



Order No. EA-13-109

RS-14-081  
RA-14-021

June 2, 2014

U.S. Nuclear Regulatory Commission  
ATTN: Document Control Desk  
Washington, DC 20555-0001

Oyster Creek Nuclear Generating Station  
Renewed Facility Operating License No. DPR-16  
NRC Docket No. 50-219

Subject: Request for Extension to Comply with NRC Order EA-13-109, "Order Modifying Licenses With Regard To Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions"

References:

1. NRC Order EA-13-109, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions, dated June 6, 2013
2. Interim Staff Guidance, JLD-ISG-2013-02, Compliance with Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions, dated November 25, 2013 (FRN/Vol. 78, No. 227)
3. Letter from Exelon Generation Company, LLC, Notification Pursuant to Condition C.1 of the June 6, 2013 Commission Order Modifying License with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order No. EA-13-109), dated December 13, 2013
4. Letter from Exelon Generation Company, LLC, Permanent Cessation of Operations at Oyster Creek Nuclear Generating Station, dated January 7, 2011

On June 6, 2013, the Nuclear Regulatory Commission (NRC) issued Order EA-13-109 (Reference 1) to all licensees that operate boiling-water reactors with Mark I and Mark II containment designs. The Order was effective immediately and is applicable to Oyster Creek Nuclear Generating Station (Oyster Creek). On November 25, 2013, the NRC issued Interim Staff Guidance, JLD-ISG-2013-02 (Reference 2). In Reference 3, Exelon Generation Company, LLC (EGC) provided the required 20-day notification for Oyster Creek pursuant to Condition C.1 of the Order EA-13-109 for implementation of Phase 1. Reference 3 indicated that EGC was evaluating the complex plant modifications that would be required to meet the Phase 1 and Phase 2 severe accident capable vent requirements specified in Order EA-13-109 in view of the limited remaining plant operating life. In Reference 4, EGC had previously notified the NRC of

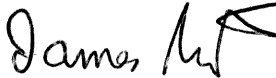
EGC's plans to permanently shut down Oyster Creek and cease operation no later than December 31, 2019.

In accordance with Section IV of NRC Order EA-13-109, EGC is hereby requesting that the Director, Office of Nuclear Reactor Regulation, grant an extension to comply with the requirements in Section IV of NRC Order EA-13-109 concerning implementation of the Phase 1 (wetwell vent) and Phase 2 (drywell vent) at Oyster Creek until January 31, 2020. Additionally, EGC will submit a request for relief from NRC Order EA-13-109 no later than January 31, 2020 based upon the permanent shutdown condition of the plant at that time. Enclosure 1 to this letter provides the basis and justification supporting the request for extension to comply with the requirements of NRC Order EA-13-109 for Oyster Creek.

This letter contains no new regulatory commitments. If you have any questions regarding this request, then please contact David P. Helker at 610-765-5525.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 2<sup>nd</sup> day of June 2014.

Respectfully submitted,



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James Barstow  
Director – Licensing & Regulatory Affairs  
Exelon Generation Company, LLC

Enclosures:

1. Request for Extension to Comply with NRC Order EA-13-109, Section IV Requirements Regarding Implementation of Phase 1 and Phase 2 Severe Accident Capable Vents for Oyster Creek Nuclear Generating Station

cc: Director, Office of Nuclear Reactor Regulation  
NRC Regional Administrator – Region I  
NRC Senior Resident Inspector – Oyster Creek Nuclear Generating Station  
NRC Project Manager, NRR – Oyster Creek Nuclear Generating Station  
Mr. Robert L. Dennig, NRRIDSS/SCVB, NRC  
Ms. Jessica Kratchman, NRR/JLD/JPMB, NRC  
Mr. Jeremy Bowen, NRR/JLD/MSPB, NRC  
Mr. John Hughey, NRR/DPR/MSD/MSPB, NRC  
Mr. John G. Lamb, NRR/DORL/LPL 1-2, NRC  
Manager, Bureau of Nuclear Engineering – New Jersey Department of Environmental Protection  
Mayor of Lacey Township, Forked River, NJ

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#### **Request for Extension:**

Pursuant to Nuclear Regulatory Commission (NRC) Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions" (Reference 1), Exelon Generation Company, LLC (EGC) hereby submits a request for extension to comply with the requirements in Section IV of NRC Order EA-13-109 concerning implementation of Phase 1 (wetwell vent) and Phase 2 (drywell vent) at Oyster Creek Nuclear Generating Station (Oyster Creek) until January 31, 2020. Additionally, EGC will request relief from NRC Order EA-13-109 no later than January 31, 2020 based upon the permanent shutdown condition of the plant at that time.

#### **Order Requirement from Which Extension is Requested:**

NRC Order EA-13-109, Section IV.B requires licensees to complete implementation of Phase 1 (severe accident capable wetwell venting system) no later than startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever occurs first. NRC Order EA-13-109, Section IV.B also requires licensees to complete implementation of Phase 2 (severe accident capable drywell venting system) no later than startup from the first refueling outage that begins after June 30, 2017, or June 30, 2019, whichever occurs first.

Based on the timelines specified in NRC Order EA-13-109, EGC is required to implement Phase 1 (severe accident capable wetwell venting system) at Oyster Creek by startup from the OC1R26 Refueling Outage (Fall 2016), and Phase 2 (severe accident capable drywell venting system) by startup from the OC1R27 Refueling Outage (Fall 2018).

EGC has evaluated the complex modifications required to meet the Phase 1 and Phase 2 venting capability requirements specified by the Order, and concluded that an extension to compliance with these Order requirements is reasonable considering the limited remaining plant operating life at the time these modifications are required to be implemented. As previously identified in Reference 2, EGC plans to permanently shut down Oyster Creek and cease operation no later than December 31, 2019.

#### **Justification for Extension Request:**

In accordance with the requirements of Section IV of NRC Order EA-13-109, EGC is required to implement Phase 1 (severe accident capable wetwell venting system) at Oyster Creek by startup from the OC1R26 Refueling Outage (Fall 2016), and Phase 2 (severe accident capable drywell venting system) by startup from the OC1R27 Refueling Outage (Fall 2018). These requirements are intended to provide a reliable Hardened Containment Vent System (HCVS) to prevent or limit core damage upon loss of heat removal capability during beyond-design-basis severe accident conditions until other means of heat removal are available, such as the

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Residual Heat Removal and Shutdown Cooling systems. Oyster Creek is less reliant on containment vents for decay heat removal because the existing Isolation Condenser System (ICS) transfers decay heat energy directly to the outside atmosphere, limiting the heat added to the containment. The Oyster Creek ICS provides a robust and reliable source of decay heat removal capability, which consists of two fully-redundant and independent safety-related subsystems, with each subsystem equipped with multiple shell side makeup water sources, one of which does not require AC or DC power to provide makeup water. The implementation of FLEX strategies at Oyster Creek in accordance with the requirements of NRC Order EA-12-049 (Reference 3) provides further capability to limit decay heat input into the containment during beyond-design-basis severe accident conditions. In addition to the installed ICS, Oyster Creek has a torus and drywell hardened vent capable of removing one percent of decay heat load.

A detailed discussion of the Oyster Creek ICS design and operational capability, the FLEX strategy enhancements being implemented in accordance with NRC Order EA-12-049 (Reference 3), and the capabilities of the existing hardened vent at Oyster Creek is provided below.

#### Isolation Condenser System Design and Operation Capability

The existing Oyster Creek plant design incorporates a redundant, safety-related ICS, which is a standby high-pressure system for the removal of fission product decay heat when the reactor is isolated from the Main Condenser. The system consists of two full-capacity isolation condensers, four AC motor-operated isolation valves, four DC motor-operated isolation valves, and three vent lines to the atmosphere. The system prevents overheating of the reactor fuel, controls the reactor pressure rise, and limits the loss of reactor coolant through the relief valves. Current procedures allow operators to manually place the ICS in service if power is lost during a severe external event. Other than the DC electrical system used to place the ICS in operation, no other external power is required. The system operates by allowing steam to flow from the Reactor Pressure Vessel (RPV) through the condenser tubes and returning the accumulated condensate, by gravity (natural circulation), to the RPV forming a closed loop. The ICS removes decay heat from the RPV by transferring decay heat energy to the shell side water. The ICS then releases the decay heat energy directly to the outside atmosphere, limiting the heat added to the containment due to ambient loss from the RPV and associated piping. The ICS also provides an alternate shutdown capability. In the event of damage from a fire or severe natural phenomena (e.g., tornadoes, seismic, flooding), the ICS removes reactor decay heat to establish a safe shutdown condition.

Makeup during ICS operation is provided from the Demineralized Water Transfer System or the Condensate Transfer System. An emergency makeup water supply is also provided from the fire suppression and Core Spray Systems. During a loss of offsite power, makeup water to the ICS is provided by two independent diesel-driven firewater pumps supplying the site firewater header. Equipment and procedures that comply with NEI 06-12 (Reference 6) can also supply ICS shell water from various water sources using a mobile diesel driven pump if plant infrastructure is damaged in a severe external event.

The existing ICS provides a highly reliable, fully-redundant, safety-related decay heat removal system, with multiple cooling water makeup sources, specifically designed to prevent damage to

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reactor fuel under loss of all AC power events and severe external events.

#### FLEX Strategy Enhancements

Implementation of FLEX strategies at Oyster Creek in accordance with the requirements of NRC Order EA-12-049 (Reference 3) provides further capability to limit decay heat input to the containment, extend availability of required systems, and provide makeup water sources to the RPV under postulated Extended Loss of all AC Power (ELAP) beyond-design-basis events. Oyster Creek FLEX Phase 1 strategies accomplish this using permanent plant equipment. FLEX Phase 2 strategies take suction from the intake or discharge canal with the FLEX portable pump and provide low-pressure makeup water to the ICS shells and RPV. DC loads are shed to extend battery life for ICS valve operation. DC load shedding also maintains instrumentation required for transient mitigation. In addition, limited AC bus restoration will occur at approximately three hours using the FLEX generator. The FLEX strategies recover station battery chargers to ensure continued operation of the 125-volt DC system. FLEX strategies also provide a high-pressure RPV injection source from the Control Rod Drive system if the Condensate Storage Tank is available. FLEX strategies isolate reactor recirculation pumps, limiting pump seal leakage from the RPV and energy addition into containment. FLEX strategies implemented in Phase 2 are designed to maintain the plant in a hot shutdown condition. After 24 hours, Phase 3 strategies will provide consumables (additional diesel fuel oil) and backup equipment to ensure these strategies function indefinitely.

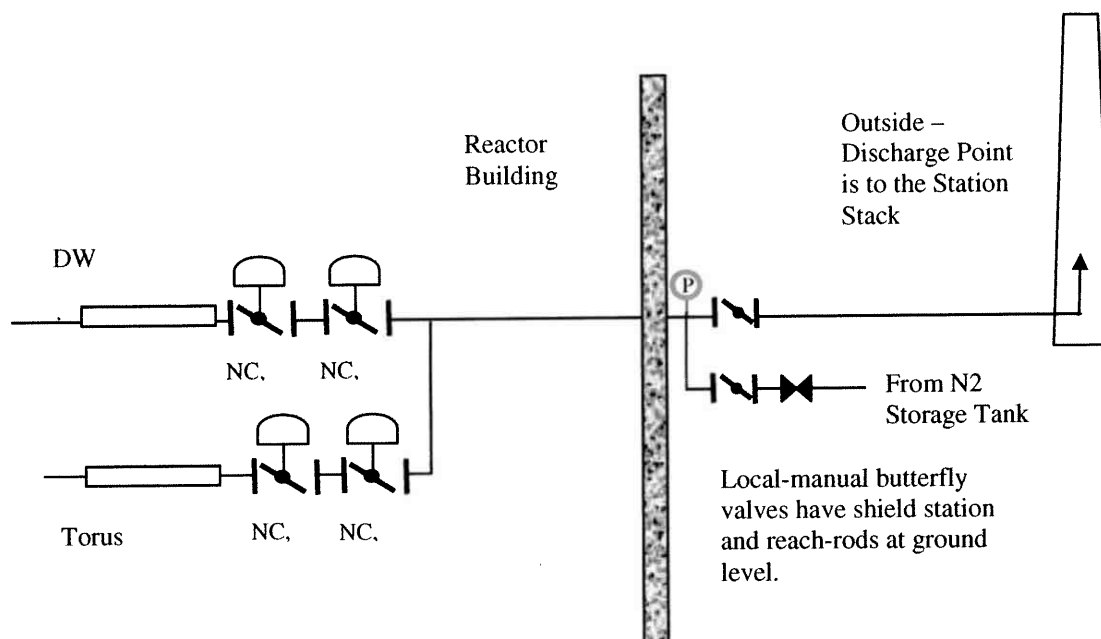
As stated above, the ICS removes decay heat with essentially no loss of inventory from the reactor coolant system, and with no addition of heat to the suppression pool. The shell side of the ICS is replenished with sufficient water via FLEX strategies early in the event and will remove adequate decay heat to maintain core cooling. The ICS removes core decay heat and discharges it outside of containment thus preventing the suppression pool limits from being compromised. Permanently installed equipment and FLEX portable equipment at Oyster Creek will effectively remove decay heat and ensure that containment design limits are not exceeded.

#### The Existing Hardened Vent Capability

The Oyster Creek Generic Letter (GL) 89-16 design includes Torus and Drywell (DW) vent paths that join together into a common flow path. Each of these two containment penetrations has two air-to-open, spring-to-shut Containment Isolation Valves (CIV) located on the outside of the containment. The common vent path exits the Reactor Building (RB) at ground level and is then routed to the station stack. The top of the stack is well above any nearby structures. The common path includes a valve to control the vent flow to the stack; this valve is manually operated by an extension rod through a shield wall. The shielding at the manual control valve was based on 20% fuel pin damage. There is a local line pressure gage at the shield wall. The only interfacing system is the nitrogen system used to inert the containment. The nitrogen system is isolated from the vent path by two manual valves; one valve is normally closed and the second one can be shut by the extension rod through the shield wall.

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Except for opening the CIVs, the hardened vent system requires no motive or electrical power. The Torus and Drywell CIVs have separate accumulators sized for 6 valve openings in a 24-hour period. The amount of time the valves remain open can be extended by limiting valve cycling, which depletes the air stored in the accumulators. Solenoid valves, which must be energized to allow motive air to open the CIVs, are powered from a rotary inverter. During an ELAP, the rotary inverter is supplied by the "B" vital battery bank. Power for the solenoid valves is available as long as "B" battery can supply power and indefinitely once the FLEX generator restores the "B" battery charger. There is a bypass switch in the Main Control Room (panel 12XR) to allow opening these valves following a containment isolation signal. Operators will rely on containment pressure transmitters and Torus water level indication in making the decision to vent.

The instruments are qualified for 87 psia and 318F at 100% relative humidity. The piping is designed for 75 psig and 305F. The design pressure exceeds the torus design pressure (35 psig) and the PCPL (55 psig). The design temperature was based on the saturation temperature at 55 psig. The CIV seat material was upgraded to withstand 400F. The rated capacity is 1% of rated thermal power assuming a containment pressure of 55 psig. The HCVS vent path up to and including the downstream CIV – including piping, piping supports, CIVs, valve actuators, pneumatic accumulator, and instrumentation is designed consistent with the design basis of the plant.

As summarized in the FLEX Overall Integrated Plan (OIP) (Reference 5), the Modular Accident Analysis Program (MAAP) analysis bounding condition assumed that the ICS makeup was not achieved, which resulted in emergency depressurization and eventual containment venting. Additional MAAP analysis, with ICS makeup not achieved, allowed for venting at 35 psig. Containment venting in these cases did not occur until approximately 39 hours, when a

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pressure of 35 psig was reached. In the MAAP analysis, with ICS makeup achieved, containment venting was not required.

Although the GL 89-16 vent was not designed for severe accident conditions, if such an event were to occur, then the GL 89-16 hardened vent system design considers radiation levels based on the following two scenarios:

- 1) No fuel failure.  
Per the existing design calculations, the radiation dose rates of the entire vent path will be less than 1 mrem/hr with no fuel failure. Based on the robustness of the FLEX strategy highlighted above, no fuel failure would be expected.
- 2) 20% fuel pin damage.  
If the torus is vented 24 hours after 20% fuel damage, the dose rate 10 feet away from the vent path is 500 mrem/hr. At the valve station, behind the radiation shield wall, the dose rate is 700 mrem/hr. These dose rates are based on the methodology provided in NUREG-1228 using 20% failed fuel pins and release of the radioactivity in the pin gap only.

If there is a loss of station air, AC, and DC power, then the current site B.5.b procedures direct manual opening of the HCVS isolation valves. Containment or torus venting will then be controlled with a reach rod from behind the installed shield wall from outside of the RB. This strategy, which provides increased defense-in-depth, is being incorporated into the site FLEX support guidelines.

If valve position indication cannot be restored, then the available pressure indication located outside of the RB will be relied upon to provide indication that venting has commenced.

#### **Conclusion:**

The existing plant safety features at Oyster Creek, along with implementation of FLEX strategies in accordance with NRC Order EA-12-049 (Reference 3) and the installed capability of the existing HCVS, will provide additional defense-in-depth measures and enhanced plant capability to mitigate the consequences of a beyond-design-basis external event and to prevent severe accident conditions. Therefore, the need for severe accident containment venting capability at Oyster Creek is extremely unlikely during the remaining duration of plant operation. Compliance with NRC Order EA-13-109 (Reference 1) for Oyster Creek is not necessary to achieve the underlying purpose of the Order based on the special conditions at Oyster Creek and the planned permanent cessation of plant operations no later than December 31, 2019 (Reference 2). A sequence of events such as those that occurred at the Fukushima Dai-ichi accident is unlikely to occur in the United States based on current regulatory requirements and existing plant capabilities, and the limited remaining duration of plant operating life at Oyster Creek. Therefore, the requested extension to the compliance requirements of NRC Order EA-13-109 for Oyster Creek does not pose a significant increase in plant risk and does not reduce nuclear safety or safe plant operations.

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Accordingly, based on the special circumstances at Oyster Creek, EGC requests an extension to comply with the requirements in Section IV of NRC Order EA-13-109 concerning implementation of the Phase 1 (wetwell vent) and Phase 2 (drywell vent) at Oyster Creek until January 31, 2020. Additionally, EGC will request relief from NRC Order EA-13-109 no later than January 31, 2020 based upon the permanent shutdown condition of the plant at that time. EGC believes that the requested extension milestone of January 31, 2020 will not be reached because Oyster Creek will cease operations and submit the certifications required by 10CFR50.82(a)(1). The requested extension does, however, preserve the final implementation requirement in the interim, prior to submission of the required certifications.

#### **References:**

1. NRC Order EA-13-109, "Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," dated June 6, 2013
2. Exelon Generation Company, LLC letter to USNRC, "Permanent Cessation of Operations at Oyster Creek Nuclear Generating Station," dated January 7, 2011
3. NRC Order Number EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012
4. NRC Interim Staff Guidance JLD-ISG-2013-02, "Compliance with Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," Revision 0, dated November 14, 2013
5. Exelon Generation Company, LLC letter to USNRC, "Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order EA-12-049)," dated February 28, 2013 (RS-13-023)
6. NEI 06-12, "B.5.b Phase 2 & 3 Submittal Guideline," Revision 2, December 2006