Xcel Energy®

Monticello Nuclear Generating Plant
2807 W County Road 75
Monticello, MN 55362

October 12, 2015

L-MT-15-047
10 CFR 2.202

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

Monticello Nuclear Generating Plant
Docket No. 50-263
Renewed Facility Operating License No. DPR-22

Monticello Nuclear Generating Plant: Update of Information Related to NRC Order EA-12-049 Mitigation Strategies for Beyond-Design-Basis External Events (TAC No. MF0923)

References:

1. NRC Order 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. (ADAMS Accession No. ML12054A735)
2. Letter from K. Fili (NSPM) to Document Control Desk (NRC), "Request for Relaxation from NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" - Monticello Nuclear Generating Plant," L-MT-14-083, dated October 1, 2014. (ADAMS Accession No. ML14289A512)
3. Letter from W. Dean (NRC) to K. Fili (NSPM), "Subject: Monticello Nuclear Generating Plant - Relaxation of Certain Schedule Requirements for Order EA-12-049 'Issuance of Order to Modify Licenses With Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events' (TAC No. MF0923)," dated November 21, 2014. (ADAMS Accession No. ML14294A061)
4. NRC Order EA-13-109, "Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," dated June 6, 2013. (ADAMS Accession No. ML13143A334)

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On March 12, 2012, the Nuclear Regulatory Commission (NRC) staff issued Order EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (Reference 1), to all NRC power reactor licensees and holders of construction permits in active or deferred status. Reference 1 was effective immediately and directed Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, to develop, implement and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities following a beyond-design-basis external event for the Monticello Nuclear Generating Plant (MNGP). Specific requirements are outlined in Attachment 2 of Reference 1.

In Reference 2, NSPM requested relaxation of order EA-12-049 for the MNGP. NSPM requested relaxation of the completion of the Order from startup from the Spring 2015 refueling outage (RFO) to startup from the Spring 2017 RFO. The reason for the relaxation was to permit NSPM to design and install the severe accident capable hardened containment wetwell vent in accordance with Order EA-13-109 (Reference 4), and integrate it into the mitigating strategies required for Order EA-12-049. The relaxation request stipulated that the relaxation request only applied to the hardened containment vent portion of Order EA-12-049, and further stipulated that other requirements of Order EA-12-049 would be completed prior to startup from the Spring 2015 RFO.

In Reference 3, the NRC approved NSPMs relaxation request and accepted both the justification and the stipulations regarding completion of the balance of Order EA-12-049 by the completion of the 2015 RFO.

The purpose of this letter is to inform the NRC that the equipment and modifications required to implement the mitigating strategies required by Order EA-12-049 have been completed and are available for use in accordance with the original implementation schedule requirements, except for installation of a severe accident capable hardened containment wetwell vent as required by NRC Order EA-13-109, and integration of its operation into the mitigating strategies required for Order EA-12-049. This is supported by the information provided in Enclosure 1. In Enclosure 2, NSPM is providing updates to NRC information requests to demonstrate implementation of Order EA-12-049 to the extent described in Reference 3.

Please contact John Fields at 763-271-6707, if additional information or clarification is required.

Summary of Commitments

This letter makes no new commitments and no revisions to existing commitments.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on October 12, 2015.

for P. Gardner
Kent Scott

Peter A. Gardner
Site Vice President, Monticello Nuclear Generating Plant
Northern States Power Company – Minnesota

Enclosures (2)

cc: Administrator, Region III, USNRC
Project Manager, Monticello Nuclear Generating Plant, USNRC
Resident Inspector, Monticello Nuclear Generating Plant, USNRC

**ENCLOSURE 1**

**Monticello Nuclear Generating Plant**
**Implementation of Required Action by NRC Order EA-12-049**
**Mitigation Strategies for Beyond-Design-Basis External Events**

## 1.0 Background

On March 12, 2012, the Nuclear Regulatory Commission (NRC) staff issued Order EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (Reference 1), to all NRC power reactor licensees and holders of construction permits in active or deferred status. Reference 1 was effective immediately and directed Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, to develop, implement and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities following a beyond-design-basis external event for the Monticello Nuclear Generating Plant (MNGP). Specific requirements are outlined in Attachment 2 of Reference 1.

NSPM submitted the MNGP Overall Integrated Plan (OIP) for compliance of Order EA-12-049 by letter dated February 28, 2013 (Reference 2). By letter dated, November 25, 2013 (Reference 3) the NRC provided its interim staff evaluation of the OIP and requested additional information necessary for completion of the review. The information requested by the NRC is included in Enclosure 2.

In Reference 4, NSPM requested relaxation of order EA-12-049 for the MNGP. NSPM requested relaxation of the completion of the Order from startup from the Spring 2015 refueling outage (RFO) to startup from the Spring 2017 RFO. The reason for the relaxation was to permit NSPM to design and install the severe accident capable hardened containment wetwell vent in accordance with Order EA-13-109, and integrate it into the mitigating strategies required for Order EA-12-049[1]. The relaxation request stipulated that the relaxation request only applied to the hardened containment vent (HCV) portion of Order EA-12-049, and further stipulated that other requirements of Order EA-12-049 would be completed prior to startup from the Spring 2015 RFO.

In Reference 5, the NRC approved NSPMs relaxation request and accepted both the justification and the stipulations regarding completion of the balance of Order EA-12-049 by the completion of the 2015 RFO.

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[1] MNGP has previously and continues to maintain the ability and procedural direction to perform wetwell venting during specified emergency conditions. The approved relaxation did not remove the ability or procedural direction to perform wetwell venting during Extended Loss of AC Power (ELAP) events.

## 2.0 Implementation

**STRATEGIES - IMPLEMENTED**

MNGP strategies are in compliance with Order EA-12-049, except as permitted by the NRC approved Order relaxation. There are no strategy related Open Items, Confirmatory Items, or Audit Questions/Audit Report Open Items, except information related to the HCV installation and strategies are incomplete at this time.

**MODIFICATIONS - IMPLEMENTED**

The modifications required to support the FLEX strategies for MNGP have been fully implemented in accordance with the station design control process, except as permitted by the NRC approved Order relaxation.

**EQUIPMENT – PROCURED AND MAINTENANCE & TESTING - IMPLEMENTED**

The equipment required to implement the FLEX strategies for MNGP has been procured in accordance with NEI 12-06, Section 11.1 and 11.2, received at MNGP, initially tested/performance verified as identified in NEI 12-06, Section 11.5, and is available for use, except as permitted by the NRC approved Order relaxation.

Maintenance and testing will be conducted through the use of the MNGP Preventative Maintenance program such that equipment reliability is achieved and maintained.

**PROTECTED STORAGE - IMPLEMENTED**

The storage facilities required to implement the FLEX strategies for MNGP have been completed and provide protection from the applicable site hazards. The equipment required to implement the FLEX strategies for MNGP is stored in its protected configuration.

**PROCEDURES - IMPLEMENTED**

FLEX Support Guidelines (FSGs) for MNGP have been developed and integrated with existing procedures, except as permitted by the NRC approved Order relaxation. The implemented FSGs and affected existing procedures have been verified and are available for use in accordance with the site procedure control program.

## TRAINING - IMPLEMENTED

Training for MNGP has been implemented in accordance with an accepted training process as recommended in NEI 12-06, Section 11.6.

## STAFFING - IMPLEMENTED

The staffing study for MNGP has been completed in accordance with 10CFR50.54(f), "Request for Information Pursuant to Title 10 of the Code of Federal Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force review of Insights from the Fukushima Dai-ichi Accident," Recommendation 9.3, dated March 12, 2012 (Reference 6), as documented in a letter to the NRC dated April 30, 2015 (Reference 7). The staffing study concluded that no additional staff is required to mitigate the extended loss of alternating current (ac) power (ELAP) event.

## NATIONAL SAFER RESPONSE CENTERS - IMPLEMENTED

NSPM has established a contract with Pooled Equipment Inventory Company (PEICo) and has joined the Strategic Alliance for FLEX Emergency Response (SAFER) Team Equipment Committee for off-site facility coordination. It has been confirmed that PEICo is ready to support MNGP with Phase 3 equipment stored in the National SAFER Response Centers in accordance with the site specific SAFER Response Plan.

## VALIDATION - COMPLETE

NSPM has completed performance of validation in accordance with industry developed guidance to assure required tasks, manual actions and decisions for FLEX strategies are feasible and may be executed within the constraints identified in the OIP and Request for Additional Information Responses (i.e. the Open Items, Confirmatory Items, Audit Questions and Safety Evaluation questions included in Enclosure 2 of this letter) for Order EA-12-049, except as permitted by the NRC approved Order relaxation.

## FLEX PROGRAM DOCUMENT - ESTABLISHED

The NSPM FLEX Program Document for MNGP has been developed in accordance with the requirements of NEI 12-06.

## 3.0 References

1. NRC Order 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. (ADAMS Accession No. ML12054A735)
2. Letter from M. Schimmel (NSPM) to Document Control Desk (NRC), "Monticello Nuclear Generating Plant's 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)," L-MT-13-017, dated February 28, 2013. (ADAMS Accession No. ML13066A066)
3. Letter from J. Bowen (NRC) to K. Fili (NSPM), "Monticello Nuclear Generating Plant – Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (TAC No. MF0923)," dated November 25, 2013. (ADAMS Accession No. ML13220A139)
4. Letter from K. Fili (NSPM) to Document Control Desk (NRC), "Request for Relaxation from NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events" - Monticello Nuclear Generating Plant," L-MT-14-083, dated October 1, 2014. (ADAMS Accession No. ML14289A512)
5. Letter from W. Dean (NRC) to K. Fili (NSPM), "Subject: Monticello Nuclear Generating Plant - Relaxation of Certain Schedule Requirements for Order EA-12-049 'Issuance of Order to Modify Licenses With Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events' (TAC No. MF0923)," dated November 21, 2014. (ADAMS Accession No. ML14294A061)
6. Letter from E. Leeds/M. Johnson (NRC), to Licensees, "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f), Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 12, 2012. (ADAMS Accession No. ML12053A340)
7. Letter from P. Gardner (NSPM) to Document Control Desk (NRC), "Monticello Nuclear Generating Plant Phase 2 Staffing Assessment Revised - Onsite and Augmented Staffing Assessment Considering Functions Related to Near-Term Task Force (NTTF) Recommendation 4.2," L-MT-15-027, dated April 30, 2015. (ADAMS Accession No. ML15128A264)

# ENCLOSURE 2

## Monticello Nuclear Generating Plant
## Completion of Required Action by NRC Order EA-12-049
## Mitigation Strategies for Beyond-Design-Basis External Events

## Responses to Requests for Additional Information

Northern States Power Minnesota, a Minnesota corporation (NSPM), doing business as Xcel Energy developed an Overall Integrated Plan (OIP) for (Reference 1), documenting the diverse and flexible strategies (FLEX), in response to Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," (Reference 2 ) for Monticello Nuclear Generating Plant (MNGP).

In Reference 3, the NRC documented their review of the MNGP OIP and provided Open Items (OIs) and Confirmatory Items (CIs) for NSPM to address. Subsequently, prior to the on-site audit of the MNGP FLEX Order and the Spent Fuel Pool Instrumentation (SFPI) Order, the NRC also provided Audit Questions (AQs) and Safety Evaluation Items (SEs) for NSPM to address as well (Reference 4).

All responses to the OIs/CIs/AQs/SEs were previously provided to the NRC in the online reference portal or during the FLEX/SFPI audit performed in November 2014. Each item is complete pending NRC closure.

This enclosure contains formal responses to the NRC's OIs/CIs/AQs/SEs. The NRC's OI/CI/AQ/SE is provided in italics font and the NSPM response is in the normal font.

The OI/CI/AQ/SE responses were initially provided to the NRC via the online reference portal during completion of the design and analyses associated with the FLEX strategies. Most of the OI/CI/AQ/SE responses are unchanged except for small editorial changes and replacement of future tense statements with past tense statements as necessary to reflect the completed status of the associated actions. However, the following responses have been modified more significantly to provide updated information. A brief synopsis of the changes is provided below:

- OI 3.2.3.A – The original response to the NRC indicated that the Reactor Pressure Vessel (RPV) would be maintained at a pressure of 200 – 400 psig to support Reactor Core Isolation Cooling (RCIC) pump operation during phase 1 and while transitioning to phase 2 of the extended loss of alternating current (ac) power (ELAP) event. The RPV pressure range was subsequently changed to be from 150 – 300 psig. This impacted heat load in the Torus (also called suppression pool) and the time for Torus temperature to reach approximately 250°F. See the responses to AQ 62 and OI 3.2.3.A for further details.

- OI 3.2.4.3.A – The original response to the NRC indicated that the ELAP procedure would contain a discussion about the effects of loss of heat tracing in cold weather. This was later deemed not to be necessary for FLEX Order compliance.
- AQ 62 – The original response indicated that RCIC pump operation was assumed to cease when the suppression pool temperature reached 240°F and the portable diesel pump would be operating at that time. This has been revised to cease RCIC pump operation and begin portable diesel pump operation at approximately 250°F. See the responses to AQ 62 and OI 3.2.3.A for further details.
- SE 5 – Added the FLEX strategies validation document as the basis for demonstrating human factors considerations for FLEX strategies have been adequately addressed.

References:

1. Letter from M. Schimmel (NSPM) to Document Control Desk (NRC), "Monticello Nuclear Generating Plant's 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)," L-MT-13-017, dated February 28, 2013. (ADAMS Accession No. ML13066A066)
2. NRC Order 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. (ADAMS Accession No. ML12054A735)
3. Letter from J. Bowen (NRC) to K. Fili (NSPM), "Monticello Nuclear Generating Plant – Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Order EA-12-049 (Mitigation Strategies) (TAC No. MF0923)," dated November 25, 2013. (ADAMS Accession No. ML13220A139)
4. Letter from P. Bamford (NRC) to K. Fili (NSPM), "Monticello Nuclear Generating Plant - Plan For the Onsite Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051 (TAC Nos. MF0923 and MF0924)," dated October 22, 2014. (ADAMS Accession No. ML14290A367)

**Responses to**
**Open Items (OIs), Confirmatory Items (CIs),**
**Audit Questions (AQs), and Safety Evaluation (SEs)**

**OI 3.1.1.3.A**

*The licensee's integrated plan did not address the potential impacts from large internal flooding sources that are not seismically robust and do not require ac power, the potential loss of ac power to mitigate ground water in critical locations, or the impact of potential failure of non-seismically robust downstream dams.*

NSPM Response

NEI 12-06, Section 5.3.3, states:

*"Consideration should be given to the impacts from large internal flooding sources that are not seismically robust and do not require ac power (e.g., gravity drainage from lake or cooling basins for non-safety-related cooling water systems)."*

MNGP does not have any lakes or cooling basins capable of creating large internal flooding. The principal source of internal flooding at MNGP is a pipe break. The major pipe breaks include Condensate Storage Tank (CST) flooding from a large pipe break in the Turbine Building (TB), Condenser failure, and flooding from the diesel driven fire pump pumping into non-seismic fire piping. Procedural guidance addressing internal flooding is available for operational consideration. This flooding could affect the FLEX alternate electrical connections for the Division I 125V battery chargers. However, the flooding would not affect the primary FLEX electrical connections.

NEI 12-06, Section 5.3.3, states:

*"For sites that use ac power to mitigate ground water in critical locations, a strategy to remove this water will be required."*

MNGP occasionally experiences minor amounts of ground water seepage into the plant. If groundwater in-leakage occurs, the flooding response procedures provide power and pumps to control in-leakage.

NEI 12-06, Section 5.3.3, states:

*"Additional guidance may be required to address the deployment of FLEX for those plants that could be impacted by failure of a not seismically robust downstream dam."*

The nearest downstream dam is the Coon Rapids Dam, which is approximately 35 river miles downstream from the plant. The impact of a Coon Rapids dam failure on the river level at MNGP has not been evaluated. However, failure of a downstream dam will not impact the MNGP discharge canal level, as there is a weir between the discharge canal and the river. NEI 12-06, section 3.2.1.3, item 4, does not require that licensees assess for loss of the water inventory in the ultimate heat sink. Instead, only the normal access to the ultimate heat sink is assumed to be lost, but the water inventory in the ultimate heat sink remains available. Even assuming a weir failure; a significant amount of water remains in the discharge canal and another source of water is available in the intake basin.

Following the ELAP initiating event, an assessment of the site is performed to determine the availability and accessibility of the following sources of water:

- Discharge Canal
- Intake
- Condensate Storage Tanks / Condensate Storage Tank Pit.

Based on the above assessment, the Control Room Supervisor will select the appropriate staging location for the portable diesel pump.

**<u>OI 3.1.2.2.A</u>**

*The licensee's integrated plan did not address flooding deployment issues for restocking supplies during flooding conditions, protection for fuel supplies assuring connection points are protected, the need to provide water extraction pumps, and the need for temporary flood barriers.*

NSPM Response

The MNGP flood response procedures provide for alternate access to the site by installing an additional gravel roadway, thereby allowing for access and delivery of necessary provisions including consumables, fuel, etc. The MNGP flood plan builds a horseshoe levee to connect with the currently installed bin walls thereby encircling the fuel tanks and pump house that support the emergency diesels (needed to obtain fuel oil for FLEX equipment). The hose and electrical connection points are also fully contained within the levee and protected from flooding. Pumps, generators and other equipment necessary for the flood mitigation are identified in procedures and stored onsite or are readily available through existing contracts.

**Supplies and Restocking Plans**

Site procedures define the items that need to be obtained at the time of an external flooding event.

The procedure for flood protection implementation directs the acquisition of Polyurethane Joint Sealant for general use for sealing gaps. This is a common material that is easily obtainable by supply chain. The procedure also directs the acquisition of 9200 cubic yards of clay for substation levee construction. This is through a standing contract with our levee constructor from a local clay pit that we have tested clay characteristics on file. Finally, the procedure also directs the acquisition of diesel generators that would be used for powering pumps and other components during a flood. These would be obtained through standing contracts with multiple vendors.

Site procedures also direct the levee constructor to bring materials and equipment to site to build the flood barrier. This is established equipment that can be mobilized and delivered in time to build the barrier and stay ahead of the rising river water. Specific timing is contained in a site calculation and in the Technical Execution Plan (TEP).

Site procedures direct the acquisition of facilities needed to support personnel that will be working to protect the plant during a flood. These items include portable restrooms, food, water, etc. In addition, the following items are stored for use as necessary for a Beyond Design Basis event or an event that would require FLEX mitigation strategies. These items include forty 5 gallon bottles of drinking water, twenty cases of Meals Ready to Eat (MREs) (~1 pallet), work lights, flashlights, gloves, hoses and fittings, hand tools, satellite phones, life jackets, radios, ladders, etc.

The acquisition of diesel fuel oil and gasoline, as needed to support pumps and generators during the event, is also described in procedures.

All of these items would be procured under the direction of the duty station manager by supply chain, operations, and construction leadership.

If a flood was underway, the emergency response organization (ERO) would be mobilized. In such a case, the NRC, Institute of Nuclear Power Operations (INPO), Federal Emergency Management Agency (FEMA), and county and state governments would be contacted to support the site as needed.

All other items that the site needs to respond to a flood are already on site and stored primarily in Parking Lot H and the receiving warehouse.

Prior to river levels reaching the point of hampering site access, materials would be provided via normal means. As water levels rise and cover the access road, procedures require that a temporary access road be built from County Road 75 through a wooded area west of the Independent Spent Fuel Storage Installation (ISFSI) and connect to the existing road that runs from the ISFSI to the plant domestic water wells. This is also a pre-established plan to be executed by our levee constructor and the specific timing is determined by a site calculation and communicated in the TEP. This procedure ensures the road is built so as to not interrupt the ability to access the site. There is ample real estate to the west of the plant where elevations are above the Probable Maximum Flood (PMF) height for staging of materials and equipment. This also allows access into the area protected by the levee which includes the power block.

Watercraft and helicopters can also be utilized for material delivery.

**Fuel Supplies and Connections Points**

Technical Specification Bases B.3.8.3 (Diesel Fuel Oil, Lube Oil and Starting Air) identifies that the onsite fuel oil supply capacity is sufficient to operate one Emergency Diesel Generator (EDG) for a period of 7 days under full load (2500 kW). The onsite fuel oil capacity is sufficient to operate the portable diesel generators for a time period longer than the time to replenish the onsite supply from outside sources. In order to get the fuel to the site per this requirement, a contract with a supplier has been established as well as a route to get to the site during a flooding event. MNGP has a standing contract with Flint Hills Resources, LP to deliver fuel to the site when called upon.

During a flooding event, not all normal roads to the site will be navigable; therefore a temporary road will be constructed as described previously. Although all of Minnesota (MN) will not be at the same flood conditions, it is reasonable to assume that some roads will not be available. If this is the case, there are recommended routes established in plant documentation with alternatives. Two recommended alternative routes are described from the Flint Hills Rosemount, MN resource facility to MNGP during a flood. The direct route from the Flint Hills facility to MNGP is approximately 1 hour. The two alternative routes provided that are recommended during flooding conditions take approximately 2 hours and 2.5 hours respectively. This is a negligible increase in the time required for delivery and well within the 7 day requirement.

Instructions are provided in plant documents to order fuel at the time of flood. These work orders (WOs) direct topping off of T-44, Diesel Oil Storage Tank as well as T-83, Diesel Oil Receiving Tank upon onset of flooding conditions. Additionally, tanker(s) will be ordered with the intent to remain at the site during the event to use their inventory as needed, additional tankers will be ordered prior to emptying onsite tankers, and as a contingency measure, helicopters (per SAFER plan) and watercraft will be utilized if all other methods of fuel delivery fail.

Additionally, multiple connection points are provided to fill the diesel fuel storage tanks. These connection points are protected by the horseshoe levee.

Finally, site documents also direct the acquisition of gasoline to power pumps and generators as needed.

## OI 3.1.2.3.A

*The licensee did not discuss the need for temporary flood barriers and dewatering pumps during flooding events.*

NSPM Response

MNGP flooding procedures specifically describe the actions needed including the construction of a horseshoe levee around the site, sealing of penetrations and other activities to mitigate flooding up to and including the PMF. MNGP implements the use of flooding barriers and dewatering pumps through these procedures.

## OI 3.2.1.2.A

*The licensee did not Identify or provide justification for the assumptions made regarding primary system leakage from the recirculation pump seals and other sources.*

NSPM Response

NSPM completed the Modular Accident Analysis Program (MAAP) analysis of an ELAP event for MNGP. The primary system leakage used in the MAAP analysis ranged from 30 gpm to 165 gpm, assuming an initial RPV pressure of 1000 psig (nominal operating pressure). The primary system leakage was assumed to occur at the transient initiation. As the RPV was depressurized, leakage decreased. The maximum leakage from the failure of both seals for each reactor recirculation pump is 70 gpm. The maximum leakage for both reactor recirculation pumps plus the

Technical Specification (TS) primary system boundary leakage of 25 gpm, equals a total primary system leakage of up to 165 gpm.

Sulzer/Bingham has reported that the Seal Model # is RV-600. Further, Sulzer states the pump and seal geometry is per the original design and the design evaluated by GE in NEDO-24083, dated November 1978. NEDO-24083 determined the equivalent makeup requirement for the seals is 65.27 gpm. The 65.27 gpm supports use of a maximum leakage of 70 gpm in the MAAP analysis as a conservative number.

**OI 3.2.3.A**

*Additional plant-specific Extended Loss of AC Power (ELAP) analysis information commensurate with the level of detail contained in NEDC-33771P, including analysis assumptions and results in their tabulated and plotted formats is needed to conclude that containment functions will be maintained.*

NSPM Response

NSPM completed a plant-specific ELAP analysis, called a MAAP analysis. The reference case analysis assumptions used in the MAAP analysis are the following:

- 90°F per hour cool down was initiated at 30 minutes, after which pressure was maintained between 150 and 300 psig.
- Leakage from the RPV was assumed to be 165 gpm.
- Reactor water level was maintained near +39.5" by the RCIC system.
- RCIC was assumed to be available until the suppression pool temperature reaches 240°F. This was revised by a later evaluation. See information below.
- Above 240°F, it was assumed that RPV level was maintained by a portable pump. This was revised by later evaluation. See information below.
- The hardened containment vent (HCV) (also called hard pipe vent (HPV)) was opened when the containment pressure reaches 10 psig and the suppression pool temperature was greater than 212°F. HCV was closed if drywell pressure dropped to 5 psig.

Additional cases were run to evaluate sensitivities to:

- Depressurization time (2 hrs vs 30 min)
- HCV opening pressure (30 psig vs 10 psig)
- Containment vent coefficient

- RPV leakage (30 and 61 gpm vs 165 gpm)
- Reactor water level range (RCIC operating in batch mode with a water level range of -100" to +48" and -47" to +48")
- RCIC suction from the CSTs vs the suppression pool and the transfer time
- High Pressure Coolant Injection (HPCI) system being used instead of the RCIC system
- Initial suppression pool temperature
- Initial suppression pool water level
- RPV insulation

A summary of the results of the reference case analysis is provided as follows:

- Reactor depressurization started at 30 minutes.
- Hard pipe vent opened at 7.1 hours.
- The suppression pool reached 240°F at 10.5 hours (Subsequently changed to 250°F and 11.5 hours as described below).
- Adequate core cooling was achieved for Phases 1 and 2 using RCIC for 10.5 hours and then a portable pump after 10.5 hours (Subsequently changed to 11.5 hours as described below).
- Drywell temperature did not exceed 300°F.
- Suppression pool temperature stabilized at approximately 250°F. Peak suppression pool temperature by the analysis is approximately 250.7°F and occurs at 11.7 hours into the ELAP event.

NSPM subsequently evaluated use of the RCIC pump at higher temperatures and determined that there was adequate margin to run the RCIC pump with suppression pool temperature at the peak temperature from the analysis (approximately 250.7°F). Use of this temperature extends the run time of RCIC from 10.5 hours to greater than 11.5 hours[2] and should not impact the functionality of the RCIC pump.

[2] The peak suppression pool temperature through the first 11.5 hours of the ELAP event is approximately 250.4°F.

**<u>OI 3.2.3.B</u>**

*The licensee needs to resolve the issue of the potential for the BWROG revised venting strategy to increase (relative to currently accepted venting strategies) the likelihood of detrimental effects on containment response for events in which the venting strategy is invoked. In particular it has not been shown that the potential for negative pressure transients, hydrogen combustion, or loss of containment overpressure (as needed for pump net positive suction head) is not significantly different when implementing Revision 3 of the Emergency Planning Guidelines/Severe Accident Guidelines (EPG/SAG) vs. Revision 2 of the EPG/SAG.*

NSPM Response

On January 9, 2014, the NRC endorsed the NEI/BWROG paper titled "BWR Containment Venting" that addresses the NRC staff's concerns with the revised venting strategy in Revision 3 of the EPG/SAG (ADAMS Accession No. ML13358A206). The NRC's endorsement letter noted that plant specific implementation of the EPG/SAG relied on such items as the capabilities of the installed vent path, the Net Positive Suction Head (NPSH) for RCIC, and guidance to prevent negative containment pressures. NSPM addresses each of these plant-specific implementation items in the paragraphs below.

<u>Installed Vent Path</u>
The MNGP HCV consists of an 8-inch diameter line starting at a dedicated penetration at the top of the torus, connected to two containment isolation valves. The 8-inch line expands to a 10-inch diameter pipe to a rupture disc and exits to a release point above the Reactor Building roof near the Reactor Building exhaust on the north side of the Reactor Building. The HCV piping travels up the north side of the reactor building. The vent was designed to a temperature of 309°F and a pressure of 62 psig. The completed MAAP analysis verified that venting with the HCV will prevent the containment pressure from exceeding its design pressure.

<u>NPSH for RCIC</u>
The discussion of the NPSH for RCIC operation is provided in response to Confirmatory Item 3.2.1.8.A.

<u>Hard Pipe Vent Strategy</u>
The HPV strategy was designed with the following goals in mind:

- Develop a strategy that is as simple as possible, recognizing that the operators are functioning in the most challenging of times, and
- Ensuring sufficient NPSH exists for RCIC pump operation, and
- Address the potential to develop a negative pressure in containment.

Based on these criteria NSPM has developed the following strategy for venting MNGP containment:

- Open the HPV when containment pressure is $\geq$10 psig AND the torus water temperature is $\geq$ 212°F
- Close the HPV before containment pressure decreases to 5 psig.
- Repeat venting as needed to maintain containment pressure between 5 - 10 psig.

Strategy Justification
If the HPV is opened at 10 psig during an ELAP event (without consideration of torus water temperature), containment pressure will drop to near atmospheric for the next several hours while the torus water heats up for the several hours reaching boiling in approximately 7 hours. At 7 hours, the containment pressure again starts to increase.

The following figures show this graphically. Figure OI 3.2.3.B - 1 assumes a large primary coolant leak (165 gpm) and this drives the containment pressure to increase rapidly. This yields an opening of the vent at approximately 1.7 hours.

**Figure OI 3.2.3.B – 1 – Early Venting - Large Primary System Leak**

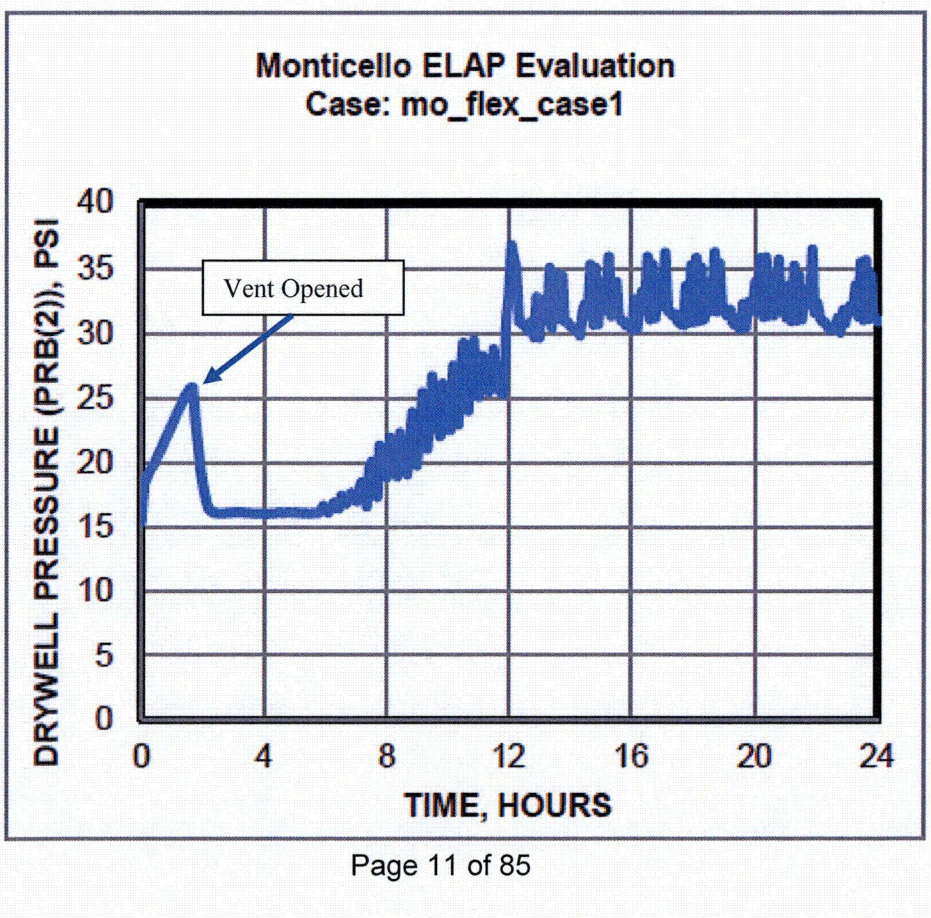
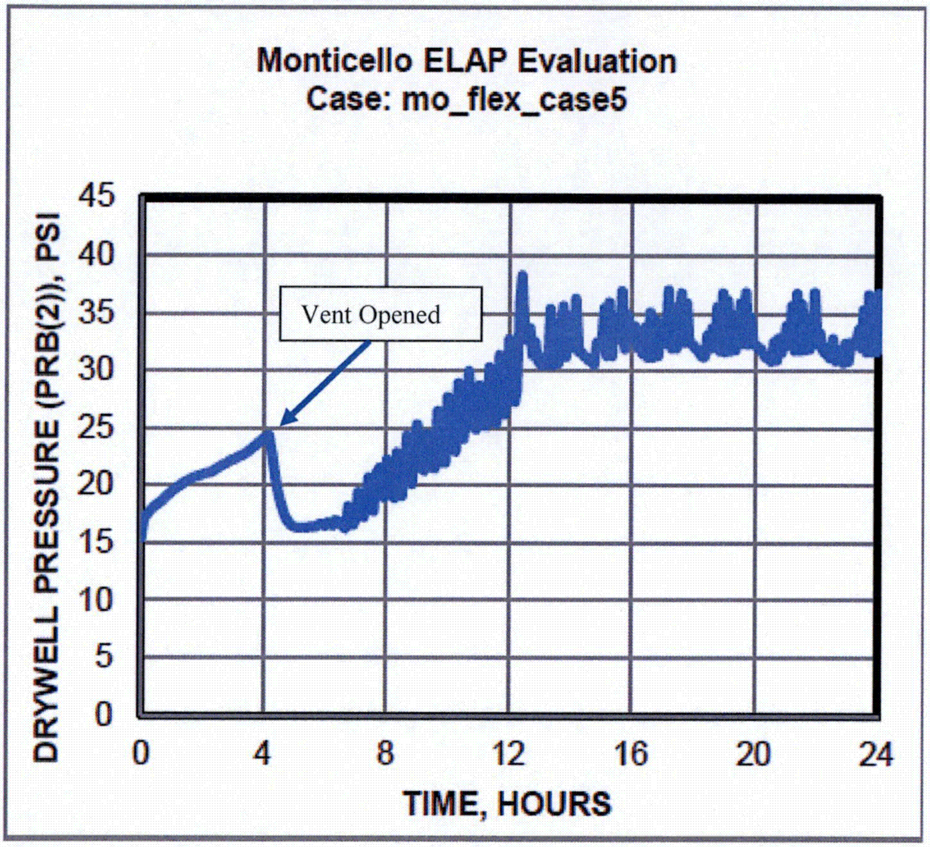


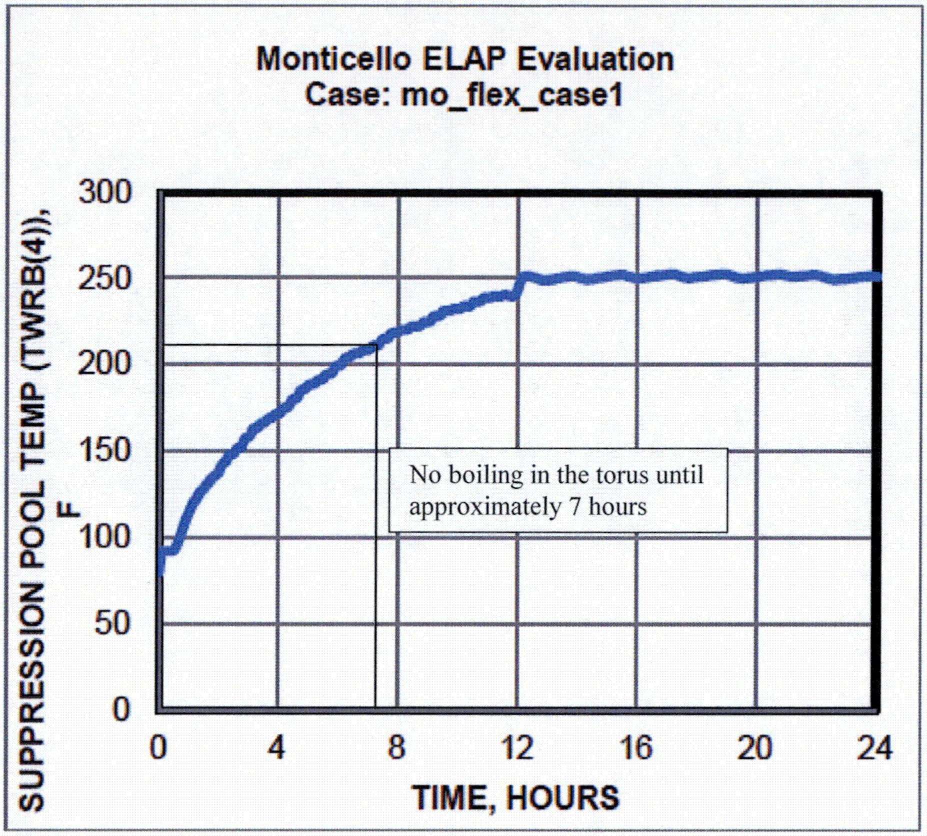
Figure OI 3.2.3.B - 2 assumes a 30 gpm primary coolant leak and shows a similar but shorter time with containment pressure near atmospheric pressure. Still this shows a vent opening occurring at approximately 4 hours.

**Figure OI 3.2.3.B – 2 – Early Venting - Small Primary System Leak**




In these figures, venting removes the nitrogen overpressure and steam leaking from the primary system; no significant amount of energy is lost from the torus. The nitrogen loss reduces RCIC NPSH so that its flow is limited. There is not much decay heat removed from the containment during this period as shown in Figure OI 3.2.3.B – 3 below. Opening the vent this early is of marginal use and provides some challenges.

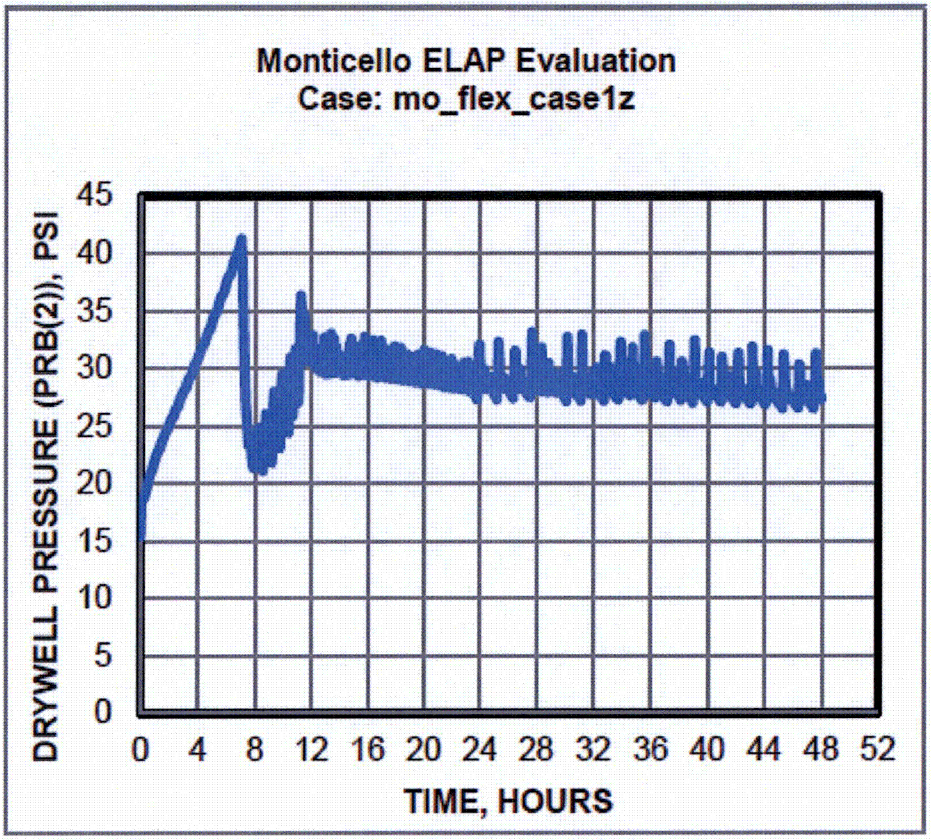
**Figure OI 3.2.3.B – 3 – Torus Water Temperature with Early Venting**




What is clear from figures OI 3.2.3.B – 3 and OI 3.2.3.B – 4 is that once the torus is heated up to boiling (Case 1 – around 7 to 8 hours) the containment pressure will be fairly constant (~30 - 38 psia, (15 - 23 psig)) for the next day or more.

However, when the venting strategy criterion is changed to 10 psig <u>and</u> torus temperature greater than 212°F, the containment pressure remains positive with margin. The modified MAAP run is shown below in Figure OI 3.2.3.B - 4. Note, this case was run out to 48 hours instead of 24 hours.

**Figure OI 3.2.3.B – 4 – Torus Pressure with Later Venting**




In order to address the NRC concern of preventing a negative pressure in the containment and admitting oxygen into the containment (a concern if core damage occurred producing hydrogen in the containment), a venting criterion was added to close the vent if containment pressure drops below 5 psig.

With this venting strategy, operators will need to do minimal cycling of the HPV valve. Cycling will not be needed until several days after the event when decay heat reduces.

Guidance to Prevent Negative Pressure In Containment

As described above, guidance is provided in the containment venting procedure to ensure that the HCV is closed before a negative pressure is created in the containment.

**<u>OI 3.2.4.3.A</u>**

*The licensee needs to provide a discussion of the effects of loss of power to heat tracing.*

NSPM Response

Heat tracing will be lost due to the loss of power. Heat traced components that could be used in an ELAP, but are not credited in the FLEX strategies, are sections of piping in the condensate storage system, diesel fuel oil system, and the fire protection system.

Piping associated with the CSTs is equipped with heat tracing to protect the pipes from freezing. The CSTs are insulated and heated with a typical temperature of 100°F. The CSTs and associated piping are insulated, which will slow cooling and delay freezing of the piping. The normal suction supply for both RCIC and HPCI are the non-seismically qualified CSTs and are the preferred source of makeup water, if available.

If the CSTs are available to supply RCIC, the already heated water would be flowing through the lines and would not be subject to freezing.

Heat tracing is also provided to a diesel fuel oil line and two fire hose stations in the TB Addition. These components are not credited in MNGP's FLEX strategies.

**<u>OI 3.2.4.5.A</u>**

*The licensee needs to provide information regarding local access to the protected areas under ELAP.*

NSPM Response

Keys are available to Operations personnel and allow Operators local access to internal locked areas in the plant (protected areas) during an ELAP.

**OI 3.2.4.8.A**

*The licensee did not provide any information regarding loading/sizing calculations of portable diesel generator(s) and strategy for electrical isolation for FLEX electrical generators from installed plant equipment.*

NSPM Response

The 480 Vac FLEX Diesel Generators (DGs) were sized based on supplying Station Blackout (SBO) loads to battery chargers (D10, D20, D52, D54, D70, and D90). The chargers provide 125/250 Vdc power to the #11 (125 Vdc Division 1), #12 (125 Vdc Division 2), #13 (250 Vdc Division 1) and #16 (250 Vdc Division 2) batteries.

The 480 Vac Flex DGs are isolated from the normal plant battery charger power supply by safety related (SR) circuit breakers. Each battery charger (D10, D20, D52, D54, D70, and D90) was modified to include a new SR circuit breaker to be used to connect the 480 Vac FLEX DGs. The new SR circuit breakers are mechanically interlocked with the existing incoming circuit breakers, such that only one circuit breaker on a battery charger can be closed at any one time, thereby providing isolation from the normal plant equipment.

The Strategic Alliance for FLEX Emergency Response (SAFER) 4160 Vac DGs are sized to be 1MW units, which will operate in parallel, to provide 2 MW. The SAFER 4160 Vac DGs are equipped with an integrated distribution panel (with 1200 ampere breaker) which provides isolation from plant equipment.

The SAFER 4160 Vac DGs are sized to permit operation of a Residual Heat Removal (RHR) pump, an RHR Service Water (RHRSW) pump and additional small loads. NSPM confirmed from the loading calculations for Busses 15 and 16 that operation of an RHR pump and a RHRSW pump from either bus could be accomplished with sufficient margin when these loads are connected to two SAFER 4160 Vac DGs.

The cable being supplied by SAFER to connect from the 4160 Vac DG to either Bus 15 or Bus 16 has been determined to be adequate for supplying the required power.

Investigation of the cable used to connect the 480 Vac Portable Generator to the battery chargers has demonstrated that for a maximum of 365 feet of 4/c #4 AWG with a full load current at 80% power factor, the voltage drop is 1.68% (less than the 2.5% acceptance criteria). Both 4160 Vac and the 480 Vac generators may be adjusted to raise the voltage if either is determined to have a voltage drop issue.

**OI 3.2.4.8.B**

*The licensee needs to provide a description of the instrumentation that will be used to monitor portable/FLEX electrical power equipment including their associated measurement tolerances/accuracy to ensure that the electrical equipment remains protected and that operators are provided with accurate information.*

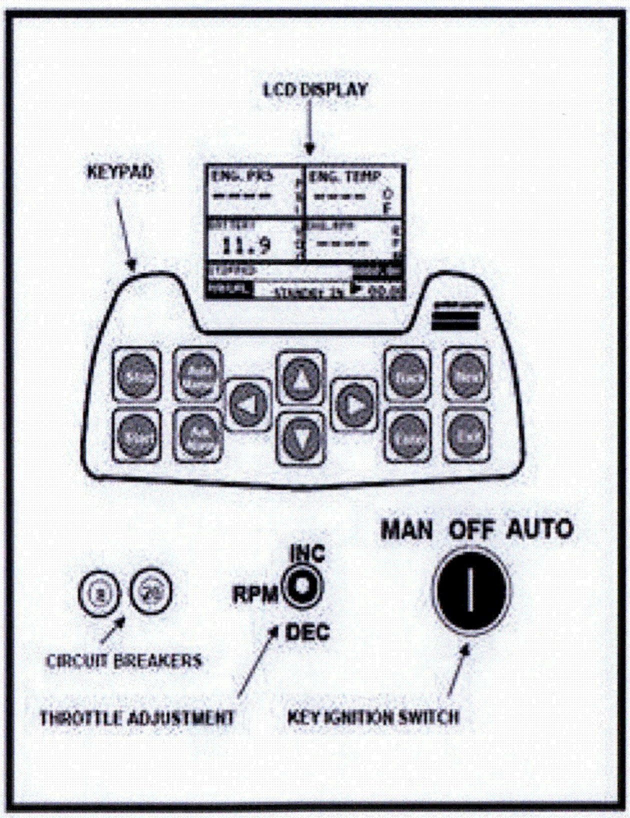
NSPM Response

**Site Portable FLEX Equipment**

NSPM will rely on the instrumentation on the portable pumps and portable 480 Vac diesel generators. In addition, NSPM will use flow instrumentation to verify adequate pump flow and instrumentation on the battery chargers to verify adequate charging of the batteries.

The FLEX portable pump engine controls are shown in Figure OI 3.2.4.8.B - 1 below:

**Figure OI 3.2.4.8.B – 1 - Portable FLEX Pump Controls**




| | |
|---|---|
| **LCD DISPLAY** | Backlit LCD display shows operating parameters in default mode (oil press., temp., RPM, voltage). |
| **KEYPAD** | Touch-sensitive pad for maneuvering through menus and editing parameters. |
| **CIRCUIT BREAKER** | 8 and 20 amp circuit breakers. |
| **THROTTLE ADJUSTMENT** | Toggle switch to manually increase and decrease engine RPM. |
| **KEY IGNITION SWITCH** | Select Manual or Automatic panel operation. |

The FLEX portable 480 Vac generator controls are shown in Figures OI 3.2.4.8.B - 2 and OI 3.4.8.B – 3 below:

**Figure OI 3.2.4.8.B – 2 - Portable FLEX 480 Vac Generator Controls**

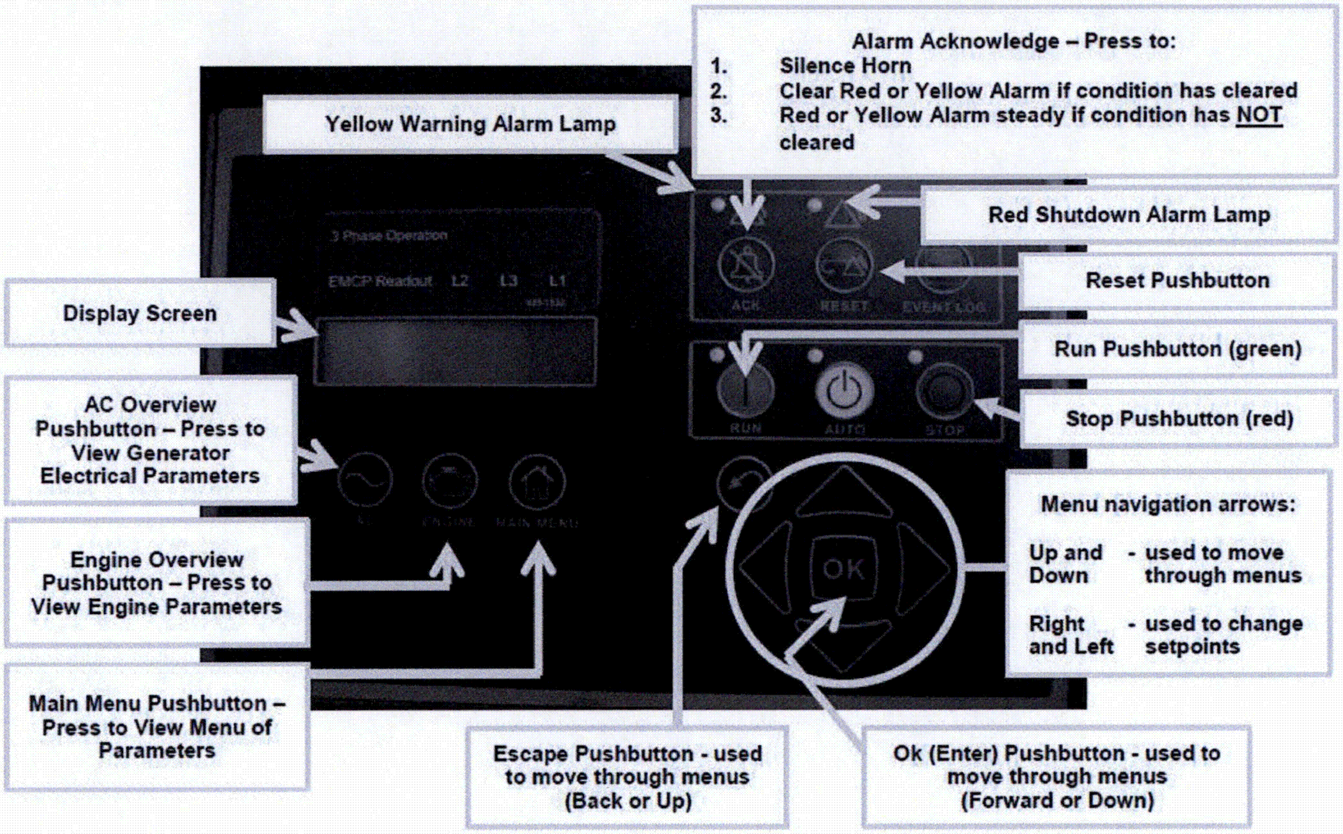
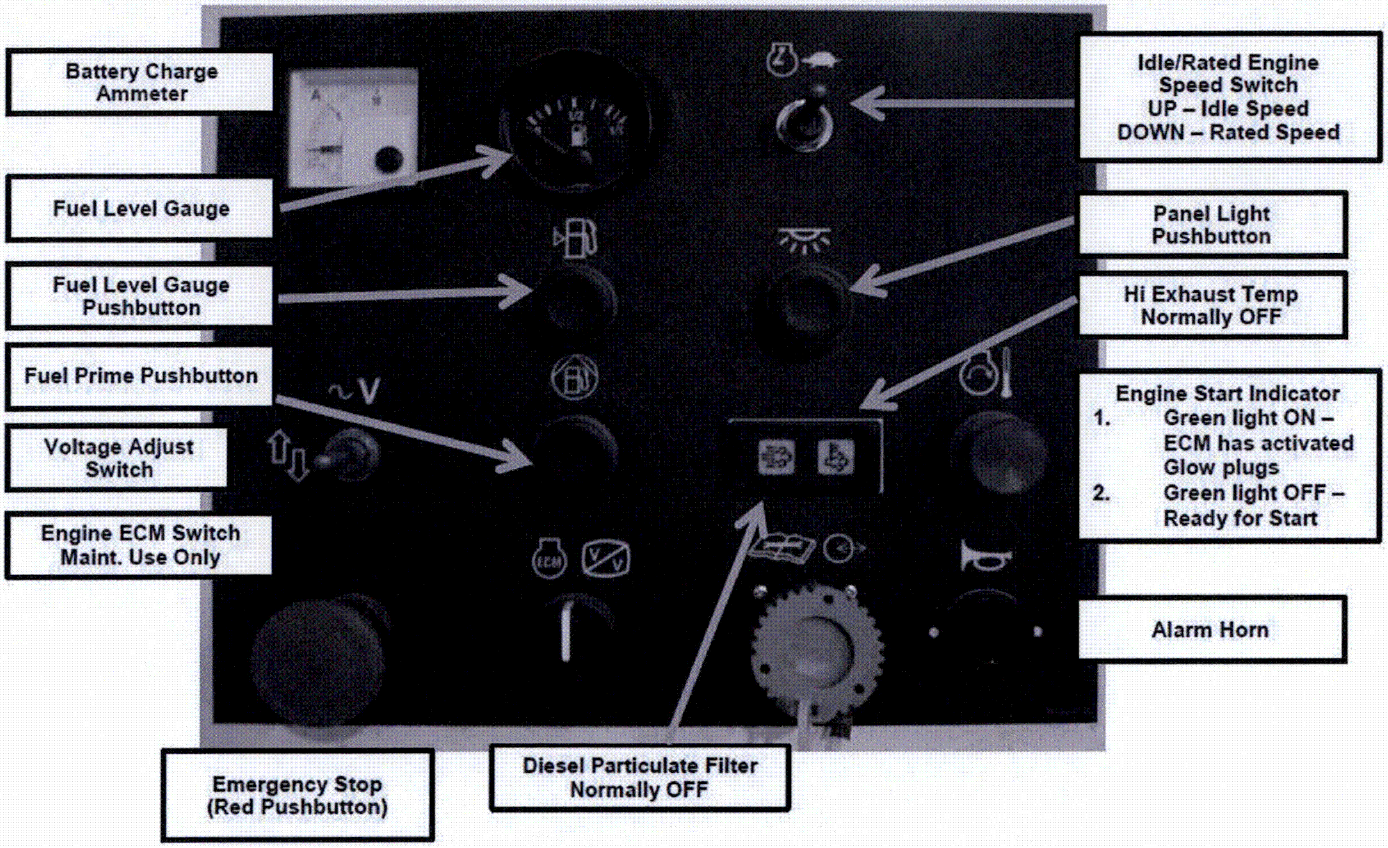


**Figure OI 3.2.4.8.B – 3 - Portable FLEX 480 Vac Generator Controls**




## SAFER Equipment

The SAFER Response Center will provide 480 Vac and 4160 Vac DGs for additional capability and redundancy from off-site equipment until power, water, and coolant injection systems are restored. The SAFER DGs provide displays that will alert operators to off-normal conditions. These displays will be monitored during diesel generator operation. Specific conditions monitored during SAFER DG operation include Racepak and Woodward EasyGen 3000 displays, oil reservoir level, and oil and fuel lines for leakage. The level in the external fuel tank will also be monitored.

**<u>CI 3.1.1.2.A</u>**

*The licensee is still developing storage locations and associated deployment pathways for Phase 2 equipment. The availability of the potential need for ac power to deploy equipment could not be evaluated.*

NSPM Response

Two FLEX storage buildings have been completed. The FLEX storage buildings use manual roll up doors. The loss of AC power will not adversely impact the deployment of FLEX equipment. Flashlights, portable lights and portable generators will be used to support the deployment of equipment from the storage locations.

AC electrical power is not required to deploy equipment. All outside doors and gates required to be opened can be done so manually. Airlock doors (e.g. DOOR-73 and DOOR-78 between the Reactor Building and the Motor Generator (MG) Set Room) have a battery backup that prevents opening both doors simultaneously.

Procedures include guidance for defeating airlock battery backups to allow simultaneous opening of both doors to an airlock to setup portable lighting and portable fans.

**<u>CI 3.1.1.4.A</u>**

*The licensee's integrated plan did not identify Regional Response Center resources, the off-site staging areas, and delivery methods sufficiently in order to evaluate the means to obtain the resources from off site.*

NSPM Response

MNGP is participating in the industry SAFER Program through a contractual agreement with the Pooled Equipment Inventory Co. (PEICo). PEICo and its subcontractor AREVA (together called the SAFER Team) will provide engineering and management services for selecting and procuring emergency response equipment. The SAFER Team will also provide ongoing monthly management, maintenance, and testing of the National SAFER Response Center (NSRC) equipment.

**<u>Resources</u>**
The NSRC (i.e. Regional Response Center) resources include both "Generic" and "Non-Generic" equipment for MNGP. As a member of SAFER, MNGP has access to

all of the Generic equipment as well as specific Non-Generic equipment as specified.

Generic NSRC current capabilities include:

- 4kV Turbine Generators with non-integral fuel tanks
- 4kV Distribution Panel
- 480 Vac Turbine Generator with non-integral fuel tanks
- High Pressure Pump (2000 psi / 60 gpm)
- Low Pressure – Medium Flow Pump (300 psi / 2500 gpm)
- SG/RPV Makeup Pump (500 psi / 500 gpm)
- Low Pressure – High Flow Pump (150 psi / 5000 gpm)
- Diesel Fuel Transfer (fuel storage, pump and hoses)
- Standard Hoses and Connections (suction, discharge, strainers)
- Standard Generator Connection Cables
- Portable Lighting
- SAFER Team Equipment (Communications, Material Handling, and Habitability)
- Limited spare parts

MNGP is also a participant for selected Non-Generic Equipment from the NSRC. The Non-Generic equipment list for MNGP is:

- Water Treatment Systems
- Water Treatment Generators
- Water Storage
- Suction Booster Pump

Off-site Staging Area (Staging Area C)

The off-site staging area for MNGP is the Xcel Energy Maple Grove Service Center. This Staging Area is located 26 miles direct path from the site; and, therefore, is inside the recommended 35-mile radius for helicopter operation. The facility has several buildings and parking lots that provide multiple options for personnel logistics and equipment maneuvering. A memorandum of understanding (MOU) with Maple Grove Service Center has been implemented for use of Staging Area C. See Figure 4-2 from the SAFER plan below for Staging Area C overview.

**Figure 4-2: Staging Area "C" (Maple Grove Service Center)**

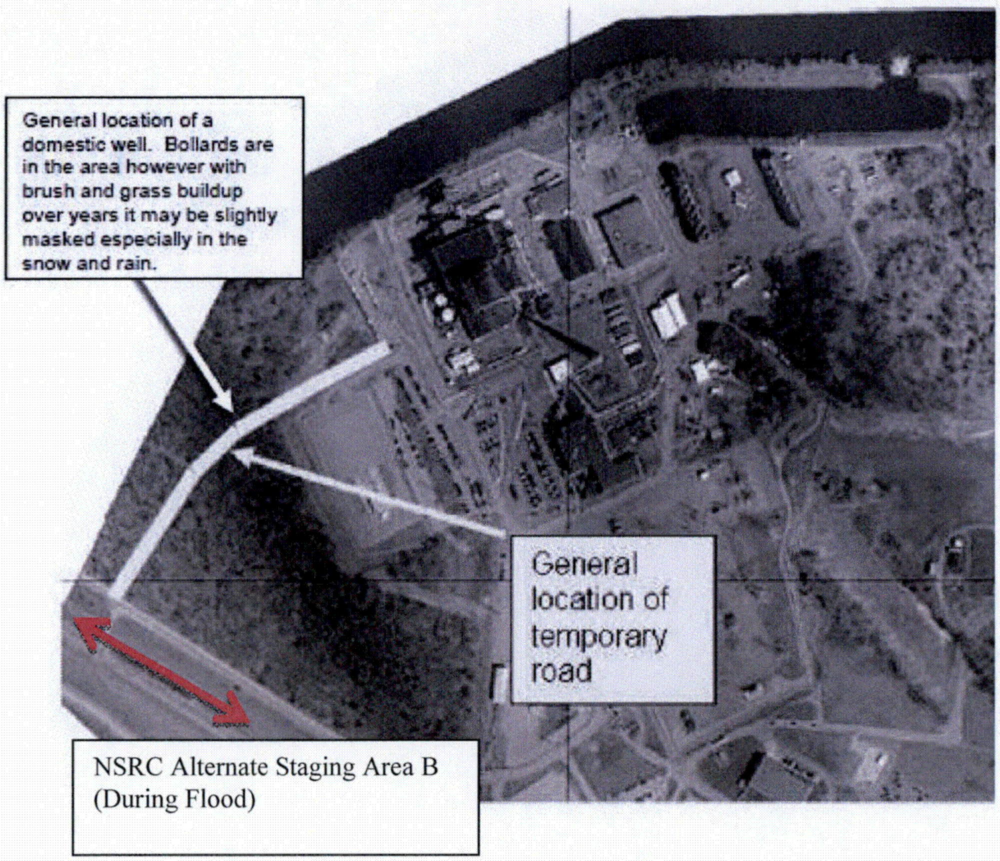
**Delivery Methods**

The SAFER team will deliver equipment to either the Maple Grove Service Center (Staging Area C) or directly to the MNGP site (Staging Area B - shown below) depending on conditions. Primary and Secondary land routes from Staging Area C to the site have been identified. There is a tiered approach to helicopter availability and operations if the site cannot be reached by ground transportation, as described in the SAFER Capabilities White Paper. See Figure 4-1 below for Staging Area B overview.

**Figure 4-1: Staging Area "B" (Onsite)**

If a flooding condition prohibits use of Staging Area B, MNGP procedures include an alternate Staging Area B for offloading of SAFER equipment. MNGP procedures direct a temporary road to be constructed during external flooding events if the main plant road is projected to flood. Figure 2 below shows the general location of the temporary road and the alternate Staging Area B.

Figure 2
GENERAL LOCATION OF TEMPORARY ROAD
(Refer to PART P, Build Temporary Access Road to Site)




The equipment delivered by the NSRC will be delivered off Country Hwy 75 (see red arrow above) and equipment will be moved through the temporary access road and onto the site. The MNGP SAFER Response Plan also includes directions to the alternate Staging Area B.

**CI 3.1.5.3.A**

*The licensee did not provide measures for operating FLEX equipment at possible excessively high temperatures that may exist inside plant structures and buildings.*

NSPM Response

NSPM has completed elevated temperature analyses for the ELAP scenario. The analyses were performed for the main control room (MCR), battery rooms, RCIC room, the reactor building and in the Emergency Filtration Train (EFT) Building.

During Phase 2 supplemental ventilation is provided for the operators in the MCR, Battery Rooms, RCIC Room, and EFT Building using portable ducting and fans for air circulation as necessary. Portable fans will need to be powered by a portable DG. 250V and 125V battery charger rooms require cooling when the battery charger is energized. Ventilation is provided by staging portable fans to circulate air through the rooms for cooling and to mitigate the potential for hydrogen buildup.

Procedures require that within 1 hour the decision is made to declare an ELAP. Ventilation is required for battery and charger operation and for operator habitability. After 10.5 hours portable FLEX fans will be staged and powered by the 120 Vac generators to provide cooling.

The analyses conclude that adequate ventilation is available to support operating FLEX equipment if high temperatures occur inside plant buildings. Therefore, these analyses confirm the FLEX strategy documented in the MNGP procedures.

**CI 3.2.1.1.A**

*From the June position paper, identify and discuss the benchmarks which are relied upon to demonstrate that MAAP4 is an appropriate code for simulation the of ELAP event.*

NSPM Response

A generic benchmark is provided by Electric Power Research Institute (EPRI) Boiling Water Reactor (BWR) Roadmap "Technical Basis for Establishing Success Timelines in Extended Loss of AC Power Scenarios in Boiling Water Reactors Using MAAP4," (EPRI Product ID 3002002749). The MNGP calculation was performed using MAAP 4.0.6.

The benchmark ensures that MAAP4 has sufficient fidelity to perform the mass and energy balances required for the ELAP calculations. Table CI 3.2.1.1.A – 1, below, provides the BWR specific calculations that support all of the code calculations needed to model the ELAP scenarios.

**Table CI 3.2.1.1.A – 1**

| Sequence Initiating Event | Type of Benchmark | Number and Types of Sequences | Overall Agreement | Sequence Time Frame |
|---|---|---|---|---|
| **BWR transients** (including SBOs, LOFW, and turbine trips) **Total with MAAP4: 3 + 4 minor support Total with MAAP3B: 6** | Plant event: Oyster Creek (PE3) | 1 LOFW | Very good | 30 min |
| | Integral code comparison to TRACG02 (IC3) | 2 LOOPs with LLOCAs | *Good* | *8 min* |
| | Integral code comparison to SAFE (IC11)-MAAP3B | 4 LOFW | Good agreement with MAAP3B | 15 min-2 hr |
| | Integral experiment comparison to FIST (IE11)-MAAP3B | 2 LOFW | Good agreement with MAAP3B | 15-50 min |
| | Integral code comparison to MELCOR (IC10) | 1 SBO and 3 transients | Good: only a minor supporting benchmark for Level 1 applications | 40 hr |
| **BWR LLOCAs** (excluding MSLBs) **Total with MAAP4: 3 + 1 minor support** | Integral code comparison to TRACG02 (IC3) | 2 LOOPs with LLOCA | Good | 8 min |
| | Integral code comparison to SR5 and MELCOR (IC5) | 1 LLOCA | Good | 4 hr |
| | Integral code comparison to MELCOR (IC10) | 1 LLOCA | Good: only a minor supporting benchmark for Level 1 applications | 40 hr |
| **BWR MLOCAs and SLOCAs None with MAAP4 Total with MAAP3B: 2** | Integral code comparison to SAFE (IC11) – MAAP3B | 1 SLOCA | Good agreement with MAAP3B | 1 hr |
| | Integral experiment comparison to FIST (IE11) –MAAP3B | 1 MLOCA | Good agreement with MAAP3B | 8 min |

| Sequence Initiating Event | Type of Benchmark | Number and Types of Sequences | Overall Agreement | Sequence Time Frame |
|---|---|---|---|---|
| **BWR MSLBs None with MAAP4 Total with MAAP3B: 1** Can be considered a subset of LLOCAs | Integral code comparison to SAFE (IC11) – MAAP3B | 1 MSLB | Good agreement with MAAP3B | 7 min |
| **BWR interfacing system LOCAs** (discharge outside of containment) | No supporting benchmarks, but essentially covered by LLOCA and S/MLOCA benchmarks. | | | |
| **BWR stuck- open SRVs** | No supporting benchmarks with stuck-open SRVs as an initiator, but similar to SLOCAs if discharge is to the gas space (versus to the suppression pool). Sequences are also supported by benchmarks in which stuck-open or manually opened SRVs are subsequent conditions. | | | |
| **BWR Feedwater line breaks** | No supporting benchmarks, but essentially covered by S/MLOCA benchmarks | | | |
| **BWR ATWS** | No supporting benchmarks | | | |

## <u>CI 3.2.1.1.B</u>

*Confirm that the collapsed level remains above Top of Active Fuel (TAF) and that the cool down rate was within the technical specification limits.*

NSPM Response

NSPM completed the MAAP analysis for MNGP. The MAAP analysis confirmed that the collapsed level remains above the TAF. The MAAP analysis assumed a 90°F per hour cool down rate, which is within the TS limit.

**CI 3.2.1.1.C**

*Confirm that MAAP was used in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June position paper.*

NSPM Response

The MAAP analysis performed for MNGP was carried out in accordance with Sections 4.1, 4.2, 4.3, 4.4, and 4.5 of the June 2013 position paper, EPRI Technical Report 3002001785, "Use of Modular Accident Analysis Program (MAAP) in Support of Post-Fukushima Applications."

**CI 3.2.1.1.D**

*Identify and justify the subset of key modeling parameters taken from Tables 4-1 through 4-6 of the MAAP4 Applications Guidance (EPRI 1020236). This should include response at a plant-specific level regarding specific modeling options and parameter choices for key models that would be expected to substantially affect the ELAP analysis performed for that licensee's plant. Although some suggested key phenomena are identified below, other parameters considered important in the simulation of the ELAP event by the vendor /licensee should also be included.*

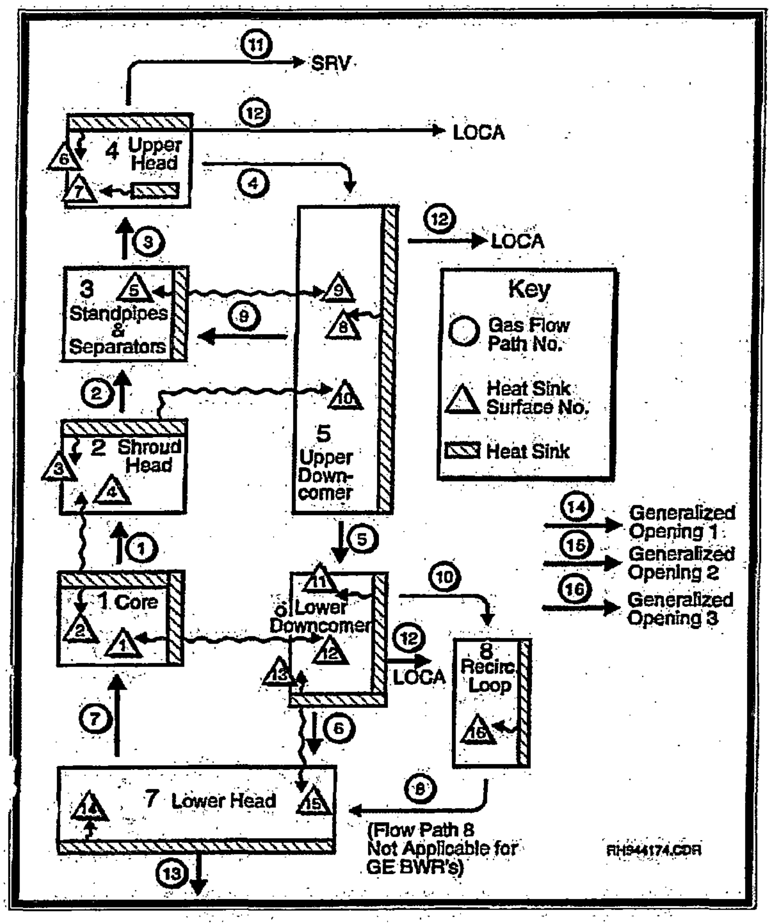
a. *Nodalization*
b. *General two-phase flow modeling*
c. *Modeling of heat transfer and losses*
d. *Choked flow*
e. *Vent line pressure losses*
f. *Decay heat (fission products / actinides / etc.)*

NSPM Response

Each of the specific modeling options requested are discussed below:

a) Nodalization: The reactor vessel nodalization is fixed by the MAAP code and cannot be altered by the user, with the exception of the detailed core nodalization. The MNGP MAAP 4.0.6 parameter file divides the core region into 5 equal volume radial regions and 27 axial regions. The axial nodalization represents 24 equal-sized fueled nodes, 1 unfueled node at the top, and 2 unfueled nodes at the bottom. Figure CI 3.2.1.1.D - 1 below, taken from the MAAP User's Manual, illustrates the vessel nodalization scheme.

**Figure CI 3.2.1.1.D – 1 – MAAP MNGP Vessel Nodalization Scheme**

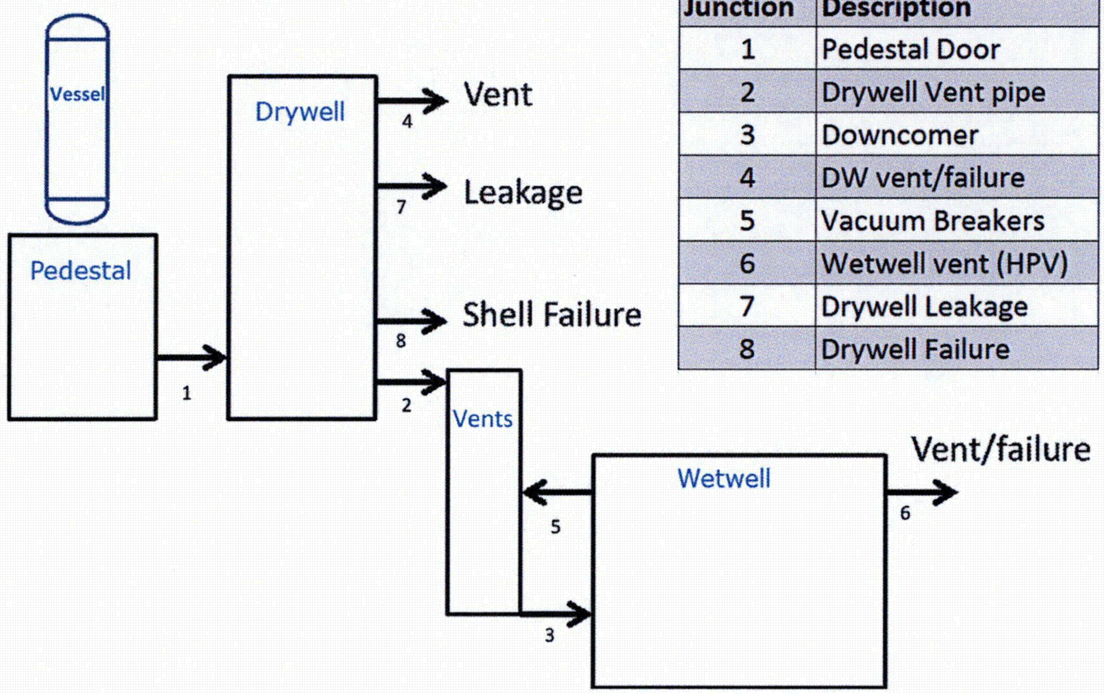



Containment nodalization is defined by the user. The standard nodalization scheme is used in the MNGP MAAP 4.0.6 parameter file and represents the following individual compartments:

- Pedestal - Drywell Opening (Nodes 1-2)
- Drywell - Vent Line/Downcomer (Nodes 2-3)
- Vent/Downcomer - Torus (Nodes 3-4)
- Drywell Vent; Drywell - Half of 962' Elev. (Nodes 2-13)
- Vacuum Breakers - Torus - Vent Header (Nodes 4-3)
- Wetwell Vent; Wetwell - Torus Room (Nodes 4-5)
- Leakage; Drywell To Half of 962' (Nodes 2-13)
- Containment Failure - Vent Pipes To Torus Room (Nodes 3-5)

Figure CI 3.2.1.1.D – 2 below illustrates the MNGP containment nodalization along with an identification of containment flow junctions.

**Figure CI 3.2.1.1.D – 2 – MAAP MNGP Containment Nodalization Scheme**




| Junction | Description |
|---|---|
| 1 | Pedestal Door |
| 2 | Drywell Vent pipe |
| 3 | Downcomer |
| 4 | DW vent/failure |
| 5 | Vacuum Breakers |
| 6 | Wetwell vent (HPV) |
| 7 | Drywell Leakage |
| 8 | Drywell Failure |

b) General two-phase flow modeling: General two-phase flow from the reactor vessel is described in the EPRI Technical Basis for ELAP Success Timelines report (EPRI Product ID 3002002749). In the case of the scenario outlined in the integrated plan, flow can exit the RPV via the open safety relief valve(s) (SRV(s)) and from the assumed recirculation pump seal leakage. Flow from an SRV will be single-phase steam, and flow from the recirculating pump seal will be single-phase liquid due to the location of the break low in the RPV with RPV level continued to be maintained above TAF. Upon exiting the RPV, the seal leakage will flash a portion of the flow to steam based on saturated conditions in the drywell, creating a steam source and a liquid water source to the drywell. As described in the EPRI report there are two parameters that can influence the two-phase level on the RPV. Table CI 3.2.1.1.D – 1 below confirms that the parameter values match the recommended values that are outlined in the EPRI report.

**Table CI 3.2.1.1.D – 1**

| Parameter Name | Value used in MNGP MAAP analysis | EPRI recommended value |
|---|---|---|
| FCO | 1.5248 | 1.5248 |
| FCHTUR | 1.53 | 1.53 |

Modeling of heat transfer and losses: Modeling of heat transfer and losses from the RPV are described in the EPRI Technical Basis for ELAP Success Timelines report (EPRI Product ID 3002002749). The parameters that control these processes, as defined in the report, are provided in Tables CI 3.2.1.1.D – 2 and CI 3.2.1.1.D – 3 below with the values selected to represent MNGP.

**Table CI 3.2.1.1.D – 2**

| Parameter Name | Value used in MNGP MAAP analysis | Comment |
|---|---|---|
| QCO – not-thru-insulation heat transfer from RPV during normal operation. | 3.55E6 BTU/hr (1.04 MW) | Plant specific value based on drywell heat removal to coolers during normal operation. Typical values range between 1-2 MW. |
| FINPLT – number of plates in reflective insulation | 8.0 | Plant-specific value |
| XTINS – average reflective insulation thickness | 0.335 ft. | Plant-specific value |

Additional Information relating to MAAP Analysis Parameter Values relating to heat transfer and losses is provided in Table CI 3.2.1.1.D – 3 below.

**Table CI 3.2.1.1.D – 3**

| Parameter Definition | Parameter Name in MAAP | Parameter Value in MNGP MAAP Analysis |
|---|---|---|
| Power level, MWth | QCR0 (BTU/hr) | 6.84E9 BTU/hr |
| Initial CST water volume, gal | VCST0 ($ft^3$) | 35,187 $ft^3$ |
| Initial CST water temperature, F | HCST (enthalpy) | 67.97 BTU |
| Initial suppression pool water mass, lbm | Calculated from input | 4,371,000 lbm |
| Initial suppression pool water level, ft | XWRB0(i), where i is node number for wetwell | 11.2 ft |
| Initial suppression pool water temperature, F | TWRB0(i), where i is node number for wetwell | 80°F |

| Parameter Definition | Parameter Name in MAAP | Parameter Value in MNGP MAAP Analysis |
|---|---|---|
| Drywell free volume, $ft^3$ | VOLRB(i), where i is node number for drywell | 114,936.4 $ft^3$ |
| Wetwell free volume, $ft^3$ | VOLRB(i) – volume of suppression pool water from initial pool mass | 176,000 $ft^3$ |
| Containment vent pressure, psia | Refer to Section 4.1 of the main report | 24.7 psia |
| RCIC max flow rate, gpm | WVRCIC | 400 gpm |
| Max FLEX pump flow rate, gpm | Refer to Section A.1 (Parameter WVHPSW(8)) | 2200 gpm |
| Lowest set SRV flow rate, lb/hr | Derived from SRV area, ASRV | 83,800 lb/hr |
| Lowest set SRV pressure, psia | PSETRV | 1066.7 psia |
| Recirculating pump seal leakage, gpm | Value that was used to define LOCA area, ALOCA | 70 gpm per pump |
| Total leakage used in the transient, gpm | Value that was used to define LOCA area, ALOCA | 165 gpm |

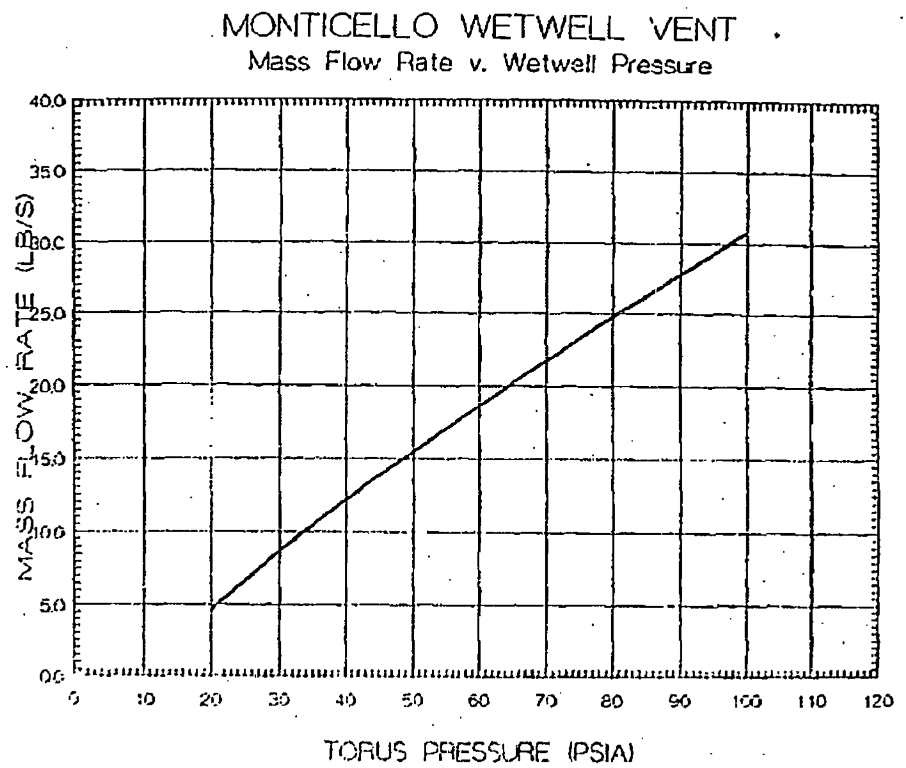
c) Choked flow: Choked flow from the SRV and the recirculation pump seal leakage is discussed in the EPRI Technical Basis for ELAP Success Timelines report (EPRI Product ID 3002002749). The parameters identified that impact the flow calculation are listed in Table CI 3.2.1.1.D – 4 below with input values identified.

**Table CI 3.2.1.1.D – 4**

| Parameter Name | Value used in MNGP MAAP analysis | EPRI recommended value |
|---|---|---|
| ASRV – effective flow area for relief valve | 0.1105 $ft^2$ | Plant-specific value |
| ALOCA – seal leakage area | 1.19E-3 $ft^2$ | Plant-specific value |
| FCDBRK – discharge coefficient for seal leakage | 0.75 | 0.75 |

d) Vent line pressure losses: Vent line pressure loss can be represented in two different approaches. One approach is to input the actual piping flow area along with a discharge coefficient (FCDJ). An alternative approach would be to calculate the effective flow given the estimated piping losses, and input a loss coefficient of 1.0. The MNGP MAAP analysis utilizes the discharge coefficient approach. The MNGP MAAP analysis flow rate out of the hard pipe vent was compared to the MNGP HPV flow curve which is displayed in Figure CI 3.2.1.1.D - 3 below. Figure CI 3.2.1.1.D – 3 was used to develop a function that correlates the torus pressure to the vent flow rate using the discharge coefficient. The MAAP analysis was reviewed to verify that the flow rate was well represented by this modeling approach.

**Figure CI 3.2.1.1.D – 3 – MNGP Hard Pipe Vent Flow Curve**




e) Decay heat (fission products/actinides/etc.): Decay heat representation in MAAP is discussed in the EPRI Technical Basis for ELAP Success Timelines report (EPRI Product ID 3002002749). Input parameters used to compute the decay heat are identified in the report and are listed in the Table CI 3.2.1.1.D – 5 along with the values used in the MNGP analysis.

**Table CI 3.2.1.1.D – 5**

| Parameter Name | Value used in MNGP MAAP analysis | EPRI recommended value |
|---|---|---|
| FENRCH – normal fuel enrichment | 0.0384 | Plant-specific value |
| EXPO – average exposure | 33974.6 | Plant-specific value |
| FCR – total capture rate of U-238 / total absorption rate | 0.324 | Plant-specific value |
| FFAF – total absorption rate / total fission rate | 2.37 | Plant-specific value |

| Parameter Name | Value used in MNGP MAAP analysis | EPRI recommended value |
|---|---|---|
| FQFR1 – fraction of fission power due to U-235 and PU-241 | 0.476 | Plant-specific value |
| FQFR2 – fraction of fission power due to PU-239 | 0.437 | Plant-specific value |
| FQFR3 – fraction of fission power due to U-238 | 0.087 | Plant-specific value |
| TIRRAD – average effective irradiation time for entire core | 33,580 hrs. | Plant-specific value |

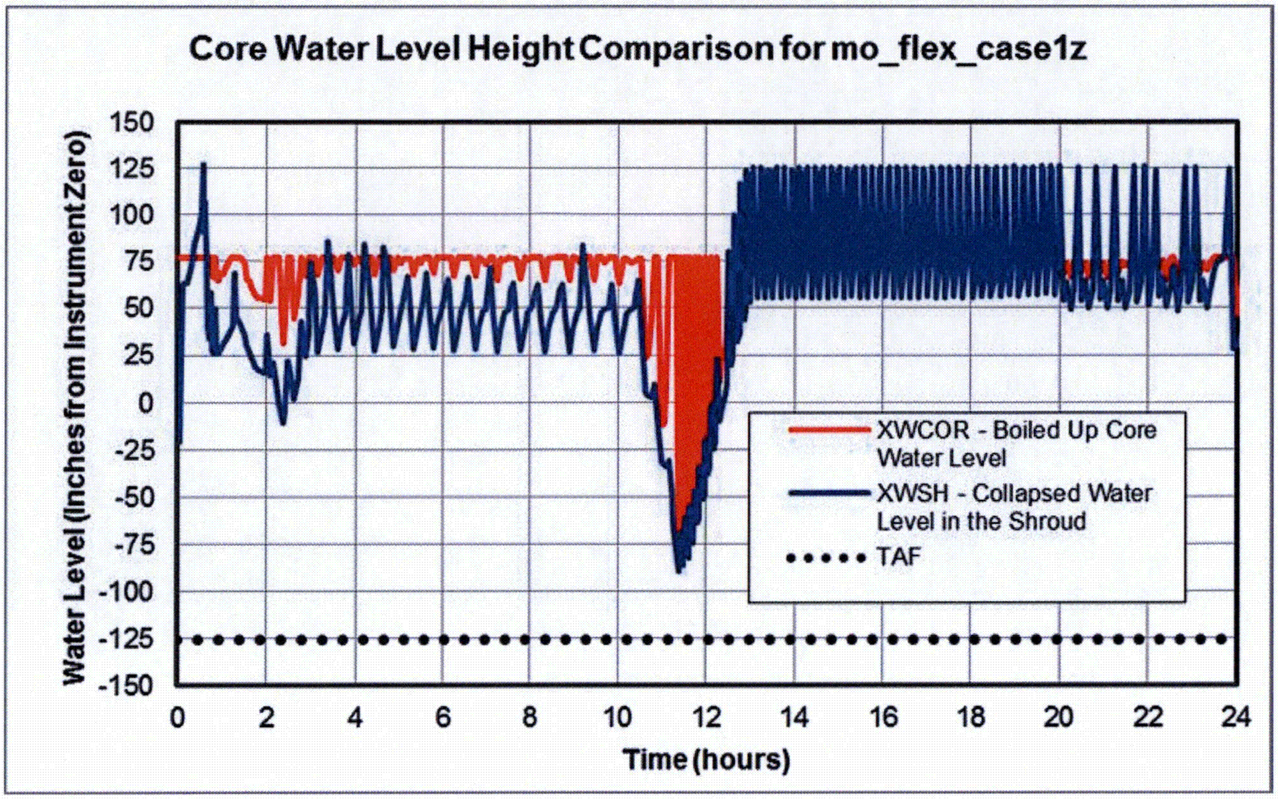
**CI 3.2.1.1.E**

*Identify the specific MAAP analysis case that was used to validate the timing of mitigating strategies in the integrated plan and state that it is available on a web portal for NRC staff to view. Alternately, a comparable level of information may be included in the response to the question. In either case, the analysis should include a plot of the collapsed vessel level to confirm that TAF is not reached (the elevation of the TAF should be provided) and a plot of the temperature cool down to confirm that the cool down is within tech spec limits.*

NSPM Response

The MNGP MAAP Analysis modeled several scenarios representative of the OIP and performed a case that is defined as the representative case for the Monticello ELAP strategy. The analysis considers collapsed RPV water levels as indicated by instrumentation (parameter XWSH) and boiled-up water levels in the core (parameter XWCOR). Figure CI 3.2.1.1.E – 1, below illustrates the vessel water level relative to instrument zero (-126") over the scenario duration (24 hours) ELAP case. Note that neither the collapsed nor boiled-up water level parameters indicate that fuel was uncovered.

**Figure CI 3.2.1.1.E – 1 – MNGP Core Level during ELAP Event**



Figures CI 3.2.1.1.E – 2 and CI 3.2.1.1.E – 3 illustrate primary system water temperature and RPV pressure, respectively, during the RPV cooldown phase for the ELAP case. These figures indicate that the cooldown rate was maintained <100°F/hr, within the TS limits. Figure CI 3.2.1.1.E – 2 indicates the RPV coolant temperature drops from 550°F to 400°F over the period from 0.5 hours to 2.2 hours. This corresponds to approximately a 90°F/hr cooldown rate.

**Figure CI 3.2.1.1.E – 2 – MNGP Primary System Water Temperature During ELAP Event**

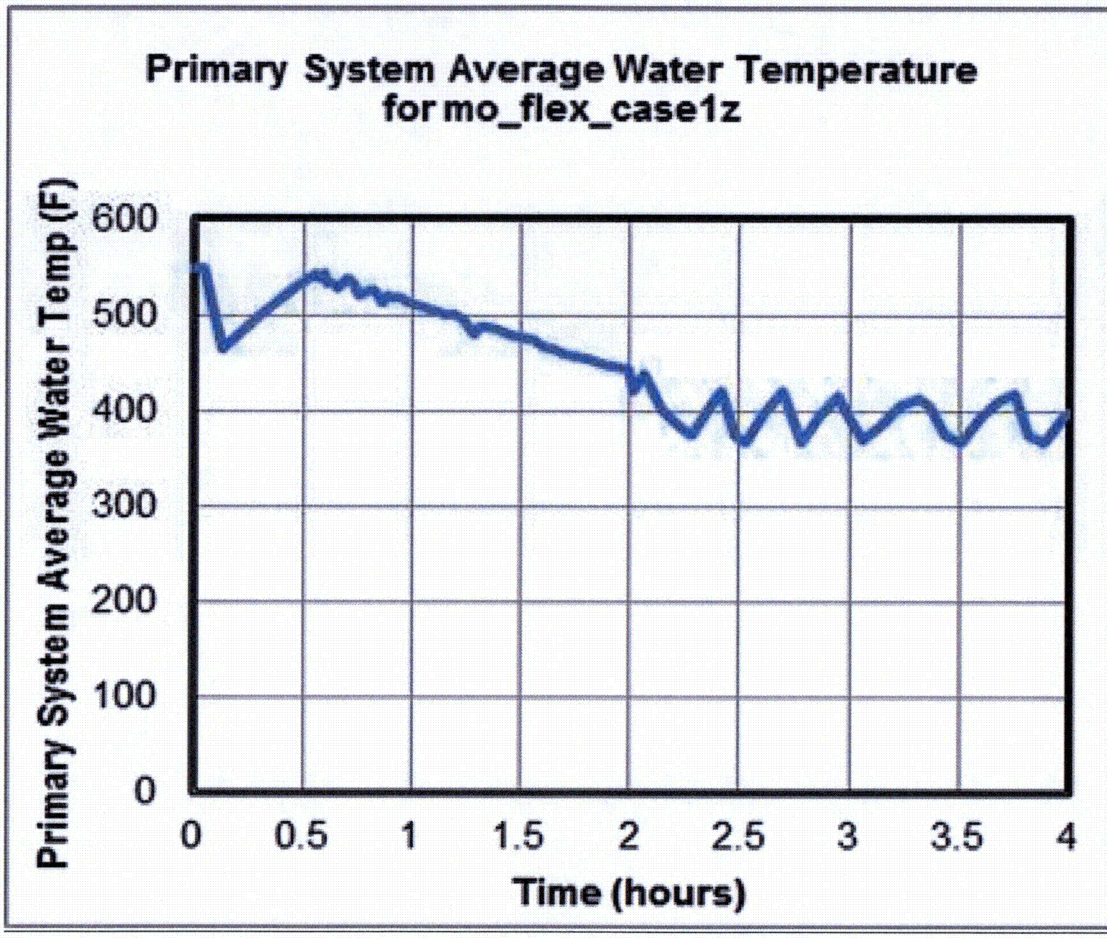
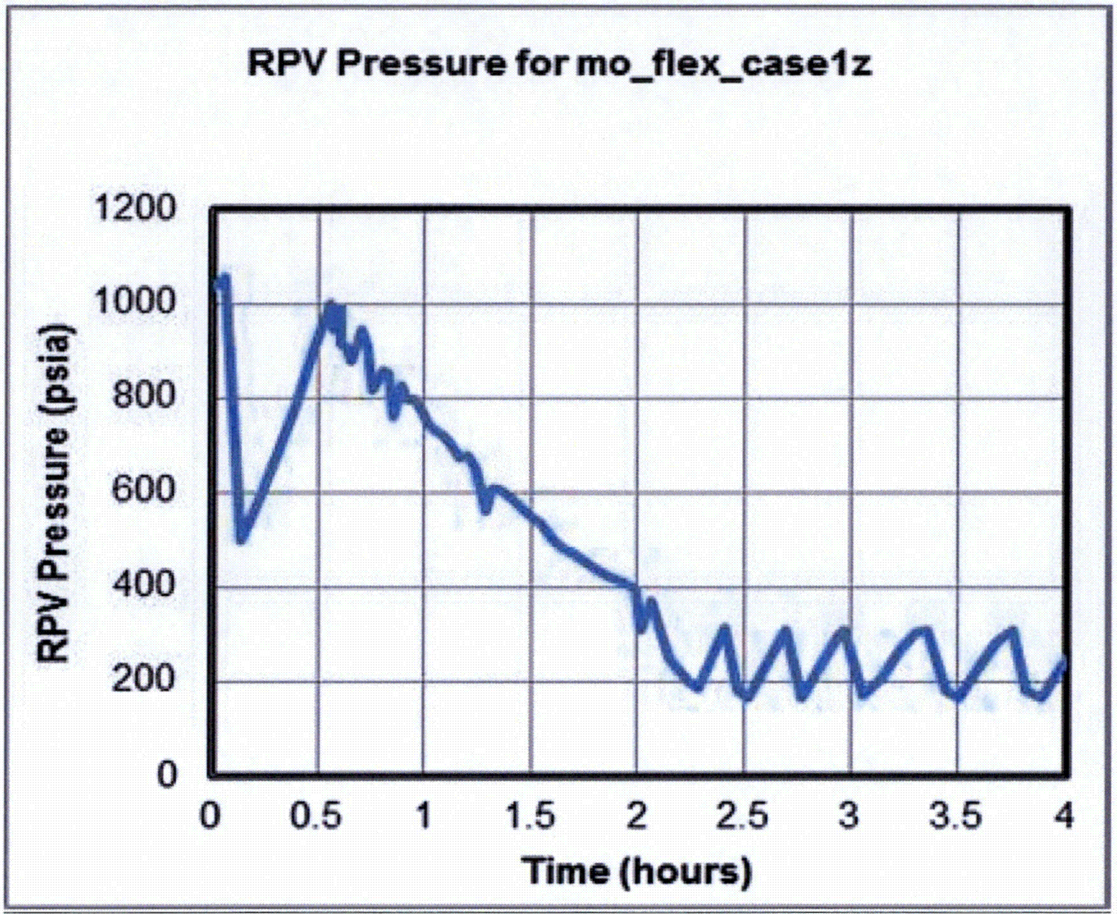


**Figure CI 3.2.1.1.E – 3 – MNGP Reactor Vessel Pressure during ELAP Event**




Note: Lo-Lo set controls RPV pressure for initial 30 min. or until RPV depressurization (cooldown) is initiated.

<u>**CI 3.2.1.3.C**</u>

*The licensee did not provide a completed analysis for repowering batteries using the portable FLEX 480 volt ac diesel generator and the associated time constraint for battery life. Additional analysis is required to confirm timing.*

NSPM Response

NSPM has completed DC Load Flow and Cell Sizing analyses for the ELAP scenario with associated deep load shed. The analyses incorporate battery recharging using the portable FLEX 480 Vac DG and the associated time constraint for battery life.

The shift manager must declare an ELAP event has occurred by procedure within 1 hour of the event occurring. Once the declaration is made, load shedding will be performed on the Division I and Division II station batteries to extend the time station batteries can be used to operate equipment and instruments used to provide core cooling. The battery calculations have been performed using the remaining loads to demonstrate that the batteries life was extended to 12 hours.

When an ELAP is declared, the DC load shed is completed within 2 hours from the onset of the event. Within 11 hours the batteries are re-powered using the FLEX 480 Vac DGs.

The analyses conclude that the batteries can support a 12 hour coping duration. Therefore, these analyses confirm the FLEX mitigation strategy as outlined in the plant procedures is acceptable with margin for repowering the batteries at MNGP.

## CI 3.2.1.3.D

*The licensee did not provide the basis for SOE Action Item 9 regarding the 8-hour time the portable diesel driven FLEX pumps will be staged. Additional analysis is required to confirm timing.*

NSPM Response

The FLEX portable diesel driven pump can be credited as being staged for use within 10.5 hours. This time was chosen as the earliest reasonable time for pump staging, as additional staff can be credited as arriving on site at six hours and it is reasonable that debris can be cleared within the following two hours. Staging could be completed earlier depending on the amount of debris and the timing of personnel arriving on site. Pump deployment and hose layout have been demonstrated to be accomplished within two hours in previous time studies.

Staging of the FLEX portable pump is not identified as a time constraint as the MNGP strategy relies on RCIC to supply core cooling as long as possible. The FLEX portable pump does not need to be utilized until RCIC failure. The MAAP analysis shows that the suppression pool temperature will reach 240°F at approximately 10.5 hours and the RCIC pump could be stopped at that point as the FLEX portable pump would be available just after hour 10. An NSPM evaluation determined that RCIC pump operation would last at least 11.5 hours based on suppression pool temperature and the ruggedness of the RCIC pump and turbine. Since the MAAP analysis shows that suppression pool temperature peaks at approximately 250.7°F, it is expected that RCIC will run well past 11.5 hours.

Also, battery power for RCIC will be available continuously throughout the event. Battery capacity/Load shed calculations show 12 hours of power are available. The portable diesel generator will be staged and available for use by hour 10.5.

**CI 3.2.1.3.E**

*The licensee provided preliminary times for SOE Action Items 10, 11, and 12 regarding ventilation needs for various areas of the plant. Additional analysis is required to confirm timing.*

NSPM Response

NSPM has completed elevated temperature analyses for the ELAP scenario. The analyses were performed on the MCR, battery rooms, RCIC room and the reactor building.

During Phase 2 supplemental ventilation is provided for the operators in the MCR, Battery Rooms, RCIC Room, and EFT Building using portable ducting and fans for air circulation as necessary. Portable fans will need to be powered by a portable DG. 250V and 125V battery charger rooms require cooling when the battery charger is energized. Ventilation is provided by staging portable fans to circulate air through the rooms for cooling and to mitigate the potential for hydrogen buildup.

Procedures require that within one hour the decision is made to declare an ELAP. After 10.5 hours portable FLEX fans will be staged and powered by the 120 Vac generators to provide cooling.

The analyses conclude that adequate ventilation is available to support operating FLEX equipment if high temperatures occur inside plant buildings. Therefore, these analyses confirm the FLEX strategy documented in the MNGP procedures.

**CI 3.2.1.4.A**

*The licensee did not provide complete updated information regarding FLEX portable pump flow analyses. This will be provided in the licensee's February 2014 status update report.*

NSPM Response

Of the possible combinations of portable diesel pump (PDP) suction sources and injection locations, the longest run of hose will be required to transfer water from the discharge canal to the RHR/RHRSW cross-tie (located on the 931' east elevation of the TB). From the pump discharge, two 5" hoses are routed south between the cooling towers. From there the hoses are routed over the security barricade, through the security fence at the east gate just south of the Plant Engineering Building (PEB)), then west toward the Plant Administration Building (PAB). Other sources can be connected to the Division 1 (or A train) RHR - system, or the 12 Cooling Tower Fire connection. If the intake is used as the suction source for the PDP, the 12 Cooling Tower Fire system connection is not used as an injection location.

At the hose run closest to the Reactor Building railroad doors, a splitter is attached to each hose. The splitter has a 5" inlet, a 5" outlet, and at least one 2½" outlet. The 5" outlet is used to continue to route the 5" hose on the east end of the PAB, around the Compressed Air Building, and into the TB through the north door of the 13.8 kV room.

Near the entrance to the TB, the two 5" hoses are connected to the double end of a Y-fitting. The single 5" hose from the outlet of the Y-fitting is then connected to a flow meter. The outlet of the flow meter is connected to a single 5" hose, which is then connected to the RHR/RHRSW cross-tie through RHRSW-68. See CI 3.2.1.8.B for further information on this connection point.

Adding water to the SFP can be accomplished via several means:

1. Via hoses to the SFP:
    a. Pump through 5" hoses, to RHRSW-68, to RHRSW-46, through Fire Protection piping, through 1½" hoses on the refuel floor, or
    b. Each of the two 2½" outlets from the above mentioned splitters are used to route 2½" fire hoses through the reactor building railroad doors, up to 1027' elevation of the reactor building.

2. Via RHR:
    a. Pump through 5" hoses, to RHRSW-68, to RHRSW-14, to PC-18 to the spent fuel pool (SFP).

Three hydraulic calculations have been performed to determine the acceptability of this hose deployment strategy:

- The first calculation evaluated the use of the PDPs to provide flow to the SFP spray taking flow from the discharge canal. A number of different hose routes and spray configurations are presented. This calculation evaluated the flow paths determined to require the highest pump discharge head and provides options for hose configurations which could reduce the required head to provide margin for pump operation, if required. The calculation determined that the portable pumps can provide sufficient flow and pressure for the spray at the SFP handrail, SFP deck, and Reactor Building roof level from any of the three pump locations.

- The second calculation confirmed that a minimum of 300 gpm of cooling water from the Mississippi River or discharge canal can be delivered to the RPV, through the Low Pressure Coolant Injection (LPCI) A loop, using a combination of existing piping systems and interconnecting hoses in conjunction with a portable pump. The analysis is performed assuming an RPV pressure of 100 psig and injection through the A LPCI flow path. The calculation assumes the RPV water level is at the bottom of the main steam line (998'-3"). A summary table of pump flow and pump head, at their operating point, for each pump configuration is contained in the calculation. The calculation concluded that use of a portable diesel pump in any of the four hose configurations for water injection allows for an injection rate of over 300 gpm.

- The final calculation confirmed that a minimum of 300 gpm of makeup water can be delivered to the RPV simultaneously with makeup water (200 gpm) or spray water (250 gpm) supplied to the SFP. Flow paths to both the RPV and SFP are through a combination of existing piping systems RHR, RHRSW, Fuel Pool Cooling (FPC), and Fire Protection (FP) and interconnecting hoses in conjunction with a PDP.

**<u>CI 3.2.1.4.B</u>**

*The licensee needs to provide further technical basis or a supporting analysis for the portable/Flex diesel generator capabilities considering the capacity of the equipment. A summary of the sizing calculation for the FLEX 480 V diesel generators to show that they can supply the loads assumed in phases 2 is also needed.*

NSPM Response

An Engineering Evaluation was prepared to size the 480 Vac portable diesel generators. This evaluation was based on the FLEX Strategies for the ELAP event. MNGP uses the 480 Vac portable generator to supply power to six battery chargers to support the use of the DC control power for greater than 24 hours.

MNGP is using a Caterpillar XQ200 portable diesel generator with a prime rating of 182 kW. The engineering evaluation determined that a generator with a continuous rating in the range of 175 kW and 200 kW is recommended. Therefore, the MNGP portable diesel generator is sized appropriately for MNGP's mitigating strategy.

**<u>CI 3.2.1.6.A</u>**

*The licensee specified that the 24-hour time constraint for supplying alternate nitrogen is preliminary but provided no technical basis or analysis to support the 24-hour requirement to supply alternate nitrogen. The licensee will provide updated information in a six-month status report in February 2014.*

NSPM Response

A calculation was performed which determined that the currently installed capacity of the Alternate Nitrogen system (four bottles) could adequately supply the system needs for up to 9.4 hours. A 24 hour supply would require an installed capacity of six bottles.

This condition is acceptable as additional nitrogen bottles are staged in the Make-up Demineralizer Area, and compressed gas storage building. These bottles may be used to replace the bottles depleted by routine system usage. There are eight nitrogen bottles staged in the Make-up Demineralizer Area (931' TB NE). Four bottles are staged to allow replacement of a bottle bank within four hours.

Therefore, during an ELAP event, a greater than 24 hour supply of nitrogen would be available in the TB to supply the Alternate Nitrogen system.

In addition to the nitrogen stored in the TB, nitrogen bottles dedicated for use only in the Alternate Nitrogen System, are available in the plant warehouse. 17 nitrogen bottles per train, for a total supply of 34 bottles are required by procedure to be staged in the warehouse.

Procedural guidance is provided to operators to monitor alternate nitrogen system bottle pressure every six hours and to replace bottles as necessary.

Information in this response is subject to change when Order EA-13-109 is implemented. Order EA-13-109 will likely change the quantities of nitrogen used in an ELAP event.

**CI 3.2.1.8.A**

*The licensee did not provide a discussion regarding the methodology used to assure adequate NPSH for the RCIC pump and justify that it is adequate in light of the potential for limited margins and potentially significant transient phenomena. Additional information will be provided in a six-month update.*

NSPM Response

NPSH has been evaluated for the RCIC pump. The evaluation did not assume any nitrogen gas was present in the suppression chamber atmosphere. The evaluation assumed saturated conditions in the suppression pool. With a suppression pool level greater than 11 feet and RCIC flow less than 300 gpm, the evaluation concluded that there is NPSH margin. The evaluation assumed that the suppression pool liquid was a uniform temperature. This assumption is conservative because of water stagnation. With water stagnation, hotter water is on the surface; and therefore, cooler water at the suppression pool ring header would be drawn into the RCIC pump suction.

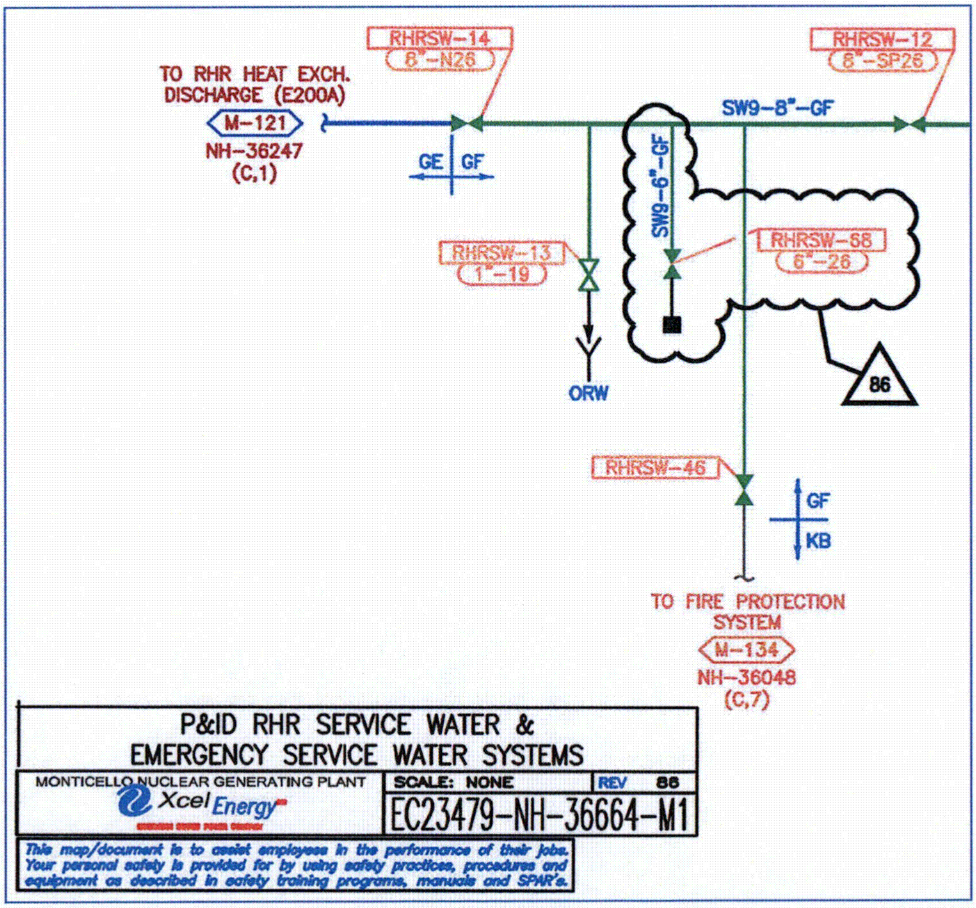
## CI 3.2.1.8.B

*The integrated plan provides no details regarding; actual connection points, (e.g., system valve numbers and actual location in plant piping) the length of hose runs and associated connecting fittings required to connect the portable pump at the primary and alternate locations, and no details regarding portable pump capabilities to correlate with actual flow and pressure requirements. It is not possible to determine based on the limited information that the strategies for phase 2 core cooling are viable.*

NSPM Response

NSPM installed a new connection point to the RHRSW piping in the TB. The new connection piping consists of a new valve (RHRSW-68) and a fire hose connection (see Figure CI 3.2.1.8.B – 1 below). This is the primary location for connecting the discharge of the portable diesel pump to allow injecting into the RPV.

**Figure CI 3.2.1.8.B – 1 – MNGP Primary PDP RPV Injection Point**

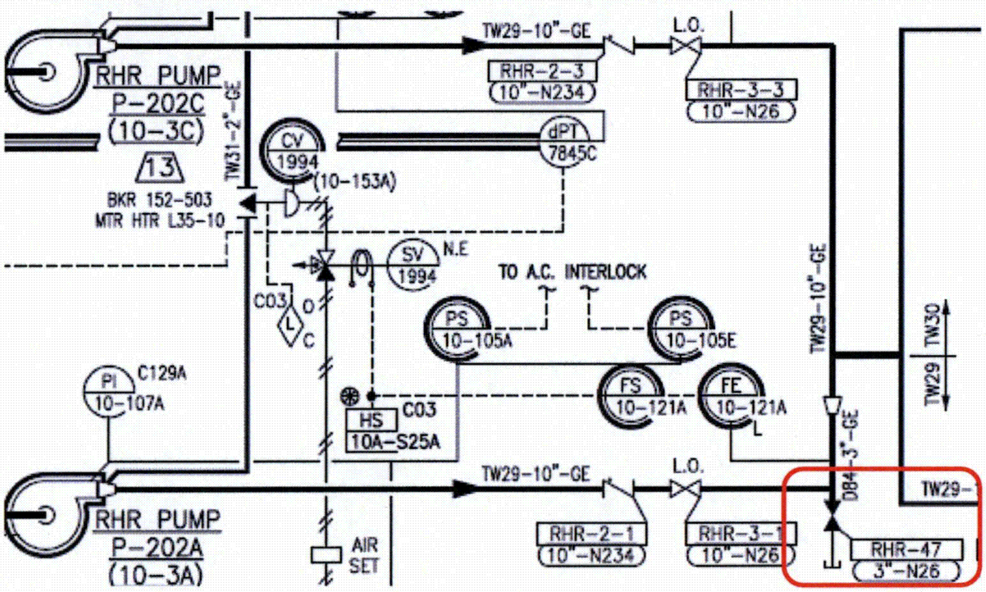


With the discharge from the PDP connected to RHRSW-68, water can be injected into the RPV by opening RHRSW-14 (Emergency Injection via A RHRSW Loop). RPV water level can be controlled by throttling RHRSW-14 as necessary.

FLEX procedures provide instructions for connecting hoses from the portable diesel pump to RHRSW-68 and instructions for controlling RPV water level.

The alternate portable diesel pump injection location is into the Division I RHR system through RHR-47, which is located in the Division I RHR room. See Figure CI 3.2.1.8.B - 2 below.

**Figure CI 3.2.1.8.B – 2 – MNGP Primary PDP RPV Injection Point**




FLEX procedures provide instructions for connecting hoses from the PDP to RHR-47 and instructions for controlling RPV water level.

See the response to CI 3.2.1.4.A for a summary of the calculations and analyses verifying the acceptability of the hose runs and associated connecting fittings required to connect the portable pump at the primary and alternate locations. In addition, the response to CI 3.2.1.4.A provides details regarding portable pump capabilities to correlate with actual flow and pressure requirements.

**CI 3.2.1.8.C**

*The licensee will provide additional information regarding final design and implementation plans for use of impure water for core makeup.*

NSPM Response

The normal suction supply for RCIC and HPCI pumps are the two CSTs, which are non-seismic, and the suppression pool. Since the CSTs may not be available for all scenarios, the credited makeup water source for the FLEX portable pumps is from the discharge canal, where river water is processed through the traveling screens prior to the loss of power. The hoses taking suction from the discharge canal will have strainers with 3/8" holes to prevent large debris from entering the pump. The Mississippi River, at the intake structure, serves as a backup source of water to the discharge canal.

NSPM participated in the development of BWROG-TP-14-006, Revision 0, which was issued in March 2014. This document concludes BWR fuel is adequately cooled when the inside shroud is flooded, thus allowing raw water to enter the fuel through the top of the fuel channel. The inside shroud is maintained flooded by either injecting raw water inside the shroud or by maintaining the water level above the steam separator return elevation if injecting into the downcomer.

During an ELAP condition, NSPM will inject raw water into the MNGP RPV using LPCI injection piping, which injects into outer shroud region. Under this condition, RPV water level must be maintained above the steam separator return elevation (approximately +47.25 inches).

By procedure RPV water level is controlled in a band from +55 inches to +100 inches when injecting raw water into the RPV. This maintains water level above the steam separator return elevation and below the main steam lines.

**CI 3.2.1.8.D**

*The licensee provided insufficient information to support a conclusion that the switchover from CST to the torus function will be accomplished in a timely manner so that RCIC injection to RPV will commence without delay and remain uninterrupted. Additional information to be provided in a six-month update.*

NSPM Response

When the CST level drops to 2'-8", the RCIC torus suction valves (MO-2100 and MO-2101) will automatically open. Limit switches on these valves will cause the CST suction valve (MO-2102) to automatically close when both torus suction valves are full open. These actions automatically transfer RCIC suction from the CST to the torus.

MO-2100, MO-2101, and MO-2102 are DC powered valves that will be capable of changing state following an ELAP event.

**CI 3.2.2.A**

*The licensee will provide additional information regarding providing alternate makeup via RHR spent fuel cooling piping, e.g., the routing of hoses from the FLEX portable pump, location where the portable pump is connected to the RHR system, FLEX pump flow and pressure requirements using this flow path in a six-month update.*

NSPM Response

See response to CI 3.2.1.4.A for details concerning use of the PDP to supply water to the SFP via the RHR system or using hoses to the FP system or using hoses directly into the SFP. These flow path combinations have been evaluated and determined to meet flow and pressure requirements.

## CI 3.2.2.B

*The licensee did not provide complete information regarding the FLEX portable pump for the strategy for maintaining SFP level including routing of hoses, available flow rates and flow rates required to the SFP.*

NSPM Response

CI 3.2.1.4.A describes the hose deployment strategy for moving water into the SFP. Calculations to support the strategy demonstrated that adequate flow and pressure would be available to supply sufficient water to the SFP. See CI 3.2.1.4.A for the response.

## CI 3.2.4.1.A

*The licensee did not provide additional formal analysis to determine the timing and scope of the supplemental cooling water, or systems and components need to support ELAP strategies. The results of this analysis will be provided in a six-month status report.*

NSPM Response

Supplemental Cooling water is not required for any FLEX Phase 1 components. Supplemental Cooling (in the form of opening doors and deploying fans) is required for the RCIC room in Phase 1.

CI 3.2.4.2.A provides a response regarding the timing and scope of ventilation required to support the FLEX Phase 2 components.

**CI 3.2.4.2.A**

*The licensee did not perform calculations or supporting analysis regarding the effects of loss of ventilation in the RCIC room (that NEI 12-06 states may be addressed by plant-specific thermal hydraulic calculations) nor other areas of the plant (main control room (MCR) and battery room) when normal ventilation will not be available during the ELAP. This should include formal analysis for supplemental cooling of the RCIC room and battery room using portable fans, opening doors, and the timing and scope of such actions.*

NSPM Response

NSPM has completed elevated temperature analyses for the ELAP scenario. The analyses were performed on the MCR, battery charger rooms, RCIC pump room and the entire Reactor Building.

During Phase 2 of the ELAP event supplemental ventilation is provided for the operators in the MCR, Battery Rooms, RCIC Room, and EFT Building using portable ducting and fans for air circulation as necessary. Portable fans will need to be powered by a portable diesel generator. Division I 250V battery room requires cooling as the battery charger is energized. Portable fans, as required, are placed outside the PAB doors with ducting to rooms to circulate air through the rooms for cooling and to mitigate hydrogen buildup.

Procedures require that within one hour the decision is made to declare an ELAP. After 10.5 hours portable FLEX fans will be staged and powered by the 120 Vac generators to provide cooling.

The analyses conclude that adequate ventilation is available to support operating FLEX equipment if high temperatures occur inside plant buildings. Therefore, these analyses confirm the FLEX strategy documented in the MNGP procedures.

**CI 3.2.4.2.B**

*The licensee needs to provide information to confirm that the habitability limits of the MCR will be maintained in all Phases of an ELAP considering MIL-STD-1472C, which is incorporated by reference in NEI 12-06 via NUMARC 87-00 and specifies that 110°F is tolerable for light work for a 4-hour period while dressed in conventional clothing with a relative humidity of ~30%.*

NSPM Response

NSPM has not used MIL-STD-1472C in the determination of the MNGP MCR temperature. In section 2.2.1, of the Supplemental Safety Evaluation - Monticello Nuclear Generating Plant Station Blackout Rule (10CFR50.63) (TAC M68569), the NRC states that the expected calculated peak temperature for the SBO event would be below the temperature limit of 120°F. Therefore, 120°F remains the MNGP temperature limit for the MCR.

NSPM performed a calculation that determined the peak area temperature in one MCR sub-volume for SBO at 120.4°F. The significance of this temperature was considered negligible since the initial MCR temperature used was 80°F rather than the normal MCR temperature of 78°F. If 78°F would have been used all MCR sub-volumes would have remained below 120°F. The ELAP maximum peak temperature for the same sub-volume space was calculated at 120.2°F. The calculation concludes that in both the SBO and the ELAP events the average maximum temperature of 120°F is not exceeded. The calculation does not open any doors nor makes use of any forced ventilation.

In addition, procedural guidance exists which would prop open the MCR door and use portable fans to add ventilation into the MCR.

**CI 3.2.4.4.A**

*The licensee needs to provide a discussion that includes a rationale for eliminating power to 125 volt dc emergency lighting. This action is inconsistent with other sections of the licensee's response regarding emergency lighting.*

NSPM Response

The DC emergency lighting powered from SR batteries will be load shed early in the event to preserve batteries for other uses. Local battery powered emergency lighting (wall mounted units) will supply lighting for at least eight hours. These wall mounted units overlap the DC emergency lighting in the areas required to be accessed.

DC emergency lighting will be restored following:

1) re-powering battery chargers from 480 Vac portable diesel generator, and
2) restoration of DC loads.

If there is a lighting gap between the lighting supplied by the local battery powered emergency lighting (wall mounted units) and DC emergency lighting powered from SR batteries, and flashlights will be used to facilitate safe movement in the plant. Therefore, DC emergency lighting is not needed.

The OIP stated that the DC emergency lighting system was going to be modified to use light emitting diode (LED) bulbs. Based on the above information, the modification was determined not to be necessary.

**CI 3.2.4.4.B**

*Review of the licensee communications enhancements for confirmation that upgrades to the site's communications systems have been completed if necessary.*

NSPM Response

The site's communication system upgrade has been completed. The upgrade installed the following equipment:

- 24 new satellite phones and docking stations
- 24 new satellite phone external antennas
- coaxial cabling between the new external antennas and the satellite phone docking stations
- 24 new analog phones for each docking station
- dedicated phone circuits between the 24 new analog phones and the satellite phone docking stations
- three uninterruptible power supplies (UPS) that provide backup power for satellite phone systems in the PAB, PEB and Monticello Training Center (MTC)
- integrated the 24 satellite phones into the MNGP phone system.

**CI 3.2.4.9.A**

*The licensee did not address actions to maintain the quality of fuel stored in the tanks of the portable equipment for potentially long periods of time when the equipment (diesel driven pumps and generators) will not be operated.*

NSPM Response

The PDPs (P-506 & P-507) have established preventative maintenance plans which change out the fuel stored in the pumps once per year.

The 200 kw 480 Vac portable DGs (G-506 & G-507) have established preventative maintenance plans which change out the fuel stored in the portable DGs once per year.

The 12 kw FLEX portable DGs (G-101 & G-102) have established preventative maintenance plans which change out the fuel stored in the portable DGs once per year.

The PM program for each component also includes additional PM activities along with a quarterly operation of each component.

**CI 3.2.4.10.A**

*The licensee provided various examples of loads to be shed, and loads to remain powered from both divisions of the 125V DC and 250V DC buses, and stated that the station batteries do not require portable supplemental charging before eight (8) hours. The licensee needs to provide a completed load shed analysis.*

NSPM Response

NSPM has completed DC Load Flow and Cell Sizing analyses for the ELAP scenario with associated deep load shed. The analyses incorporate battery recharging using the portable FLEX 480 Vac DG and the associated time constraint for battery life.

The operator must declare an ELAP event has occurred by procedure within one hour of the event occurring. Once the declaration is made, load shedding will be performed on the Division I and Division II station batteries to extend the time station batteries can be used to operate equipment and instruments used to provide core cooling. The battery calculations have been performed using the remaining loads to demonstrate that the batteries life was extended to 12 hours.

When an ELAP is declared, then within two hours from the onset of the event the DC load shed is completed. Within 11 hours the batteries are re-powered using the FLEX 480 Vac Diesel Generators.

The analyses conclude that the batteries can support a 12 hour coping duration. Therefore, these analyses confirm the FLEX mitigation strategy as outlined in the plant procedures is acceptable with margin for repowering the batteries at MNGP.

**CI 3.3.2.A**

*The licensee needs to provide a description of the configuration control program it will implement that includes a program document that will contain; a historical record of previous strategies and the basis for changes, and a change control process to allow changes to the strategies only if they continue to meet the guidelines of NEI 12-06.*

NSPM Response

The MNGP FLEX program configuration control requirements are contained within the MNGP FLEX program document and NSPM FLEX procedures. Below is a description of those configuration control requirements.

FLEX Program Document:
The Diverse and Flexible Coping Strategies (FLEX) Program Document contains the following requirements as required by NEI 12-06:

- Maintains the FLEX strategies and associated basis.
- Contains a historical record of previous strategies and the basis for changes.
- Contains the basis for the ongoing maintenance and testing programs chosen for the FLEX equipment.

NSPM FLEX Procedures
NSPM FLEX procedures provide instructions for the tracking, preparation, and approval of changes to the FLEX strategies in response to order EA-12-049.

Changes to the FLEX strategies can be made without NRC approval provided:

1. The revised FLEX strategy meets the requirements of NEI 12-06, and
2. An engineering basis is documented that ensures that the change in FLEX strategy continues to ensure the key safety functions (core and SFP cooling, containment integrity) are met.

Any changes to FLEX Strategies are evaluated and documented.

Modifications that Potentially Affect FLEX Strategies
Plant modifications are assessed for any impact on the FLEX mitigating strategies. The Design Input Checklist is the vehicle by which potential impacts are identified. If a potential change is identified, then the change will be evaluated per NSPM FLEX procedures.

**CI 3.4.A**

*The licensee needs to provide additional information regarding the minimum capabilities for offsite resources for which each licensee should establish availability as noted in considerations 2 through 10 of NEI 12-06, Section 12.2 lists the following minimum capabilities.*

NSPM Response

NEI 12-06, Revision 0, Section 12.2, "Minimum Capabilities of Off-Site Resources" states that:

*"Each site will establish a means to ensure the necessary resources will be available from off-site. Considerations that should be included in establishing this capability include:*

*...*

2. *Off-site equipment procurement, maintenance, testing, calibration, storage, and control.*
3. *A provision to inspect and audit the contractual agreements to reasonably assure the capabilities to deploy the FLEX strategies including unannounced random inspections by the Nuclear Regulatory Commission.*
4. *Provisions to ensure that no single external event will preclude the capability to supply the needed resources to the plant site.*
5. *Provisions to ensure that the off-site capability can be maintained for the life of the plant.*
6. *Provisions to revise the required supplied equipment due to changes in the FLEX strategies or plant equipment or equipment obsolescence.*
7. *The appropriate standard mechanical and electrical connections need to be specified.*
8. *Provisions to ensure that the periodic maintenance, periodic maintenance schedule, testing, and calibration of off-site equipment are comparable/consistent with that of similar on-site FLEX equipment.*

9. *Provisions to ensure that equipment determined to be unavailable/non-operational during maintenance or testing is either restored to operational status or replaced with appropriate alternative equipment within 90 days.*
10. *Provision to ensure that reasonable supplies of spare parts for the off-site equipment are readily available if needed. The intent of this provision is to reduce the likelihood of extended equipment maintenance (requiring in excess of 90 days for returning the equipment to operational status)."*

MNGP is participating in the industry Strategic Alliance for FLEX Emergency Response (SAFER) Program through a contractual agreement with the Pooled Equipment Inventory Co. (PEICo). PEICo and its subcontractor AREVA (together called the SAFER Team) will provide engineering and management services for selecting and procuring emergency response equipment. The SAFER Team also provides ongoing monthly management, maintenance, and testing of the National SAFER Response Center (NSRC) equipment.

There are two, redundant NSRCs established with five sets of generic equipment stored in Memphis and Phoenix. There are also diverse delivery methods for transporting this equipment to the site:

- Air and ground transport to Staging Area C (Maple Grove Service Center – greater than 25 miles direct path from MNGP) from NSRC
- Delivery to Staging Area B (on site staging area adjacent to Receiving Facility) from Staging C or directly from NSRC
- Air or ground transport to Staging Area B

The SAFER capabilities are described in the White Paper - National SAFER Response Centers document dated September 11, 2014. The white paper includes a table that identifies that the SAFER team meets the specific requirements of NEI 12-06, Section 12.2.

By letter Dated September 26, 2014 from NRC to NEI the NRC staff concluded that:

*"SAFER has procured equipment, implemented appropriate processes to maintain the equipment, and developed plans to deliver the equipment needed to support site responses to BDBEEs, consistent with NEI 12-06 guidance... . Therefore, the NRC staff concludes that ... licensees can reference the SAFER program and implement their SAFER Response Plans for plant-specific compliance with the final phase requirements of Order EA-12-049."*

Regarding guideline 5, a MOU with Maple Grove Service Center has been implemented for use of Staging Area C. Communication with State and County officials is covered by plant procedures that will be in place (or equivalent) for the life of the plant.

Regarding guideline 7, mechanical and electrical connections for off-site equipment are specified and controlled by AREVA document 51-9199717, "Regional Response Center Equipment Technical Requirements."

Based on the above, NSPM has determined that NEI12.06 Revision 0 Section 12.2 considerations 2 through 10 have been adequately addressed.

## AQ 2

*NEI 12-06, Section 5.3.3, "Procedural Interfaces," Consideration 1 specifies criteria for compiling a reference source for plant operators for obtaining necessary instrument readings to support the implementation of the coping strategies in the event a beyond-design-basis seismic event affects seismically qualified electrical equipment.*

*In its Overall Integrated plan (OIP), NSPM identified that it is possible to determine local readings for containment temperature using a portable handheld device. The OIP did not provide the detail needed to determine whether a reference source currently exists for obtaining containment temperatures or other key reactor parameter local instrument readings (e.g., at control room panels or containment penetrations) in this same manner (handheld device) or some other method to be developed.*

*Provide a discussion regarding the ability to read key instrumentation locally in the event Main Control Room and non-Main Control Room instrumentation is not available.*

NSPM Response

In the event of loss of all AC or DC power (including an ELAP event) procedural guidance is provided which directs personnel to obtain information regarding the following parameters:

- Reactor Water Level
- Reactor Pressure
- SRV Tailpipe Differential Pressure
- Drywell Pressure
- Suppression Pool Water Level

- Drywell Temperature
- Suppression Chamber Temperature
- Reactor Metal Temperatures

With this guidance, operators can use hand held meters to take measurements of the installed instruments locally in the plant or in the CR as directed. Each specific instrument has detailed instructions of the necessary steps to measure the parameter and translate the instrument reading into the specified parameter, i.e. level, pressure, and temperature.

Operators can also use local indicators to read parameters directly, if available.

## **AQ 5**

*NEI 12-06, Section 6.2.3.1, "Protection of FLEX Equipment," Option 1.c. permits storage of FLEX equipment below flood level if time is available and plant procedures/guidance address the needed actions to relocate the equipment. Section 3.2.1.7, "Event Response Actions," Principle 6 discusses that strategies that have a time constraint should be identified with a basis the time can reasonably be met.*

*NSPM is proposing to store the FLEX equipment at a location in buildings that are not designed to withstand an external flood because the flood hazard has ample warning time to allow deployment of FLEX equipment. NSPM noted that the planned new storage building will be located at an elevation that prevents a flood from impacting access to FLEX equipment during the early stages of the flood. NSPM did not provide the actual elevations for the new storage location relative to the maximum flood level, nor discussion regarding the time needed to move the equipment before either of the two storage buildings were flooded (except to say in the early stages of the flood).*

*Provide a discussion of the timing required for relocation of the FLEX equipment in order to provide a basis to show that time constraints can reasonably be met.*

NSPM Response

American Engineering Testing, Inc. (AET) was contracted to perform subsurface exploration for the siting of the FLEX storage building. Included in their report is an elevation map of the FLEX building. This map shows the elevation around the FLEX building to be approximately 919 feet mean sea level (MSL).

The map also shows the elevation of a proposed building site near Warehouse 6 that ultimately was not constructed. This map shows the elevation of the road near Warehouse 6 to be at approximately 932 feet MSL. A portion of Warehouse 6 is being used as the second location for storing FLEX equipment.

Based on projections for the Probable Maximum Flood, river height will reach 915.5 feet MSL at the end of day 4 and will reach 931.0 feet MSL at the end of day 7.

By procedural guidance, FLEX equipment stored in the FLEX building will be moved inside the berm if the projected river crest exceeds 919.0 feet MSL. FLEX equipment stored in Warehouse 6 will be moved inside the berm if the projected river crest exceeds 930.0 feet MSL. If the projected river crest exceeds 930.0 feet MSL, a portable diesel pump is staged to draw water from the CST to inject into the RPV and SFP.

**AQ 9**

*NEI 12-06, Section 8.3.2, "Deployment of FLEX Equipment," Consideration 2 discusses that provisions should be made for snow/ice removal to obtain and transport FLEX equipment from storage to its deployment location.*

*In its OIP, NSPM identified that the administrative program for deployment of the strategies will include elements to ensure pathways are clear or require actions to clear pathways, but did not provide the detail needed regarding the program and capabilities.*

*Provide a discussion regarding the snow/ice removal program and related capabilities.*

NSPM Response

The MNGP facilities group is responsible for the snow removal around the MNGP. Snow removal is performed with the front end loader stored in the FLEX storage building. The snow removal is performed by a contracting company in conjunction with MNGP mechanical maintenance personnel. The mechanical maintenance personnel operate both the front end loader and the forklift to remove debris during a FLEX event.

A MNGP procedure establishes the requirements and duties for snow removal and maintaining accessibility in support of FLEX strategies deployment. In the event of snow accumulation of equal or greater than 6 inch depth, the procedure provides the following guidance for clearing snow from areas to support deployment of FLEX strategies:

- All Entrances and Exits to Warehouse 6
- All Entrances and Exits to FLEX Equipment Storage Building
- Area Adjacent to the Discharge Canal

This area is to be cleared to support deployment of equipment near the concrete vehicle barrier wall, adjacent to the northeast corner of the Protected Area fence (area cleared is to be a minimum of 20 foot wide to provide a sufficient pathway for vehicles and FLEX equipment).

- Alternate Protected Area Access Port

This area, on east of the protected area fence line near trash compactors, is to be cleared to include the area between the inner and outer fences.

- All cleared areas are to have adequate ice melt applied on a periodic basis to maintain the pathways safe for travel to support the FLEX Strategy.
- Clear paths approximately 12 feet wide (or as needed) to support FLEX Portable Diesel Pump Deployment Paths and Staging Areas.
- Manhole cover by Intake

## AQ 23

*The integrated plan on pages 33 and 34 notes that the battery load shed analysis is preliminary and provides a high level summary of potential loads that can be shed and loads that will remain for the 125V and 250V DC batteries. It also notes that additional analysis will be accomplished and if the analysis results require a change in strategy this will be communicated in a six-month status update. Identify the six-month status report in which this information is to be provided. When accomplishing this further analysis, include a discussion of the following issues in the appropriate six month status update:*

*With regard to the load shedding of the dc bus in order to conserve battery capacity:*

a. *Provide the dc load profile for the mitigation strategies to maintain core cooling, containment, and spent fuel pool cooling during all modes of operation. In your response, describe any load shedding that is assumed to occur and the actions necessary to complete each load shed. Also provide a detailed discussion on the loads that will be shed from the dc bus, the equipment location (or location where the required action needs to be taken), and the required operator actions necessary and the time to complete each action. In your response, explain which functions are lost as a result of shedding each load and discuss any impact on defense-in-depth strategies and redundancy.*
b. *Identify any plant components that will change state if vital ac or dc power is lost or de-energized during the load shed. The NRC is particularly interested in whether a safety hazard is introduced, such as de-energizing the dc-powered seal oil pump for the main generator and allowing hydrogen to escape, which could contribute to risk of fire or explosion in the vicinity from the uncooled main turbine bearings.*
c. *Identify dc breakers that must be opened as a part of the load shed evolution.*
d. *Identify whether the dc breakers that must be opened will be physically identified by special markings to assist operators in manipulating the correct breakers.*

NSPM Response

A response to each of the four elements of the NRC question is provided below.

a) The load profile for the mitigating strategies to maintain core cooling, containment, and SFP cooling for the ELAP condition are in the cell sizing/load profiles from the calculations. The load shedding required is directed by procedure. The loads are located in the Division 1 - 125 Vdc Battery Room, Division 1 – 250 Vdc Battery Room, Division 2 - 125 Vdc Battery Room, which are in the PAB Basement, and Division 2 - D100, which is the first floor EFT

Building. Inverter Y20 is located on the 2nd floor of the EFT Building and inverters Y80 and Y84 are located on the 3rd floor of the EFT Building.

b) Plant procedures direct that 87 circuit breakers and fused disconnects are opened as part of the MNGP's deep load shed strategy; with these actions, hundreds of individual components are de-energized. NSPM assessed and documented the impact of the load shed concluded the credited systems are available and will operate acceptably following the deep DC Load Shed.

c) The DC Breakers to be opened as part of the mitigating strategy are controlled via a site procedure. The procedure directs that 87 circuit breakers and fused disconnect switches be opened as part of the load shed strategy.

d) The individual circuits to be shed have been labeled with reflective labels for operations to identify as FLEX support equipment.

**<u>AQ 24</u>**

*NEI 12-06, Section 3.2.1, "General Criteria and Baseline Assumptions" discusses the criteria and assumptions to be used in establishing the baseline coping capability.*

*On pages 33-34 of the OIP, NSPM states that "with this deep load shedding strategy, it is expected that the station batteries can be extended through Phase 1 and do not require portable supplemental charging before eight hours for the most limiting battery. Additional formal analysis will be performed to support this. If analysis results require a change in strategy, that change will be communicated in a six-month status report. This approach will reduce critical instrument diversity as only Division II of essential instrumentation will remain powered after load shedding."*

*Identify the six-month OIP update for NSPM set to provide the formal load shed and battery life extension analysis mentioned above and any resulting changes in strategy.*

NSPM Response

See response to AQ 23 for the load shed analysis. See CI 3.2.4.10.A for the length of time instrumentation will remain powered after load shedding.

## AQ 27

*NEI 12-06 Section 3.2.1.7, principle 6, specifies that strategies that have a time constraint to be successful should be identified and a basis provided that the time can reasonably be met. No technical basis or supporting analysis is provided for (1) why Action Item 5 (depressurization of the RCS to 100 psig) has no time constraint, (2) why depressurization is required prior to venting the Torus, (3) the rate of depressurization that would be implemented, or (4) that the resulting pressure or temperature conditions in the containment have been determined to be acceptable, e.g., for RCIC NPSH.*

*Provide additional information and analysis to address the gaps (1) through (4) identified above.*

NSPM Response

Each of the four bases is provided below:

1) RPV depressurization to 150 to 300 psig is performed in a controlled manner for the following reasons:
    a. RPV depressurization removes energy from the RPV
    b. Reducing RPV pressure reduces the time required to depressurize when low pressure pumps are required for RPV injection.
    c. RPV depressurization into the range of 150 to 300 psig does not impact RCIC injection capability
    d. RPV depressurization reduces the reactor coolant temperature, which ultimately reduces the fuel temperature.

   RPV depressurization is begun after an ELAP is declared as required by procedure. An ELAP is declared at or before one hour has elapsed following a station blackout. There is no time constraint, as the RPV depressurization in the range of 150 to 300 psig will take approximately two hours, and the earliest RPV injection with low pressure pumps is needed is approximately 11 hours.

2) The depressurization is required to reduce the energy within the RPV before reaching plant conditions for which the pressure suppression system (Torus) may not be able to safely accommodate Automatic Depressurization System (ADS) valves opening. If the pressure suppression pressure is exceeded depressurization is required.

3) The depressurization rate is procedurally restricted:

   Concurrent opening of all ADS valves is within analyzed plant design limits. Cool down rate is controlled to less than 100°F/hr unless a higher cool down rate (emergency depressurization) is required/allowed by the EOPs.

4) The resulting pressure or temperature conditions in the containment have been determined to be acceptable for RCIC NPSH. The maximum containment temperature is less than 300°F, ensuring SRV solenoid operability. The maximum containment pressure is less than the design temperature. The NPSH for RCIC is acceptable. The RCIC flow may need to be limited after the nitrogen overpressure is removed (i.e. when containment venting occurs).

**AQ 38**

*Battery Room Ventilation. With regard to ventilation, the licensee stated that "there are two strategies for venting the battery rooms. The primary strategy will be to repower the existing exhaust fan which is connected to the emergency power bus. The alternate strategy is to prop open doors and set up portable fans."*

*Provide a discussion of the hydrogen gas exhaust path for each strategy.*

NSPM Response

The primary strategy as described in AQ 38 has been abandoned. The strategy for Battery room ventilation is as follows.

During Phase 2 supplemental ventilation is provided for the Battery Rooms using portable ducting and fans for air circulation as necessary. Portable fans will need to be powered by a portable DG. 250V and 125V battery charger rooms require cooling when the battery charger is energized. Ventilation is provided by staging portable fans to circulate air through the rooms for cooling and to mitigate the potential for hydrogen buildup. By opening room doors and circulating air with portable fans, hydrogen is exhausted or sufficiently diluted to have no adverse effects.

## AQ 40

*Electrical Isolations and Interactions. NEI 12-06, Section 3.2.2, guideline (13) specifies that appropriate electrical isolation and interactions for portable equipment diesel generator should be addressed in procedures/guidance. In its integrated plan, NSPM provides no information on the electrical isolations of the portable diesel generators.*

*Describe how the portable/FLEX diesel generators and installed generators and switchgear are isolated to prevent simultaneously supplying power in order to conform to NEI 12-06, Section 3.2.2, guideline (13). Provide a discussion or analysis regarding electrical isolations when complete.*

*The following generic item questions represent information the NRC staff will need in order to assess the adequacy of the response to Order EA-12-049. The NRC staff is pursuing resolution of these issues under a separate effort; however, the questions listed below represent how these generic issues relate to the individual licensee Order EA-12-049 responses. Licensees are asked to review the generic items and consider how they will provide the information requested to the NRC staff in the future in coordination with the separate effort.*

NSPM Response

Each station battery charger required following an ELAP event was modified to install a 480 Vac receptacle and an input breaker for the receptacle. A mechanical interlock was added to each battery charger that allows either the normal AC input breaker to be closed or the input breaker from the 480 Vac receptacle to be closed, but not both. With only one input breaker closed, the 480 Vac receptacle is isolated from the normal AC input to the battery charger.

The MNGP FLEX procedures provide instructions for connecting the 480 Vac Portable DGs to essential battery chargers. Prior to connecting the power cable from the portable DG to the battery charger, the input breaker from the 480 Vac receptacle is verified to be in the OFF position, thus providing isolation between the portable DG and the normal supply to the battery charger.

MNGP FLEX procedures also provide instructions for powering the required station battery chargers from the portable DGs. For each battery charger, the first step is to verify both the Motor Control Center (MCC) supply breaker and the receptacle supply breaker are in the OFF position.

If access to the battery chargers is not available, the portable DG is used to supply the associated MCC. The procedures provide instructions for connecting the portable DG to the associated MCC. In each case, prior to connecting the portable

DG to the MCC, the MCC feeder breaker at the Load Center is verified to be in the OPEN position.

Maintaining either the battery charger supply breaker at the MCC in the OFF position or the MCC feeder breaker at the Load Center in the OPEN position provides electrical isolation between the FLEX portable DG and the normal switchgear, thus preventing simultaneously supplying electrical power to the battery charger or MCC from both the FLEX portable DG and the normal power supply.

Procedures are also provided to give guidance for installing the 4KV generator brought onsite by the National SAFER Response Center. Included in this guidance are instructions to ensure electrical isolation exists between the portable and permanently installed power supplies.

**AQ 41**

*The response discusses use of the HCVS line from the torus that will be opened to remove heat from the torus to reduce containment temperature for both Phase 1 and 2 strategies. On page 34, the discussion regarding nitrogen supplies, notes that, "HCVS usage includes breaking the rupture disc and operation of air operated valves."*

*Provide a discussion of valve operations and actions required to break the rupture disc to allow flow from the torus to the vent piping, number of operators required to accomplish this activity, and any special equipment or tools required to access and break the rupture disc. Discuss any access limitations that may result from any adverse environmental effects and how this will be mitigated.*

NSPM Response

The MNGP Emergency Operating Procedures (EOPs) for primary containment control are entered if drywell pressure exceeds 1.84 psig. The EOPs permit primary containment venting to maintain drywell pressure within the Drywell Pressure Limit. Primary containment venting is also permitted if primary containment pressure reduction is required to restore and maintain adequate core cooling or reduce the total offsite dose. The EOPs direct use of the HPV system to vent primary containment.

Procedures provide instruction for venting primary containment through the HPV. To supply Nitrogen to the HPV valves, AI-651, located in the TB, must be opened. If drywell pressure is below 50 psig, HS-4541 (at the Alternate Shutdown System (ASDS) panel) is used to open the rupture disc (PSD-4543). From the ASDS panel, AO-4540 and AO-4539 are opened to vent containment through the hard pipe vent. When venting is complete, AO-4540 and AO-4539 are closed from the ASDS panel.

Opening AI-651 requires one operator and does not require any special tools. Operating HS-4541 and manipulating AO-4539 and AO-4540 at the ASDS panel requires one operator. Keys for the hand switches on the ASDS panel are maintained along with procedural guidance in the MNGP CR.

Since manipulations occur in either the TB or the EFT Building, there are no adverse environmental effects associated with these tasks.

Nitrogen calculations to support hard pipe vent operation are described in CI 3.2.1.6.A. See CI 3.2.1.6.A for additional alternate nitrogen supply discussion.

## AQ 49

*The MNGP integrated plan for Phase 2 SFP makeup for the normal and emergency heat load case contains insufficient information to determine the adequacy of SFP cooling strategies and did not provide any details regarding providing makeup via the RHR spent fuel cooling piping to include the routing of hoses from the FLEX portable pump, location where the portable pump is connected to the system, and FLEX pump flow and pressure requirements and capabilities using this flow path.*

*Provide a discussion and analysis regarding how this strategy will be implemented considering the above factors and an analysis to show that the required flow can be delivered to the SFP with the planned deployment strategy.*

NSPM Response

The SFP normal and emergency heat load values and basis are provided in the response to AQ 51. Hose deployment strategies and makeup paths are described in the response to CI 3.2.1.4.A.

The USAR, section 10.2.2.3 provides the following regarding evaporation and flow rates associates with maintaining the SFP cooling level under emergency heat load conditions:

> *If fuel pool cooling capability is lost, the minimum possible time to achieve bulk pool boiling is 8.3 hours (assuming a maximum initial fuel pool temperature of 120°F). The maximum evaporation rate after bulk boiling commences is 53 gpm. 8.3 hours would be sufficient time to establish 53 gpm makeup rate from the Residual Heat Removal Service Water System (emergency makeup source).*

53 gpm is considered the maximum bounding makeup rate for the worst case loss of cooling to the SFP.

The decay heat at ~11.1 hours is 14.5 MW. Assuming all this energy goes into the latent heat of evaporation requires 139 gpm of make-up to the reactor per the following equation.

$$139 \text{ gpm} = \frac{\underline{14.5 \text{ MW} \times 3{,}412{,}000 \text{ BTU/hr/MW} \times 0.018182 \text{ ft}^3\text{/lb (300 psig)} \times 7.48 \text{ gal/ ft}^3}}{(60 \text{ min/hr} \times 804.9 \text{ BTU/hr (300 psig))}}$$

This assumes all the decay heat goes into boiling and no heat raises the water temperature to boiling.

Calculations described in CI 3.2.1.4.A show the FLEX PDPs (P-506, P-507) can supply flow rates greater than the sum of the SFP emergency make-up requirements and the boil off rate (139 + 53 = 192 gpm). The calculations also demonstrate that adequate flow is achieved from a single FLEX PDP when supplying both the SFP (makeup water (200 gpm) or spray water (250 gpm)) and the reactor (300 gpm of makeup water) at the same time.

Therefore, the FLEX PDPs can maintain SFP level and reactor level after 11.1 hours from the beginning of an ELAP event.

**AQ 51**

*The source of the information (reference) for the determination of emergency core off load heat load discussed above was not provided. The source of information for the normal heat load was the USAR.*

*Provide the appropriate reference.*

NSPM Response

The source for both the normal and emergency SFP heat load is the MNGP Updated Safety Analysis Report (USAR) Section 10.2.2.3. USAR section 10.2.2.3 states the following regarding SFP normal and emergency heat load:

*"The normal spent fuel pool heat load is evaluated using conditions such that would be expected during routine refuel shuffles and includes the heat load associated with a fully loaded 64 cell contingency fuel storage rack .... The Normal Heat Load for this condition is $5.55 \times 10^6$ Btu/hr for a discharge completed 216 hours after shutdown. The Emergency Heat Load is nominally $24.7 \times 10^6$ Btu/hr for conditions which are as defined as:*

*Emergency Heat Load - assumes full core discharge required 30 days following last refueling discharge and fills last 484 spaces; full core discharge is complete approximately 192 hours after shutdown."*

**AQ 53**

*In its integrated plan, NSPM relies on diesel fuel reserves from the diesel generator day tanks, and installed fuel transfer pumps. Additional information is required to determine if the areas of the plant containing fuel tanks and pumps are fully protected for probable maximum flood (PMF) events. This information is required in order to form the basis for conclusions with respect to conformance to the guidance of NEI 12-06, Section 3.2.1.3, initial condition (5).*

*Provide a discussion regarding protection of fuel supplies and pumping systems during PMF conditions.*

NSPM Response

The MNGP flood plan builds a horseshoe levee to connect with the currently installed bin walls thereby encircling and protecting the EDG buildings, fuel tanks and pump house that support the emergency diesels from flooding. These procedures form the response for MNGP flooding mitigation up to and including the PMF.

FLEX equipment stored in the FLEX building will be moved inside the berm if the projected river crest exceeds 919.0 feet MSL. FLEX equipment stored in Warehouse 6 will be moved inside the berm if the projected river crest exceeds 930.0 feet MSL. If the projected river crest exceeds 930.0 feet MSL, a PDP is staged to draw water from the CST to inject into the RPV and SFP. The MNGP flood response procedures provide for alternate access to the site by installing an additional gravel roadway, thereby allowing for access and delivery of necessary provisions including consumables, fuel, etc.

Specific guidance is provided to the operators for refueling the FLEX diesel equipment using several methods. These methods include:

- Refueling the portable FLEX equipment is performed using the installed emergency diesel generator day tanks (two tanks with a capacity of 1500 gallons each). Both day tanks are located in a Class 1 seismic structure and would be located inside the licensee constructed PMF levee and thus protected from flood waters.

- Refueling the portable FLEX equipment is performed using the fuel transfer cubes (FTCs) provided by the SAFER response. In the event of flooding the FTCs would be delivered to the site and stored inside the flooding berm.

**AQ 62**

*Page 14 states that when RCIC operation is no longer possible, the reactor will be fully depressurized using the SRVs.*

*Clarify the criteria that are used to determine whether RCIC operation is possible (e.g., fluid temperature, NPSH) and justify their adequacy. Include clarification as to whether the assessment of RCIC pump NPSH margin considers the potential for transient conditions associated with cyclical safety/relief valve discharge (potentially in the vicinity of the RCIC suction line) and containment venting while the suppression pool is saturated or nearly saturated. Provide a discussion of the methodology used to assure adequate NPSH for the RCIC pump and justify that it is adequate in light of the potential for limited margins and potentially significant transient phenomena.*

NSPM Response

From an operational point of view, RCIC would be run as long as possible (i.e., it would be run to failure). From an analysis point of view, NSPM assumed RCIC will run until the suppression pool temperature reaches approximately 250°F based on analysis and data recorded for Fukushima Unit 2.

An NPSH evaluation was performed for the conditions when no nitrogen overpressure is present (per Figure AQ 62 – 2 a minimum of approximately 20 psi is available in the suppression pool after the HCV is opened). This analysis concluded that margin existed for steady state conditions at all flow rates below 300 gpm for the suppression pool levels expected when the RCIC suction is connected to the suppression pool. The NPSH evaluation shows approximately 5 ft of NPSH margin at the flow rates necessary to make-up for boil off for the suppression pool level expected.

At Fukushima Dai-ichi, RCIC provided water to the reactor with a suppression pool temperature well above 250°F with no operator actions. This data suggests that transients associated with SRV actuations did not prevent RCIC operation. NSPM procedures will use multiple SRVs to remove decay heat from the reactor to the suppression pool.

The MAAP analysis shows that the opening vent reduces NPSH as the nitrogen overpressure is vented off with steam releases. The suppression pool temperature peaks at approximately 250°F following the initial venting. See Figures AQ 62 - 1 and AQ 62 – 2 for Suppression Pool Temperature and Pressure, respectively, during an ELAP event.

**Figure AQ 62 – 1 – MNGP Suppression Pool Temperature during ELAP Event**

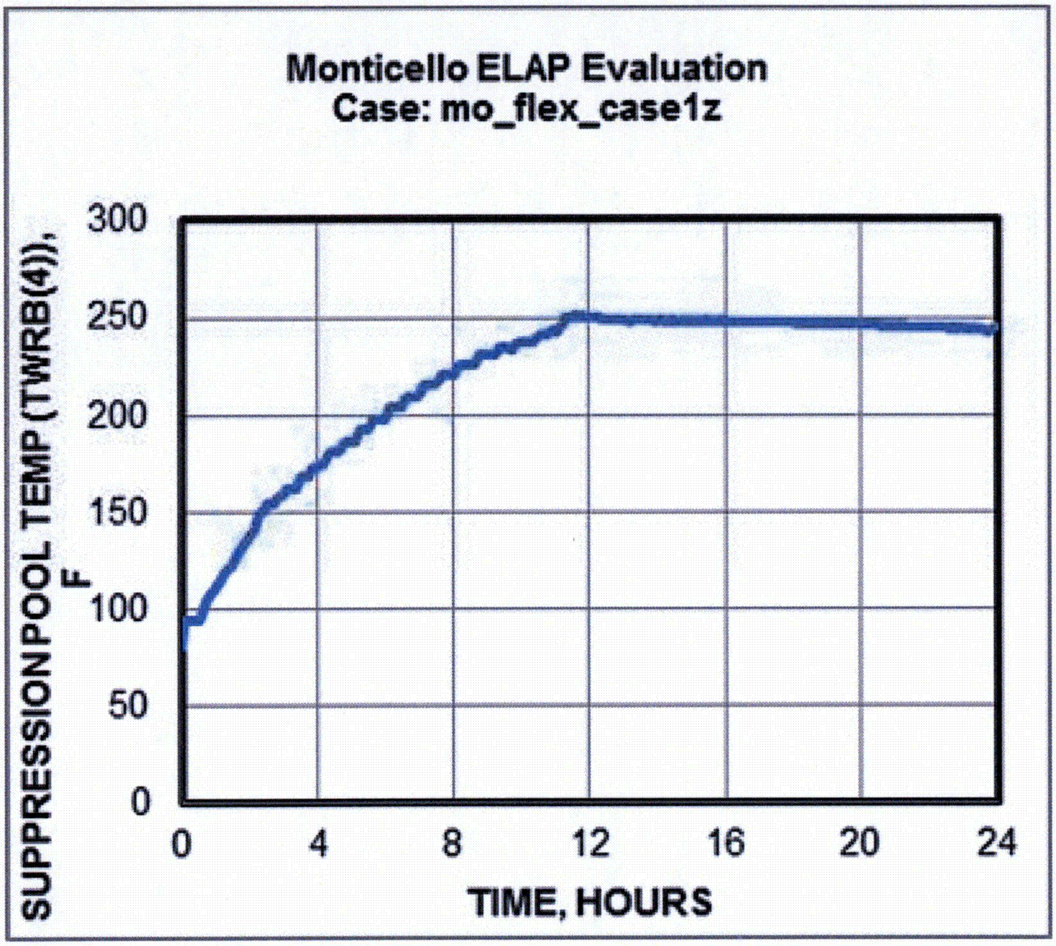
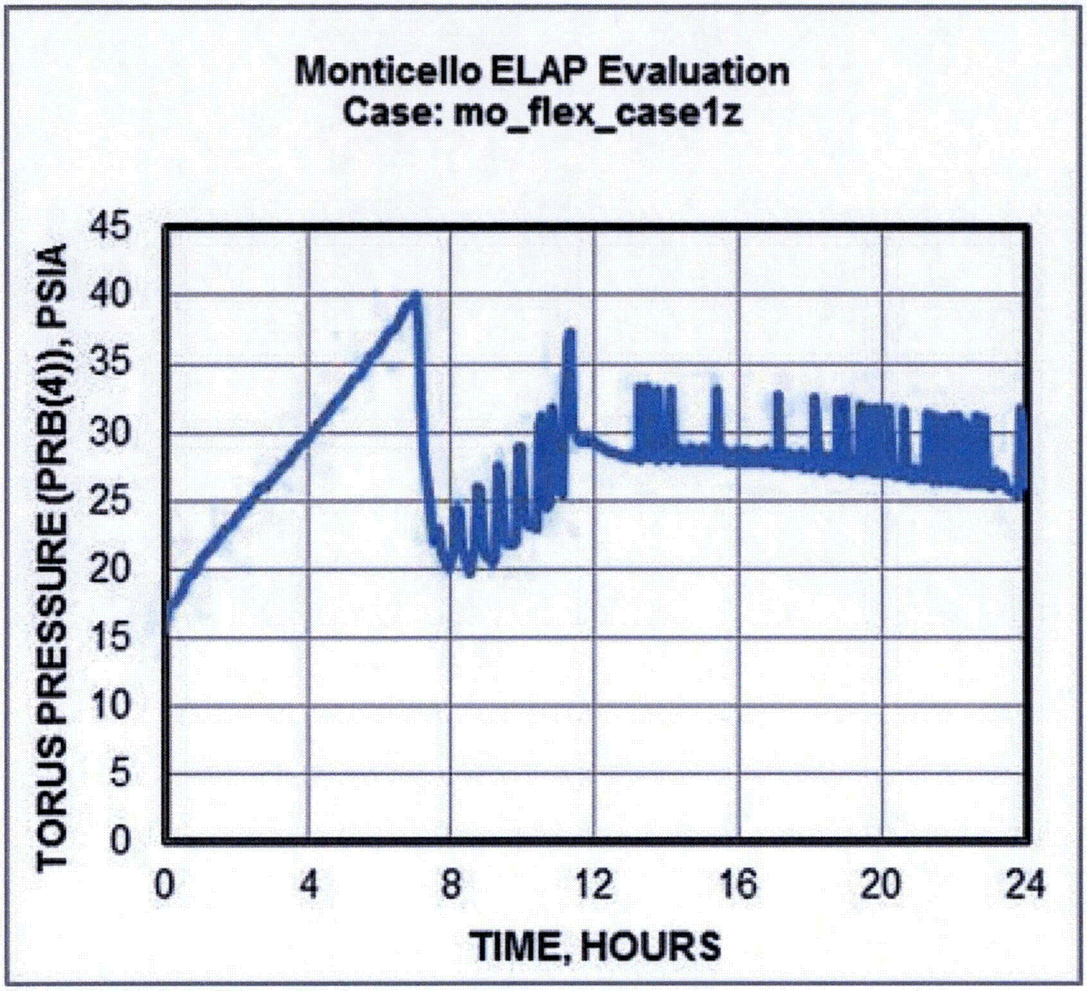


**Figure AQ 62 – 2 – MNGP Suppression Pool Pressure during ELAP Event**




Based on the RCIC operations at Fukushima Unit 2 and the NPSH margin present, NSPM expects that RCIC will not fail during the ELAP event as suppression pool temperature peaks at approximately 250.7°F. However, the strategy conservatively plans for the FLEX portable pump to be available when suppression pool temperature reaches 250°F.

**<u>AQ 63</u>**

*The information provided in the submittal suggests that a single FLEX pump may be used to provide cooling flow to multiple destinations (e.g., the reactor core, the suppression pool, and the spent fuel pool). Confirm that the FLEX pump can supply adequate flow and clarify whether the pumped flow will be split and simultaneously supplied to all destinations or whether the flow will be alternated between them. If simultaneous flow will be used, then clarify how the flow splits will be measured and controlled (i.e., whether control exists for the total flow on a common line or on lines to individual destinations) to ensure that adequate flow (i.e., sufficient but not excessive) reaches each destination.*

NSPM Response

A calculation was performed that confirmed that a minimum of 300 gpm of makeup water can be delivered to the RPV simultaneously with makeup water (200 gpm) or spray water (250 gpm) supplied to the SFP. Flow paths to both the RPV and SFP are through a combination of existing piping systems (RHR, RHRSW, FPC and FP) and interconnecting hoses in conjunction with a PDP.

RPV injection and SFP makeup instructions are provided by procedure. In all of the configurations, specific valves are identified and throttled to maintain, restore and balance the necessary makeup water flow for simultaneous flow to the RPV and SFP.

See CI 3.2.1.4.A for a full description of the hose deployment paths and the calculations supporting adequate flow to the RPV and SFP. Suppression pool cooling is not required as the suppression pool peak temperature peaks at approximately 250.7°F. See Figure OI 3.2.3.B – 3 and Figure AQ 62 – 1 for further details.

**AQ 65**

*Provide a discussion on the effects of heightened temperatures (i.e., temperatures above those assumed in the sizing calculation for each battery) on each battery's capability to perform its function for the duration of the ELAP event.*

NSPM Response

The vendor instruction manual for the 1E batteries states that heat accelerates chemical activity. The vendor states that higher-than-normal temperature has the following effects on a lead acid battery:

- Increase performance
- Increases internal discharge or local action losses
- Lower cell voltage for a given charge voltage
- Shortens life
- Increases water usage
- Increases maintenance requirements

Therefore, NSPM has concluded that the battery's capability to perform its function until a charger is placed in service will not be adversely impacted.

The effects of increased in cell electrolyte temperatures will have no appreciable effect on the magnitude of short-circuit current delivered by the battery. An increase cell temperature during an ELAP will not result in a challenge to the interrupting rating of the distribution system protective devices.

The maximum temperatures calculated in the battery rooms remained below the acceptance criterion of 120°F with forced ventilation being used.

## SE 4

*Please address the following items regarding the use of raw water sources for mitigating an ELAP event:*

a. *Please discuss the quality of the water (e.g., suspended solids, dissolved salts) that will be used for primary makeup during ELAP events, accounting for the potential for increased suspended or dissolved material in some raw water sources during events such as flooding or severe storms.*
b. *Please discuss whether instrumentation available during the ELAP event is capable of providing indication that inadequate core cooling exists for one or more fuel assemblies due to blockage at fuel assembly inlets or bypass leakage flow paths.*
c. *As applicable, please provide justification that the use of the intended raw water sources will not result in blockage of coolant flow across fuel assembly inlets and applicable bypass leakage flow paths to an extent that would inhibit adequate core cooling. Or, if deleterious blockage at the core inlet cannot be precluded under ELAP conditions, then please discuss alternate means for assuring the adequacy of adequate core cooling in light of available indications. For example, will ELAP mitigation procedures be capable of ensuring top-down cooling of the reactor core?*

NSPM Response

a. The raw water source for the Monticello plant is the Mississippi river. Portable FLEX pumps will draw water from the intake (behind the traveling screens) or the discharge canal after water has traversed though the travelling screens. The FLEX pump suction line is equipped with a filter that stops debris larger then 3/8" (see response to SE 9).

   The typical quality of the Mississippi river as measured near the Monticello plant:
   Specific Conductivity minimum/maximum/average (uS/em) = 276/667/415
   Total suspended Solids minimum/maximum/average (mg/l) = 1.1/13.4/4.1
   Suspend-Sediment sieve dia < 0.0625 mm (%) upstream average = 90%
   Suspend-Sediment sieve dia < 0.0625 mm (%) downstream average = 83%

   During a flood, the FLEX equipment will be moved inside the berm. Should an ELAP occur in this condition, the CSTs will be used as a source of water for the FLEX PDPs.

b. Reactor fuel blockage is very unlikely when RCIC is supplying water to the reactor. Furthermore, currently installed Reactor level indication instrumentation is available which will ensure adequate core cooling. These instruments will be used for monitoring level in all cases. When raw water is used, the reactor water level will be raised above the separator return elevation (spillover level) as discussed in the response below. This will ensure all fuel assemblies are covered with water even if water blockage occurs at the bottom of one or more bundles. See CI 3.2.1.8.C for further information.

c. When a portable pump is injecting water from the intake or the discharge canal, reactor fuel is adequately cooled if the reactor water level outside the shroud is maintained above the steam separator return elevation of approx. +48 inches. If fuel blockage occurs, the fuel can be cooled from water spilling over in the core through the steam separators. Procedures direct operators to maintain reactor water level in the range +55" to + 100".

   The portable pump will inject thru LPCI injection, thru the jet pumps into lower reactor head. Water will flow up into the fuel unless the flow is blocked by debris. In this condition, the fuel can still be adequately cooled with water spilling over through the separators. This is supported by BWROG-TP-14-006, Revision 0, "Raw Water Issue: Fuel inlet blockage from debris", March 2014. See CI 3.2.1.8.C for further information.

   In order to monitor for adequate cooling, reactor water level instruments are required (vessel flood instrumentation). Station batteries are still available during an ELAP and provide power to the reactor water level instruments. If power is lost, procedural guidance is available to provide instructions for local level measurement with hand held instruments.

**SE 5**

*Verify that appropriate human factors are applied for the implementation of the FLEX strategies.*

NSPM Response

NSPM personnel performed a validation of the FLEX strategies to define and document that personnel can perform the required tasks, manual actions, and decisions necessary to implement the FLEX strategies. The results of the FLEX strategies validation determined that the FLEX strategies are feasible and may be executed within the constraints of Order EA-12-049.

The purpose of the review was to ensure that adequate resources (personnel, equipment, materials) are available to implement the individual strategies to achieve the intended results of the FLEX strategies.

One of the Key Site Assumptions in the Monticello OIP is: "Deployment resources are assumed to begin arriving at hour six and fully staffed by 24 hours". These times were agreed to in discussions between with the NRC staff and are documented in NEI 12-01, "Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities", Section 2.2: Assumptions Common to Both Assessments.

Use of FLEX equipment requires personnel to be available to perform the following:

1) Select staging areas and deployment paths,
2) Debris removal from the deployment paths, if necessary,
    a. Move debris by hand,
    b. Move larger debris with a truck and chains, slings and come-alongs,
    c. Move largest debris with a front-end loader or large forklift,
3) Staging the FLEX equipment:
    a. The act of moving portable equipment from the FLEX buildings to the staging location,
    b. Laying out, and connecting cables for the FLEX diesel generators and hoses for the FLEX pump,
    c. Breaker manipulation, if necessary,
    d. Starting the diesel engines, starting the battery chargers and preparing the equipment to deliver water and electricity.

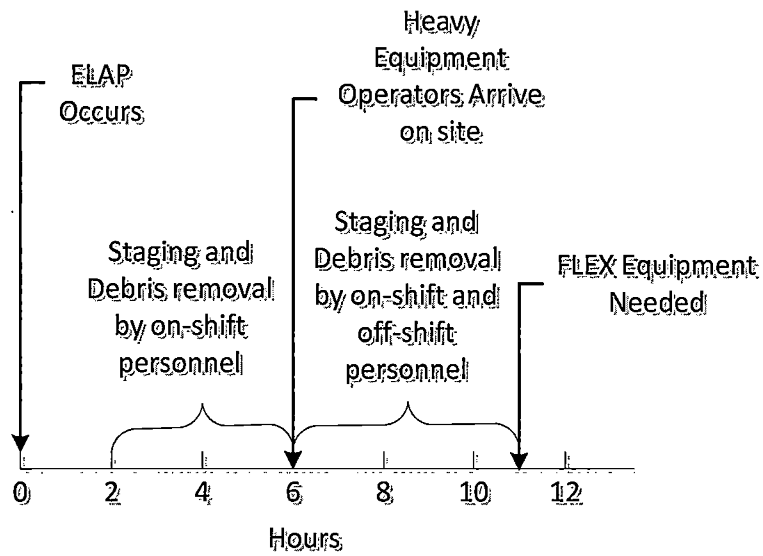
    Note: Staging of hoses and cables could begin before debris removal begins.

On-shift personnel can perform all the above tasks except for task 2)c. They are not qualified to operate the front-end loader or the large forklift (e.g. heavy equipment).

FLEX equipment, which includes a FLEX PDP, a 120 Vac portable DG and a 480 Vac portable DG, will not be needed before hour 11, based on MAAP analysis, load shedding and preliminary battery calculations.

Debris removal will begin as early as hour two by on-site personnel. The staffing study assumes that 3 members of the duty crew (operations, chemists and radiation protection personnel) are available to begin staging cables and hoses as well as performing debris removal. A truck, another piece of dedicated FLEX equipment, using chains and tow straps, can be used to begin moving debris prior to hour six. The staffing study identifies 10 person-hours available for staging/debris removal prior to hour six. These efforts will reduce the time required after hour six to complete staging and perform any additional debris removal required. See Figure SE 5-1 below.

**Figure SE 5-1 FLEX Timeline**




Staging the FLEX pump, a 120 Vac portable DG and a 480 Vac portable DG will require less than two hours. Hoses and cables can be staged by on-site personnel within the first six hours, reducing the post-six hour staging time by up to an hour. Between hour six and hour 11, there are five hours to remove any large debris and finish staging the FLEX PDP, a 120 Vac portable DG and a 480 Vac portable DG. The equipment will be ready for use between hour 10 and hour 11.

There are many mechanical maintenance employees that are qualified to operate the front-end loader and the large forklift. The mechanical maintenance employees are members of the emergency organization and carry pagers. The FLEX strategy assumes only one of these individuals arrives on-site at hour six and begins debris removal.

The site has a variety of equipment on-site, e.g., skid-steer loaders, cranes, trucks, forklifts, etc. For example, the site typically maintains two skid-steer loaders on-site for everyday work. These require less training to operate and more people have experience operating these than a front-end loader. The skid-steer loaders and other heavy equipment will not be credited in the FLEX program for debris removal, but could be used by on-site personnel in the first six hours to remove debris. On-shift personnel will not be trained on skid-steer loader operation as an individual can become modestly proficient with a skid-steer loader in 15 to 30 minutes. When not in use, one skid-steer loader will generally be stored in each FLEX building. A placard with basic operating instructions is provided with each skid-steer loader.

Based on the following:

1) the staging/debris removal by on-site personnel prior to hour six,
2) the large number of trained and qualified heavy-equipment operators,
3) heavy-equipment operators are paged as part of the ERO activation, and
4) the amount of time available after hour six for completion of debris removal,

it is reasonable to assume that a qualified individual will be available at hour six, if necessary to remove larger debris, and that the FLEX equipment will be available when it is needed.

**SE 6**

*Provide the basis for the minimum dc bus voltage that is required to ensure proper operation of all required electrical equipment.*

NSPM Response

Load flow and cell sizing analyses have been performed to assess the capability of the station batteries to support specific loads during ELAP event. For each calculation, a minimum battery terminal voltage was selected to assure the most limiting device minimum terminal voltage acceptance criteria was satisfied for those loads credited during the ELAP scenario.

The circuits and load descriptions considered for each battery are summarized below:

D1 125V Division I Station Battery
D11-06, RCIC Indication and Drain Solenoid Valves
D11-07, Evacuation Siren Control Power
D11-12, RCIC Logic
D11-17, Inboard Isolation Valve Relay Panel C-41

D2 125V Division II Station Battery
D21-05, HPCI Logic and Indication
D21-12, SRV Logic and Solenoids
D21-15, HPCI Logic

D3 250V Division I Station Battery
D31-06, Supply to N-3106 (Plant Evacuation Siren)
D31-08, Supply to D33
D31-10, MCC for RCIC MOVs
D31-12, Y71 Inverter
D33-01, RCIC MOV Contactor Circuits

D6 250V Division II Station Battery
D100-01, HPCI MOV Contactor Circuits
D100-03, SRV Logic and Solenoids
D100-04, Supply to C-292, ASDS
D100-05, Supply to C-303B, ECCS Analog Trip Unit
D100-11, MCC for HPCI MOVs
D100-12, Y81 Inverter

D7 250V Non-1E Station Battery
D71-01, Y91 UPS
D71-03, Emergency Seal Oil Pump Motor

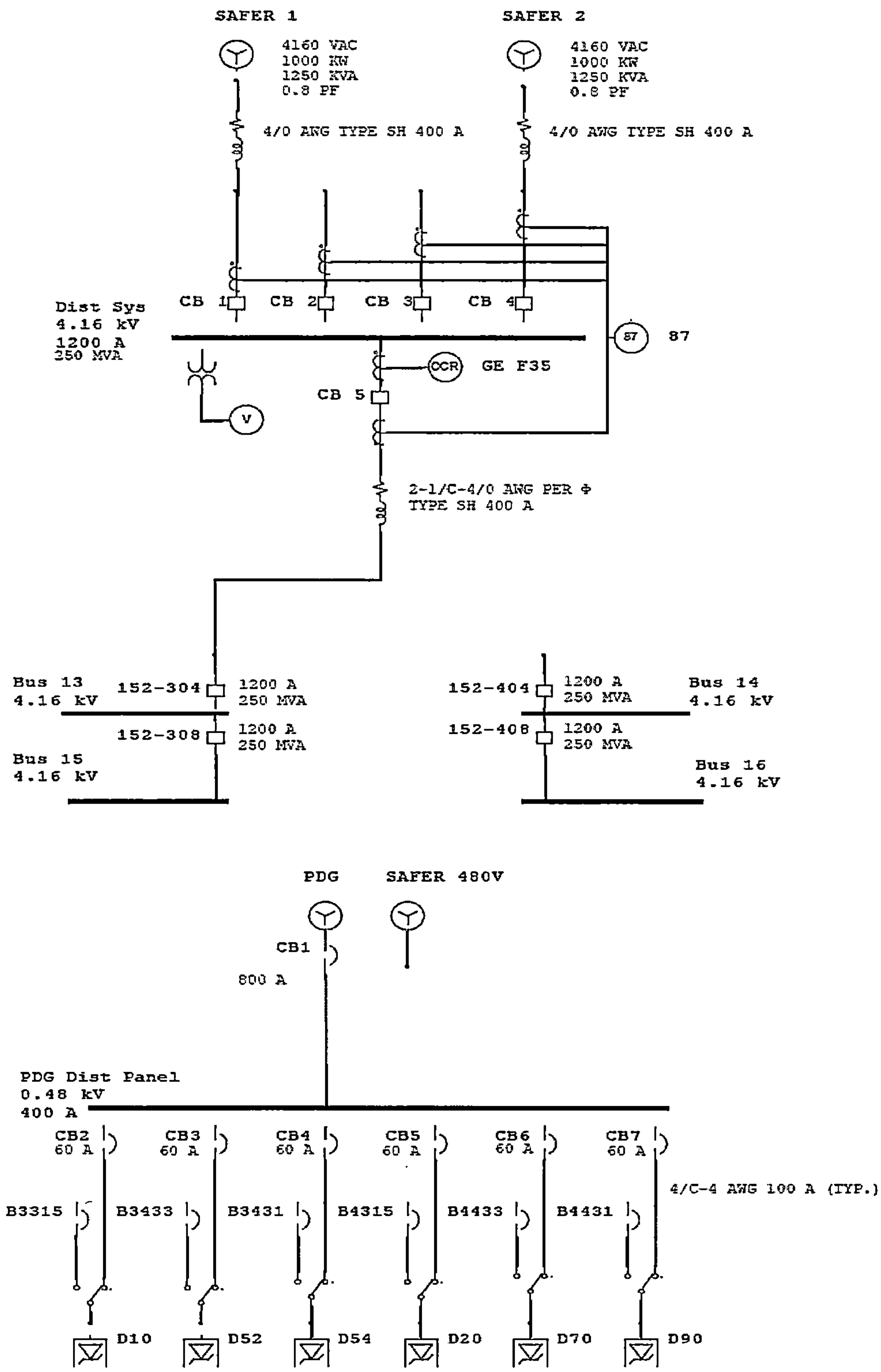
## SE 7

*Provide electrical Single Line Diagrams showing the proposed connections of Phase 2 and 3 electrical equipment to permanent plant equipment. Show protection information (breaker, relay etc.) and rating of the equipment on the Single Line Diagrams.*

NSPM Response

See Figure SE 7 - 1 below.

## Figure SE 7 – 1 – FLEX PDG/SAFER Single Line Diagram



## SE 8

*In the August 2014 update, the licensee discussed changing the portable FLEX pump connections to RHRSW from the Reactor Building to the Turbine Building. Confirm this change provides reasonable assurance that accessibility to at least one connection point of FLEX equipment is limited to seismically robust structures. This access includes both the connection point and any areas that plant operators will have to access to deploy or control the capability as required by NEI-12-06, Section 5.3.2. Consideration 2. Provide additional information to demonstrate conformance to NEI 12-06, Section 5.3.2, Consideration 2.*

NSPM Response

NEI 12-06, Section 5.3.2, Consideration 2 states:

> *"At least one connection point of FLEX equipment will only require access through seismically robust structures. This includes both the connection point and any areas that plant operators will have to access to deploy or control the capability."*

All Class I structures are shown in Table SE 8 - 1.

The connection points for FLEX PDPs and portable DGs are located in Class I structures (see Figure SE 8 - 1). The portions of the MNGP TB that support electrical controls and instrumentation for Class I equipment were designed in accordance with criteria for design of portions of Class I structures enclosing Class I equipment for seismic loads. This includes the portion of the TB below elevation 951'0".

The portable FLEX pump connection to RHRSW is located below the TB 951'0" elevation.

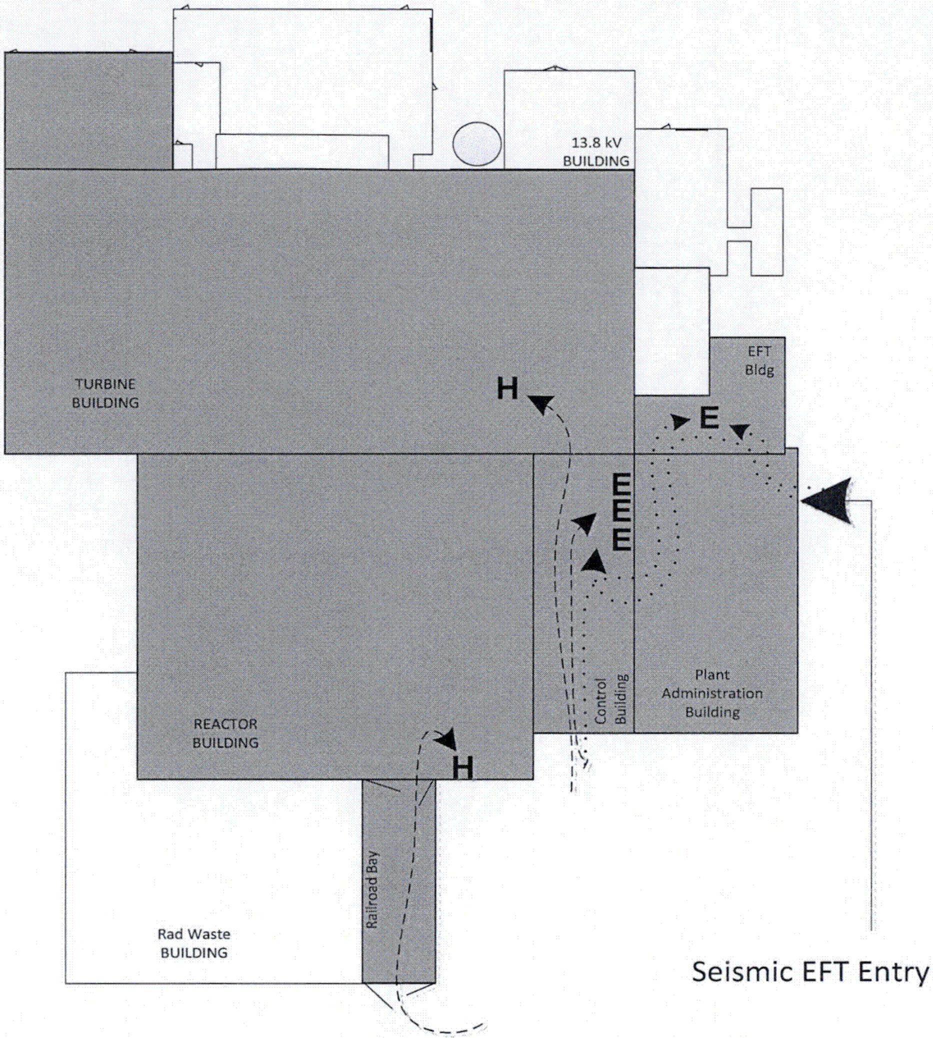
The Reactor Building railroad bay is part of the Radwaste Building (see Table SE 8 - 1). The Rail Car Shelter (or railroad bay) portion of the building has been evaluated for a Safe Shutdown Earthquake (SSE) event to assure that it will remain intact in an SSE. Thus, the Rail Car Shelter is considered seismically robust for FLEX, even though the Radwaste Building is a Class II structure.

Electrical cables to the Division I battery chargers and the 125V Division II battery charger will be run through the seismically robust control building. Both paths to the Division II 250 V battery chargers must pass through the PAB (See Table SE 8 - 1) to get to the EFT Building. The PAB has been evaluated for a SSE event to assure that it will remain intact in an SSE. Thus, the PAB is considered seismically robust for FLEX, even though the PAB is classified as a Class II structure.

**Table SE 8 – 1 – MNGP Class I Structures**

| **MNGP Class I Structures**<br>**Pertinent structures only as discussed in the USAR Section 12.2** | |
|---|---|
| Structure | FLEX Strategy Significance |
| Reactor Building (up to Operating Floor-1027-foot 8-inch) | Connection points for SFP and Reactor |
| Plant Control and Cable Spreading Structure (a portion of the PAB) * | Connection points for Division I SR batteries and Division II 125 V SR battery |
| Parts of TB Housing Class I Equipment | Connection points for SFP and Reactor |
| EFT Building | Connection points for Division II 250 V SR battery |
| Railroad Bay (or Rail Car Shelter) ^ | Deployment path for hoses to support FLEX strategy |
| * The PAB is made up of two areas: a seismic I section - Plant Control and Cable Spreading Structure and the old office building which is a Class II structure. The structure was analyzed to withstand design basis earthquake in accordance with Class I design criteria set forth in USAR Section 12.2.1.4 to prevent failure of the fire main and subsequent internal flooding of the battery rooms. The resulting forces and displacements from the dynamic analysis of the entire Office and Control Building were used in the analysis of the old office building. | |
| ^ The Railroad Bay occupies a portion of the Radwaste Building. Per USAR Section 12.2.1.3, the Radwaste Building is a Class II structure, and was not evaluated for the Design Basis Earthquake (DBE). However, to ensure a spent fuel cask was not damaged in the event of a DBE, the Rail Car Shelter was evaluated for a DBE. The results of the calculation determined that the Rail Car Shelter would stay intact and not collapse on to a spent fuel cask due to a DBE. Thus, since it has been demonstrated that the Rail Car Shelter will remain intact due to a DBE, and will provide a viable pathway for FLEX hoses into the Reactor Building. | |

**Figure SE 8 – 1 – FLEX Hose and Cable Deployment Paths**




Legend

**H** Hose connection location

**E** Electrical connection location

---------Seismic I Hose and electrical Connection Path

· · · · · ·Seismic I ElectricalConnection Path

Seismic I Building

**SE 9**

A. *Discuss the design of the suction strainers used with FLEX pumps taking suction from raw water sources, including perforation dimension(s) and approximate surface area.*
B. *Provide reasonable assurance that the strainers will not be clogged with debris (accounting for conditions following, flooding, severe storms, earthquakes or other natural hazards), or else that the strainers can be cleaned of debris at a frequency that is sufficient to provide the required flow. In the response, consider the following factors:*
   i. *The timing at which FLEX pumps would take suction on raw water relative to the onset and duration of the natural hazard.*
   ii. *The timing at which FLEX pumps would take suction on raw water relative to the timing at which augmented staffing would be available onsite.*
   iii. *Whether multiple suction hoses exist for each FLEX pump taking suction on raw water, such that flow interruption would not be required to clean suction strainers.*

NSPM Response

A. Suction Strainer design: (See CI 3.2.1.4.A for flow calculations. See CI 3.2.1.8.C for strainer use.)

   The suction strainer is 13.75" long, 6" diameter, with 950 - 3/8" holes. It is a floating strainer that is designed to float at a depth of 1ft. It is assumed that the suction strainer is maintained relatively clear of debris. Significant margin exists in the strainer geometry (an open area of approximately 105 $in^2$ vs. a 6 in pipe cross section of 28 $in^2$), such that small amounts of debris blockage can be tolerated with negligible impact on the pressure drop across the strainer. The pump suction strainer can be manually cleaned if clogged.

B. See response to SE 4 for FLEX pump suction sources during flooding conditions and typical Mississippi River water quality data. This data has been gathered at locations near MNGP.

   The FLEX PDP is expected to be ready for use 10.5 hours after the ELAP event occurs and 4.5 hours after augmented staff will be available. One of the two available pumps and respective strainers will be available as one is stored in each storage building. The pump will not need to run continuously as the pump capacity exceeds the flow required in the reactor and the SFP and levels maintained will have considerable margin. Therefore, interruptions in flow will not adversely affect the fuel to be adequately cooled, allowing the pump to be shut down and the strainer cleaned, as required.

During a flood, the FLEX equipment will be moved inside the berm. Should an ELAP occur in this condition, the CSTs will be used as a source of water for the FLEX pumps.