switchgear rooms could be postulated. CO_2 migration from the CSR to the switchgear rooms was not measured during the initial discharge test so there is no baseline data.

Access paths for operators that may need to perform actions outside of the control room following a CO_2 discharge will remain available. As noted above, CO_2 from the CSR will primarily migrate into the turbine building, where the large building volume and ventilation will prevent a build-up of CO_2.

(10) Do CSR CO_2 fire extinguishing systems maintain a primary and secondary CO_2 supply? In case of CO_2 system failure, provide the type of available fire suppression in CSR other than hand held extinguishers. Assuming system failure (i.e., stuck selector or discharge valve) what is maximum quantity of CO_2 that may be discharged into the CSR and EDG rooms?

Response: Both the CSR and EDG CO_2 fire suppression systems have adequate quantities of CO_2 within their respective storage tanks to permit a second shot of CO_2 following the initial discharge. In the event of a system failure, the maximum amount of CO_2 that can be discharged into the CSR is 24,000 pounds (with a design quantity of 9600 pounds). The maximum amount of CO_2 that can be discharged into a single EDG room in the event of a system failure is 5500 pounds (the design quantity is 2190 pounds). Emptying the entire contents of the CO2 tank into the room is a hazard that is associated with a CO_2 system regardless of the type of actuation. In fact, with automatic actuation, the potential for an inadvertent discharge is greater, thus the potential for a system malfunction is greater. The manual system being installed at PBAPS reduces the potential for an inadvertent discharge, thus reducing the potential for a system failure allowing the entire contents of the tank to flow into the room. Responses to questions 4 (EDG) and 5 (CSR) above provide information on other fire fighting options in lieu of the CO_2 system.

(11) Has the CO_2 fire extinguishing system installed in the CSR ever inadvertently discharged? If so, describe any CO_2 migration to the MCR, 4kV switchgear rooms, and

areas of alternate shutdown panels or access or egress paths to areas of alternate shutdown panels.

Response: There is no record of the CO_2 system in the CSR ever accidentally discharging agent into the room.

(12) Are CSR normally occupied areas? Describe any egress problems associated with CSR.

Response: The CSR is not continuously occupied, but is entered many times each shift by operations, security and maintenance personnel. Therefore, the CSR is considered to be normally occupied. Most activities within the CSR are performed at floor level, and egress while at floor level can be accomplished in a timely manner. However, occasionally, work is required in the overhead cable tray area which hampers the ability to egress the CSR. When work is performed in the overhead area, the CO_2 system is tagged out of service for personnel safety.

(13) Provide the most recent full discharge test results of CO_2 fire extinguishing system installed in CSR and EDG rooms (include concentration, soak time, number of sensors, location of sensors, and any NFPA 12 COR information). Provide copies of actual discharge test results along with the COR verification test.

Response: Discharge tests for the CO_2 systems in the EDG and CSR rooms were performed as part of initial fire protection equipment acceptance testing in 1971. Copies of the discharge tests are available for inspection at PBAPS. A summary of the tests is provided below.

A separate test was performed in each EDG room. There was a single CO_2 sensor located 20 ft from the east wall, 10 ft from the north wall, over the center of the EDG. The same location was documented for each test. The concentration was recorded at one minute and then at five minutes, after which time the test was terminated. In summary, the EDG room results were as follows;

EDG #	Discharge Duration	1 Minute Concentration	5 minute Concentration
E-1	60 seconds	51%	46%
E-2	60 seconds	54%	50%
E-3	59 seconds	48%	46%
E-4	58 seconds	52%	50%*

*This is the 4 minutes concentration as the E-4 test was terminated at 4 minutes.

Note that COR recommended concentration for an oil hazard is 34%, which is well below the concentration that remained in the room following the test soak time. In terms of soak time, NFPA 12-1968, Paragraph 2355 states, "Under normal conditions surface fires (Class B fires) are usually extinguished during the discharge period." A soak time of 5 minutes was more than adequate. The manual CO_2 system will provide the same quantity of CO_2 based on discharge time. Therefore, the manual system will be effective in suppressing a fire in any of the EDG rooms.

The CSR discharge test included a single sensor. The location was not specified in the test summary document. CO_2 concentration was recorded at one minute and five minutes into the test. Note that the discharge time is 125 seconds so at 1 minute full concentration was not expected.

	Discharge Duration	1 Minute Concentration	5 minute Concentration
CSR	125 seconds	42%	58%

(14) For smoke and heat ventilation the SRP Section 9.5.1 specifies that to facilitate manual fire fighting separate smoke and heat vents should be provided in specific areas such as CSR and other areas where the potential exists for heavy smoke conditions. Does PBAPS Units 2 and 3 CSR and EDG rooms have any engineered smoke management and/or products of combustion removal systems installed? If so, provide details of operation, exhaust paths etc.

Response: PBAPS does not have engineered smoke management systems for the CSR or EDG. As a point of clarification regarding this question, PBAPS was reviewed against the guidance of Appendix A to BTP APCSB 9.5-1, "Plants Under Construction and Operating Plants," (both Units 2 and 3 where in operation prior to BTP APCSB 9.5-1 being issued). Appendix A to the BTP states, "Smoke and heat vents may be useful in specific areas such as cable spreading rooms and EDG fuel oil storage rooms and switchgear rooms." As noted in the PBAPS FPP and approved by the NRC, venting is provided by the normal ventilation system supplemented by portable ventilation fans after a fire as necessary.

(15) Has the delay in actuation of a manual only CO_2 fire extinguishing system in the CSR been evaluated with respect to deep-seated cable fires? i.e., has Exelon evaluated the extra delay in CO_2 fire extinguishing system discharge?

Response: The potential delay in fire fighting resulting from a manual actuation vs. automatic actuation of the CO_2 system was evaluated as part of this change process. To evaluate the impact on both fire growth and safe plant operation given a manual CO_2 system discharge, the credible fire scenarios for the CSR need to be considered. The first step in developing a credible fire scenario is to consider the combustible materials and potential ignition sources in the CSR. The PBAPS CSR contains primarily instrument and control cables in stacked cable trays and low voltage instrument and relay cabinets (120 VAC and 125 VDC). The exposed cables in the room have fire retardant (thermoset type) insulation. There are no high voltage cabinets or switchgear in the room, the few 480 volt cables in the room are in conduit, and there are no oil filled electrical components in the room. Work in the room is limited to activities directly related to operation and maintenance of the equipment within the room. The electrical components in the room will not produce a high energy fault condition or a high heat release rate fast growing fire. Therefore, a slow growth electrical fire is the type of fire postulated.

The 25 smoke detectors in the room will provide an early warning of a fire condition in the room while the fire is still in an incipient stage. The smoke detection alarm will result in the dispatch of the fire brigade. With a manual CO_2 system, the fire brigade leader, who reports directly to the scene upon alarm, will be able to enter the room, identify the source of the smoke and extinguish the fire with a portable fire extinguisher. (Note that

with an automatic CO_2 system, an entry into the CSR could not be made until personnel with SCBA had arrived for safety reasons.) Response to the CSR by the fire brigade leader will be rapid (see response to question 5 above). Size-up of the room by the fire brigade leader and the decision to use a portable fire extinguisher or manually discharge the CO_2 system would also be rapid. The total time between first alarm and the decision to manually actuate the CO_2 system would be approximately 6 minutes or less. For an automatic CO_2 system, the unknown factor is the time for the second detector to alarm. Assuming a quick response for the second detector of 1 minute, the difference is approximately 5 minutes. Fire retardant cables have demonstrated their resistance to develop into deep-seated fires for at least 15 minutes. Therefore, a delay of up 5 minutes will not result in the development of a deep-seated cable fire.

(16) Each EDG room has 16 heat detectors that currently initiate the automatic CO_2 fire extinguishing system. Does heat detector spacing meet NFPA 72, "National Fire Alarm Code®," COR and listings? Provide justification for assurance that the heat detection system will detect incipient fires in time for an operator to respond and manually initiate the CO_2 fire extinguishing system.

Response: Each EDG room has 16 heat detectors arranged in groups of 2 heat detectors, resulting in an effective heat detector arrangement of 8 heat detectors. Each EDG room has a dimension of 25 ft by 64 ft (1600 ft^2). The spacing of the detectors is within that of NFPA 72 considering the detector spacing in the Underwriters Laboratory listing and the reduction in spacing due to ceiling height. The temperature rating of these rate compensated heat detectors is 190^oF.

Heat detection is not designed to provide detection while a fire is in the incipient stage. A fire in the EDG room that is detected by a heat detector will already be of significant size with the operation of the EDG already in jeopardy. It is assumed that a fire in an EDG room will result in the loss of that EDG regardless of automatic or manual initiation. Therefore, the delay in CO_2 system initiation that may result from a manual actuation vs. an automatic actuation is inconsequential in terms of the operation of the emergency EDG.

(17) The CSR has 25 smoke detectors and are arranged in two zones to provide a cross-zoned configuration that is currently used for automatically actuating the CO_2 fire extinguishing system. The combination of the existing cross-zoned smoke detection system with the manual actuation of CO_2 fire extinguishing system has been proposed. Does smoke detector spacing meet NFPA 72, "National Fire Alarm Code®," COR? If not, provide justification that the combination of an inadequate fire detection system and no automatic fire suppression will detect and extinguish a postulated fire before it could fully develop.

Response: A review of the existing layout of the 25 smoke detectors located at the CSR ceiling has been evaluated and determined to be consistent with the spacing guidelines of NFPA 72. Any of the 25 smoke detectors will provide an alarm to the control room resulting in a response by the fire brigade.

(18) The in-situ combustible loading in the CSR consists of a large amount of electrical cable insulation, which may develop into a deep-seated fire if the actuation of CO_2 system is delayed. Manual fire fighting involving large amounts of cables is a considerable challenging even to the most well trained and equipped fire brigade.

Describe how the facility fire brigade personnel are instructed about the potential for a deep-seated fire, hazards associated with cable re-ignition, and methods to manually extinguish a deep-seated electrical cable fire.

Response: The fire brigade is trained on fighting cable tray fires. The fire brigade is trained to provide a reflash watch following fire extinguishment. The fire brigade will use water to extinguish an established cable tray fire. A Coast Guard applicator nozzle has been obtained to allow the fire brigade to apply water more directly within the cable trays.

(19) Describe any common plenums (ventilation combustion air inlets) that may be common to any EDG rooms and describe how they maintain adequate three hour fire barriers.

Response: Each EDG room has its own air supply plenum area. There is no common area.

(20) Figure 2 or your amendment request, CSR layout sketch, shows CO_2 EMPC's and Disarm Switches inside the CSR. Describe what impact a CSR fire may have on maintaining the proposed manual actuation capability. This figure also shows air-conditioning units. Describe how these have been evaluated as an ignition and combustible source. Provide the type and quantity of oil (if applicable) contained in the each of air-conditioning units in the CSR.

Response: The EMPC valves and the new manual discharge valves and control panel are located outside of the CSR room. Since the manual actuation capability is located outside of the CSR, there is no impact on the ability to manually actuate the system. A photograph of the location outside of the CSR is provided below.

The refrigeration/compressor units for these air conditioners are actually located outside of the CSR and computer rooms. Only the air-handling portion of the system is located within the CSR. The air-handling units within the CSR do not contain oil and, therefore, are not a significant ignition or combustible material source.

(21) For a full area fire in CSR, will manual operations be required to prevent maloperation of systems required to achieve and maintain safe shutdown? Assume all three-hour fire barriers do not fail.

Response: Appendix R already requires that we assume that there is a "full area" fire in the CSR. PBAPS has a fire safe shutdown analysis that supports this scenario. The fire scenario includes a shutdown at the alternate shutdown panel. There are manual actions associated with that shutdown as described to the NRC in previous correspondence and summarized in the PBAPS FPP, Section 5.2.

(22) The staff would like to understand how you considered realistic fires that can occur in the EDG rooms, when you revised your fire protection strategy from "automatic" to "manual". In that context please provide the following information:

- Have any fires occurred in the PBAPS, units 2 and 3 EDG rooms? Provide details.

  Response: There have been small fires associated with the Fairbanks-Morse EDGs on the exhaust manifolds. These fires are very small and burn themselves out without manual intervention. The only reason that these fires are identified is due to operators in the room during EDG operation. These fires have not damaged the EDG, have not affected EDG operation, and have not resulted in heat detector actuation.

- With a manual actuated only CO_2 fire extinguishing system, it becomes more likely that fire could grow causing water to be needed to suppress. Are fire water drains installed in the EDG rooms? Are drains sized to accept significant water from fire fighting hose streams?

  Response: The EDG rooms are provided with floor drains. These drains are approximately 4 inches in diameter. Water from hose streams would be captured by the drains. In addition, curbing around doors to adjacent EDG rooms will prevent water and oil from traveling between rooms.

- Provide a comparative analysis (i.e., automatic and manual verses manual only) of the reliability of CO_2 fire extinguishing systems installed in the EDG rooms.

  Response: The current EDG automatic CO_2 system design is initiated by actuation of the installed heat detection. Upon detector actuation, the system control panel initiates local and remote alarms. The control panel energizes the master-selector valve EMPC solenoid, which allows passage of CO_2 vapor from the storage tank to the operating piston in the master selector valve. With the master-selector valve open, CO_2 discharges into the EDG bay. Once the discharge has occurred for the designed discharge time-period, the EMPC solenoid is de-energized, closing the master-selector valve and halting the CO_2 discharge.

  The current system design allows for manual system initiation in one of two ways. The first method entails the use of a manual pushbutton to initiate the system control panel logic in a similar manner as heat detector actuation. The second manual method involves mechanical operation of the EMPC lever to pass CO_2 vapor from the storage tank to the master-selector valve.

The design for the EDG CO_2 manual system is in an early stage. The proposed manual system design will keep much of the current major equipment in place and any new equipment will be listed for CO_2 system use. The most significant difference is that there is no method for the system control panel to operate the EMPC and allow passage of CO_2 to the master/selector or selector valve. In the new system design, this will require mechanical EMPC operation by the fire brigade, and therefore, eliminate the potential for an automatic or manual system logic circuit failure to cause an inadvertent system discharge. In the proposed design, a heat detector actuation will cause a Main Control Room fire alarm. The alarm will initiate a fire brigade response to the EDG building. If the fire brigade determines that a CO_2 discharge is the most prudent fire-fighting method, a fire brigade member can initiate the system through mechanical operation of the EMPC. This will result in the initiation of required system logic (including ventilation shutdown and local alarms), as well as the discharge of CO_2 into the associated EDG bay.

By removing the potential for a circuit failure to electrically operate the EMPC valve, the reliability of the system against inadvertent actuation has been greatly improved. The Exelon configuration control process and subsequent periodic testing required by the Technical Requirements Manual will ensure continued reliability of the proposed manual system.

The staff would like to understand how you considered realistic fires that can occur in the CSR, when you revised your fire protection strategy from "automatic" to "manual". In that context please provide the following information:

- Have any fires occurred in the PBAPS, units 2 and 3 CSR? Provide details.

  Response: No fires have ever been reported in the PBAPS CSR.

- With a manual actuated only CO_2 fire extinguishing system, it becomes more likely that fire could grow causing water to be needed to suppress. Are fire water drains installed in the CSR? Are drains sized to accept significant water from fire fighting hose streams?

  Response: There are no drains in the CSR. In the unlikely event that hose streams are necessary to suppress a fire in the CSR, water will drain through the two doors that lead into the turbine building. The electrical equipment in the CSR is located on housekeeping pads and would be unaffected by water on the floor. Water that flowed under the door into the turbine building would not affect any shutdown equipment.

- Provide a comparative analysis (i.e., automatic and manual verses manual only) of the reliability of CO_2 fire extinguishing systems installed in the CSR.

  Response: The current CSR automatic CO_2 system design is initiated by actuation of the installed smoke detection. Upon detector actuation, the system control panel initiates local and remote alarms. The control panel operates the master and selector valve EMPC solenoids, which allows passage of CO_2 vapor to the operating pistons in the master and selector valves. With the master and selector valves open, CO_2 discharges into the CSR. Once the discharge has occurred for the designed

discharge time-period, the EMPC solenoids are returned to their standby condition, closing the master and selector valves and halting the CO_2 discharge.

The current system design allows for manual system initiation in one of two ways. The first method entails the use of a manual pushbutton to initiate the system control panel logic in a similar manner as smoke detector actuation. The second manual method involves mechanical operation of the EMPC levers to pass CO_2 vapor to the master and selector valves.

The proposed manual system design will keep much of the current major equipment in place. New components will be listed for use with CO_2 fire suppression systems. The most significant difference is that there is no method for the system control panel to operate one of the EMPCs and allow passage of CO_2 to the master or selector valve. In the new system design, this will require mechanical EMPC operation by the fire brigade, and therefore eliminate the potential for an automatic or manual system logic circuit failure to cause an inadvertent system discharge. In the proposed design, a smoke detector actuation will cause a Main Control Room fire alarm. The alarm will initiate a fire brigade response to the CSR. If the fire brigade determines that a CO_2 discharge is the most prudent fire-fighting method, a fire brigade member can initiate the system through mechanical operation of the EMPC. This will result in the initiation of required system logic (including ventilation shutdown and local alarms), as well as the discharge of CO_2 into the CSR.

By removing the potential for a circuit failure to electrically operate the EMPC valve, the reliability of the system against inadvertent actuation has been greatly improved. The Exelon configuration control process and subsequent periodic testing required by the Technical Requirements Manual will ensure continued reliability of the proposed manual system.