Exelon Generation.

Order No. EA-12-049

RS-13-022

February 28, 2013

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

Limerick Generating Station, Units 1 and 2
Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: 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 Number EA-12-049)

References:
1. NRC Order Number EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" dated March 12, 2012
2. NRC Interim Staff Guidance JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," Revision 0, dated August 29, 2012
3. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, dated August, 2012
4. Exelon Generation Company, LLC's Initial Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated October 25, 2012

On March 12, 2012, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an order (Reference 1) to Exelon Generation Company, LLC (EGC). Reference 1 was immediately effective and directs EGC to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event. Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 requires submission of an Overall Integrated Plan by February 28, 2013. The NRC Interim Staff Guidance (ISG) (Reference 2) was issued August 29, 2012 which endorses industry guidance document NEI 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 3 provides direction regarding the content of this Overall Integrated Plan.

Reference 4 provided the EGC initial status report regarding mitigation strategies, as required by Reference 1.

The purpose of this letter is to provide the Overall Integrated Plan pursuant to Section IV, Condition C.1, of Reference 1. This letter confirms EGC has received Reference 2 and has an Overall Integrated Plan developed in accordance with the guidance for defining and deploying strategies that will enhance the ability to cope with conditions resulting from beyond-design-basis external events.

The information in the enclosure provides the Limerick Generating Station, Units 1 and 2 Overall Integrated Plan for mitigation strategies pursuant to Reference 3. The enclosed Integrated Plan is based on conceptual design information. Final design details and associated procedure guidance, as well as any revisions to the information contained in the Enclosure, will be provided in the 6-month Integrated Plan updates required by Reference 1.

This letter contains no new regulatory commitments. If you have any questions regarding this report, 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 28th day of February 2013.

Respectfully submitted,

Michael D. Jesse
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosure:

1. Limerick Generating Station, Units 1 and 2 Mitigation Strategies (MS) Overall Integrated Plan

cc: Director, Office of Nuclear Reactor Regulation
NRC Regional Administrator - Region I
NRC Senior Resident Inspector - Limerick Generating Station, Units 1 and 2
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Enclosure 1

Limerick Generating Station, Units 1 and 2

Mitigation Strategies (MS)

Overall Integrated Plan

(72 pages)

General Integrated Plan Elements	
Site: Limerick Generating Station (LGS)	
Determine Applicable Extreme External Hazard **Ref: NEI 12-06 section 4.0 -9.0 JLD-ISG-2012-01 section 1.0**	*Input the hazards applicable to the site; seismic, external flood, high winds, snow, ice, cold, high temps.* *Describe how NEI 12-06 sections 5 – 9 were applied and the basis for why the plant screened out for certain hazards.* Seismic events, except soil liquefaction; external flood (due to a Local Intense Precipitation), severe storms with high winds; snow, ice and extreme cold; and high temperatures were determined to be applicable Extreme External Hazards for Limerick Generating Station (LGS) per the guidance of NEI 12-06 and are as follows: **Seismic:** Per the Updated Final Safety Analysis Report (UFSAR) Section 2.5, the seismic criteria for LGS include two design basis earthquake spectra: Operating Basis Earthquake (OBE) and the Design Basis Earthquake (DBE) (Safe Shutdown Earthquake). The DBE and the OBE are 0.15g and 0.075g, respectively. These values constitute the design basis of LGS. Per the UFSAR, the buildings and equipment that have been designed for seismic loads include, but are not limited to, the Reactor Enclosure, Control Structure, Diesel Generator Enclosures, Spray Pond Pump House, High Pressure Coolant Injection, and Reactor Core Isolation Cooling. Per NEI 12-06, all sites will consider the seismic hazard. (References 1, 2) Soil liquefaction was reviewed for Limerick Generating Station. Based on the UFSAR, the soil at the seismic Category I spray pond was analyzed for liquefaction potential. The soils at other seismic Category I facilities were not analyzed since these soils are not saturated and the potential for becoming saturated is negligible. Based on the UFSAR, the spray pond does not have a soil liquefaction concern. Therefore, Limerick site screens in for an assessment of seismic hazards, as required for all plants per NEI 12-06. **Flooding:** As discussed in the UFSAR, the design basis flood level of

	the Schuylkill River at the site is 207 feet, including wave activity. The shortest horizontal distance from the contour at elevation 207 feet to the nearest safety-related structure is approximately 200 feet. Grade level is no lower than elevation 215' at any of the safety-related structures, and none of the safety-related structures has exterior openings below elevation 217'. Therefore, the safety-related structures are secure from Schuylkill River flooding and no special provisions for flood protection are necessary. Therefore, Limerick is built above the design basis flood level and is considered "dry" by the NEI guidance and dry sites are not required to evaluate flood-induced challenges. The other area that was reviewed for effects of flooding was the spray pond. Based on the UFSAR, the maximum flood level at the spray pond is 254.9 feet. The lowest elevation for the spray pond pump house is 268 feet. Therefore, the spray pond pump house does not have a flooding concern. It should also be noted the Limerick Station has been analyzed for a Local Intense Precipitation (LIP, transient flood). The affects of a LIP are analyzed in calculation NPB-117. Based on the results and due to the analyzed flood planes for Limerick, the station will need to ensure storage and deployment of equipment is not impeded due to a transient flood (LIP). Thus the Limerick site screens in for an assessment for storage and transportation of equipment during a Local Intense Precipitation for external flooding. **<u>Severe Storms with High Winds:</u>** Limerick Generating Station is located at approximately 40°13'26" north latitude and 75°35'16" west longitude. Per Figure 7-1 of NEI 12-06, Limerick is susceptible to hurricanes due to location. Per Figure 7-1, peak wind gusts at Limerick will be between 130 and 140 mph. Also, according to the UFSAR and Figure 7-2 of NEI 12-06, Limerick Generating Station is susceptible to Tornado induced winds and is classified as region 2 with maximum wind speeds of 170 mph. It should be noted that all Category I classified structures are able to withstand a rotational wind velocity of 300 mph, as given in the UFSAR. Also, safety-related structures have been assessed for tornado missiles and determined to be acceptable, per the UFSAR. The challenges produced by a tornado event would be debris in the way of the FLEX deployment path.

	Therefore, based on the above, Limerick Generating Station screens in for an assessment of Severe Storms with High Winds for both hurricanes and tornados. **<u>Snow, Ice and Extreme Cold:</u>** The guidelines provided in NEI 12-06 (Section 8.2.1) generally include the need to consider extreme snowfall and low temperatures at plant sites above the 35th parallel. The Limerick Generating Station site is located above the 35th parallel and thus the capability to address impedances caused by extreme snowfall need to be provided. Per the UFSAR, the temperature in the region of Limerick Generating Station site rarely exceeds 100°F or drops below 0°F. Also, per Figure 8-2 of the NEI 12-06, LGS is classified as a Level 4 Ice Severity. A Level 4 Severity for ice means Severe Damage to power lines and/or existence of large amounts of ice. Also, the spray pond (Ultimate Heat Sink (UHS) at LGS) would need to be reviewed for icing conditions. The spray pond, per the UFSAR, is designed to operate during icing conditions. Return flow to the pond is initially directed to the winter bypasses, which inject the warm return water directly to the pond volume. The bypasses are directed toward the ends of the pond to allow the return water to circulate and mix with the pond volume, and avoid hydraulic short-circuiting. The increasingly warmer pond water causes any ice layer present on the pond surface to melt. Once a hole is formed in the ice layer, a return path for spray water is available, and the spray networks may be used as water temperature dictates. During beyond-design-basis external events (BDBEE) conditions, there would be no warm water return to the spray pond. Therefore, the water source connections will need to be designed to ensure the water source will be available during cold water conditions. Since Limerick Generating Station is Level 4 Severity, an assessment for impact of snow, ice, and extreme cold will need to be completed for storage and deployment of the FLEX equipment.

	<u>High Temperatures:</u> NEI 12-06 states that all sites must consider high temperatures. The issues here are similar to cold and ice in that the equipment must be sufficiently protected from the high temperatures such that it will still be able to function when necessary. Per the UFSAR, the temperature in the region of Limerick Generating Station site rarely exceeds 100°F or drops below 0°F. Per the UFSAR, the maximum temperature measured in the local area (Philadelphia) from 1874 to 1976 was 106°F in August, 1908. Therefore, Limerick Generating Station must assess high temperatures protection and deployment of FLEX equipment. <u>Reference(s):</u> 1. LGS UFSAR, Revision 16, September 2012. 2. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, August 2012. 3. NPB-117, Potential Flooding of Plant Areas – PMP, CT Dike Failure, CW Pipe Break, Revision 6.
Key Site assumptions to implement NEI 12-06 strategies. **Ref: NEI 12-06 section 3.2.1**	*Provide key assumptions associated with implementation of FLEX Strategies:* • Flood and seismic re-evaluations pursuant to the 10 CFR 50.54(f) letter of March 12, 2012 are not completed and therefore not assumed in this submittal. As the re-evaluations are completed, appropriate issues will be entered into the corrective action system and addressed on a schedule commensurate with other licensing bases changes. • Additional staff resources are assumed to begin arriving at hour 6 and fully staffed by 24 hours. • DC systems are available. • AC and DC distribution systems are available. • Plant initial response is the same as SBO. • No single failure of SSC assumed (beyond the initial failures that define the extended loss of alternating current (ac) power (ELAP)/loss of normal access to the ultimate heat sink (LUHS) scenario in NEI 12-06). (Reference 3)

	• Primary and secondary storage locations have not been selected; once locations are finalized, implementation routes will be defined. • Storage locations will be chosen in order to support the event timeline. • BWROG Emergency Procedure and Severe Accident Guidelines, Revision 3, containing items such as guidance to allow early venting and to maintain steam driven injection equipment available during emergency depressurization, is approved and implemented in time to support compliance date. • Maximum environmental room temperatures for habitability or equipment availability are based on NUMARC 87-00 Reference 1 guidance and Limerick Specification for Environmental Service Conditions, Reference 2. • This plan defines strategies capable of mitigating a simultaneous loss of all alternating current (ac) power and loss of normal access to the ultimate heat sink resulting from a beyond-design-basis event by providing adequate capability to maintain or restore core cooling, containment, and Spent Fuel Pool (SFP) cooling capabilities at all units on a site. Though specific strategies are being developed, due to the inability to anticipate all possible scenarios, the strategies are also diverse and flexible to encompass a wide range of possible conditions. These pre-planned strategies developed to protect the public health and safety will be incorporated into the station emergency operating procedures (EOP) in accordance with established EOP change processes, and their impact to the design basis capabilities of the unit evaluated under 10 CFR 50.59. The plant Technical Specifications contain the limiting conditions for normal unit operations to ensure that design safety features are available to respond to a design basis accident and direct the required actions to be taken when the limiting conditions are not met. The result of the beyond-design-basis event may place the plant in a condition where it cannot comply with certain Technical Specifications, and, as such, may warrant invocation of 10 CFR 50.54(x) and/or 10 CFR 73.55(p). Reference(s): 1. NUMARC 87-00, Guidelines and Technical Bases for NUMARC Initiatives Addressing Station

	Blackout at Light Water Reactors, Revision 1, May 1993. 2. M-171, Specification for Environmental Service Conditions, Limerick Generating Station, Units 1 & 2, Revision 16. 3. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, August 2012. 4. NEI 12-01, Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities, Revision 0, April 2012. 5. BWR Owners' Group, Emergency Procedure and Severe Accident Guidelines, Revision 3, February 2013. 6. Task Interface Agreement (TIA) 2004-04, "Acceptability of Proceduralized Departures from Technical Specifications (TSs) Requirements at the Surry Power Station," (TAC Nos. MC4331 and MC4332)," dated September 12, 2006. (Accession No. ML060590273)
Extent to which the guidance, JLD-ISG-2012-01 and NEI 12-06, are being followed. Identify any deviations to JLD-ISG-2012-01 and NEI 12-06. **Ref: JLD-ISG-2012-01 NEI 12-06 13.1**	*Include a description of any alternatives to the guidance, and provide a milestone schedule of planned action.* Full conformance with JLD-ISG-2012-01 and NEI 12-06 is expected with no deviations.
Provide a sequence of events and identify any time constraint required for success including the technical basis for the time constraint. **Ref: NEI 12-06 section 3.2.1.7 JLD-ISG-2012-01 section 2.1**	*Strategies that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walk through of deployment).* *Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline Attachment 1A* Issuance of BWROG document NEDC-33771P, "GEH Evaluation of FLEX Implementation Guidelines" on January 31, 2013 did not allow sufficient time to perform the analysis of the deviations between Exelon's engineering analyses and the analyses contained in the BWROG document prior to commencing regulatory reviews of the

	Integrated Plan. This analysis is expected to be completed, documented on Attachment 1B, and provided to the NRC in the August 2013 6-month status update. See attached sequence of events timeline (Attachment 1A). Spent Fuel Pool (SFP) makeup is not a time constraint with the initial condition of Mode 1 at 100% power, since the worst case fuel pool heat load conditions only exist during a refueling outage. Under non-outage conditions, the maximum SFP heat load is 10.4 x 10^6 BTU/hour. Loss of SFP cooling with this heat load and an initial SFP temperature of 140 degrees F results in a time to boil of 10.3 hours, and 138 hours to the top of active fuel. Therefore, completing the equipment line-up for initiating SFP makeup at 12 hours into the event ensures adequate cooling of the spent fuel is maintained. The worst case SFP heat load during an outage is 50.4 x 10^6 BTU/hour. Loss of SFP cooling with this heat load and an initial SFP temperature of 140 degrees F results in a time to boil of 2.1 hours, and 28 hours to the top of active fuel. With the entire core being located in the SFP, manpower resources normally allocated to aligning core cooling along with the Operations outage shift manpower can be allocated to aligning SFP makeup which ensures the system alignment can be established within 8 hours. Initiation at 8 hours into the event ensures adequate cooling of the spent fuel is maintained. Initial calculations were used to determine the fuel pool timelines. Formal calculations will be performed to validate this information during development of the spent fuel pool cooling strategy detailed design, and will be provided in a future 6-month update. Reference(s): 1. NEDC-33771P, GEH Evaluation of FLEX Implementation Guidelines, Revision 1, January 2013. 2. Passport AR 1468452-02, Determine Times and Levels for the Spent Fuel Pool in Support of FLEX Integrated Plan Submittal for Fukushima During an Extended Loss of AC Power Event. The times to complete actions in the Events Timeline are based on operating judgment, the conceptual designs, and

	the current supporting analyses. The final timeline will be time validated once detailed designs are completed and procedures are developed. The results will be provided in a future 6-month update. <u>Discussion of Time Constraints Technical Basis</u> <u>Action Item 4</u> HPCI is required to be shutdown within 10 minutes to prevent reactor level from exceeding +54". (Reference 1, E-1 Bases) <u>Action Item 11</u> Within an hour of initiation of the event, the Control Room crew should be able to assess the event and declare an ELAP. Timely declaration will enable entry into ELAP procedures which will require extended DC load shedding and setup of portable FLEX equipment to respond to the event. <u>Action Item 13</u> Input to the CFLUD analysis for RCIC room temperature analysis. Natural ventilation needs to be established within 1.5 hours to maintain RCIC room temperature below the environmental qualification (EQ) limit for the equipment in the RCIC room. (Reference 2) <u>Action Item 14</u> Existing SBO Guidance, E-1, requires that these loads are shed within 2 hours. DC analysis shows that by stripping the existing E-1 loads within 2 hours, and performing the additional load shedding to maximize battery life during the ELAP, the station batteries can provide power for approximately 7 hours. (References 3, 4) <u>Action Item 15</u> Additional load shedding requirements have been identified to extend battery life to respond to the ELAP. These loads can be shed in 3 hours after event initiation and are an input to the DCSDM analysis. (Reference 4) <u>Action Item 17</u> Venting of the containment will be initiated such that peak Suppression Pool temperature remains below the maximum allowed for RCIC operation. Preliminary analysis shows

	that containment venting through the Hardened Vent (EA-12-050 requirement) at approximately 6 hours, will maintain Suppression Pool temperature at or below 236° F. A BWROG review of RCIC operation with elevated suction temperatures was conducted by GE Hitachi following the events at Fukushima-Daiichi. The review indicated RCIC could continue to operate up to approximately 230° F suction temperature. Operation of RCIC above 230° F is currently being evaluated by General Electric and the BWROG (Reference 9). Additional work will be performed during detailed design development to ensure Suppression Pool temperature will support RCIC operation, in accordance with approved BWROG analysis, throughout the event. (References 5, 6, 7, 11) <u>Action Item 18</u> Additional load shedding requirements have been identified to extend battery life to respond to the ELAP. This evaluation indicates that the limiting battery life is approximately 7 hours. Portable generators need to provide power to the battery chargers prior to 7 hours. (Reference 4) <u>Action Item 20</u> Spent Fuel Pool (SFP) make-up is not a time constraint with the initial condition of Mode 1 at 100% power, since the worst case fuel pool heat load conditions only exist during a refueling outage. Under non-outage conditions, the maximum SFP heat load is 10.4 x 10^6 BTU/hour. Loss of SFP cooling with this heat load and an initial SFP temperature of 140 degrees F results in a time to boil of 10.4 hours, and 138 hours to the top of active fuel (TAF). Therefore completing the equipment line-up for initiating SFP make-up at 12 hours into the event provides margin to degraded radiological conditions and TAF. (Reference 9) <u>Action Item 21</u> Preliminary analysis shows that with containment venting in progress, makeup to the Suppression Pool will be required at approximately 65 hours from the beginning of the event to ensure suppression pool level remains above 13.5 feet. This level was chosen to agree with procedure T-102, Primary Containment Control, Step SP/L-5, which is above the downcomer openings and is the level where shutdown of RCIC is directed due to NPSH concerns, if it is not required to maintain adequate core cooling. (References 5, 8)

	<u>Reference(s):</u> 1. E-1 Bases, Loss of All AC Power (Station Blackout), Revision 7. 2. LM-0689, RCIC Pump Room Temps for Extended Loss of AC Power – Post Fukushima Scenario, Revision 0. 3. E-1, Loss of All AC Power (Station Blackout), Revision 43. 4. Passport AR 1468452, Evaluation 01, Battery Coping Times during ELAP with Extended Load Shedding. 5. LG-MISC-012, MAAP Analysis to Support FLEX Initial Strategy, Revision 1. 6. RS-13-113, Exelon Generation Company, LLC's Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Reliable Hardened Containment Vents (Order EA-12-050), 2/28/2013. 7. BWROG Report 0000-0143-0382-R1, BWROG RCIC System Operation in Prolonged Station Blackout – Feasibility Study, March 2012. 8. T-102 Bases, Primary Containment Control – Bases, Revision 24. 9. Passport AR 01468452, Evaluation 02, SFP Evaluation. 10. NEDC-33771P, GEH Evaluation of FLEX Implementation Guidelines, Revision 1, January 2013. 11. BWROG Report 0000-0155-1545-R0, BWROG RCIC Pump and Turbine Durability Evaluation – Pinch Point Study, currently in approval process.

Identify how strategies will be deployed in all modes. **Ref: NEI 12-06 section 13.1.6**	*Describe how the strategies will be deployed in all modes.* Deployment of FLEX is expected for all modes of operation. Transportation routes will be developed from the equipment storage area to the FLEX staging areas. An administrative program will be developed to ensure pathways remain clear or compensatory actions will be implemented to ensure all strategies can be deployed during all modes of operation. This administrative program will also ensure the strategies can be implemented in all modes by maintaining the portable FLEX equipment available to be deployed during all modes. Identification of storage locations and creation of the administrative program are open items. Closure of these items will be documented in a 6-month update.
Provide a milestone schedule. This schedule should include: • **Modifications timeline** o **Phase 1 Modifications** o **Phase 2 Modifications** o **Phase 3 Modifications** • **Procedure guidance development complete** o **Strategies** o **Maintenance** • **Storage plan (reasonable protection)** • **Staffing analysis completion** • **FLEX equipment acquisition timeline** • **Training completion for the strategies** • **Regional Response Centers operational** **Ref: NEI 12-06 section 13.1**	*The dates specifically required by the order are obligated or committed dates. Other dates are planned dates subject to change. Updates will be provided in the periodic (six month) status reports.* See attached milestone schedule, Attachment 2. Exelon Generation Company, LLC (Exelon) fully expects to meet the site implementation/compliance dates provided in Order EA-12-049 with no exceptions. Any changes or additions to the planned interim milestone dates will be provided in a future 6-month update.

Identify how the programmatic controls will be met. **Ref: NEI 12-06 section 11** **JLD-ISG-2012-01 section 6.0**	*Provide a description of the programmatic controls equipment protection, storage and deployment and equipment quality. See section 11 in NEI 12-06. Storage of equipment, 11.3, will be documented in later sections of this template and need not be included in this section.* *See section 6.0 of JLD-ISG-2012-01.* Limerick Generating Station will implement an administrative program for FLEX to establish responsibilities, and testing & maintenance requirements. A plant system designation will be assigned to FLEX equipment which requires configuration controls associated with systems. This will establish responsibilities, maintenance and testing requirements for all components associated with FLEX. Unique identification numbers will be assigned to all components added to the FLEX plant system. Equipment associated with these strategies will be procured as commercial equipment with design, storage, maintenance, testing, and configuration control as outlined in JLD-ISG-2012-01 section 6 and NEI 12-06 section 11. Installed structures, systems, and components pursuant to 10CFR50.63(a) will continue to meet the augmented quality guidelines of Regulatory Guide 1.155, Station Blackout. Standard industry PMs will be developed to establish maintenance and testing frequencies based on type of equipment and will be within EPRI guidelines. Testing procedures will be developed based on the industry PM templates and Exelon standards.
Describe training plan	*List training plans for affected organizations or describe the plan for training development* Training materials for FLEX will be developed for all station staff involved in implementing FLEX strategies. For accredited training programs, the Systematic Approach to Training, SAT, will be used to determine training needs. For other station staff, a training overview will be developed per change management plan.

Describe Regional Response Center plan	Limerick Generating Station has contractual agreements in place with the Strategic Alliance for FLEX Emergency Response (SAFER). The industry will establish two (2) Regional Response Centers (RRC) to support utilities during beyond design basis events. Each RRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested, the fifth set will have equipment in a maintenance cycle. Equipment will be moved from a RRC to a local Assembly Area, established by the SAFER team and the utility. Communications will be established between the affected nuclear site and the SAFER team and required equipment moved to the site as needed. First arriving equipment, as established during development of the nuclear site's playbook, will be delivered to the site within 24 hours from the initial request. Reference(s): 1. NEI Workshop presentation, Strategic Alliance for FLEX Emergency Response (SAFER), Washington, DC, 11/27/12. 2. Request for Proposal, RFP-20480, Regional Response Center(s), United States Nuclear Industry, June 8, 2012.
Notes: Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.	

Maintain Core Cooling

Determine Baseline coping capability with installed coping[1] modifications not including FLEX modifications, utilizing methods described in Table 3-1 of NEI 12-06:

- **RCIC/HPCI/IC**
- **Depressurize RPV for injection with portable injection source**
- **Sustained Water Source**

BWR Installed Equipment Phase 1:

Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain core cooling. Identify methods (RCIC/HPCI/IC)and strategy(ies) utilized to achieve this coping time.

- RCIC Injection will maintain RPV inventory.
- SRVs will be used to control RPV pressure. RPV pressure will be lowered using SRVs to allow for injection with portable injection source in Phase 2.
- Makeup to the RPV will be from the Suppression Pool via RCIC.
- Spray Pond is the sustained water source.

At the initiation of the event the operators will enter the TRIPs (Transient Response Implementation Procedures) and E-1 (Loss of All AC Power (Station Blackout)). The FLEX Support Guidelines will be entered when there has been an ELAP, including all eight on-site Emergency Diesel Generators, with confirmation of no imminent return of any of these power sources to service.

Reactor Level Control

Initial RPV water level control will be accomplished using the RCIC System, which is independent of AC power. The RCIC System consists of a steam-driven turbine-pump unit and associated valves and piping capable of delivering makeup water to the reactor vessel. The steam supply to the RCIC turbine comes from the "B" main steam line between the reactor vessel and inboard MSIV and exhausts to the suppression pool. The RCIC pump can take suction from the condensate storage tank (CST) or from the suppression pool. The RCIC pump discharges to the feedwater line. The makeup water is delivered into the reactor vessel through a connection to the "B" feedwater line and is distributed within the reactor vessel through the feedwater spargers. Cooling water for the RCIC turbine lube oil cooler and barometric condenser is supplied from the discharge of the pump. If the CST is unavailable, suction will be transferred to the suppression pool. It is expected that RCIC would remain a viable source as long as 125 VDC control power is available for system control and 250 VDC is available for control of valves, the Barometric Condenser Vacuum Pump and Condensate Pump. There is procedural direction to operate RCIC without DC power, which is contained in TSG-4.1. (References 2, 3)

[1] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increase operating time on battery powered equipment.

Venting of the containment will be initiated to maintain peak Suppression Pool temperature below the maximum allowed for RCIC operation. A BWROG Study indicates that RCIC will remain functional as long as Suppression Pool temperature can be maintained less than approximately 230° F (Reference 1). Operation of RCIC above 230° F is currently being evaluated by General Electric and the BWROG (Reference 9). The preliminary analysis performed for strategy development indicated a maximum Suppression Pool temperature of 236° F with containment venting (Reference 8). Additional work will be performed during detailed design development to ensure Suppression Pool temperature will support RCIC operation in accordance with approved BWROG analysis, throughout the event.

Reactor Pressure Control

The SBO event will cause the RPV to be isolated from the main condenser. Pressure in the RPV will be controlled by automatic and then manual actuation of the main steam relief valves (SRVs). SRV discharge is piped to the suppression pool. Each of the five relief valves provided for automatic depressurization (ADS) is equipped with an accumulator and check valve arrangement. These accumulators are provided to ensure that the valves can be held open following failure of the nitrogen supply to the accumulators.

The Primary Containment Instrument Gas (PCIG) system provides a safety-related gas supply for the ADS valves in the event that the non-safety related normal PCIG supply is unavailable. Two seismic Category 1 gas supplies (nitrogen bottles) are provided to assure the availability of the ADS valves for long-term operation. One set of gas bottles serves three ADS valves; another set serves the other two ADS valves. These long-term gas supplies have been designed to remain operable following a loss of offsite power. Either set of bottles will supply the ADS valves with sufficient nitrogen for seven days of operation and are connected at all times during normal operation.

Cold Shutdown and Refueling

When in Cold Shutdown and Refueling, many variables impact the ability to cool the core. In the event of an ELAP during these Modes, installed plant systems cannot be relied upon to cool the core; thus, transition to Phase 2 will begin immediately. All efforts will be made to expeditiously provide core cooling and minimize heat-up and repressurization. Exelon has a program in place to determine the time to boil for all conditions during shutdown periods (Reference 7, 10). This time will be used to determine the time required to complete transition to Phase 2.

To accommodate the activities of vessel disassembly and refueling, water levels in the reactor vessel and the reactor cavity are often changed. The most limiting condition is the case in which the reactor head is removed and water level in the vessel is at or below the reactor vessel flange. If an ELAP/LUHS occurs during this condition then (depending on the time after shutdown) boiling in the core may occur quite rapidly.

Deploying and implementing portable FLEX pumps to supply injection flow must commence immediately from the time of the event. This should be plausible because more personnel are on site during outages to provide the necessary resources. Strategies for makeup water include

deployment of a FLEX pump to take suction from the Spray Pond as described in the Phase 2 Core Cooling section.

Guidance will be provided to ensure that sufficient area is available for deployment and that haul paths remain accessible without interference from outage equipment during refueling outages.

<u>Reference(s):</u>

1. BWROG Report 0000-0143-0382-R1, BWROG RCIC System Operation in Prolonged Station Blackout – Feasibility Study, March 2012.
2. LGS UFSAR, Revision 16, September 2012.
3. TSG-4.1, Operational Contingency Guidelines, Revision 13.
4. E-1 Bases, Loss of All AC Power (Station Blackout), Revision 7.
5. T-101, RPV Control, Sheet 1 of 1, Revision 21.
6. E-1, Loss of All AC Power (Station Blackout), Revision 43.
7. OP-AA-108-117-1001, Spent Fuel Storage Pools Heat-up Rate with Loss of Normal Cooling, Revision 0.
8. LG-MISC-012, MAAP Analysis to Support FLEX Initial Strategy, Revision 1.
9. BWROG RCIC Pump and Turbine Durability Evaluation – Pinch Point Study, 0000-0155-1545-XX – currently in approval process
10. OU-AA-103, Shutdown Safety Management Program, Revision 12.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* T-101, RPV Control provides direction to use RCIC and SRVs. E-1, SBO procedure will be modified with a condition to go to the extended SBO guidance. LGS will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.
Identify modifications	None.

Key Reactor Parameters	*List instrumentation credited for this coping evaluation.* RPV Water Level – LI-42-*R604 (Wide Range), LI-42-*R606A, B, C (Narrow Range), LI-42-*R610 (Fuel Zone) RPV Pressure – PI-42-*R605 * indicates unit designator, i.e., 1 for LGS Unit 1, 2 for LGS Unit 2 The evaluation of the FLEX strategy for LGS may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance or to indicate imminent or actual core damage. Any differences will be communicated in a future 6-month update following the identification of additional parameters.
Notes: Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.	

Maintain Core Cooling

BWR Portable Equipment Phase 2:

Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain core cooling. Identify methods (RCIC/HPCI/IC)and strategy(ies) utilized to achieve this coping time.

RCIC will continue to maintain RPV inventory. FLEX pumps will be connected and available to maintain RPV inventory if needed. The current strategy is to utilize the FLEX pumps to maintain suppression pool level such that RCIC NPSH requirements are met.

SRVs will continue to be used to control RPV pressure.

RPV Level Control

RCIC will continue to maintain RPV inventory. Re-energizing 480VAC load centers and battery chargers will ensure continued functionality of the RCIC System, by allowing control of the system from the Main Control Room, and continued operation of the system valves and the Barometric Condenser Vacuum Pump and Condensate Pump. Refer to the Safety Functions Support section of this report for a description of the 480VAC strategy.

Venting of the containment will be initiated to maintain peak Suppression Pool temperature below the maximum allowed for RCIC operation. A BWROG Study indicates that RCIC will remain functional as long as Suppression Pool temperature can be maintained less than approximately 230° F (Reference 5). Operation of RCIC above 230° F is currently being evaluated by General Electric and the BWROG (Reference 6). The preliminary analysis performed for strategy development indicated a maximum Suppression Pool temperature of 236° F (Reference 1). Additional work will be performed during detailed design development to ensure Suppression Pool temperature will support RCIC operation in accordance with approved BWROG analysis, throughout the event.

Addition of makeup water to the Suppression Pool will ensure adequate inventory exists for RCIC suction needs.

Line-up of the FLEX pump will also allow for injection into the RPV, if RCIC experiences a failure.

The alternate water source for makeup to the Suppression Pool and RPV is the Spray Pond.

Primary Method:

Two diesel driven portable pumps (FLEX Pumps) will take suction on the Spray Pond and discharge into the common Residual Heat Removal Service Water (RHRSW) Systems, which will then be cross-connected to the respective unit's Residual Heat Removal (RHR) System.

The RHRSW system is a safety-related system designed to supply cooling water to the RHR heat exchangers of both units. The system is common to the two reactor units, and consists of two trains. Each train services one RHR heat exchanger in each unit, and provides sufficient cooling for safe

Maintain Core Cooling
BWR Portable Equipment Phase 2:

shutdown, cooling and accident mitigation of both units. Each train has two pumps located in the spray pond pump structure, which is a seismic Category I structure. One pump supplies 100% flow to one RHR heat exchanger. During two unit operation, there are two heat exchangers (one per unit), and therefore, two of the four pumps are required for safe shutdown and accident mitigation.

The RHRSW can be cross-connected to the RHR system through existing piping. The RHRSW B train can be cross-connected to the Unit 1 RHR B train; the RHRSW A train can be cross-connected to the Unit 2 RHR A train. Injection into the Unit 1 RHR B train and the Unit 2 RHR A train will be used to provide makeup to the Suppression Pool, and will be available as a backup for RPV injection if required.

Alternate Method:

Additional diversity for RPV Injection is provided by a new RHRSW to RHR cross-tie on both units. This cross-tie will allow each train of RHRSW to provide flow to both units' A and B RHR trains in the event one of the trains is out of service.

In addition, if the Fire Water System is available, a FLEX pump could provide water from the Fire Water System to the RHR A train on Unit 1 and to the RHR B train on Unit 2 through the existing RHR to Fire Water connection. The Fire Water System would be available for all events except a seismic event.

RPV Pressure Control

SRVs will continue to be used to control RPV pressure. Re-energizing 480VAC load centers and battery chargers will ensure continued functionality of the SRVs, by allowing control of the system from the Main Control Room.

Makeup of water to the Suppression Pool will ensure adequate inventory. Preliminary analysis shows that with containment venting in progress, makeup to the Suppression Pool will be required at approximately 65 hours from the beginning of the event to ensure Suppression Pool level remains above 13.5 feet. This level was chosen to agree with procedure T-102, Primary Containment Control, Step SP/L-5, which is above the downcomer openings and is the level where shutdown of RCIC is directed due to NPSH concerns, if it is not required to maintain adequate core cooling. (References 1, 2, 3)

Cold Shutdown and Refueling

When in Cold Shutdown and Refueling, many variables exist which impact the ability to cool the core. In the event of an ELAP during these Modes, installed plant systems cannot be relied upon to cool the core; thus, transition to Phase 2 will begin immediately. All efforts will be made to expeditiously provide core cooling and minimize heat-up and repressurization. Exelon has a program in place (Reference 7, 8) to determine the time to boil for all conditions during shutdown

Maintain Core Cooling
BWR Portable Equipment Phase 2:

periods. This time will be used to determine the time required to complete transition to Phase 2.

To accommodate the activities of vessel disassembly and refueling, water levels in the reactor vessel and the reactor cavity are often changed. The most limiting condition is the case in which the reactor head is removed and water level in the vessel is at or below the reactor vessel flange. If an ELAP/LUHS occurs during this condition then (depending on the time after shutdown) boiling in the core may occur quite rapidly.

Deploying and implementing portable FLEX pumps to supply injection flow must commence immediately from the time of the event. This should be plausible because more personnel are on site during outages to provide the necessary resources. Strategies for makeup water include deploying a FLEX pump to take suction from the UHS (enter applicable site water source) as described in the Phase 2 Core Cooling section.

Guidance will be provided to ensure that sufficient area is available for deployment and that haul paths remain accessible without interference from outage equipment during refueling outages.

Reference(s):

1. LG-MISC-012, MAAP Analysis to Support FLEX Initial Strategy, Revision 1.
2. LGS UFSAR, Revision 16, September 2012.
3. T-102, Primary Containment Control, Revision 24.
4. T-102 Bases, Primary Containment Control – Bases, Revision 24.
5. BWROG Report 0000-0143-0382-R1, BWROG RCIC System Operation in Prolonged Station Blackout – Feasibility Study, March 2012.
6. BWROG Report 0000-0155-1545-XX, BWROG RCIC Pump and Turbine Durability Evaluation – Pinch Point Study, currently in approval process.
7. OP-AA-108-117-1001, Spent Fuel Storage Pools Heat-up Rate with Loss of Normal Cooling, Revision 0.
8. OU-AA-103, Shutdown Safety Management Program, Revision 12.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* LGS will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.

Maintain Core Cooling	
BWR Portable Equipment Phase 2:	
Identify modifications	*List modifications* Modify RHRSW System to allow portable pump injection, which will allow injection from Spray Pond into RHR and then into the Suppression Pool and RPV. Provide new RHRSW to RHR cross-tie on both units. Provide dry hydrant(s) to allow FLEX Pump to take suction from the Spray Pond under all conditions.
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* RPV Water Level – LI-42-*R604 (Wide Range), LI-42-*R606A, B, C (Narrow Range), LI-42-*R610 (Fuel Zone) RPV Pressure – PI-42-*R605 The evaluation of the FLEX strategy for LGS may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance or to indicate imminent or actual core damage. Any differences will be communicated in a future 6-month update following the identification of additional parameters.

Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.

Maintain Core Cooling	
BWR Portable Equipment Phase 2:	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
High Temperatures	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.

Maintain Core Cooling		
BWR Portable Equipment Phase 2:		
Deployment Conceptual Modification **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
Storage location and structure have not been decided yet. The FLEX Pumps will be brought to the area of the Spray Pond Pump House. The suction of the pumps will be routed to the Spray Pond or a dry hydrant supplied by the Spray Pond; the discharge of the pumps will be routed to the RHRSW System of each unit. Water from the Spray Pond will be injected into the RHRSW System and from there into the RHR System. With injection being supplied to the RHR System, makeup to the Suppression Pool can begin when required, and makeup to the RPV will be available if necessary. Fuel capacity in the FLEX Pumps will provide for more than 12 hours of operation. After 12 hours, fuel oil will be extracted from an Emergency Diesel Generator Storage Tank and be provided to the FLEX Pumps.	Modify RHRSW System of each unit to add a flange with a quick disconnect from the FLEX Pump. Security fence will be modified and/or dry hydrant(s) will be installed to allow suction from the Spray Pond. Construct storage structure in the vicinity of the Spray Pond Pump House to store the FLEX Pumps and required supporting equipment.	The RHRSW connection is located inside the Spray Pond Pump House, which is a safety related, Class I structure.

Maintain Core Cooling
BWR Portable Equipment Phase 2:
Notes: Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.

Maintain Core Cooling	
BWR Portable Equipment Phase 3:	
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain core cooling. Identify methods (RCIC/HPCI/IC) and strategy(ies) utilized to achieve this coping time. Phases 1 and 2 strategy will provide sufficient capability such that no additional Phase 3 strategies are required. Phase 3 equipment for LGS includes backup portable pumps and generators. The portable pumps will be capable of providing the necessary flow and pressure as outlined in the Phase 2 response for Core Cooling & Heat Removal, RCS Inventory Control and Spent Fuel Pool Cooling. The portable generators will be capable of providing the necessary 480 volt power requirements as outlined in Phase 2 response for Safety Functions Support.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* LGS will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs. Additional procedural direction for RRC equipment implementation is planned for future development.
Identify modifications	*List modifications* No additional modification required.
Key Reactor Parameters	*List instrumentation credited or recovered for this coping evaluation.* RPV Water Level – LI-42-*R604 (Wide Range), LI-42-*R606A, B, C (Narrow Range), LI-42-*R610 (Fuel Zone) RPV Pressure – PI-42-*R605 The evaluation of the FLEX strategy for LGS may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance or to indicate imminent or actual core damage. Any differences will be communicated in a future 6-month update following the identification of additional parameters.

Maintain Core Cooling		
BWR Portable Equipment Phase 3:		
Deployment Conceptual Modification **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
None.	None.	None.

Notes:

Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.

Maintain Containment

Determine Baseline coping capability with installed coping[2] modifications not including FLEX modifications, utilizing methods described in Table 3-1 of NEI 12-06:

- **Containment Venting or Alternate Heat Removal**

BWR Installed Equipment Phase 1:

Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain core cooling. Identify methods (containment vent or alternative / Hydrogen Igniters) and strategy(ies) utilized to achieve this coping time.

At the initiation of the event the operators will enter the TRIPs (Transient Response Implementation Procedures) and E-1 (Loss of All AC Power (Station Blackout)). The FLEX Support Guidelines will be entered when there has been an Extended Loss of Offsite Power, including all eight on-site Emergency Diesel Generators, with confirmation of no imminent return of any of these power sources to service.

Containment integrity is maintained by normal design features, such as the containment isolation valves. In accordance with NEI 12-06, the containment is assumed to be isolated following the event. The SBO event will cause the RPV to be isolated from the main condenser. Pressure in the RPV will be controlled by automatic and then manual actuation of the main steam relief valves (SRVs). SRV discharge is piped to the Suppression Pool, which will cause the Containment, including the Suppression Pool to heat up and pressurize. Without the use of containment venting, there is no current method to remove heat from the containment.

The strategy at Limerick for this ELAP is to commence early containment venting at approximately 6 hours into the event. Venting containment will serve to limit Containment pressure rise and Suppression Pool temperature rise, which will allow for long term operation of the RCIC System (Reference 1).

The containment design pressure is 55 psig. This pressure is not expected to be reached during the event as indicated by preliminary analysis, because suppression pool venting is initiated early on. Monitoring of Drywell pressure will be available via normal plant instrumentation (References 1, 5).

When Suppression Pool temperature reaches the Unsafe Region of the HCTL, RPV emergency depressurization is required. In accordance with EPGs and per BWR Owner's Group (BWROG) guidance, TRIPs will be revised to allow termination of RPV emergency depressurization at a pressure that will allow continued RCIC operation, because steam driven RCIC is the sole means of core cooling.

[2] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increase operating time on battery powered equipment.

Per the requirements of Order EA-12-050, the Hardened Containment Vent modification will result in the ability to operate the required components for at least 24 hours without re-energizing the station batteries (Reference 3).

Preliminary analysis shows that when early containment venting is initiated at approximately 6 hours, Suppression Pool temperature does not exceed 236° F. HCTL is reached at approximately 4 hours (Reference 1).

Reference(s):

1. LG-MISC-012, MAAP Analysis to Support FLEX Initial Strategy, Revision 1.
2. BWROG Report 0000-0143-0382-R1, BWROG RCIC System Operation in Prolonged Station Blackout – Feasibility Study, March 2012.
3. RS-13-113, Exelon Generation Company, LLC's Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Reliable Hardened Containment Vents (Order EA-12-050), 2/28/2013.
4. T-102, Primary Containment Control, Revision 24.
5. LGS UFSAR, Revision 16, September 2012.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* LGS will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.
Identify modifications	*List modifications* EA-12-050, Hardened Containment Vent Modification

<table>
<tr><td>Key Containment Parameters</td><td>List instrumentation credited for this coping evaluation.

Drywell pressure – PI-42-*70-1
Suppression Pool temperature – TI-41-*02
Suppression Pool level – LIS-55-*N662B, F

The evaluation of the FLEX strategy for LGS may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance or to indicate imminent or actual core damage. Any differences will be communicated in a future 6-month update following the identification of additional parameters.</td></tr>
<tr><td colspan="2">Notes:

Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.</td></tr>
</table>

Maintain Containment

BWR Portable Equipment Phase 2:

Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain core cooling. Identify methods (containment vent or alternative / Hydrogen Igniters)and strategy(ies) utilized to achieve this coping time.

The primary strategy for maintaining containment integrity is to continue venting the containment using the Suppression Pool hardened vent line.

Station personnel will line-up portable equipment to supply makeup to the Suppression Pool and to re-energize 480VAC load centers for the purpose of re-energizing the battery chargers.

With containment venting in progress, make-up to the Suppression Pool is required to replace inventory lost through the Suppression Pool vent. Without makeup, Suppression Pool level will reach 13.5 feet approximately 65 hours from the beginning of the event. To ensure suppression pool level remains above 13.5 feet, make-up to the Suppression Pool will be initiated. This level was chosen to agree with procedure T-102, Primary Containment Control, Step SP/L-5, which is above the downcomer openings and is the level where shutdown of RCIC is directed due to NPSH concerns, if it is not required to maintain adequate core cooling (References 1, 2 ,3)

Suppression Pool Makeup:

Primary Method:

The RHRSW can be cross-connected to the RHR system through existing piping. The RHRSW B train can be cross-connected to the Unit 1 RHR B train; the RHRSW A train can be cross-connected to the Unit 2 RHR A train. Injection into the Unit 1 RHR B train and the Unit 2 RHR A train will be used to provide makeup to the Suppression Pool.

Two diesel driven portable pumps (FLEX Pumps) will take suction on the Spray Pond and discharge into the common Residual Heat Removal Service Water (RHRSW) Systems, which will then be cross-connected to the respective unit's Residual Heat Removal (RHR) System.

Alternate Method:

Additional diversity for Suppression Pool makeup is provided by a new RHRSW to RHR cross-tie on both units. This cross-tie will allow either train of RHRSW to provide flow to both units' A and B RHR trains in the event one of the trains is out of service.

In addition, if the Fire Water System is available, a FLEX pump could provide water from the Fire Water System to the RHR A train on Unit 1 and to the RHR B train on Unit 2 through the existing RHR to Fire Water connection. The Fire Water System would be available for all events except a seismic event.

Maintain Containment	
BWR Portable Equipment Phase 2:	
Reference(s): 1. LG-MISC-012, MAAP Analysis to Support FLEX Initial Strategy, Revision 1. 2. T-102, Primary Containment Control, Revision 24. 3. T-102 Bases, Primary Containment Control – Bases, Revision 24. 4. RS-13-113, Exelon Generation Company, LLC's Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Reliable Hardened Containment Vents (Order EA-12-050), 2/28/2013.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* LGS will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.
Identify modifications	*List modifications* Modify RHRSW System to allow the FLEX Pump injection, which will allow injection from Spray Pond into RHR and then into the Suppression Pool.
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* Drywell pressure – PI-42-*70-1 Suppression Pool temperature – TI-41-*02 Suppression Pool level – LIS-55-*N662B, F The evaluation of the FLEX strategy for LGS may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance or to indicate imminent or actual core damage. Any differences will be communicated in a future 6-month update following the identification of additional parameters.
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	

Maintain Containment	
BWR Portable Equipment Phase 2:	
Seismic	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.

Maintain Containment	
BWR Portable Equipment Phase 2:	
High Temperatures	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.

Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
Storage location and structure have not been decided yet. The FLEX Pumps will be brought to the area of the Spray Pond Pump House. The suction of the pumps will be routed to the Spray Pond or a dry hydrant supplied by the Spray Pond; the discharge of the pumps will be routed to the RHRSW System of each unit. Water from the Spray Pond will be injected into the RHRSW System and from there into the RHR System. With injection being supplied to the RHR System, makeup to the Suppression Pool can begin when required, and makeup to the RPV will be available if necessary.	Modify RHRSW System of each unit to add a flange with a quick disconnect to accept a hose connection from the FLEX Pump. Security fence will be modified and/or dry hydrant(s) will be installed to allow suction from the Spray Pond. Construct robust structure in the vicinity of the Spray Pond Pump House to store the FLEX Pumps and required supporting equipment.	The RHRSW connection is located inside the Spray Pond Pump House, which is a safety related, Class I structure.

Maintain Containment		
BWR Portable Equipment Phase 2:		
Fuel capacity in the FLEX Pumps will provide for more than 12 hours of operation. After 12 hours, fuel oil will be extracted from an Emergency Diesel Generator Storage Tank and be provided to the FLEX Pumps.		

Notes:

Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.

Maintain Containment
BWR Portable Equipment Phase 3:
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain core cooling. Identify methods (containment vent or alternative / Hydrogen Igniters)and strategy(ies) utilized to achieve this coping time. It is expected that continued use of containment venting along with makeup to the Suppression Pool from the Spray Pond using the FLEX Pump(s) will provide for long-term availability of containment. Phases 1 and 2 strategy will provide sufficient capability such that no additional Phase 3 strategies are required. Phase 3 equipment for LGS includes backup portable pumps and generators. The portable pumps will be capable of providing the necessary flow and pressure as outline in the Phase 2 response for Core Cooling & Heat Removal, RCS Inventory Control and Spent Fuel Pool Cooling. The portable generators will be capable of providing the necessary 480 volt power requirements as outlined in Phase 2 response for Safety Functions Support.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* LGS will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.
Identify modifications	*List modifications* None.
Key Containment Parameters	*List instrumentation credited or recovered for this coping evaluation.* Drywell pressure – PI-42-*70-1 Suppression Pool temperature – TI-41-*02 Suppression Pool level – LIS-55-*N662B, F The evaluation of the FLEX strategy for LGS may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance or to indicate imminent or actual core damage. Any differences will be communicated in a future 6-month update following the identification of additional parameters.

Maintain Containment		
BWR Portable Equipment Phase 3:		
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
None.	None.	None.

Notes:

Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.

Maintain Spent Fuel Pool Cooling

Determine Baseline coping capability with installed coping[3] modifications not including FLEX modifications, utilizing methods described in Table 3-1 of NEI 12-06:

- **Makeup with Portable Injection Source**

BWR Installed Equipment Phase 1:

Provide a general description of the coping strategies using installed equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup with portable injection source)and strategy(ies) utilized to achieve this coping time.

The Unit 1 and Unit 2 spent fuel pools are located in the refueling area within the Reactor Enclosure. Each spent fuel pool is licensed for a maximum fuel storage capacity of 4117 fuel assemblies. The water level in the spent fuel pools is maintained at about 23 feet above the tops of the stored fuel assemblies to provide radiation shielding of normal building occupancy by operating personnel.

Spent Fuel Pool (SFP) makeup is not a time constraint with the initial condition of Mode 1 at 100% power, since the worst case fuel pool heat load conditions only exist during a refueling outage. Under non-outage conditions, the maximum SFP heat load is 10.4 x 10^6 BTU/hour. Loss of SFP cooling with this heat load and an initial SFP temperature of 140 degrees F results in a time to boil of 10.3 hours, and 138 hours to the top of active fuel. Therefore, completing the equipment line-up for initiating SFP makeup at 12 hours into the event ensures adequate cooling of the spent fuel is maintained.

The worst case SFP heat load during an outage is 50.4 x 10^6 BTU/hour. Loss of SFP cooling with this heat load and an initial SFP temperature of 140 degrees F results in a time to boil of 2.1 hours, and 28 hours to the top of active fuel. With the entire core being located in the SFP, manpower resources normally allocated to aligning core cooling along with the Operations outage shift manpower can be allocated to aligning SFP makeup which ensures the system alignment can be established within 8 hours. Initiation at 8 hours into the event ensures adequate cooling of the spent fuel is maintained.

An initial evaluation was performed to determine the fuel pool timelines. Formal calculations will be performed to validate this information during development of the detailed design, and will be provided in a future 6-month update.

Reference(s):

1. LGS UFSAR, Revision 16, September 2012.
2. Passport AR 1468452-02, Determine Times and Levels for the Spent Fuel Pool in Support of FLEX Integrated Plan Submittal for Fukushima During an Extended Loss of AC Power Event.

[3] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increase operating time on battery powered equipment.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	N/A
Identify any equipment modifications	SFP Level Modification as required by EA-12-051
Key SFP Parameter	SFP Level provided by modification required by EA-12-051

Notes:

Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.

Maintain Spent Fuel Pool Cooling

BWR Portable Equipment Phase 2:

Provide a general description of the coping strategies using on-site portable equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup with portable injection source) and strategy(ies) utilized to achieve this coping time.

SFP Makeup and Overspray:

Primary Method:

The RHRSW can be cross-connected to the RHR system through existing piping. The RHRSW B train can be cross-connected to the Unit 1 RHR B train; the RHRSW A train can be cross-connected to the Unit 2 RHR A train. Injection into the Unit 1 RHR B train and the Unit 2 RHR A train will be used to provide makeup to the Spent Fuel Pool. This requires the installation of a spool piece that provides the flow path or a bypass of the installed spool piece for RHR Fuel Pool Cooling mode. During normal operation, a spool piece with blind flanges that blocks this flowpath is installed. If this flowpath is required, installation of an open spool piece or bypass of the existing installed spool piece would be required (Reference 3).

Two diesel driven portable pumps (FLEX Pumps) will take suction on the Spray Pond and discharge into the common Residual Heat Removal Service Water (RHRSW) Systems, which will then be cross-connected to the respective unit's Residual Heat Removal (RHR) System.

The new RHRSW to RHR crosstie on each unit will include a quick hose connection that can be used to supply water from the RHRSW into a hose attached to a new run of piping that will be installed from elevation 201' to the refuel floor elevation, 352'. At the refuel floor elevation, another hose connection will be provided that can be used to provide the capability for overspray of the Spent Fuel Pools.

Alternate Method:

Additional diversity for Spent Fuel Pool cooling is provided by a new RHRSW to RHR cross-tie on both units. This cross-tie will allow each train of RHRSW to provide flow to both units' A and B RHR trains in the event one of the trains is out of service.

In addition, if the Fire Water System is available, a FLEX pump could provide water from the Fire Water System for overspray of the Spent Fuel Pools in accordance with existing procedural guidance (Reference 1).

Note: If one of the LGS units is in a refuel outage with a full core offload, then makeup to the RPV and Suppression Pool will be unnecessary for that unit.

Reference(s):

1. TSG-4.1, Operational Contingency Guidelines, Revision 13, Attachment 3.

Maintain Spent Fuel Pool Cooling	
BWR Portable Equipment Phase 2:	
2. Passport AR 1468452-02, Evaluation for SFP makeup time requirement. 3. LGS UFSAR, Revision 16, September 2012.	
Schedule:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* LGS will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs. Procedural changes will include reference to level indication that will be provided in accordance with EA-12-051.
Identify modifications	Modify RHRSW System to allow the FLEX Pump injection, which will allow injection from the Spray Pond into RHR and then into the Spent Fuel Pool. Add RHRSW to RHR cross-connect for the A train of RHR for Unit 1 and for the B train of RHR for Unit 2. Include a hose connection to provide a source of water for Spent Fuel Pool overspray. Modify RHR to Fuel Pool Cooling supply line to provide hose connections that support bypass of the normally installed spool piece. Provide riser pipe, one per unit, from elevation 201' to elevation 352' to provide a flow path from RHRSW to the fuel floor. SFP Level Modification as required by EA-12-051
Key SFP Parameter	SFP Level provided by modification required by EA-12-051
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion.

Maintain Spent Fuel Pool Cooling	
BWR Portable Equipment Phase 2:	
	Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
High Temperatures	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary

Maintain Spent Fuel Pool Cooling		
BWR Portable Equipment Phase 2:		
	locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.	
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
Storage location and structure have not been decided yet. The FLEX Pumps will be brought to the area of the Spray Pond Pump House. The suction of the pumps will be routed to the Spray Pond or a dry hydrant supplied by the Spray Pond; the discharge of the pumps will be routed to the RHRSW System of each unit. Water from the Spray Pond will be injected into the RHRSW System and from there into the RHR System. With injection being supplied to the RHR System, makeup to the SFP is available when necessary.	Modify RHRSW System of each unit to add a flange with a quick disconnect from the FLEX Pump. Security fence will be modified and/or dry hydrant(s) will be installed to allow suction from the Spray Pond. Construct robust structure in the vicinity of the Spray Pond Pump House to store the FLEX Pumps and required supporting equipment.	The RHRSW connection is located inside the Spray Pond Pump House, which is a safety related, Class I structure.
Storage location and structure have not been decided yet. The FLEX Pumps will be brought to the south yard near the south Reactor Enclosure air lock doors. The suction of the pumps will be routed to the nearest fire hydrant in the south yard; the discharge of the pumps will be routed to the spent fuel pool of each unit.	None.	

Maintain Spent Fuel Pool Cooling
BWR Portable Equipment Phase 2:
Notes: Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.

Maintain Spent Fuel Pool Cooling
BWR Portable Equipment Phase 3:
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain spent fuel pool cooling. Identify methods (makeup with portable injection source)and strategy(ies) utilized to achieve this coping time. Phases 1 and 2 strategy will provide sufficient capability such that no additional Phase 3 strategies are required. Phase 3 equipment for LGS includes backup portable pumps and generators. The portable pumps will be capable of providing the necessary flow and pressure as outlined in the Phase 2 response for Core Cooling & Heat Removal, RCS Inventory Control and Spent Fuel Pool Cooling. The portable generators will be capable of providing the necessary 480 volt power requirements as outlined in Phase 2 response for Safety Functions Support.

Schedule:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation* LGS will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs. Procedural changes will include reference to level indication that will be provided in accordance with EA-12-051.
Identify modifications	*List modifications* None.
Key SFP Parameter	SFP Level provided by modification required by EA-12-051

Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
None.	None.	None.

Maintain Spent Fuel Pool Cooling
BWR Portable Equipment Phase 3:
Notes: Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.

Safety Functions Support
Determine Baseline coping capability with installed coping[4] modifications not including FLEX modifications.

BWR Installed Equipment Phase 1
Provide a general description of the coping strategies using installed equipment including station modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy(ies) utilized to achieve coping times.   Electrical Support   The Class 1E 125/250VDC System consists of four independent and redundant electrical power divisions per unit. Divisions I and II each consist of two series connected 125 VDC batteries, each with its own charger and a 125/250 VDC, 3-wire ungrounded distribution system. Divisions III and IV each consist of one 125 VDC battery with its own charger, and a 2-wire ungrounded distribution system.   Each Class 1E 125/250VDC System battery charger receives 480 VAC, 3 phase, 60 hz power from a 480 VAC Class 1E MCC associated with the same Unit and safeguards channel as the charger. Each Class 1E 125/250VDC System battery is connected in parallel with the associated battery charger and automatically provides the primary source of power to the Class 1E loads immediately upon loss of the battery charger. Each battery charger remains connected to the Class 1E 125/250VDC System and immediately replaces the battery as the primary source of power upon restoration of the charger.   Safety Related 250VDC and 125VDC Bus voltage will be maintained by their associated batteries until the transition to Phase 2 at which time portable 480V generators will be placed in service to re-energize the battery chargers.   DC load shedding will be accomplished in accordance with E-1, Loss of All AC Power (Station Blackout) (Reference 1).   Additional load shedding will be performed to extend battery life for the ELAP (Reference 7). This additional DC load shedding will be proceduralized after the detailed design has been completed.   Preliminary analysis indicates that with this additional load shedding, battery voltage will fall below acceptable values at the following times: Division I - 1A1D101 7.5 hours

[4] Coping modifications consist of modifications installed to increase initial coping time, i.e., generators to preserve vital instruments or increase operating time on battery powered equipment.

Division I - 1A2D101	9 hours
Division II - 1B1D101	20 hours
Division II - 1B2D101	20 hours
Division III - 1CD101	8.5 hours
Division IV - 1DD101	7.5 hours

RCIC Room Habitability

Per RCIC Room Temperature Calculation, LM-0689, RCIC Room temperature will reach 156° F within 1.5 hours. Unit 1 and 2 RCIC Room doors and blowout panels will be opened within 1.5 hours to limit room temperature rise. The temperature limit for the RCIC room is 158° F, based on the environmental qualification (EQ) of the equipment in the RCIC room. (Reference 2, 6)

Main Control Room Habitability

Several actions can be taken in accordance with ON-115, Loss of Control Enclosure Cooling, which will reduce the heat load in the Main Control Room (MCR) and extend the time of its habitability. However, the use of portable fans with other procedurally directed actions similar to those described in SE-1-3 will need to be implemented to prevent MCR temperature from exceeding 120° F. (References 3, 4, 5)

Battery Room Ventilation

It is expected that the rise in temperature in the safety-related battery rooms due to the loss of ventilation will not adversely affect the functionality of the batteries. However, hydrogen generation upon re-energizing the battery chargers will be addressed in Phase 2.

Reference(s):

1. E-1, Loss of All AC Power (Station Blackout), Revision 43.
2. LM-0060, Limerick Generating Station – SBO Analysis for the RCIC and HPCI Pump Rooms, Revision 2.
3. ON-115, Loss of Control Enclosure Cooling, Revision 19.
4. SE-1-3, Protected Ventilation Source, Revision 15.
5. M-78-76, Portable Ventilating Fan Capacity for Control Enclosure Rooms – Appendix R, Revision 2.
6. LM-0689, RCIC Pump Room Temps for Extended Loss of AC Power – Post Fukushima Scenario, Revision 0.
7. Passport AR 1468452, Evaluation 01, Battery Coping Times during ELAP with Extended Load Shedding.

Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation.* E-1, Loss of All AC Power (Station Blackout), will be modified with a condition to go to the extended SBO guidance. This procedure

	currently provides direction to open the RCIC Room doors and blowout panels. Additional procedural guidance for load shedding for the ELAP will be provided. ON-115 currently provides direction to take action to reduce the heat load in the Main Control Room. LGS will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.
Identify modifications	*List modifications and describe how they support coping time.* None.
Key Parameters	*List instrumentation credited for this coping evaluation phase.* The evaluation of the FLEX strategy for LGS may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance or to indicate imminent or actual core damage. Any differences will be communicated in a future 6-month update following the identification of additional parameters.

Notes:

Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.

Safety Functions Support

BWR Portable Equipment Phase 2

Provide a general description of the coping strategies using on-site portable equipment including station modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy(ies) utilized to achieve coping times.

Electrical Support

Primary Strategy:

The electrical strategy conceptual design contains features to expedite and simplify implementation, and may not be required in order to meet the event timeline for maintaining the safety function requirements of NEI 12-06. Power from the FLEX generators will be provided through FLEX electrical connections in the Emergency Diesel Generator (EDG) 480 V Motor Control Centers (MCCs), D114-D-G, D124-D-G, and D134G for Unit 1 and D214-D-G, D224-D-G, and D234-D-G for Unit 2. These MCCs will back feed the 480V ESF buses to provide power for Division I, II and III ESF loads. In order to power an individual battery charger, the generator is connected to the MCC corresponding to the appropriate electrical division. Once the correct MCC is powered, the individual critical load will be powered. All loads must be stripped from the buses and only required loads are powered.

Alternate Strategy:

The second proposed modification completes the installation of transfer switches and welding receptacles to the remaining battery chargers. These modifications would allow for direct powering of individual battery chargers from the FLEX diesel generators. This modification would be performed on the 1BCA1, 1BCA2, 1BCB2, 2BCA1, 2BCB1, and 2BCB2 battery chargers. Pre-staged cables would be run from the FLEX generators to the battery chargers required.

RCIC Room Habitability

Per RCIC Room Temperature Calculation, LM-0689, RCIC Room temperature will reach 156° F within 1.5 hours. Units 1 and 2 RCIC Room doors and blowout panels will be opened within 1.5 hours to limit room temperature rise. The temperature limit for the RCIC room is 158° F, based on the environmental qualification (EQ) of the equipment in the RCIC room. (References 1, 5)

Main Control Room Habitability

Exelon Generation Company, LLC (Exelon) intends on maintaining Operational command and control within the Main Control Room. Habitability conditions will be evaluated and a strategy will be developed to maintain Main Control Room habitability. The strategy and associated support analyses will be provided in a future six month update.

Several actions can be taken in accordance with ON-115, Loss of Control Enclosure Cooling, which will reduce the heat load in the MCR and extend the time of its habitability. However, the use of

Safety Functions Support	
BWR Portable Equipment Phase 2	
portable fans with other procedurally directed actions similar to those described in SE-1-3 will need to be implemented to prevent MCR temperature from exceeding 120° F. (References 2, 3, 4) Battery Room Ventilation It is expected that the rise in temperature in the Safety Related Battery Rooms due to the loss of ventilation will not adversely affect the functionality of the batteries. Battery Room doors will be opened to prevent the occurrence of high hydrogen concentration in the rooms once the battery chargers are re-energized. Procedural guidance to prop open the Battery Room doors similar to that provided in ON-115 will be implemented. (Reference 2) Refuel Floor Conditions Evaluation of the spent fuel pool area for steam and condensation has not yet been performed. The results of this evaluation and the vent path strategy, if needed, will be provided in a future 6-month update. Fuel Oil Supply to Portable Equipment Fuel oil to FLEX Pumps and Generators will be supplied by the quantity of fuel in the tanks located on the skids of the portable equipment. This will then be supplemented by fuel tanks contained on the back of the FLEX Truck. When required, fuel can then be pumped from the EDG Fuel Storage Tanks. Reference(s): 1. LM-0060, Limerick Generating Station – SBO Analysis for the RCIC and HPCI Pump Rooms, Revision 2. 2. ON-115, Loss of Control Enclosure Cooling, Revision 19. 3. SE-1-3, Protected Ventilation Source, Revision 15. 4. M-78-76, Portable Ventilating Fan Capacity for Control Enclosure Rooms – Appendix R, Revision 2. 5. LM-0689, RCIC Pump Room Temps for Extended Loss of AC Power – Post Fukushima Scenario, Revision 0.	
Details:	
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* LGS will utilize the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures

Safety Functions Support	
BWR Portable Equipment Phase 2	
	and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.
Identify modifications	*List modifications necessary for phase 2* <u>Electrical Support</u> EDG MCCs will be modified as necessary to enable connection from the FLEX generators to supply power to the Motor Control Centers (MCCs) supplying the required components. Installation of transfer switches and welding receptacles to the battery chargers that do not currently have these installed.
Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* Phase 2 FLEX equipment will have installed local instrumentation needed to operate the equipment. The use of these instruments will be in the associated procedures for use of the equipment. These procedures will be based on inputs from the equipment suppliers, operational experience, and expected equipment function in an ELAP.
Storage / Protection of Equipment : **Describe storage / protection plan or schedule to determine storage requirements**	
Seismic	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.

Safety Functions Support	
BWR Portable Equipment Phase 2	
Flooding Note: if stored below current flood level, then ensure procedures exist to move equipment prior to exceeding flood level.	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
Severe Storms with High Winds	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.
Snow, Ice, and Extreme Cold	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.

Safety Functions Support		
BWR Portable Equipment Phase 2		
High Temperatures	*List how equipment is protected or schedule to protect* Structures to provide protection of FLEX equipment will be constructed to meet the requirements of NEI 12-06 Section 11. Schedule to construct permanent building(s) is contained in Attachment 2, and will satisfy the site compliance date. Temporary locations will be used until building construction completion. Procedures and programs will be developed to address storage structure requirements, haul path requirements, and FLEX equipment requirements relative to the external hazards applicable to LGS.	
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
The FLEX generator(s) will be housed in a nearby storage structure.	EDG MCCs will be modified as necessary to enable connection from the generators to supply power to the Motor Control Centers (MCCs) supplying the required components. Installation of transfer switches and welding receptacles to the battery chargers that do not currently have these installed. Construct storage structure in the South Yard to store the FLEX Generator(s) and required supporting equipment.	Electrical FLEX connections will meet NEI 12-06 Revision 0 protection requirements.

Safety Functions Support
BWR Portable Equipment Phase 2
Notes: Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.

Safety Functions Support		
BWR Portable Equipment Phase 3		
Provide a general description of the coping strategies using phase 3 equipment including modifications that are proposed to maintain and/or support safety functions. Identify methods and strategy(ies) utilized to achieve coping times. Phases 1 and 2 strategy will provide sufficient capability such that no additional Phase 3 strategies are required. Phase 3 equipment for LGS includes backup portable pumps and generators. The portable pumps will be capable of providing the necessary flow and pressure as outlined in the Phase 2 response for Core Cooling & Heat Removal, RCS Inventory Control and Spent Fuel Pool Cooling. The portable generators will be capable of providing the necessary 480 volt power requirements as outlined in Phase 2 response for Safety Functions Support.		
Details:		
Provide a brief description of Procedures / Strategies / Guidelines	*Confirm that procedure/guidance exists or will be developed to support implementation with a description of the procedure / strategy / guideline.* LGS will use the industry developed guidance from the Owners Groups, EPRI and NEI Task team to develop site specific procedures or guidelines to address the criteria in NEI 12-06. These procedures and/or guidelines will support the existing symptom based command and control strategies in the current EOPs.	
Identify modifications	*List modifications necessary for phase 3* None.	
Key Parameters	*List instrumentation credited or recovered for this coping evaluation.* The evaluation of the FLEX strategy for LGS may identify additional parameters that are needed in order to support key actions identified in the plant procedures/guidance or to indicate imminent or actual core damage. Any differences will be communicated in a future 6-month update following the identification of additional parameters.	
Deployment Conceptual Design **(Attachment 3 contains Conceptual Sketches)**		
Strategy	**Modifications**	**Protection of connections**

Safety Functions Support		
BWR Portable Equipment Phase 3		
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
None.	None.	None.

Notes:

Exelon Generation Company, LLC (Exelon) has not finalized the engineering designs for compliance with NRC Order EA-12-049. Detailed designs based on the current conceptual designs will be developed to determine the final plan and associated mitigating strategies. Analysis will be performed to validate that the plant modifications, selected equipment, and identified mitigating strategy can satisfy the safety function requirements of NEI 12-06. Once these designs and mitigating strategies have been fully developed, Exelon will update the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the initial designs as submitted in the February 28, 2013 Integrated Plan.

BWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Three (3) large self prime pumps	X	X	X			1200 gpm, 250 psig	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 Section 6 and NEI 12-06 Section 11.
Three hose trailers	X	X	X			Contain hoses and fittings necessary to strategies associated with portable pumps	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 Section 6 and NEI 12-06 Section 11.

BWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Three (3) 480 VAC Generators	X	X	X	X		400 kw (minimum)	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 Section 6 and NEI 12-06 Section 11.
Heavy Duty Truck	X	X	X	X		F-750 with on-board fuel tanks for refueling portable equipment. Used to transport portable equipment and clear debris	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 Section 6 and NEI 12-06 Section 11.

BWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Six (6) Industrial Blowers					X	42" 120V, 2 speed fan 13,300 CFM ON HIGH AND 9,500 CFM ON LOW	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 Section 6 and NEI 12-06 Section 11.
Ten (10) Portable fans with flexible ducting					X	115V 5200 cfm	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 Section 6 and NEI 12-06 Section 11.

BWR Portable Equipment Phase 2							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Maintenance*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		Maintenance / PM requirements
Six (6) 120/240V Portable AC Generators					X	5.5 kW	Equipment maintenance and testing will be performed in accordance with the industry templates, as outlined in JLD-ISG-2012-01 Section 6 and NEI 12-06 Section 11.

BWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
Note: The RRC equipment has not been procured at the time of this submittal. Once the SAFER committee determines the equipment specifications for bid, updates will be made as necessary to this table. The Phase 3 portable equipment table will be updated once all of the equipment has been procured and placed in inventory.							
Medium Voltage Diesel Generator	X	X	X	X	X	2 MW output at 4160 VAC, three phase	• Generator must be common commercially available. • Must run on diesel fuel.
Low Voltage Diesel Generator	X	X	X	X	X	500 kW output at 480 VAC, three phase	• Generator must be common commercially available. • Must run on diesel fuel.
Low Pressure Pump	X	X	X			300 psi shutoff head, 2500 gpm max flow	Low Pressure Pump
Low Pressure Pump	X		X			500 psi shutoff head, 500 gpm max flow	Low Pressure Pump

BWR Portable Equipment Phase 3							
Use and (potential / flexibility) diverse uses						*Performance Criteria*	*Notes*
List portable equipment	Core	Containment	SFP	Instrumentation	Accessibility		
Low Pressure Pump					X	110 psi shutoff head, 400 gpm max flow submersible	Low Pressure Pump
Low Pressure Pump	X	X				150 psi shutoff head, 5000 gpm max flow	Low Pressure Pump
Air Compressor		X				120 psi minimum pressure, 2000 scfm	Air Compressor

Phase 3 Response Equipment/Commodities	
Item	**Notes**
Radiation Protection Equipment • **Survey instruments** • **Dosimetry** • **Off-site monitoring/sampling**	The RRC will not stock this type of equipment but this equipment will be requested from site-to-site and utility-to-utility on an as required basis.
Commodities • **Food** • **Potable water**	The RRC will not stock these commodities but they will be requested from site-to-site and utility-to-utility on an as required basis.
Fuel Requirements	300 – 500 gallon bladders that can be delivered by air.
Heavy Equipment • **Transportation equipment** • **Debris clearing equipment**	TBD during site specific playbook development Redundant Phase 2 equipment to be located at RRC.

Attachment 1A
Sequence of Events Timeline

Action item	Elapsed Time	Action	Time Constraint Y/N [5]	Remarks / Applicability
	0	Event Starts	NA	Plant @100% power
1	0	Enter TRIPS	N	Operator Response
2	0	Enter SBO Procedure	N	Operator Response
3	< 10 minutes	Manually operate MSRV, stabilize Reactor Pressure, initiate cooldown	N	E-1, SBO Procedure
4	< 10 minutes	If HPCI automatically initiated, shutdown HPCI	Y	E-1, SBO Procedure
5	< 10 minutes	Maintain RCIC with suction from the Suppression Pool	N	E-1, SBO Procedure
6	< 10 minutes	Attempts to start EDGs from MCR unsuccessful	N	E-1, SBO Procedure
7	< 10 minutes	Dispatch operators to attempt to start EDGs locally	N	E-1, SBO Procedure
8	~ 20 minutes	Commence cooldown of RPV	N	E-1, SBO Procedure
9	~ 45 minutes	DC load shedding initiated	N	E-1, SBO Procedure
10	1 hour	Attempts to start EDGs locally unsuccessful	N	E-1, SBO Procedure
11	1 hour	Control Room crew has assessed SBO and plant conditions and declares an Extended Loss of AC Power (ELAP) event.	Y	Time constraint because decision drives timeline for additional load shedding and setup of FLEX equipment.

[5] Instructions: Provide justification if No or NA is selected in the remarks column
If yes, include technical basis discussion as required by NEI 12-06 section 3.2.1.7

Action item	Elapsed Time	Action	Time Constraint Y/N [5]	Remarks / Applicability
12	1 hour	Dispatch Operators to begin setup/connection of FLEX equipment.	N	Preliminary DC analysis shows the batteries have a minimum of 7 hours coping capability with initial and deep load shedding completed.
13	< 1.5 hours	Complete actions to establish natural ventilation to RCIC Rooms.	Y	Limit heatup of RCIC Room to allow prolonged RCIC operation.
14	2 hours	Complete initial SBO DC Load Shed.	Y	Prolong battery life. E-1 SBO Procedure requires that this is completed in 2 hours. Actual time to complete has been evaluated to confirm that it can be completed within 2 hours.
15	3 hours	Complete additional load sheds (ELAP) identified for battery life extension.	Y	Prolong battery life beyond current SBO guidance. Current analysis basis.

Action item	Elapsed Time	Action	Time Constraint Y/N [5]	Remarks / Applicability
16	4 hours	Heat Capacity Temperature Limit (HCTL) curve exceeded, RPV depressurization to ~ 200 psig required. RPV pressure maintained at 150 to 200 psig to support RCIC Operation.	N	Preliminary analysis indicates that the HCTL curve will be exceeded at ~4 hrs based on this strategy. RPV depressurization stops at ~200 psig (pressure band of 150-250 psig used) in RPV to preserve RCIC operation. Modified depressurization approach supported by BWROG changes to EPGs.
17	6 hours	Initiate early containment venting.	Y	Preliminary analysis
18	< 7 hours	Portable Generators providing power to battery chargers.	Y	Preliminary analysis indicates that battery life to support RCIC operation is limited to approximately 7 hours. Restore power to battery chargers prior to reaching 7 hours.
19	12 hours	Portable Pumps connected to RHRSW and available to provide water for suppression pool cooling and inventory control, SFP makeup.	N	Time critical actions are Items #20 and #21
20	12 hours	Provide SFP makeup via portable pumps to RHRSW/RHR to SFP.	Y	Documented in sequence of events basis section as Action Item

Action item	Elapsed Time	Action	Time Constraint Y/N 5	Remarks / Applicability
21	~ 20 hours	Provide Suppression Pool makeup via portable pumps to RHRSW/RHR.	Y	Preliminary analysis indicates that Suppression Pool makeup will be required at approximately 65 hours.
22	24 hours	Initial equipment from Regional Response Center becomes available.	N	Not time critical since RRC equipment is not needed at 24 hours to support actions.
23	24 -72 hours	Continue to maintain critical functions of core cooling (via RCIC), containment (via hardened vent opening and FLEX pump injection to suppression pool) and SFP cooling (FLEX pump injection to SFP). Utilize initial RRC equipment in spare capacity and begin setup for suppression pool cooling via the additional RRC equipment to be delivered (4160 VAC generator to power RHR pump and large FLEX pump to provide cooling water flow from Spray Pond to the RHR Heat Exchanger).	N	Not time critical since Phase 2 actions result in indefinite coping times for all safety functions.
24	72+ hours	Establish suppression pool cooling via RRC equipment and continue to maintain critical functions.	N	Not time critical since Phase 2 actions result in indefinite coping times for all safety functions.

Attachment 2
Milestone Schedule

Original Target Completion Date		Activity	Status {Include date changes in this column}
		Submit 60 Day Status Report	Complete
		Submit Overall Integrated Implementation Plan	Complete
		Contract with RRC	Complete
Recurring action, August and February		Submit 6-month updates	Ongoing
Unit 1	Unit 2	Modification Development	
Feb 2015	Mar 2014	• Phase 2 modifications	Note 1
Feb 2015	Mar 2014	• Phase 3 modifications	Note 1
Unit 1	Unit 2	Modification Implementation	
Apr 2016	Apr 2015	• Phase 2 modifications	Note 1
Apr 2016	Apr 2015	• Phase 3 modifications	Note 1
		Procedure development	
April 2015		• Strategy procedures	Note 1
April 2015		• Maintenance procedures	Note 1
November 2014		Staffing analysis	Note 1
April 2015		Storage Plan and Construction	Note 1
April 2015		FLEX equipment acquisition	Note 1
April 2015		Training completion	Note 1
December 2014		Regional Response Center Operational	(will be a standard date from RRC)
April 2016		Unit 1 Implementation date	Note 1
April 2015		Unit 2 Implementation date	Note 1

Note(s):

1. Exelon will update the status of ongoing and future milestones in the Integrated Plan for LGS during a scheduled 6-month update. This update will include any changes to the milestone schedule as submitted in the February 28, 2013 Integrated Plan.

Attachment 3
Conceptual Sketches

(Conceptual sketches, as necessary to indicate equipment which is installed or equipment hookups necessary for the strategies.)

FILE: MECHANICAL LIMERICK - UNIT 1 DATE: 1/24/2013 1:30 PM USER: SHARED
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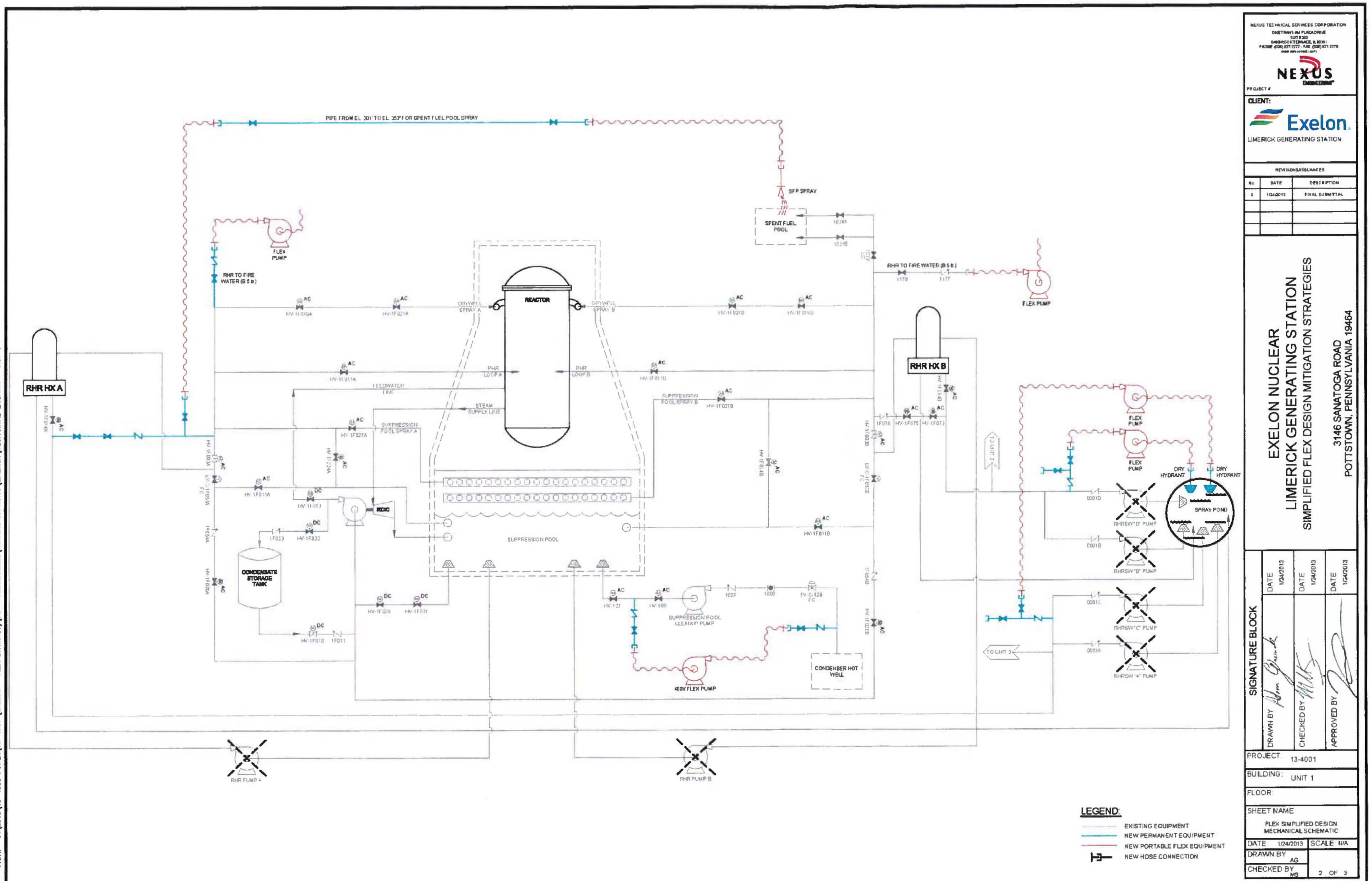

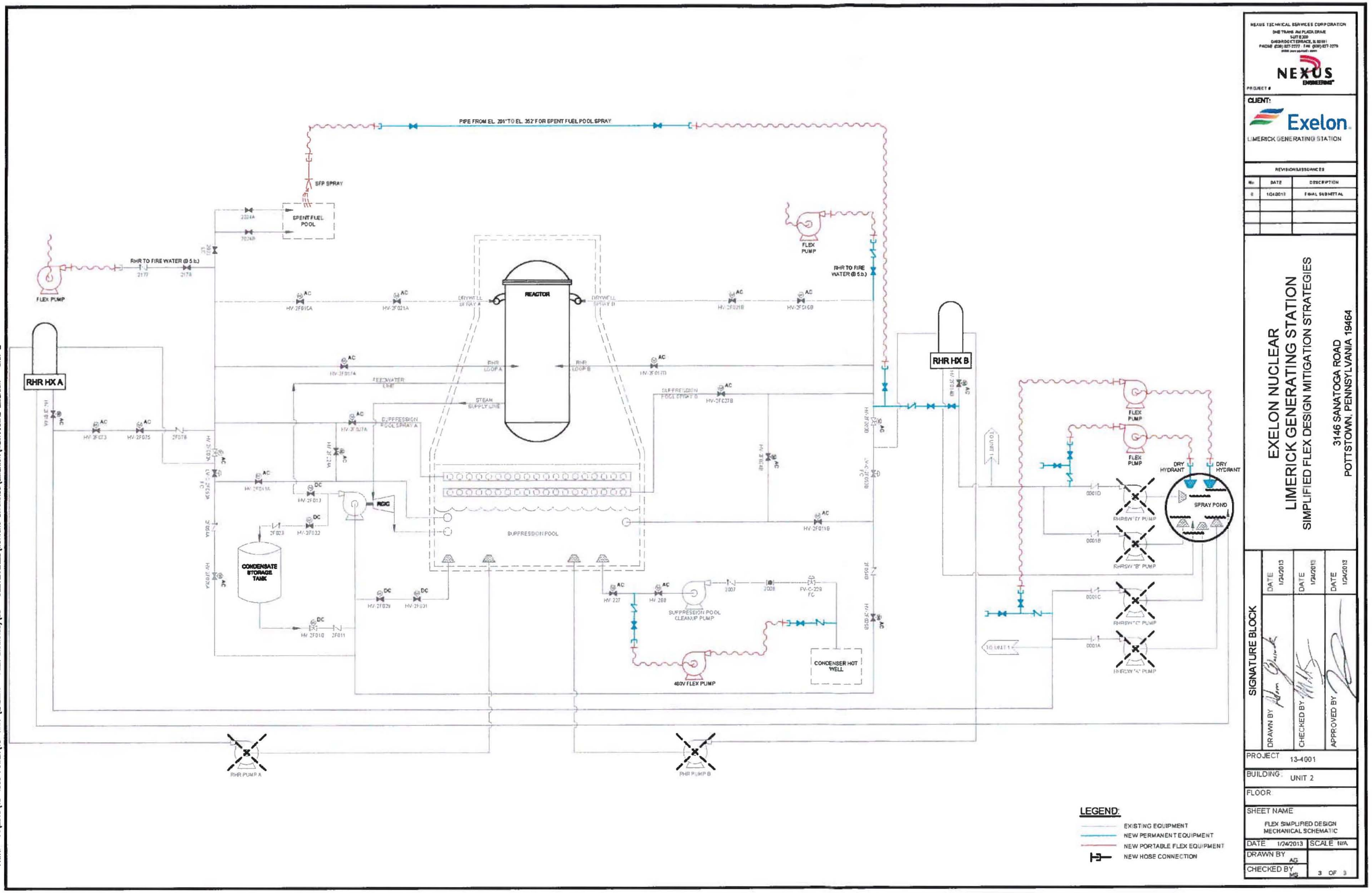

PIPE FROM EL. 291' TO EL. 352' FOR SPENT FUEL POOL SPRAY
SFP SPRAY
SPENT FUEL POOL
RHR TO FIRE WATER (8.5 b.)
FLEX PUMP
RHR HX A
RHR HX B
REACTOR
SUPPRESSION POOL
CONDENSATE STORAGE TANK
RCIC
SUPPRESSION POOL CLEANUP PUMP
400V FLEX PUMP
CONDENSER HOT WELL
DRY HYDRANT
SPRAY POND
RHR PUMP A
RHR PUMP B
LEGEND:
EXISTING EQUIPMENT
NEW PERMANENT EQUIPMENT
NEW PORTABLE FLEX EQUIPMENT
NEW HOSE CONNECTION
NEXUS
CLIENT:
Exelon
LIMERICK GENERATING STATION
EXELON NUCLEAR
LIMERICK GENERATING STATION
SIMPLIFIED FLEX DESIGN MITIGATION STRATEGIES
3146 SANATOGA ROAD
POTTSTOWN, PENNSYLVANIA 19464
SIGNATURE BLOCK
DRAWN BY
CHECKED BY
APPROVED BY
PROJECT 13-4001
BUILDING UNIT 2
FLOOR
SHEET NAME
FLEX SIMPLIFIED DESIGN MECHANICAL SCHEMATIC
DATE 1/24/2013
SCALE N/A
DRAWN BY AG
CHECKED BY
3 OF 3

FILE: ELECTRICAL - LIMERICK DATE: 1/24/2013 1:30 PM USER: SHARED
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