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U. S. Nuclear Regulatory Commission
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Dresden Nuclear Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

Subject: Response to NRC Acknowledgement of Response to NRC Request for a Written Response to NRC Observations and Concerns Regarding Dresden Station Response Plan for External Flooding Events

References:

1. Letter from Jamnes L. Cameron (NRC) to Michael J. Pacilio (Exelon Generation Company, LLC (EGC)), "Request for a Written Response to NRC Observations and Concerns Regarding Dresden Station Response Plan for External Flooding Events," dated November 1, 2012
2. Letter from David M. Czufin (EGC) to U. S. NRC, "Response to NRC Request for a Written Response to NRC Observations and Concerns Regarding Dresden Station Response Plan for External Flooding Events," dated December 1, 2012
3. Letter from Jamnes L. Cameron (NRC) to Michael J. Pacilio (EGC), "Acknowledgement of Response to NRC Request for a Written Response to NRC Observations and Concerns Regarding Dresden Station Response Plan for External Flooding Events," dated January 3, 2013
4. Letter from Jamnes L. Cameron (NRC) to Michael J. Pacilio (EGC), "Deferral of Decision to Hold a Public Meeting to Discuss Responses to NRC Observations and Concerns Regarding Dresden Station Plan for External Flooding Events," dated January 24, 2013

In Reference 1, the NRC requested a written response to observations and concerns related to Dresden Nuclear Power Station's (DNPS's) response plan for external flooding events. Exelon Generation Company, LLC (EGC) provided that information in Reference 2. In Reference 3, the NRC requested a written response to additional questions that the NRC identified following its review of EGC's Reference 2 responses. The attachment to this letter contains the EGC responses to the Reference 3 request in accordance with the requested schedule provided by the NRC in Reference 4.

Should you have any questions concerning this letter, please contact Mr. Hal Dodd, DNPS Regulatory Assurance Manager, at (815) 416-2800.

Respectfully,

David M. Czufin
Site Vice President
Dresden Nuclear Power Station

Attachment: "DNPS Response to Additional NRC Questions"

cc: Regional Administrator, NRC Region III
Project Manager, NRC NRR
Branch Chief, NRC Region III
NRC Senior Resident Inspector, Dresden Nuclear Power Station

Below are DNPS responses to NRC clarifying questions contained in the Enclosure of Reference 3.

NRC Observations of procedural weakness of the external flooding plan

Follow up Question:
1.1. What training periodicity do you intend to ensure this procedure works as written?

Exelon Generation Company, LLC (EGC) Response:

Licensed Operators, Non-licensed Operators, and Maintenance Technicians receive initial and refresher training, as directed by each program, on basic knowledge and skills required to implement the flooding response plan at various periodicities as part of their accredited training programs. The training schedules encompass the activities identified in the flooding response plan with the exception of the temporary flood barrier described below.

EGC intends to provide refresher training on the flood response plan on a biennial basis for Operations. This training will include a review of the entry conditions and use of the procedure in a simulated or table top environment for licensed operators and a review of significant activities performed by non-licensed operators. Maintenance technicians received an awareness briefing on the flooding response plan. The maintenance activities associated with the flooding response plan are not unique and fall within the skills and knowledge obtained in the initial and continuing training provided to the Dresden Nuclear Power Station (DNPS) Maintenance Department personnel; therefore, additional periodic flooding response plan training for maintenance technicians is not required.

Initial and refresher training frequency for the installation of temporary flood barrier(s) has yet to be established. A training request (TR) has been written to document the analysis and development of this training and is currently in progress with an expected completion date of June 30, 2013.

Future revisions to the flooding response plan or equipment will be evaluated for training needs within current training program guidance.

Follow up Question:
2.1. The licensee stated, "level may be determined by using plant process computer (PPC) Point E354, "Discharge Canal Water Level," which "is currently nonfunctional", What are the site's plans for preventative maintenance and surveillance frequencies to ensure functionality?

EGC Response:

EGC has initiated maintenance activities to address the functionality of the transmitter for Plant Process Computer (PPC) Point E354, "Discharge Canal Water Level." Currently, the instrumentation loop has been verified to be receiving a valid signal from the associated transmitter. The next action is to verify the transmitter is functioning correctly.

In parallel, the station is pursuing additional telemetry instrumentation alternatives to provide increased reliability and redundancy.

As an improvement to local monitoring capability, the site has stenciled reference levels in both the Unit 2/3 Cribhouse and the Reactor Building. These markings are available for station personnel to quickly determine flooding levels.

Actions have been initiated to implement preventive maintenance and surveillances to ensure functionality of plant PPC Point E354. Two service requests were initiated to track the completion of these actions: one was written to track the implementation of an annual instrument functional test, and the other for the implementation of a monthly operations verification of functionality.

Follow up Question:
2.2. The Dresden site elevation is at 517 ft. The current design basis probable maximum flood (PMF) event elevation is 528 ft. It is our understanding that the "temporary flood barrier" that Exelon has acquired is 8 feet high. In the event of the PMF the temporary flood barrier will be over topped. What are the planned actions between 525 ft and 528 ft flood levels?

EGC Response:

The temporary flood barrier is approximately eight (8) ft high when fully deployed. Discussion with the manufacturer indicates that although a high level of confidence exists that the barrier will remain functional up to its nominal height; the barrier is not "certified" to this height. The maximum certified height is approximately 5.6 ft.

The temporary flood barrier is not intended to mitigate the Probable Maximum Flood (PMF). Its acquisition and use are intended to provide an additional layer of defense to mitigate a range of flooding less than the PMF and to provide additional coping time in the event of a PMF.

Under current guidance, in the event that flooding exceeds the capability of the temporary flood barrier, the actions contained in the DNPS External Flooding Response Procedure DOA 0010-04, "FLOODS," will be performed, including use of the diesel-driven emergency make-up pump, as necessary.

DNPS is continuing with the engineering efforts referenced in our original response as follows:

- A study will be performed to identify an alternate source of water for decay heat removal utilizing permanently installed plant equipment. This study is expected to complete on or before March 31, 2013.

- A study will be performed to identify a strategy that will provide better flood protection of permanently installed safety related equipment. This study is expected to complete on or before March 31, 2013.

Preliminary analysis results support the development of modifications that will result in protection of safety related equipment in the reactor building and the use of permanently installed, safety related equipment to ensure adequate decay heat removal during a PMF.

Follow up Question:
2.3. How much time will it take to deploy the rubber flood barrier? Is there sufficient time, using Dresden's predictions for an untimely estimate of flood conditions, to get the barrier deployed considering the environmental conditions? Has the barrier potential location been surveyed/walked to make sure there are no connections, e.g. manholes or cable penetrations, on both sides of the berm location that might allow flooding inside the berm/barrier?

EGC Response:

Based on discussion with other similar facilities and the manufacturer the time required to install the flood barrier cannot be definitively determined without validation. Another similar facility reported that a similar barrier was deployed without previous training or time verification as a first time evolution in approximately 3.5 days. This is the basis for the DNPS action documented in our previous response to perform a time verification of the barrier installation by July 31, 2013.

This verification will likely involve assembly of representative sections of the flood barrier and require time extrapolation to determine a reasonable installation estimate. These results will be used to ensure use of the flood barrier is appropriately implemented into the flood response procedure.

The tentative barrier location has been walked down. The results of these walkdowns are being incorporated in the ongoing studies previously mentioned to identify and address connections on both sides of the barrier location.

Follow up Question
6.1. What is the minimum number of boats required to implement the flooding plan? Will these boats be available? Where will the boats be located and maintained?

EGC Response:

DOA 0010-04 requires one boat to perform actions necessary to ensure adequate core cooling is maintained. EGC has purchased and taken delivery of multiple boats to provide defense-in-depth and ensure one boat is always available to support the actions required in the external flooding procedure.

These additional boats are also available to support actions that may be beyond the necessary actions to ensure adequate core cooling such as transport of personnel, materials, or plant patrols during the flood period.

The boats are stored, and maintained on site within the owner controlled area.

Follow up Question
8.1. How does the site plan to deal with the effects on personnel and equipment from the potential buildup of toxic gases during the use of the diesel and gasoline pumps in the reactor building?

EGC Response:

DNPS recognizes that the use of diesel and/or gasoline driven equipment within the reactor building will result in the emission of exhaust gases that could degrade the reactor building environment. A review by engineering indicates that accumulation of toxic gas is not expected to challenge the personnel or equipment during operation of the flood pump. It is recognized that the procedurally directed opening of the 2/3 reactor building interlock door to atmosphere creates an approximately 160 square foot opening to atmosphere in the vicinity of the diesel driven flood pump. This provides a passive ventilation flow path that will aid in precluding the build-up of exhaust gases inside the building.

This passive ventilation flow combined with the significant volume of the reactor building and the expected reduction in flood pump demand as decay heat reduces over time will limit the accumulation of toxic gas that pose a threat to personnel safety during the assumed mission time of operation during the PMF.

Additionally, the exhaust emissions will not challenge the operation of the diesel driven or gasoline driven equipment. Adequate oxygen concentrations will remain available in the reactor building atmosphere to support the operation of the diesel and/or gasoline driven equipment throughout the expected duration of use.

Exelon procedure RP-AA-442, "Selection of Respiratory Protection for Non-Radiological Use," provides guidance so that potential non-radiological air contaminants are properly evaluated. RP-AA-442 implements air quality sampling and monitoring requirements and includes guidance to establish engineering controls and respiratory protection necessary to protect workers. In the event that air quality was to degrade significantly the station maintains respiratory protective equipment, portable generators, and ventilation fans on site available for use.

Based upon our station review an item has been entered into the Corrective Actions Program to evaluate additional enhancements to the ventilation strategy of the flood mitigation procedure.

<u>NRC Observations of design weakness of the external flooding plan</u>

Follow up Question
2.1. During the flooding procedure how does the site intend on monitoring Reactor Vessel Level and Pressure without electrical power? What level of communications will the flooding procedure require between the isolation condenser level control and diesel flood pump operation?

<u>EGC Response:</u>

In accordance with DOA 0010-04, reactor pressure vessel (RPV) pressure and level are monitored at Instrument Rack 2202(3)-5 or 2202(3)-6 using the following instruments [located Reactor Building 545 ft, East(West)], if necessary:

REACTOR PRESSURE
- PI 2(3)-0263-60A OR B, U2(3) REACTOR PRESSURE.

REACTOR WATER LEVEL
- LI 2(3)-263-59A, OR B, U2(3) REACTOR WATER LEVEL.

All of these instruments are mechanical instruments and require no electrical power to function.

The flood procedure does not explicitly direct establishing communications between the operator at the diesel-driven emergency make-up pump and the operator maintaining level of the shell side of the isolation condenser. In accordance with DOA 0010-04 the isolation condenser will initially have make-up provided by the permanently installed isolation condenser make-up pumps until flood waters are at 518 ft, where DOA 0010-04 directs the alignment of the diesel-driven emergency make-up pump. By the time the transition to diesel-driven emergency make-up pump occurs the isolation condenser will be in service. Beyond start-up of the isolation condenser, there is minimal communication needed between operators.

If isolation condenser make-up flow needs adjustment DOA 0010-04 provides two options:

1. Adjust flow locally at the Isolation Condenser using a valve hand wheel near the Isolation Condenser shell side level sight glass.

   Or

2. Adjust flow locally at the diesel-driven emergency make-up pump utilizing the pump throttle.

If method 1 is utilized to adjust make-up flow to the isolation condenser, the operator will be observing isolation condenser shell side level change and manually operate a valve to control isolation condenser shell side level within the indicated range of the local sightglass. This method would require no communication.

If method 2 is utilized to adjust make-up flow to the isolation condenser, the operator will be observing isolation condenser shell side level change and use a portable battery powered radio to communicate with the operator locally at the diesel-driven emergency make-up pump to adjust the pump throttles to control isolation condenser shell side level. This method requires minimal communication while adjusting make-up flow to ensure isolation condenser shell side level is controlled within the indicated range of the local sightglass. Radio communications will be sufficient for this task.

<u>Additional NRC Staff Identified Issues with the External Flooding Design Plan</u>

Follow up Question
2.1. The Dresden Flooding Plan historically assumed the use of four pumps to provide redundant means to provide makeup water to the isolation condenser. The current procedure only has a single pump to providing cooling water to two reactor units and requires coordination between multiple operators. Please justify this reduction in redundancy and discuss which regulatory change process was used to permit this procedural modification. Discuss the mission time and duty of the pump; demonstrate through evaluation the capability of the pump to provide required pressure and flow. Discuss the sites commensurate actions should the single diesel flood pump engine fail versus a required support component fail, e.g. clogged hose. Approximately how much time is available before the isolation condenser would boil dry or to a level in the shell beneath the tube bundle? What impact would that have on reactor conditions?

<u>EGC Response:</u>

The historical use of four engine driven pumps was not to ensure redundancy. Based on historical Updated Final Safety Analysis Report (UFSAR) information, at least two 150 gpm pumps were to be installed with their suction being taken from the intake canal and discharging into the fire protection system. Once the flood level reached the 517 ft elevation, the two portable pumps which were taking suction from the intake canal were assumed to be non-functional or moved inside the reactor building. The pumps that were placed in the building would be utilized to take suction from the surrounding flood waters to discharge into the fire protection system to continue supplying makeup water to the isolation condensers and fuel pools. Based on an NRC recommendation made in the NUREG 0823, "Integrated Plant Safety Assessment Systematic Evaluation Program, for Dresden Nuclear Power Station, Unit 2," DNPS should have the capability to install a 100 percent capacity pump above the maximum flood. Two pumps would be located above the PMF level to supply makeup to the isolation condenser and other cooling needs for the duration of the flood. Each pump would be used to supply a unit to ensure safe shutdown.

During initial plant licensing, the makeup water sources for the isolation condenser were supplied from the condensate transfer system and the fire protection system. Subsequently, a modification to the isolation condenser makeup water supply was evaluated in accordance with 10 CFR 50.59 and implemented. The modification installed two diesel engine driven pumps to provide makeup to the shellside of the isolation condenser. Plant procedures were revised to use the diesel driven isolation condenser makeup pumps. With the installation of the diesel driven isolation condenser makeup pump, credit could now also be taken for the permanently installed isolation condenser makeup pumps when the flood level reached 509 ft instead of the two gasoline-powered portable pumps being put in place to take suction from the intake canal and discharging to the fire protection header. Based on current test procedures, the flow capacity of each pump is expected to be greater than 1200 gpm which is more than adequate to supply makeup water to both units' isolation condensers (i.e., 350 gpm) and fuel pools (i.e., 51 gpm).

The number of pumps was specified to ensure that the assumed makeup capacity was available for makeup to each unit's isolation condenser and the spent fuel pool.

Changing to a single portable pump which has at least twice the capacity of the two pumps that were originally credited still meets the intent of the use of a 100 percent capacity pump for each unit. The change to use a single portable pump verses two pumps was evaluated using a 10 CFR 50.59 screening. The screening determined the use of the single portable pump was acceptable. Therefore, using one pump verses two to provide makeup does not adversely affect the ability to safely shutdown the plant.

In accordance with DOA 0010-04, when the Unit 2/3 Crib House intake canal level reaches 509 ft, the diesel-driven emergency make-up pump will be moved and set up on floating dock in the area near the 2/3 Reactor Building Trackway. The pump suction hose is inserted into the U2 control rod drive (CRD) pull put-pit and the pump discharge is connected to the fire header. According to the PMF hydrograph, the water level rises from 509 ft to 517 ft in about seven (7) hours. Once the water enters the reactor building and the Unit 2/3 Crib House intake canal level reaches 518 ft, the diesel-driven emergency make-up pump is started. According to the PMF hydrograph, the flood level will recede below 517 ft in about 57 hours. At this time the pump suction hose will be moved to the Reactor Building Basement. If needed, a secondary pump will be used to bring water into the basement from a water source such as a plant cooling canal. The staged diesel fuel is sufficient for a 90 hour operation.

The required total flow rate for the two Isolation condensers and two spent fuel pools is 350 gpm (i.e., 175 gpm/unit). The flow path was analyzed for pressure drop. The maximum head requirements (i.e., friction and elevation) were calculated to be 108 ft of water. These values are well within the capabilities of the pumps. The pump speed curves show pump operation between 1400 and 2400 rpm. As discussed in the response for previous question, if make-up flow to the isolation condenser needs to be adjusted, DOA 0010-04 provides guidance for two methods, one of which allows the diesel-driven emergency make-up pump speed to be throttled within its range.

One possible failure mechanism is clogging of the suction hose. DOS 1300-04, "Operation of the Isolation Condenser External Flood Emergency Makeup Pump," provides guidance for troubleshooting the diesel-driven emergency make-up pump, including actions for a clogged pump suction line. A less probable failure is malfunction of the diesel engine. EGC purchased two gas powered 11 HP floating pumps. In case the diesel engine fails, these pumps are available as a backup option and are currently being incorporated into the flood response plan. Each pump is capable of delivering 200 gpm at 124 ft of head. Therefore, the floating pumps capacities exceed the system requirements of flow and pressure.

In accordance with DOA 0010-04 if Unit 2/3 Crib House intake canal level is predicted to exceed 509 ft elevation anytime within the next 72 hours then shut down Unit 2 and Unit 3. During a flooding event, if the shutdown was not complete when flood waters reach 509 ft elevation and flood water is predicted to continue to rise, DOA 0010-04 then directs the operating crew to scram the reactor. During a PMF, the plant flood levels could reach 517 ft in about 7 hours. The Isolation Condenser make up flow rate at 6 hours after a scram is 174 gpm per unit. The boil off volume in the Isolation Condenser is 16020 gallons. This yields a boil off time of approximately 92 minutes.

Follow up Question
5.1. Please provide the basis for using a non-safety related pump to respond to a Design Basis Event.

EGC Response:

Systems, structures, and components (SSCs) that are used in response to external events as specified in 10 CFR 50, Appendix A, General Design Criterion (GDC) 2, "Design Basis for Protection Against Natural Phenomena," are not required to be classified as safety related in accordance with the guidance that is found in RG 1.29, "Seismic Design Classification;" 10 CFR 50 Appendix A, "General Design Criteria for Nuclear Power Plants;" and GL 84-01, "NRC Use of the Terms, 'Important to Safety' and "Safety Related.'" Additionally EGC believes that safety related SSCs are required to mitigate the consequences of an accident as documented in 10 CFR Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants" and RG 1.29.

This philosophy is consistent with the intent of the Systematic Evaluation Program (SEP) that evaluated and approved DNPS's post-licensing approach to external flood mitigation. It is also consistent with previous NRC decisions regarding application of GDC.

Chronology
In June 1970 and November 1971, DNPS Units 2 and 3 commenced commercial operations. A Provisional Operating License (POL) was issued for Unit 2 in 1969. DNPS was licensed prior to "safety-related" classification requirements. Chapter 12 of the original FSAR identified systems which were considered "safety related", although the terminology at that time was Class 1 equipment.

In June 1972, RG 1.29 was issued. In Section A of RG 1.29 a description of systems "important to safety" and "safety related functions" are referenced. In the case of important to safety, RG 1.29 (current revision) points to 10 CFR 50, Appendix A, GDC 2. Natural phenomena described in GDC 2 include earthquakes, tornados, hurricanes, floods, tsunami, and seiches. RG 1.29 also refers to safety related functions with regard to Appendix B of 10 CFR 50. This portion of RG 1.29 discusses establishing requirements for equipment that prevents or mitigates the consequences of postulated accidents. Additionally, RG 1.29 references Appendix A, "Seismic and Geological Siting Criteria for Nuclear Power Plants," to 10 CFR 100 which discusses the SSCs that are used to ensure: (1) the integrity of the reactor coolant pressure boundary, (2) the capability to shut down the reactor and maintain it in a safe shutdown condition, or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of 10 CFR Part 100.

In August, 1973, RG 1.59, "Design basis Floods for Nuclear power Plants," was issued. Section B of RG 1.59 states that safety related SSCs should be designed to withstand and retain cold shutdown during the design basis flood. When referring to safety related SSCs, RG 1.59 refers back to equipment that was indentified in RG 1.29, which only discussed safety related function in light of postulated accidents. In 1975, the Standard Review Plan containing the GDC was issued. In 1977, the Systematic Evaluation Program (SEP) was initiated to review the designs of older operating reactors (i.e., reactors licensed prior to 1975). DNPS, Unit 2 was selected as one of ten SEP plants to undergo detailed review (i.e., Phase II review). SEP was a means for the NRC to review and validate the safety of older plants based on newer licensing criteria without imposing changes to the licensing basis or imposing a backfit. It was designed to provide a rationale for acceptable departures from the new criteria.

In February 1983, NUREG-0823, "Integrated Plant Safety Assessment – Systematic Evaluation Program," was issued. NUREG-0823 indicated the flooding issues identified in the SEP would be resolved through the IPEEE.

In 1983, Generic Letter 83-28 was issued. Section 2 of GL 83-28 gave guidance in the classification of safety related equipment. Safety related was defined in GL 83-28 (same as 10 CFR 50.2). The definition is similar to the definition cited above in Section VI., Appendix A of 10 CFR 100.

> Safety-related structures, systems, and components are those that are relied upon to remain functional during and following design basis events to ensure: (1) the integrity of the reactor coolant boundary, (2) the capability to shut down the reactor and maintain it in a safe shutdown condition, and (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guidelines of 10 CFR Part 100.

GL 83-28 did not specify what constitutes a design basis event.

In 1984 GL 84-01 was issued to address confusion that has risen between the use of the terms "Important to Safety" and "Safety Related". In GL 84-01 a clear distinction was drawn between the two terms. The following is an excerpt from a letter attached to GL 84-01 from H.R. Denton to T.S. Ellis, dated December 19, 1983:

> I agree that the use of these terms in a variety of contexts over the past several years has not been consistent. In recognition of this problem I attempted in my 1981 memorandum to NRR personnel to set forth definitions of these terms for use in all future regulatory documents and staff testimony before the adjudicatory boards. As you are aware, the position taken in that memorandum was that "important to safety" and "safety-related" are not synonymous terms as used in Commission regulations applicable to nuclear power reactors. The former encompasses the broad scope of equipment covered by Appendix A to 10 CFR Part 50, the General Design Criteria, while the latter refers to a narrower subset of this class of equipment defined "in Appendix A to 10 CFR Part 100 Section VI(a)(l) and, more recently, in 10 CFR 50.49(b)(1). Based on such a distinction between these terms, it generally has been staff practice to apply the quality assurance requirements of Appendix B to 10 CFR Part 50 only to the narrower class of "safety-related" equipment, absent a specific regulation directing otherwise.

The information that is contained in FSAR Chapter 12, "Structural Design and Shielding," follows the guidance that is in Regulatory Guide 1.29. RG 1.29 was initially issued in the early seventies, after the Dresden units were licensed.

In 1989, NUREG-0823 Supplement 1 was issued documenting the final report for the Dresden SEP. In this document, the issue of external flooding is documented as "Complete".

In 1992, the NRC issued SECY-92-223 entitled "Resolution of Deviations Identified during the Systematic Evaluation Program". SECY-92-223 documents the unanimous agreement by the NRC that:

> ...the staff will not apply the General Design Criteria (GDC) to plants with construction permits issued prior to May 21, 1971... While compliance with the intent of the GDC is important, each plant licensed before the GDC were formally adopted was evaluated on a plant specific basis, determined to be safe, and licensed by the Commission. Furthermore, current regulatory processes are sufficient to ensure that plants continue to be safe and comply with the intent of the GDC. Backfitting the GDC would provide little or no safety benefit while requiring an extensive commitment of resources.

As stated above external events are covered in Appendix A of 10 CFR 50 which relates to important to safety; whereas safety related functions of SSCs are related to postulated accidents.

The Isolation Condenser is safety related inasmuch as it serves as an extension of the primary containment boundary; however, its normal water sources are not classified as safety related. Therefore, the emergency flood pump was not purchased or classified as safety related.

In 1982, NRC provided Dresden with a technical evaluation that had been completed by the Franklin Research Center. In this report, it was acknowledged that receiving portable engine driven pumps from the central Commonwealth Edison supply division was a reasonable scenario. Based on the discussion, it appears that it was understood that the portable pumps which were intended to be used were not safety related. In NUREG-0823, the NRC recognized the intent to use a portable pump to supply cooling water to the isolation condenser using the fire water system.

Follow up Question
7.1. The site's flooding strategy does not describe resources or efforts required to secure radiological and chemical hazards due to the effects from flooding, and any associated effects due to flooding, including potential impacts to dry fuel storage containers. Please describe actions presently required to be taken and actions that may be required to ensure during a flooding event that radiological and chemical source conditions do not constitute a threat to plant staff or cause an uncontrolled offsite release.

EGC Response:

During a flooding event, EGC Emergency Response Organization (ERO) Radiation Protection Technicians (RPTs) are designated to conduct habitability surveys. The purpose for conducting habitability surveys is to ensure the staff is not exposed to unacceptable radiological conditions while responding to the event. The process is governed by EP-AA-1000, "Exelon Nuclear Standardized Radiological Emergency Plan," and its associated suite of procedures and training and reference materials.

Radioactive materials that are stored outside the power block primarily consist of locked cargo containers of low-level waste and/or contaminated equipment. Cargo containers typically contain small quantities of radionuclides with little to no measurable radiation levels on the outside the container. During a flooding event, EGC would evaluate relocating (i.e., shipping) the containers. In the event that cargo containers were not shipped off-site and were translocated off-site by flood waters, the vast majority of radionuclides would likely remain in the locked cargo container. Each cargo container is marked with radiological postings to warn personnel of hazards that may be present. Radiological surveys would be conducted as part of the recovery response to validate no spread of contamination or to quantify the release and allow for proper remediation.

Flood waters that impact contaminated areas may result in low levels of radioactive materials being carried away with the flood waters and also re-deposit those materials as the flood waters recede. Dresden's aggressive housekeeping program ensures the total amount of radioactive materials available to contaminate flood waters is minimal. Throughout the flooding event and recovery phase, flood water samples will be collected to ensure sufficient data is available to assess any release.

Chemical sources at DNPS primarily include chemicals that are used to treat plant raw water systems (e.g., circulating water and service water) and are; therefore, designed to be injected into water. The chemical feed tanks are contained in concrete berms extending approximately three ft above plant grade elevation and are located adjacent to the 2/3 Crib House and near the plant's cooling towers. In an extreme flood event, depending on the chemical level in each of those tanks, one or more of the tanks may become buoyant and its contents may be dispersed into the rapidly moving flood waters.

The quantities of water-treatment chemicals maintained on-site are relatively small in comparison to the immense volume of flood water that would inundate and flow past the site in the event of a PMF. It is expected that any release of chemicals as a result of one or more storage tank breaches would rapidly be diluted, thus yielding minimal off-site or on-site impact. Additionally, it is not expected that plant personnel would be in the vicinity of the crib house or the plant's cooling towers during this phase of a flooding event, so the risk to plant workers is also judged to be minimal.

The DNPS Independent Spent Fuel Storage Installation (ISFSI) and Dry Cask Storage (DCS) Program are governed under 10 CFR Part 72, Subpart K. To ensure that loaded dry cask storage containers meet design basis requirements, the DCS Certificate of Compliance (CoC) (i.e., which is issued to a DCS vendor in accordance with 10 CFR Part 72, Subpart L for a specific DCS system) requires that a user (i.e., a General Licensee such as EGC) verify that certain site-specific parameters are enveloped by the conditions described in the applicable Final Safety Analysis Report (FSAR). DNPS utilizes the Holtec International HI-STORM 100 DCS and HI-STAR 100 DCS (i.e., CoC 1014 and CoC 1008, respectively).

The flood criteria required to be verified by the site are:

1. Flood velocity
2. Flood depth
3. Flood duration (this relates to operability of passive heat removal systems for HI-STORM type dry casks, does not apply to HI-STAR type casks)

The effects on dry cask storage of flood velocity, depths, and duration have been evaluated. Based on the evaluations, impacts due to flood velocity do not require site actions and have insignificant effect on dry cask storage. Regarding flood depth and duration, the operability of the passive heat removal system can be affected by having the lower inlet vents covered. The applicable CoCs for DNPS dry casks do not explicitly limit flood durations. The DCS Technical Specification LCO 3.1.2, "Spent Fuel Storage Casks Heat Removal System," limit the length of time that the passive heat removal system can be inoperable for HI-STORM type dry casks to 56 hours for East ISFSI and 72 hours for West ISFSI. Based upon the PMF hydrograph the flood duration under which the HI-STORM 100 Overpack inlet ducts are inoperable is calculated to be 49.8 hrs. Therefore, the site-specific PMF falls within the time restraints dictated by LCO 3.1.2.

Although the DNPS site-specific PMF is not anticipated to exceed time allowances of LCO 3.1.2 (i.e., 56 hours for East ISFSI and 72 hours for West ISFSI), an analysis was performed for the East ISFSI based on a 70-hour duration. The analysis concludes that the temperature limits of the loaded HI-STORM 100 dry casks on the East ISFSI are not exceeded. The allowed heat removal system inoperability in LCO 3.1.2 for the West ISFSI is 72 hours. This is 2 hours more than the analysis performed on East ISFSI.

Additionally there is guidance in the current revision of DOA 0010-04 for DNPS operators to reference the CoCs during the flooding event and post-flood. DOA 0010-04 also has actions to perform dry cask storage post-flood inspections for signs of impact, damage, sliding, or tipping. If any of these conditions are observed, then radiation surveys and structural inspections are to be performed based on the as-found conditions. Additionally, the Dry Cask Program Manager is required to determine recovery actions as needed. All of these actions are intended to ensure that all design basis analyses are valid, signifying that the ISFSI radiation limits found in 10 CFR 72.104 and 10 CFR 72.106 are not challenged. No other actions are required to be taken.