Exelon Generation.

Order No. EA-12-049

RS-15-117

June 8, 2015

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

Nine Mile Point Nuclear Station, Unit 1
Renewed Facility Operating License No. DPR-63
NRC Docket No. 50-220

Subject: Report of Full Compliance with March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)

References:

1. NRC Order Number EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements For Mitigation Strategies For Beyond-Design-Basis External Events," dated March 12, 2012
2. NRC Interim Staff Guidance JLD-ISG-2012-01, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," Revision 0, dated August 29, 2012
3. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, dated August 2012
4. Letter from M. G. Korsnick (CENG) to Document Control Desk (NRC), Initial Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated October 26, 2012
5. Letter from M. G. Korsnick (CENG) to Document Control Desk (NRC), 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), dated February 28, 2013
6. Letter from M. G. Korsnick (CENG) to Document Control Desk (NRC), Supplement to 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), dated March 8, 2013
7. Letter from E. D. Dean (CENG) to Document Control Desk (NRC) Six Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated August 27, 2013

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8. Letter from M. G. Korsnick (CENG) to Document Control Desk (NRC), February 2014 Six Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated February 27, 2014
9. Letter from M. G. Korsnick (CENG) to Document Control Desk (NRC), August 2014 Six Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated August 26, 2014
10. Letter from M. G. Korsnick (CENG) to Document Control Desk (NRC), February 2015 Six Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated February 19, 2015
11. NRC letter from J. S. Bowen (NRC) to J. A. Spina (CENG), Nine Mile Point Nuclear Station, Units 1 and 2 – Interim Staff Evaluation Relating to Overall Integrated Plans in Response to Order EA-12-049, (Mitigation Strategies) (TAC Nos. MF1129 and MF1130), dated December 19, 2013
12. NRC Letter, 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
13. Letter from M. G. Korsnick (CENG) to Document Control Desk (NRC), Response to March 12, 2012, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, Enclosure 5, Recommendation 9.3, Emergency Preparedness – Staffing, Requested Information Items 1, 2, and 6 - Phase 2 Staffing Assessment, dated November 17, 2014

On March 12, 2012, the Nuclear Regulatory Commission ("NRC" or "Commission") issued Order EA-12-049, "Order Modifying Licenses with Regard to Requirements For Mitigation Strategies For Beyond-Design-Basis External Events," (Reference 1) to Exelon Generation Company, LLC (EGC), known previously as Constellation Energy Nuclear Group, LLC (Exelon, the licensee) for Nine Mile Point Nuclear Station, Unit 1. Reference 1 was immediately effective and directed EGC to develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event. Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 required submission of an initial status report 60 days following issuance of the final interim staff guidance (Reference 2) and an Overall Integrated Plan (OIP) pursuant to Section IV, Condition C. Reference 2 endorsed industry guidance document NEI 12-06, Revision 0 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the EGC initial status report regarding mitigation strategies. References 5 and 6 provided the Nine Mile Point Nuclear Station, Unit 1 OIP.

Reference 1 required submission of a status report at six-month intervals following submittal of the OIP. References 7, 8, 9, and 10 provided the first, second, third, and fourth six-month status reports, respectively, pursuant to Section IV, Condition C.2, of Reference 1 for Nine Mile Point Nuclear Station, Unit 1.

The purpose of this letter is to provide the report of full compliance with the 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) (Reference 1) pursuant to Section IV, Condition C.3 of the Order for Nine Mile Point Nuclear Station, Unit 1.

Nine Mile Point Nuclear Station, Unit 1 has developed, implemented, and will maintain the guidance and strategies to maintain or restore core cooling, containment function, and spent fuel pool cooling capabilities in the event of a beyond-design-basis external event in response to Order EA-12-049. The information provided herein documents full compliance for Nine Mile Point Nuclear Station Unit 1, with Reference 1.

EGC's response to the NRC Interim Staff Evaluation (ISE) open and confirmatory items identified in Reference 11 have been addressed and closed as documented in References 7, 8, 9, and 10, and below, and are considered complete pending NRC closure. OIP open items have been addressed and closed as documented in References 7, 8, 9, and 10, and below, and are considered complete pending NRC closure. The following tables provide completion references for each OIP open item and NRC ISE open or confirmatory item.

Overall Integrated Plan Open Items

OIP Open Item	Completion Response Reference
OIP Open Item No. 1	Reference 8
OIP Open Item No. 2	Reference 10
OIP Open Item No. 3	Reference 10
OIP Open Item No. 4	Reference 10
OIP Open Item No. 5	Reference 7
OIP Open Item No. 6	Reference 10
OIP Open Item No. 7	Deleted – Addressed in Reference 9
OIP Open Item No. 8	Reference 10
OIP Open Item No. 9	Reference 8 and updated with this submittal as provided below
OIP Open Item No. 10	Reference 10
OIP Open Item No. 11	Reference 9
OIP Open Item No. 12	Reference 10
OIP Open Item No. 13	Reference 10 and updated with this submittal as provided below
OIP Open Item No. 14	Reference 10
OIP Open Item No. 15	Reference 10
OIP Open Item No. 16	Reference 10
OIP Open Item No. 17	Reference 10
OIP Open Item No. 18	Reference 7 and updated with this submittal as provided below
OIP Open Item No. 19	Reference 10 and updated with this submittal as provided below
OIP Open Item No. 20	Reference 7 and updated with this submittal as provided below
OIP Open Item No. 21	Reference 8 and updated with this submittal as provided below
OIP Open Item No. 22	Reference 9 and updated with this submittal as provided below
OIP Open Item No. 23	Reference 8 and updated with this submittal as provided below
OIP Open Item No. 24	Reference 10
OIP Open Item No. 25	Reference 10
OIP Open Item No. 26	Reference 10
OIP Open Item No. 27	Reference 9 and updated with this submittal as provided below

OIP Open Item	Completion Response Reference
OIP Open Item No. 28	Reference 10
OIP Open Item No. 29	Reference 10
OIP Open Item No. 30	Deleted – Addressed in Reference 9
OIP Open Item No. 31	Deleted – Addressed in Reference 9
OIP Open Item No. 32	Deleted- Addressed in Reference 9
OIP Open Item No. 33	Reference 10
OIP Open Item No. 34	Reference 9
OIP Open Item No. 35	Reference 10
OIP Open Item No. 36	Deleted – Addressed in Reference 9
OIP Open Item No. 37	Reference 9
OIP Open Item No. 38	Reference 10
OIP Open Item No. 39	Reference 10
OIP Open Item No. 40	Reference 9
OIP Open Item No. 41	Deleted – Addressed in Reference 7
OIP Open Item No. 42	Reference 9
OIP Open Item No. 43	Deleted – Addressed in Reference 7
OIP Open Item No. 44	Deleted – Addressed in Reference 7
OIP Open Item No. 45	Deleted – addressed in Reference 7
OIP Open Item No. 46	Reference 8
OIP Open Item No. 47	Deleted – Addressed in Reference 9
OIP Open Item No. 48	Deleted – Addressed in Reference 7
OIP Open Item No. 49	Reference 10
OIP Open Item No. 50	Reference 8 and updated with this submittal as provided below
OIP Open Item No. 51	Deleted – Addressed in Reference 7
OIP Open Item No. 52	Deleted - Addressed in Reference 9
OIP Open Item No. 53	Reference 8 and updated with this submittal as provided below
OIP Open Item No. 54	Reference 9 and updated with this submittal as provided below
OIP Open Item No. 55	Reference 9 and updated with this submittal as provided below
OIP Open Item No. 56	Deleted - Addressed in Reference 10
OIP Open Item No. 57	Reference 10 and updated with this submittal as provided below
OIP Open Item No. 58	Reference 8 and updated with this submittal as provided below
OIP Open Item No. 59	Reference 8 and updated with this submittal as provided below
OIP Open Item No. 60	Deleted – Addressed in Reference 9
OIP Open Item No. 61	Deleted – Addressed in Reference 9

Interim Staff Evaluation Open Items

Item No. 3.1.1.3.A	Reference 10
Item No. 3.2.1.3.A	Reference 10

Interim Staff Evaluation Confirmatory Items

Item No. 3.1.1.1.A	Reference 10
Item No. 3.1.1.2.A	Reference 10
Item No. 3.1.1.4.A	Reference 10
Item No. 3.2.1.1.A	Reference 9
Item No. 3.2.1.1.B	Reference 9
Item No. 3.2.1.1.C	Reference 9
Item No. 3.2.1.1.D	Reference 9
Item No.3.2.1.1.E	Reference 9
Item No. 3.2.1.2.A	Reference 10
Item No. 3.2.3.A	Reference 9
Item No. 3.2.3.B	Reference 9
Item No. 3.2.4.2.A	Reference 9
Item No. 3.2.4.2.B	Reference 10
Item No. 3.2.4.4.A	Reference 10
Item No. 3.2.4.4.B	Reference 9 and updated with this submittal as provided below
Item No. 3.2.4.6.A	Reference 10
Item No. 3.2.4.8.A	Reference 10
Item No. 3.2.4.8.B	Reference 10
Item No. 3.2.4.9.A	Reference 10
Item No. 3.2.4.10.A	Reference 10
Item No. 3.4.A	Reference 10
Item No. 3.4.B	Reference 10

NRC Audit Questions/Audit Report open items are considered complete pending NRC closure. It is EGC's understanding that the NRC Audit Report contains one remaining audit open item (SE Tracker Item 8-E) regarding the Nine Mile Point Nuclear Station, Unit 1 compliance with NRC Order EA-12-049. The information necessary to close this item has been provided to the NRC Staff for review and in this submittal as provided below.

The table below documents the completion of the final remaining open actions as identified in Reference 10, and above. As stated above, EGC provides the response for the following items and considers them to be complete for Nine Mile Point Nuclear Station, Unit 1.

Item	Description	Reference
OIP Open Item No. 9	NMP1 compliance is based on the current capability for on-site communications utilizing hand-held 450MHz radios in the radio-to-radio or 'talk-around' mode with sound powered phones as a backup to meet FLEX requirements. Small portable generators that are stored in the FLEX Storage Building will be used to recharge radio batteries as needed. The evaluation of the Uninterruptible Power Supply (UPS) strategy for	Complete

Item	Description	Reference
	the NMP radio system is complete. Installation of an Uninterruptible Power Supply for support of the NMP1 and NMP2 Radio Communication system will be complete by 12/31/2016 to support NMP2 compliance.	
OIP Open Item No. 13	S-PM-FLEX FLEX- EQUIPMENT INVENTORIES AND CHECKLISTS was issued on 03/20/2015. This procedure provides an inventory of materials necessary to support the various FLEX strategies and their designated locations in FLEX Storage Building, NMP1 Turbine Building, Screenwell Building, Main Control Room, and Reactor Building.	Complete
OIP Open Item No. 18	CC-NM-118-1001, SAFER Response Plan for Nine Mile Point Nuclear Station, was issued 03/24/2015	Complete
OIP Open Item No. 19	At Nine Mile Point, Site Buildings and Grounds personnel are tasked with keeping roadways clear of snow and ice and do so using their "Snow and Ice Removal Plan & Winter Contingency Plan". They have been provided with a Site map showing the Primary and Alternate FLEX deployment paths. These paths are currently included in their Snow and Ice Removal Plan. In addition, new BDB No Parking signs have been placed throughout the NMP1 deployment paths advising personnel that these areas must be kept clear. This was completed 3/31/2015. In addition, CC-NM-118-101 Beyond Design Basis Administrative Controls, Attachment 5 Site Deployment Paths and Assessment Criteria, describes requirements for ensuring deployment pathways are maintained clear and it defines how the routes will be posted and maintained. It was issued on 4/02/2015.	Complete
OIP Open Item No. 20	S-PM-001 AND S-PM-005, FLEX 3419MX WATER PUMP TEST procedures were developed to provide instructions for performing periodic testing on the BDB FLEX Water Pump. S-PM-003, 450 KW PORTABLE DIESEL GENERATOR TEST, provides instructions for performing periodic testing on the FLEX 450 KW	Complete

Item	Description	Reference
	Portable D/G. These procedures were issued on 4/02/2015.	
OIP Open Item No. 21	Exelon procedure OU-AA-103 Shutdown Safety Management Program outlines actions under Contingency Plans to consider the use of FLEX equipment and when it may be appropriate to pre stage FLEX equipment.	Complete
OIP Open Item No. 22	A Case 621 wheeled loader is the primary debris removal vehicle and it was refurbished in March of 2015 and is staged in the robust FLEX Storage Building.There is also a John Deere JD6115D four-wheel drive tractor that is equipped with a snow removal blade in the winter and a front end loader in the summer that would be capable of assisting in debris removal if needed; this was staged in the FLEX Storage Building on 04/02/2015.	Complete
OIP Open Item No. 23	NMP1 Emergency Operating Procedures (EOPs) were upgraded to EPSAGs revision 03 and issued on 04/03/2015.	Complete
OIP Open Item No. 27	The design change to provide a modification at NMP1 that will provide a make-up to the Emergency Condensers with a FLEX portable pump (ECP-13-001034) was completed on 04/02/2015.	Complete
OIP Open Item No. 50	The design change to provide permanent suction hose access points for FLEX portable pump suction (ECP-13-001036) at NMP1 was completed on 04/02/2015.	Complete
OIP Open Item No. 53	The design change to provide a modification that will provide a make-up at NMP1 to the SFP with a FLEX portable pump (ECP-13-001036) was completed on 04/02/2015.	Complete
OIP Open Item No. 54	NMP1 procedure N1-DRP-FLEX-MECH - Emergency Damage Repair-BDB/FLEX Pump Deployment Strategy was issued on 3/20/2015. Section 6.4 Spent Fuel Pool Makeup and Spray With BDB/FLEX Pumps establishes the Primary and Alternate methods.	Complete
OIP Open Item No. 55	NMP1 procedure N1-SOP-33A.2 – STATION BLACKOUT/ELAP was issued on 04/02/2015. The flow chart, in the immediate actions section,	Complete

Item	Description	Reference
	directs initiation of the Emergency Condensers and closure of the Main Steam Isolation Valves.	
OIP Open Item No. 57	Timed validation of deploying the FLEX portable diesel driven pump and associated suction and discharge hose for NMP1 was completed on 03/21/2015. The Validation Plan contained sub tasks necessary to provide make-up to the RPV which were validated on earlier dates. The total aggregate time for completing the FLEX pump deployment to support Reactor Pressure Vessel make-up was 1hr 40 min.	Complete
OIP Open Item No. 58	The design change to provide a modification for NMP1 that provides a make-up connection into the Control Rod Drive system return line to the Reactor Pressure Vessel for use with a FLEX portable diesel driven pump (ECP-13- 001034) was completed on 04/02/2015.	Complete
OIP Open Item No. 59	The design change to implement a modification for NMP1 to connect a portable diesel generator and portable battery charger to Battery 11 and Battery 12 (ECP-12-000658) was completed on 04/02/2015.	Complete
ISE Confirmatory Item No. 3.2.4.4.B	Communication equipment necessary to support FLEX strategy implementation at NMP1 is in place. Initial communication announcements to on-site personnel during a BDB external event will be via the Plant Paging and Announcement system which are battery backed-up. If the Plant Paging and Announcement system is not available for on-site communications, bullhorns are available in the FLEX Storage Building for use for notification of site personnel. Onsite communications can be performed using either the installed sound powered phone system or the 450 MHz hand held radios utilized in the 'talk-around' or radio-to-radio mode of operation. Offsite communications can be made utilizing portable satellite phones staged in each NMP Main Control Room and Technical Support Center. Spare batteries and battery chargers for portable communications equipment can be powered from the small portable generators that are stored in the FLEX Storage Building.	Complete

Item	Description	Reference
Nov. 2014 FLEX Audit SE Tracker Item 8-E (new)	EPRI Templates are used for equipment where applicable. However, in those cases where EPRI templates were not available, Preventative Maintenance (PM) actions were developed based on manufacturer provided information/ recommendations and Exelon fleet procedure ER-AA-200, Preventive Maintenance Program. Detailed information on FLEX and FLEX support equipment PMs is contained in FLEX program document CC-NM-118 Section 4.4. FLEX equipment testing procedures contain inspection and test criteria for functional and performance tests per the frequency determined. A summary of the FLEX electrical component PMs, associated test and acceptance criteria, and items with shelf life limits is provided on the eportal for NRC staff review.	Complete

MILESTONE SCHEDULE – ITEMS COMPLETE

Milestone	Completion Date
Submit 60 Day Status Report	October 26, 2012
Submit Overall Integrated Plan	February 28, 2013
Contract with National SAFER Response Center	March 3, 2015
Six Month Integrated Plan Progress Report	August 27, 2013
Engineering and Design Completion – Equipment Storage Facility	November 2014
Six Month Integrated Plan Progress Report	February 27, 2014
Engineering and Design Completion – Portable Equipment Connections	August 2014
Six Month Integrated Plan Progress Report	August 26, 2014
Six Month Integrated Plan Progress Report	February 19, 2015
Non-Outage Installation – Portable Equipment Connection	March 2015
Validation Walkdowns Complete	March 2015
Portable Equipment Procedures Changes	March 2015
FLEX Training	April 2015
Outage Installation – Portable Equipment Connections	April 2015
Equipment Storage Facility Installation	April 2015
Final Implementation Notification to USNRC (with this submittal)	June 2015

ORDER EA-12-049 COMPLIANCE ELEMENTS SUMMARY

The elements identified below for Nine Mile Point Nuclear Station, Unit 1 as well as the site OIP response submittal (References 5 and 6), the 6-Month Status Reports (References 7, 8, 9, and 10), and any additional docketed correspondence, demonstrate compliance with Order EA-12-049.

Strategies - Complete

Nine Mile Point Nuclear Station, Unit 1 strategies are in compliance with Order EA-12-049. There are no strategy related Open Items or Confirmatory Items. It is EGC's understanding that the NRC Audit Report contains one remaining audit open item (SE Tracker Item 8-E) regarding the Nine Mile Point Nuclear Station, Unit 1 compliance with NRC Order EA-12-049. The information necessary to close this item has been provided to the NRC Staff for review and in this submittal. The Nine Mile Point Nuclear Station, Unit 1 Final Integrated Plan for mitigating strategies is provided with this letter as Enclosure 1.

Modifications - Complete

The modifications required to support the FLEX strategies for Nine Mile Point Nuclear Station, Unit 1 have been fully implemented in accordance with the station design control process.

Equipment – Procured and Maintenance & Testing – Complete

The equipment required to implement the FLEX strategies for Nine Mile Point Nuclear Station, Unit 1 have been procured in accordance with NEI 12-06, Section 11.1 and 11.2, received at Nine Mile Point Nuclear Station, Unit 1, initially tested/performance verified as identified in NEI 12-06, Section 11.5, and is available for use.

Maintenance and testing will be conducted through the use of the Nine Mile Point Nuclear Station, Unit 1 Preventative Maintenance program such that equipment reliability is maintained.

Protected Storage – Complete

The storage facilities required to implement the FLEX strategies for Nine Mile Point Nuclear Station, Unit 1 have been completed and provide protection from the applicable site hazards. The equipment required to implement the FLEX strategies for Nine Mile Point Nuclear Station, Unit 1 is stored in its protected configuration.

Procedures – Complete

FLEX Support Guidelines (FSGs) for Nine Mile Point Nuclear Station, Unit 1 have been developed, and integrated with existing procedures. The FSGs and affected existing procedures have been validated and are available for use in accordance with the site procedure control program.

Preventive maintenance actions have been developed for FLEX equipment including procedures for functional and performance testing.

Training – Complete

Training for Nine Mile Point Nuclear Station, Unit 1 has been completed in accordance with an accepted training process as described in NEI 12-06, Section 11.6.

Staffing – Complete

The Phase 2 staffing study for Nine Mile Point Nuclear Station, Unit 1 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 12), as documented in Reference 13.

National SAFER Response Center – Complete

EGC 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 Nine Mile Point Nuclear Station, Unit 1 with Phase 3 equipment stored in the National SAFER Response Centers in accordance with the site specific SAFER Response Plan.

Validation – Complete

EGC 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 Overall Integrated Plan (OIP) / Final Integrated Plan (FIP) for Order EA-12-049.

FLEX Program Document - Established

The Nine Mile Point Nuclear Station, Unit 1 FLEX Program Document has been developed in accordance with the requirements of NEI 12-06.

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

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 8th day of June 2015.

Respectfully submitted,

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

Enclosure 1: Nine Mile Point Nuclear Station, Unit 1 Final Integrated Plan Document – Mitigating Strategies NRC Order EA-12-049

cc: Director, Office of Nuclear Reactor Regulation
NRC Regional Administrator - Region I
NRC Senior Resident Inspector – Nine Mile Point Nuclear Station
NRC Project Manager, NRR – Nine Mile Point Nuclear Station
Mr. Jeremy S. Bowen, NRR/JLD/JOMB, NRC
Ms. Jessica A. Kratchman, NRR/JLD/JPSB, NRC
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Enclosure 1

Nine Mile Point Nuclear Station, Unit 1

Final Integrated Plan Document – Mitigating Strategies NRC Order EA-12-049

(101 pages)

Exelon Generation®

NINE MILE POINT NUCLEAR STATION UNIT 1

FINAL INTEGRATED PLAN DOCUMENT – MITIGATING STRATEGIES NRC ORDER EA-12-049

June 2015

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1. Background

In 2011, an earthquake-induced tsunami caused Beyond-Design-Basis (BDB) flooding at the Fukushima Dai-ichi Nuclear Power Station in Japan. The flooding caused the emergency power supplies and electrical distribution systems to be inoperable, resulting in an extended loss of alternating current (AC) power (ELAP) in five of the six units on the site. The ELAP led to (1) the loss of core cooling, (2) loss of spent fuel pool cooling capabilities, and (3) a significant challenge to maintaining containment integrity. All direct current (DC) power was lost early in the event on Units 1 & 2 and after some period of time at the other units. Core damage occurred in three of the units along with a loss of containment integrity resulting in a release of radioactive material to the surrounding environment.

The US Nuclear Regulatory Commission (NRC) assembled a Near-Term Task Force (NTTF) to advise the Commission on actions the US nuclear industry should take to preclude core damage and a release of radioactive material after a natural disaster such as that seen at Fukushima. The NTTF report contained many recommendations to fulfill this charter, including assessing extreme external event hazards and strengthening station capabilities for responding to beyond-design-basis external events.

Based on NTTF Recommendation 4.2, the NRC issued Order EA-12-049 (Reference 1) on March 12, 2012 to implement mitigation strategies for Beyond-Design-Basis External Events (BDBEEs). The order provided the following requirements for strategies to mitigate BDBEEs:

1. Licensees shall develop, implement, and maintain guidance and strategies to maintain or restore core cooling, containment, and SFP cooling capabilities following a BDBEE.

2. These strategies must be capable of mitigating a simultaneous loss of all AC power and loss of normal access to the ultimate heat sink and have adequate capacity to address challenges to core cooling, containment and SFP cooling capabilities at all units on a site subject to the Order.

3. Licensees must provide reasonable protection for the associated equipment from external events. Such protection must demonstrate that there is adequate capacity to address challenges to core cooling, containment, and SFP cooling capabilities at all units on a site subject to the Order.

4. Licensees must be capable of implementing the strategies in all modes.

5. Full compliance shall include procedures, guidance, training, and acquisition, staging or installing of equipment needed for the strategies.

The order specifies a three-phase approach for strategies to mitigate BDBEEs:

- Phase 1 - Initially cope relying on installed equipment and on-site resources.
- Phase 2 - Transition from installed plant equipment to on-site BDB equipment
- Phase 3 - Obtain additional capability and redundancy from off-site equipment and resources until power, water, and coolant injection systems are restored or commissioned.

NRC Order EA-12-049 (Reference 1) required licensees of operating reactors to submit an overall integrated plan, including a description of how compliance with these requirements would be achieved by February 28, 2013. The Order also required licensees to complete implementation of the requirements no later than two refueling cycles after submittal of the overall integrated plan or December 31, 2016, whichever comes first.

The Nuclear Energy Institute (NEI) developed NEI 12-06 (Reference 5), which provides guidelines for nuclear stations to assess extreme external event hazards and implement the mitigation strategies specified in NRC Order EA-12-049. The NRC issued Interim Staff Guidance JLD-ISG-2012-01 (Reference 3), dated August 29, 2012, which endorsed NEI 12-06 with clarifications on determining baseline coping capability and equipment quality.

NRC Order EA-12-051 (Reference 2) required licensees to install reliable SFP instrumentation with specific design features for monitoring SFP water level.

NEI 12-02 (Reference 6) provided guidance for compliance with Order EA-12-051. The NRC determined that, with the exceptions and clarifications provided in JLD-ISG-2012-03 (Reference 4), conformance with the guidance in NEI 12-02 is an acceptable method for satisfying the requirements in Order EA-12-051.

2. NRC Order 12-049 – Mitigation Strategies (FLEX)

2.1 General Elements

2.1.1 Assumptions

The assumptions used for the evaluations of a Nine Mile Point Unit 1 ELAP/LUHS event and the development of FLEX strategies are stated below.

Boundary conditions consistent with NEI 12-06 Section 3.2.1, *General Criteria and Baseline Assumptions* are established to support development of FLEX strategies, as follows:

- The BDB external event occurs impacting both units at the site.
- Both reactors are initially operating at power, unless there are procedural requirements to shut down due to the impending event. The reactors have been operating at 100% power for the past 100 days.
- Each reactor is successfully shut down when required (i.e., all control rods inserted, no ATWS). Steam release to maintain decay heat removal upon shutdown functions normally, and reactor coolant system (RCS) overpressure protection valves respond normally, if required by plant conditions, and reseat. The emergency cooling system initiates and operates normally, providing decay heat removal, thus obviating the need for further overpressure protection valve operation.
- On-site staff is at site administrative minimum shift staffing levels.
- No independent, concurrent events, e.g., no active security threat.
- All personnel on-site are available to support site response.
- The reactor and supporting plant equipment are either operating within normal ranges for pressure, temperature and water level, or available to operate, at the time of the event consistent with the design and licensing basis.

The following plant initial conditions and assumptions are established for the purpose of defining FLEX strategies and are consistent with NEI 12-06 Section 3.2.1, *General Criteria and Baseline Assumptions*, for Nine Mile Point Unit 1:

- No specific initiating event is used. The initial condition is assumed to be a loss of off-site power (LOOP) with installed sources of emergency on-site AC power unavailable with no prospect for recovery.

- Cooling and makeup water inventories contained in systems or structures with designs that are robust with respect to seismic events, floods, and high winds and associated missiles are available. Permanent plant equipment that is contained in structures with designs that are robust with respect to seismic events, floods, and high winds and associated missiles, are available. The portion of the fire protection system that is robust with respect to seismic events, floods, and high winds and associated missiles is available as a water source.

- Normal access to the ultimate heat sink is lost, but the water inventory in the ultimate heat sink (UHS) remains available and robust piping connecting the UHS to plant systems remains intact. The motive force for UHS flow, i.e., pumps, is assumed to be lost with no prospect for recovery.

- Fuel for FLEX equipment stored in structures with designs that are robust with respect to seismic events, floods and high winds and associated missiles, remains available.

- Installed Class 1E electrical distribution systems, including inverters and battery chargers, remain available since they are protected.

- No additional accidents, events, or failures are assumed to occur immediately prior to or during the event, including security events.

- Reactor coolant inventory loss consists of unidentified and identified leakage at the upper limit of Technical Specifications (25 gpm) and reactor recirculation pump seal leakage of 20 gpm for five pumps for a total of 45 gpm leakage at rated pressure (pressure dependent).

- For the spent fuel pool, the heat load is assumed to be the maximum design basis heat load. In addition, inventory loss from sloshing during a seismic event does not preclude access to the pool area.

Additionally, key assumptions associated with implementation of FLEX Strategies are as follows:

- Exceptions for the site security plan or other (license/site specific) requirements of 10CFR may be required.

- Site access is impeded for the first 6 hours, consistent with NEI 12-01 (Reference 7). Additional resources are assumed to begin arriving at hour 6 with limited site access up to 24 hours. By 24 hours and beyond, near-normal site access is restored allowing augmented resources to deliver supplies and personnel to the site.

This plan defines strategies capable of mitigating a simultaneous loss of all alternating current (AC) power and loss of normal access to the ultimate heat sink resulting from a BDB event by providing adequate capability to maintain or restore core cooling, containment, and spent fuel pool (SFP) cooling capabilities at all units on a site. Though specific strategies have been developed, due to the inability to anticipate all possible scenarios, the strategies are also diverse and flexible to encompass a wide range of possible conditions. These pre-planned strategies developed to protect the public health and safety have been incorporated into the unit emergency operating procedures in accordance with established emergency operating procedure (EOP) change processes, and their impact to the design and license bases capabilities of the unit evaluated under 10 CFR 50.59.

The plant Technical Specifications contain the limiting conditions for normal unit operations to ensure that design safety features are available to respond to a design basis accident and direct the required actions to be taken when the limiting conditions are not met. The result of the BDB event may place the plant in a condition where it cannot comply with certain Technical Specifications and/or with its Security Plan, and, as such, may warrant invocation of 10 CFR 50.54(x) and/or 10 CFR 73.55(p). This position is consistent with the previously documented Task Interface Agreement (TIA) 2004-04, “Acceptability of Proceduralized Departures from Technical Specification (TSs) Requirements at the Surry Power Station”, (TAC Nos. MC42331 and MC4332), dated September 12, 2006 (Reference 13).

2.2 Strategies

The objective of the FLEX Strategies is to establish an indefinite coping capability in order to 1) prevent damage to the fuel in the reactor, 2) maintain the Containment function and 3) maintain cooling and prevent damage to fuel in the spent fuel pool (SFP) using installed equipment, on-site portable equipment, and pre-staged off-site resources. This indefinite coping capability will address an extended loss of all AC power (ELAP) – loss of off-site power and emergency diesel generators, but not the loss of AC power to buses fed by station batteries through inverters – with a simultaneous loss of access to the ultimate heat sink (LUHS) and loss of motive force for UHS pumps, but the water in the UHS remains available and robust piping connecting the UHS to plant systems remains intact. This condition could arise following external events that are within the existing design basis with additional failures and conditions that could arise from a Beyond-Design-Basis external event.

The plant indefinite coping capability is attained through the implementation of pre-determined strategies (FLEX strategies) that are focused on maintaining or restoring key plant safety functions. The FLEX strategies are not tied to any specific damage state or mechanistic assessment of external events. Rather, the strategies are developed to maintain the key plant safety functions based on the evaluation of plant response to the coincident ELAP/LUHS event. A safety function-based approach provides consistency with, and allows coordination of, existing plant emergency operating procedures (EOPs). FLEX strategies are implemented in support of EOPs using FLEX Support Guidelines (FSGs).

The strategies for coping with the plant conditions that result from an ELAP/LUHS event involve a three-phase approach:

- Phase 1 – Initially cope by relying on installed plant equipment and on-site resources.
- Phase 2 – Transition from installed plant equipment to on-site BDB equipment.
- Phase 3 – Obtain additional capability and redundancy from off-site equipment and resources until power, water, and coolant injection systems are restored.

The duration of each phase is specific to the installed and portable equipment utilized for the particular FLEX strategy employed to mitigate the plant condition. The strategies described below are capable of mitigating an ELAP/LUHS resulting from a BDB external event by providing adequate capability to maintain or restore core cooling, containment, and SFP cooling capabilities at Nine Mile Point Unit 1. Though specific strategies have been developed, due to the inability to anticipate all possible scenarios, the strategies are also diverse and flexible to encompass a wide range of possible conditions. These pre-planned strategies developed to protect the public health and safety are incorporated into the Nine Mile Point emergency operating procedures in accordance with established EOP change processes, and their impact to the design basis capabilities of the unit evaluated under 10 CFR 50.59.

2.3 Reactor Core Cooling and Heat Removal Strategy

The FLEX strategy for reactor core cooling and decay heat removal is to manually initiate both loops of the Emergency Cooling (EC) system.

Both loops of Emergency Cooling will remain in service for 8 hours (their design service time without make up). After 8 hours, one loop of the Emergency Cooling system will remain in service with shell make up provided by a portable diesel driven pump.

DC bus load shedding will ensure battery life is extended to 8 hours. Portable generators will re-power instrumentation prior to battery depletion. DC load shed of all non-essential loads would begin when it is recognized that the station is in a Station Blackout (SBO) condition, and completed within 30 minutes. With DC load shedding, the useable station Class 1E battery life is calculated to be eight (8) hours for NMP1.

RPV makeup provided by a portable diesel driven pump, hereinafter called the FLEX Pump, will be initiated by 4 hours to ensure that reactor water level will remain above the Top of Active Fuel (TAF).

2.3.1 Phase 1 Strategy

2.3.1.1 Power Operation, Startup, and Hot Shutdown

At the initiation of the BDBEE, Main Steam Isolation Valves (MSIVs) automatically close, feed water flow to the reactor is lost, and Electromatic Relief Valves (ERV) automatically cycle to control pressure, causing reactor water level to decrease. Emergency Cooling (EC) will automatically initiate on high reactor pressure or low-low reactor water level (Reference 15) after the initiation of the SBO. In support of an ELAP condition, in order to preserve inventory in the reactor, Special Operating Procedure N1-SOP-33A.2 (Reference 11) was revised such that Operators will manually initiate both EC loops and close MSIV's when it is determined that an SBO condition exists versus waiting for an automatic initiation to occur. To conserve makeup water in the EC makeup tanks, operators are directed by the Special Operating Procedure for SBO (Reference 11) to throttle the makeup blocking valve to the ECs within the first 30 minutes of the SBO and to remove one EC loop from service in an attempt to limit the cool down to less than 100°F per hour. The action to remove one EC from service has been determined to be counterproductive to ensuring the longer term strategies under ELAP conditions. In order to ensure challenges to the recirculation pump seals are minimized and that leakage into the containment is maintained low, it is appropriate to initiate both EC loops regardless of the resulting reactor cooldown rate and to leave them in service for 8 hours.

After determination that EDGs cannot be restarted and off-site power cannot be restored for a period greater than the SBO coping time (4 hours), the operating crew determines the event is an ELAP. It is assumed that this determination is made less than one 1 hour into the event. Overall coping time for core cooling in Phase 1 is 5.7 hours (time to TAF) (Reference 36). This assumes both EC loops are in service at or near the onset of the event and adequate core cooling as a result of core submergence due to reactor water level staying above the TAF during this time period. This coping time is based on limited leakage from the reactor coolant pressure boundary as explained below

Total reactor coolant pressure boundary leakage during an ELAP condition can be assumed to be less than 45 gallons per minute (gpm) (reactor recirculation pump total seal leakage is less than or equal to 20 gpm for all five reactor recirculation pumps plus 25 gpm Technical

Specification maximum allowable identified leakage) extending overall coping time to 5.7 hours based on NMP1 Appendix R Safe Shutdown Analysis (Reference 36). This seal leakage is based on the testing that was performed on the CAN2A seal cartridge in 1992 and 1997 and documented in References 37 and 38.

Although the reactor water level will remain above the TAF for at least 5.7 hours, upon recognition of an ELAP, plant personnel will proceed immediately with deployment of a portable FLEX diesel driven pump that will take suction from Lake Ontario at one of two pre staged locations in the Screen House and discharge to the installed Control Rod Drive (CRD) return header. This capability will be achieved within 4 hours from the onset of the ELAP. Alternate injection capability for core cooling from a portable FLEX diesel driven pump through the feedwater system (see Figure 4) can also be deployed in approximately 4 hours. The portable FLEX Pump will be installed to take suction with non-collapsible hose from the Screen House intake/Lake Ontario.

2.3.1.2 Cold Shutdown and Refueling

The overall strategy for core cooling for Cold Shutdown and Refueling are, in general, similar to those for Power Operation, Startup, and Hot Shutdown.

If an ELAP occurs during Cold Shutdown, water in the reactor pressure vessel (RPV) will heat up. When temperature reaches 212°F, (Hot Shutdown) the RPV will begin to pressurize. During the heat up, the EC loops can be returned to service, or ERVs can be opened to prevent reactor heatup and re-pressurization. The primary strategies for Cold Shutdown are the same as those for Power Operation, Startup, and Hot Shutdown as discussed above for core cooling.

During Refueling, many variables impact the ability to cool the core. In the event of an ELAP during Refueling, there are no installed plant systems to provide makeup water to cool the core. Thus, the deployment of Phase 2 equipment will begin immediately. To accommodate the activities of RPV disassembly and refueling, water levels in the RPV and the reactor cavity are often changed. The most limiting condition is the case in which the reactor head is removed and water level in the RPV is at or below the reactor vessel flange. If an ELAP/LUHS occurs during this condition then (depending on the time after shutdown) boiling in the core may occur in a relatively short period of time (e.g. approximately 3 hours).

Per NEI Shutdown/ Refueling Position Paper (Reference 39) endorsed by the NRC (Reference 40), pre-staging of FLEX equipment can be credited for some predictable hazards, but cannot be credited for all hazards per the guideline of NEI 12-06. Deployment of portable FLEX pumps to supply injection flow should commence immediately from the time of the event. This is possible because more personnel are on site during outages to provide the necessary resources. During outage conditions, sufficient area and haul paths should be maintained in order to ensure FLEX deployment capability is maintained.

2.3.2 Phase 2 Strategy

Primary strategy: Deployment of Phase 2 portable equipment will begin when it is recognized an SBO/ELAP condition exists (within 1 hour) in Phase 1. A portable FLEX Pump will be deployed and aligned to inject to the RPV via the CRD return line within the coping time for Phase 1 (5.7 hours). A portable DG will be deployed and will enable re-energizing an existing safety related Static Battery Charger 171A or 171B for #12 Battery within the 8 hour battery coping time following DC load shed.

At one hour into the event (an hour being allowed for debris removal between the robust FLEX Storage Building and the staging area for the NMP1 pump) a portable FLEX Pump and associated suction and discharge hoses will be deployed to the NMP1 Screen House. The suction hose will be routed through the North wall via a penetration and into the Circulating Water intake tunnel for an indefinite supply of water for make up to the RPV, the Emergency Condenser shells and the SFP. An alternate staging area for the FLEX Pump and suction hose is available from the West side of the Screen House in the event the North side Screen House area is not accessible. Discharge hoses from the FLEX pump will be routed to a portable distribution manifold in the Reactor Building where make up can be directed to the RPV, ECs, and SFP.

Alternate strategy: If the situation existed in which the FLEX Pumps were not able to discharge to the CRD return line, the capability exists to connect the discharge hose of a FLEX Pump to a hose connection into the feedwater line to the reactor in the Turbine Building. The hose connection is installed in the cross tie between fire protection piping and high pressure feedwater piping located between the feedwater pumps and the 5th point feedwater heaters. A 3 inch hose will be routed from the FLEX Pump discharge to this hose connection located inside the Turbine Building. VLV-29-412 can be used to throttle flow at the connection as necessary.

Primary Strategy for repowering 125 VDC: Prior to depletion of the Class 1E 125 VDC batteries, vital 125 VDC circuits will be re-powered to continue to provide key parameter monitoring instrumentation using portable diesel generators (DGs) stored on-site. The 125 VDC batteries are available for up to 8 hours without recharging (References 19 and 30). Before battery voltage can no longer support essential loads, the battery charger will be repowered with AC power from a portable diesel generator.

The strategy uses a portable diesel generator (DG) to power the existing Train #12 600VAC /125VDC Static Battery Charger (SBC) 171A or B. The connection between the portable diesel generator and the existing 600VAC/125VDC static battery charger (SBC) 171A or B is via temporary cable and connectors.

An alternate to powering up the SBC for 12 Battery with the portable diesel driven generator is to provide external connection points for an NFPA 805 portable battery charger and associated cabling capable of providing 125VDC electric power to either of the two existing 125VDC Battery Buses (Battery Board 11 or 12). This battery charger would be powered by the portable diesel generator.

The strategy uses a portable diesel generator to power a new portable DC battery charger. The connection to the new connector junction boxes (DC connections) is via temporary cables and connectors. There is one (1) new connector junction box in each battery board room which is connected to the respective battery board bus via a disconnect switch, fuses and associated cables. The connection between the new portable diesel generator (DG) and the new portable DC battery charger (AC connections) is via temporary cables and connectors. The portable battery charger will be staged following event onset outside the Turbine Building (south of the existing battery board rooms) in close proximity to the portable diesel generator

The portable diesel generator and portable battery charger will be stored in the robust FLEX building. The necessary electrical cable will be stored on a support vehicle for the portable diesel generators or on the battery charger and in the Turbine Building near their intended use.

Preparation of the portable diesel generator for service will commence at two hours from the time of the initiating event (allowing two hours for debris removal and other operator actions). Placing the portable diesel generator into service can be completed in 3 hours after initiated. It is therefore reasonable to expect the portable diesel generator to be supplying power to the key instrumentation within 5 hours of a BDB external event which initiates an ELAP event (Reference 61).

2.3.3 Phase 3 Strategy

The Phase 3 strategy is to use the Phase 2 connections, both mechanical and electrical, but supply water using Phase 3 portable pumps and AC power using Phase 3 portable generators if necessary. The Phase 3 equipment will act as backup or redundant equipment to the Phase 2 portable equipment and is deployed from an off-site facility and delivered to Nine Mile Point. The off-site facility supplying this equipment is the National SAFER Response Center (NSRC) through executed contractual agreements with Pooled Equipment Inventory Company (PEICo). The NSRC will support initial portable FLEX equipment delivery to the site within 24 hours of a request for deployment per the Nine Mile Point SAFER Response Plan (Reference 45). The NMP SAFER Response Plan defines the actions necessary to deliver pre-specified equipment to Nine Mile Point. Designated local staging areas have been selected to support deliveries of requested SAFER equipment from the NSRC to Nine Mile Point. Resources will be available, and sufficient, at the times required for Phase 3 implementation.

No plant modifications have been installed to support mitigating strategies for Phase 3. The connection of the majority of Phase 3 equipment can be made to connection points established for Phase 2 equipment and strategies. The remaining Phase 3 non-redundant equipment will be deployed as needed utilizing field established connections, without the reliance on plug and play type modifications. Other Phase 3 equipment that is not a backup or redundant to Phase 2 can be applied towards recovery efforts.

2.3.4 Systems, Structures, Components

2.3.4.1 Emergency Cooling System

The primary function of the Emergency Cooling system (EC) is to remove reactor decay heat when the vessel is isolated from the main heat sink. Following an isolation, the reactor pressure will rise causing ERVs to cycle to control reactor pressure below safety valve set points. Normally, both EC loops are placed into operation automatically by opening the condensate return valves with signals from the Reactor Protection

System (RPS) as follows: high reactor pressure (greater than 1080 psig) sustained for 12 seconds, or low-low reactor water level (5 feet below minimum normal) sustained for 12 seconds. In a station black out condition the operators are directed to manually initiate both loops of EC and to close the MSIVs. This will minimize loss of inventory through the ERVs and downstream steam loads. Both loops of EC will remain in service irrespective of the cooldown rate. This will result in lowering reactor pressure at a rate that will minimize coolant loss from any leakage. EC system design provides for 8 hours of continuous operation. During this 8 hour period additional make up to the EC condenser shells will be provided by placing into service a FLEX Pump taking a suction from the UHS that will be capable of providing make up to the EC condenser shell allowing for operation beyond 8 hours.

2.3.4.2 Batteries

The safety related batteries and associated DC distribution systems are located within safety related structures designed to meet applicable design basis external hazards and will be used to initially power required key instrumentation and applicable DC components required for monitoring RPV level and Emergency Cooling operation. Within 30 minutes of ELAP/LUHS event onset, load shedding of non-essential equipment provides an estimated total service time of approximately 8 hours of operation.

2.3.4.3 Primary RPV Make Up

Primary water make up to the RPV, EC loops and SFP will all be via a manifold, mounted on a push cart, located in the NMP1 Reactor Building track bay which will receive water from the FLEX Pump. When not in use, the manifold/cart will be stored locally, just outside the track bay (inside the Reactor Building), with the wheels chocked to prevent movement. When needed, the manifold/cart will be un-chocked and moved to the Reactor Building track bay. This manifold provides the ability for a single operator to control the flow rates to each of the three injection points when deployment of the primary injection paths is successful for all three key safety functions.

Primary RPV make up consists of 50 feet of 1.5 inch hose routed from manifold valve VLV-BDB-004, through door D-132, and interfaces with a FLEX hose connection located on the CRD return to RPV line. The hose will be stored near the CRD FLEX hose connection. Valves VLV-44.3-34 and VLV-44.3-35 are opened in order to allow injection into the RPV. In order to prevent back flow into the CRD system, upstream valve VLV-44.3-09 is required to be closed prior to providing make up to the RPV.

2.3.4.4 Alternate RPV Make Up

In the event the primary RPV make up method to the CRD return line is not available, an alternate make up connection is provided. A hose connection was installed in the cross-tie between fire protection piping and high pressure feedwater piping located between the feedwater pumps and the 5th point feedwater heaters. 3 inch hose is routed from the FLEX Pump discharge to this hose connection located inside the Turbine Building. This valve and the hose connection are close to the floor and no special equipment is needed for access.

2.3.4.5 Primary Electrical Connection

The primary strategy (Figure 1) uses a FLEX portable diesel generator (DG) to power the existing 600VAC /125VDC Static Battery Charger (SBC) 171A or B to restore and maintain charging of the #12 Battery. The connection between the portable diesel generator and the existing 600VAC/125VDC static battery charger (SBC) 171A or B is via temporary cables and connectors at a junction box and fused disconnect switch located adjacent to SBC 171A and SBC 171B.

Figure 1

Fukushima Primary Electrical Strategy:
This scheme uses the new portable Diesel Generator (DG) to power the existing division 12 600VAC /125VDC Static Battery Charger (SBC) 171A/B . The connection between the Diesel Generator (DG) and the existing 600VAC / 125VDC Static Battery Charger (SBC) 171A/B is via temporary TPC cable and connectors. A new connector junction box and new fusible transfer switch will also be required for this scheme. The DC output connections for the existing chargers are not affected.

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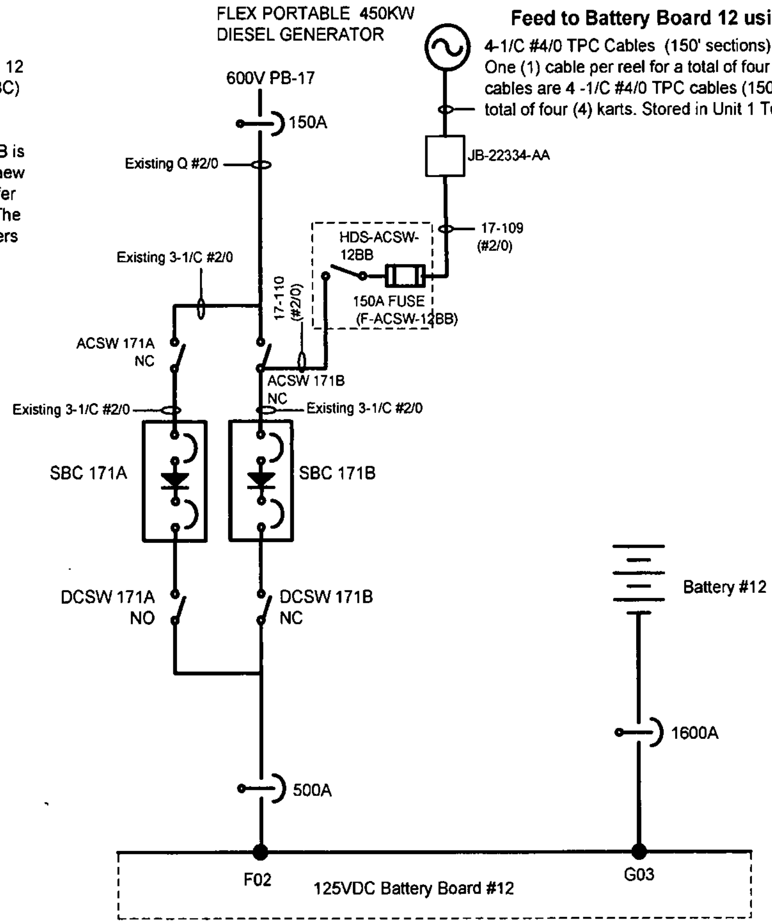
References:
1) C19839C-001
2) C19839C-002
3) C19839C-003
4) C23193C-002

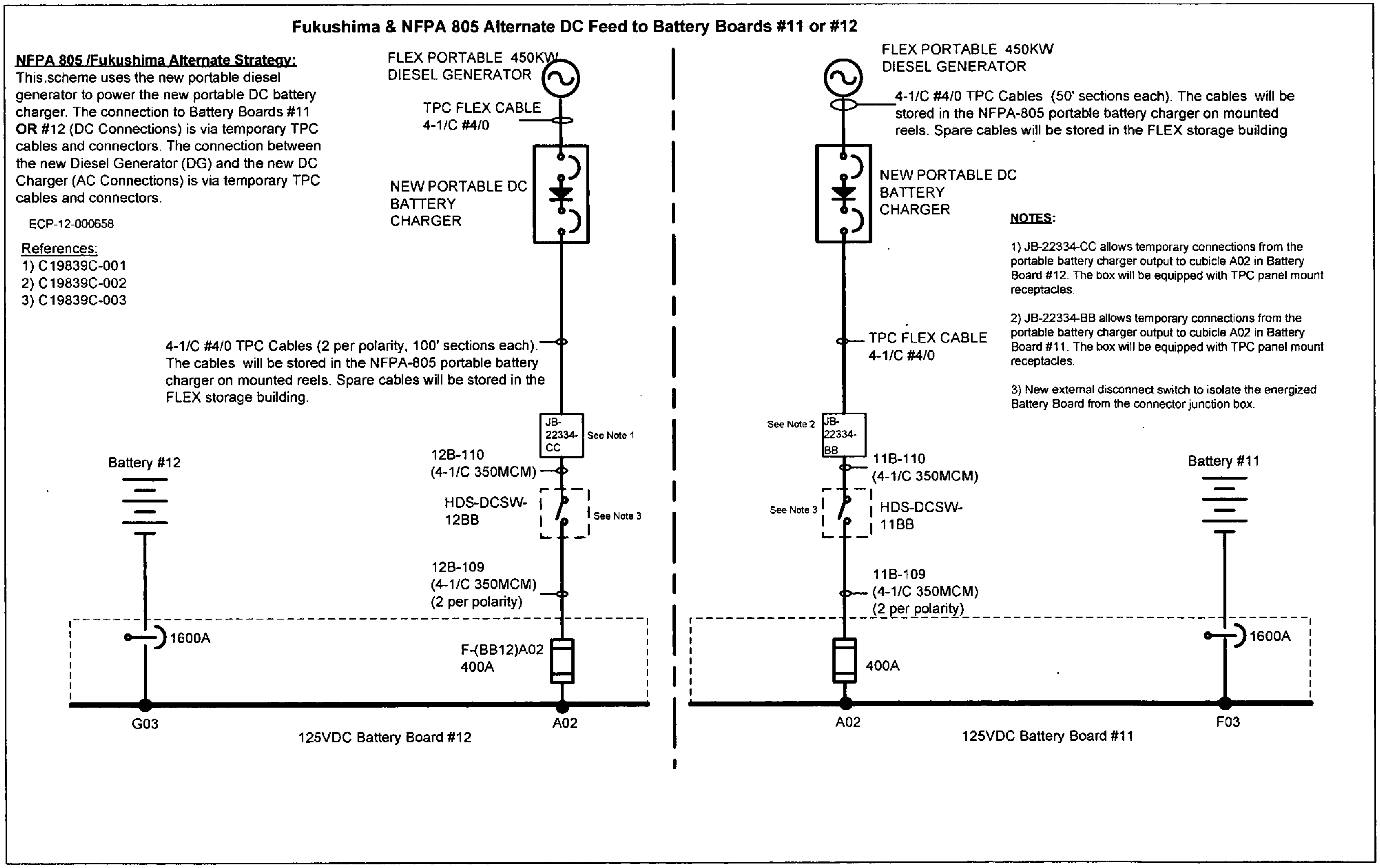
Feed to Battery Board 12 using the new FLEX portable DG.
4-1/C #4/0 TPC Cables (150' sections)
One (1) cable per reel for a total of four (4) karts. Stored in the FLEX bldg. The spare cables are 4 -1/C #4/0 TPC cables (150' sections each). One (1) cable per reel for a total of four (4) karts. Stored in Unit 1 Turbine Bldg.



2.3.4.6 Alternate Electrical Connection

The strategy uses a FLEX portable diesel generator to power the NFPA 805/FLEX portable battery charger. The connections between the portable battery charger and #12 Battery Board or #11 Battery Board are via temporary cables and connectors. The connections are made to a junction box in one of the two selected battery board rooms which is then connected to the respective battery board bus via a fused disconnect switch. The connections between the FLEX portable diesel generator and the NFPA 805/FLEX portable battery charger (AC connections) are via temporary cables and connectors. The FLEX portable diesel generator and NFPA 805/FLEX portable battery charger are stored in the robust FLEX Storage Building. The necessary electrical cables are stored in the FLEX Storage Building for the portable diesel generators and in the Turbine Building near their intended use location.

Figure 2


Fukushima & NFPA 805 Alternate DC Feed to Battery Boards #11 or #12
NFPA 805 /Fukushima Alternate Strategy:
This scheme uses the new portable diesel generator to power the new portable DC battery charger. The connection to Battery Boards #11 OR #12 (DC Connections) is via temporary TPC cables and connectors. The connection between the new Diesel Generator (DG) and the new DC Charger (AC Connections) is via temporary TPC cables and connectors.
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References:
1) C19839C-001
2) C19839C-002
3) C19839C-003
FLEX PORTABLE 450KW DIESEL GENERATOR
TPC FLEX CABLE 4-1/C #4/0
NEW PORTABLE DC BATTERY CHARGER
4-1/C #4/0 TPC Cables (2 per polarity, 100' sections each). The cables will be stored in the NFPA-805 portable battery charger on mounted reels. Spare cables will be stored in the FLEX storage building.
JB-22334-CC
See Note 1
Battery #12
12B-110 (4-1/C 350MCM)
HDS-DCSW-12BB
See Note 3
12B-109 (4-1/C 350MCM) (2 per polarity)
1600A
F-(BB12)A02 400A
G03
A02
125VDC Battery Board #12
FLEX PORTABLE 450KW DIESEL GENERATOR
4-1/C #4/0 TPC Cables (50' sections each). The cables will be stored in the NFPA-805 portable battery charger on mounted reels. Spare cables will be stored in the FLEX storage building
NEW PORTABLE DC BATTERY CHARGER
NOTES:
1) JB-22334-CC allows temporary connections from the portable battery charger output to cubicle A02 in Battery Board #12. The box will be equipped with TPC panel mount receptacles.
2) JB-22334-BB allows temporary connections from the portable battery charger output to cubicle A02 in Battery Board #11. The box will be equipped with TPC panel mount receptacles.
3) New external disconnect switch to isolate the energized Battery Board from the connector junction box.
TPC FLEX CABLE 4-1/C #4/0
See Note 2
JB-22334-BB
11B-110 (4-1/C 350MCM)
See Note 3
HDS-DCSW-11BB
Battery #11
11B-109 (4-1/C 350MCM) (2 per polarity)
400A
1600A
A02
125VDC Battery Board #11
F03

2.3.5 Key Reactor Parameters

Instrumentation providing the following key parameters is credited for all phases of the reactor core cooling and decay heat removal strategy with the indication available in the NMP1 MCR:

- RPV Level: LI 36-43 & LI-36-44
- RPV Pressure: PI 36-32A & PI 36-31A
- Emergency Cooling Condenser Level: LI 60-28A & LI 60-29A

The above instrumentation is available prior to and after DC load shedding of the DC buses during SBO/ELAP response procedure implementation for up to 8 hours. Availability after 8 hours is dependent on actions to restore and maintain the #12 Battery Chargers (SBC 171A or SBC 171B) with the FLEX portable diesel generator (Primary) or the FLEX portable diesel generator supplying the NFPA 805/FLEX portable battery charger to restore and maintain #12 Battery or #11 Battery (Alternate).

In the unlikely event that the #12 or #11 Battery Bus infrastructures or supporting equipment is damaged and non-functional rendering key parameter instrumentation unavailable in the NMP1 Main Control Room, alternate methods for obtaining the critical parameters locally is provided in procedure N1-SOP-29.1, *EOP Key Parameter–Alternate Instrumentation.*

2.3.6 Thermal Hydraulic Analysis

At the initiation of the ELAP, main steam isolation valves (MSIVs) automatically close, feed water flow to the reactor is lost, and ERVs automatically cycle to control pressure, causing reactor water level to decrease. Total reactor coolant pressure boundary leakage during an ELAP condition has been evaluated to be less than 45 gallons per minute (gpm) at rated pressure (recirculation pump total seal leakage is less than or equal to 20 gpm plus 25 gpm Technical Specification maximum allowable identified leakage).

The reactor water level evaluation (GE SAFE code) and the primary containment analysis (GE SHEX analysis, NMP1 GOTHIC calculation) assume a reactor coolant leak located at the bottom of the reactor vessel. The leakage is defined by assuming moody two phase critical flow assuming discharge to the primary containment. The GE SHEX drywell model and the GOTHIC model are a single lumped volume of the drywell atmosphere, which assumes uniform mixing. The design basis SAFE analysis includes a conservative initial condition case which scrams on low level and has MSIV closure on low-low levels. These conditions bound the potential inventory loss either through an ERV lift or inventory lost through the main turbine bypass valves. The evaluation includes initiation of both EC loops which are sufficient to control reactor pressure such that an ERV lift or bypass valve opening results in an inventory loss less than the SAFE analysis assumptions. The S0-GOTHIC-ELAP02 (Reference 48) evaluation for primary containment includes ERV lifts.

The NMP1 ELAP is the same scenario as the design basis Appendix R coping evaluation. The Appendix R eight hour coping evaluation bounds the assumed loss of AC and DC power as it considers conservative initial conditions. The evaluation considered a total leakage of 45 gpm (pressure dependent) saturated liquid line break and credit the NMP1 emergency cooling.

NMP1 design basis Appendix R analysis (Reference 35) provides a design verified reactor water level response assuming a 45 gpm leakage at rated pressure. The analysis uses safety related GEH software qualified to perform LOCA analyses. This analysis has been reviewed and the assumptions are consistent with the conditions required to evaluate the FLEX coping strategy. Based on the review of this calculation, the time to reach Top of Active Fuel (TAF) is shown to be 5.7 hours. In support of the FLEX strategy, the analysis S0-GOTHIC-ELAP002 Primary Containment Response Following an Extended Loss of AC Power (Reference 48) shows that with two EC loops in operation for the first 8 hours of the ELAP, RPV pressure lowers from 1030 psig to below 93 psig at 3 hours. RPV makeup flowrate of 100 gpm with the FLEX pump is achieved at an RPV pressure of 93 psig or less and RPV level will begin to rise. Although the use of two EC loops for the removal of decay heat will result in a cooldown rate greater than allowed by Technical Specifications, it assures that the FLEX strategy will be able to inject to the RPV with the FLEX Pump within 5 hours and maintain reactor level above TAF. In addition, reactor pressure is lowered at a faster rate using two EC loops thereby decreasing the RCS leakage driving head and any recirculation pump seal leakage. With one EC taken out-of- service (or if one becomes unavailable) at 8 hours after the ELAP, the reactor pressure quickly increases above 93 psig between the 8 to 35 hour timeframe and then slowly drops below 93 psig. The peak RPV pressure reached during this time is 127 psig. Hydraulic calculations performed for RPV makeup (Reference 46) demonstrate that adequate RPV makeup flow can be supplied at the peak RPV pressure of 127 psig.

2.3.7 Reactor Coolant Pump Seals

The NMP1 reactor recirculation pump CAN2A seals are assumed to leak a total of 20 gpm (gallons per minute) total for all five recirculation pumps and do not fail catastrophically during the ELAP. A station specific recirculation pump seal performance evaluation was completed that supports the assumed leakage rate.

The NMP1 recirculation pump seal station blackout test reports document the recirculation pump CAN2A seal performance under loss of forced RBCLC seal cooling conditions. The testing models the reactor depressurization that is expected for a single EC loop reactor cool down profile. The seal test pressure profile follows the expected reactor depressurization defined in the GE SBO SHEX referenced analysis.

The pump seal testing includes the full scale integral pump seal cooler. The integral seal cooler under SBO conditions maintains the seal cooling subcooled by the boiling heat transfer of the RBCLC coolant and counter current makeup RBCLC gravity driven makeup to the cooler. The test included a mockup of the RBCLC piping to simulate the static head available to maintain the boiling heat transfer and to model the counter current flow regime. The test report summarizes the seal subcooling. Because the integral seal cooler maintained subcooled inlet conditions, the SBO testing of the seal demonstrated the leakage remained single phase throughout the test time frame.

2.3.8 Shutdown Margin Analysis

Per NEI 12-06 section 2, bounding conditions for the FLEX strategies includes the following:

> "Each reactor is successfully shut down when required (i.e.: all control rods inserted, no ATWS)."

The NMP1 Technical Specification (Reference 16) for the cold shutdown margin demonstration (T.S. Section 3.1.1) requires that the shutdown margin at any time during the fuel cycle be equal to or greater than: (1) 0.38% Δk/k with the highest worth rod analytically determined, or (2) 0.28% Δk/k with the highest worth rod determined by test. Core designs provide a minimum of 1% shutdown margin

This requirement is verified during the startup after each refueling by an in-sequence control rod withdrawal. Because core reactivity values will vary through core life as a function of fuel depletion and poison burnup, the demonstration of shutdown margin is performed in the cold (68°F), xenon-free condition and must show the core to be subcritical by at least R + 0.38% Δk/k. The value of R, in units of % Δk/k, is the difference between the calculated values of maximum core reactivity (cold, with the highest worth rod withdrawn) throughout the operating cycle, and that at beginning–of–cycle (BOC).

As reported in Section 4 of the Supplemental Reload Licensing Report for Reload 23/Cycle 22 (Reference 51) for the Spring 2015 refueling and current operating cycle, the value of R is 0.000 % Δk. Therefore the minimum shutdown margin that occurs is at BOC. The BOC cold $K_{effective}$ with the strongest rod withdrawn is 0.987. This translates to a minimum shutdown margin of 1.3% Δk/k, or approximately 3 to 4 times the Tech Spec requirement. Therefore, NMP1 will remain shut down during a simultaneous ELAP and LUHS event with all control rods fully inserted.

2.3.9 FLEX Pumps and Water Supplies

Consistent with NEI 12-06, Appendix C, RPV injection capability is provided using FLEX Pumps through a primary and alternate connection. The FLEX Pump is a Power Prime model 3419MX rated at 770 gpm (@ 363 psid) pump. The FLEX Pump is a trailer-mounted, diesel engine driven centrifugal pump that is stored in the robust FLEX Storage Building.

A hydraulic calculation was performed (Reference 46) to verify the capability of the FLEX Pumps and piping/hose system to deliver the required amount of water to each required location in the plant.

For RPV makeup, the hydraulic calculation S0-FLEX-F001 (Reference 46) conservatively determined an RPV makeup flowrate of 97 GPM was required with an assumed constant RPV leakage rate of 45 GPM despite slowly lowering RPV pressure. As documented in a safe shutdown analysis (Reference 36), the RPV leakage is assumed to be 45 GPM at the event onset but is RPV pressure dependent. Additional RPV makeup is also required due to lowering temperature and increasing density of the water inside the RPV of 52 GPM (Reference 47) which results in RPV level shrink. The hydraulic calculation S0-FLEX-F001 uses an RPV makeup rate of 100 GPM (45 GPM + 52 GPM + margin) to verify that the RPV water level stays above Top of Active Fuel (TAF). RPV level begins to rise provided RPV injection starts at 5 hours from event onset.

For Emergency Cooling Condenser (EC) makeup, the hydraulic calculation (Reference 46) determined an EC makeup flowrate of 113 GPM was required. This flow rate is based on the reactor decay heat at 8 hours after the start of the event.

As used in calculation S0-GOTHIC-ELAP002 (Reference 48), the ANSI/ANS 5.1-1979 decay heat curve is used to determine the decay heat 8 hours into the event. The calculated EC makeup value of 113 GPM was rounded up (margin) to establish the EC makeup requirement of 130 GPM.

For Spent Fuel Pool (SFP) makeup, 42 GPM is the calculated boiling rate of the pool for a full core offload as given in calculation S14-54HX018. The ability to supply 250 GPM is a requirement of NEI 12-06 (spray cooling), in the event of a crack in the pool or other means of unforeseen leakage. The 250 GPM is inclusive of the 42 GPM normal boil off rate and was therefore established as the SFP makeup in the hydraulic calculation (Reference 46).

The effect of the water source on FLEX Pump performance as it relates to pump NPSH requirements was also evaluated in hydraulic calculation S0-FLEX-F001. The water source is taken from the intake tunnel of the NMP1 Circulating Water system which draws from Lake Ontario. Regular monitoring of the quality of water supplies drawn from Lake Ontario shows that water quality meets or exceeds public health standards for drinking supplies. Per the NMP2 USAR (Reference 32) the lowest regulated lake level elevation is 244'. To add conservatism, a minimum lake level of 243' was used. The water temperature was modeled at 84°F (NMP1 FSAR, Ref. 9), which is the maximum lake (raw) water temperature. The hydraulic calculation verifies that the FLEX Pump NPSH available is greater than the NPSH required for the FLEX strategy flowrates being implemented.

Testing on the FLEX Pumps was completed by NMP personnel to confirm pump performance. The test modeled the suction lift requirements for the pumps. The test results show that the pumps are capable of providing the required pressure and flow for NMP1FLEX strategy makeup requirements.

For NMP1, one FLEX Pump is capable of supplying the primary make up requirements to the RPV, Emergency Cooling Condensers, and Spent Fuel Pool. A second pump will have to be used if the maximum spent fuel pool make up flow of 250 GPM is required while the first pump is supplying maximum make up to the ECs and RPV.

2.3.10 Electrical Analysis

Nine Mile Point Unit 1 has two (2) Class 1E batteries. The Class 1E battery duty cycle for NMP1 was calculated (Reference 52) in accordance with the IEEE-485 methodology using manufacturer discharge test data applicable to the NMP1 FLEX strategy as outlined in the NEI white paper on Extended Battery Duty Cycles (Reference 57) resulting in 8.2 hours for #12 Battery and 8.3 hours for #11 Battery. The time margin between the calculated battery duration for the FLEX strategy and the expected deployment time for FLEX equipment to supply the DC loads is approximately three (3) hours for NMP1.

The strategy to re-power the station's safety-related DC bus requires the use of a 600 VAC diesel powered generator to either re-power installed station battery chargers via temporary connections or to deploy a portable battery charger with the portable diesel generator to re-power DC loads and charge the respective battery via battery board temporary connections. Both the portable FLEX generators and the NFPA 805/FLEX portable battery charger are stored in the robust FLEX Storage Building.

The FLEX diesel generators are trailer-mounted units rated at 450 kW/562 kVA, 575 VAC, 3 phase, 60Hz, with integral 500 gallon fuel tank capable of supporting 15.6 hours of operation at full load. Per the FLEX diesel generator sizing calculation (Reference 53), the FLEX generator will be loaded to a total of 58.4% of its continuous duty rating when supplying AC power to both a NMP1 Static Battery Charger (SBC 171A or SBC 171B) and the NFPA 805/FLEX portable charger.

NFPA 805/FLEX portable charger is a trailer-mounted solid state constant current/constant voltage battery charger consisting of a 12 pulse SCR regulated full-bridge rectifier, DC filter, with controls and monitoring. It has a continuous duty rating of 400 amps at a nominal 130 VDC and is capable of using the 575 VAC, 3 phase power from the FLEX generators via cables and connectors. Per the NFPA 805/FLEX portable charger sizing calculation (Reference 54), the portable battery charger is capable of continuously supplying the loads on the #12 or #11 DC system and at the same time recharging the #12 or #11 Battery to full capacity in 13.44 hours.

For FLEX Phase 3, the National SAFER Response Center (NSRC) will supply two (2) Turbine Marine 1.1 MW 480 VAC 3 phase generators with 600VAC step up transformer. This NSRC equipment is a backup to on-site phase 2 equipment. NSRC generators come with the same size connectors as the on-site Phase 2 FLEX generators.

2.4 Containment Integrity

With an ELAP, containment cooling is lost and over an extended period of time containment temperature and pressure can be expected to slowly increase. An analysis was performed to determine the containment pressure profile during an ELAP/LUHS event, and to justify that the instrumentation and controls in containment which are relied upon by the operators are sufficient to perform their intended functions (S0-GOTHIC-ELAP002). The result from this analysis was used to develop an appropriate mitigating strategy, including any necessary modifications.

Heat addition to the containment during Phase 1 is directly related to the radiative heat and leakage from the recirculation pump seals and components. This leakage is less than 45 gpm and does not result in any significant pressure or temperature challenge to the containment. Some heat addition does occur initially from two of six Electromatic Relief Valves (ERV) automatically cycling to control reactor pressure until Emergency Cooling is placed into service.

In Phase 2, heat addition continues to be primarily from the reactor coolant system piping and the reactor vessel. Both loops of Emergency Cooling are in service for the first 8 hours, rejecting decay heat to the atmosphere, and one loop continues to remove heat for the remaining duration of the event. This limits the peak primary containment pressure and temperature during Phase 2. At the end of 72 hours, Primary Containment pressure is predicted to be 20.2 psig with an average containment temperature of 261 degrees F, which is below containment pressure and temperature design limit.

2.4.1 Phase I

During Phase 1, Primary Containment integrity is maintained by normal design features of the containment, such as the containment isolation valves. In accordance with NEI 12-06, the containment is assumed to be isolated following the event. Two of six Electromatic Relief Valves (ERV) automatically cycle to control reactor pressure until the Emergency Condensers are placed into service. Emergency Cooling (EC) will be initiated manually per the initial actions of N1-SOP-33A.2, Station Blackout/ELAP procedure, to support immediate manual initiation identified in FLEX Core Cooling Phase 1. The EC loops will remove the decay heat energy from the Reactor Pressure Vessel (RPV) and return the water to the RPV. The energy deposited to the containment is from radiative heat transfer, leakage from the reactor recirculation pump seals, and unidentified containment leakage. The total leakage to the containment is nominally 45 gpm based on Technical Specification maximum allowable identified leakage limit of 25 GPM plus 20 GPM Recirculation Pump seal leakage.

2.4.2 Phase 2

Two Emergency Cooling (EC) loops continue to operate so that decay heat is removed from the RPV thus limiting the heat released to the Primary Containment. During an ELAP/LUHS event, EC makeup water is throttled to conserve inventory. This action is directed immediately per procedure N1-SOP-33A.2, Station Blackout/ELAP. This action will preserve EC normal supply of makeup water which if lost would otherwise render the EC loops unavailable to remove decay heat. Before 8 hours has elapsed, additional make-up capability to the EC Condensers will be necessary to preserve EC operation. This is accomplished by providing make up from a portable FLEX Pump to a connection point on the make-up supply line to the 12 EC loop. Current EC design identifies that makeup water for the EC loops (and therefore EC functionality) will be available for approximately 8 hours based on the volume of the EC make-up tanks. The alternate make up method is from a portable FLEX Pump aligned to a qualified section of the Turbine Building fire header that can be aligned to the EC Make Up tanks. 12 Emergency Cooling loop will remain in service throughout Phase 2. With the EC in service, decay heat continues to be removed from the RPV thus limiting the heat released to the Primary Containment. At the 8 hour point, the reactor will be at approximately 100 psig (Reference 48). One EC loop with alternate makeup established will remain in service to stabilize reactor pressure and to continue with the cool down.

2.4.3 Phase 3

Necessary actions to reduce Containment temperature and pressure and to ensure continued functionality of the key parameters will utilize existing plant systems restored by off-site equipment and resources during Phase 3. During Phase 3, #12 EC will remain in service with EC make-up continuing to be provided by Phase 2 portable equipment and backed up by NSRC pumps. The Containment temperature and pressure will be monitored and, if necessary, the Primary Containment will be vented using existing procedures and systems.

2.4.4 Key Containment Parameters

Instrumentation providing the following key parameters is credited for all phases of the Containment Integrity strategy:

- Torus Water Temperature TI 201.2-519, TI 201.2-520
- Torus Water Level LI 201.2-594C, LI 201.2-595D
- Torus Pressure PI 201.2-594A, PI 201.2-595A
- Drywell Ambient Temperature TI 201-27B, TI 201-33B
- Drywell Pressure PI 201.2-483A, PI 201.2-484A

In the unlikely event that the #12 or #11 Battery Bus infrastructures or supporting equipment is damaged and non-functional rendering key parameter instrumentation unavailable in the NMP1 Main Control Room, alternate methods for obtaining the critical parameters locally is provided in procedure N1-SOP-29.1, *EOP Key Parameter–Alternate Instrumentation* (Reference 15).

2.4.5 Thermal-Hydraulic Analyses

Conservative evaluations (Reference 48) have concluded that Primary Containment temperature and pressure will remain below containment design limits and that key parameter instruments subject to the containment environment will remain functional for a minimum of 7 days.

Critical inputs to the analysis are as follows:

- Reactor vessel injection begins at 5 hours @ 100 gpm.
- Reactor vessel makeup flow is throttled to maintain 75" on Instrument scale.
- Both Emergency Cooling (EC) loops are credited for 8 hours, and 1 EC loop is credited for the remainder of the event.
- The reactor coolant leakage is no more than 45 gpm at normal operating conditions.

The initial drywell pressure rise within first hour into the event is 4 psig to 5.6 psig. The maximum Primary Containment pressure with 45 gpm leakage is predicted to be 20.3 psig at the end of 72 hours. Subsequent pressure rate increase after 72 hours is at a lower rate of ~2.5 psi/day without mitigation actions being taken.

The peak drywell local temperature above elevation 303.25' is 320°F that occurs at 30 hours. The peak temperature is 5°F higher without the leakage. The drywell temperature below elevation 303.25' is 261°F, which occurs at 72 hours. The temperature continues to increase after 72 hours at a rate of 2°F/day.

Torus water temperature change is minimal because the Emergency Cooling (EC) system is removing decay heat from the reactor vessel and it is bounded by the DB LOCA. The maximum torus air temperature predicted is 210°F.

With two EC loops in operation for the first 8 hours of the ELAP, RPV pressure lowers from 1030 psig to below 93 psig at 3 hours. RPV target makeup flowrate of 100 gpm is achieved at RPV pressure of 93 psig or less. With one EC taken out-of-service (or if one becomes unavailable) at 8 hours after the ELAP, the reactor pressure quickly increases above 93 psig between the 8 to 35 hour timeframe and then slowly drops below 93 psig. The peak pressure reached during this time is 127 psig. Hydraulic calculations performed for RPV makeup (Reference 46) demonstrate that adequate RPV makeup flow can be supplied at the peak RPV pressure of 127 psig. RPV makeup requirements after 8 hours are significantly less than 100 gpm due to the reduced RPV pressure.

2.4.6 Flex Pump and Water Supplies

The NSRC is providing additional pumps in Phase 3 that can be used if required to provide water for containment cooling. Water supplies are as described in Section 2.3.9 (Lake Ontario).

2.5 Spent Fuel Pool Cooling/Inventory

The Nine Mile Point U1 Spent Fuel Pool (SFP) is a wet spent-fuel storage facility located on the refueling floor in the Secondary Containment (Reactor Building). It provides specially designed underwater storage space for the reactor spent fuel assemblies which require shielding and cooling during storage and handling. Normal makeup water source to the SFP is from the Condensate Transfer System. The basic FLEX strategy for maintaining SFP cooling is to monitor SFP level and provide makeup water to the SFP sufficient to maintain substantial radiation shielding for a person standing on the SFP operating deck and cooling for the spent fuel.

2.5.1 Phase 1 Strategy

Evaluations estimate that with no operator action following a loss of SFP cooling, at the SFP maximum design heat load (outage condition, full core offload, SFP gates installed), the SFP will reach 212°F in approximately 8 hours and boil off to a level 10 feet above the top of fuel in 45 hours from initiation of the ELAP / LUHS event. During non-outage conditions, the time to boiling in the pool is significantly longer typically greater than 24 hours. The FLEX strategy during Phase 1 of an ELAP / LUHS event for SFP cooling is to utilize the SFP water level instrumentation installed in response to NRC Order EA-12-051 to monitor the SFP water level. Within the first 16 hours, stage a FLEX Pump for the addition of makeup water to the SFP as it is needed in order to restore and maintain the normal level in Phase 2.

2.5.2 Phase 2 Strategy

Using the design basis maximum heat load, the SFP water inventory will heat up from 140°F to 212°F during the first 8 hours (Reference 22). Calculations identify that the required makeup rate to maintain the SFP filled during this time is 42 gpm. There are approximately 9,900 gallons per foot of level in the SFP. Using the makeup rate identified above, preliminary calculations identify that SFP water level will lower approximately 1 foot every 3.5 hours. At 23 feet above the fuel, it will take approximately 45 hours to reach a level 10 feet above the spent fuel (the level below which is assumed to prohibit access to the refuel floor from a radiological perspective). Thus, the transition from Phase 1 to Phase 2 for SFP cooling function is conservatively established to occur in Phase 2 within 24 hours of the onset of the ELAP/LUHS event.

SFP cooling will be established in Phase 2 utilizing a portable FLEX pump to makeup to the SFP keeping the spent fuel covered with water. Phase 2 actions to have the pump connected and available for makeup are targeted to occur at less than or equal to 16 hours from onset of the ELAP/LUHS event. By then, SFP water level should only have lowered by approximately 4.5 feet. The Phase 2 Primary strategy uses a permanent hose connection point on Reactor Building 318' elevation for a FLEX Pump to supply lake water to the SFP. The FLEX Pump takes suction from Lake Ontario at the NMP1 Circulating Water intake location in the Screen House to supply water from the intake to a distribution manifold in the Reactor Building with a discharge connection point to the Spent Fuel Pool. SFP makeup hoses are routed from the FLEX distribution manifold to the hard-pipe connection point on elevation 318' of the Reactor Building which continues up to the SFP on elevation 340'. The FLEX Pump deployment is expected to be completed within four (4) hours of the event onset as described previously in section 2.3.

The Alternate injection method to provide water to SFP is to run a fire hose from the FLEX Pump to the refuel floor and inject into the SFP. The pump will take suction from one of two Screen House protected locations discussed in section 2.3.2. The discharge hose of the pump can be simply attached to the railing of the SFP or alternatively the discharge hose from the FLEX Pump can be attached to a spray nozzle stored on the refuel floor (for 10CFR50.54(hh)(2)). The oscillating spray nozzle can be used to provide spray flow over the SFP for cooling if the SFP integrity has been compromised.

2.5.3 Phase 3 Strategy

Phase 3 Strategy is to continue with the Phase 2 methodologies using the FLEX Pumps. Additional High Capacity Pumps will be available from the NSRC as a backup to the on-site FLEX Pumps.

2.5.4 Structures, Systems, and Components

2.5.4.1 Primary Strategy

FLEX Pumps are stored in the FLEX Storage Building. The procedure N1-DRP-FLEX-MECH (Reference 29) details the deployment path of the pumps from the storage location to the locations where they can be used. The primary location for use is on the North side of the NMP1 Screen House. Two new wall penetrations have been created which are used to feed 6 inch suction hose into the Screen House building. The penetration is simply a small segment of pipe with a Victaulic style cap installed on the outside. This cap (which is much lighter than a blank flange) will have to be removed from the pipe penetration. Once the hose has been fed inside the building, it can be fed into the Circulating Water system intake tunnel via a hinged door that has been installed in the existing deck plate above the intake tunnel. A single 50 foot length of hose will be used from the pump suction connection in order to reach the low lake level of 243'. The hose (not including the suction strainer installed on the end of the hose) will be submerged by at least 4 feet under the surface to prevent vortexing. Primary water makeup to the RPV, EC loops and SFP will all be via a manifold, mounted on a push cart, located in the Reactor Building track bay which will receive water from the FLEX Pump. When not in use, the manifold/cart will be stored locally, just outside the track bay (in the RB), with the wheels chocked to prevent movement. When needed, the manifold/cart will be un-chocked and moved to the Reactor Building track bay on elevation 261'. This manifold provides the ability for a single operator to control the flow rates to each of the three injection points (RPV, EC, SFP) when deployment of the primary injection paths is successful for all three key safety functions.

A 1.5 inch hose is routed from manifold valve VLV-BDB-005, up the hoist well to elevation 318'. A permanent hose connection hard-piped to the SFP on elevation 340' is located near Reactor Building column N-11 on elevation 318'. It requires two (2) 100 foot lengths of 1.5 inch hoses to make the connection between the manifold and permanent hose connection. The 1.5 inch hoses will be stored in the Reactor Building on elevation 318', with the end of one of the hoses being lowered down the hoist well in order to connect with the manifold. A hose saddle attached to the railing is used to keep the hose from resting on an edge of the floor.

2.5.4.2 Alternate Strategy

The FLEX implementation guidance given in NEI 12-06 requires that alternate methods of water make up are available. The alternate make up method for NMP1 to the SFP is similar to the method used to make up water with the 10CFR50.54(hh)(2) pumps. A 3 inch hose is to be run from the FLEX Pump at the NMP1 Screen House, into the Reactor Building track bay via doors D-196 and D-045, then into the Reactor Building via D-132 and up the nearby stairs to elevation 318'. There, a valved hose splitter will be used to create two hose paths, one routed to the side of the spent fuel pool, interfacing with a spray nozzle, and the other to be tied down to the railing on the side of the pool for direct SFP makeup. The hoses from the splitter to the SFP are already stored on the refuel floor, intended for NMP1's 10CFR50.54(hh)(2) capability The FLEX Pump speed or discharge valve can be adjusted in order to get the desired flow rate. Access to the Reactor Building 340' elevation is necessary in order to bring the hose to the top of the spent fuel pool. Calculations (Reference 55) have determined that the Reactor Building elevation 340' will reach 120° F and inhibit access at approximately one (1) hour into the ELAP/LUHS event. Therefore, the SFP Alternate strategy to deploy hoses on Reactor Building elevation 340' down to Reactor Building elevation 318' is directed before one (1) hour has elapsed from the start of the event, in accordance with the SBO/ELAP procedure N1-SOP-33A.2.

2.5.4.3 Ventilation

During an ELAP/LUHS event, normal and emergency Reactor Building ventilation will be non-functional. In addition to the spent fuel pool, the NMP1 Reactor Building elevation 340' area also contains four Emergency Cooling (EC) Condensers, which generate heat when EC loops are placed into service. FLEX manual actions have to be performed on the Reactor Building elevation 340' following an ELAP/LUHS event. To identify any limitations, temperatures on Reactor Building elevation 340' (Spent Fuel Pool) and elevation 318' (SFP level instrument electronics) were evaluated in calculation S0-GOTHIC-ELAP001, Reactor Building Response Following an ELAP (Reference 55). The area temperature on Reactor Building 340' in the first one (1) hour and three (3) hours is predicted to be 120°F and 135°F respectively. The significant temperature rise is due to the combination of heat from the uninsulated Emergency Cooling Condenser surfaces and the loss of decay heat removal from the spent fuel pool.

Based on the calculation, operator response actions in the NMP1 Reactor Building on 340'elevation following an ELAP/LUHS event should be completed within the first hour after the event onset. Therefore, the SFP Alternate strategy to deploy hoses on Reactor Building elevation 340' down to Reactor Building elevation 318' is directed before one (1) hour has elapsed from the start of the event, in accordance with the SBO/ELAP procedure N1-SOP-33A.2.

Additional actions to initiate passive cooling and ventilation in the NMP1 Reactor Building to prevent excessive steam accumulation and high temperature conditions are directed within eight (8) hours of the event onset in accordance with the SBO/ELAP procedure N1-SOP-33A.2. The results of the calculation show Reactor Building temperatures on elevation 340' will rise and peak at 168°F provided passive cooling actions are implemented within eight (8) hours of the ELAP event. The passive cooling actions are to open specified doors in the Reactor Building and Turbine Building, in addition to the Turbine Building side-wall vents, to cooldown areas in the Reactor Building and channel potentially contaminated air/steam mixture from the Turbine Building roof to atmosphere.

2.5.5 Key SFP Parameters

The key parameter for the SFP Make-up strategy is the SFP water level. The SFP water level is monitored by the instrumentation that has been installed in response to Order EA-12-051, *Reliable Spent Fuel Pool Level Instrumentation* (Reference 2). SFP wide range level indicators were installed (Reference 56) to comply with NRC issued order EA-12-051, per design change ECP-13-000651 and complies with the industry guidance provided by the Nuclear Energy Institute guidance document NEI 12-02 (Reference 6).

Spent Fuel Pool Wide range level is a through air radar type indication consisting of two (2) physically separate channels utilizing waveguides mounted at the Northeast and Southeast edges of the Spent Fuel Pool. SFP level can be monitored on indicators LI-54-65A and LI-54-65B on PNL-54-65H located in the Auxiliary Control Room, Northeast corner. Indications are also available in the plant on LI-54-65B-1 and LI-54-65A-1 which are located on the East wall of the Reactor Building 318' elevation. 100% scale is equivalent to 339.13' and 0% scale is equivalent to 315.95'. Normal SFP Level is 339' and top of the SFP fuel storage racks is 315.95'. The accuracy of the level measurement instrument is ± 1 inch considering both the reference accuracy conditions and effects of losses in the waveguide. Under conditions of saturated steam at the horn end of the waveguide and 176°F at the sensor, the accuracy is ±3 inches. Each channel has backup batteries (24 VDC) which can be selected to power the unit on loss of normal 120 VAC power for 131 hours (5.4 days).

2.5.6 Thermal-Hydraulic Analyses

For NMP1, the normal SFP water level at the event initiation is approximately 23' feet over the top of the spent fuel seated in the storage racks. Maintaining the SFP full of water at all times during the ELAP/ LUHS event is not required; the requirement is to maintain adequate water level to protect the stored spent fuel and limit exposure to personnel on-site and off-site. For the purposes of this strategy, the objective is to maintain the SFP level at least 10 feet above the spent fuel seated in the spent fuel racks. This is conservatively identified as Level 2 in NEI 12-02, Industry Guidance for Compliance with NRC Order EA-12-051, "To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation" and is specified as at least 10 feet above the fuel seated in the spent fuel racks.

Using the design basis maximum heat load, the SFP water inventory will heat up from 140°F to 212°F during the first 8 hours (Reference 22). Calculations identify that the required makeup rate to maintain the SFP filled during this time is 42 gpm (Reference 22). There are approximately 9,900 gallons per foot of level in the SFP. Using the makeup rate identified above, calculations identify that SFP water level will lower approximately 1 foot every 3.5 hours. At 23 feet above the fuel, it will take approximately 45 hours to reach a level 10 feet above the spent fuel (the level below which is assumed to prohibit access to the refuel floor from a radiological perspective). Thus, the transition from Phase 1 to Phase 2 for SFP cooling function is conservatively established to occur in Phase 2 within 24 hours of the onset of the ELAP event.

SFP cooling will be established in Phase 2 utilizing a FLEX Pump to makeup to the SFP keeping the spent fuel covered. Phase 2 actions to have the pump connected and available for makeup are targeted to occur at less than or equal to 16 hours. By then, SFP water level should only have lowered by about 4.5 feet.

2.5.7 Flex Pump and Water Supplies

2.5.7.1 FLEX Diesel-driven Portable Pump (Refer to 2.3.9)

The FLEX Pump is a Power Prime model 3419MX rated at 770 gpm (@ 363 psid) pump. The FLEX Pump is a trailer-mounted, diesel engine driven centrifugal pump that is stored in the robust FLEX Storage Building.

A hydraulic calculation was performed (Reference 46) to verify the capability of the FLEX Pumps and piping/hose system to deliver the required amount of water to each required location in the plant.

For Spent Fuel Pool (SFP) makeup, 42 GPM is the calculated boiling rate of the pool for a full core offload as given in calculation S14-54HX018. The ability to supply 250 GPM is a requirement of NEI 12-06 (spray cooling), in the event of a crack in the pool or other means of unforeseen leakage. The 250 GPM is inclusive of the 42 GPM normal boil off rate and was therefore established as the SFP makeup in the hydraulic calculation.

For NMP1, one FLEX Pump is capable of supplying the primary make up requirements to the RPV, Emergency Cooling Condensers, and Spent Fuel Pool. A second pump will have to be used if the maximum spent fuel pool make up flow of 250 GPM is required while the first pump is supplying maximum make up to the EC loops and RPV.

2.5.7.2 Water Supplies

Lake Ontario is the primary source of water for deployment of the Phase 2 strategy. The water source is taken from the intake tunnel of the NMP1 Circulating Water system which draws from Lake Ontario.

2.5.8 Instrumentation

The Spent Fuel Pool will be monitored by instrumentation installed (Reference 56) by Order EA-12-051. The Spent Fuel Pool Instrumentation Power Control Panels PNL-54-65A and PNL-54-65B are supplied 120VAC power from Reactor Protection System (RPS) Trip Busses 131 and 141 respectively. Each Power Control Panel also contains eight Tadiran Model TL-5920 C-cell lithium batteries that provide backup power when normal 120VAC power is not available. The battery life for worst case condition of 20 milliamps (mA) discharge rate is 131 hours (5.4 days). In addition, the batteries may be replaced, if required, since the power control panels are readily accessible in the Auxiliary Control Room.

Alternative power to either instrument channel will be provided within 8 hours using FLEX portable generators to provide power to the instrumentation and panels per the Phase 2 FLEX electrical strategy.

2.6 Characterization of External Hazards

2.6.1 Seismic

Seismic Hazard Assessment

Per NMP1 Design Criteria Document, DCD-115 (Reference 10), the seismic criteria for NMP1 is the Design Basis Earthquake (DBE) (Safe Shutdown Earthquake (SSE)). The Operating Basis Earthquake (OBE) is not included in the NMP1 License Basis. The licensing basis DBE is 0.11g (Reference 9). As part of the NMP1 seismic reevaluation program, an upgraded design basis SSE ground response spectrum (GRS) was developed based upon methods established during the NRC's Systematic Evaluation Program (SEP). Based upon the seismogenic zones and their credibility, the upgraded SSE is anchored to a peak ground acceleration (PGA) of 0.13g (Reference23). The upgraded SSE was used in the NMP1 seismic evaluations in USI A-46 and Individual Plant Examination for External Events (IPEEE) (References 20, 21 and 42). Therefore, the upgraded GRS anchored to 0.13g PGA represents the current SSE for NMP1. New equipment that is installed at NMP1 is designed to 0.13g as a result of upgraded design basis requirements instituted in 1984.

In accordance with the NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, Nine Mile Point developed a Seismic Hazard and Screening Report utilizing the guidance in NRC endorsed EPRI Report 1025287, "Seismic Evaluation Guidance, Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic (ML12333A170). The NMP Seismic Hazard and Screening Report was submitted to the NRC on March 31, 2014 (Reference 27).

For both NMP1 and NMP2, the Seismic Hazard and Screening Report determined that the SSE envelopes the Ground Motion Response Spectra (GMRS) in the frequency range of 1 to 10 Hz. Therefore per the SPID, Sections 3.2 and 7, NMP1 and NMP2 screen out of further seismic risk assessments in response to NTTF 2.1: Seismic, including seismic probabilistic risk assessment (SPRA) or seismic margin assessment (SMA), as well as spent fuel pool integrity evaluations. Additionally, NMP1 and NMP2 screen out of the Expedited Seismic Evaluation Process (ESEP) interim action per the "Augmented Approach" guidance document, Section 2.2.

For NMP1 FLEX, the earthquake is assumed to occur without warning and result in damage to non-seismically designed structures and equipment. Non-seismic structures and equipment may fail in a manner that would prevent accomplishment of FLEX-related activities (normal access to plant equipment, functionality of non-seismic plant equipment, deployment of beyond-design-basis (BDB) equipment, restoration of normal plant services, etc.). Alternate FLEX strategies and alternate deployment paths have been developed to accommodate impact from a seismic event. Debris removal equipment is stored in the FLEX Storage Building.

Additional evaluation was performed to evaluate for soil liquefaction potential at Nine Mile Point. The evaluation concluded that based upon the original site borings, the extensive borings conducted for the installation of the Dry Spent Fuel Storage Facility (ISFSI) and the associate Heavy Haul Path, and the recent soil borings for the design of the new FLEX Storage Building, the soil liquefaction potential for the Primary and Alternate Deployment Paths is considered minimal.

2.6.2 External Flooding

Site Layout and Topography

The NMP site is located on the southeastern shore of Lake Ontario in the Lake Ontario watershed. That hydrologic setting generally provides an overland pathway for runoff directly into the lake with any streams mostly small and intermittent. The nearby Oswego River is one of only five major rivers that are exceptions to this condition for the entire lake.

Plant grade for NMP1 is approximately elevation 261 feet. The NMP site, in the immediate vicinity of the plant, is graded to carry onsite runoff to Lake Ontario. In addition, exterior barriers (i.e., berms) located on all three land sides of the immediate plant area divert offsite surface water flow from the watershed adjacent to the plant from reaching the plant site. The flood control berms also prevent onsite runoff from leaving the site in most directions. Surface water flow inside the flood control berms, and directly adjacent to plant facilities, are generally controlled by two outlets: a site drainage channel that discharges to Lake Ontario and overland flow to the north, next to the plant structures (Reference 9 and 32). The shoreline adjacent to NMP is protected by a 1,000 foot long rock dike adjacent to NMP1 transitioning to a revetment ditch adjacent to NMP2, both with a top elevation of 263 feet. The lake shore is approximately 200 feet from the nearest safety-related building. The intermediate area, starting from the shoreline, includes a shore protection dike adjacent to NMP1 constructed from rock with soil fill at an elevation of 263 feet and 50 feet wide, and a revetment and interior drainage ditch adjacent to NMP2 at an elevation of 263 feet and averaging 24 feet wide. The ditch, with an elevation ranging from 254 feet to 249 feet, allows crashing waves to break and flow back to the lake to the southwest end of the dike. Finally, the plant grade rises along the protected area security fence, 80 feet to 100 feet from the shoreline to at least elevation 260 feet. Encompassing the NMP site are two watersheds. The berms located east, west and south of the plant physically separate these watersheds from the plant site. However, the Lake Road culvert connects the upgradient of one of the watersheds to the plant south side allowing a portion of drainage from the watershed to enter the plant inside the flood control berm. This culvert also connects to the plant main drainage located south of the Cooling Tower which continues along the south side of the plant going west and then north into the lake. There are four culverts along the main site drainage.

Current Design Basis Flood Elevations

NMP1 was designed and built prior to the requirements presented in the NRC Standard Review Plan (SRP) criteria for external floods (NUREG-75/087). Therefore, the evaluation and documentation to satisfy the SRP external flooding criteria was not required. However, the NMP1 Individual Plant Examinations for External Events (IPEEE) process (Reference 42) was used to find vulnerabilities with respect to the SRP external flooding criteria. Various possible flood scenarios were considered and information from calculations for NMP2 were used to show that the only flooding scenario of concern for the plant was one involving a probable maximum precipitation (PMP) event. Based on the NMP2 flood analysis, the worst flood height for NMP1 resulting from the PMP is 261.75 feet. This value includes the conservative assumptions that the storm water drainage system is inoperable and that the culverts located southwest of the NMP1 switchyard are not blocked.

Current Licensing Basis Flood Protection and Mitigation Features

The NMP1 licensing basis for flooding protection is provided by the Principal Design Criteria of the US Atomic Energy Commission (USAEC 1965) and did not contain any formal flooding analyses. NMP1 was licensed to standards prior to the issuance of the SRP (NUREG-0800), which provides the licensing criteria for NMP2. Current licensing basis (CLB) for NMP1 is defined from the respective plant UFSAR documents (Reference 9). NMP1 was not designed to satisfy the requirements stated in the NRC SRP and the NMP1 Individual Plant Examinations for External Events (IPEEE) (Reference 42 and 43) process was used to find vulnerabilities with respect to the SRP external flooding criteria.

Flood Protection Components

NMP1 relies on exterior walls of the substructure and the base slab structures housing safety related equipment designed to resist hydrostatic pressure and uplift due to exterior flooding to elevation 249 ft. (Waste Disposal, Turbine and Reactor Buildings and Control Room Floor). NMP1 also has a rock dike 1000-ft long at the shoreline that protects the SSCs from lake wave action or possible ice accumulation. The dike is 2 feet higher than yard grade at elevation 263 feet and is constructed of rock. Large rocks face the lake side of the dike and have proven very effective in wave damping and as a barrier to floating ice.

Flood Hazard Reevaluation

Since the original submittal of the Integrated Plan, Nine Mile Point has completed and submitted the Flood Hazard Reevaluation Report (FHRR) (Reference 41) requested by the 10 CFR 50.54(f) letter dated March 12, 2012. The reevaluation represents the most current flooding analysis for Nine Mile Point Units 1 and 2. The reevaluation results were mostly bounded by the original Nine Mile Point UFSAR/USAR site flooding vulnerabilities and characteristics evaluations. No new flooding hazards were identified in the reevaluation and the limiting flood event for Nine Mile Point continues to be a Local Intense Precipitation (LIP) event.

The NMP FHRR report describes the approach, methods, and results from the reevaluation of flood hazards at NMP1 and NMP2. The eight flood-causing mechanisms and a combined effect flood are described in the report along with the potential effects on NMP1 and NMP2. Only one reevaluated flood mechanism, Local Intense Precipitation (LIP) for both NMP1 and NMP2, exceeded the current design basis flood. For both NMP1 and NMP2, the assumed flood duration has increased from 20 minutes to 20 hours. For only NMP1, the flood elevation height has increased above the current license basis value (261.75 feet) by 0.45 feet. The calculated flooding duration change and the flooding elevation change will impact the amount of water ingress into structures for both units. Details of the LIP event can be obtained from Section 2.1 of the FHRR. Flooding protective measures have been proceduralized and integrated into FLEX strategy implementation. The reevaluated flood hazard will not prevent NMP1 from implementing FLEX strategies provided the specified flooding protective measures planned are implemented.

2.6.3 Severe Storms with High Wind

Per NEI 12-06 Figure 7-1, NMP1 has a 1 in 1 million chance per year of a hurricane induced peak-gust wind speed of > 120 miles per hour (mph). Thus, NMP1 does not need to address high straight wind hazards.

Per NEI 12-06 Figure 7-2, NMP1 has a 1 in 1 million chance of tornado wind speeds of 169 mph. This is greater than the threshold of 130 mph and therefore NMP1 has evaluated tornado hazards, including tornado missiles, impacting FLEX deployment.

NMP1 may have some warning time prior to the event in which a significant tornado event could occur within the vicinity of the site. The most probable approach direction is from the south-west. Site debris would most likely include all types of building material (metal siding, roofing, lumber, etc.), power lines and poles, Sea-vans, vehicles, light poles, trees and stored material. Minimal debris impacting deployment routes would be generated from offsite sources. Flex portable N and N+1 equipment is stored in the tornado and tornado missile proof FLEX Storage Building. Travel routes for FLEX deployment are considerably wide in most areas providing a drivable path even with debris. FLEX trucks and trailers should be able to travel over small debris such as sheet metal, vegetation and other similar objects. Some FLEX hoses, cables, and connection points for FLEX Pumps and generators are located in designated areas of NMP1 structures that maintain safe shutdown capability in the event of a tornado (Reference 9). Deployment pathways blocked by tornado debris can be cleared using the FLEX pay loader and other debris removal tools such as chainsaw, disaster saw, tow chains, etc., which are stored in the FLEX Storage Building.

The NMP1 stack can fall during the high winds resulting from a tornado. The NMP1 stack diameter is 20.5 feet at 110 feet from the bottom and this is the approximate distance from the stack to the deployment locations (north and west). Given the separation of the north and west deployment locations of about 60 feet and the diameter of the stack at about 20 feet, it is not expected that the stack will impact both deployment locations; therefore one of them is preserved for all events. Given the diverse capability in place for deployment of the FLEX Pumps at NMP1 (i.e. north side or west side of the screen house), the capability for deployment is maintained if the stack falls on one or the other location.

2.6.4 Ice, Snow and Extreme Cold

The guidelines provided in NEI 12-06 (Section 8.2.1) generally include the need to consider extreme snowfall at plant sites above the 35th parallel. NMP1 site is located at 43°31' 17" N latitude and 76° 24' 36" W longitude. The NMP1 site is located above the 35th parallel (Reference 5); thus, the capability to address hindrances caused by extreme snowfall with snow removal equipment will be provided. Per Section 8.2.1 of NEI 12-06, "It will be assumed that this same basic trend applies to extremely low temperatures". The lowest recorded temperature at or near NMP1 is -26°F and occurred in 1979. The NMP1 site is located within the region characterized by the Electric Power Research Institute (EPRI) as ice severity level 5 (Reference 5).

Snow and ice storms can provide enough buildup to affect travel within the site. However, reasonable warning time should provide enough time for progressive snow / ice removal by normal means. Clearing of FLEX deployment pathways has been incorporated into the Nine Mile Point snow removal plan. The FLEX pay loader can be used for snow removal of FLEX deployment pathways along with the FLEX tractor which is equipped with a snow removal blade during the winter months. The FLEX pay loader, tractor, trucks, generators, and pumps are housed in the FLEX Storage Building which is temperature controlled. Each of the vehicles, generators, and pumps is also equipped with a starting battery trickle charger to maintain the batteries at full charge for cold weather starts.

The FLEX generators are rated for full load operation at temperatures as low as -25°F. The NFPA 805/FLEX portable battery charger is rated to operate as low as 0°F and is equipped with a space heater to maintain the charger at or above 0°F. Freeze protection for FLEX Pumps and hoses is provided by maintaining flow in the pump/hose through the use of a minimum flow line controlled at the FLEX distribution manifold by the operator.

Diesel fuel for FLEX equipment is treated with a fuel additive during cold weather conditions to prevent gelling.

2.6.5 High Temperatures

Per NEI 12-06 Section 9.2, "all sites will address high temperatures" for impact on deployment of FLEX equipment. The maximum temperature observed at NMP1 was 98°F and occurred in 1953. Extreme high temperatures are not expected to impact the utilization of off-site resources or the ability of personnel to implement the required FLEX strategies.

Portable diesel equipment and portable static battery charger will be operated in areas outdoors, where the temperature will effectively be ambient. Vendor information has been reviewed to verify the equipment is expected to operate at high temperatures.

The maximum temperature referenced in the Nine Mile Point Unit 2 Updated Safety Analysis Report, Section 2.3.1.2.2. Climatological Normals and Extremes, is 102°F (Reference 32). Given the location of NMP1 in the immediate vicinity on site, it is reasonable to extend this maximum referenced temperature to both units.

The FLEX generators vendor manual shows a max ambient temperature of 158°F for the control unit and 122°F for the cooling system.

The NFPA 805/FLEX battery charger vendor manual shows a maximum ambient temperature of 122°F for the machine.

The FLEX Pumps were built with John Deere 6068HF485 diesel engines. The application review done by John Deere reports that the Limiting Ambient Temperature for the engines is 132° F. Per Power Prime, the FLEX Pump manufacturer, the pump limiting temperature component is the rubber goods in the seals and there should be no concerns for ambient temperatures below 180°F.

The FLEX hoses are manufactured to NFPA 1961 standards. Over-aging tests are done at a temperature of 158°F +/- 3.6°F for 96 hrs. The hoses and fittings for the FLEX equipment will be cooled by the lake water flowing through them.

The FLEX cables used with the portable generator and charger are TPC Power Cable, 2000V rated, stranded copper, Super-Trex type W, type RHH/RHW-2, single conductor #4/0 AWG, 90°C (194°F) conductor temperature rating.

The FLEX Storage Building has its own heating and ventilation system. Per the building design (Reference 44), the maximum predicted temperature of 105.34°F inside the building is based on a maximum outdoor temperature of 103°F (Reference 32). This 105.34°F temperature does not challenge the FLEX portable equipment capabilities.

2.7 Planned Protection of Flex Equipment

Nine Mile Point has constructed a single hardened FLEX storage structure of approximately 8,400 square feet that will meet the requirements for the external events identified in NEI 12-06, such as earthquakes, external floods, storms (high winds, and tornadoes), extreme snow, ice, extreme heat, and cold temperature conditions (Reference 44). The FLEX Storage Building is located inside the Protected Area (PA) fence on the west side of NMP1, South of the Sewage Treatment Plant (STP) and North of the Independent Spent Fuel Storage Installation (ISFSI) area.

The FLEX Storage Building is designated as a seismic Category I and QA Category II structure (Non-Safety Related). The building design is based on SDC-1, Structural Design Criteria Rev 07 (NMP2's CLB design for SSC for external hazards), which envelopes NMP1 requirements. The top of the slab (floor elevation) is 263.3 feet which is significantly above the reevaluated flood hazard maximum probable flood elevation of 261.8 feet in that area of the site. The FLEX Storage Building was designed and constructed to prevent water intrusion and built to protect the housed FLEX equipment from other hazards identified in Section 2.6 above. The FLEX Storage Building has its own heating and ventilation, and fire suppression system.

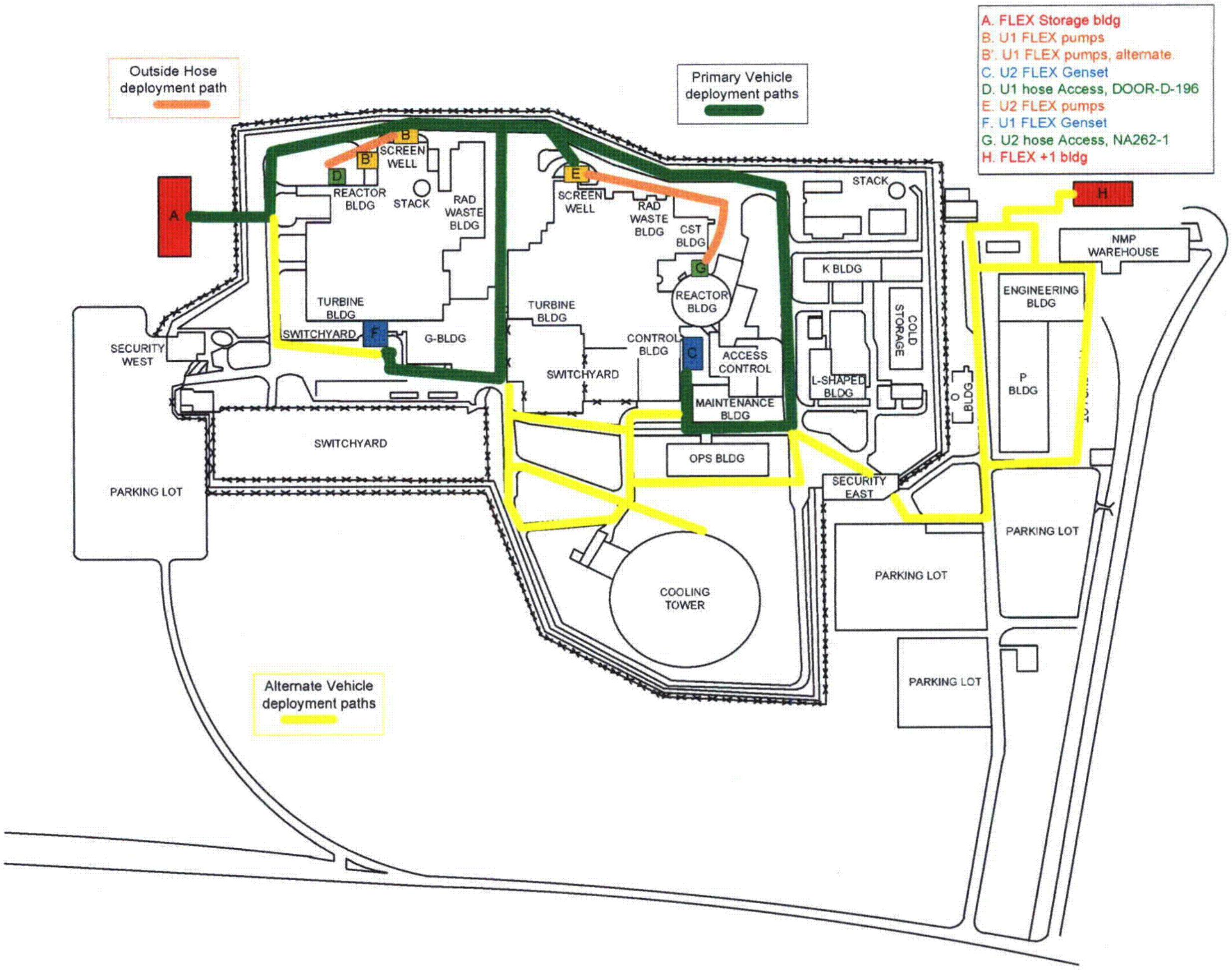
Large FLEX portable equipment such as pumps, generators, portable battery charger, fuel trailers, pay loader, tractor, and trucks are secured with tie-down straps to floor anchors inside the FLEX Storage Building to protect them during a seismic event. The FLEX Storage Building anchors are integrated into the floor slab.

Debris removal equipment such as the FLEX pay loader and tractor are stored inside the FLEX Storage Building in order to be reasonably protected from external events such that the equipment will remain functional and deployable to clear obstructions from the pathway between the FLEX Storage Building and its deployment location(s).

Deployments of the FLEX and debris removal equipment from the FLEX Storage Building are not dependent on off-site power. All actions required to access and deploy debris removal equipment and BDB/FLEX equipment can be accomplished manually.

As required by NEI 12-06, all equipment credited for implementation of the FLEX strategies at NMP1 is either stored in the FLEX Storage Building or in a plant structure that meets the station's design bases for Safe Shutdown Earthquake (SSE), specifically the NMP1 Reactor Building, Turbine Building, and Screen House Building.

Figure 3: FLEX Storage Building Location and Haul Route



2.8 Planned Deployment of Flex Equipment

2.8.1 Haul Paths and Accessibility

Pre-determined, preferred haul paths have been identified and documented in procedures N1-DRP-FLEX-MECH (Reference 29) and N1-DRP-FLEX-ELEC (Reference 30). Figure 3 shows the haul paths from the FLEX Storage Building to the various deployment locations. These haul paths have been reviewed for possible obstructions, Reference 60). Debris removal equipment is stored inside the FLEX Storage Building to be protected from the severe storm and high wind hazards such that the equipment remains functional and deployable to clear obstructions from the pathway between the FLEX Storage Building and the deployment location(s).

The potential impairments to required access are: 1) doors and gates, and 2) site debris blocking personnel or equipment access. The coping strategy to maintain site accessibility through doors and gates is applicable to all phases of the FLEX coping strategies, but is required as part of the immediate activities required during Phase 1.

Doors and gates serve a variety of barrier functions on the site. One primary function is security and is discussed below. However, other barrier functions include fire, flood, radiation, ventilation, tornado, and HELB. As barriers, these doors and gates are typically administratively controlled to maintain their function as barriers during normal operations. Following a BDB external event and subsequent ELAP/LUHS event, FLEX coping strategies require the routing of hoses and cables to be run through various barriers in order to connect FLEX equipment to station fluid and electrical systems. For this reason, certain barriers (gates and doors) will be opened and remain open. This violation of normal administrative controls is acknowledged and is acceptable during the implementation of FLEX coping strategies.

The ability to open doors for ingress and egress, ventilation, or temporary cables/hoses routing is necessary to implement the FLEX coping strategies. Security doors and gates that rely on electric power to operate opening and/or locking mechanisms are barriers of concern. The Security force will initiate an access contingency upon loss of power as part of the Security Plan. Access to the Owner Controlled Area, site Protected Area, and areas within the plant structures will be controlled under this access contingency as implemented by Security personnel.

The deployment of onsite FLEX equipment to implement coping strategies beyond the initial plant capabilities (Phase 1) requires that pathways between the FLEX Storage Building and various deployment locations be clear of debris resulting from seismic, high wind (tornado), excessive snow/ice, or flooding events. Clearing of FLEX deployment pathways has been incorporated into the Nine Mile Point snow removal plan. Signs requiring paths and areas to remain clear of obstructions have been posted along deployment pathways and at FLEX equipment deployment locations.

The FLEX debris removal equipment includes a John Deere 4-wheel drive tractor equipped with a snow removal attachment and rear tow connections in order to move or remove debris from the needed travel paths. A Case 621 pay loader is also available to deal with more significant debris conditions. FLEX debris removal hand tools such as tow chains, chainsaw, demolition saw, axe, sledgehammer, and bolt cutters are also available. All equipment is stored in the FLEX Storage Building.

Phase 3 of the FLEX strategies involves the receipt of equipment from offsite sources including the NSRC with various commodities such as fuel and supplies. Transportation of these deliveries will be through airlift or via ground transportation utilizing the Nine Mile Point SAFER Response Plan (Reference 45). Debris removal for the pathway between Staging Areas 'A' and the NSRC receiving location Staging Area 'B' and from the various plant access routes may be required based on conditions present.

2.9 Deployment of strategies

2.9.1 Makeup Water Supply Strategy

Lake Ontario provides an indefinite supply of water as make-up to the Screen House inlet structure (Reference 9). The water will be drawn from the Circulating Water System intake tunnel. The intake and discharge tunnels are Class I seismic structures. The inlet of the intake tunnels of both units are at a minimum, 1000' off shore, near the lake floor (well under the surface of the lake). Lake Ontario water is normally clear with little particulate or debris. The FLEX Pumps' suction will be taken upstream of circulating water screens and trash rakes. At the required pump flow rates, intake water will be flowing at a very low velocity (500 GPM = 0.014 ft/sec) such that it is not expected that significant debris will be carried into the area where the FLEX Pumps will be taking their suction. However, to be conservative, an inlet barrel strainer at the end of the suction hose will be installed.

The portable FLEX Pumps will be transported from the FLEX Storage Building to a location near the selected water source. On the North wall of the NMP1 Screen

House two penetrations have been installed in pre-cast wall panels of the Screen House. The penetrations use 12 inch, schedule 40 pipe in order to accommodate the 6 inch suction hoses and the hose fittings, which measure to be 10 inches across when the clasping arms are down. In order to access the circulating water system intake tunnel, two 16 inch x 16 inch hinged access openings can be opened in two of the four sections of deck plate that make up a large 8 foot x 8 foot covering over the intake tunnel on the North side of the building. The 6 inch suction hose will then be routed from the FLEX Pump suction to the water source where water will be drawn through a strainer to limit solid debris to prevent damage to the FLEX Pump. The cross sectional area through this strainer is large compared to the cross sectional area of the suction hose such that pressure losses are expected to be negligible. Should debris block a portion of the inlet strainer, there will still be enough flow area to prevent significant pressure loss that would jeopardize the NPSH at the pump suction. Particulate small enough to pass through the inlet strainer will also pass through the FLEX Pumps without adverse impact. The suction end of the barrel strainer will be located below the low level elevation of the lake at least 4 feet below the water surface (scribed line on suction hose), but well above the floor of the intake tunnel, preventing any debris that may have settled on the bottom of the tunnel to be lifted into the suction hose.

An alternate staging area for the FLEX Pump and suction hose is available from the West side of the Screen House in the event the North side Screen House area is not accessible. The FLEX Pump suction hose will be installed in an opening upstream of the intake trash rakes.

2.9.2 RPV Make-up Strategy

The FLEX Pumps are stored in the FLEX Storage Building and are protected against snow, ice, high and low temperatures, seismic, flood, high wind and associated wind-driven missiles.

The Primary water make up to the RPV, EC loops and SFP will all be via a manifold, mounted on a push cart, located in the Reactor Building track bay which will receive water from the portable FLEX Pump. When not in use, the manifold/cart will be stored locally, just outside the track bay (in the Reactor Building), with the wheels chocked to prevent movement. When needed, the manifold/cart will be un-chocked and moved to the track bay. This manifold provides the ability for a single operator to control the flow rates to each of the three injection points when deployment of the primary injection paths is successful for all three key safety functions. 3 inch diameter hose is used to make the connection between the FLEX Pump discharge and the inlet of the portable distribution manifold. A third connection on the inlet side of the manifold is used as a minimum flow line. If the pump is ready to be started, but injection is not yet required, the pump can still be started and water can flow through the minimum flow line to ready the pump for service. The min flow line also supports the FLEX freeze protection strategy of maintaining flow in supply hoses routed outside of buildings.

As an alternate to running the 3 inch hoses outdoors into the Reactor Building track bay via doors D-196 and D-045, the hose can be routed indoors, through the Turbine Building (via door D-046) and into the Reactor Building (via air lock doors D-052 and D-053). This will require parallel runs of 800 feet of hose if make up to all three locations is required through this route.

Primary RPV make-up utilizes 50 feet of 1.5 inch hose routed from the portable distribution manifold valve VLV-BDB-004, through Reactor Building door D-132 and interfaces with a hose connection located on the Control Rod Drive (CRD) return to RPV line. This hose is stored near the CRD hose connection. Valves VLV-44.3-34 and VLV-44.3-35 in the CRD line are opened in order to allow injection into the RPV. In order to prevent back flow into the CRD system, CRD valve VLV-44.3-09 (located off of the stairway down to the next elevation) is required to be closed prior to providing make up to the RPV to isolate upstream piping.

Alternate RPV make-up utilizes a hose connection in the cross tie between fire protection piping and high pressure feedwater piping located, between the feedwater pumps and the 5th point feedwater heater. 3 inch hose is routed from the FLEX Pump discharge to this hose connection located inside the Turbine Building on the 261' elevation near the electric Feedwater pumps. The connection on the cross tie is a Storz connection which uses a Storz to NST adaptor to make the hose connection. The hose run contains eight (8) 100 foot lengths of 3 inch hose routed from the FLEX Pump discharge, into the screen house via door D-037, into the Turbine Building via door D-046, and then to the hose connection at the Storz adapter. Valve VLV-29-412 at the connection in the Turbine Building can be used to throttle flow as necessary. This valve and the hose connection are close to the floor and no special equipment is needed for access.

2.9.3 Emergency Cooling Make-up Strategy

Primary Emergency Cooling (EC) Condenser make-up strategy uses a permanent hose connection point on Reactor Building 318' elevation for a FLEX Pump to supply lake water to the EC make-up piping. The FLEX Pump takes suction from Lake Ontario at the NMP1 Circulating Water intake location in the Screen House to supply water from the intake to the portable distribution manifold in the Reactor Building with a discharge connection point to the EC make-up piping. From the portable distribution manifold, 200 feet of 1.5 inch EC makeup hose is routed to the hard-pipe connection point on elevation 318' of the Reactor Building which ties into the EC make-up piping.

For the Alternate EC make-up strategy, a FLEX Pump is used to supply lake water and aligned to a qualified section of the Turbine Building Fire Water distribution header that can be aligned to the EC Make-Up tanks. The FLEX Pump takes suction from Lake Ontario at the NMP1 Circulating Water intake location in the Screen House to supply water from the intake to the EC make-up hoses. 600 feet of 3 inch hose from FLEX Pump at Screen House is routed through Turbine Building overhead door D-40, to connect at Fire Hose Station FS-128 in the Turbine Building 261' track bay. Three Firewater system valves, all located in the Turbine Building, require closure to align the system for EC make-up, VLV-100-64, VLV-100-24, and VLV-100-299. Once closed, VLV-100-638 at Fire Hose Station FS-128 is opened, and VLV-100-68 and VLV-100-69 are throttled open to initiate make-up flow to EC Make-up Tanks 12 and 11, respectively.

2.9.4 Spent Fuel Pool Make-up Strategy

Primary SFP make-up strategy uses a permanent hose connection point on Reactor Building 318' elevation for a FLEX Pump to supply lake water to the SFP. The FLEX Pump takes suction from Lake Ontario at the NMP1 Circulating Water intake location in the Screen House to supply water from the intake to the portable distribution manifold in the Reactor Building with a discharge connection point to the Spent Fuel Pool. From the portable distribution manifold, 200 feet of 1.5 inch SFP makeup hose is routed to the hard-pipe connection point on elevation 318' of the Reactor Building which continues to the SFP on Reactor Building elevation 340'.

For the Alternate SFP make-up strategy, a FLEX Pump is used to supply lake water to the SFP. The FLEX Pump takes suction from Lake Ontario at the NMP1 Circulating Water intake location in the Screen House to supply water from the intake to the SFP make-up hoses. 600 feet of 3 inch hose is routed from the FLEX Pump discharge at the NMP1 Screen House, into the Reactor Building track bay via doors D-196 and D-045, then into the Reactor Building via D-132, and up the nearby stairs to elevation 318'. On Reactor Building elevation 318', a valved hose splitter is used to create two 200 foot hose paths to the SFP, one routed to the side of the spent fuel pool and connected to an oscillating spray nozzle (Ozzi), and the other is tied down to the SFP railing on the side of the pool for direct SFP makeup. The oscillating spray nozzle can be used to provide spray flow over the SFP for cooling in the SFP integrity has been compromised. The 3 inch hoses from the splitter on

Reactor Building 318' to the SFP are already stored on Reactor Building elevation 340', intended for NMP1's 10CFR50.54(hh)(2) capability.

2.9.5 <u>Electrical Strategy</u>

The strategy uses a portable FLEX diesel generator to power the existing #12 600VAC /125VDC Static Battery Charger (SBC) 171A or 171B, or an NFPA 805/FLEX portable battery charger to supply #12 or #11 Battery Board, in order to maintain vital DC loads necessary to support FLEX strategy implementation. The connection between the portable FLEX diesel generator and the existing 600VAC/125VDC static battery charger (SBC) 171A or B is via temporary 4/0 cables and connectors. The connection between the portable FLEX diesel generator and the NFPA 805/FLEX portable battery charger is via temporary 4/0 cables and connectors, and then to the #12 or #11 Battery Boards via temporary 4/0 cables and connectors. The FLEX portable diesel-driven generators and NFPA 805/FLEX portable battery charger are stored in the FLEX Storage Building and are protected against snow, ice, high and low temperatures, seismic, flood, high wind and associated wind-driven missiles. Connection points are located inside qualified structures as protection from external hazards.

The Primary strategy for maintaining power to the vital DC bus is to deploy the FLEX portable generator to the south side of the NMP1Turbine Building. Four (4) 150 foot 4/0 power cables are routed from the FLEX generator through #12 Battery Board Room (via an exterior wall penetration) and through interior Turbine Building door D-106 to connections on junction box JB-22334-AA located near SBC 171A&B. The FLEX generator is then started, a phase rotation check is performed, and then the selected static battery charger for #12 Battery, SBC 171A or SBC 171B is placed into service.

The Alternate strategy is to use the FLEX portable generator to provide power to the NFPA 805/FLEX portable battery charger. Connections and associated cabling for providing 125VDC electric power from the NFPA 805/FLEX portable charger to either of the two existing vital 125VDC Battery Boards (Battery Board 11 or 12) are installed at NMP1. The connection to the junction boxes in the Battery Board Rooms (DC connections) are via four (4) 100 foot 4/0 cables and connectors, two (2) cables for each the positive (+) and negative (-) polarity feeds. There is one (1) connector junction box in each #12 and #11 Battery Board Rooms which is be connected to the respective battery board bus via a disconnect switch, fuses and associated cables. The connection between the FLEX portable diesel generator and the NFPA 805/FLEX portable battery charger (AC connections) is via four (4) 50 foot 4/0 cables and connectors. The NFPA 805/FLEX portable battery charger will be deployed to outside the Turbine Building on the South-side of the Battery Board Rooms in close proximity to the FLEX portable diesel generator.

The electrical cables will be stored on a FLEX truck vehicle for the portable diesel generators and on the NFPA 805/FLEX battery charger trailer. Additional cables are also in the Turbine Building near the #11 and #12 Battery Board Rooms.

2.9.6 Fueling of Equipment

The FLEX strategies for safety functions and/or maintenance of safety functions involves several elements including the supply of fuel to necessary diesel powered generators, pumps, hauling vehicles, etc. The general coping strategy for supplying fuel oil to diesel driven portable equipment, i.e., pumps and generators, being utilized to cope with an ELAP / LUHS, is to draw fuel oil out of the NMP2 Emergency Diesel Generator Fuel Oil Storage Tanks. NMP1 Emergency Diesel Generator Fuel Oil Storage Tanks are below grade and will not be accessible per the reevaluated flood hazard. In order to ensure proper sizing and strategies for appropriate response for the eventual simultaneous full implementation of FLEX mitigation strategies at both NMP units, calculations associated with fuel consumption were performed assuming the equipment required for full implementation of mitigation strategies at both NMP1 and NMP2 are in operation simultaneously.

Fuel consumption for both NMP1 and NMP2 portable equipment to support FLEX (4 diesel driven portable pumps, 2 diesel driven portable generators and 1 diesel driven portable air compressor) is approximately 130 gallons per hour (GPH) for all items operating at full load. The Technical Specification (TS) minimum fuel storage on site is over 141,000 gallons in the Emergency Diesel Generator Fuel Oil Storage and Day Tanks. The fuel at NMP1 is not being credited because fuel is not accessible during flooding conditions which cover tank access ports. Fuel available at NMP2 is assumed with one (1) of three (3) Emergency Diesel Generator Fuel Oil Storage Tank unavailable (i.e. TS allowable).

Equipment	Fuel Tank Capacity	Full Load Consumption Rate	Total Run Time	Run Time to 20% of FO Tank Capacity
FLEX Pump	~190 gal	14 gal/hr	13.57 hrs	10.85 hrs
FLEX Generator	~500 gal	32 gal/hr	15.6 hrs	12.5 hrs
FLEX Air Compressor (NMP2 only)	~40 gal	5.3 gal/hr	7.5 hrs	6 hrs.

The remaining capacity of the two NMP2 Emergency Diesel Generator Fuel Oil Storage Tanks is greater than 85,000 gallons and will provide over 25 days of fuel for all FLEX portable equipment. The FLEX Phase 3 equipment from the NSRC designated for use at Nine Mile Point acts as replacement or backup to Phase 2 on-site portable diesel driven equipment. NSRC equipment can theoretically increase fuel consumption rate to 270 GPH if all NSRC equipment were deployed and operated at full load. The higher rate is due to design differences and larger equipment (i.e. 1.1MW turbine generator versus 450kW diesel generator). Even at this higher consumption rate, on-site fuel reserves would provide greater than 13 days of operation without off site replenishment. It is expected that the emergency response organization can ensure delivery of replenishment fuel as required within the times identified above.

Nine Mile Point will utilize two (2) 528 gallon fuel tanks mounted on separate trailers equipped with a 12 VDC/20 gpm, 1 inch transfer pump kit w/automobile nozzle, and stored in the FLEX Storage Building to support FLEX diesel driven equipment refueling. Each FLEX refuel tank's pump is powered from an on-board battery or the towing vehicle's DC power and will be used to refuel the FLEX portable equipment. These 528 gallon tanks will be filled from the on-site NMP2 Emergency Diesel Generator Fuel Oil Storage Tanks using portable fuel oil transfer pumps. The fuel oil transfer pumps and fuel to operate them are stored in the FLEX Storage Building, and are used to pump the fuel oil out of the NMP2 Emergency Diesel Generator Fuel Oil Storage Tanks into the trailer-mounted refueling tanks. The transfer pumps have been tested on-site and provide over 31 gpm flowrate (1860 GPH). The pump capacity of the deployment tank pump/nozzle is approximately 20 gpm (1200GPH). These delivery rates are well above the full load usage rate of all FLEX Phase 2 portable equipment.

Assuming a portable FLEX refuel tank pump out rate of 20 gpm, and a FLEX fuel oil transfer pump fill rate of 30 gpm, one cycle of filling the FLEX refuel tank and discharging its contents is approximately 44 minutes (0.75 hours) excluding travel time and setup. There will be a total of four (4) fill-and-distribute evolutions to refuel all portable FLEX equipment assuming one (1) for each FLEX generator and one (1) for each 'set' of two FLEX Pumps at each unit for a total refuel evolution time of 360 minutes (6 hours). This bounds the consumption rates identified above, and provides significant conservatism to be able to continue portable equipment refueling without challenging the transfer rates or running out of fuel on any piece of Phase 2 portable FLEX equipment. The total refueling cycle should take less than 6 hours with one truck and tank performing FLEX refueling duty. In order to refuel the FLEX

Pumps and generators before they reach a level of 20% fuel tank capacity, the refueling effort should start at approximately 10 hours into the event. The FLEX air compressor used for NMP2 FLEX will need refueling commencing 6 hours after placing the compressor into service.

2.10 Offsite Resources

2.10.1 National SAFER Response Center

The industry has established two (2) National SAFER Response Centers (NSRCs) to support utilities during BDB events. Nine Mile Point has established contracts and issued purchase orders to Pooled Inventory Management (for participation in the establishment and support of two (2) National SAFER Response Centers (NSRC) through the Strategic Alliance for FLEX Emergency Response (SAFER). Each NSRC will hold five (5) sets of equipment, four (4) of which will be able to be fully deployed when requested. The fifth set will have equipment in a maintenance cycle. In addition, on-site BDB/FLEX equipment hoses and cable end fittings are standardized with the equipment supplied from the NSRC. In the event of a BDB external event and subsequent ELAP/LUHS condition, equipment will be moved from an NSRC to a local assembly area established by the Strategic Alliance for FLEX Emergency Response (SAFER) team. For Nine Mile Point the local assembly area is the Syracuse Hancock International Airport. From there, equipment can be taken to the Nine Mile Point site and staged at Staging Area 'B' by helicopter if ground transportation is unavailable or inhibited. Communications will be established between the Nine Mile Point site and the SAFER team via satellite phones and required equipment moved to the site as needed. First arriving equipment will be delivered to the site within 24 hours from the initial request. The order at which equipment is delivered is identified in the Nine Mile Point SAFER Response Plan documented in procedure CC-NM-118-1001 (Reference 45).

2.10.2 Equipment List

The equipment stored and maintained at the NSRC for transportation to the NMP Staging Area 'B' to support the response to a BDB external event at Nine Mile Point is listed in Table 5. Table 5 identifies the equipment that is specifically credited in the FLEX strategies for Nine Mile Point but also lists the equipment that will be available for backup/replacement should on-site equipment break down. Since all the equipment will be located at the NMP Staging Area 'B', the time needed for the replacement of a failed component will be minimal.

2.11 Habitability and Operations

2.11.1 Equipment Operating Conditions

Following a BDB external event and subsequent ELAP/LUHS event at Nine Mile Point, ventilation providing cooling to occupied areas and areas containing FLEX strategy equipment will be lost. Per the guidance given in NEI 12-06, FLEX strategies must be capable of execution under the adverse conditions (unavailability of installed plant lighting, ventilation, etc.) expected following a BDB External Event (BDBEE) resulting in an ELAP/LUHS. The primary concern with regard to ventilation is the heat buildup which occurs with the loss of forced ventilation in areas that continue to have heat loads. A loss of ventilation n analyses was performed to quantify the maximum steady state temperatures expected in specific areas of the plant related to FLEX implementation to ensure the environmental conditions remain acceptable for personnel habitability and within equipment qualification limits, for specifically, the Main Control Room and Reactor Building. To protect station personnel from the adverse effects of performing FLEX related mitigation actions in thermally elevated environments, an evaluation of the plant areas requiring access for mitigation actions was performed and compensatory actions or restrictions were identified and incorporated into procedures (Reference 58).

The key operating areas identified for all phases of execution of the FLEX strategy activities are the Main Control Room and Reactor Building. These areas have been evaluated to determine the temperature profiles following an ELAP/LUHS. The area temperature for the habitability region on Reactor Building elevation 340' in the first one (1) hour and three (3) hours (prior to opening doors) is predicted to be 120°F and 135°F respectively. The significant temperature rise is due to the heat from the uninsulated Emergency Condenser surfaces which are placed into service immediately and the loss of decay heat removal to the Spent Fuel Pool. Human activity in the NMP1 Reactor Building 340' elevation following an ELAP should be limited to the first hour after the onset of the event. The area temperatures for habitability in the Main Control Room and Auxiliary Control Room are predicted to reach 101°F and 103.6°F respectively over a 72 hour period from the event onset.

Within eight (8) hours of the ELAP event, Reactor Building doors (D-196, D-045) at elevation 261', Turbine Building doors (D-056, D-057) elevation 340', Turbine Building door (D-128) on elevation 333', and Turbine Building sidewall vents 1A/1B/2A/2B on the South side of the wall on elevation 351' are opened to cool down areas in the Reactor Building and channel potentially contaminated air/steam mixture for an elevated release point. This action is expected to create a convection path, i.e., air is drawn in through an exterior personnel access door at Reactor

Building ground level and exits through the Reactor Building 340' elevation into the Turbine Building and then out the roof door and side wall vents to atmosphere, and helps to minimize the temperature rise within the Reactor Building. These actions are directed by procedure N1-SOP-33A.2, Station Blackout/ELAP.

The Main Control Room doors (D-071, D-073) and Auxiliary Control Room doors (D-107, D-109, D-265, D-086) are directed by procedure N1-SOP-33A.2, Station Blackout/ELAP, to be opened prior to temperatures in those areas reaching 94 °F in order to establish a passive cooling flow path by convection. Based on environmental conditions and cooling needs, these doors are subsequently cycled open/close as needed for temperature control. Other heat load reduction actions are directed before two (2) hours has elapsed from event onset to remove the Plant Process Computer from service by shutdown of the Uninterruptible Power Supply (UPS 175) providing it power. Additional actions include opening all Main Control Room and Auxiliary Control Room instrument panel doors within 30 minutes of event onset for equipment cooling.

An additional ventilation concern applicable to an ELAP/LUHS event is the potential buildup of hydrogen in the battery rooms. At NMP1, during normal plant operation, the Battery Room ventilation is provided from the Turbine Building ventilation system. The Battery Room ventilation occurs by air flow being drawn through the battery door louvers and room air volume being discharged through the Turbine Building ventilation exhaust ducts located in the room. The Turbine Building ventilation is non-safety related and during an ELAP condition this system is not functional. Therefore during an ELAP, the hydrogen gas will accumulate in the ventilation duct work, which is located above the Battery Rooms, while the batteries are being recharged. To prevent unacceptable hydrogen gas concentrations in the Battery Room ductwork, 3 inch diameter holes are located in the top of the Battery Room exhaust ducts. The exhaust holes are normally closed by dampers and open during a loss of power. The exhaust holes will allow the hydrogen gas to escape from the duct into the Turbine Building atmosphere. Due to the immense volume of the Turbine Building, the hydrogen concentration will be extremely low (below 1%) and dissipate. This condition had been previously analyzed for the loss of forced ventilation due to loss of offsite power in NMP Calculation S10-H2GAS-HV01 (Reference 33).

2.11.2 Foul Weather Gear

Nine Mile Point has on-hand fifteen (15) sets of cold weather garments (coats, boots, and gloves) and fifteen (15) sets of rain gear, in various sizes, for responders to wear during foul weather conditions supporting outside FLEX deployment actions. Portable heaters and shelters are also available for deployment when outside actions during adverse weather conditions are needed for extended periods. All the foul weather equipment is stored in the FLEX Storage Building.

2.11.3 Heat Tracing

Most of the equipment used to support the FLEX strategies is stored in the FLEX Storage Building which is designed and protected from snow, ice, and extreme cold in accordance with NEI 12-06, and is temperature controlled. FLEX connection points are located inside qualified structures which are temperature controlled therefore heat tracing is not used or required. Equipment/tools needed to support making the connections is stored in areas immediately adjacent to the deployment connections. Major components for FLEX strategies such as tow vehicles and generators are provided with cold weather packages. FLEX Pumps once deployed will be monitored for icing conditions with minimum flow lines provided to prevent freezing of hoses when flow is not required for make-up to the RPV, ECs or SFP. The FLEX manifold located in the Reactor Building track bay has an additional connection to allow water to flow from the FLEX Pump, into the manifold and back out through valve VLV-BDB-003. A hose attached at this location is to be routed back out of the Reactor Building and towards Lake Ontario. The purpose of this hose is to allow the FLEX Pump to continue to operate and flow water during low or zero system demand in order to meet minimum pump flow requirements. This will also aid in freeze protection if operating in cold weather. In lieu of installing flow instrumentation to monitor FLEX Pump flow, the pump vendor manual explains that a temperature rise between the pump intake and discharge of greater than 18°F is indicative of low flow. The FLEX procedure requires temperature monitoring of the pump intake and discharge (via a handheld infrared temperature sensor, or similar instrument), or to keep the minimum flow line always open, and close as needed to provide required pressure and flow to the EC's, RPV and/or SFP.

2.12 Personnel Habitability

Personnel habitability was evaluated as in section 2.11 above and determined to be acceptable.

2.13 Lighting

In order to validate the adequacy of supplemental lighting and the adequacy and practicality of using portable lighting to perform FLEX strategy actions, an evaluation of the tasks to be performed and the available lighting in the designated task areas was completed. Tasks evaluated included traveling to/from the various areas necessary to implement the FLEX strategies, making required mechanical and electrical connections, performing instrumentation monitoring, and component manipulations.

Battery Powered (10CFR50 Appendix "R") emergency lights were determined to provide adequate lighting for all Primary FLEX connection points in the FLEX strategies including the illumination for all interior travel pathways needed to access the connection points. These emergency lights are designed and periodically tested to insure the battery pack will provide a minimum of eight (8) hours of lighting with no external AC power sources. This lighting may not be available following a seismic event.

Battery-powered portable hand lights have been provided for use by the Fire Brigade and other operations personnel required to achieve safe plant shutdown. A supply of flashlights, headlights, batteries and other lighting tools are routinely used by operators. Fire cabinet supplies including flashlights are provided in strategic storage locations throughout the site. These are checked per EPMP-EPP-02 on periodic basis. There is an EOP tool box in the NMP1 Main Control Room that is inventoried and tested quarterly per N1-PM-Q006, containing 5 flashlights.

There are no emergency lighting fixtures in the outside areas of the protected area to provide necessary lighting in those areas where portable FLEX equipment is to be deployed. The tow vehicles for the FLEX portable pump and generator carry hand held flash lights and head lamps that can be used while deploying the pump and hoses, generator and cables. In addition, the FLEX Storage Building contains a stock of eight (8) flashlights & batteries, four (4) head lamps and batteries, and fifteen (15) battle lanterns (rated for 30 hours each) that are on constant charge, to further assist the staff responding to a BDB event during low light conditions.

For Phase 3, the NSRC is deploying portable lighting towers per the Nine Mile Point SAFER Response Plan. The deployment of six (6) 6 kW, 440,000 lumens, diesel-driven lighting towers from SAFER will support Nine Mile Point exterior lighting for equipment staging areas and FLEX deployment locations.

2.14 Communications

2.14.1 Onsite

Initial communication announcements to on-site personnel during a BDB external event will be via the NMP1 Plant Paging and Announcement systems which are battery backed-up. If the Plant Paging and Announcement system is not available for on-site communications, bull horns that are stored in the FLEX Storage Building, with spare batteries, will be used by designated on-site individuals for performing notification of site personnel.

Communication between operators in NMP1 Main Control Room (MCR) and FLEX deployment locations will utilize either the 450 MHz radios in the radio-to-radio or 'talk around' mode, or the installed sound powered phone system.

The primary strategy for on-site communications is utilization of hand-held portable 450 MHz radios using the radio-to-radio feature also known as 'talk-around' mode. There are twelve (12) radios in the NMP1 MCR and twelve (12) radios in the OSC/TSC. In addition, there are six (6) radios in each of the three (3) Fire Brigade Storage cabinets. Forty eight (48) spare radio batteries on chargers are stored in the FLEX Storage Building to provide extended radio service time. Battery chargers for the radio equipment will be powered from the small portable generators that are stored in the FLEX Storage Building as needed during an ELAP/LUHS event.

The backup strategy for on-site communications uses Sound Powered Phones (SPP) between FLEX deployment locations and the Main Control Rooms. Six (6) SPP kits with headsets and cords to reach the local FLEX deployment location SPP jack and SPP kits for the MCR operators to use have been staged in plant storage boxes, FLEX deployment vehicles, and NMP1 MCR. Testing was performed to validate communication functionality via SPP system.

FLEX communication equipment is protected from hazards by storage in the FLEX Storage Building or designated in-plant storage boxes in buildings that meet the plant's design bases for the Safe Shutdown Earthquake (SSE). Portable communications equipment is inventoried and functional checked per station procedures S-PM-FLEX, S-PM-004, and EPMP-EPP-02.

2.14.2 Offsite

Offsite communications will utilize portable iridium satellite phones staged in the NMP1 Main Control Room and Technical Support Center. There are four (4) portable satellite phones located in the TSC, one (1) located at the EOF, one (1) in NMP1 MCR, and one (1) in NMP2 MCR, all on chargers. Four (4) additional high capacity batteries and chargers are also at located the TSC. The EOF has an installed backup generator at the facility to support satellite phone battery chargers. Satellite phones in the TSC and MCR's will be charged from small portable generators that are stored in the FLEX Storage Building. Satellite phones are inventoried and functional checked per station procedure and EPMP-EPP-02.

2.15 Water Sources

Nine Mile Point Unit 1 has chosen to use Lake Ontario as the primary water source throughout the ELAP/LUHS event. This allows the FLEX strategy to position the FLEX Pumps at a source that can provide make-up water to the RPV, Emergency Condensers, and Spent Fuel Pool that is unlimited.

The water source is taken from the intake tunnel of the NMP1 Circulating Water system which draws from Lake Ontario. Water from Lake Ontario is of drinking water quality. Regular monitoring of the quality of water supplies drawn from Lake Ontario shows that water quality meets or exceeds public health standards for drinking supplies. An evaluation for using Lake Ontario water for FLEX mitigation actions was performed which concluded it is acceptable to inject this raw water into the RPV to maintain level above the top of active fuel (TAF) during an ELAP event (Reference 59).

At NMP1, there is a single intake tunnel that extends 1195 feet into the lake. Water is admitted to the intake tunnel through a bell-mouth shaped inlet. The inlet is surmounted by a hexagonally-shaped guard structure of concrete, the top of which is about 6 feet above the bottom of the lake and 14 feet below the lowest anticipated lake level. The structure is covered by a roof of sheet piling supported on steel beams, and each of the six sides have a water inlet about 5 feet high by 10 feet wide, with the latter openings guarded by galvanized steel racks. The foot of this shaft contains a sand trap to catch and store any lake-bottom sand which may wash over the sills of the inlet structure.

The FLEX Pumps' suction will be taken upstream of Circulating Water screens and trash rakes. The normal system is designed for circulating water flow of 250,000 gpm and service water flow of 20,000 gpm. With no flow occurring from the normal pumps due to the loss of power, the only flow will be from the FLEX Pump suction. The maximum FLEX Pump suction flow rate will be less than 500 gpm as compared to the normal flow rate of 270,000 gpm. This low flow rate through the large intake flow area results in the intake water flowing at a very low velocity on the order of 0.014 ft/sec max. The only debris that is likely to flow into the intake is that previously postulated to flow in prior to the loss of all station pumps.

The FLEX Pump suction hose utilizes a basket strainer submerged 4 feet below the water surface. The 6 inch suction hose has a zinc-plated suction strainer with 1 inch holes screwed on to it to prevent larger debris from becoming entrained in the pump suction line. The suction hose has a clearly visible line scribed on it 4 feet above the strainer and the FLEX procedure requires the strainer basket be submerged 4 feet below the water's surface to the scribed line. The strainer will be approximately 33 feet above the bottom of the intake bay. The portable FLEX Pump suction flow will begin 4 hours after the initial loss of power to the Circulating Water or Service Water pumps. After 4 hours heavier debris in the intake would be expected to settle down to the bottom of the intake and lighter smaller debris could be at the surface or a few feet below. The suction flow through the 6 inch hose is not sufficient to draw surface debris 4 feet below the surface into the strainer nor can it pick debris 33 feet up off the bottom of the intake into the strainer.

2.16 Shutdown and Refueling Analysis

Nine Mile Point Nuclear Station will follow the guidance provided by the Nuclear Energy Institute (NEI) position paper titled "Shutdown/Refueling Modes" (Reference 39) addressing mitigating strategies in shutdown and refueling modes. This position paper is dated September 18, 2013 and has been endorsed by the NRC staff (Reference 40) and incorporated into Exelon procedure OU-AA-103, Shutdown Safety Management Program.

For planned outages and early in an unplanned outage, an outage risk profile is developed per Exelon Shutdown Safety Management Program, OU-AA-103. This risk assessment is updated on a daily bases and as changes are made to the outage schedule. Contingency actions are developed for high risk evolutions and the time needed for such evolutions is minimized. During the outage additional resources are available on site and during the high risk evolutions individuals are assigned specific response actions (e.g. response team assigned to close the containment equipment hatch). The risk assessment accounts for, among other things, environmental conditions and the condition of the grid. In order to effectively manage risk and maintain safety during outages, Nine Mile Point Nuclear Station develops contingencies to address the conditions and response actions for a loss of cooling. These contingencies not only direct actions to minimize the likelihood for a loss of cooling but also direct the actions to be taken to respond to such an event. Nine Mile Point has procedures in place to determine the time to boil for all conditions during shutdown periods.

The FLEX strategies for Cold Shutdown are the same as those for Power Operation, Startup, and Hot Shutdown. If an ELAP/LUHS event occurs during Cold Shutdown, water in the Reactor Pressure Vessel (RPV) will heat up. During the heat up, the Emergency Condensers (EC) are manually initiated as directed by station procedure N1-SOP-33A.2, Station Blackout/ELAP. When reactor coolant temperature reaches 212°F (Hot Shutdown), the ECs will passively maintain RPV pressure at low values (0 – 30 psig).

When in Refueling mode with the RPV head removed, many variables exist which may impact the ability to cool the core. In the event of an ELAP/LUHS event during this condition, installed plant systems cannot be relied upon to cool the core; therefore transition to FLEX Phase 2 will begin immediately and is directed by N1-SOP-33A.2, Station Blackout/ELAP. All efforts will be made to expeditiously provide core cooling and minimize heat-up. To accommodate the activities of vessel disassembly and refueling, water levels in the reactor vessel and the reactor cavity are often changed. The most limiting condition is the case in which the reactor head is removed and water level in the vessel is at or below the reactor vessel flange. If an ELAP/LUHS event occurs during this condition then (depending on the time after shutdown) boiling in the core may occur quite rapidly. Again, deployment and implementation of portable FLEX Pumps to supply injection flow must commence immediately from the time of the event. This should be plausible because more personnel are on site during outages to provide the necessary resources. Strategies for makeup water may include special FLEX deployment briefings, just in time training or deployment walkthroughs, tabletop discussions of mitigation strategies, or actual deployment of FLEX equipment (pump/generator) to make it ready. It should be noted that pre-deployment (i.e.: FLEX equipment in deployment location immediately ready to support the key safety function) of equipment exposes it to the very external hazards that it is intended to be protected from in order to provide prompt response capability for a beyond design basis external event. If pre-deployment is selected as a contingency to mitigate high risk conditions during an outage, the "+1" equipment will be used first and the "N" equipment will remain protected. In addition, guidance (station postings/signage and markings) per procedure CC-NM-118-101 Beyond Design Basis Administrative Controls, has been provided to ensure that travel paths are available for deployment and that deployment areas remain accessible without interference from outage related equipment.

Figure 4

RPV Hose Deployment Options

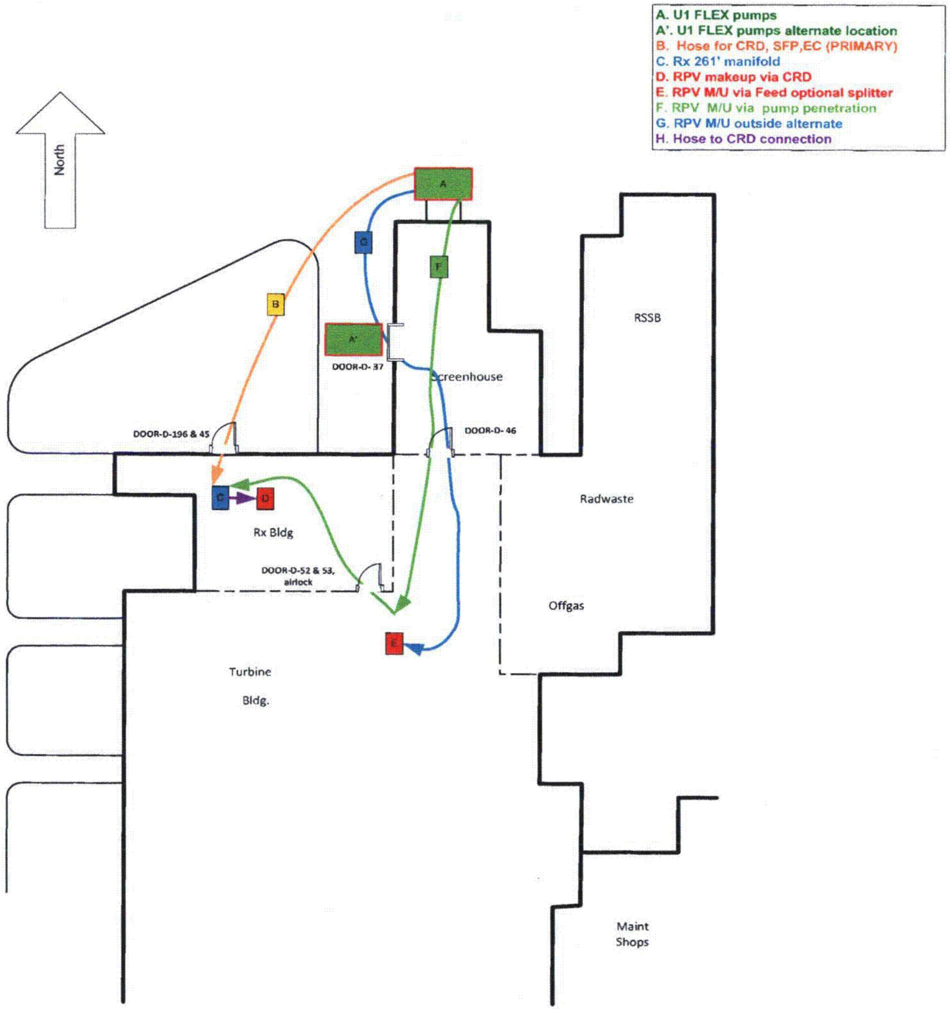


Figure 5

Fuel Pool Hose Deployment Options

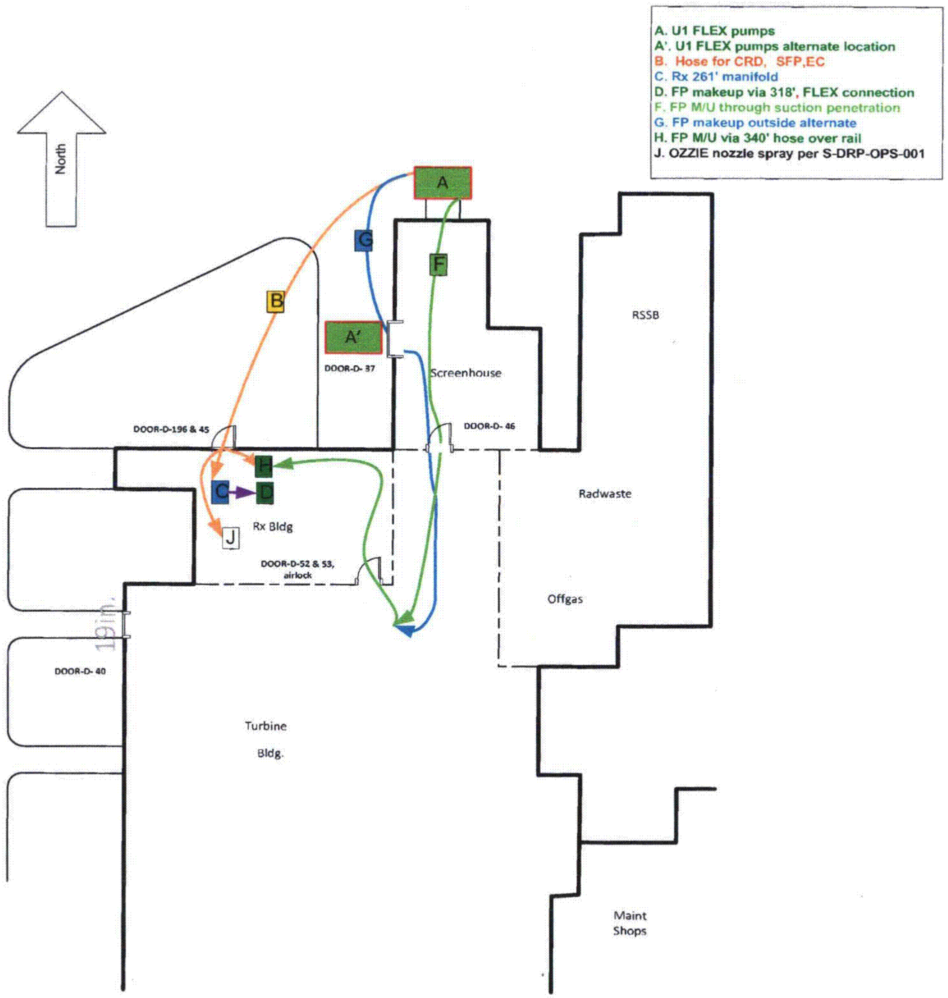


Figure 6

EC Hose Deployment Options

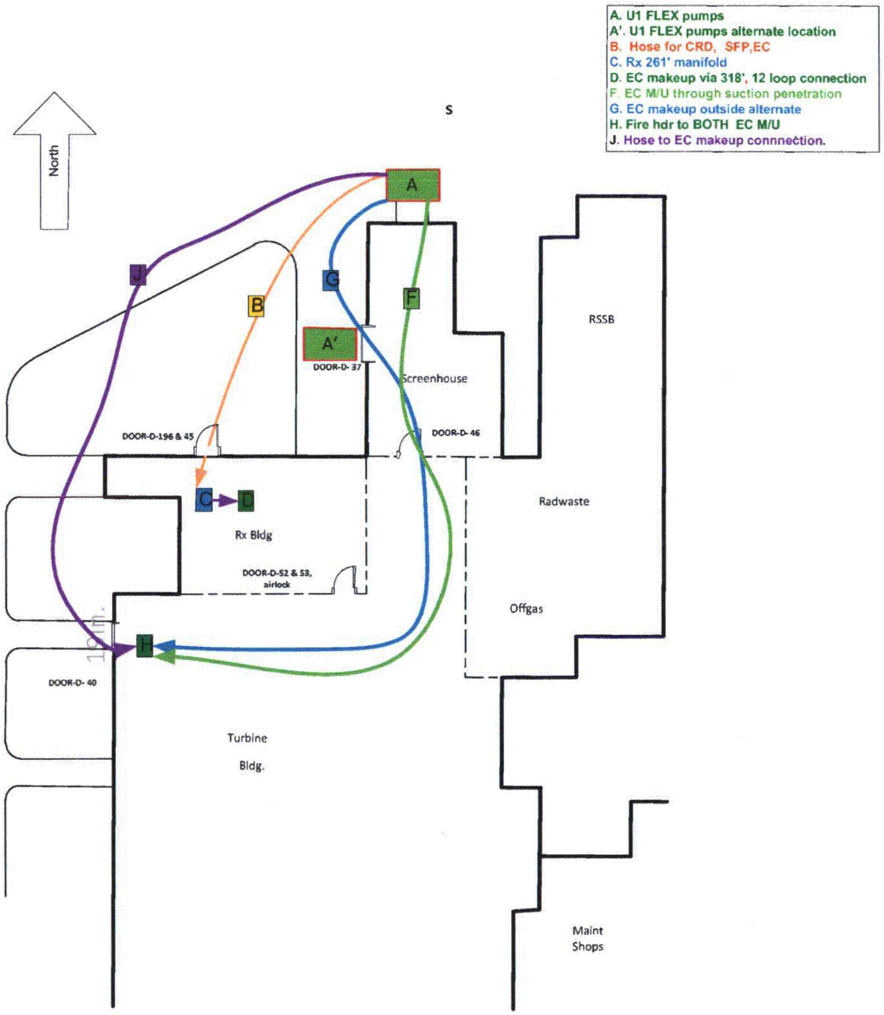


Figure 7

EC Makeup Connections

<u>NOTE ON FITTINGS</u>:
NH = NHS = Threaded fitting sealed with gasket. Typical fire hose connection
NPT = Threaded fitting where threads do the sealing.
Storz = Latching hose fitting

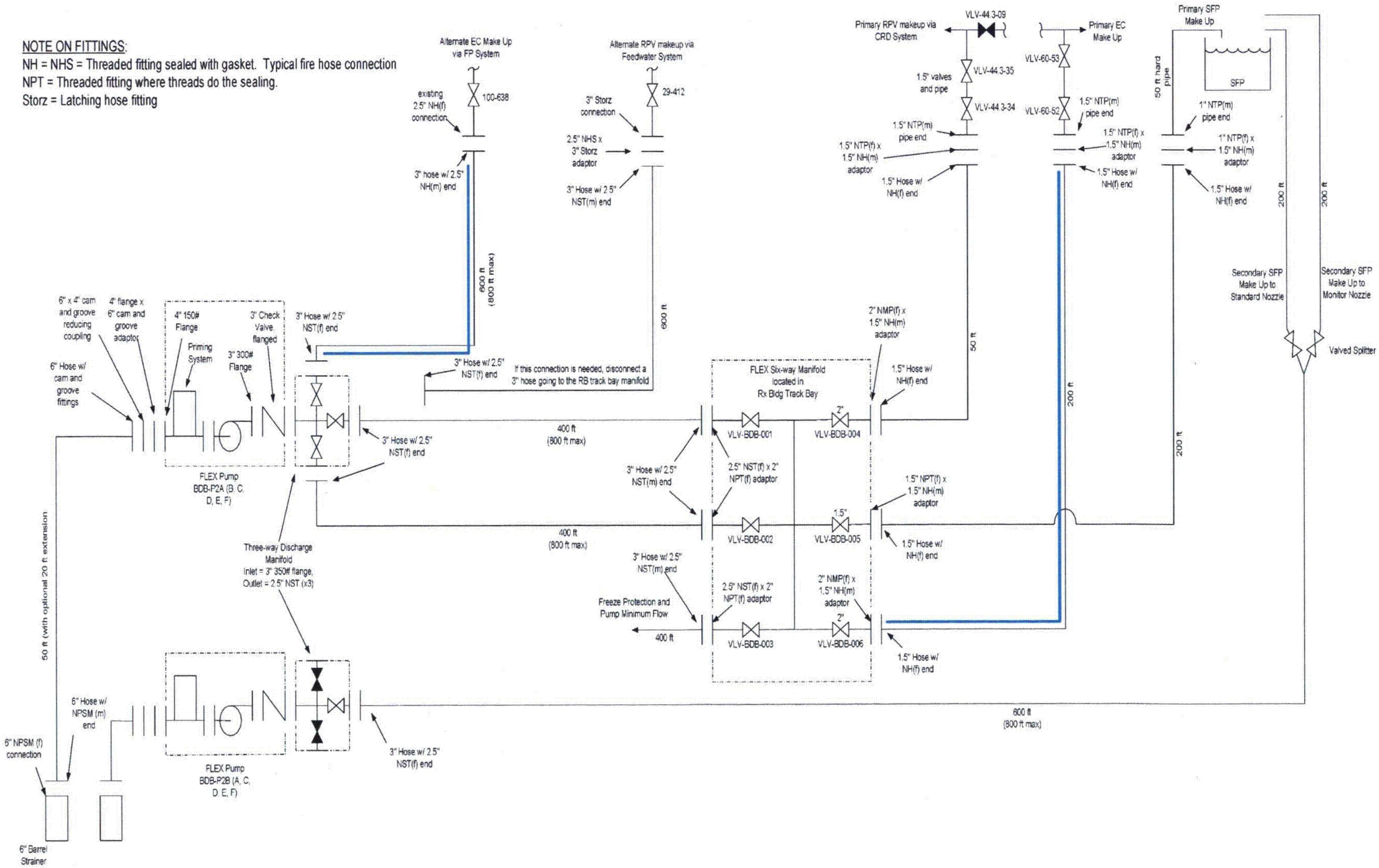


Figure 8

RPV Makeup Connections

NOTE ON FITTINGS:
NH = NHS = Threaded fitting sealed with gasket. Typical fire hose connection
NPT = Threaded fitting where threads do the sealing.
Storz = Latching hose fitting

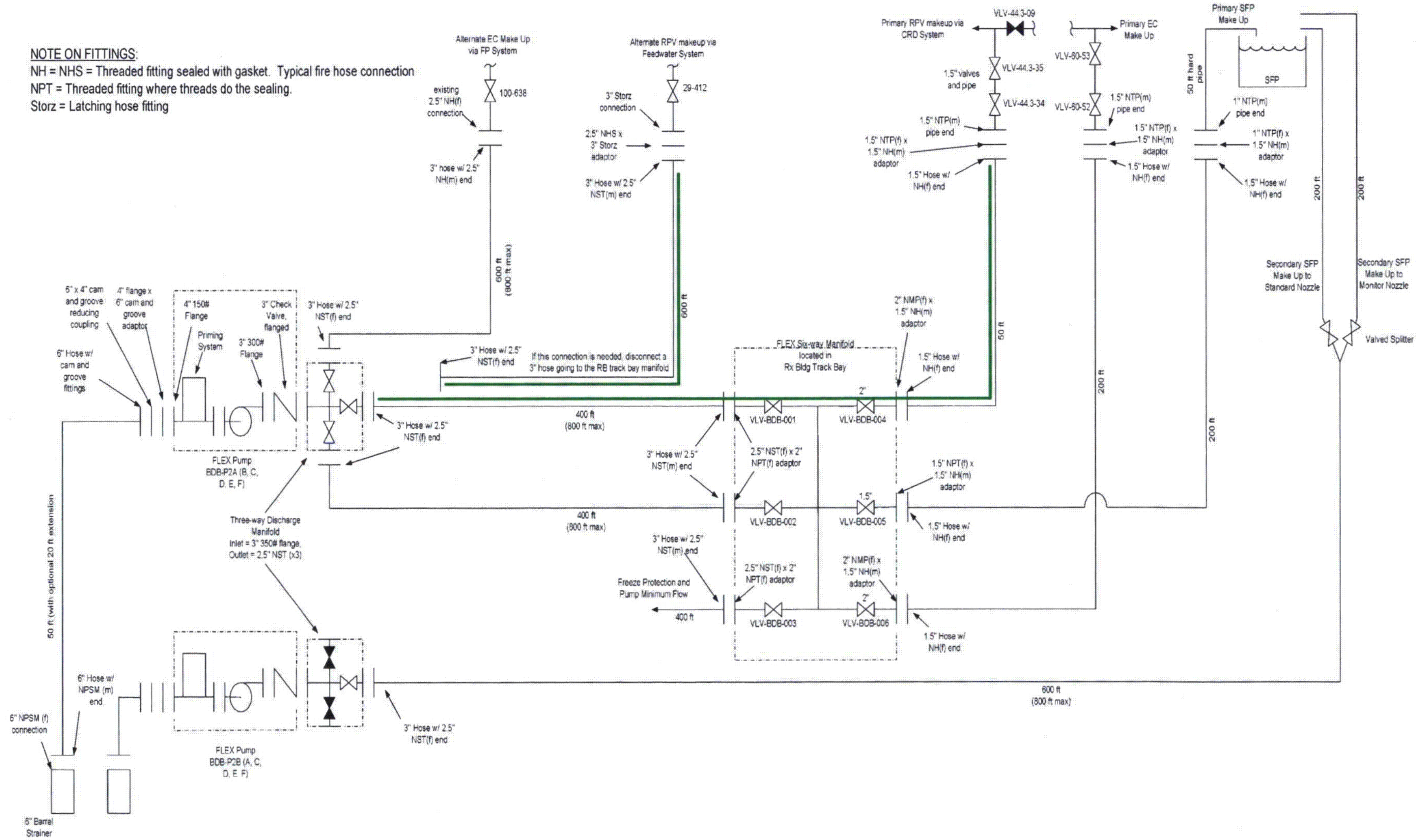


Figure 9

Spent Fuel Pool Make-Up Connections

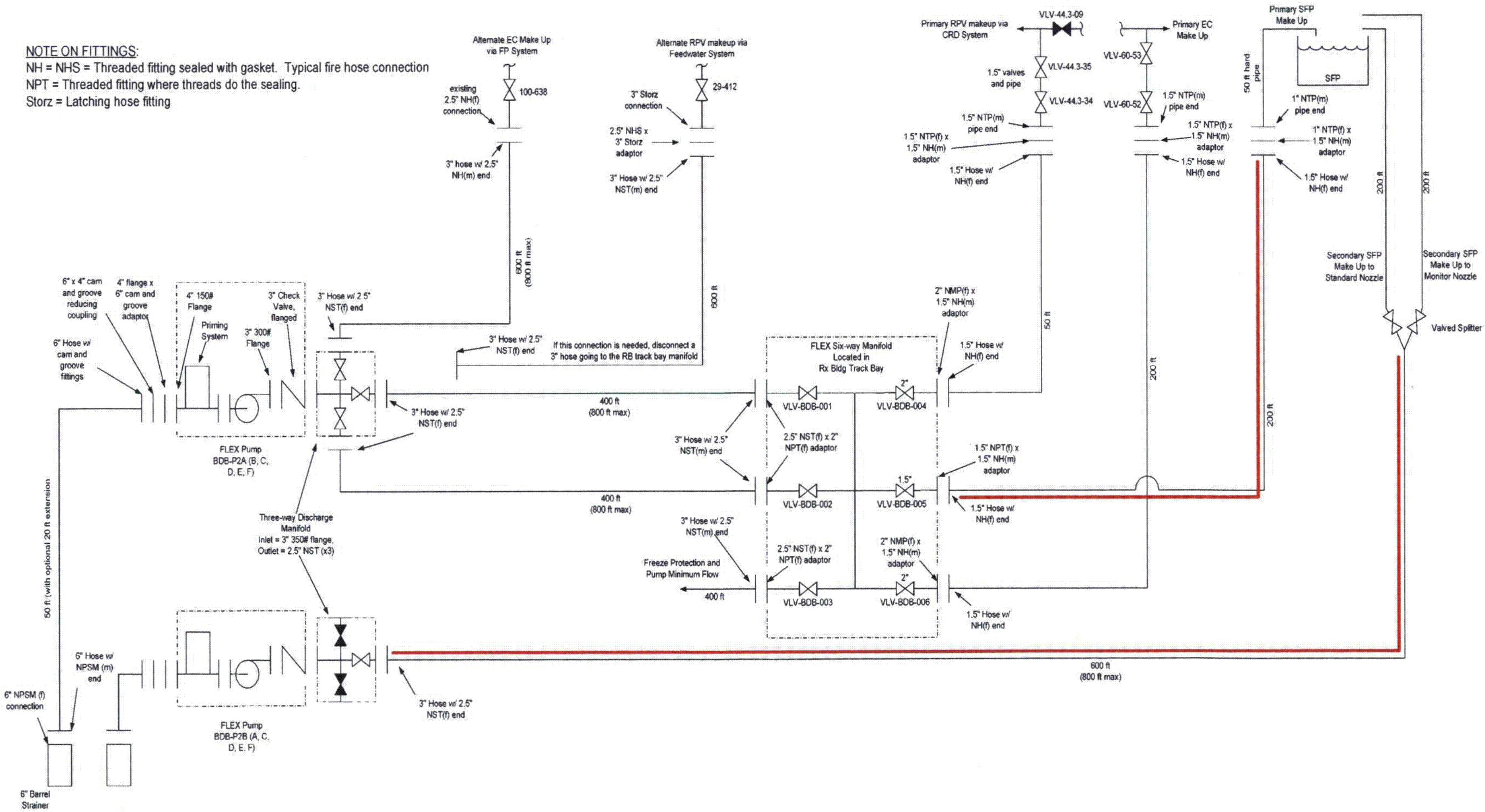


Figure 10

125 VDC Re-Powering Connections Primary Strategy

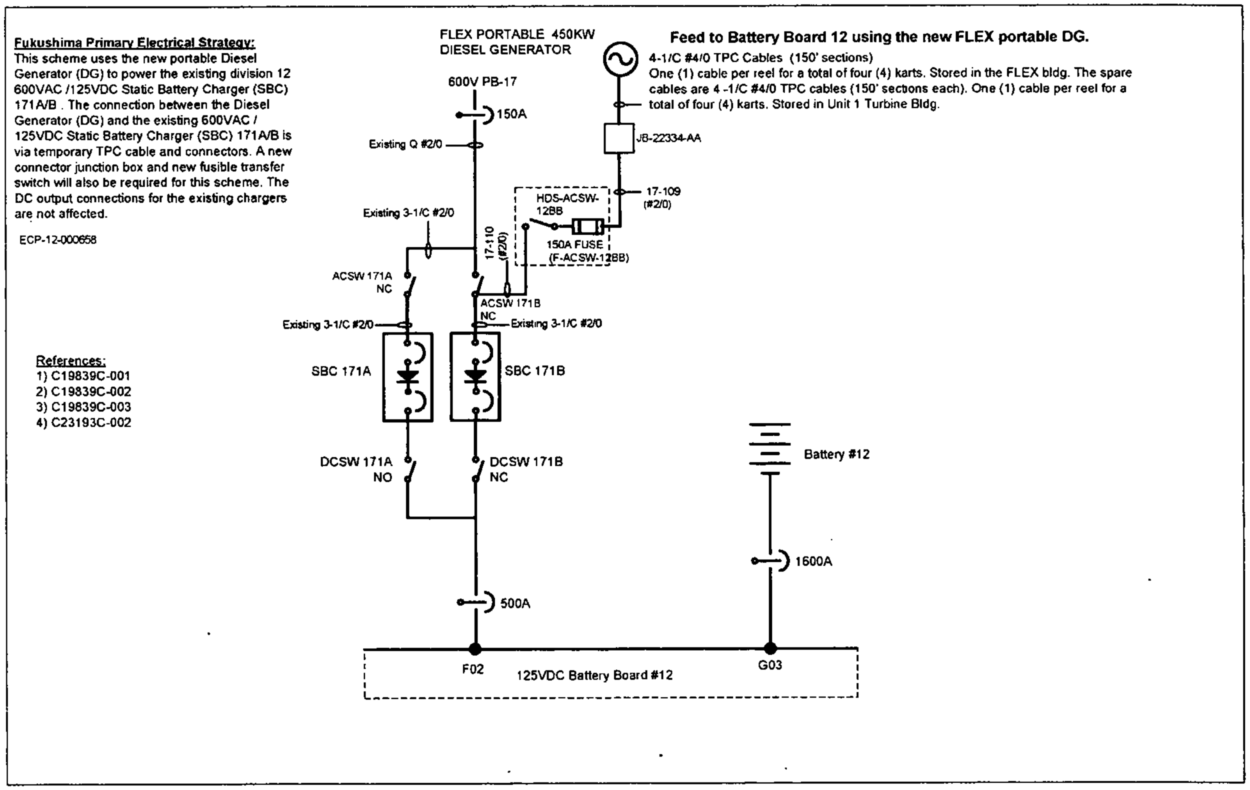
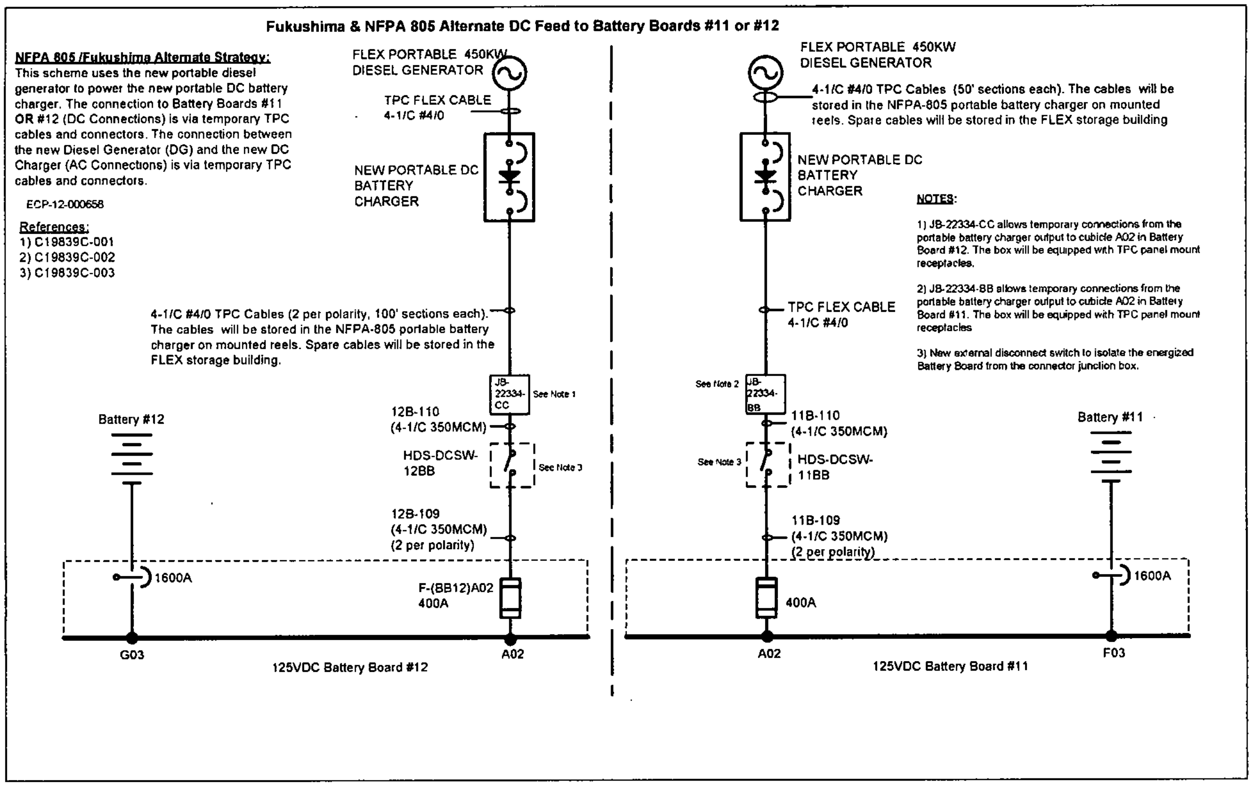


Figure 11

125 VDC Re-Powering Connections Alternate Strategy



2.17 Sequence of Events

The Table 1 below presents a Sequence of Events (SOE) Timeline for an ELAP/LUHS event at NMP1. Validation of each of the Flex time constraint actions has been completed in accordance with the Flex Validation Process document issued by NEI and includes consideration for staffing. Time to clear debris to allow equipment deployment is assumed to be up to 2 hours. This time is considered to be reasonable based on site reviews of the deployment paths and the location of the FLEX Storage Building. Debris removal equipment is stored in the FLEX Storage Building.

Table 1: Sequence of Events Timeline

Action Item	Elapsed Time	Action	FLEX Time Constraint Y/N	Remarks/Applicability
	0	Event Starts	N/A	Plant scram / no AC Power, SBO event response required
1	15 sec	Enter N1-SOP-1 Reactor Scram procedure	N	Reactor Operator (RO) Immediate Actions
2	15 sec	Enter N1-SOP-33A.2 Station Blackout/ELAP	Y Level A	Within **2 min** Control Room Supervisor (CRS) enters and remains in the procedure for the duration of the SBO/ELAP
3	0-3 min	Manually place 11 and 12 Emergency Condensers(EC) in service	Y Level A	Within **3 min** ECs initiated by RO manually to minimize time ERVs are open and verify MSIVs closed

Action Item	Elapsed Time	Action	FLEX Time Constraint Y/N	Remarks/Applicability
4	2 min	Enter EOPs	N	CRS action and occurs in parallel with Reactor Scram and SBO/ELAP procedures
5	1-10 min	Dispatch operator for debris removal IAW N1-SOP-33A.2, Attachment 10	Y Level A	Directed by CRS upon entry in SBO/ELAP procedure. Need to clear Unit 1 pump deployment area in **1 hr** - continues for 2 hrs total
6	1-10 min	Direct actions for loss of air (to EC Level Control) IAW SOP-33A.2, Attachment 2	Y Level A	Within **10 min** CRS directs, then, Equipment Operator (EO) performs EC shell level control within 30 min
7	1-10 min	Direct actions for DC load shed IAW SOP-33A.2, Attachment 4	Y Level A	Within **10 min** CRS directs, then EO performs load shed for SR batteries within 30 min
8	1-15 min	Direct deployment of 3 inch hose for SFP Alternate injection and Spray IAW N1-SOP-33A.2, Attachment 9	Y Level A	Directed by CRS within **15 min**. 2 EOs carry out in 1hr from T=0. Hoses are deployed early following event initiation due to environmental condition changes on Refuel Floor that could prevent access

Action Item	Elapsed Time	Action	FLEX Time Constraint Y/N	Remarks/Applicability
9	10-30 min	Perform actions for loss of air (to EC Level Control) IAW SOP-33A.2, Attachment 2	Y Level A	EO performs EC shell level control within **30 min**
10	10-30 min	Perform actions for DC load shed IAW SOP-33A.2, Attachment 4	Y Level A	EO performs load shed for Safety Related batteries 11 and 12 within **30 min** in order to preserve battery capacity for up to 8 hrs
11	10-60 min	Refuel Floor early hose deployment for Alternate SFP makeup	Y Level A	3 inch hoses are deployed within **1 hr** following event initiation for SFP makeup so that environmental condition changes on Refuel Floor will not prevent access if Alternate strategy is needed. Reactor Bldg 340' elevation is projected to reach 120°F in the first hour and 144°F at 8 hrs

Action Item	Elapsed Time	Action	FLEX Time Constraint Y/N	Remarks/Applicability
12	45-60 min	Notify NSRC that SAFER equipment deployment should begin	N	SM notification to Nuclear Duty Officer (NDO) to contact SAFER for deployment of FLEX Phase 3 equipment to NMP. (FLEX Phase 1 and 2 actions not dependent on this notification) SBO coping time is 4 hrs. Determination of ELAP event will occur within 4 hrs of T=0
13	60-75 min	Deploy 1.5 in hose from 12 EC shell MU connection to manifold in Reactor Bldg track bay	Y Level B	Directed by CRS within 15 min, EC shell makeup required within **8 hrs** of EC initiation, 2 EOs connect staged hoses to EC M/U connection on Reactor Bldg 318'

Action Item	Elapsed Time	Action	FLEX Time Constraint Y/N	Remarks/Applicability
14	60-75 min	Deploy 1.5 inch hose from SFP MU connection to manifold in Reactor Bldg track bay	Y Level B	Directed by CRS within 15 min, SFP level is estimated to be 4.5 feet below normal level at 16 hrs from T=0. Time to 10 feet above spent fuel pool based on boil-off rate of 1 foot every 3.5 hrs is **45 hrs**. 2 EOs connect staged hoses to SFP M/U connection on Reactor Bldg 318'
15	1-4 hrs	Deploy 1st FLEX Pump using Primary or Alternate RPV makeup path	Y Level A	RPV level reaches TAF at 5.7 hrs from event initiation. Pump deployment is required within **4 hrs.** Deployment pathway debris removal occurs in parallel with first hour

Action Item	Elapsed Time	Action	FLEX Time Constraint Y/N	Remarks/Applicability
16	2-6 hrs	Deploy portable generator to charge Battery 12 for Primary Charging Strategy	Y Level A	With load shed, Battery 12 can support required loads for **8 hrs** without a charger. Portable diesel generator will connect into power supply for Static Battery Charger (SBC) 171A or 171B to maintain SR Battery 12 and associated loads for the Primary charging strategy
17	2-6 hrs	Deploy portable generator and NFPA805/FLEX battery charger to charge Battery 11 or 12, for Alternate Charging Strategy, if necessary	Y Level A	With load shed, Battery 12 or 11 can support required loads for **8 hrs** without a charger. Portable diesel generator will connect to NFPA 805/FLEX portable battery charger to charge SR Battery 12 (preferred) or SR Battery 11 (alternate) as the Alternate charging strategy if the Primary charging strategy cannot be implemented

Action Item	Elapsed Time	Action	FLEX Time Constraint Y/N	Remarks/Applicability
18	6 hrs	Augmented Staff arrive on Site	N/A	Reference NEI 12-01
19	6-8 hrs	Deploy Alternate Emergency Condenser Makeup Hose	Y Level B	Intent is to have the Alternate EC makeup hoses in place as a backup prior to **8 hrs** from T=0
20	3-8 hrs	Implement Reactor Building Passive Cooling and Ventilation	Y Level B	Within **8 hrs** of T = 0 for habitability of EO controlling EC level on Turbine Bldg 369'. Doors on Reactor Bldg 261' opened when RPV makeup hose deployed into Reactor Bldg. Turbine Bldg door and wall vents can be opened prior to Reactor Bldg 340' airlock

Action Item	Elapsed Time	Action	FLEX Time Constraint Y/N	Remarks/Applicability
21	8-12 hrs	Deploy 2nd FLEX Pump to Screen House for Alternate SFP make up	Y Level B	SFP level is estimated to be 4.5 feet below normal level at 16 hrs from T=0. Time to 10 feet above spent fuel pool based on boil-off rate of 1 foot every 3.5 hrs is **45 hrs**
22	10-24 hrs	Refuel Portable Equipment	Y Level B	Refueling portable diesel equipment begins at 10 hrs from T=0, evaluation supports refueling cycle completed within 6 hrs of start using two EOs with one truck and 528 gallon fuel cube on trailer filed from on-site storage tanks

2.18 Programmatic Elements

2.18.1 Overall Program Document

NMP1 procedure CC-NM-118 (Reference 12) provides a description of the Diverse and Flexible Coping Strategies (FLEX) Program for Nine Mile Point Nuclear Station. This procedure implements Exelon fleet program document CC-AA-118 which contains governing criteria and detailed requirements. The key elements of the program include:

- Summary of the NMP1 FLEX strategies
- Maintenance of the FSGs including any impacts on the interfacing procedures (EOPs, OPs, SOPs, etc.)

- Maintenance and testing of FLEX equipment (i.e., SFP level instrumentation, emergency communications equipment, portable FLEX equipment, FLEX support equipment, and FLEX support vehicles)
- Portable equipment deployment routes, staging areas, and connections to existing mechanical and electrical systems
- Validation of time critical operator actions
- The FLEX Storage Building and the National SAFER Response Center
- Supporting evaluations, calculations, and FLEX drawings
- Tracking of commitments and FLEX equipment unavailability
- Staffing and Training
- Configuration Management
- Program Maintenance

The instructions required to implement the various elements of the FLEX Program at Nine Mile Point Unit 1and thereby ensure readiness in the event of a Beyond Design Basis External Event are contained in Exelon fleet program document CC-AA-118, Diverse and Flexible Coping Strategies (FLEX) and Spent Fuel Pool Instrumentation Program Document.

Existing design control procedures CC-AA-309-10, Engineering Technical Evaluations has been revised to ensure that changes to the plant design, physical plant layout, roads, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies.

Future changes to the FLEX strategies may be made without prior NRC approval provided 1) the revised FLEX strategies meet the requirements of NEI 12-06, and 2) an engineering basis is documented that ensures that the change in FLEX strategies continues to ensure the key safety functions (Core and SFP cooling, Containment integrity) are met.

2.18.2 Procedural Guidance

The inability to predict actual plant conditions that require the use of BDB equipment makes it impossible to provide specific procedural guidance. As such, the FSGs provide guidance that can be employed for a variety of conditions. Clear criteria for entry into FSGs will ensure that FLEX strategies are used only as directed for BDB external event conditions, and are not used inappropriately in lieu of existing procedures. When FLEX equipment is needed to supplement EOPs or

Abnormal Procedures (SOPs) strategies, the EOP or SOP, Severe Accident Mitigation Guidelines (SAMGs), or Extreme Damage Mitigation Guidelines (EDGMs) will direct the entry into and exit from the appropriate FSG procedure.

FLEX strategy support guidelines have been developed in accordance with BWROG guidelines. FLEX Support Guidelines (FSG) will provide available, pre-planned FLEX strategies for accomplishing specific tasks in the EOPs or SOPs. FSGs will be used to supplement (not replace) the existing procedure structure that establishes command and control for the event.

Procedural interfaces have been incorporated into N1- SOP-33A.2, STATION BLACKOUT/ELAP, to the extent necessary to include appropriate reference to FSGs and provide command and control for the ELAP. Additionally, procedural interfaces have been incorporated into the following procedures to include appropriate reference to FSGs:

- N1-SOP-29.1,EOP KEY PARAMETER-ALTERNATE INSTRUMENTATION
- N1-OP-64, Meteorological Monitoring

Changes to FSGs are controlled by Exelon fleet procedure AD-AA-101, Processing of Procedures and T&RMs (Reference 34). FSG changes will be reviewed and validated by the involved groups to the extent necessary to ensure the strategy remains feasible. Validation for existing FSGs has been accomplished in accordance with the guidelines provided in NEI APC14-17, FLEX Validation Process, issued July 18, 2014 (Reference 28).

2.18.3 <u>Staffing</u>

Using the methodology of NEI 12-01, *Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities*, an assessment of the capability of Nine Mile Point Nuclear Station (NMP) on-shift staff and augmented Emergency Response Organization (ERO) to respond to a Beyond Design Basis External Event (BDBEE) was performed. The results were provided to the NRC in a letter dated November 17, 2014 (Reference 38).

The assumptions for the NEI 12-01 Phase 2 scenario postulate that the BDBEE involves a large-scale external event that results in:

1) an extended loss of AC power (ELAP)
2) an extended loss of access to ultimate heat sink (UHS)
3) impact on units (all units are in operation at the time of the event)

4) impeded access to the units by off-site responders as follows:
   - 0 to 6 Hours Post Event – No site access.
   - 6 to 24 Hours Post Event – Limited site access. Individuals may access the site by walking, personal vehicle or via alternate transportation capabilities (e.g., private resource providers or public sector support).
   - 24+ Hours Post Event – Improved site access. Site access is restored to a near-normal status and/or augmented transportation resources are available to deliver equipment, supplies and large numbers of personnel.

NMP1 Operations personnel conducted a table-top review of the on-shift response to the postulated BDBEE and extended loss of AC power for the Initial and Transition Phases using the FLEX mitigating strategies. Resources needed to perform initial event response actions were identified from the Emergency Operating Procedures (EOPs) and Special Operating Procedures (SOPs). Particular attention was given to the sequence and timing of each procedural step, its duration, and the on-shift individual performing the step to account for both the task and time motion analyses of NEI 10-05, *Assessment of On-Shift Emergency Response Organization Staffing and Capabilities*.

This Phase 2 Staffing Assessment concluded that the current minimum on-shift staffing as defined in the Emergency Response Plan for NMP1, as augmented by site auxiliary personnel, is sufficient to support the implementation of the FLEX strategies on Unit 1, as well as the required Emergency Plan actions, with no unacceptable collateral duties.

The Phase 2 Staffing Assessment also identified the staffing necessary to support the Expanded Response Capability for the BDBEE as defined for the Phase 2 staffing assessment. This staffing will be provided by the current Nine Mile Point site resources, supplemented by Exelon fleet resources, as necessary.

2.18.4 Training

Nine Mile Point's Nuclear Training Program has been revised to assure personnel proficiency in the mitigation of BDB external events is adequate and maintained. These programs and controls were developed and have been implemented in accordance with the Systematic Approach to Training (SAT) Process (References 17, 18, 19).

Using the SAT process, Job and Task analyses were completed for the new tasks identified as applicable to the FLEX Mitigation Strategies. Based on the analysis, training for Operations was designed, developed and implemented for Operations continuing training. "ANSI/ANS 3.5, Nuclear Power Plant Simulators for use in Operator Training" certification of simulator fidelity is considered to be sufficient for the initial stages of the BDB external event scenario training. Full scope simulator models have not been explicitly upgraded to accommodate FLEX training or drills. Overview training on FLEX Phase 3 and associated equipment from the SAFER NSRCs was also provided to NMP1 Operators. Upon SAFER equipment deployment and connection in an event, turnover and familiarization training on each piece of SAFER equipment will be provided to station operators by the SAFER deployment/operating staff.

Initial training has been provided and periodic training will be provided to site emergency response leaders on BDB emergency response strategies and implementing guidelines. Personnel assigned to direct the execution of mitigation strategies for BDB external events have received the necessary training to ensure familiarity with the associated tasks, considering available job aids, instructions, and mitigating strategy time constraints.

Where appropriate, integrated FLEX drills will be organized on a team or crew basis and conducted periodically; with all time-sensitive actions to be evaluated over a period of not more than eight years. It is not required to connect/operate temporary/permanently installed equipment during these drills.

2.18.5 Equipment List

The equipment stored and maintained at the Nine Mile Point FLEX Storage Building and various pre-staged locations at NMP1 necessary for the implementation of the FLEX strategies in response to a BDB external event at NMP are listed in Table 3. Table 3 identifies the quantity, applicable strategy, and capacity/rating for the major BDB/FLEX equipment components only, as well as, various clarifying notes. Details regarding fittings, tools, hose lengths, consumable supplies, etc. are not in Table 3, but are detailed in S-PM-FLEX, FLEX Equipment Inventories and Checklists.

2.18.6 Equipment Maintenance and Testing

Periodic testing and preventative maintenance of the BDB/FLEX equipment conforms to the guidance provided in INPO AP-913. A fleet procedure has been developed to address Preventative Maintenance (PM) using EPRI templates or manufacturer provided information/recommendations, equipment testing, and the unavailability of equipment.

EPRI has completed and has issued “Preventive Maintenance Basis for FLEX Equipment – Project Overview Report” (Reference 26). Preventative Maintenance Templates for the major FLEX equipment including the portable diesel pumps and generators have also been issued.

The PM Templates include activities such as:

- Periodic Static Inspections
- Fluid analysis
- Periodic operational verifications
- Periodic functional verifications with performance tests

The EPRI PM Templates for FLEX equipment conform to the guidance of NEI 12-06 providing assurance that stored or pre-staged FLEX equipment are being properly maintained and tested. EPRI Templates are used for equipment where applicable. However, in those cases where EPRI templates were not available, Preventative Maintenance (PM) actions were developed based on manufacturer provided information/recommendations and Exelon fleet procedure ER-AA-200, Preventive Maintenance Program. Detailed information on FLEX and FLEX support equipment PM's is contained in FLEX program document CC-NM-118 section 4.4 (Reference 12).

Table 2: NMP1 FLEX Equipment Test and Maintenance Overview

Equipment[1]	Quantity	Weekly	Quarterly	6 Month	Annual	3 Year	Notes
Diesel Pump 3419MX	3	Walk down		Functional Test and Inspection (Dry Run)			Performance Test, Inspection and PM (Wet Run) once per cycle per S-PM-005
Diesel Generator (Cummins 450 kW)	2	Walk down		Functional Test and Inspection (Unloaded Run)	Performance Test, Inspection and PM (30% Loaded Run)	Performance Test, Inspection and PM (100% Loaded Run)	
NFPA 805/FLEX Portable Battery Charger	1	Walk down			Performance Test, Inspection and PM (with diesel generator)		
Cables (for both generators and battery charger cables)	Stored in Plant and FLEX Building (see S-PM-FLEX for location)				Visual Inspection and assessment		Replace every 10 years or test and justify extension/life

Table 2: NMP1 FLEX Equipment Test and Maintenance Overview

Equipment[1]	Quantity	Weekly	Quarterly	6 Month	Annual	3 Year	Notes
Hoses (for both pumps and permanent connections hoses)	Stored in Plant and FLEX Building(see S-PM-FLEX for location)				Visual Inspection and assessment	Hydrostatic test of all hoses	Replace every 10 years
Communications (hand-held radios, Sound powered phones, 120VAC generators)	6 - SPP 6 - 120VAC generators 9 - radios			Functional test and inspection (Radios), Functional test including associated FLEX circuits (sound powered phones)		Inspection (small 120VAC generators and TruFuel)	

The unavailability of FLEX equipment and applicable connections that directly perform a FLEX mitigation strategy for core, containment, and SFP is controlled and managed per Nine Mile Point procedure CC-NM-118-101, Beyond Design Basis Administrative Controls, such that risk to mitigating strategy capability is minimized. The guidance in this procedure conforms to the guidance of NEI 12-06 as follows:

- Portable FLEX equipment may be unavailable for 90 days provided that the site FLEX capability (N) is available
- If portable equipment becomes unavailable such that the site FLEX capability (N) is not maintained, initiate actions within 24 hours to restore the site FLEX capability (N) and implement compensatory measures (e.g., use of alternate suitable equipment or supplemental personnel) within 72 hours

FLEX support equipment is defined as equipment not required to directly support maintenance of the key safety functions. There are no requirements specified in NEI12-06 for unavailability time for any of the FLEX support equipment. This equipment is important to the successful Implementation of the NMP1 FLEX strategy and Exelon Generation Company (EGC) requires establishment of an unavailability time (Reference 25).

- One or more pieces of FLEX support equipment available but not in its evaluated configuration for protection restore protection within 90 days

- One or more pieces of FLEX support equipment is unavailable, restore the equipment to available within 45 days AND implement compensatory measures for the lost function within 72 hours

When FLEX equipment deficiencies are identified the following action will be taken:

1. Identified equipment deficiencies shall be entered into the corrective action program.
2. Equipment deficiencies that would prevent FLEX equipment from performing the intended function shall be worked under the station priority list in accordance with the work management process.
3. Equipment that cannot perform its intended functions shall be declared unavailable. Unavailability **shall** be tracked per CC-NM-118-101, Beyond Design Basis Administrative Controls, utilizing the electronic Equipment Status Log (ESL).

Table 3 – Water Sources								
Water sources and associated piping that fully meet ALL BDB hazards, i.e., are FLEX qualified								
Water Sources	Usable Volume (Gallons)	Applicable Hazard					Time Based on Decay Heat	Cum. Time Based on Decay Heat
		Satisfies Seismic	Satisfies Flooding	Satisfies High Winds	Satisfies Low Temp	Satisfies High Temp		
Water from Lake Ontario via FLEX Pump (Phase 2&3)	Unlimited-greater than 250,000 gpm	Y	Y	Y	Y	Y	Indef.	Indef.

Table 4 – BWR Portable Equipment Stored On-Site

	Use and (Potential / Flexibility) Diverse Uses					
List Portable Equipment	Core	Containment	SFP	Instrumentation	Accessibility	**Performance Criteria**
FLEX diesel-driven pumps (3)[3] and associated hoses and fittings	X	X	X			341 gpm @ 245 psig, Supports core, containment and SFP cooling
FLEX generators (2) and associated cables, connectors	X	X		X		450 kW, 600 VAC, Supports instrumentation and controls
NFPA 805/FLEX Battery Charger (1)[2], and cables for portable battery chargers (2 sets)	X	X		X		380 amps, 125 VDC, Supports instrumentation and controls
Tow vehicles (2)	X	X	X		X	Support large FLEX equipment deployment

Table 4 – BWR Portable Equipment Stored On-Site

Use and (Potential / Flexibility) Diverse Uses						**Performance Criteria**
List Portable Equipment	Core	Containment	SFP	Instrumentation	Accessibility	
Payloader (1) [1]					X	Debris Removal of deployment paths
Fuel trailer (1) with 528 gal. tank and pump	X	X	X	X	X	Support adding fuel to diesel engine driven FLEX equipment
Fuel transfer pumps (2)[1]	X	X	X	X	X	Support adding fuel to diesel engine driven FLEX equipment
Communications equipment [1] (SPP, spare radio batteries and chargers, handheld satellite phones)	X	X	X	X	X	Support on-site and off-site communications

Table 4 – BWR Portable Equipment Stored On-Site

Use and (Potential / Flexibility) Diverse Uses						Performance Criteria
List Portable Equipment	Core	Containment	SFP	Instrumentation	Accessibility	
Communications small portable generators (6)[1] and associated and associated extension cords and power strips	X	X	X	X	X	9 kW, 120 VAC, Support communication equipment
Misc. debris removal equipment[1] (demolition saw, chain saw, axe, tow chains)					X	Support FLEX deployment
Misc. Support Equipment[1] (hand tools, flashlights & batteries, jumper cables, foul weather gear, battle lanterns, TruFuel gasoline, extension cords, power strips, spill kits, rope)					X	Support FLEX deployment

Table 4 – BWR Portable Equipment Stored On-Site
NOTES: 1. Support equipment. Not required to meet N+1. 2. NFPA 805/FLEX battery charger is an alternate strategy to the 600 VAC generators for charging Vital Batteries Therefore, only N is required. 3. One FLEX Pump is needed to implement the FLEX spray SFP cooling strategies. This pump is stored in the FLEX Storage Building along with the N plus 1 pumps for core, containment, and SFP make up, protected from hazards.

Table 5 – BWR Portable Equipment From NSRC

Use and (Potential / Flexibility) Diverse Uses									Performance Criteria		Notes
List Portable Equipment	Quantity Req'd /Unit	Quantity Provided / Unit	Power	Core Cooling	Cont. Cooling/ Integrity	Access	Instrumentation.	RCS Inventory			
Medium Voltage Generators	0	2	Jet Turb.	X	X		X		4.16 kV	1 MW	(1)
Low Voltage Generators	1	1	Jet Turb	X	X		X		480VAC	1100 KW	(1)
High Pressure Injection Pump	0	1	Diesel					X	2000psi	60 GPM	(1)
SG / RPV Makeup Pump	1	1	Diesel	X	X			X	500 psi	500 GPM	(1)
Low Pressure / Medium Flow Pump	1	1	Diesel	X	X			X	300 psi	2500 GPM	(1)

Table 5 – BWR Portable Equipment From NSRC

Use and (Potential / Flexibility) Diverse Uses									Performance Criteria		Notes
List Portable Equipment	Quantity Req'd /Unit	Quantity Provided / Unit	Power	Core Cooling	Cont. Cooling/ Integrity	Access	Instrumentation.	RCS Inventory			
Low Pressure / High Flow Pump	0	1	Diesel	X	X			X	150 psi	5000 GPM	(1)
Lighting Towers	3	3	Diesel			X				440,000 Lu	(1)
Diesel Fuel Transfer	1	1	AC/DC	X	X	X	X	X	30 GPM AC, 20 GPM .DC	500 Gal	(1)
Suction Booster Lift Pump	2	2	Diesel	X	X			X	26 Feet Lift	5000 GPM	(2)
Low Voltage Step-Up Transformer	1	1	N/A	X	X		X		480 VAC to 600 VAC	1375 KVA	(3)

NSRC Generic Equipment – Not required for Phase 2 FLEX Strategy – Provided as Defense-in-Depth.
NSRC Non-Generic Equipment needed to support use of NSRC Generic Pumps due to suction lift requirements using Lake Ontario as source of make-up water – Not required for Phase 2 FLEX Strategy – Provided as Defense-in-Depth
NSRC Non-Generic Equipment Needed to support use of NSRC Low Voltage Generator at NMP – Not required for Phase 2 FLEX Strategy – Provided as Defense-in-Depth

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28) NEI APC14-17, FLEX Validation Process, July 2014
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30) N1-DRP-FLEX-ELEC, Emergency Damage Repair – BDB/FLEX Generator Deployment Strategy, Revision 00000.00, March 2015
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