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

St. Lucie Units 1 and 2
Docket Nos. 50-335 and 50-389

Florida Power & Light/St. Lucie Site Revised FLEX Final Integrated Plan

References:

1. NRC Order Number EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events dated March 12, 2012, Accession No. ML12054A736.
2. FPL letter L-2015-143 dated May 14, 2015, Florida Power & Light/St. Lucie Unit 1 Status of Required Actions for EA-12-049 Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, Accession No. ML15140A080.
3. FPL letter L-2015-297 dated December 10, 2015, Florida Power & Light/St. Lucie Unit 2 Status of Required Actions for EA-12-049 Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, and Submittal of the St. Lucie Site FLEX Final Integrated Plan, Accession No. ML15351A009.

On March 12, 2012, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an order (Reference 1) to Florida Power & Light (FPL). Reference 1 was immediately effective and directs FPL/St. Lucie 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.

References 2 and 3 provided notification that FPL completed the requirements of EA-12-049 and was in full compliance with the Order for St. Lucie Units 1 and 2, respectively. Reference 3 also provided the St. Lucie site Final Integrated Plan (FIP) for FLEX. This letter is providing revision 1 of the FIP that addresses comments from NRC staff review that resulted in additional discussion regarding equipment operating environment qualification post-ELAP and restating the sequence of events timeline regarding initial cooldown conditions.

This letter contains no new regulatory commitments.

If there are any questions regarding this submittal, please contact Ken Frehafer at (772) 467-7748.

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NRR

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

Executed on **MAR 2 1 2016**

Respectfully submitted,

Christopher R. Costanzo
Site Vice President
St. Lucie Plant

CRC/KWF

cc: USNRC Regional Administrator, Region II
USNRC Senior Resident Inspector, St. Lucie Units 1 and 2

Attachment - St. Lucie FLEX Final Integrated Plan (Attachment 1 to Engineering Evaluation PSL-ENG-SEMS-14-005, Revision 1)

St. Lucie Final Flex Integrated Plan Document

(PSL-ENG-SEMS-14-005 Attachment 1 Rev. 1)

Following 70 Pages

ST LUCIE
FLEX FINAL
INTEGRATED
PLAN
DOCUMENT

ST. LUCIE
POWER STATION
UNITS 1 AND 2

PSL-ENG-SEMS-14-005

ATTACHMENT 1 Rev. 1

ST. LUCIE PLANT FLEX FINAL INTEGRATED PLAN DOCUMENT

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1. Introduction

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 (SFP) 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 [Ref. 5.3] 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 (BDBEEs). NRC Order EA-12-049 [Ref. 5.4] was subsequently issued to implement these recommendations including installation of reliable Spent Fuel Pool Instrumentation, the scope of which was mandated separately under NRC Order EA-12-051 [Ref. 5.8]. This document provides a report on how those recommendations have been met and is formally maintained as controlled document [Ref. 5.88] to ensure changes in the St. Lucie Plant (PSL) BDBEE response that are implemented under the governing PSL Program [Ref. 5.87] maintain compliance with the NRC Order [Ref. 5.4].

2. Regulatory Evaluation

2.1. Order EA-12-049

Based on NTTF Recommendation 4.2, the NRC issued Order EA-12-049 [Ref. 5.4] 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.

NRC Order EA-12-049 [Ref. 5.4] 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.

NEI 12-06 [Ref. 5.6] provided guidance for compliance with Order EA-12-049. The NRC determined that, with the clarifications provided in JLD-ISG-2012-01 [Ref. 5.5], conformance with the guidance in NEI 12-06 is an acceptable method for satisfying the requirements in Order EA-12-049.

St. Lucie Plant (PSL) submitted its Overall Integrated Plan (OIP) [Ref. 5.27] and provided updates [Refs. 5.29, 5.31, 5.33, 5.35, 5.39 & 5.42] describing changes in the plan and the status of analyses, physical modifications, procedure development and staff training required to implement the plan.

2.2. Order EA-12-051

NRC Order EA-12-051 [Ref. 5.8] required licensees to install reliable SFP instrumentation with specific design features for monitoring SFP water level. This order was prompted by NTTF Recommendation 7.1 [Ref. 5.3].

NEI 12-02 [Ref. 5.9] provided guidance for compliance with Order EA-12-051. The NRC determined that, with the exceptions and clarifications provided in JLD-ISG-2012-03 [Ref. 5.10], conformance with the guidance in NEI 12-02 is an acceptable method for satisfying the requirements in Order EA-12-051.

PSL submitted its Overall Integrated Plan with regard to Reliable SFP Instrumentation [Ref. 5.26] and provided updates [Refs. 5.30, 5.32, 5.36, 5.40 & 5.41] describing changes in the plan and the status of analyses, physical modifications, procedure development and staff training required to implement the plan.

3. Technical Evaluation of Order EA-12-049

3.1. Overall Mitigation Strategy (Three Phases)

The objective of the FLEX Strategies is to establish an indefinite coping capability in order to 1) prevent damage to the fuel in the reactors, 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 addresses an extended loss of all AC power (ELAP) – loss of off-site power, emergency diesel generators and any alternate AC source, 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). 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 with, 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 FLEX 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 plant conditions following the BDBEE. The sequence of events for St. Lucie during Modes 1-5 with Steam Generators (SGs) available is tabulated in Table 1. See Section 3.11 for Modes without SGs available.

Table 1 Integrated FLEX Strategy Unit 1/Unit 2 Timeline- SGs Available

Action	Phase	Begin (hrs.)	Duration (hrs.)	Time Constraint	Description
1	1	0	1	N/A	Event Initiation - Enter Diagnosis Phase - Begin Phase 1
2	1	0	0.17	Y	Close RCP CBO - Complete in 10 minutes
3	1	0.25	0.25	Y	Establish CR cross-flow ventilation – Open CR Doors
4	1	1	N/A	N/A	Enter FLEX FSGs
5	1	1	0.5	Y	Establish CR ventilation – Stage & start 6KW DG's & Portable Fans

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Table 1 Integrated FLEX Strategy Unit 1/Unit 2 Timeline- SGs Available

Action	Phase	Begin (hrs.)	Duration (hrs.)	Time Constraint	Description
6	1	1	0.5	Y	Perform Extended DC Load Shedding
7	1	1	2	Y	Open FHB 62 ft. Elevation Personnel Doors & 19 ft. Elevation East Door, Layout Hoses/Nozzles on FHB Deck for Makeup & Spray
8	1	1	N/A	N/A	Initiate FESB Access & Portable Equipment Deployment
9	1	1	1	Y	Establish Local Control of ADV(s) – Unit 1 Only
10	1	2	6	N	Cooldown RCS at 75°F/hr. to the earlier of RCS pressure of 170 - 180 psia or SG pressure at 120 psia minimum
11	1	5	1	Y	Prepare 480 VAC Buses for FLEX 480V DG
12	1	5	2	Y	Deploy 480 VAC FLEX DGs
13	2	8	1	Y	Refill U1 CST from U2 CST through Cross-Tie – Unit 1 Only
14	2	8	N/A	N/A	FLEX 480V DGs in Service
15	2	8	1	Y	Power Battery Chargers CR Lighting & Battery Room and Electrical Equipment Room Fans from 480 VAC FLEX DG and Open Electrical Equipment and Battery Room Doors
16	2	8	3	N	Restore Power to SIT outlet MOVs (control N2 Injection)
17	2	9	1	Y	Power Charging Pump(s) & CVCS Components from 480 VAC FLEX DG
18	2	10	1	Y	Align charging pump & CVCS Components and borate from BAM Tanks
19	2	10	2	N	Deploy & connect FLEX SG Pump - Backup to TDAFWP
20	2	11	2	Y	Deploy FLEX CST Pump & Hose Trailer and align to refill CST from PWST(s)/TWST/RWT(s)/FPU/ CWST(S)

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Table 1 Integrated FLEX Strategy Unit 1/Unit 2 Timeline- SGs Available					
Action	**Phase**	**Begin (hrs.)**	**Duration (hrs.)**	**Time Constraint**	**Description**
21	2	12	N/A	N/A	FLEX SG Pump Deployed and connected for TDAFW Pump Backup
22	2	12	N/A	N/A	Deploy Refueler for FLEX Equipment
23	2	17	N/A	N/A	FLEX CST Pump in Service
24	2	17	9	Y	Deploy FLEX SFP Pump & Hose Trailer (FPU/Intake) for SFP makeup
25	2	26	N/A	N/A	FLEX SFP Pump in Service
26	2	72	N/A	N	Receive NSRC Phase 3 Equipment - 4KV DGs/LUHS Pumping System
27	2	72	42	N	Deploy LUHS pumping system to Intake, Install/Connect Intake Flanges
28	2	72	1	N	Prepare 4KV Buses for NSRC 4KV DG(s)
29	2	72	24	N	Deploy/Connect NSRC 4KV DGs to site
30	2	96	NA	N/A	NSRC 4KV DGs in Service
31	2	114	2	N	Power CCW Pump - Establish flow to SDC HX
32	2	116	1	N	NSRC LUHS Pumping System in Service - ICW Flow Established
33	2	117	3	N	Power LPSI Pump - Establish flow from RCS through SDC HX
34	3	120	N/A	N/A	SDC Established - Enter Phase 3
35	3	120	2	N	Cool Containment - Start 2 CFC Fans/Align CCW

The strategies described below are capable of mitigating an ELAP/LUHS resulting from a BDBEE by providing adequate capability to maintain core cooling, containment, and SFP cooling capabilities at both units at St. Lucie. 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 St. Lucie 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.

3.2. Reactor Core Cooling Strategies

The FLEX strategy for reactor core cooling and decay heat removal is to release steam from the Steam Generators (SG) using the Atmospheric Dump Valves (ADVs) or Main Steam Safety Valves (MSSVs) with the addition of a corresponding amount of feedwater to the steam generators (SGs) via the turbine driven AFW (TDAFW) pump with backup provided by the FLEX SG Pump and connected hoses and fittings. The AFW system includes the Condensate Storage Tank (CST) as the initial water supply to the TDAFW pump. RCS cooldown will be initiated within the first 2 hours following a BDBEE that initiates an ELAP/LUHS event.

DC bus load shedding will ensure battery life is extended to at least 8 hours. Portable generators will repower battery chargers prior to battery depletion to ensure continued availability of the essential instrumentation.

3.2.1. Phase 1 Strategy

Immediately following the loss of power, the reactor will trip and the plant will initially stabilize at no-load reactor coolant system (RCS) temperature and pressure conditions, with reactor decay heat removal via steam release to the atmosphere through the steam generator safety valves and/or SG atmospheric dump valves (ADVs). Natural circulation of the reactor coolant system will develop to provide core cooling and the steam turbine driven auxiliary feedwater pump will provide flow from the condensate storage tank (CST) to the steam generators to make-up for steam release.

Operators will respond to the event in accordance with emergency operating procedures (EOPs) to confirm reactor coolant system, secondary system, and Containment conditions. A transition to 1(2)-EOP-10 "Station Blackout" [Ref. 5.82] will be made upon the diagnosis of the total loss of AC power. This procedure directs isolation of RCS letdown pathways and Reactor Coolant Pump (RCP) Controlled Bleed Off (CBO), confirmation of natural circulation cooling, verification of Containment isolation, reducing DC loads on the station Class 1E batteries, and establishment of electrical equipment alignment in preparation for eventual power restoration. The operators re-align auxiliary feedwater flow to all steam generators, establish manual control of the SG ADVs, and stabilize the plant. 1(2)-EOP-10 directs local manual control of auxiliary feedwater flow to the steam generators and

manual control of the SG ADVs to control steam release to control the RCS cooldown rate, as necessary. Entry into FLEX Support Guidelines is made when conditions to restore AC power are not present.

Secondary-Reactor core cooling is accomplished by natural circulation of the Reactor Coolant System (RCS) through the steam generators (SG). The steam generators are supplied makeup water by the auxiliary feedwater (AFW) system and steam pressure is controlled by the atmospheric dump valves (ADVs).

Unit 1 ADVs are air operated valves. If instrument air is not available, steam pressure will initially be controlled by the operation of the main steam safety valves (MSSVs). Cooldown is directed by 1(2)-EOP-10. The cooldown is described in Appendix Y of 1-EOP-99 [Ref. 5.83]. No operator actions are necessary for the operation of the MSSVs. These valves will respond to SG pressure until the operators take local control of the ADVs per Appendix U of 1-EOP-99. The Unit 1 ADVs can be manually operated, however, the field operators will install pneumatic jumpers from the seismically installed, missile and flood protected, compressed gas backup to the ADVs to provide a local control capability to facilitate long term operation. The compressed gas supply (high pressure gas bottles) is sized to last 120 hours [Ref. 5.58]. Additional bottles can be readily swapped out to extend the time frame indefinitely. Unit 2 ADVs are DC powered and do not require field operators to support their operation.

The makeup source for this strategy is the turbine-driven auxiliary feedwater (TDAFW) pump, which is automatically actuated to provide feedwater to the steam generators for the removal of reactor core decay heat following a loss of main feedwater. The TDAFW pump supplies flow to both steam generators through individual (DC powered) motor-operated flow control valves (FCVs). Unit 2 also has DC powered solenoid valves upstream of the FCVs that open on Auxiliary Feedwater Actuation Signal (AFAS) [Ref. 5.60].

Feedwater supply for each TDAFW pump is from a Seismic Category 1, Condensate Storage Tank (CST). Individually, the CSTs provide sufficient inventory to meet Phase 1 requirements (Unit 1, 9 hours; Unit 2, 26 hours) [Appendix 8.5 of Ref. 5.54, Ref. 5.75].

The qualified inventory of the two CSTs will be shared between the units to provide makeup flow to the steam generators for approximately 17 hours [Appendix 8.5 of Ref. 5.54, Ref. 5.75].

RCS- RCS cooldown will be initiated within the first 2 hours following a BDBEE that initiates an ELAP/LUHS event. The RCS cooldown rate will be approximately 75°F/hr. via the ADVs to a SG pressure of approximately 120 psia. [Ref. 5.97]. TDAFW pump flow will be increased to approximately 495 gpm between hours 2 and 6 for the cooldown [Appendix 8.5 of Ref. 5.54]. The RCS will be cooled down and depressurized until Steam Generator secondary side pressure reaches 120 psia. RCS inventory will be maintained during the Phase 1 RCS cooldown as a result of Safety Injection Tank (SIT) injection. The makeup from the SIT's replaces the RCS volume displaced by RCS leakage and RCS shrinkage. To ensure that SIT injection does not continue to the extent that its nitrogen enters the RCS, initial RCS cooldown will be terminated at an RCS pressure of 170 to 180 psia and this pressure maintained until the SIT's are isolated in Phase 2.

Electrical/Instrumentation – Load stripping of all non-essential loads would begin at the declaration of an ELAP/LUHS (approximately 1 hour after loss of power) and be completed within the next 30 minutes. With load stripping, the useable station Class 1E battery life is calculated to be 21.5 hours for Unit 1 and 14.9 hours for Unit 2 batteries [Ref. 5.47, 5.48].

3.2.2. Phase 2 Strategy

RCS core cooling and heat removal will be maintained while performing a cooldown and depressurization of the RCS. Several actions are required during Phase 2 for reactor core cooling. The main strategy is dependent upon the continual operation of the TDAFW pump, which is capable of feeding the steam generators provided there is an ample steam supply to drive the TDAFW pump turbines.

As a baseline capability for reactor core cooling for Phase 2 a portable diesel driven pump (FLEX SG pump) will be deployed for injection into the steam generators in the event that the TDAFW pump fails. Implementing this capability requires depressurizing the steam generators to allow for makeup with the FLEX SG pump. To allow for defense-in-depth actions in the event of an unforeseen failure of the TDAFW pump, the portable FLEX SG pump for

the Phase 2 core cooling will be staged and made ready as resources are available following the BDBE event. The FLEX SG Pump will be staged at a location near the CST. The supply for the FLEX SG pump will be the CSTs. Modifications added connection points for connection of the FLEX SG pump to the CST (Figure 1). The discharge from the FLEX SG Pump will feed into the TDAFW pump connections (Figure 2).

A CST makeup capability will be deployed in Phase 2 to restore inventory to the CST prior to inventory depletion. A portable FLEX CST pump will be staged at a location to draw water from water sources selected on the basis of their water quality and availability. The FLEX CST pump will discharge into the CST via tank nozzles separate from that supplying the FLEX SG pump. Modifications have provided connection points for connection of the FLEX CST pump to the CST (Figure 1).

At 120 psia SG secondary pressure, the ADVs are throttled to stabilize steam generator pressure and prevent adverse impact to the TDAFW pump operation. At a steam generator pressure of 120 psia, the RCS temperature and pressure are expected to decrease to approximately 350°F and 150 psia [Ref. 5.97].

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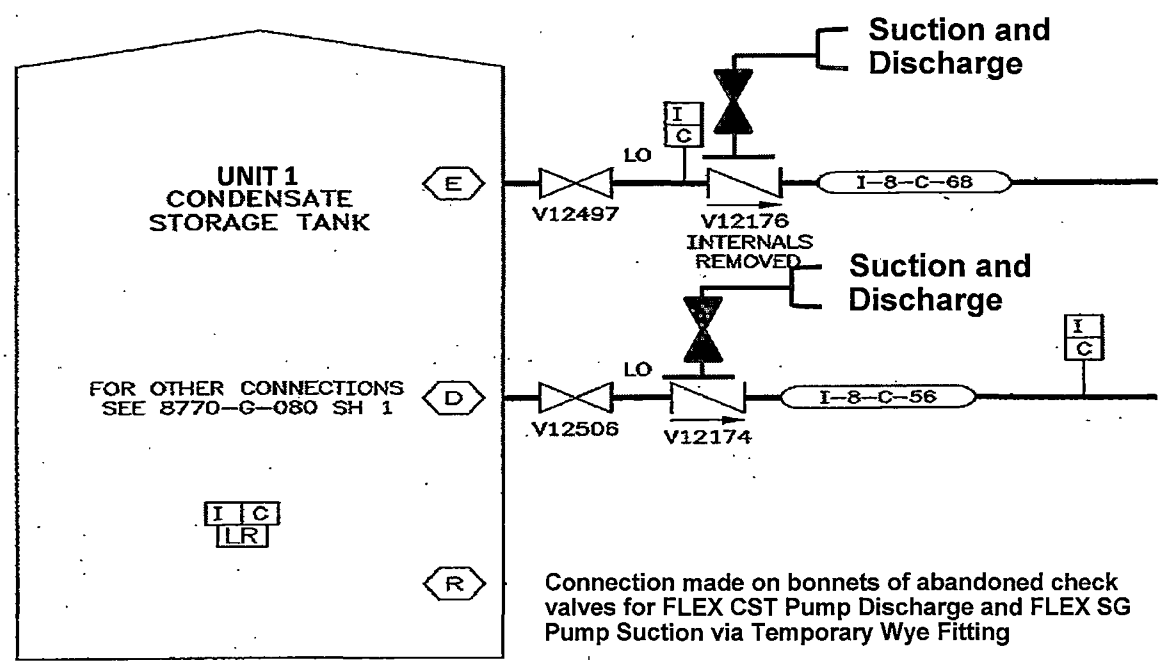

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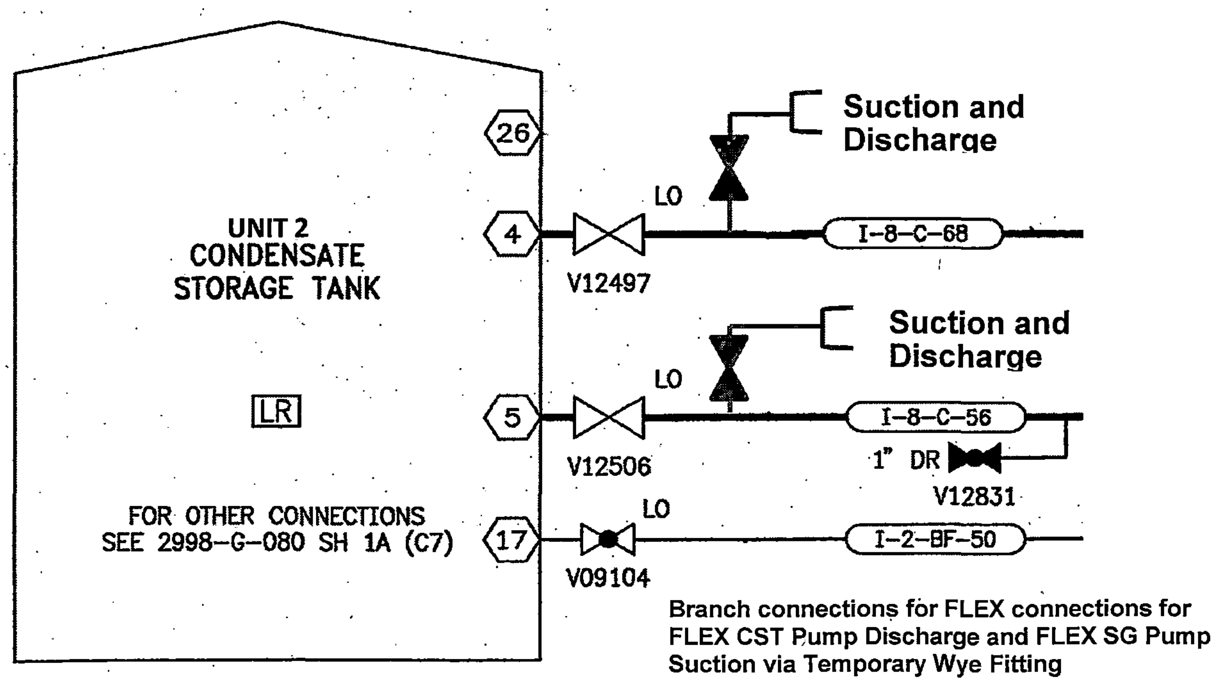

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Figure 1 Connections for FLEX SG Pump Suction and FLEX CST Pump Discharge on CSTs

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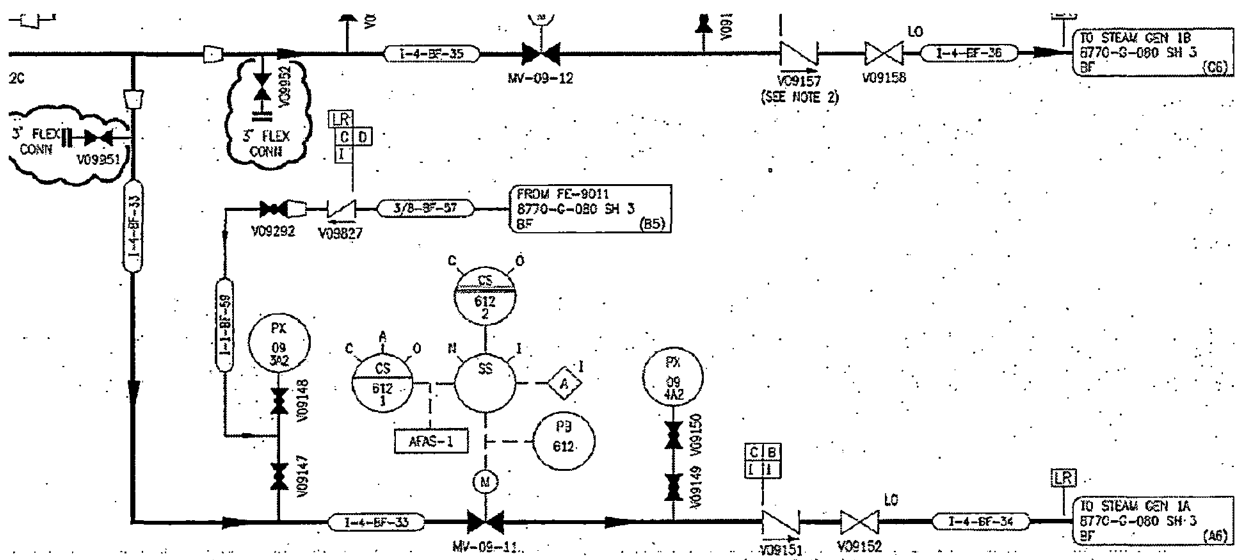
Installed 3" isolation valves and hose connection to the AFW Pump 1C(2C) discharge piping for Steam Generator injection by using a FLEX SG Pump



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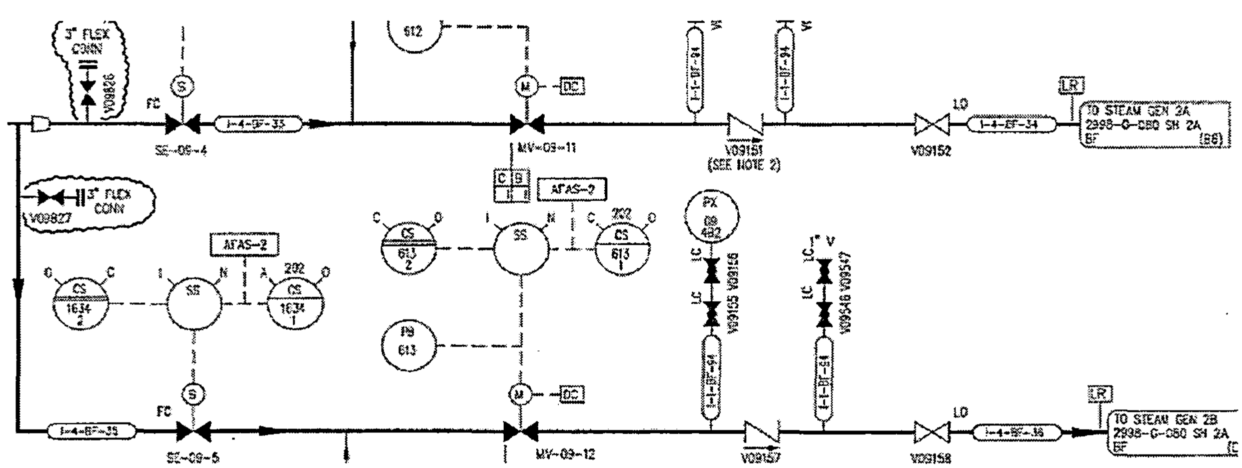

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2998-G-080 Sh. 2B

Figure 2 Connections for FLEX SG Pump Discharge to the SGs

During Phase 2, a FLEX 480V Diesel Generator will be deployed, staged and connected to repower a station 480 VAC bus to ensure power is available to the battery chargers prior to depletion of the station batteries. In order to ensure that the batteries remain available until the FLEX 480 VAC Diesel Generator is operational, extended manual load shedding will be used. Extended manual load shedding will increase the duration of the battery powered control and instrumentation monitoring function on Unit 1 to approximately 12 hours for each of the 1A and 1B station batteries and on Unit 2 to approximately 9.5 hours and 8 hours for 2A and 2B station batteries respectively [Ref's. 5.47, 5.48]. Assuming 1 hour duration to accomplish swapping from the A to B and both sets of batteries being loaded for 90 minutes, the total duty cycle for Unit 1 batteries is calculated at 21.5 hours and for Unit 2, 14.9 hours [Ref's. 5.47, 5.48].

During Phase 2, the permanently installed SIT outlet valves will be available once repowered from the FLEX 480VAC Diesel Generator via installed 480VAC and 120VAC electrical systems and cables stored in the electrical equipment room. Closure of these valves will be performed to prevent nitrogen injection into the RCS during subsequent RCS depressurization and cooldown. These normally open valves have Limitorque SMB-1 (Unit 1) and SMB-2 (Unit 2) operators that were specified, purchased and installed to the same requirements as the other ECCS motor operated valves (MOV's) installed in Containment (e.g. Shutdown Cooling System suction isolation valves). The Limitorque SMB-1 and SMB-2 operators have been qualified for harsh environment by testing of similar components [5.77, 5.79] Though the SIT isolation valve operators are passive for post Design Basis Accident function and thus not designated as requiring environmental qualification (EQ), the similarity with EQ valves can be relied on to ensure their function in the conditions present (<160°F at less than 20 hours per Ref. 5.46) when they would be closed following the ELAP.

During Phase 2, a permanently installed charging pump will be available once repowered from the FLEX 480 VAC Diesel Generator. The charging pump will be available for borated water injection into the RCS when it becomes necessary to maintain RCS inventory and Reactor shutdown margin. The primary charging pump borated water suction flow path is from the safety-related BAMTs. This path includes for each unit: the two (2) BAMTs per unit,

two (2) 100% capacity installed boric acid makeup pumps per unit, which would also be powered by the FLEX 480V DG on that unit, a gravity drain flow path that can bypass the boric acid makeup pumps and associated piping and valves. This suction flow path is fully protected from all external hazards applicable to PSL (seismic, flood, high winds and associated wind-driven missiles and extreme temperatures). All components are located indoors inside each unit's seismic Class 1 reactor auxiliary buildings that is not subject to harsh environmental conditions. The charging pump motors are qualified for harsh environment. The charging and makeup pumps do not rely on external cooling water systems. The charging pumps incorporate a natural circulation passive stuffing box flushing loop.

The alternate charging suction flow path is from the safety-related RWT. This flow path includes the RWT (one per unit) and associated piping and valves. This flow path is fully protected from all external hazards with the exception of the RWT. The two RWTs are protected from all external hazards except the effects of tornado wind-driven missiles. An evaluation [5.75] has concluded that the tank robustness and nearby structures provides reasonable protection.

The primary charging pump discharge flow path to the RCS is from the charging pump discharge to the RCS loop 1A2/2A2 and 1B1/2B1 cold legs. This path includes the three (3) 100% capacity charging pumps on each unit, regenerative heat exchanger and associated piping and valves. This discharge flow path is fully protected from all external hazards applicable to PSL (seismic, flood, high winds and associated wind-driven missiles and extreme temperatures). All components are located indoors inside the seismic Class 1 auxiliary building and reactor containment buildings (RCBs).

The alternate charging pump discharge flow path to the RCS is from the charging pump discharge to the High Pressure Safety Injection connections to all the RCS loops cold legs. This path includes the three (3) charging pumps on each unit and associated piping and valves. This discharge flow path is fully protected from all external hazards applicable to PSL (seismic, flood, high winds and associated wind-driven missiles and extreme temperatures). All components are located indoors inside the seismic Class 1 reactor auxiliary building and reactor containment buildings (RCBs). The components in the RCB's are qualified for harsh environmental conditions.

Note that the charging pump suction flow paths upstream of the common suction piping and discharge flow paths have sufficient valving to allow them to be isolated from one another in the unlikely event of a failure. Together, these two borated water charging pump flow paths are considered to meet the NEI requirement for separate divisions/trains. Connections and fittings on the charging pump discharge are also available for external pumping of borated water from the RWT.

Borated water injection will be required prior to when extended RCS cooldown to below 120 psia SG secondary side pressure commences. RCS venting will be accomplished as needed via Reactor Vessel Head and Pressurizer Vent valves that are qualified to operate in a harsh environment [Ref's 5.78 & 5.80].

3.2.3. Phase 3 Strategy

Phase 3 strategies for all modes of RCS cooling will be to establish Shutdown Cooling (SDC) which will require an NSRC pumping system capable of cooling the CCW Heat Exchanger that in turn cools the SDC Heat Exchanger and a NSRC 4.16 KVAC generator to power Component Cooling Water (CCW) and Low Pressure Safety Injection (LPSI) pumps. RCS makeup will be continued in Phase 3 using the same strategies employed for Phase 2.

The NSRC pumping system will provide a minimum of 5,000 gpm per unit based on the cooling requirements of the CCW heat exchanger during Phase 3. This flow was evaluated as adequate for the reduce heat loads concurrent with ELAP/LUHS event [Ref. 5.68].

The NSRC 4.16 KVAC generator will re-power several loads in support of Shutdown Cooling. One low pressure safety injection (LPSI) pump will be re-powered to establish RCS recirculation. Heat removal will be through the SDC heat exchangers which are cooled by establishing flow through the CCW system by re-powering one of the CCW pumps.

Temporary power cables will be supplied with the NSRC 4.16kV generators for connection to the Class 1E 4.16kV Buses through switchgear located in the Electrical Equipment Rooms of each unit.

3.2.4. Reactor Core Cooling Strategies Evaluation

3.2.4.1. Systems, Structures and Components (SSCs) Availability

3.2.4.1.1. Permanent Plant SSCs

All the equipment described to support FLEX Strategies are located in flood and missile protected structures that are seismically qualified.

- Turbine Driven Auxiliary Feedwater (TDAFW) Pump

  The TDAFW pump will automatically start and will deliver AFW flow to the steam generators following an ELAP / LUHS event. Two motor operated valves supply steam to the TDAFW pump turbine. These DC powered MOVs are normally closed. The MOVs are actuated by AFAS signal. In the event the TDAFW pump fails to start, procedures direct the operators to manually reset and start the pump (which does not require electrical power for motive force or control). The TDAFW pump is sized to provide more than the design basis AFW flow requirements and is located in a safety related Steam Trestle structure designed for protection for applicable design basis external events. The TDAFW pumps are installed in the outdoor environment within the Steam Trestle structure and are not subject to harsh environmental conditions. No ventilation fans are required for safety related design functions or post-ELAP conditions. TDAFW pump bearings do not rely on external cooling systems.

- Steam Generator Atmospheric Dump Valves (ADVs)

  During an ELAP / LUHS event with the loss of all AC power and instrument air, reactor core cooling and decay heat will be removed from the SGs for an indefinite time period by manually opening / throttling the SG ADVs. On Unit 1, the throttling will be controlled from the Control Room with positioners locally supplied with nitrogen via hand loader fed from backup nitrogen bottles. On Unit 2 Power to the SG ADV controllers in the Control Room (CR) will be provided by the DC batteries. The SG ADVs along with the SG Main Steam Safety Valves (MSSV's) are safety-related, missile

protected, seismically qualified valves installed in the Safety Related Steam Trestle structure that is not subject to harsh environmental conditions.

- Batteries

  The safety related batteries and associated DC distribution systems are located within safety related structures designed to meet applicable design basis external hazards. The batteries power required essential instrumentation, and applicable DC control components. Load shedding of non-essential equipment provides an estimated total service time of approximately 21.5 hours for Unit 1 and 14.9 hours for Unit 2 both of which exceed the 9 hour time for battery charger repowering as shown in Table 1.

- Condensate Storage Tank (CST)

  The condensate storage tanks (CST's) provides a water source at the initial onset of the event for the core cooling and heat removal strategy. The tanks are safety related and within tornado missile protected structures and are therefore designed to withstand applicable design basis external events [Ref. 5.75]. CST usable volume is maintained greater than or equal to 162,050 gallons on Unit 1 and 303,900 on Unit 2. The tanks can be cross tied to provide 232,975 gallons, per unit, of usable volume for emergency makeup to the SGs.

- TDAFW Pump Discharge Connection

  The primary AFW Pump discharge connection for SG injection is located on the TDAFW pump discharge line in the AFW Pump room. A hose will be routed from the FLEX SG Pump discharge to the primary connection in the AFW Pump room. This connection supports symmetric flow to both Steam Generators. Hydraulic analysis of the flow path from the CST Refill connection to the primary AFW Pump discharge connection has confirmed that applicable performance requirements are met [Ref. 5.44].

- TDAFW Pump Discharge Alternate Connection

  In the event that the primary AFW Pump discharge connection is not available, an alternate connection location is provided. The alternate AFW Pump discharge connection for SG injection is located on the TDAFW pump discharge line in the AFW Pump room. This connection supports symmetric flow to both Steam Generators. A flexible hose will be routed from the FLEX SG Pump discharge to the alternate connection. Hydraulic analysis of the flow path from the CST Refill connection to the alternate AFW Pump discharge connection confirmed that applicable performance requirements are met [Ref. 5.44].

- CST Connections

  Suction and refill connections to the CST (Figure 1) are installed to facilitate refill of the CST or provide a suction source to the FLEX SG Pump. The connection is seismically designed and located inside the missile and flood protection of the CST Building. The connection includes a hose coupling suitable for easy connection of a hose supplying water from the FLEX CST pump that draws of one of multiple sources of water to refill the CST.

- Low Pressure Safety Injection Connections

  The primary connection for the discharge of the FLEX SG Pump into the RCS is a permanently installed hose connection located downstream of the Low Pressure Safety Injection (LPSI) Pump "A" discharge motor operated valves to the RCS cold legs (Figure 3). This is used in the Modes 5 and 6 without SGs available per NEI guidance [Ref. 5.6].

  The primary supply to the FLEX SG pump for RCS makeup is via a permanent hose connection to a tank nozzle allowing borated water from the Refueling Water Tank (RWT) to be supplied to a the FLEX SG pump.

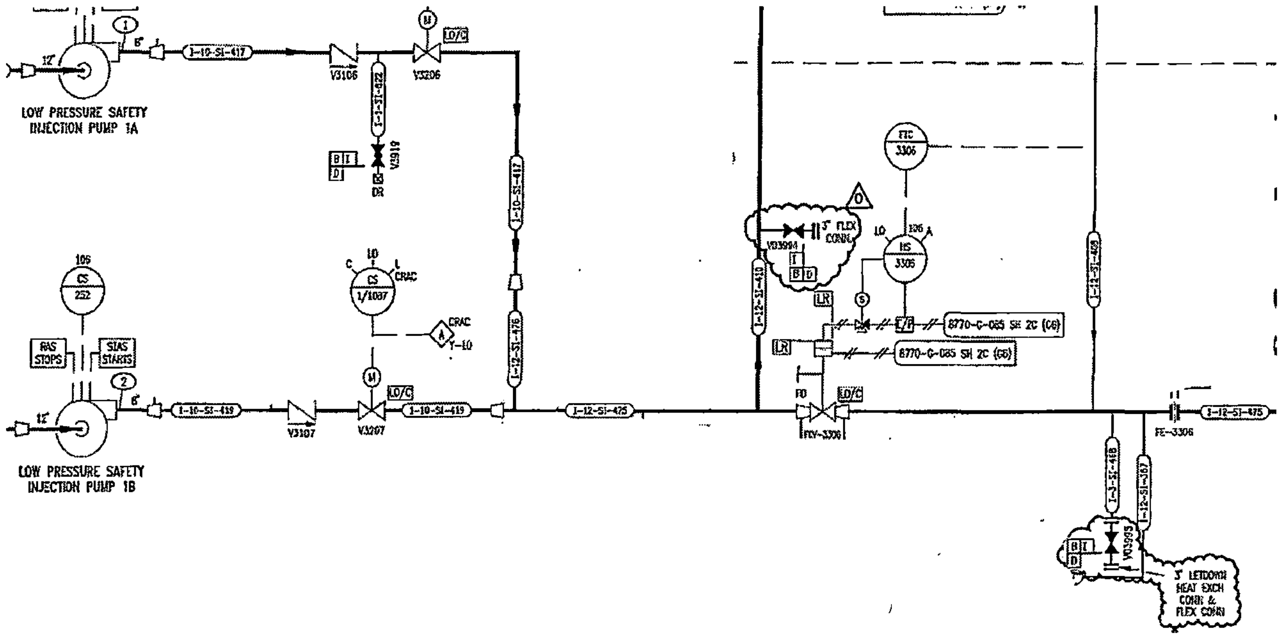
  In the event one unit's RWT is damaged, the suction hose to the FLEX SG pump can be routed from the opposite units RWT

alternate connection to provide a borated water source to the FLEX SG Pump.

- Alternate LPSI Connection

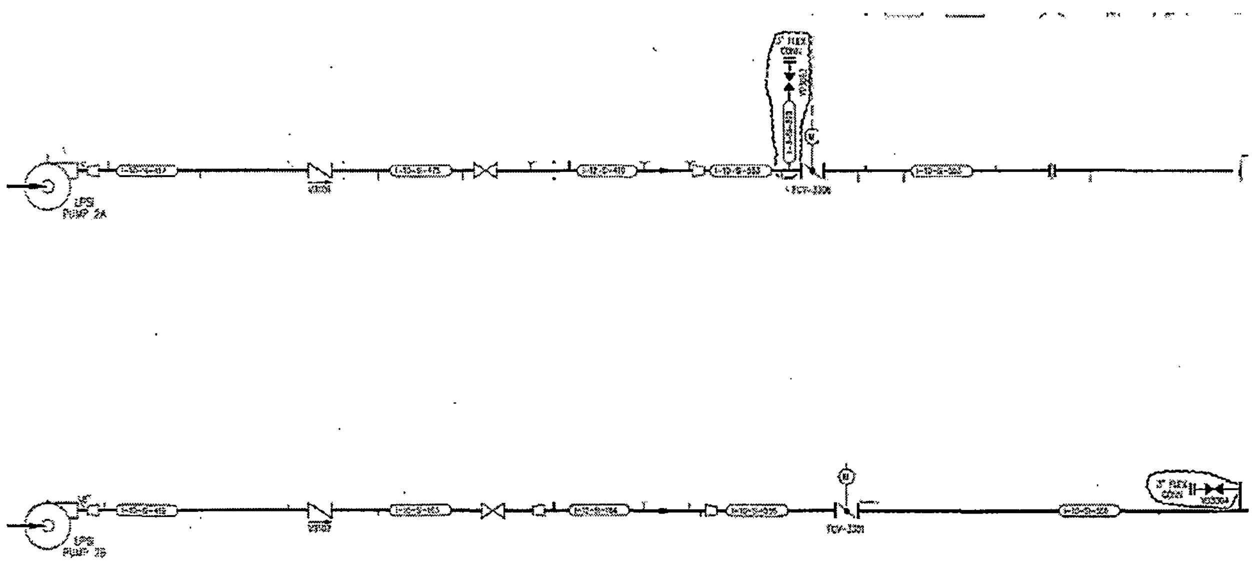
  The alternate connection is a permanently installed hose connection located downstream of the Low Pressure Safety Injection (LPSI) Pump "B" discharge motor operated valves to the RCS cold legs (Figure 3). The alternate supply to the FLEX SG pump for RCS makeup is via a permanent hose connection to a manway installed on the RWT.

Install primary and secondary 3" isolation valves & hose connections on the LPSI 1A/1B Pumps common discharge piping. For RCS cold leg injection with FLEX SG Pump drawing suction from the RWT.



Portion of Drawing 8770-G-078 Sh. 130B

Install 3" isolation valves and hose connections on each of the LPSI 2A & 2B Pumps discharge piping. For RCS cold leg injection with FLEX SG Pump drawing suction from the RWT.



Portion of Drawing 2998-G-078 Sh. 130B

Figure 3 Connections for SG FLEX Pump Discharge to LPSI Pump Discharge Lines

- Primary Electrical Connections
  - 480 V Connection

    The primary connection for the FLEX 480V generator is at the 1(2)A2, 480V load center. The 1(2)A Charging Pump is powered directly from the 1(2)A2 load center. A load center cross tie to the 1(2)AB load center is also available.

  - 4160V Connection

    The primary connection for the FLEX 4.16 kV generator is at the 1B3/2A3, 4.16 kV switchgear. The 1B/2A LPSI and 1B/2A CCW pumps are powered directly from the 1B3/2A3 switchgear bus.

- Alternate Electrical Connection
  - 480 V Connection

    The alternate connection for the FLEX 480V generator is at the 1(2)B2, 480 V load center. The 1(2)B Charging Pump is powered directly from the 1(2)B2 load center. A load center cross tie to the 1(2)AB load center is also available.

  - 4160V Connection

    The alternate connection for the FLEX 4.16 kV generator is at the 1A3/2B3, 4.16 kV switchgear. The 1A/2B LPSI pumps and 1A/2B CCW pumps are powered directly from the 1A3/2B3 switchgear bus.

3.2.4.1.2. Plant Instrumentation

Instrumentation providing the following key parameters is credited for all phases of the reactor core cooling and decay heat removal strategy:

- Auxiliary Feedwater Flow

- SG Water Level (Narrow Range)
- SG Pressure
- RCS Hot Leg Temperature
- RCS Cold Leg Temperature
- Core Exit Thermocouples
- CST Level
- Pressurizer Level
- Reactor Vessel Level .
- Neutron Flux
- RCS WR Pressure
- Containment Pressure
- Containment Temperature
- DC Bus Voltage
- Safety Injection Tank Level
- Spent Fuel Pool Level
- Refueling Water Tank Level
- Refueling Cavity Level

The above instrumentation being relied upon as part of the St. Lucie Units 1 and 2 FLEX strategy, has been evaluated against the environmental conditions of temperature and pressure anticipated during the entire duration of the event. The areas for which the qualification of this equipment and instrumentation were done include the containment, electrical equipment rooms, control room, and battery rooms for both units. Further detail regarding these evaluations can be found in References 5.46, 5.50, 5.51, 5.70, 5.71, 5.72 and 5.74.

The above essential instrumentation will be available prior to and after load stripping of the DC and AC buses during Phase 1. All indications will be in the Control Room (CR). Should any of the signal cabling to the CR indicators be damaged or DC power lost, all process parameters can be obtained at remote locations with hand held devices. Procedure 1(2)-FSG-07 [Ref. 5.84] provides location and termination information in the CR for all essential instrumentation. For those containment transmitters where signal integrity is lost between the penetration and the CR, FSGs provide terminal numbers for the transmitter outputs at the RAB side of the penetrations. For other instruments not in the containment, measurements can be taken locally at the transmitter. Scaling sheets to convert the transmitter milli-amp output, where applicable, to the process variable are provided as part of the FSG documentation. The hand held devices have built in power supplies which can be used to provide loop power.

Portable FLEX equipment is supplied with the local instrumentation needed to operate the equipment. The use of these instruments is detailed in the associated FSGs for use of the equipment. These procedures are based on inputs from the equipment suppliers, operation experience, and expected equipment function in an ELAP.

3.2.4.2. Thermal-Hydraulic Analyses

3.2.4.2.1. Secondary Analysis

Thermal Hydraulic calculations were performed to determine the inventory required to maintain steam generator levels and times associated with the volumes. The conclusions from this analysis showed that the existing Condensate Storage tank usable volume of approximately 232,975 gallons per unit (cross-tie between units) would be depleted in approximately 17 hours at which time another source of water is required [Appendix 8.5 of Ref. 5.54]. The alternate water sources on site at St. Lucie plant are the Treated Water Storage Tank, Primary Water Storage Tanks and City Water Storage Tanks (see Table 2) whose total volume can supply approximately 600,000 gallons for each unit that would be depleted in approximately 96 hours following depletion of the CSTs. The preferred alternate source from offsite is the Fort Pierce Utilities Authority main pipeline adjacent to the St. Lucie Site that provides an unlimited supply of water. The last source of water is the Intake Structure that functions as the ultimate heat sink.

3.2.4.2.2. Reactor Coolant System Analysis

The model used for determination of RCS response was that used in the generic analysis in WCAP-17601, Section 5.2.3 [Ref. 5.97]. Florida Power & Light performed a site specific applicability review of the analysis and confirmed applicability to St. Lucie. Parameters used in the model were compared to the St. Lucie plant and the overall results were confirmed to be bounded by the model and inputs used in the WCAP and associated analytical codes.

RCS inventory makeup will begin by 24.7 hours for Unit 1 and 18.6 hours for Unit 2 following the onset of the ELAP condition. Makeup will be provided by installed charging pumps that are repowered and aligned for makeup within 11 hours (Table 1). Based on information from WCAP 17601 and results for RCP seal leakage provided in WCAP-16175 [Ref. 5.96], natural circulation is considered to be maintained during the initial cooldown to 120 psia SG pressure and reflux cooling is avoided.

3.2.4.3. Reactor Coolant Pump Seals

St. Lucie is a Combustion Engineering plant with Flowserve N-9000 RCP seals. As demonstrated by testing documented in WCAP-16175-P-A [Ref. 5.96], the RCP seal leakage associated with the loss of seal component cooling water (LOCCW)/Station Blackout (SBO) events for the N-9000 RCP seals at PSL is under 1 gpm per seal. As described on page B-8 and B-29 of WCAP-16175-P-A [Ref. 5.96], seal leakage was maintained at 0.04 gpm throughout an 8 hour LOCCW test of an N-9000 RCP seal with bleed off CBO isolated at 30 minutes. For the PSL ELAP scenario, 1(2)-EOP-10 [Ref. 5.82] isolated CBO within 10 minutes of the event. Subsequent analysis [Ref. 5.43] provided further detail on leakage characteristics from the Flowserve N-Seals following an ELAP. Limitations on this analysis included in the NRC's review [Ref. 5.20] are satisfied as the PWR Owners Group was provided by PSL its site specific design and FLEX strategies including early CBO isolation, use of saturation temperature associated with the lowest MSSV setpoint and for FLEX strategies, the RCP seal leakage rates being conservatively assumed at 1 gpm per pump which provides adequate margin for density changes when converting from volumetric flow to mass flow.

3.2.4.4. Shutdown Margin Analyses

A Shutdown Margin (SDM) Analysis was performed and determined the reactivity SDM of at least 1% (Keff<0.99) is available through the initial cooldown period to the earlier of 120 psia SG pressure [Ref. 5.52, 5.53] or 170 to 180 psia RCS pressure based on the initial boron concentration and effects of SIT injection. However, to maintain shutdown margin into and through the extended cooldown phase, additional core boron is needed in order to continue to 50°F RCS temperature. Calculations show that injection of up to 2300 gallons of 5400 ppm borated water from the Boric Acid Monitor Tank (BAMT) or up to 32,000 gallons of 1900 ppm borated water from the RWT will be adequate to meet shutdown reactivity requirements at the limiting condition (Unit 2, Beginning of Cycle). This additional boron requirement is met at less than 12 hours of RCS makeup (RWT feeding charging pump). The makeup volume is displaced via the DC power Reactor Coolant Gas Vent System (RCGVS) valves.

The SDM calculation assumes a uniform boron mixing model. Boron mixing was identified as a generic concern by the NRC and was then

addressed by the PWR Owner's Group (PWROG). The NRC endorsed the PWROG boron mixing position paper with the clarification that a one hour mixing time was adequate provided that the flow in all loops is greater than or equal to the corresponding single-phase natural circulation cooling (NCC) flow rate. Single phase NCC is confirmed by monitoring that ΔT remains at or above the values described in WCAP-17792-P [Ref. 5.98]. The mixing time is included in the timing for extended cooldown. Since RCS makeup will be initiated prior to 24.7 hours (Unit 1) or 18.6 hours (Unit 2), and the pump capacity of 44 gpm exceeds the maximum RCS leakage, the NRC clarification regarding single-phase flow has been addressed and a one hour mixing time is acceptable. This is due to additional boron is not being required until extended cooldown is initiated in Phase 3, more than 72 hours after the ELAP event.

3.2.4.5. Flex Pumps and Water Supplies

3.2.4.5.1. FLEX CST Pumps

The FLEX CST pump, rated for 500 gpm (@224 ft TDH), provides make-up to the CST's from the several water sources identified to support Core Cooling and heat removal strategy. The FLEX CST Pump is a trailer-mounted, diesel driven centrifugal pump that is stored in the FLEX Equipment Storage Building (FESB). The pump is deployed by towing the trailer to one of several designated locations near the selected water source and then connecting to that source and the affected Unit's CST. In the case of both units being affected, the CST makeup with be implemented on a single Unit's CST (preferably Unit 2) and the other Unit's CST will be filled via the cross tie. The FLEX CST pump is required to support the reactor core cooling and heat removal strategy prior to CST depletion time of 17 hours as described in 3.2.1. At this time, the single FLEX CST pump flow capacity of 500 gpm exceeds the flow requirement for the TDAFW pumps or FLEX SG pumps for reactor core heat removal on both Units that is approximately 2 x 136 gpm [Ref. 5.54 Appendix 8.5].

Hydraulic analysis of the flow path from each water source to the CST's has confirmed that applicable performance requirements are met [Ref. 5.45].

NEI-12-01 specifies a number of each type of FLEX equipment that equals the number required to satisfy FLEX strategies for the site plus one (called "N+1"). Two FLEX CST pumps are available to satisfy N+1 requirement.

3.2.4.5.2. FLEX SG Pumps

Consistent with NEI 12-06, Appendix D, the auxiliary feedwater injection capability is provided using a portable FLEX SG Pump through a primary or alternate connection. The FLEX SG pump is rated for 300 gpm (@475 psig). The FLEX SG Pump is a trailer-mounted, diesel engine driven centrifugal pump that is stored in the FESB. The FLEX SG Pump will provide a back-up SG injection method in the event that the TDAFW pump can no longer perform.

Hydraulic analyses has confirmed that the FLEX SG pump is sized to provide the required SG injection flow rate to support reactor core cooling and decay heat removal [Ref. 5.44].

Three FLEX SG pumps are available to satisfy N+ 1 requirement. The same FLEX SG pumps are available to satisfy the RCS makeup capability for Modes 5/6 without SGs available as provided in NEI guidance [Ref. 5.6].

3.2.4.5.3. FLEX SG Pump Water Sources

- Condensate Storage Tank

Individually, the CSTs provide sufficient inventory to meet Phase 1 requirements (Unit 1, 9 hours; Unit 2, 26 hours) [Appendix 8.5 of Ref. 5.54, Ref. 5.75].

The qualified inventory of the two CSTs (465,950 gallons) will be shared between the units to provide makeup flow to the steam generators for approximately 17 hours [Appendix 8.5 of Ref. 5.54, Ref. 5.75]. The qualified inventory excludes unusable volumes below the minimum suction nozzle submergence level.

Unit 1 and Unit 2 CST tank levels are normally maintained just below their respective high-level alarm set points. This maintains an inventory that is significantly higher (581,600 gallons for the two CSTs) than the qualified inventory describe above.

- Borated Water Sources

Two sources of borated water have been evaluated for use during a Beyond-Design-Basis event. Each borated water source is discussed below.

Refueling Water Tank (RWT): Each unit is equipped with one RWT located at grade level across the east roadway from the respective Reactor Auxiliary Building (RAB). The tanks are safety-related, seismically qualified storage tanks, but are not qualified for missile impact; however, missile protection is provided through separation with intervening hardened structures [Ref. 5.75]. During at power operations each unit's RWST volume is maintained greater than 477,360 gallons at a minimum boron concentration of 1900 ppm [Ref. 5.1]. The RWT is the borated water source for the RCS Injection strategies where the FLEX SG Pumps are deployed following a BDBEE during Modes 5 and 6 without SG's available. The RWT is also an alternate source for Charging Pumps when they are utilized for RCS makeup following a BDBEE during all Modes.

Boric Acid Makeup Tank (BAMT): In the event that both RWTs are unavailable or become depleted, seismically qualified, missile protected boric acid makeup tanks are available to provide a suction source for the charging pumps. These tanks are the primary source for the charging pumps for RCS makeup and Reactor shutdown margin maintenance. These tanks are maintained greater than 8,700 (Unit 1) and 8,750 (Unit 2) gallons at a minimum boron concentration of 5245 ppm (Unit 1) and 5420 ppm (Unit 2) [Ref. 5.1].

- Intake Structure

The St. Lucie Unit 2 intake structure is designated as a backup water source for the for the core cooling and heat removal strategy. This supply is unlimited but not preferred since it supplies sea water to the FLEX SG pump that injects to the SGs. Therefore, other sources that supply higher quality water to inject into the SGs are designated to be accessed first.

3.2.4.5.4. FLEX CST Pump Water Sources

The various sources on site that are accessed to supply the FLEX CST Pump are shown in Table 2 with their respective capacity and water quality. The order in which the sources are tapped is based on water quality. The Tanks listed in Table 2 have new FLEX connections installed that will allow hoses to be run to the FLEX CST Pump in an expeditious manner.

Table 2 – Water Sources for FLEX CST Pump

Rank	Volume (gal)	Source	Seismic	Missile protected	Water Quality
1	199,000	Treated Water Storage Tank	N	N	Demin
2	150,000 (U1) 150,000 (U2)	Primary Water Tank	N	N	Demin
3	351,000 1A 351,000 1B	City Water Storage Tanks	N	N	Potable
4	Unlimited	Ft. Pierce Utilities Supply Line	N	Y	Potable
5	477,360 (U1) 477,360 (U2)	Refueling Water Tank	Y	Y*	Borated Demin
6	3,000,000 gal	Retention Ponds	N	N	Brackish
7	Unlimited	Intake Canal	Y	Y	Seawater

*Per Ref. 5.75

3.2.4.6. Electrical Analyses

The strategy for extended load shedding of 120V loads results in a Class 1E total battery duty cycle of 21.5 hours for St. Lucie Unit 1 and 14.9

hours for Unit 2 calculated in accordance with the IEEE-485 methodology using manufacturer discharge test data [Ref. 5.47, 5.48]. These durations are beyond the expected deployment time of 9 hours for FLEX equipment to supply the DC loads and repower the battery chargers per Table 1.

The strategy to re-power the stations vital AC/DC 480V AC buses requires the use of diesel powered generators. Each unit requires one FLEX 480 VAC portable diesel generator.

The FLEX 480 VAC diesel generators are 405 KW standby rating generators that are trailer-mounted with a double-walled diesel fuel tank built into a trailer capable of 12 hours full load fuel supply. The power rating was evaluated to be adequate to support electrical loads associated with Phase 2 strategies [Ref. 5.69, 5.73].

Three FLEX 480 VAC diesel generators are available to satisfy N+ 1 requirement.

Additional replacement 480 VAC diesel powered generators and 4.16kV combustion turbine powered generators are available from the National SAFER Response Center (NSRC) for the Phase 3 strategy.

3.3. Spent Fuel Cooling Strategies

The basic FLEX strategy for maintaining each Unit's Spent Fuel Pool (SFP) cooling is to monitor SFP level and provide makeup water to the SFP sufficient to maintain the normal SFP level.

3.3.1. Phase 1 Strategy

The initial coping strategy for spent fuel pool cooling is to deploy hoses and fittings on the Fuel Handling Building (FHB) operating deck necessary for makeup or spray strategies while the spent fuel pool is starting to heat up and to monitor spent fuel pool level using instrumentation installed as required by NRC Order EA-12-051.

3.3.2. Phase 2 Strategy

Phase 2 strategies initiate makeup using the hoses and fittings deployed into the FHB in phase 1 or using the hard pipe connections at the ground elevation to direct water supplied by the FLEX SFP Pump into the pool. The FLEX SFP Pump would be deployed to the east side of the FHB's between the Units if the preferred water supply Fort Pierce Utilities Authority (FPUA) were available. The backup location for the water supply is the Intake Structure. The FLEX SFP pump would be deployed to the Unit 2 Intake structure to draft water from the Intake Canal. Required hose lengths and fittings for the suction and ground level discharge of the FLEX SFP Pump are located in the FESB. The FLEX SFP Pump is trailer mounted and will be towed to the selected deployment location by a tow vehicle also located within the protected FESB. The discharge of the pump would be connected to a hose connection outside of the FHB or a hose connection at the suction of the Spent Fuel Pool (SFP) pumps inside the FHBs.

Additionally as required by NEI 12-06, spray monitors and sufficient hose length required for the *SFP Spray Option* are located in the FHB in cabinets at the operating deck level (62 ft. elevation). The hoses to connect these to the ground level FLEX SFP Pump discharge will be deployed down from the operating deck elevation to expedite deployment.

3.3.3. Phase 3 Strategy

Phase 3 strategies continue the Spent Fuel Pool Cooling and Makeup strategy from Phase 2 indefinitely.

3.3.4. Spent Fuel Pool Cooling Strategies Evaluation

3.3.4.1. Plant Structures, Systems and Components

3.3.4.1.1. SFP Strategy Connections

- Primary Makeup Connections

The hose connection for the permanent, seismically designed SFP make-up is located on the outside wall of the Fuel Handling Building. The primary emergency SFP make-up connection is sufficiently sized to maintain SFP level long term with the loss of SFP cooling and a makeup rate of 250 gpm for SFP boil off and

overspray [Refs. 5.6, 5.49]. Use of this makeup connection to the Spent Fuel Pool will not require entry into the FHB.

The new backup SFP protected makeup connection line is a 2½-inch 150 lb. class stainless steel line with valve and inlet hose adapter that tees into the existing 8-inch 150 lb. class stainless steel line at the suction of the "A" SFP pump at the ground elevation of the FHB. The existing line is open to the SFP as the normal cooling return header. The new connection is made to provide a backup to the existing outside connection that is not missile protected. Were it to be selected, hose deployment from this connection to the outside would occur during Phase 1.

- Alternate Makeup Connections

The alternate Phase 2 strategy for providing makeup water to the SFP is to use the FLEX SFP Pumps and associated hoses and fittings to discharge to the SFP. The hoses and fittings that transfer water from the ground 19.5 foot elevation to the SFP 62 ft. elevation are stored in cabinets at the higher elevation. The hoses and fittings will be run down to the ground elevation to be connected to the FLEX SFP Pump via its discharge hoses and fittings. The SFP makeup hoses will be clamped to the spent fuel handling machine rails to fix their position so that water can be discharged directly into the pool.

An additional alternate strategy utilizes a spray option to achieve SFP make-up. The spray strategy (as required by NEI 12-06 Table D-3 for providing spray at 250 gpm) is to provide flow through portable spray monitors set up on the FHB operating deck next to the SFP. A hose will be run from the FHB operating deck to the discharge of the FLEX SFP pump via its discharge hoses and fittings. At the end of the hoses in the FHB, a 3-way splitter will feed smaller hose sections to each of the portable spray monitors. When deployed, the 3 spray monitors will be will be clamped to the spent fuel handling machine rails to spray into the SFP. These spray monitors will spray water into the SFP to maintain spent fuel assembly cooling.

The FLEX SFP Pump and its suction hoses and fittings plus its discharge hoses and fitting that are deployed at ground level are deployed from the FESB. All equipment used for SFP spray strategy that are deployed at the FHB operating deck elevation or run down to the ground elevation are stored in the FHB FLEX Storage cabinet.

- SFP Ventilation

Ventilation requirements to prevent excessive steam accumulation in the FHB are satisfied by blocking open two personnel doors at the operating deck elevation of the FHB and opening the double door at the ground elevation of the FHB to establish natural circulation. Airflow through these doors provides adequate vent pathways through which the steam generated by SFP boiling can exit the FHB.

3.3.4.1.2.Plant Instrumentation

The key parameter for the SFP Make-up strategy is the SFP water level. The SFP water level is monitored remotely by the redundant instrumentation that was installed in compliance with Order EA-12-051, *Reliable Spent Fuel Pool Level Instrumentation.*

3.3.4.2. Thermal-Hydraulic Analyses

Analyses were performed that determined the SFP temperature rise associated with the maximum expected SFP heat load immediately following a core offload [Refs. 5.57, 5.59]. The evaluations estimate that with no operator action following a loss of SFP cooling at the maximum design heat load (plant shutdown, full core offload), the SFP will reach a bulk temperature of 200ºF in approximately 5 hours (Unit 1) or 6 hours (Unit 2) and boil off to a level 6 inches above the top of fuel in 45 hours for Unit 1 and 50 hours for Unit 2 unless additional water is supplied to the SFP. Heat up and boil off times corresponding with the plant operating 100 days following refueling are 27 hours to 200°F (Unit 1, 32 hours on Unit 2) and 240 hours to 6 inches above fuel (Unit 1, 271 hours on Unit 2). A flow of 82 gpm will replenish the water being boiled on either Unit. Deployment of the SFP hose connection from the FLEX SFP pump within

24 hours with a design flow of 250 gpm for each Unit's SFP will provide for adequate makeup to restore the SFP level and maintain an acceptable level of water for shielding purposes. Hydraulic analysis of the flow path from each water source to the spent fuel pools has confirmed that applicable performance requirements are met [Ref. 5.49].

3.3.4.3. FLEX Pumps and Water Sources

3.3.4.3.1. FLEX SFP Pump

The FLEX SFP pump is rated for 600 gpm (@325 psig). It supplies the two Units to make-up the Spent Fuel Pools from the several water sources identified to support Maintaining Spent Fuel Pool Cooling strategy. The FLEX SFP Pump is a trailer-mounted, diesel driven centrifugal pump that is stored in the FESB. The pump is deployed by towing the trailer to the designated locations near the selected water source. One FLEX SFP pump is required to implement the Spent Fuel Pool strategy for both Units. Two FLEX SFP pumps are available to satisfy the N+ 1 requirement.

3.3.4.3.2. Water Supplies

The preferred source for the FLEX SFP pump is the Fort Pierce Utilities Authority (FPUA) supply connections that are located at both the north St. Lucie site meter/backflow preventer station and at the FESB Fort Pierce supply station. Should one supply station be damaged by the BDBEE, it would be isolated from the underground supply main and the other station would be utilized as the water source.

The alternate water source for the FLEX SFP pump is the Unit 2 intake structure. Access to draft intake water is via hatches downstream of the Unit 2 traveling screens.

3.3.4.4. Electrical Analyses

The Spent Fuel Pool will be monitored by instrumentation installed by Order EA-12-051. The power for this equipment has backup battery capacity for 72 hours. Options will then exist for replacement of depleted batteries with spares maintained on site and/or repowered by way of

Phase 2 and Phase 3 FLEX coping strategies including use of portable 6 KW generators if available.

3.4. Containment Function Strategies

With an Extended Loss of All AC power (ELAP) initiated while either St. Lucie unit is in Modes 1-4, containment cooling for that unit is lost for an extended period of time. Containment temperature and pressure will slowly increase [Ref. 5.46]. Structural integrity of the reactor containment building due to increasing containment pressure will not be challenged during the first several weeks of a BDBEE ELAP event.

Conservative evaluations have concluded that containment temperature and pressure will remain below containment design limits and that essential instruments subject to the containment environment will remain functional for a minimum of seven days. Therefore, actions to reduce containment temperature and pressure and to ensure continued containment integrity will not be required. Eventual containment cooling and depressurization to normal values may utilize off-site equipment and resources during Phase 3. For scenarios with steam generators removing core heat, no specific coping strategy is required for maintaining containment integrity during Phase 1, 2 or 3. Review of once-through-cooling scenarios for Modes 5 & 6 without steam generators indicates containment venting will be required to prevent exceeding containment design conditions.

3.4.1. Phase 1 Strategy

The Phase 1 coping strategy for containment involves verifying containment isolation per 1(2)-EOP-10 "Station Blackout", and monitoring containment temperature and pressure using installed instrumentation. Containment pressure and temperature will be available via essential plant instrumentation.

3.4.2. Phase 2 Strategy

Phase 2 coping strategy is to continue monitoring containment temperature and pressure using installed instrumentation. Phase 2 activities to repower instruments are adequate to facilitate continued containment monitoring.

3.4.3. Phase 3 Strategy

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. The most significant need is to provide 4.16kV power to station pumps.

The Phase 3 coping strategy discussed in Section 3.2.3 is to obtain additional electrical capability and redundancy for on-site equipment until such time that normal power to the site can be restored. This capability will be provided by 1MW 4kV portable combustion turbine generators (CTG) provided from the NSRC for each PSL Unit. Two Mobile 4kV combustion turbine generators for each unit will be brought in from the National SAFER Response Center (NSRC) in order to supply power to either of the two Class 1E 4kV buses on each unit. Additionally, by restoring the Class 1E 4kV bus, power can be restored to the Class 1E 480 VAC via the 4160/480 VAC transformers to power selected 480 VAC loads.

No additional specific phase 3 strategy is required for maintaining containment integrity. With the initiation of SDC to remove core heat, the containment will depressurize without further action. Aggressive containment cooling (i.e., initiation of containment spray) will be avoided due to containment vacuum concerns.

3.4.4. Containment Strategies Evaluation

3.4.4.1. Plant Structures, Systems and Components

3.4.4.1.1. Containment Ventilation Strategy Equipment

For Modes 6 and Mode 5 without steam generators, FSG-12 [Ref. 5.85] establishes a containment ventilation strategy that utilizes the installed Emergency Escape Hatch and FHB doorways to ventilate containment.

3.4.4.1.2. Containment Strategy Instrumentation

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

– Containment Pressure: Containment pressure indication is available in the Control Room (CR) throughout the event.

– Containment Temperature: Containment temperature indication is available in the CR throughout the event.

3.4.4.2. Thermal-Hydraulic Analyses

Evaluation using Modular Accident Analysis Program (MAAP) software [Ref. 5.46] have concluded that containment temperature and pressure will remain below containment design limits and that essential instruments subject to the containment environment will remain functional for a minimum of seven days.

3.4.4.3. FLEX Pumps and Water Sources

The NSRC is providing a high capacity low pressure pump which will be used to provide cooling loads via the SDC system as described in Section 3.4.3. Water supplies are as described in Section 3.3.4.3.2 (i.e. Intake Structure).

3.4.4.4. Electrical Analyses

Several options described above required the powering of the 4.16KV bus. The 4.16KV equipment being supplied from the NSRC will provide adequate power to perform the noted strategies and are included in calculations to support the sizing of the 4.16KV (1000 KW) generator being provided. Each unit will require 2, 4.16kV generators.

3.5. Characterization of External Hazards

3.5.1. Seismic

The design criteria for PSL accounts for two design basis earthquake spectra, Operating Basis Earthquake (OBE) and Design Basis Earthquake (DBE) also known as Safe Shutdown Earthquake (SSE). Structures, systems, and

components (SSCs) important to safety are designed to withstand loads developed from these spectra. Provisions for this hazard will be included in the FLEX integrated plan. This includes qualification of installed equipment credited for the event and effects of the event on the FLEX strategies. Seismic design of St. Lucie safety related SSCs is discussed in the UFSAR [Ref. 5.2, Chapter 3, Section 3.7, Seismic Design].

A seismic re-evaluation of the site required by the 10 CFR 50.54(f) letter of March 12, 2012 has been completed and based on comparison of the existing station SSE and reevaluated Ground Motion Response Spectra (GMRS) curves, St. Lucie Station, Units 1 & 2 screen out [Ref. 5.34].

3.5.2. Flooding

St. Lucie Power Plant is located at approximately 27° north latitude, 80° west longitude on Hutchinson Island, a barrier island, situated between the Atlantic Ocean and the Indian River. The plant is situated above the highest possible water levels attainable except for wave run-up resulting from probable maximum hurricane (PMH) considerations. The maximum hurricane surge results in a still water elevation of 17.2 feet mean low water (MLW) and wind induced waves to 18.0 ft MLW. [Ref. 5.2, Unit 2 UFSAR, Section 2.4.2.2.b].

External flooding design of St. Lucie safety related structures is discussed in UFSAR [Ref. 5.2], Section 3.4, Water Level (Flood) Design. Flood protection criteria applied to plant structures, systems and components is listed in Table 3.2-1 of Ref. 5.2.

The plant grade around the safety related structures is approximate EL +18.5 ft-PSL datum. These structures are flood protected up to EL +19.5 ft-PSL datum. Any penetrations below EL +19.5 ft-PSL datum which lead to areas containing safety-related equipment are watertight per sections 3.4 of the Unit 1 UFSAR and Unit 2 UFSAR [Ref. 5.2].

Based upon the probable maximum flood (PMF) high water level due to the PMH, wave run-up level and plant island elevation noted above, flood protection stop logs at entrances (whose minimum elevation is at least +19.5 feet) to safety-related buildings are not deemed necessary. Additional wave run-up protection is provided to entrances of the Fuel Handling Building (FHB) and Reactor Auxiliary Building (RAB) by the presence of adjacent buildings

and structures. Since no permanent structures are located on the south side of Unit 2 RAB, additional wave run-up protection has been provided by installing stop logs in the entrance on the south wall and the southernmost entrance on the east wall of Unit 2 RAB. [Ref. 5.2, Unit 2 UFSAR Section 3.4.1].

A flooding re-evaluation was performed as required by 10 CFR 50.54(f) letter of March 12, 2012 and was submitted to the NRC [Ref. 5.38]. The re-evaluation included an updated storm surge assessment, a local intense precipitation assessment, and the effects of Tsunami, and Seiche. The results of these assessments indicate the Storm Surge, Tsunami and Seiche flood levels remain below the power block elevation (+18.3 ft PSL Datum) and the flood protection level (+19.5 ft. PSL Datum) though the margin to these levels is reduced in comparison with the Current Licensing basis. However, the local intense precipitation assessment [Ref. 5.62] indicated that some internal flooding would result from LIP event but the flood volume would not exceed CLB internal flood hazard volumes. During all hazards, FLEX equipment deployment was designed to avoid locating equipment below the maximum flooding hazard reanalysis levels.

Current plant design bases address the storm hazards of hurricanes, high winds and tornados. St. Lucie is a coastal site and is subject to hurricane hazards. Hurricanes and tornado hazards are addressed for the PSL site, as PSL is situated near the 240 mph hurricane contour shown in Figure 7-1 of NEI 12-06. [Ref. 5.6].

High winds and Tornado loadings are discussed in the UFSAR, Chapter 3, Section 3.3, Wind and Tornado Loadings. [Ref. 5.2].

Per UFSAR, the design hurricane wind speed is 194 mph. Wind loads are applied to all seismic Class 1 structures based on this design wind speed. [Ref. 5.2, Unit 2 UFSAR Section 3.3.1.1, Unit 1 UFSAR Section 3.3.1].

Plant procedures require that for a Category 1, 2 or 3 Hurricane, the units shall be shutdown to Mode 3, at least two (2) hours before the projected onset of sustained hurricane force winds within the Owner Controlled Area [Ref. 5.76].

Plant procedures require that for a Category 4 or 5 Hurricane, the units shall be shutdown to Mode 5, at least two (2) hours before the projected onset of sustained hurricane force winds within the Owner Controlled Area [Ref. 5.76].

For a Beyond Design Basis External Event (BDBEE) with significant warning, such as a hurricane, both units will be shut down at the time of the event. The Severe Weather Preparations procedure [Ref. 5.76] instructs the operators to shut down and cooldown the plant to Mode 3 or 5 (with steam generators available) at least two hours prior to the projected onset of hurricane force winds. The actual mode is dependent on the category of the projected hurricane and determinations by plant personnel. On-site resources and staffing are significantly increased in advance of the projected storm. The procedure also directs operators top off major water tanks, fuel oil tanks and increase plant staffing and supplies. Therefore, prior to the arrival of hurricane induced flooding and high winds, the plant is in a unique state and well prepared to cope with the event.

3.5.3. Tornado

Current plant design bases address the storm hazards of hurricanes, high winds and tornados. Hurricanes and tornado hazards are addressed for the PSL site, as PSL is situated near the 240 mph hurricane contour shown in Figure 7-1 of NEI 12-06. [Ref. 5.6].

High winds and Tornado loadings are discussed in the UFSAR, Chapter 3, Section 3.3, Wind and Tornado Loadings. [Ref. 5.2].

Section 3.3.2 of the UFSAR states design tornado has a horizontal rotational wind speed of 300 mph and translational speed of 60 mph. The design tornado wind speed applied to St. Lucie is extremely conservative since Florida tornados are much less severe. [Ref. 5.2, Sections 3.3.2 and 2.3].

3.5.4. Snow, Ice and Extreme Cold

St. Lucie is located in South Florida below the 35th parallel. Per Section 8 of NEI 12-06, [Ref. 5.6] snow, ice, or extreme cold hazard conditions do not apply to PSL. Provisions for this hazard will not be included in the FLEX integrated plan.

3.5.5. Extreme Heat

St. Lucie climate is typical of that in southern Florida, being hot and humid in the summer and mild in the winter. The PSL site (Hutchinson Island) average maximum temperature ranges from 72° F in February to 87° F in August [Ref. 5.2, UFSAR Unit 1, Table 2.3-10].

UFSAR Tables 2.3-10, Unit 1 and 2.3-37, Unit 2, [Ref. 5.2] illustrate the monthly distribution of temperature and extremes recorded in the area. Long term temperature statistics for West Palm Beach (climate characteristics are very similar to Hutchinson Island) indicate a 101° F maximum extreme and a 27° F minimum extreme [Ref. 5.2, UFSAR Unit 2, Table 2.3-37].

It is not expected that FLEX equipment and deployment would be affected by high temperature; however, high temperature has been considered with respect to maintaining equipment within design ratings and for personnel habitability.

3.6. Planned Protection of FLEX Equipment

The FLEX Equipment Storage Building (FESB) is located on south side of the plant and east of the Independent Spent Fuel Storage Installation (ISFSI) area. On site deployment routes for FLEX equipment from the FESB are shown in Section 3.7.1 Figure 4.

The FESB is a single building capable of housing FLEX equipment required to meet FLEX strategies. There is sufficient equipment to address all functions for both units. There are additional spares, i.e., N+1 capability, where "N" is the number of units or 2N, where each piece of equipment is rated at 200% capacity and capable of supporting both units. This spare equipment is also stored the FESB.

The FESB is designed to survive PSL design basis hurricanes, tornadoes and tornado missiles.

During a hurricane induced flooding event, access to areas in the plant, as well as access to the FESB, could be restricted due to flood waters and high winds. The strategy to maintain core cooling was developed such that access to Phase 2 FLEX equipment and access to environmentally harsh areas would not be required until the high winds had subsided and the flood waters receded.

The guidelines provided in NEI 12-06 (Section 8.2.1) exclude the need to consider extreme snowfall at plant sites in the southeastern U.S. below the 35th parallel. The PSL plant site is located at approximately 27° north latitude [Ref. 5.2, Section 2.1.1] and thus the capability to address impedances caused by extreme snowfall with snow removal equipment need not be provided.

FLEX equipment (i.e., pumps, diesel generators, etc.) has been selected to be capable of operating in hot weather [Refs. 5.93, 5.94, 5.95] at or in excess of the site extreme maximum of 101°F which is below the threshold of 110° F discussed in NEI 12-06 [Ref. 5.6]. Thus, it is not expected that FLEX equipment and deployment would be affected by high temperatures. Storage of FLEX equipment in the FESB includes ventilation to maintain peak summer temperature at 80°F at 45% humidity inside the building [Ref. 5.81].

Debris removal equipment is stored inside the FESB in order to be protected from the applicable external events such that the equipment remains functional and deployable to clear obstructions from the pathway between the equipment's storage location and its deployment location. This includes mobile equipment such as a front end loader, tow vehicle (tractor) and hose trailer or utility vehicle that are stored inside the FESB.

St. Lucie has implemented a FLEX program document [Ref. 5.87] stipulating the required administrative controls over FLEX equipment and the basis for their design and use.

Existing plant configuration control procedures will be modified to ensure that changes to the plant design, physical plant layout, roads, buildings, and miscellaneous structures will not adversely impact the approved FLEX strategies. This is outlined in the program document.

3.7. Planned Deployment of FLEX Equipment

3.7.1. Haul Paths and Accessibility

Pre-determined, primary and alternate haul paths have been identified and documented in the FLEX Support Guidelines (FSGs). Figure 4 shows the haul paths from the FESB to the various deployment locations. These haul paths were reviewed for potential soil liquefaction. The review report [Ref.

5.61] concluded that for the postulated ground motions the potential liquefaction results in a ground settlement of 6 to 12 inches. The restoration of haul paths of this low magnitude is within the capability of the FLEX debris removal equipment. Additionally, the chosen haul paths avoid areas with trees, power lines, narrow passages, etc. when practical.

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 immediately required as part of the initial 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 high energy line break (HELB). As barriers, these doors and gates are typically administratively controlled to maintain their function as barriers during normal operations. Following a BDBEE and subsequent ELAP 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 electric systems at connection points within seismically robust structures. 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 will be opened using keys that are provided to operations personnel. 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 [Ref. 5.90].

The deployment of onsite FLEX equipment to implement coping strategies beyond the initial plant capabilities (Phase 1) requires that pathways between the FESB and various deployment locations be clear of debris resulting from BDBEE seismic, high wind (tornado), or flooding conditions.

The stored FLEX equipment includes tow vehicles, backhoe/loader and Bobcat equipped with front end bucket and rear tow connections in order to move or remove debris from the needed travel paths.

Vehicle access to the Protected Area is via the double gated truck trap at the south side of the Protected Area. As part of the Security access contingency, the truck trap gates will be manually controlled to allow delivery of FLEX equipment (e.g., generators, pumps) and other vehicles such as debris removal equipment into the Protected Area.

Phase 3 of the FLEX strategies involves the receipt of equipment from offsite sources including the NSRC and various commodities such as fuel and supplies. Transportation of these deliveries can be through airlift or via ground transportation. PSL is partnered with the Strategic Alliance for Flexible Emergency Response (SAFER) to ensure delivery of required FLEX equipment from the NSRC. There are four staging areas for NSRC equipment receipt for PSL. Debris removal for the pathway between the site and the NSRC receiving location and from the various plant access routes may be required. The same debris removal equipment used for on-site pathways will be used to support debris removal to facilitate road access to the site.

ST. LUCIE PLANT FLEX FINAL INTEGRATED PLAN DOCUMENT

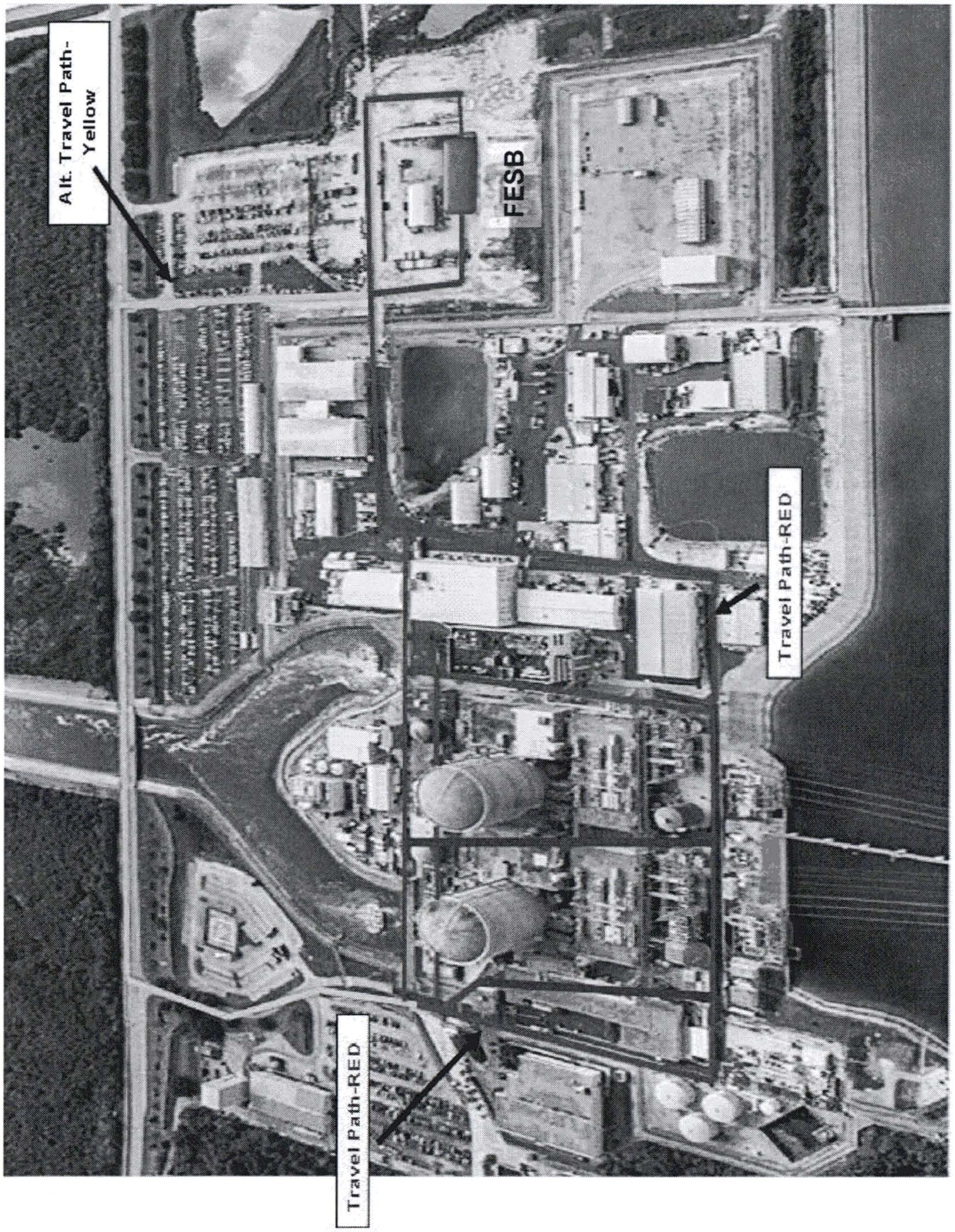


Figure 4 FLEX Equipment Storage Building (FESB) and Haul Routes

3.7.2. FLEX Equipment Transport, Connection and Refueling

3.7.2.1. RCS Cooling and Heat Removal FLEX Equipment Deployment

The FLEX SG Pump provides the backup for the TDAFW pump during Phase 2. The FLEX SG Pump is connected to TDAFW discharge connections located within the seismic category I, missile protected Main Steam Trestles. The portable, diesel driven FLEX SG pumps will be transported from the FESB to a location near the CSTs. The FLEX SG Pump primary suction connections are the CST discharge connections located inside the seismic Category I, tornado missile protected CST Buildings.

In the case where the CSTs are unavailable, the FLEX SG pump will be deployed to the Unit 2 Intake Structure. The Unit 2 intake structure provides an indefinite supply of water for RCS Cooling and Heat Removal with flow directly to the suction of the portable diesel driven FLEX SG pump. The Intake Structure will remain available for any of the external hazards listed in Section 3.5. The discharge will be routed to the TDAFW pump discharge connections described above.

The FLEX CST pumps refill the CST's during Phase 2. The CST Refill connections are located inside the seismic Category I, tornado missile protected CST Buildings. The portable, diesel driven FLEX CST pumps will be transported from the FESB to a location near the selected water sources. A flexible hose will be routed from the FLEX CST Pump discharge to the CST Refill connections. The selected water sources are based on water quality and are shown in Table 2, with demineralized water being preferred followed by potable water.

3.7.2.2. RCS Makeup (Modes 6/5 w/o SGs) FLEX Equipment Deployment

The FLEX SG pumps stored in the FESB will be deployed to the primary and alternate FLEX SG Injection pump suction connections on the Seismic I RWT's. These are located on the RWT manway via an adaptor and on the RWT drain line using an adaptor. The alternate supply should the Unit's RWT become unavailable due to high wind hazards is the other Unit's RWT. The FLEX SG Pump discharge hoses will be deployed to

RCS makeup connection located in the Emergency Core Cooling System (ECCS) rooms inside of the Reactor Auxiliary Building (RAB) of each unit to provide a path to the RCS cold legs of that unit. Accordingly, these connections are protected against all BDBEE hazards. The primary and alternate connections are on separate locations of the Low Pressure Safety Injection pumps' discharge headers.

3.7.2.3. Spent Fuel Pool Makeup or Spray FLEX Equipment Deployment

The FLEX SFP pump stored in the FESB will be deployed to the roadway east of the Fuel Handling buildings at its north or south end dependent on which location of preferred supply water (Fort Pierce Utilities) is available. In case of no availability of this preferred water supply, the FLEX SFP pump will be deployed to the Unit 2 Intake Structure to take direct suction. The discharge hoses of the FLEX SFP pump will be deployed to a location on the east roadway midway between each Unit's FHB where a flow splitter is deployed. Hoses are then routed from the splitter to each FHB for makeup or spray strategy. Makeup strategy can either be via hoses deployed from the Spent Fuel Pool operating decks at 62 ft. elevation or via installed piping connections at the roadway elevation. The piping connections are either outside connections or inside missile protected connections at the SFP pump suction to accommodate all BDBEE hazards.

3.7.2.4. 480V Repowering FLEX Equipment Deployment

A FLEX 480 VAC generator for both Unit 1 and Unit 2 will be deployed to the roadway at the southeast corner of the Reactor Auxiliary Buildings (RAB). The FLEX 480 VAC generators have fourteen 400-amp rated, 1-pole camlock connectors fed by one 600 amp circuit breaker. The circuit breaker feeds an individual set of camlock connectors per phase. The sets are labeled and color coded as such; Generator Output L1 (brown), Generator Output L2 (orange), Generator Output L3 (yellow), and Ground (green). The circuit breakers are thermal magnetic type. The 3-phase circuit breakers are three pole, molded case, and common trip with a single operating toggle. The 1-phase breakers are one pole.

Two diesel generator (DG) connection cabinets (primary and secondary), outfitted with quick disconnect cam-lock type connectors are mounted

inside the RAB on elevation 43.0'. A third connection cabinet, outfitted with quick disconnect cam-lock type connectors, is mounted in close proximity to the load centers on elevation 43.0'. These connection cabinets will be the interface point between the portable diesel generator and the 480VAC station electrical distribution system.

Flexible weatherproof cables with weatherproof connectors are installed between the primary or secondary connection cabinets and the portable diesel generators. The connecting cables are pre-staged near the connection cabinets in a cable storage cabinet.

Permanent cables have been installed (routed in existing cable trays and new conduits) between the new connection cabinets and the new circuit breaker that have been installed at the primary load center connection and the third cabinet. In a BDBEE scenario, the portable generator will be connected to one of the two connection cabinets using three 1/C #4/0 AWG color coded portable cables per phase that are pre-fabricated with matching cam-lock connectors. Portable cables will then be installed between the third connection cabinet and the primary load center connection point.

On Unit 1, an additional 480VAC/3-phase power distribution panel has been installed to provide power to the Safety Injection Tank (SIT) MOVs and other loads as deemed necessary requiring cross-tie capabilities during a FLEX scenario. This panel is powered by permanently installed cabling from an existing 100A air-frame, 90A trip setting breaker located in the swing Motor Control Center (MCC) 1AB. Two 480VAC/3-phase receptacles, supplied by the power distribution panel, are used for quick connections to selected MOVs during a FLEX scenario. Two cable assemblies, for use with MOVs during a FLEX scenario, comprised of 4-1/C #10 AWG SO cord type cables and a mating plug at one end, are provided and stored locally for quick connection to the receptacles.

Prior to charging the batteries during Phase 2 the battery room ventilation fans will be started. These fans are fed from MCCs 1A6 and 1B6 through PP-101 and PP-102, respectively.

For Unit 2, a 3-phase power distribution panel, to be used to provide power to loads requiring cross-tie capabilities during a FLEX scenario will

be powered from an existing a swing Motor Control Center (MCC) spare compartment. This distribution panel includes seven 480 VAC/3-phase receptacles, to be used for quick connections to SIT MOVs and/or other loads during a FLEX scenario. Other anticipated loads include:

- Control Room Lighting and communication equipment
- Battery Room Exhaust Fans
- Electrical Equipment Room Roof Vent Fans

Seven cable assemblies for use with SIT MOVs and/or other loads during a FLEX scenario, comprised of 4-1/C #10 AWG SO cord type cables are available in a local storage cabinet. Each cable has a mating plug at one end for quick connection to receptacles powered from cross-tie panel.

3.7.3. FLEX Deployment Staffing and Communications

Part of the PSL OIP and its update submittals described the implementation of NTTF Recommendation 9.3 [Ref. 5.3] regarding staffing and communications at PSL although the regulatory reviews were performed on a separate track [Ref. 5.13]. The PSL development of staffing and communication plans submitted to the NRC [Refs.5.21, 5.22, 5.23, 5.24, 5.25, 5.28 & 5.37] utilized the guidance from NEI 12-01 [Ref. 5.12] that was accepted by the NRC [Ref. 5.14]. PSL has validated that FLEX strategies can be implemented with on-site staffing including that supplemented with off-site support in latter phases post DBDEE. As described in Section 3.5.2, additional personnel are required on site for hurricane preparations and thus, would be available earlier in that scenario [Ref. 5.76].

The communications plan utilizes the Plant Radio and Sound Power Phone systems for on-site communications and new on-site Satellite Phone system [Refs. 5.63 & 5.64] for on-site and off-site communications should the PBX (Commercial) Telephone, EMnet Satellite Phone, Cellular Telephones, Gai-tronics(Plant Public Address), State and County Hot Ring Down Phone and Federal Telephone (NRC ENS and HPN) Systems be rendered partially or fully inaccessible following the event.

The PSL staffing and communications plans were received and reviewed by the NRC [Refs. 5.15, 5.16, 5.18 & 5.19]. The one activity that was

open from the NRC assessment of communications [Ref. 5.16] was that the upgrades to the site's communications systems be completed. This remaining activity was implemented [Refs. 5.63 & 5.64] and reported as complete in the final OIP update [Ref. 5.42].

3.7.4. FLEX Equipment Refueling Deployment

The FLEX strategies for maintenance and/or support of safety functions involve 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, being utilized to cope with an ELAP/LUHS, is to draw fuel oil out of any available existing diesel fuel oil tanks on site.

The primary source of fuel oil for portable equipment will be the Unit 2 Diesel Oil Storage Tanks. The Unit 2 Diesel Oil Storage Tanks (DOST) are fully qualified for seismic, wind, missiles and flooding. Each tank contains greater than 42,500 gallons of fuel oil [Ref. 5.1]. Gravity feed is accomplished by draining through the normal 3" fill connection (V17202). This connection is not seismically qualified or missile protected, so two new 3" valves seismically mounted inside the DOST building labyrinth, provide primary and alternate fuel oil supply connections for gravity drain into the FLEX Refueler trailer. The FLEX Refueler trailer will be stored in the FESB. 1(2)-FSG-99 [Ref. 5.86] provides operating instructions, fuel burn up rates and fueling strategies for all portable diesel driven FLEX equipment.

Fuel is gravity fed to a fuel oil tanker trailer (transfueler) that is stored in the FESB. It has a capacity of approximately 1,000 gallons [Ref. 5.91] and has a self-powered transfer pump for supply to FLEX equipment fuel tanks. The transfueler will be deployed from the FESB to be filled and to refill the FLEX equipment fuel tanks. The transfueler will return to the selected fuel source for refill once its supply is exhausted.

Diesel fuel in the fuel oil storage tanks is routinely sampled and tested to assure fuel oil quality is maintained to ASTM standards. This sampling

and testing surveillance program also assures the fuel oil quality is maintained for operation of the station Emergency Diesel generators.

Based on a fuel consumption study [Ref. 5.67], the combined fuel consumption rate is less than 65 Gal/hr. The transfueler has sufficient capacity to support continuous operation of the major FLEX equipment expected to be placed into service following a BDBEE. Based on gravity feed time of approximately 15 minutes to fill the transfueler, the bottom 13 feet of tank volume is considered unusable and the volume of available fuel is assumed to be 45,800 gallons from both tanks. At the 65 Gal/hr fuel consumption rate, the two Diesel Oil Storage Tanks, which are protected from BDB hazards, have adequate capacity to provide the on-site FLEX Equipment with diesel fuel for >28 days.

Diesel fuel from off-site sources will be needed to supplement the large LUHS pump and 4kV generators to be received from the NSRC.

The BDBEE response strategy includes a very limited number of small support engine powered equipment (chain saws, chop saws and small electrical generator units). These components will be re-fueled using small portable containers of fuel located in the FESB.

3.8. Offsite Resource Utilization

The industry has established two National SAFER Response Centers (NSRCs) to support utilities during BDBEEs. St. Lucie has established contracts with the Pooled Equipment Inventory Company (PEICo) to participate in the process for support of the NSRCs as required. Each NSRC will hold five sets of equipment, four 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 FLEX equipment hose and cable end fittings are standardized with the equipment supplied from the NSRC. In the event of a BDBEE 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 St. Lucie, the local assembly areas are the North Palm Beach County Airport or alternately the Sebastian Municipal Airport. From there, equipment can be taken to the St. Lucie site and staged at the onsite staging areas by helicopter if ground

transportation is unavailable. Communications will be established between the St. Lucie plant 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 24 hours from the initial request. The order at which equipment is delivered is identified in the "SAFER Playbook" [Ref. 5.89].

The equipment stored and maintained at the NSRC for transportation to the local assembly area to support the response to a BDBEE at St. Lucie is listed in Table 4. Table 4 identifies the equipment that is specifically credited in the FLEX strategies for St. Lucie but also lists the equipment that will be available for backup/replacement should on-site equipment break down. Available strategies for the backup/replacement equipment to support are also tabulated. Since all the equipment will be located at the local assembly area, the time needed for the replacement of a failed component will be minimal.

3.9. Habitability and Operations

Following a BDBEE and subsequent ELAP event at St. Lucie, 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 BDBEE resulting in an ELAP/LUHS. For loss of the majority of plant lighting, flashlights, head lamps and batteries are maintained in the Control Room and in all FLEX cabinets. Battery powered portable mining lamps are staged in the Radiation Monitor rooms. All of these locations are fully protected from External Events.

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. Loss of ventilation analyses [Refs. 5.50, 5.51, 5.55 & 5.56] were performed to quantify the maximum steady state temperatures expected in specific areas related to FLEX implementation to ensure the environmental conditions remain acceptable for personnel habitability and within equipment qualification limits.

3.9.1. Equipment Operating Conditions

The key areas identified for all phases of execution of the FLEX strategy activities are the Control Room (CR) and Electrical Equipment Room (EER).

These areas have been evaluated [Refs. 5.50, 5.51] to determine the temperature profiles following an ELAP/LUHS event. With the exception of the CR, results of the calculation have concluded that temperatures remain within acceptable limits based on conservative input heat load assumptions for all areas with no actions initially being taken to reduce heat load or to establish either active or passive ventilation (e.g., portable fans, open doors, etc.). In the case of the CR, the doors to the outside will be opened and left open when the CR temperature exceeds the outside temperature or a minimum 30 minutes after the ELAP. This is performed under Station Blackout Procedures to ensure that the temperatures remain within the acceptable range for equipment and personnel habitability. Within 90 minutes after the ELAP, portable fan deployment and/or load shedding will further reduce the heat load in the CR and in the EER.

The temperatures expected in the EER were evaluated to remain within the operating limits of equipment (inverters, etc.).

An additional ventilation concern applicable to Phase 2 is the potential buildup of hydrogen in the battery rooms. Off-gassing of hydrogen from batteries is only a concern when the batteries are charging. Once 480VAC repowering strategy is implemented in Phase 2 and prior to the station Class 1E batteries beginning to re-charge, power is restored to the battery room ventilation fans to prevent any significant hydrogen accumulation.

Conditions for other equipment utilized in the implementation of FLEX strategies (pumps, valves, instrumentation, etc) and the basis for equipment availability is discussed in the Reactor Core Cooling Strategies Section 3.2

3.9.2. Personnel Habitability

Personnel Habitability applies in the case of the CR. The doors to the outside will be opened and left open when the CR temperature exceeds the outside temperature or a minimum 30 minutes after the ELAP. This is performed under Station Blackout Procedures to ensure that the temperatures remain within the acceptable range for personnel habitability. Within 90 minutes after the ELAP, deployment of fans at the CR doors and load shedding will further accommodate the heat load in the CR for long term habitability.

3.10. Water Sources

Table 2 in Section 3.2.4.5.4 provides a list of potential water sources that may be used to provide cooling water to the SGs or the SFP, their capacities, and an assessment of availability following the applicable hazards identified in Section 3.5. As noted in Table 2, at least three water sources would survive all applicable hazards for St. Lucie and are credited for use in FLEX strategies. The deployment of each strategy is performed prior to the TDAFW or FLEX SG pump losing suction.

Use of the Refueling Water Tank for CST makeup using the FLEX CST Pump for water transfer would supply the required water for RCS cooling up to 110 hours after CST depletion. The RWT water is demineralized and borated. The RWT is qualified for seismic and flood hazards. The RWTs are separated and surrounded by hardened structures which lessen the probability of missile damage to both RWTs [Ref. 5.75].

Makeup water will be supplied to both Units from the potable offsite water supply (FPUA) that has tornado separation features. The main line is routed underground along Florida Route A1A that runs along the east side of the PSL site. Underground isolation valves are located along the main line at the PSL discharge canal and at branches that supply the PSL site. The above ground features for this supply are two FPU metering and backflow preventer stations. To minimize the risk of tornado missile damage, the new second station is located greater than 1650 ft. south of the existing station north of the discharge canal. This is beyond the assumed path and width of the tornado described in NEI Inquiry No. 2013-01 that is 1200 ft wide traveling west to east or southwest to northeast. Above ground FLEX connections are provided at the existing station north of the discharge canal and at a new manifold at the southeast corner of the FESB.

The results of the water source evaluation show that the credited, fully protected, on-site water sources provide for an adequate AFW supply source for the duration of Phase 2 at which time RCS cooling is provided by delivery and deployment of the NSRC 4160V Generator and LUHS pumping system and transition to Shutdown Cooling.

3.11. Shutdown and Refueling Analyses

St. Lucie Power Plant will abide by the Nuclear Energy Institute position paper entitled "Shutdown/Refueling Modes" addressing mitigating strategies in shutdown and refueling modes [Ref. 5.11]. This position paper has been endorsed by the NRC staff [Ref. 5.17].

3.12. Procedures and Training

3.12.1. Procedures

The inability to predict actual plant conditions that require the use of FLEX equipment makes it impossible to provide specific procedural guidance. As such, the FSGs will 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 BDBEE conditions, and are not used in lieu of existing procedures. When FLEX equipment is needed to supplement EOPs or Abnormal Operating Procedures (AOPs) strategies, the EOP or AOP will direct the entry into and exit from the appropriate FSG procedure.

FLEX strategy support guidelines have been developed in accordance with PWROG guidelines. FLEX Support Guidelines will provide available, pre-planned FLEX strategies for accomplishing specific tasks in the EOPs or AOPs. 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 1/2-EOP-10, "Station Blackout" 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 EOPs to include appropriate reference to FSGs:

- 1/2-EOP-15, "Functional Recovery"
- 1/2-EOP-99, "Appendices, Figures, Tables, Data Sheets"

FSG maintenance will be performed by the Operations Department group via the QI 5-PR/PSL-6, Requirements for Development and Revision of Emergency Operating Procedures.

FSGs have been reviewed and validated by the involved groups to the extent necessary to ensure the strategy is feasible. Validation has been accomplished via walk-throughs or drills of the guidelines and abides by the draft guidance provided by NEI and incorporated into NEI-12-06 Revision 1 [Ref. 5.7]. The results [Ref. 5.92] confirm PSL capability to perform strategies within applicable time frames.

3.12.2. Training

NextEra Energy Nuclear Training Program was revised to assure personnel proficiency in the mitigation of BDBEEs is adequate and maintained. These programs and controls were developed and have been implemented in accordance with the Systematic Approach to Training (SAT) Process.

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 BDBEEs have received the necessary training to ensure familiarity with the associated tasks, instructions, and mitigating strategy time constraints.

Care has been taken to not give undue weight (in comparison with other training requirements) for Operator training for BDBEE accident mitigation. The testing/evaluation of Operator knowledge and skills in this area have been similarly weighted. Operator training includes familiarity with equipment from the NSRC.

"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 BDBEE scenario until the current capability of the simulator model is exceeded. Full scope simulator models will not be upgraded to accommodate FLEX training or drills.

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 permanently installed equipment during these drills.

3.13. Maintenance and Testing

FLEX mitigation equipment was subject to initial acceptance testing and subsequent periodic maintenance and testing will occur to verify proper function. PSL complies with the EPRI generic industry program for maintenance and testing of FLEX equipment as delineated in NRC endorsement letter dated October 7, 2013; NRC ADAMS Accession No. ML13276A224. Preventive maintenance procedures and intervals have been established to ensure FLEX equipment is reliably maintained per manufacturer recommendations. Similarly, surveillance procedures and intervals have been created for functional and performance testing of applicable FLEX equipment as well as equipment inventory of all required FLEX equipment and spares.

4. Technical Evaluation of Order EA-12-051

4.1. Levels of Required Monitoring

Three Spent Fuel Pool levels were identified in the Overall Integrated Plan for reliable instrumentation [Ref. 5.26]. These consist of the level required for normal Spent Fuel Pool cooling function (56 ft. on both Units), the level required to provide approximately 10 ft. of water shielding above the fuel (46 ft. 3 in. on Unit 1 and 46 ft. 5 in. on Unit 2) and the level where the fuel remains covered (37 ft. 3 in. on Unit 1 and 37 ft. 5 in. on Unit 2) [Ref. 5.26].

4.2. Design Features

4.2.1. Instruments

The SFPLI consists of two independent channels of guided wave radar probes that are permanently installed to detect the water level inferred from the reflection of the electromagnetic energy. Instrument design and installation adopts requirements provided in NRC and NEI guidance [Refs. 5.9 and 5.10]

4.2.2. Arrangement

The SFPLI level instruments are installed close to opposite corners of the south wall of both Units' SFP's to maximum separation. Detector elevation encompasses the range of water level in the SFP required to be monitored.

Power supplies and transmitter electronics are located remotely to maximize radiation shielding provided by the SFP and Fuel Handling Building structure.

4.2.3. Mounting

The SFPLI detector and associated components are designed and installed as Seismic Class I or Seismic Class II/I components.

4.2.4. Qualification

The SFPLI instrumentation quality and expected reliability has been demonstrated by design, analysis, operating experience and testing with operating and environmental conditions applicable or bounding to the PSL FHB's following an extended loss of all AC power with concurrent loss of SFP cooling and FHB ventilation [Ref. 5.56 as modified by Ref. 5.55].

4.2.5. Independence

The SFPLI primary channel components have been constructed and arranged to be redundant and independent of the backup channel through separation and isolation of sensors, power supplies and cabling.

4.2.6. Power Supplies

The SFPLI channels are powered by separate local battery chargers fed from separate sources of 120VAC power. Separate batteries provide at least 72 hours of backup power with the provision for replacement. Provision of 120 VAC power plug for 6 KW portable generator is also included.

4.2.7. Accuracy

The SFPLI accuracy is +/- 3" (~2%). Operating Procedures establish the SFP levels with 46" of margin for normal fuel pool cooling operation and FLEX Support Guidelines establish the SFP levels with 9" of margin to the minimum shielding elevation (10 ft above fuel) where SFP spray would be initiated.

4.2.8. Testing

Factory Acceptance Testing and On-site Modification Acceptance Testing were performed for function and calibration of the new SFPLI's. Connections and test kits are provided for periodic functional and calibration surveillance procedures that have been established and scheduled.

4.2.9. Display

The SFPLI displays are located in the fully protected structure of the FHB at an elevation and location separated from the SFP and in an area that assures accessibility in conditions following a BDBEE.

4.3. Programmatic Controls

4.3.1. Training

Training impact resulting from the installation of the SFPLI was reviewed for operations, maintenance, engineering and simulator. Training lesson plans, class scheduling and sessions were completed to implement the results of these reviews.

4.3.2. Procedures

Operating, maintenance and testing procedures have been developed for SFPLI utilization and reliability. FLEX support guideline 0-FSG-11 has been issued to instruct operators on the use of the SFPLI indication following a BDBEE.

4.3.3. Testing and Calibration

Testing and calibration has been established in instrumentation functional and calibration procedures issued for each channel of each Unit's SFPLI.

5. References

(D) – Docketed, (ND) – Not Docketed

5.1. D Technical Specifications, Unit 1 Amend. 223, Unit 2 Amend. 173
5.2. D Updated Final Safety Analysis Report (UFSAR), Unit 1 Amend. 27, Unit 2 Amend. 22
5.3. D SECY-11-0093-Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated July 12, 2011 (ML11186A950)
5.4. D EA-12-049, Issuance of Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012 (ML12054A736
5.5. D 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 (ML12229A174)

5.6. D NEI 12-06 Rev. 0, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, August 2012 (ML12242A378)
5.7. D NEI 12-06 Rev. 1, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, August 2015 (ML15244B006)
5.8. D EA-12-051, 3/12/12, Issuance of Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (ML12056A044)
5.9. D NEI 12-02, Industry Guidance for Compliance with NRC Order EA-12-051, "To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation", Revision 1, dated August 24, 2012, (ML122400399)
5.10. D JLD-ISG-2012-03, Compliance with Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation, Revision 0, dated August 29, 2012 (ML12221A339)
5.11. D NEI Transmitted Shutdown and Refueling Position Paper dated 9/18/13 (ML13273A514)
5.12. D NEI 12-01, Guideline for Assessing Beyond Design Basis Accident Response Staffing and Communications Capabilities, May 2012 (ML12110A204)
5.13. D NRC Letter dated March 12, 2012, 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 (ML12053A340)
5.14. D NRC Letter dated May 15, 2012, U.S. Nuclear Regulatory Commission Review of NEI-12-01, "Guideline for Assessing Beyond Design Bases Accident Response Staffing and Communications Capabilities", Revision 0, dated May, 2012 (ML12131A043)
5.15. D NRC Letter dated July 26, 2012, Status of 90-Day Response to Request for Information Regarding Recommendation 9.3 of the Near-Term Task Force Related to the Fukushima Dai-Ichi Nuclear Power Plant Accident (ML12200A106)
5.16. D NRC Letter dated June 5, 2013, Saint Lucie Plant, Units 1 and 2 – Staff Assessment in Response Recommendation 9.3 of the Near-Term Task Force Related to the Fukushima Dai-Ichi Nuclear Power Plant Accident (TAC Nos. MF0028 and MF0029) (ML13134A050)
5.17. D NRC Letter dated September 30, 2013, Endorsement letter: Mitigation Strategies Order EA-12-049, NEI Position Paper: Shutdown/ Refueling Modes (ML13267A382)
5.18. D NRC Letter dated October 23, 2013, Response Regarding Licensee Phase 1 Staffing Submittals Associated with Near-Term Task Force Recommendation 9.3 Related to the Fukushima Dai-Ichi Nuclear Power Plant Accident (ML13233A183)
5.19. D NRC Letter dated May 5, 2015, St. Lucie Plant, Unit Nos. 1 and 2 – Response Regarding Licensee Phase 2 Staffing Submittals Associated with Near-Term Task Force Recommendation 9.3 Related to the Fukushima Dai-Ichi

Nuclear Power Plant Accident (TAC Nos. MF5337 and MF5338) (ML15117A052)
5.20. D NRC Letter dated November 12, 2015, Letter to the PWROG Regarding Endorsement of Flowserve N-Seal Reactor Coolant Pump Seal White Paper for ELAP Applications (ML15310A094).
5.21. D FPL Letter L-2012-209, FPL/St. Lucie Plant 60-Day Response to 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 May 11, 2012 (ML12136A165)
5.22. D FPL Letter L-2012-244, FPL/St. Lucie Plant 90-Day Response to 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 June 11, 2012 (ML12172A145)
5.23. D FPL Letter L-2012-249, FPL/St. Lucie Plant's Clarification of the 60-Day Response to 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 June 5, 2012 (ML12158A465)
5.24. D FPL Letter L-2012-377, St. Lucie Units 1 and 2 Docket Nos. 50-335 and 50-389 Renewed Facility Operating License Nos. DPR-67 and NPF-16, Response to NRC 10 CFR 50.54(f) Request for Information Regarding Near-Term Task Force Recommendations 9.3, dated October 31, 2012 (ML12307A116)
5.25. D FPL Letter L-2013-069, Response to Follow-up Technical Issues on NRC 10 CFR 50.54(f) Request for Information Regarding Near-Term Task Force Recommendation 9.3, Emergency Preparedness, dated February 21, 2013 (ML13057A033)
5.26. D FPL Letter L-2013-079, Florida Power and Light/St. Lucie's Nuclear Overall Integrated Plan in Response to March 12, 2012 Commission Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated February 28, 2013 (ML13063A026)
5.27. D FPL Letter L-2013-084, Florida Power & Light (FPL)/St. Lucie's Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated February 28, 2013 (ML13063A020)
5.28. D FPL Letter L-2013-147 to NRC, Response to NRC Request for Information Pursuant to 10 CF 40.54(f) Regarding Recommendation 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident, Emergency Preparedness-Phase 1 Staffing Assessment, dated April 30, 2013

5.29. D FPL Letter L-2013-192 to NRC, Florida Power & Light (FPL)/St. Lucie's Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA- 12-049), dated June 18, 2013 (ML13179A184)
5.30. D FPL Letter L-2013-253, Florida Power and Light/St. Lucie's First Six-Month Status Report to the Overall Integrated Plan in Response to March 12, 2012 Commission Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated August 27, 2013 (ML13242A006)
5.31. D FPL Letter L-2013-254 to NRC, St. Lucie's First Overall Integrated Plan Status Report in Response to March 12, 2012 commission Order Modifying Licenses with Regard to Requirement for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated August 28, 2013 (ML13242A274)
5.32. D FPL Letter L-2014-061, Florida Power and Light/St. Lucie's Second Six-Month Status Report to the Overall Integrated Plan in Response to March 12, 2012 Commission Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated February 28, 2014 (ML14064A1930
5.33. D FPL Letter L-2014-063 to NRC, St. Lucie's Second Overall Integrated Plan Status Report in Response to March 12, 2012 commission Order Modifying Licenses with Regard to Requirement for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated February 26, 2014 (ML14064A192)
5.34. D FPL Letter L-2014-089 to NRC, Florida Power & Light Seismic Hazard and Screening Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights form the Fukushima Dai-ichi Accident, March 2014)
5.35. D FPL Letter L-2014-274 to NRC, St. Lucie's Third Overall Integrated Plan Status Report in Response to March 12, 2012 commission Order Modifying Licenses with Regard to Requirement for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated August 27, 2014 (ML14253A184)
5.36. D FPL Letter L-2014-275, Florida Power and Light/St. Lucie's Third Six-Month Status Report to the Overall Integrated Plan in Response to March 12, 2012 Commission Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated August 27, 2014 (ML14253A185)
5.37. D FPL Letter L-2014-345 to NRC, FPL/St. Lucie Plant Response to NRC Request for Information Pursuant to 1 0 CFR 50.54(f) Regarding Recommendation 9.3 of the Near-Term Task Force Review of Insights from the

Fukushima Dai-Ichi Accident, Emergency Preparedness - Phase 2 Staffing Assessment, dated November 20, 2014 (ML14329A205)
5.38. D FPL Letter L-2015-048 to NRC, FPL/St. Lucie Plant's Flooding Hazards Reevaluation for Information Pursuant to 10CFR50.54(f) Regarding Flooding Aspects of Recommendations 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident, dated March 10, 2015 (ML15083A264)
5.39. D FPL Letter L-2015-049 to NRC, St. Lucie's Fourth Overall Integrated Plan Status Report in Response to March 12, 2012 commission Order Modifying Licenses with Regard to Requirement for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated February 23, 2015 (ML15071A265)
5.40. D FPL Letter L-2015-054 to NRC, Florida Power and Light/St. Lucie's Fourth Six-Month Status Report to the Overall Integrated Plan in Response to March 12, 2012 Commission Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated February 23, 2015 (ML15071A265)
5.41. D FPL Letter L-2015-214 to NRC, Florida Power and Light/St. Lucie's Fifth Six-Month Status Report to the Overall Integrated Plan in Response to March 12, 2012 Commission Order to Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Order Number EA-12-051), dated August 25, 2015 (ML15246A143)
5.42. D FPL Letter L-2015-215 to NRC, St. Lucie's Fifth Overall Integrated Plan Status Report in Response to March 12, 2012 commission Order Modifying Licenses with Regard to Requirement for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049), dated August 20, 2015 (ML15244B203)
5.43. D PWR Owners Group Letter OG-15-313, Flowserve White Paper to the Response of the N-Seal Reactor Coolant Pump (RCP) Seal Package to Extended Loss of All Power (ELAP), dated August 5, 2015 (ML15222A356) w/White Paper dated August 3, 2015 (ML15222A357) attached.
5.44. ND Calc FPL064-CALC-001, Rev 2, Steam Generator FLEX Pump Sizing
5.45. ND Calc FPL064-CALC-002, Rev 1, Condensate Storage Tank FLEX Pump Sizing
5.46. ND Calc FPL064-CALC-003, Rev 0 MAAP Containment Analysis
5.47. ND Calc FPL064-CALC-004, Rev 3, Unit 1 Battery Load Shedding Strategy
5.48. ND Calc FPL064-CALC-005, Rev 3, Unit 2 Battery Load Shedding Strategy
5.49. ND Calc FPL064-CALC-006, Rev 1, Spent Fuel Pool FLEX Pump Sizing
5.50. ND Calc FPL064-CALC-007, Rev 2, Electrical Equipment Rooms: 1A, 1B, and 1C Heat Up During an Extended Loss of Off-site Power

5.51. ND Calc FPL064-CALC-008, Rev 2, Control Room Heatup During Station Blackout
5.52. ND Calc FPL064-CALC-009, Rev 2, Unit 1 Reactivity Balance
5.53. ND Calc FPL064-CALC-010, Rev 1, Unit 2 Reactivity Balance
5.54. ND Calc FPL064-CALC-011, Rev 2, ELAP Decay Heat and Makeup Requirements
5.55. ND Calc FPLSL137-CALC-SFPI-001, Rev 1, St. Lucie Units 1 and 2 Dose to SFP Level Instrumentation Transmitter
5.56. ND Calc NAI-1784-002 Rev 0, St Lucie Nuclear Plant Units 1 and 2 Fuel Handling Building Beyond Design Basis Event Analysis
5.57. ND Calc PSL-1FJF-13-091 Rev 0, St. Lucie Unit 1 Cycle 25 Reload EC – SFP Decay Heat
5.58. ND Calc PSL-1FSM-14-001, Rev 0, Determination of Nitrogen Cylinder Requirements to Support Operation of HCV-0802A/2B for Recovery from a Beyond Design Basis External Event (BDBEE)
5.59. ND Calc PSL-2FJF-13-232, Rev 2, St. Lucie Unit 1 Cycle 21 Reload EC – SFP Decay Heat
5.60. ND Design Basis Document DBD-AFW-2, Rev 5, Auxiliary Feedwater System
5.61. ND Enercon Report FPLSL138, Rev 0, Report of Liquefaction Potential Assessment
5.62. ND Enercon Report NEE-131-PR-001, Rev 0, Effects of Local Intense Precipitation (LIP) on Plant Internal Flooding Report, dated August 19, 2015
5.63. ND Engineering Change EC 278700 Rev 2, 10CFR 50.54(f) Near Term Task Force Recommendation 9.3 Emergency Preparedness – Communications Charging Equipment Storage
5.64. ND Engineering Change EC 279287 Rev 4, PSL1 & 2 BDBEE Communication Equipment Installation
5.65. ND Engineering Change EC282155, PSL 1 Fukushima FLEX Strategy Implementation Umbrella Modification
5.66. ND Engineering Change EC282199, PSL 2 Fukushima FLEX Strategy Implementation Umbrella Modification
5.67. ND Engineering Change EC282155, PSL 1 Fukushima FLEX Strategy Implementation Umbrella Modification Civil Supporting White Paper Attachment "Evaluation of U1/U2 Diesel Fuel Oil Refueling Trailer for the St. Lucie Nuclear Power Plant".
5.68. ND Engineering Change EC282155, PSL 1 Fukushima FLEX Strategy Implementation Umbrella Modification Mechanical Evaluation White Paper Attachment "PSL NRC Interim Safety Evaluation (ISE) Confirmatory Item 3.2.1.9.C – RRC LUHS Pump Flow", Rev. 0
5.69. ND Engineering Change EC282155, PSL 1 Fukushima FLEX Strategy Implementation Umbrella Modification Electrical Evaluation White Paper Attachment "Generator Sizing", Rev. 1

5.70. ND Engineering Change EC282155, PSL 1 Fukushima FLEX Strategy Implementation Umbrella Modification Electrical and I&C Evaluation White Paper Attachment "PSL NRC Interim Safety Evaluation (ISE) Confirmatory Item 3.2.1.5.A – Rosemount pressure transmitters credited in an ELAP event will continue to function in the anticipated environmental conditions", Rev. 0

5.71. ND Engineering Change EC282155, PSL 1 Fukushima FLEX Strategy Implementation Umbrella Modification Electrical and I&C Evaluation White Paper Attachment "AQ44 – Battery Room Temperature", Rev. 0

5.72. ND Engineering Change EC282155, PSL 1 Fukushima FLEX Strategy Implementation Umbrella Modification Electrical and I&C Supporting White Paper Attachment WP-A0185 - "Rosemount Transmitters Functionality During ELAP Event", Rev. 0

5.73. ND Engineering Change EC282199, PSL 2 Fukushima FLEX Strategy Implementation Umbrella Modification Electrical Evaluation White Paper Attachment "PSL 480V FLEX Diesel-Generator Sizing", Rev. 1

5.74. ND Engineering Change EC282199, PSL 2 Fukushima FLEX Strategy Implementation Umbrella Modification Electrical and I&C Evaluation White Paper Attachment "AQ44 – Battery Room Temperature", Rev. 0

5.75. ND Evaluation PSL ENG-SECS-14-003, Rev. 0, EC279993, NRC Order EA-12-049 Response (Fukushima) PSL Tornado Missile Protected Water Sources

5.76. ND Procedure 0005753, Rev 84, Severe Weather Preparations

5.77. ND Manual 2998-A-451-3.1, Rev 16, Doc Pac - Limitorque Corporation Motor Operators

5.78. ND Manual 2998-A-451-35.6, Rev 13, Doc Pac - Target Rock Solenoid Valves

5.79. ND Manual 8770-A-451-14.0, Rev 16, Doc Pac - Limitorque Corporation Motor Operators

5.80. ND Manual 8770-A-451-21.0, Rev 6, Doc Pac - Target Rock Solenoid Valves

5.81. ND Manual 8770-18376, Rev 0, PSL Fukushima FLEX Equipment Storage Building Construction/Maintenance Manual Procedure

5.82. ND Procedure 1(2)-EOP-10, Rev 26/24, Station Blackout

5.83. ND Procedure 1(2)-EOP-99, Rev 55/52, Appendices / Figures / Tables / Data Sheets

5.84. ND Procedure 1(2)-FSG-07, Rev 1/0, Loss of DC Power

5.85. ND Procedure 1(2)-FSG-12, Rev 1/0, Containment Temperature and Pressure Control

5.86. ND Procedure 1(2)-FSG-99, Rev 2/0, Appendices / Figures / Tables / Data Sheets

5.87. ND Procedure ADM-17.34, Rev 5, Diverse and Flexible Coping (FLEX) Strategies Program

5.88. ND Procedure EN-AA-203-1100, Rev 9, Engineering Evaluations

5.89. ND Procedure EPG-10, Rev 1, Site SAFER Playbook

5.90. ND Procedure SY-AA-102-1038, Rev 0, Alternate Security Approach for Beyond-Design-Basis External Events (Security Related Information – Withhold from Public Disclosure)

5.91. ND Purchase Quotation, Quality Fuel Trailer and Tank Quote 224730, 1/23/14, Transfueler 1000 Gallon Tank

5.92. ND PSL Action Request 2031311 EDMS Archive, FLEX Validation & Verification Process Files

5.93. ND SPEC-E-059, FLEX 480V Portable Generator, Rev. 2

5.94. ND SPEC-M-198, Purchase Additional B.5.b Pumps for Fukushima Response, Rev 0

5.95. ND SPEC-M-205, Fukushima FLEX Steam Generator and Spent Fuel Pool Makeup Pumps, Rev. 2

5.96. ND WCAP-16175-P-A Revision 0, Model for Failure of RCP Seals Given Loss of Seal Cooling in CE NSSS Plants, March 2007

5.97. ND WCAP-17601-P, Rev 0, Reactor Coolant System Response to the Extended Loss of AC Power Event for Westinghouse, Combustion Engineering and Babcock & Wilcox NSSS Designs

5.98. ND WCAP-17792-P Revision 0, Emergency Procedure Development Strategies for the Extended Loss of AC Power Event for all Domestic Pressurized Water Reactor Designs PWROG, December 2013