ATTACHMENT 15
FLEX and Cross-tie Training Material

Contents

1. Document Based Instruction Guide (DBIG) DB430301, "DBIG Extensive Damage Mitigation Guide," Rev 005
2. Advanced FLEX Training, Rev 1
3. DBIG N-CL-ALL-FLEX-TRACTOR, Rev 000
4. N-CL-ALL-FLEX-F750, Rev 001
5. DBIG N-CL-OPS-DB-FLEX-ELECT, Rev 000
6. DBIG N-CL-OPS-DB-FLEX-FLUID, Rev 000
7. DBIG N-CL-OPS-DB430601-FLEX, Rev 000
8. DBIG N-CL-OPS-DB8029, Rev 000
9. DBIG N-AN-EP-BASIC-FLEX, Rev 0
10. Control Logic "Failure" Modes with Respect to FLEX Phase 1 and Phase 2 Core Cooling Flow Paths

Document Based Instruction Guide

Course/Program:	ILT/LORT/NLO	Course Code:	N/A
Title:	DBIG Extensive Damage Mitigation Guide	Guide #:	DB430301
Author:	Carl Leach	Revision/Date:	005 / 08/18/17
Revision By:	J. Matthews / Matthew Beeler	Est. Teach Time:	3.0 hrs.
Responsible site:	Clinton		

Qualified Nuclear Engineer Review (If applicable):	N/A	Date:	N/A
Training Supervision Review:	R. J. Frederes /S/	Date:	09/24/17
Program Owner Approval:	Matthew Davis /S/	Date:	11/16/17

PREREQUISITES: NONE

OBJECTIVES:

.1.1 Given CPS No. 4303.01, state the symptom(s) for entering CPS No. 4303.01.

.1.2 Given CPS No. 4303.01, describe the Prompt Action to be taken when using CPS No. 4303.01.

.1.3 Given CPS No. 4303.01, describe Technical Support Center (TSC) Actions when using CPS No. 4303.01.

.1.4 Given CPS No. 4303.01, describe Mitigating Strategies when using CPS No. 4303.01.

a. Discuss dose concerns when performing CPS No. 4303.01P017 Spent Fuel Pool Makeup From Fire Protection.

.1.5 State Location and discuss the use of the following B.5.b equipment:

a. Satellite Phones
b. MABAS Radio
c. Self reading pocket dosimeter (SIPD / SRPD)

.1.6 State the Location of B.5.b procedures.

.1.7 Discuss CPS No. 3822.04C003 Quarterly B.5.b. Equipment Checklist.

EVALUATION METHOD & PASSING CRITERIA:

Satisfactory performance for objectives will be demonstrated through written exam questions and may be administered as part of an end of course exam to evaluate retention of the objective based knowledge. 80% is required to pass the exam.

REFERENCES: *(List the procedure/subject matter here. If not readily available through other means such as EDMS, include the revision number or date of the procedure.)*

1. CM-1, RCMT 577295-16, CPS will conduct training on the mitigation strategy procedures/guidelines
2. SOER 10-2, Engaged, Thinking Organizations
3. IER L1-17-05, Line of Sight to the Reactor Core
4. IER 11-3, Weaknesses in Operator Fundamentals
5. CPS No. 4303.01, Extensive Damage Mitigation Guide
6. 4303.01F001, Extensive Damage Mitigation Guide Flowchart
7. CPS No. 4303.01P001, Containment Venting Without AC Power Available
8. CPS No. 4303.01P002, Spent Fuel Pool Makeup From Containment Pool
9. CPS No. 4303.01P003, Spent Fuel Pool Makeup From Suppression Pool
10. CPS No. 4303.01P004, SRV Operation With External DC Power
11. CPS No. 4303.01P005, Emergency RPV Makeup From Cycled Condensate System
12. CPS No. 4303.01P006, Emergency RPV Makeup From Makeup Condensate System
13. CPS No. 4303.01P007, Emergency RPV Makeup From Fire Protection
14. CPS No. 4303.01P008, Emergency Fire Protection System Management
15. CPS No. 4303.01P009, Aligning External Power for CY and MC Pump Operation
16. CPS No. 4303.01P010, Emergency Makeup To The CY Tank
17. CPS No. 4303.01P011, Spray Scrubbing and Control of Radioactive Material Runoff
18. CPS No. 4303.01P012, Emergency Hotwell Makeup
19. CPS No. 4303.01P013, RCIC Manual Operation Without DC Control Power
20. CPS No. 4303.01P014, Emergency Drywell Flooding From Fire Protection
21. CPS No. 4303.01P015, Emergency RPV Level and Pressure Determination
22. CPS No. 4303.01P016, Emergency RCIC Tank Makeup From Fire Protection
23. CPS No. 4303.01P017, Spent Fuel Pool Makeup From Fire Protection
24. CPS No. 4303.01P018, ERO Activation During Extreme Damage Event

25. CPS No. 4303.01P019, Hydrogen Igniter Operation With External AC Power
26. CPS No. 4303.01P020, Emergency Confirmation of Reactor Scram
27. CPS No. 4303.01P021, Invocation of 50.54(x) During an Extreme Damage Event
28. CPS No. 4303.01P022, DC Power Strategies
29. CPS No. 4303.01P023, Cross-Connecting Div 3 DG To Div 1(2) ECCS Electrical Busses
30. CPS No. 4303.01P024, Manual Start of an Emergency DG with Loss of DC Power
31. CPS No. 4303.01P025, Emergency Dg Operation With Alternate Cooling
32. CPS No. 4303.01P026, Emergency Containment Spray Makeup From Fire Protection
33. CPS No. 4303.01P030, Portable John Deere B.5.b. Diesel Fire Pump Operation
34. CPS No. 4303.01P031, Portable Floating Fire Pump Operation
35. RP-AA-700-1228
36. CPS No. 3822.04C003

ATTACHMENTS: (List any additional attachments here. Copies of the attachments, other than the references, should be attached to the original of the DBIG for retention.)
1. DB430301, DBIG – Extensive Damage Mitigation Guide, PowerPoint, Rev 005

COMMITMENTS:

1. None

I. INTRODUCTION

A. **Introduce yourself:**

1. Name
2. Position/responsibilities
3. Background/qualifications

B. **Introduce subject matter**

1. Procedure title/subject matter:

2. Basis for instruction (check one)
   - ☐ New procedure/subject matter
   - ☐ Revised procedure/subject matter
   - ☒ Existing procedure/subject matter review
   - ☐ Other:

   Comments: **NOTE:** *Comments section provided for amplifying/clarifying remarks (such as new equipment, general aspects of a procedure revision, description of incident/deficient performance, etc.).*

3. Establish relevance, importance, and purpose of topic

- Off Normal procedure that addresses beyond design basis events
- February 25, 2002, Interim Compensatory Measures (ICM) Order to all Licensees following the events of September 11, 2001, as part of a comprehensive effort by the NRC, in coordination with other government agencies, to improve the capabilities of commercial nuclear reactor facilities to respond to terrorist threats.
- Section B.5.b. of the Order required licensees to develop specific guidance and strategies to: maintain or restore core cooling, containment, and spent fuel pool cooling capabilities using existing or readily available resources (equipment and personnel) that could be effectively implemented under the circumstances associated with loss of large areas of the plant due to explosions or fire, including those that an aircraft impact might create

C. **Present Objectives:** (list below)

.1.1 Given CPS No. 4303.01, state the symptom(s) for entering CPS No. 4303.01.

.1.2 Given CPS No. 4303.01, describe the Prompt Action to be taken when using CPS No. 4303.01.

.1.3 Given CPS No. 4303.01, describe Technical Support Center (TSC) Actions when using CPS No. 4303.01.

.1.4 Given CPS No. 4303.01, describe Mitigating Strategies when using CPS No. 4303.01.

a. Discuss dose concerns when performing CPS No. 4303.01P017 Spent Fuel Pool Makeup From Fire Protection.

.1.5 State Location and discuss the use of the following B.5.b equipment:

a. Satellite Phones
b. MABAS Radio
c. Self reading pocket doseimeter (SIPD / SRPD)

.1.6 State the Location of B.5.b procedures.

.1.7 Discuss CPS No. 3822.04C003 Quarterly B.5.b. Equipment Checklist.

II. DESCRIPTION OF PROCEDURE/SUBJECT MATTER

Instructions: *Use a copy of the latest revision of the procedure(s)/subject matter for presentation of this section. Present the document covering it to the extent required to meet the objectives. Involve the trainees in discussion and questions to keep them active and interested. Provide adequate guidance to the instructor in this section for instructional activities and content to support achievement of objectives. Sufficient detail must be contained in this section such that there is repeatability of the instruction if the material is presented by an instructor other than the author. Scripted questions should be included in this section of the DBIG to support learning and to check for understanding. Add as many lines/pages as needed. In addition, if only select parts of the reference document are to be taught, indicate the items below. Consider addressing the following items in the training content as applicable:*

- *Why is this task performed?*
- *What does the task accomplish?*
- *What is the importance of the task with respect to plant safety?*
- *What are the consequences of performing the task incorrectly?*
- *How will the plant respond?*
- *What are the bases of procedure precautions, limitations and actions, and pre-requisites?*
- *What steps are critical for completing the task correctly?*

Include Exelon Fundamentals and relevant OPEX including applicable SOER 10-2 must-know OPEX in the training material content

A. Overview of procedure (discussion)

1. The Extensive Damage Mitigation Guide (EDMG) follows the general format of an Off-Normal procedure, however it is only a guide, and the normal rules for verbatim procedure compliance do not apply. The individual in command and control must carefully select which actions to take based on actual conditions.

2. The EDMG is designed for large-scale catastrophic events that can unfold in innumerable ways and damage states that are impossible to predict with certainty. The EDMG provides prompts for a few high priority tasks to be performed immediately after the event, and it provides a "toolbox" of TSC directed system configurations that utilize prestaged materials that are expected to survive the event.

3. The EDMG is subordinate to the EOPs and SAGs. The system configurations that the EDMG "toolbox" provides should be used to accomplish the objectives of the EOPs and SAGs.

4. Some actions in the associated documents may need to be performed by persons that do not possess the formal qualifications for those acts due to limited resources and time critical nature of the tasks. For example, mechanical and electrical connections may be made by Operations personnel.

If a large scale catastrophic event is experienced it important to think about actions taken to stabilize the plant and notify others for assistance. This would apply SOER 10-2:

- Workers did not fully understand or anticipate the effect of their actions.
- Breakdowns in the fundamentals have contributed to these consequential events.

B. Discuss the following areas of the procedure:

1. Symptoms [1.1]
2. PROMPT ACTION [1.2]
3. TSC ACTIONS [1.3]
4. Mitigating Strategies [1.4]

C. OPEX - Fukushima: On March 11, 2011, a severe 9.0 magnitude earthquake struck Japan 112 miles (180 km) off the coast of Fukushima. It caused the operating units 1 through 3 of Fukushima Daiichi to automatically scram on seismic reactor protection system trips. Units 4, 5, and 6 were already shut down for refueling and maintenance. The earthquake damaged switchyard breakers and distribution towers, causing a loss of all off-site electrical power sources to the site. The emergency diesel generators automatically started and provided AC power to emergency systems. Shortly after the earthquake, a series of large tsunamis struck the six-unit Daiichi site. Some of the tsunamis significantly exceeded the assumptions used in determining the plant's design basis. Flooding disabled safety-related equipment, including emergency diesel generators, seawater pumps associated with the ultimate heat sink, and switchgear. Flooding also resulted in a complete loss of all AC and DC power at units 1 and 2, while Unit 3 retained limited DC power. One air-cooled emergency diesel generator remained functional on Unit 6, and this diesel generator was used to stabilize units 5 and 6. Ultimately, losses of core cooling resulted in severe damage to three reactor cores, and hydrogen explosions damaged secondary containment buildings, contributing to an uncontrolled release of radioactivity and radioactive material. The event at Fukushima Daiichi was rated a level 7 on the International Nuclear and Radiological Event Scale (INES). The 1986 accident at Unit 4 of the Chernobyl Nuclear Power Plant was the only other nuclear accident to have a level 7 INES rating. Full details of the event, including an event timeline, are provided in INPO 11-005, *Special Report on the Nuclear Accident at the Fukushima Daiichi Nuclear Power Station.*

III. REVIEW AND EVALUATION

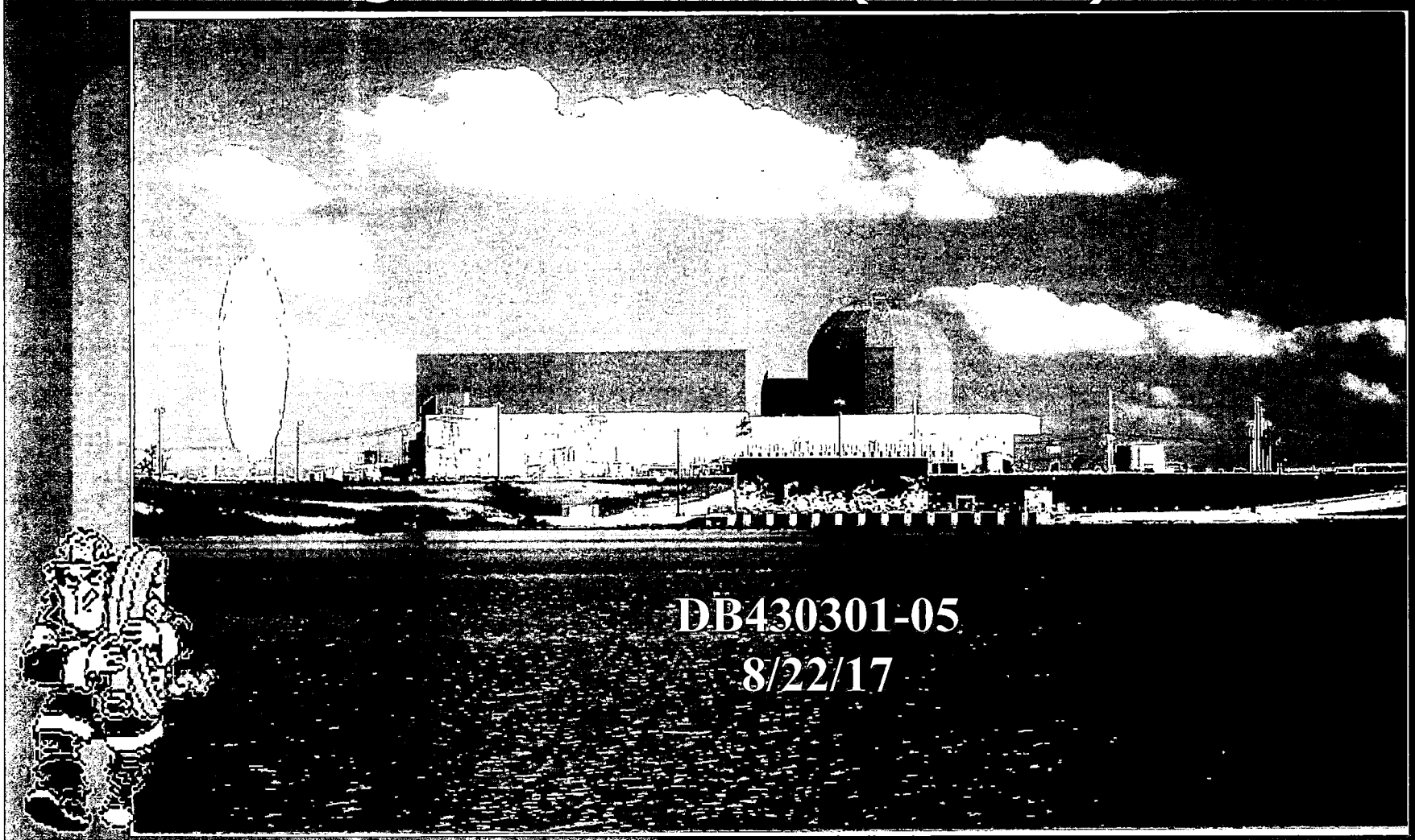
A. **Summarize the training materials including major changes.**

B. **Ask questions to assess student achievement of objectives.**

C. **Reinforce the relevance, importance, and purpose of the topic.**

D. **Ensure the trainees are aware how the objectives will be evaluated.**

4303.01 - Extensive Damage Mitigation Guide (B.5.b)



DB430301-05

8/22/17

OBJECTIVES: DB430301
Extensive Damage Mitigation Guide

In accordance with referenced plant procedures and training materials:

1. Given CPS No. 4303.01, state the symptom(s) for entering CPS No. 4303.01.
2. Given CPS No. 4303.01, describe the Prompt Action to be taken when using CPS No. 4303.01.
3. Given CPS No. 4303.01, describe Technical Support Center (TSC) Actions when using CPS No. 4303.01.
4. Given CPS No. 4303.01, describe Mitigating Strategies when using CPS No. 4303.01.
   a. Discuss Dose Concerns when performing CPS No. 4303.01P017 Spent Fuel Pool Makeup from Fire Protection

OBJECTIVES: DB430301
Extensive Damage Mitigation Guide

In accordance with referenced plant procedures and training materials:

5. State the Location and Discuss the use of the following B.5.b Equipment.
   a. Satellite Phones
   b. MABAS Radio
   c. Self Reading Pocket Dosimeters (SRPD/SIPD)
6. State the Location of B.5.b. Procedures
7. Discuss CPS No. 3822.04C003 Quarterly B.5.b. Equipment Checklist.

SOER 10-2

If a large scale catastrophic event is experienced it important to think about actions taken to stabilize the plant and notify others for assistance.

- Workers did not fully understand or anticipate the effect of their actions.
- Breakdowns in the fundamentals have contributed to these consequential events.

B.5.b INTRODUCTION

- February 25, 2002, Interim Compensatory Measures (ICM) Order to all Licensees.
- The ICM Order was issued following the events of 9/11/2001, as part of a comprehensive effort by the NRC, in coordination with other government agencies, to *improve the capabilities of commercial nuclear reactor facilities to respond to terrorist threats.*

B.5.b INTRODUCTION

- Section B.5.b. of the Order required licensees to develop specific guidance and strategies to maintain or restore:
- core cooling,
- containment, and
- spent fuel pool cooling capabilities

Basic assumptions for the development of the initial EDMGs response

- **No warning**

LOSS OF:

- **All AC & DC**
- **MCR access**
- **Equip/supplies in MCR**
- **Access to Control Building**
- **all MCR personnel**
- **Minimum site staffing**

➢ **Other on-site control rooms and personnel in separated buildings are unaffected**

Basic assumptions for the development of the initial EDMGs response

- Operators not normally located in the CB/MCR assumed to be available for EDMG implementation
- Actions taken by non-licensed personnel, i.e. NEO

Level of training on implementing procedures/guidance consistent with:

- SAMG-type actions
- utility commitments made under B.5.b Phase 1

4303.01 Extensive Damage Mitigation Guide

Entered when a large area of the station has been damaged due to:

- **explosive *OR* Fire**
- **natural / destructive phenomena**
- **Events 4305.01 – Security Threat/Intrusion**

EDMG'S

1. Subordinate to the EOPs and SAGs.
2. System configs. of the EDMG "toolbox" used to accomplish the objectives of the EOPs and SAGs.
3. Can be Performed without Licensed Operator QUAL

CPS 4303.01 series

WHERE ARE THE B.5.B PROCEDURES?

3.0 PROMPT ACTION

3.1	Minimum Staffing personnel **muster** in the Outage Control Center, 3rd floor Adminstration Building, if accessible.	☐
3.2	**Identify**/establish individual in command and control. ☞ Consider ANY Operations Personnel first.	☐
3.3	**Establish** a means of communication with offsite authorities and site personnel. ☞ Refer to Attachment 3, Communication Capabilities.	☐
3.4	**Contact** Security Central Alarm Station at 2941 to coordinate Operations/Security response. ☞ Contact Secondary Alarm Station at 2943 or Security Captain at 2940 or 5313 if no answer at the Central Alarm Station.	☐
3.5	**Notify** the 911 dispatcher of a large scale fire/medical/security emergency.	☐
3.6	**Activate** the ERO at the Site Area Emergency level per 4303.01P018.	☐

ERO Activation During Extreme Damage Event

⓪ 1.2	**LaSalle Event**		
1.2.1	**IF**	Contacted by LaSalle County Station to 'Activate the ERO Notification System for LaSalle County Station'	
	THEN	Attempt to obtain the following information: Date / Time of call: _____/_____ Name / organization of caller: _____/_____ What was power of each unit at time of event U1: _____ U2 _____ What is power of each unit at time of call: U1: _____ U2 _____ Describe extent of damage: What is your call-back number: _____	☐
1.2.2		Immediately notify the Shift Manager	☐
1.2.3		Activate the "ERO Response Required" steps for LaSalle per EP-AA-112-100-F-06, Midwest ERO Notification or Augmentation	☐
1.2.4		Transmit EP-MW-114-100-F-01, Nuclear Accident Reporting System (NARS) Form with an 'Accident Classified Time' as the time call was received in 1.2.1. Template of NARS in located Q:/Plntstff/OPS/B.5.b/LaSalle Event	☐

Extensive Damage Mitigation Guide

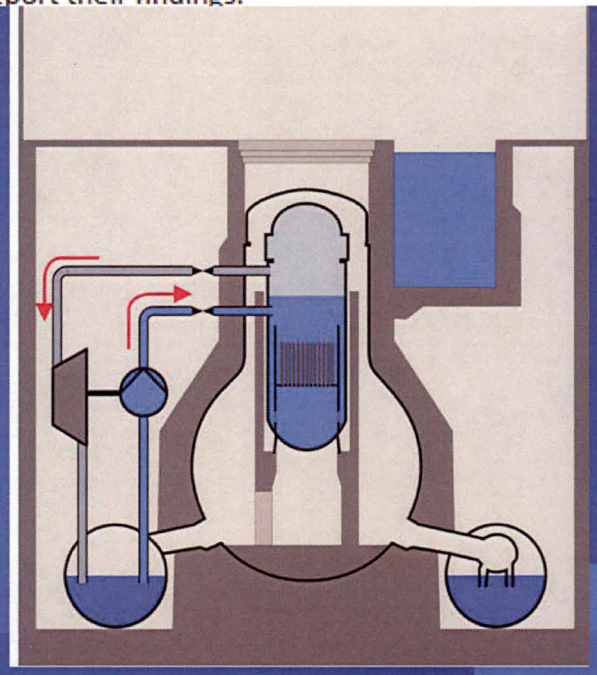
3.7	**Confirm** Reactor Trip per 4303.01P020.	☐
3.8	**Confirm** automatic start of RCIC. ☞ Locally verify RCIC pump is operating by indications of discharge pressure or flow at the RCIC room or Remote Shutdown Panel or turbine operating.	☐
3.9	**IF** RCIC did not start, **THEN** Manually **start** and control RCIC per 4303.01P013.	☐
3.10	**Determine** status of Spent Fuel Pool (SFP) level or leakage from the SFP and need to initiate makeup flow to the SFP. ☞ Delaying may result in radiation levels that prohibit access to the areas. ☞ Refer to **Spent Fuel Pool Cooling Strategies** below.	☐
3.11	**Perform** initial damage assessment using Attachment 1 and Attachment 2. ☞ Highest priority should be given to the following: 1) Control Building 800′ elevation 2) Auxiliary/Fuel Building 3) Containment Structure 4) Turbine Building	☐

Fukushima 3-11-2011

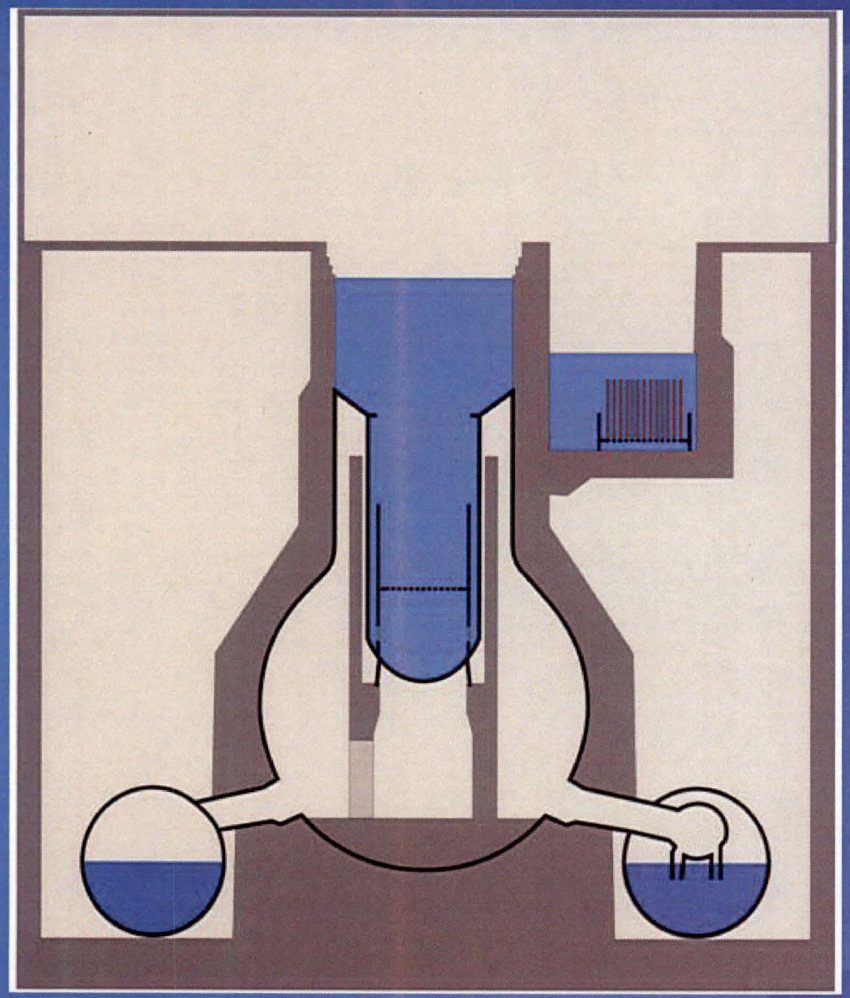
11-Mar	2102	Operators did not have reactor water level indication in the control room and were unable to verify the injection of water into the reactor using RCIC. The operators notified the government of the potential for water level to lower to the top of active fuel (TAF).
12-Mar	0030	The government confirmed the evacuation of the population within 1.9 miles (3 km) was completed.
12-Mar	--	Wearing breathing protection and boots, workers attempted to verify the condition of RCIC, but field conditions made this very difficult. Work that would normally take approximately 10 minutes required more than one hour to complete. At around 0100, operators went to the RCIC room. The room was dark, and the water level in the room came nearly to the top of the workers' boots , so they turned back without getting close enough to check system operation. However, they could hear faint metallic sounds, indicating the system was operating. Because of the lack of communications methods, the workers had to return to the control room to report their findings.

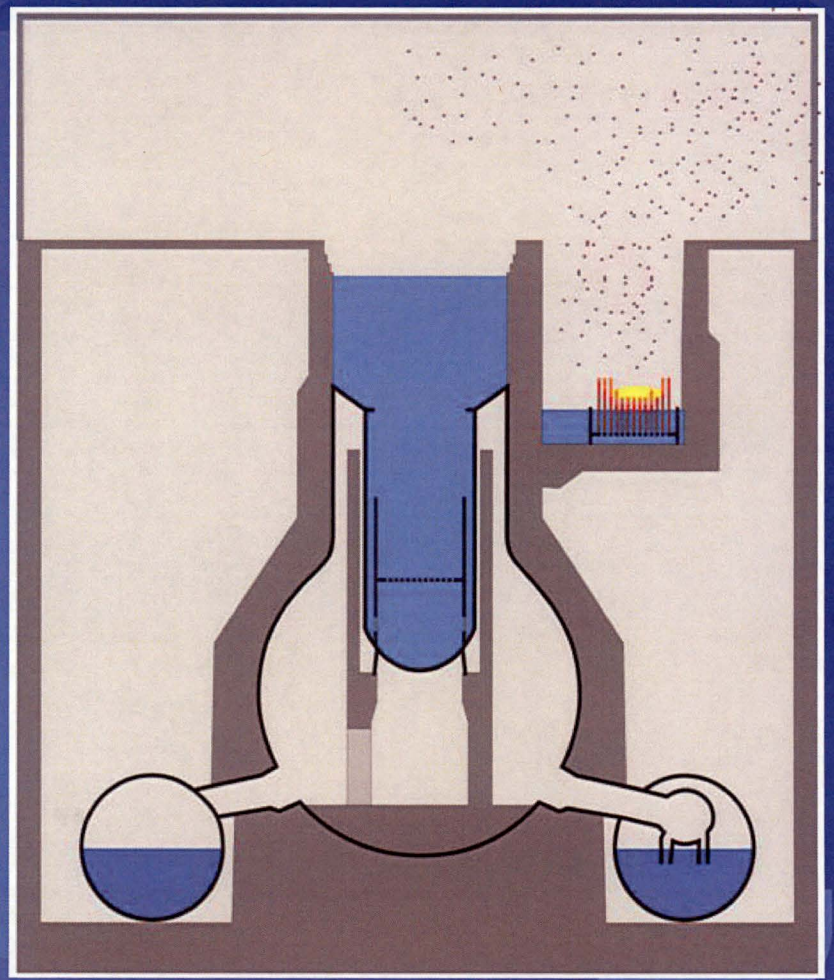
Reactor Isolation pump stops

- 11.3. 16:36 in Unit 1 (Batteries empty)
- 14.3. 13:25 in Unit 2 (Pump failure)
- 13.3. 2:44 in Unit 3 (Batteries empty)



Unit 4 Spent Fuel pool





4.0 TSC ACTIONS

4.1 General Instructions

- 10CFR50.54(X)
- EAL/E-PLAN
- All SAGs/EOPs/ONs
- 4303.01F001

CPS 4303.01F001

EXTENSIVE DAMAGE MITIGATION GUIDE

Core Cooling Response Strategy

- O Confirm Reactor Trip per 4303.01P020
- O Confirm automatic start of RCIC
- O If RCIC did not start, then use 4303.01P013 to manually start and control RCIC

Initial Damage Assessment

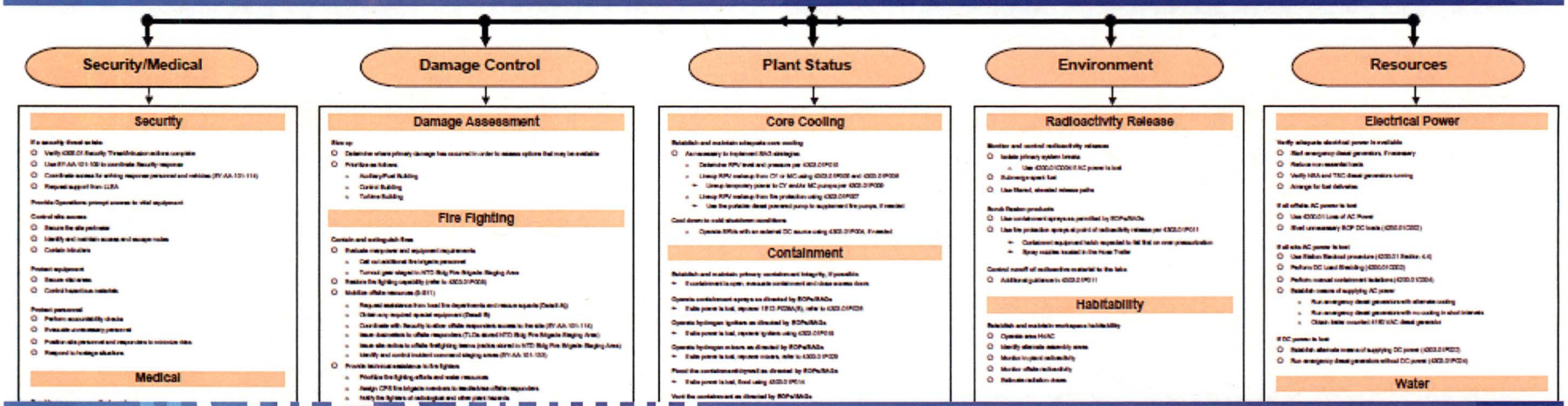
- O Perform initial damage assessment using 4303.01 Attachment 1.

Highest priority should be given to the following:

1) Control Building 800' elevation
2) Auxiliary/Fuel Building
3) Containment Structure
4) Turbine Building

Mitigating Strategies

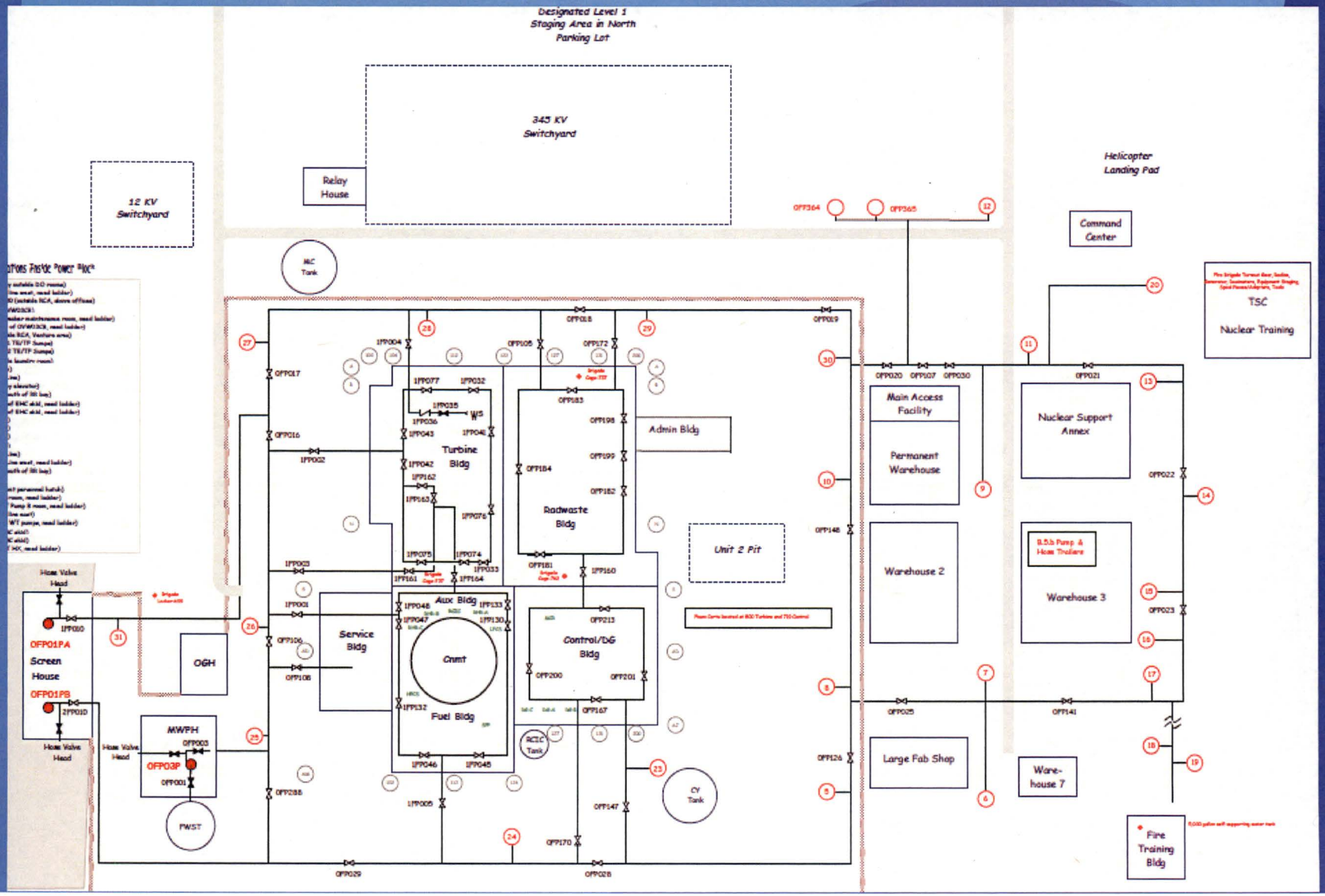
CPS 4303.01F001

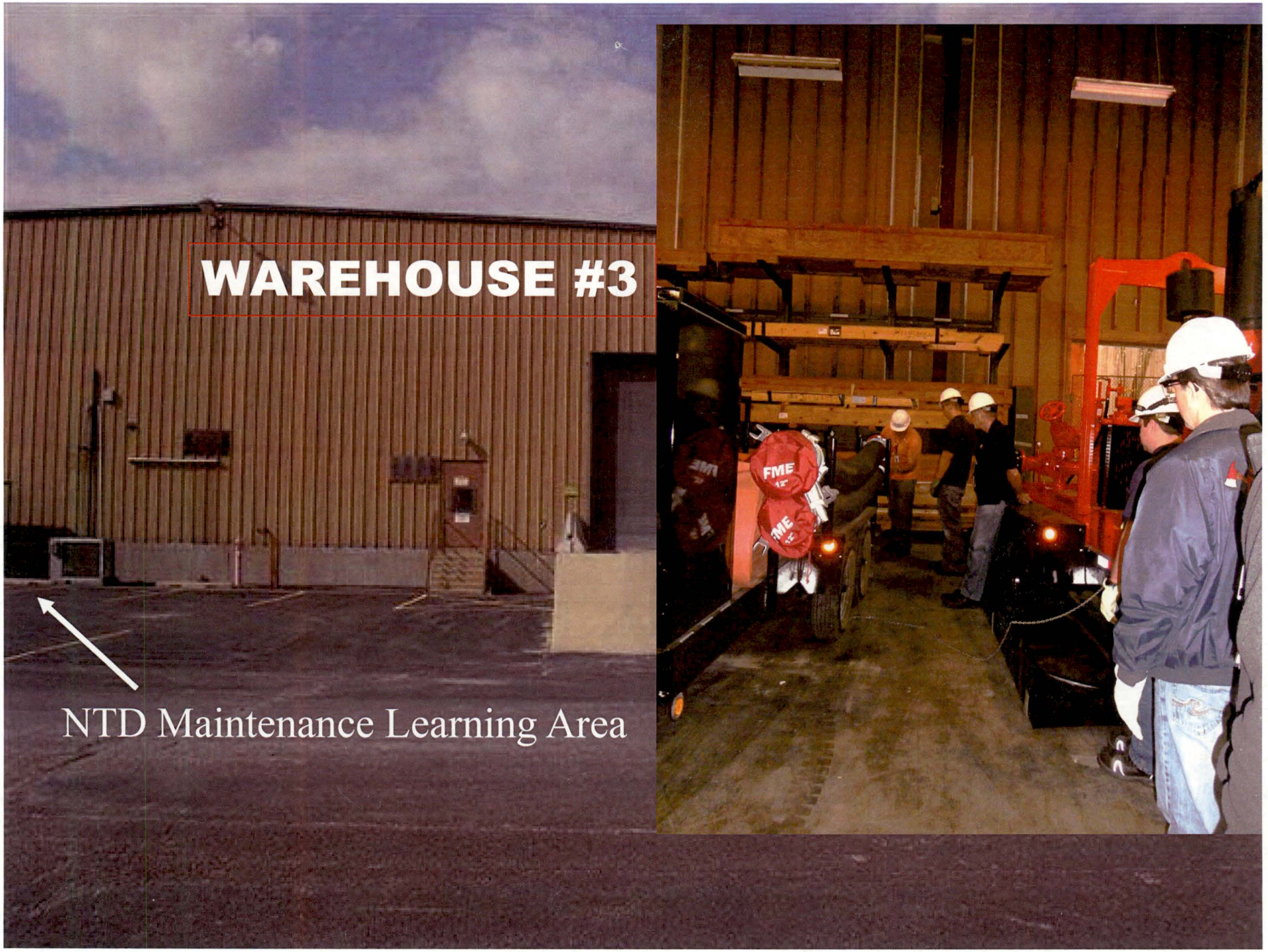


- Core Cooling
- Spent Fuel Pool Cooling
- Electrical Power Restoration
- Off-Site Release Mitigation

Fire Fighting Strategies

4303.01F002-Emergency Water Resource Management guide




WAREHOUSE #3
NTD Maintenance Learning Area


Exelon

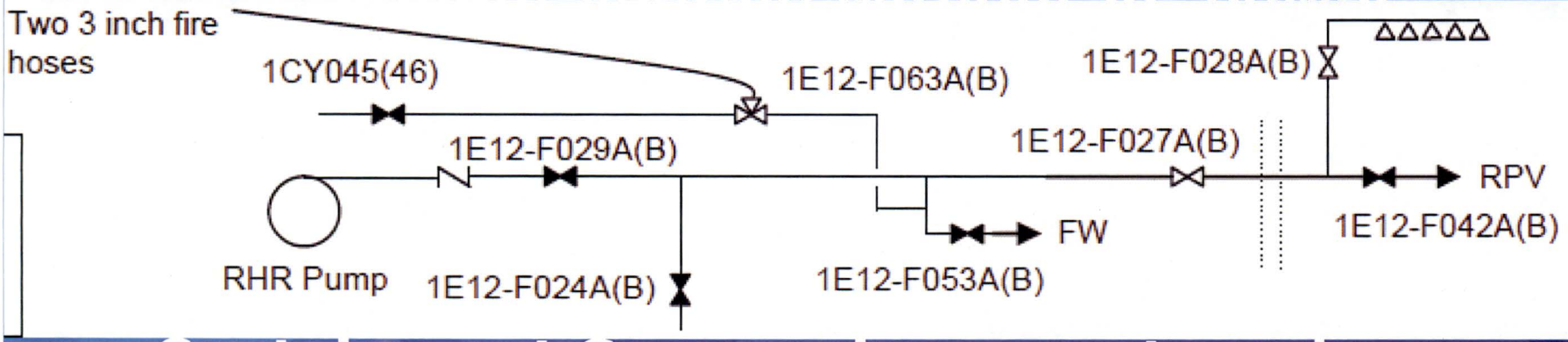
Tested at 1100 gpm for 2 hours.
Required to run 12 hours, 250 gal fuel tank.
Spent Fuel Pool makeup >500 gpm

Containment Integrity Strategies

- Containment venting without AC power- 4303.01P001
- Hydrogen Igniter operation from containment electrical penetrations- 4303.01P019
- Containment Spray using an external water and valve motive power source- 4303.01P026
- Hydrogen Mixer operation using an external motive power source- 4303.01P029

Containment Integrity Strategies

- Containment venting without AC power



- Containment Spray using an external water and valve motive power source - 4303.01P026
- Hydrogen Mixer operation using an external motive power source 4303.01P029

Containment Integrity Strategies

Hydrogen Mixer operation using an external motive power source ==→

- 4303.01P029 Additional Extensive Damage Mitigating Strategies

Containment Integrity Strategies

Q: What are the major consequences of venting the containment using some of the B.5.b strategies?

A: Direct release of radioactive materials to the environment; radiological exposure to individuals performing venting operations.

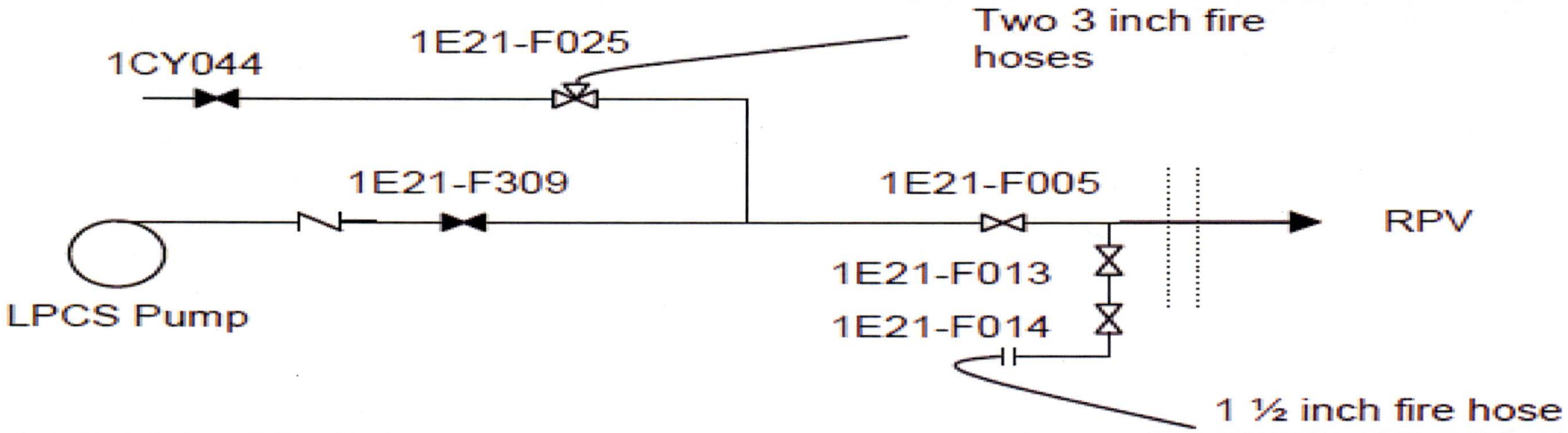
CORE COOLING STRATEGIES

SRV Operation – 4303.01P004

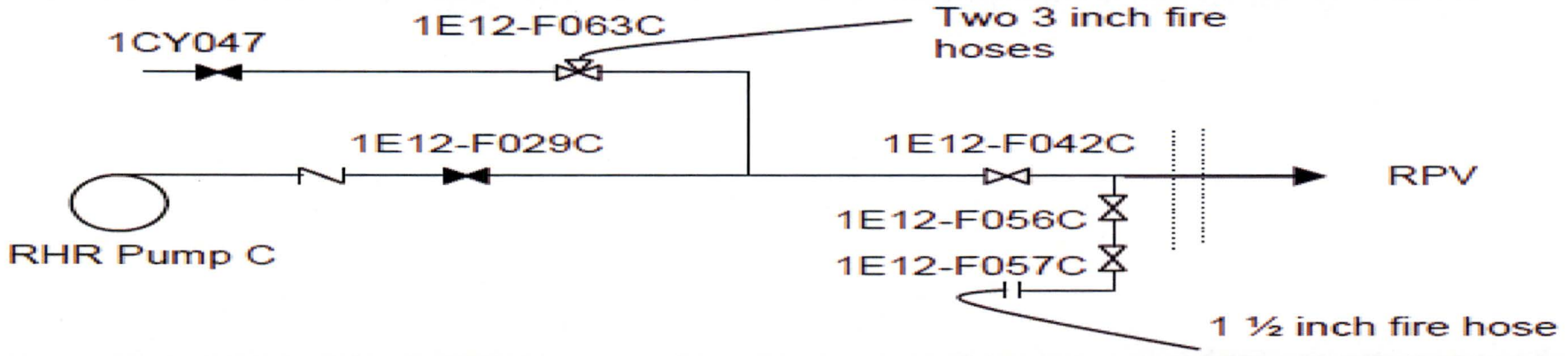
- MCR
- REMOTE SHUTDOWN PANEL
- SRV OPS FROM CNTMT E-PENTERATIONS

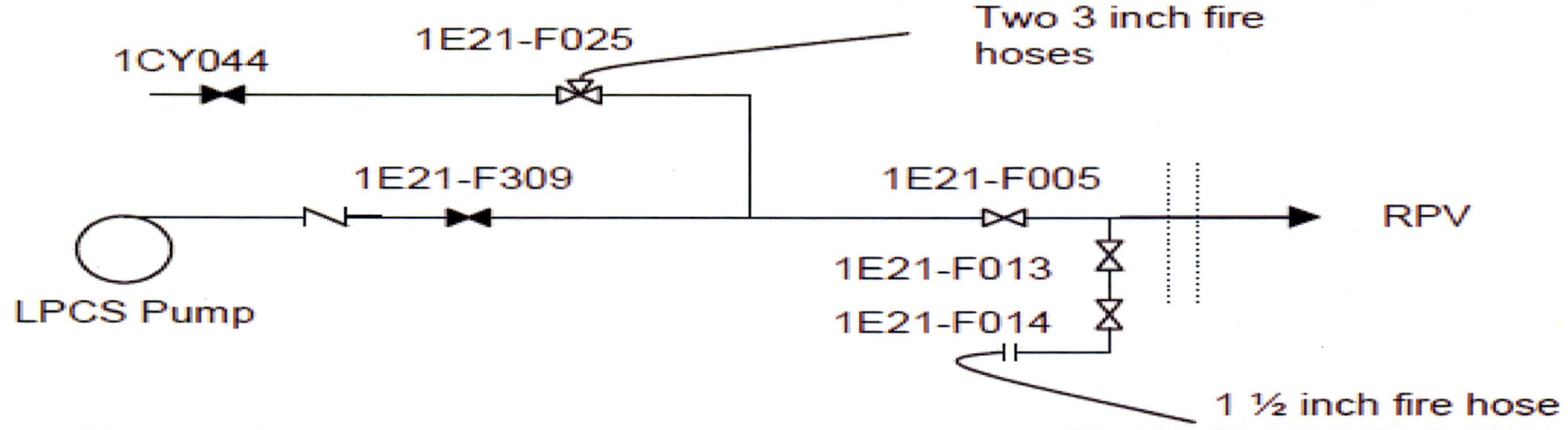
Core Cooling Strategies
- Emergency RPV Makeup

Source	Flowpath	Procedure
CY	**LPCI-C, LPCS, RHR-B, HPCS, FW**	**4303.01P005**

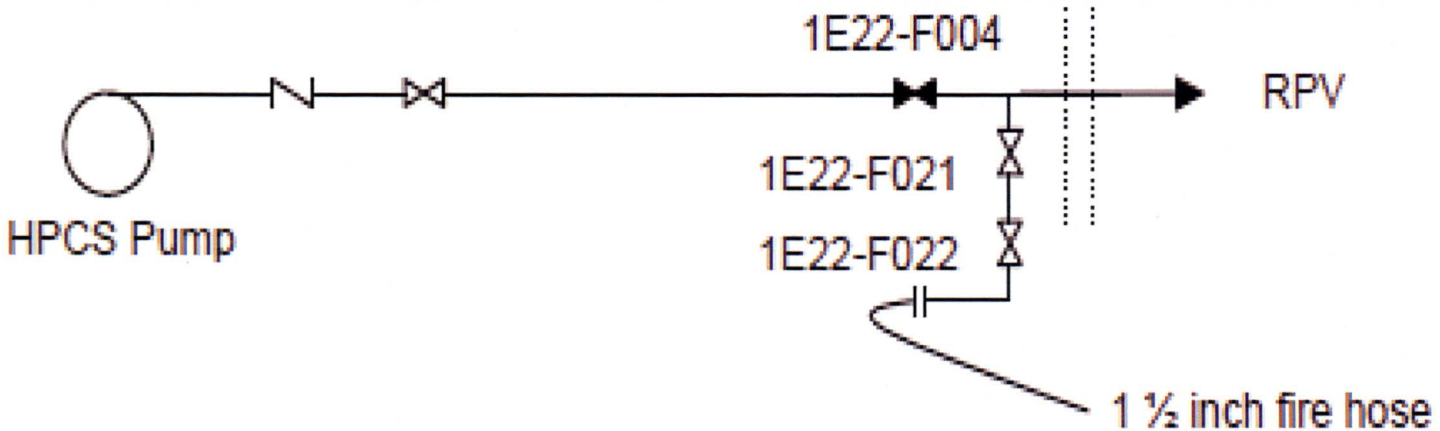


Core Cooling Strategies
- Emergency RPV Makeup





Core Cooling Strategies
- Emergency RPV Makeup

Source	Flowpath	Procedure
		
FP	RHR-C, LPCS, HPCS, RHR-SDC	4303.01P007

Core Cooling Strategies

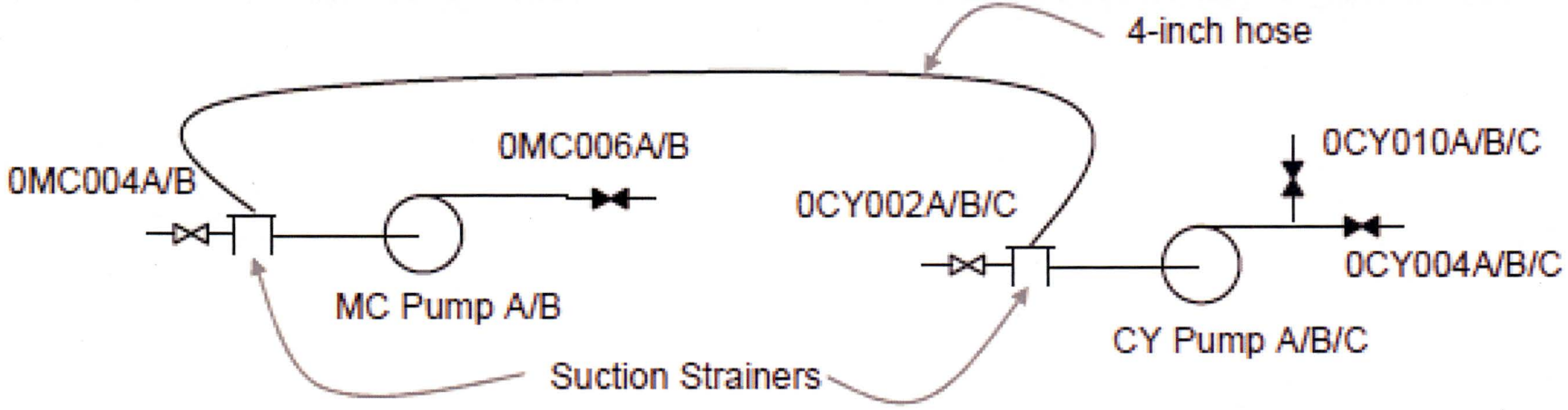
- Emergency RPV Makeup

Source	Procedure	
CY	4303.01P009	ALTERNATE POWER MC/CY - S/U& S/D
CY	4303.01P010	FILL CY FROM MC FILL CY VIS DRAIN

Core Cooling Strategies

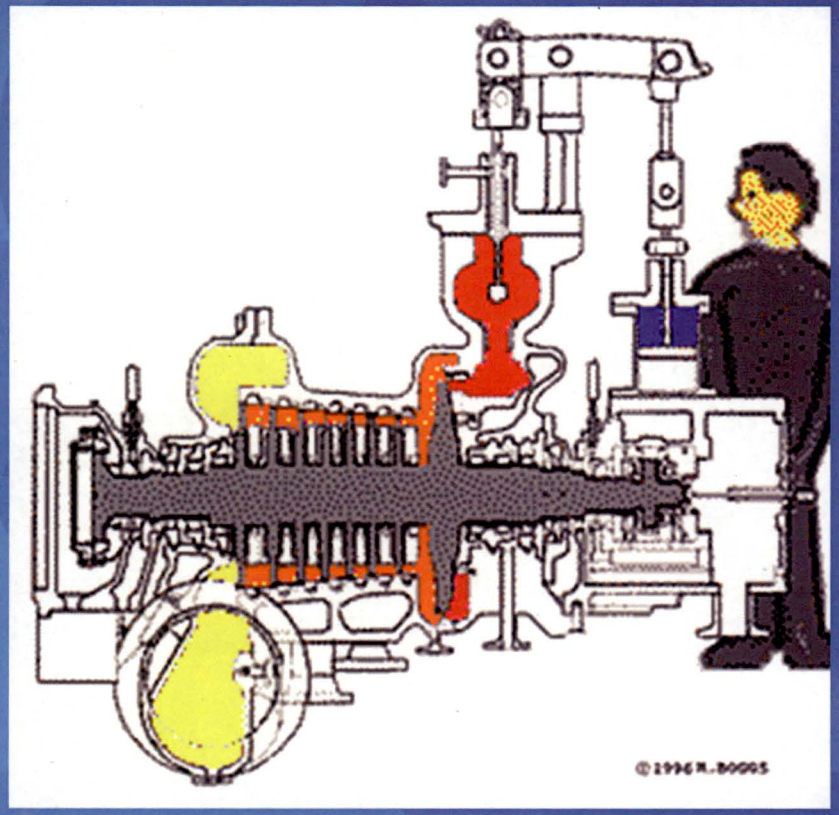
- Emergency RPV Makeup

Source	Procedure	
CY	4303.01P009	ALTERNATE POWER MC/CY - S/U& S/D
CY	4303.01P010	FILL CY FROM MC FILL CY VIS DRAIN



Core Cooling Strategies

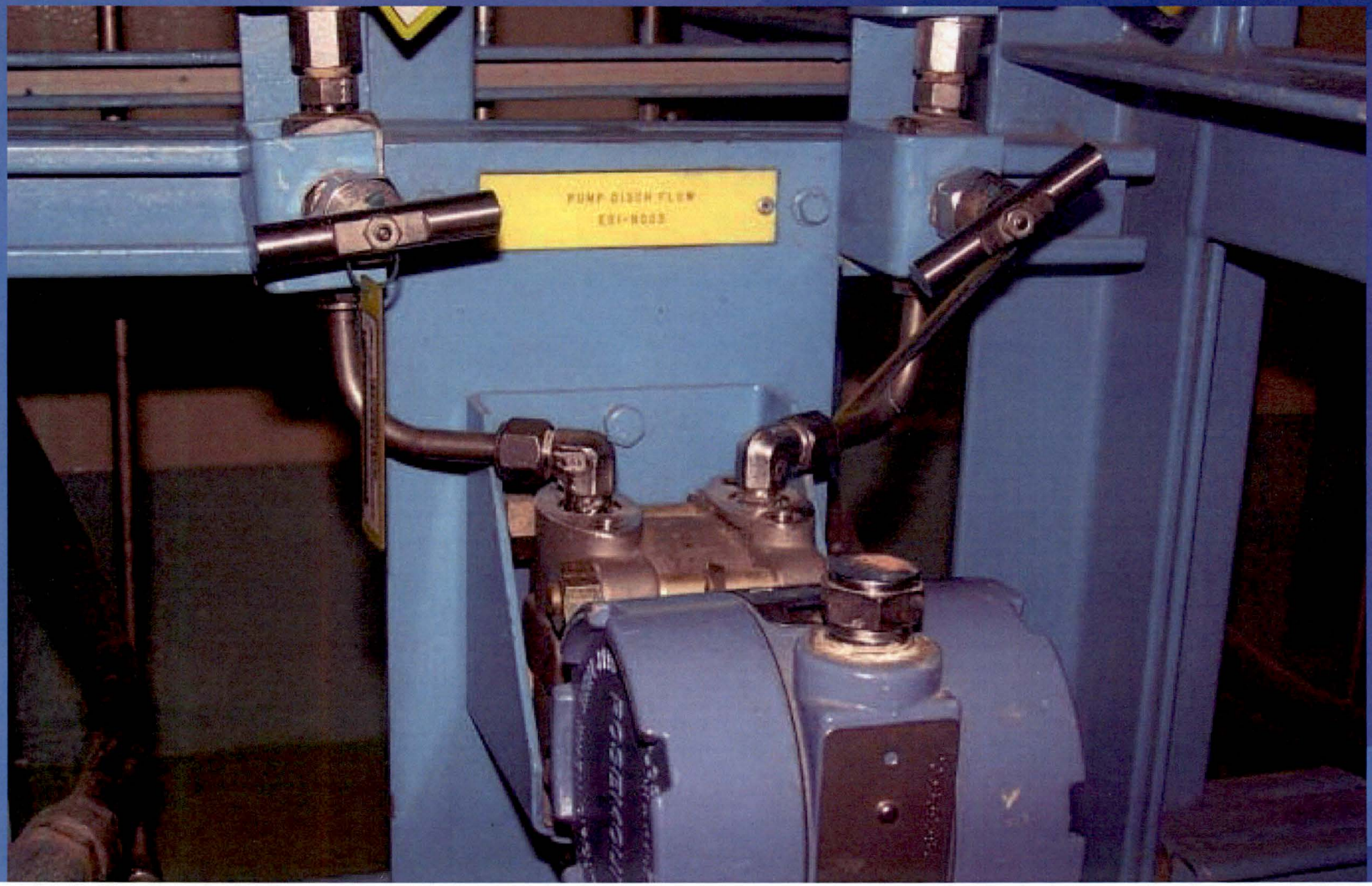
- RCIC Ops - 4303.01P013



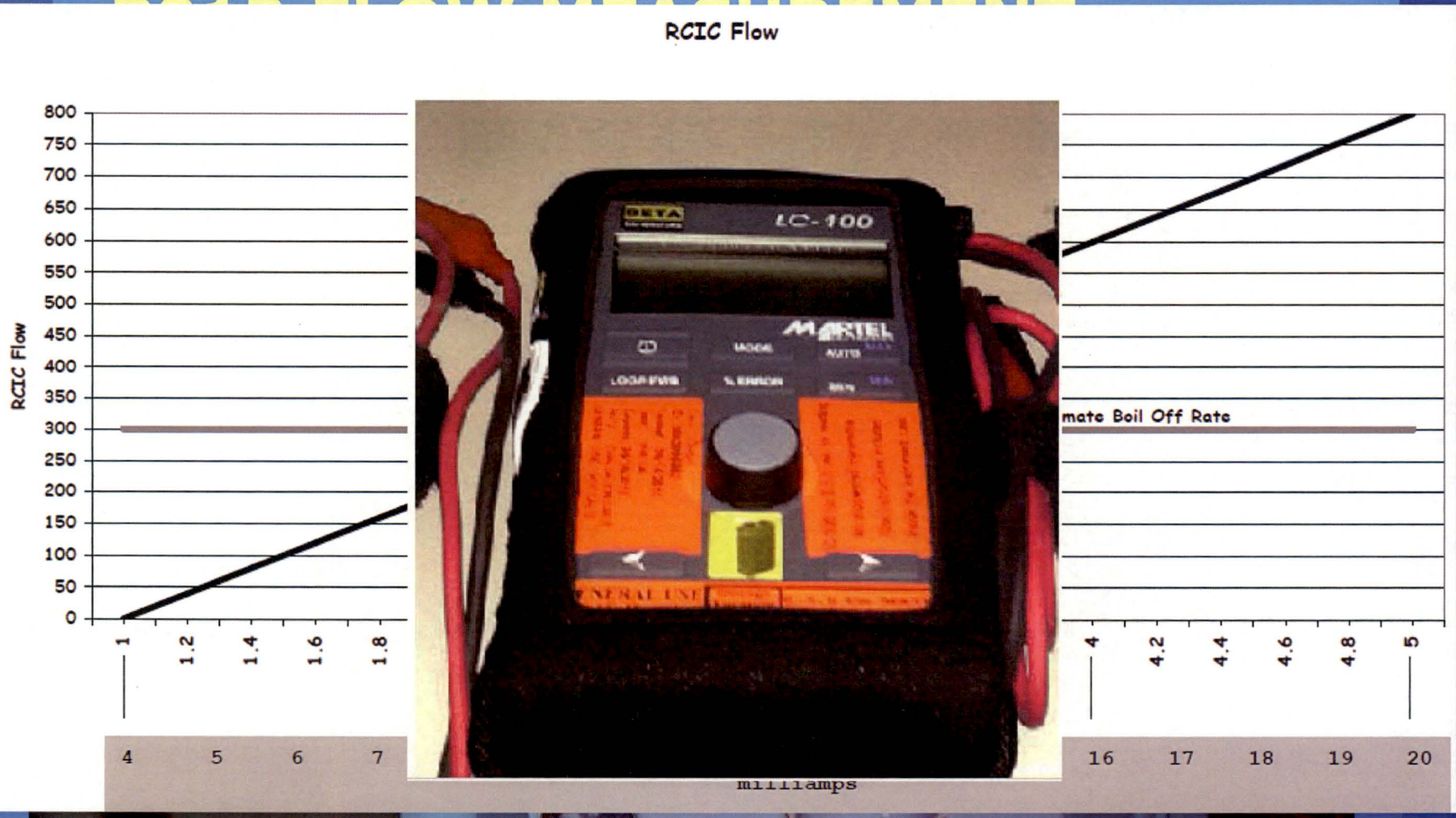
11-Mar	1636	TEPCO again entered the emergency plan in accordance with Article 15, paragraph 1 of the Nuclear Disaster Law because operators concluded they could not determine reactor water level and the status of injection into the reactor. The government was notified at 1645.
11-Mar	--	Temporary batteries and cables were gathered and carried to the units 1-2 control room. After confirming the wiring layout using drawings, batteries were connected to instrument panels. The top priority was to verify the status of water injection into the RPV, so efforts were focused on connecting batteries to the DC-powered reactor water level indicator.

U1 Supervisor

P013 RCIC FLOW MEASUREMENT



RCIC FLOW MEASUREMENT



Core Cooling Strategies 4303.01P015, RPV Level and Pressure Determination

- CONTAINMENT EE PENETRATIONS
- REMOTE SHUTDOWN PANEL
- SAME MEASURING TECHNIQUE
- GRAPH FOR EACH TYPE OF LEVEL INSTRUMENT

Core Cooling Strategies 4303.01P012

- Aligning CY Tank to the Hotwell
- Aligning Fire Protection to the Hotwell
- Aligning Fire Protection water to the Hotwell via the Condenser Vacuum Breaker

Core Cooling Strategies 4303.01P014

- RHR C FF TEST VLV
- LPCS FF TEST VLV
- RHR A/B FF TEST VLV

Core Cooling Strategies
Emergency RPV Makeup

Q: What are the sources of makeup when implementing B.5.b Core Cooling strategies?

A: CY, MC, & FP, RCIC

Emergency RPV Makeup

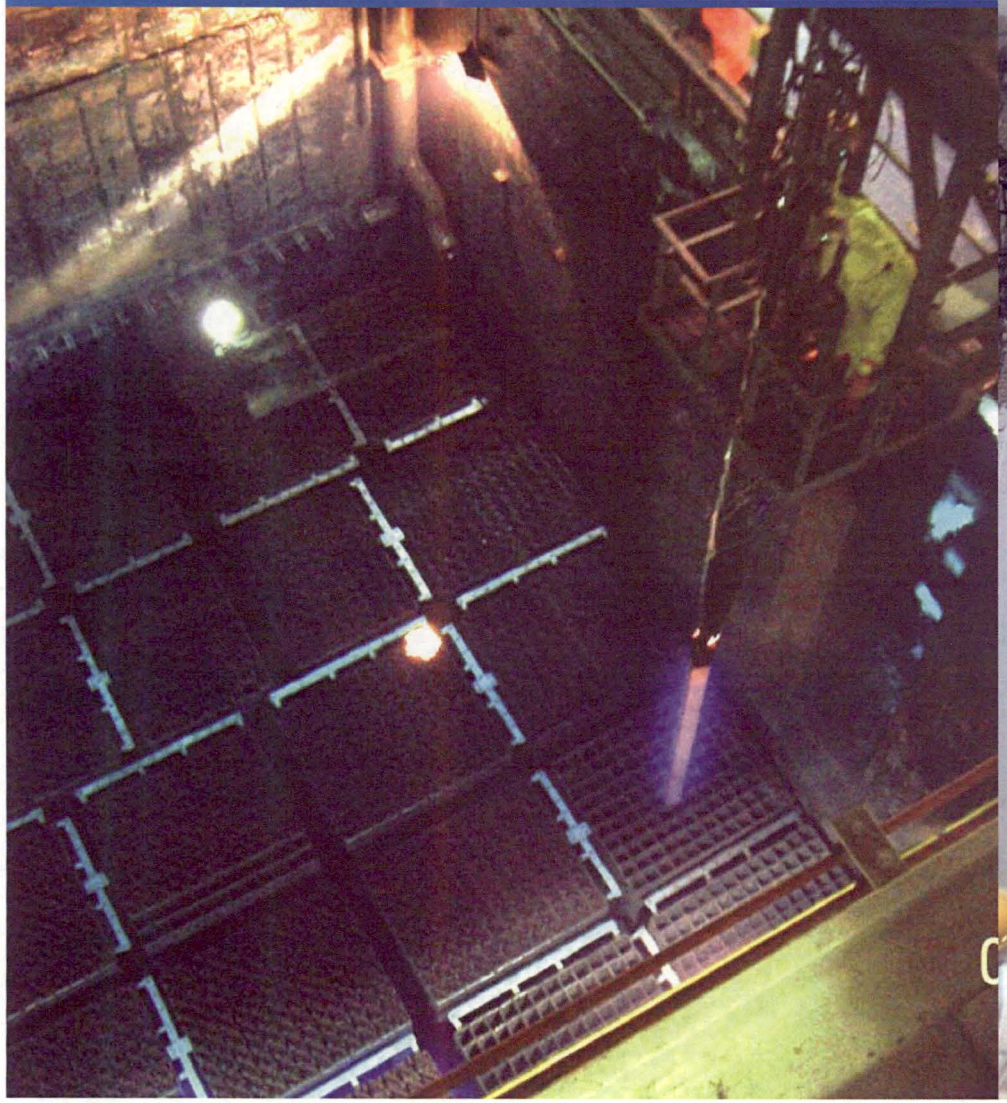
Q: What strategies may have to be carried out before B.5.b core cooling strategies will be effective?

A1: RPV depressurization < 100 psig

A2: Aligning External Power for CY and MC Pump Operation

A3: Refilling CY tank and Hotwell

Spent Fuel Pool Cooling Strategies

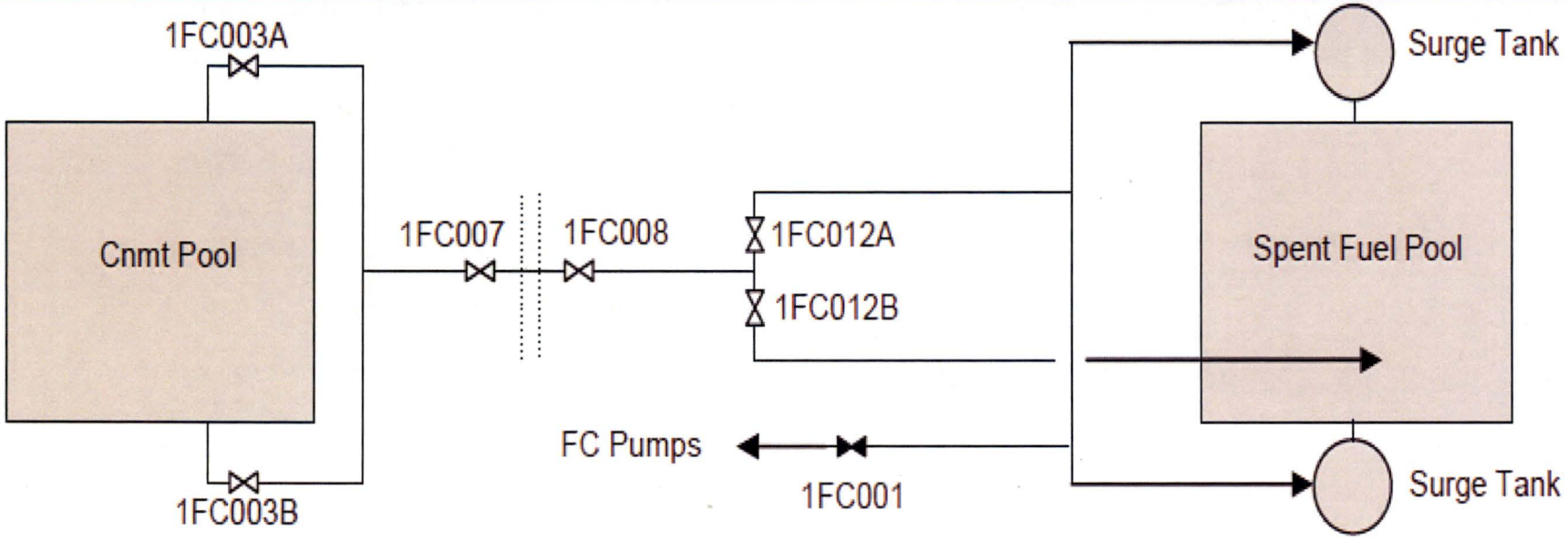


Spent Fuel Pool Cooling

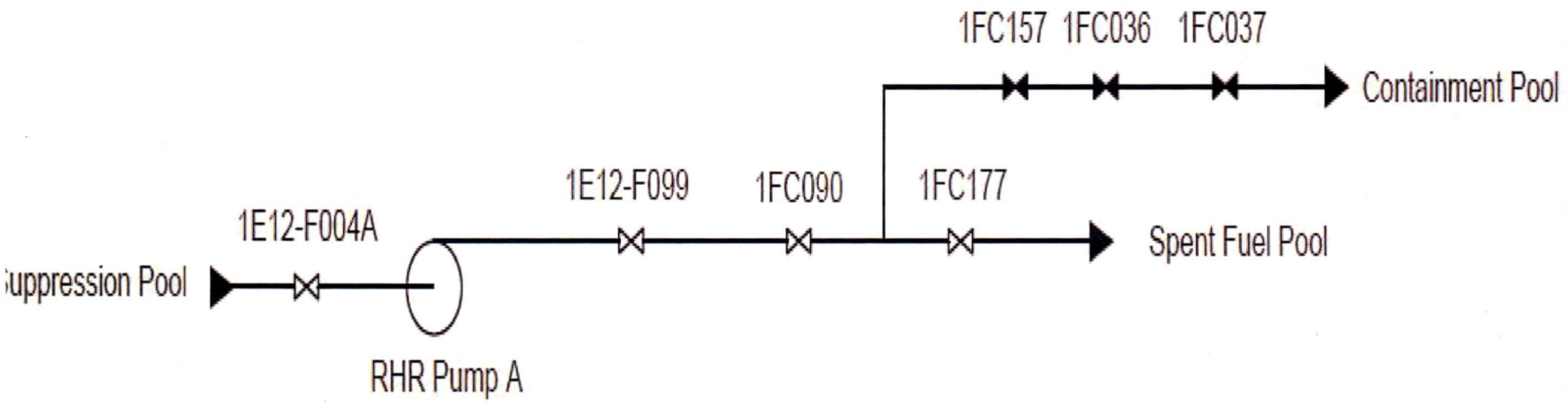
Source/Flowpath	Procedure #
IFTS	**P002**
Reactor Cavity Drains	
Suppression Pool	P003
Fire Protection	P017

Spent Fuel Pool Cooling

Source/Flowpath	Procedure #
IFTS	
Reactor Cavity	**P002**



Spent Fuel Pool Cooling

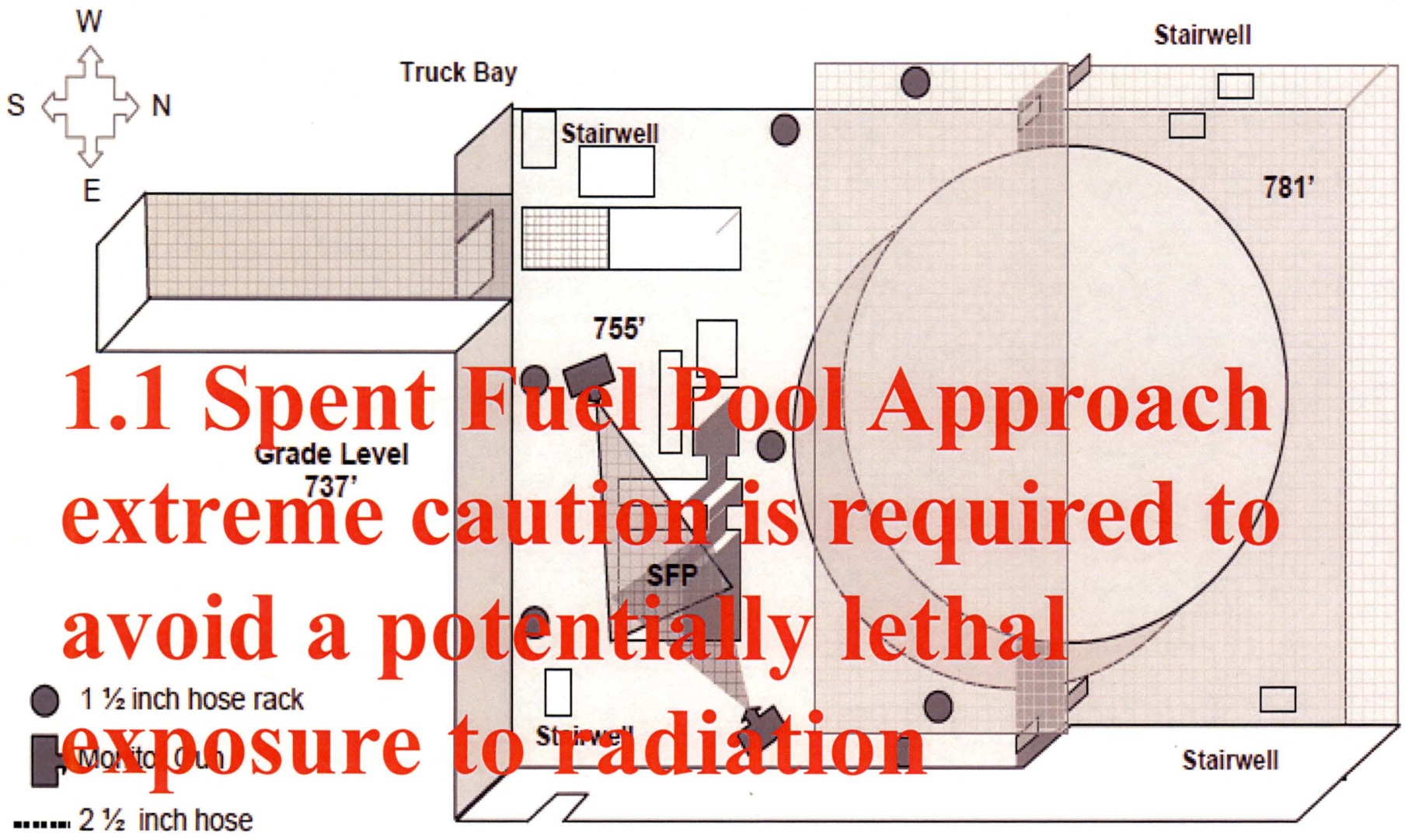


Suppression Pool	**P003**
Fire Protection	P017

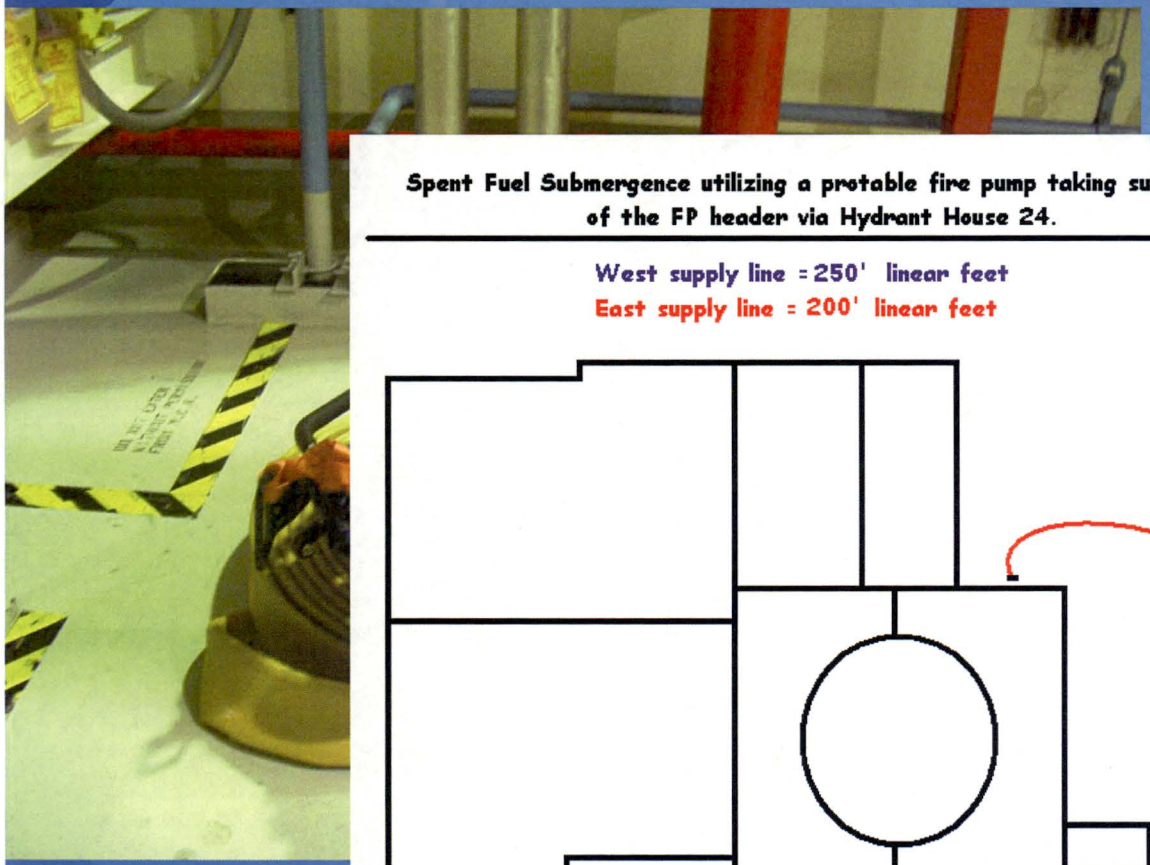
Spent Fuel Pool Cooling

Source/Flowpath	Procedure #
IFTS	P002
Reactor Cavity Drains	
Suppression Pool	P003
Fire Protection	**P017**

4303.01P017



1.1 Spent Fuel Pool Approach extreme caution is required to avoid a potentially lethal exposure to radiation

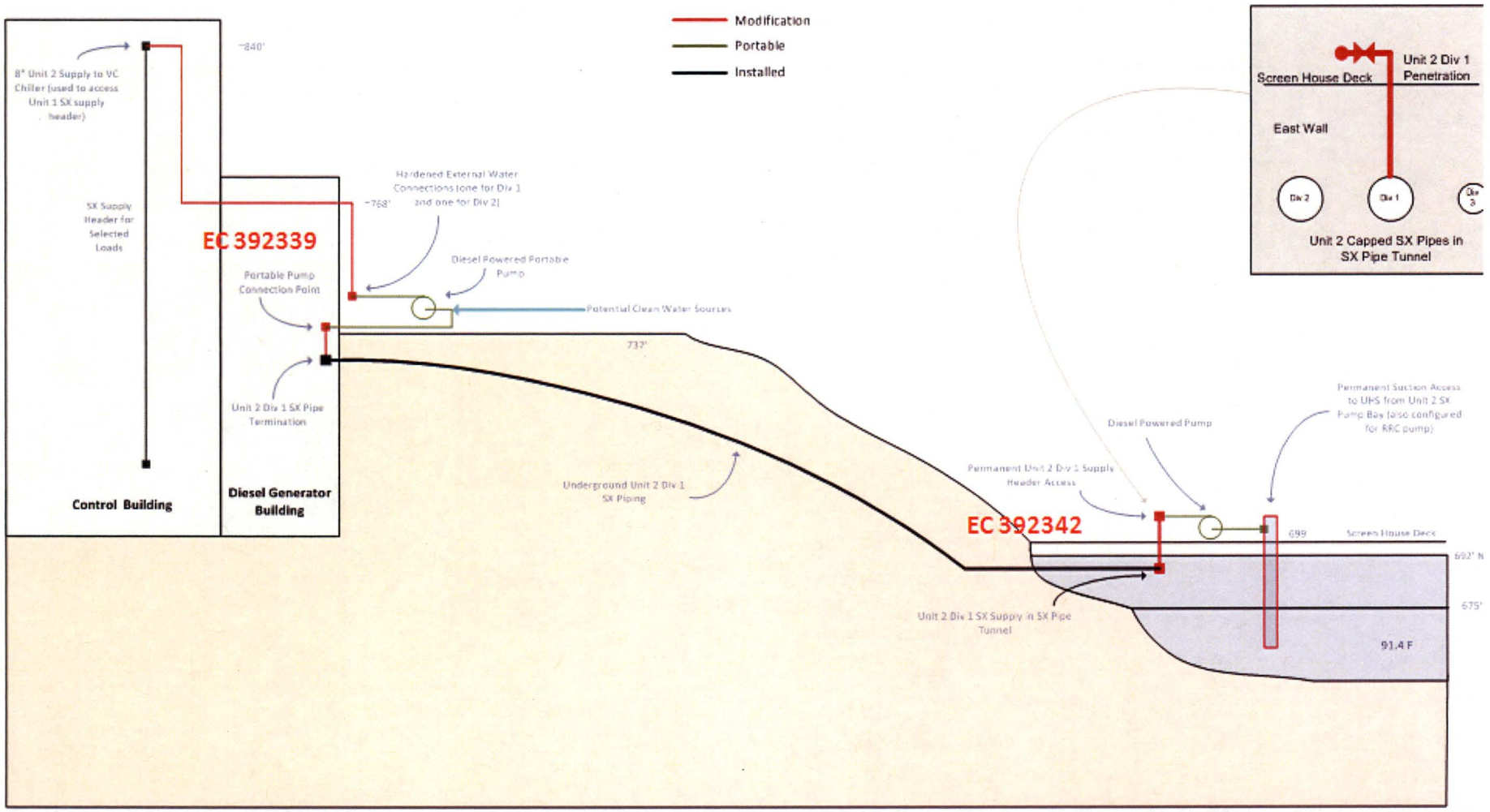


Spent Fuel Submergence utilizing a protable fire pump taking suction off of the FP header via Hydrant House 24.

West supply line = 250' linear feet

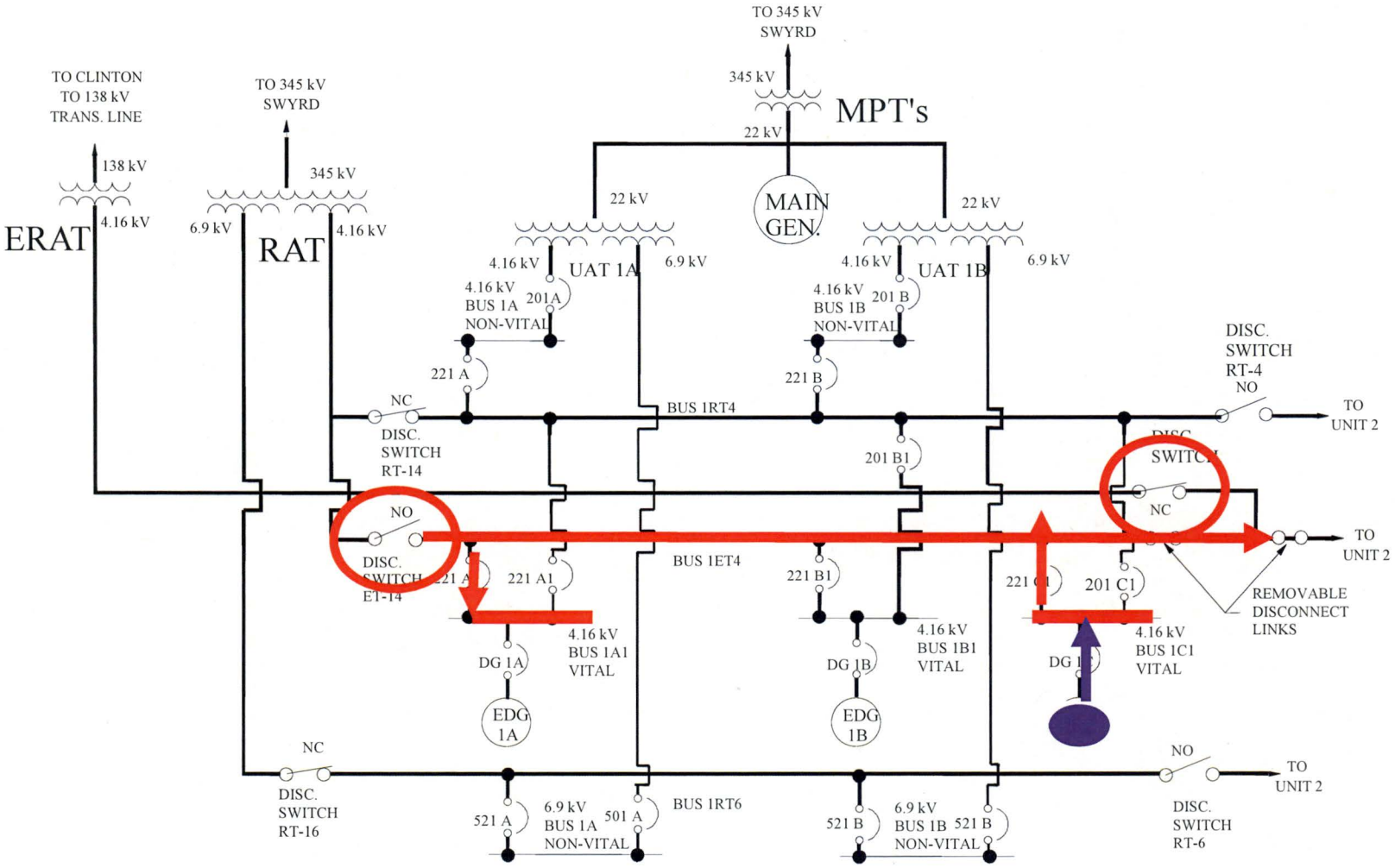
East supply line = 200' linear feet

Supply from the UHS to External Water Connections



Electrical Power Restoration Strategies

Strategy	Procedure
Restore DC Power	**4303.01P022**
Cross-Connecting Div 3 DG To Div 1(2) ECCS Electrical Busses	4303.01P023
Manual Start of EDG with no DC	4303.01P024
Emergency DG operation with alternate cooling	4303.01P025



AUXILIARY POWER SYSTEM

Electrical Power Restoration Strategies

Strategy	Procedure
Restore DC Power	4303.01P022
Cross-Connecting Div 3 DG To Div 1(2) ECCS Electrical Busses	4303.01P023
Manual Start of EDG with no DC	4303.01P024
Emergency DG operation with alternate cooling	4303.01P025

Electrical Power Restoration Strategies

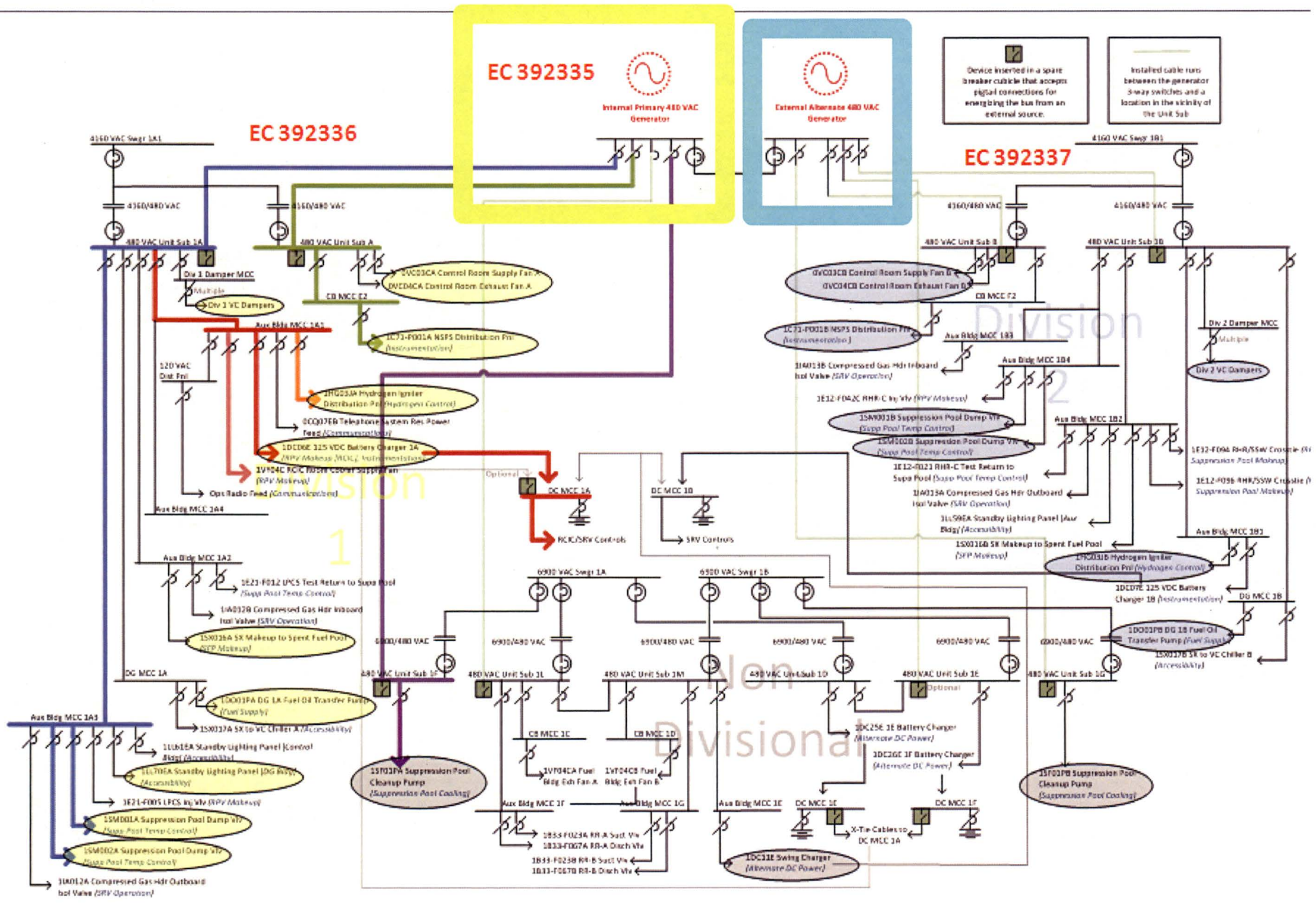
Strategy	Procedure
Restore DC Power	4303.01P022
Cross-Connecting Div 3 DG To Div 1(2) ECCS Electrical Busses	4303.01P023
Manual Start of EDG with no DC	4303.01P024
Emergency DG operation with alternate cooling	**4303.01P025**

Electrical power restoration Strategies

Q: Where does the ALTERNATE AC power for MC/CY pumps come from?

A: Construction Swyd Ckt 305 via OPS-STA-1-3 & 1-4

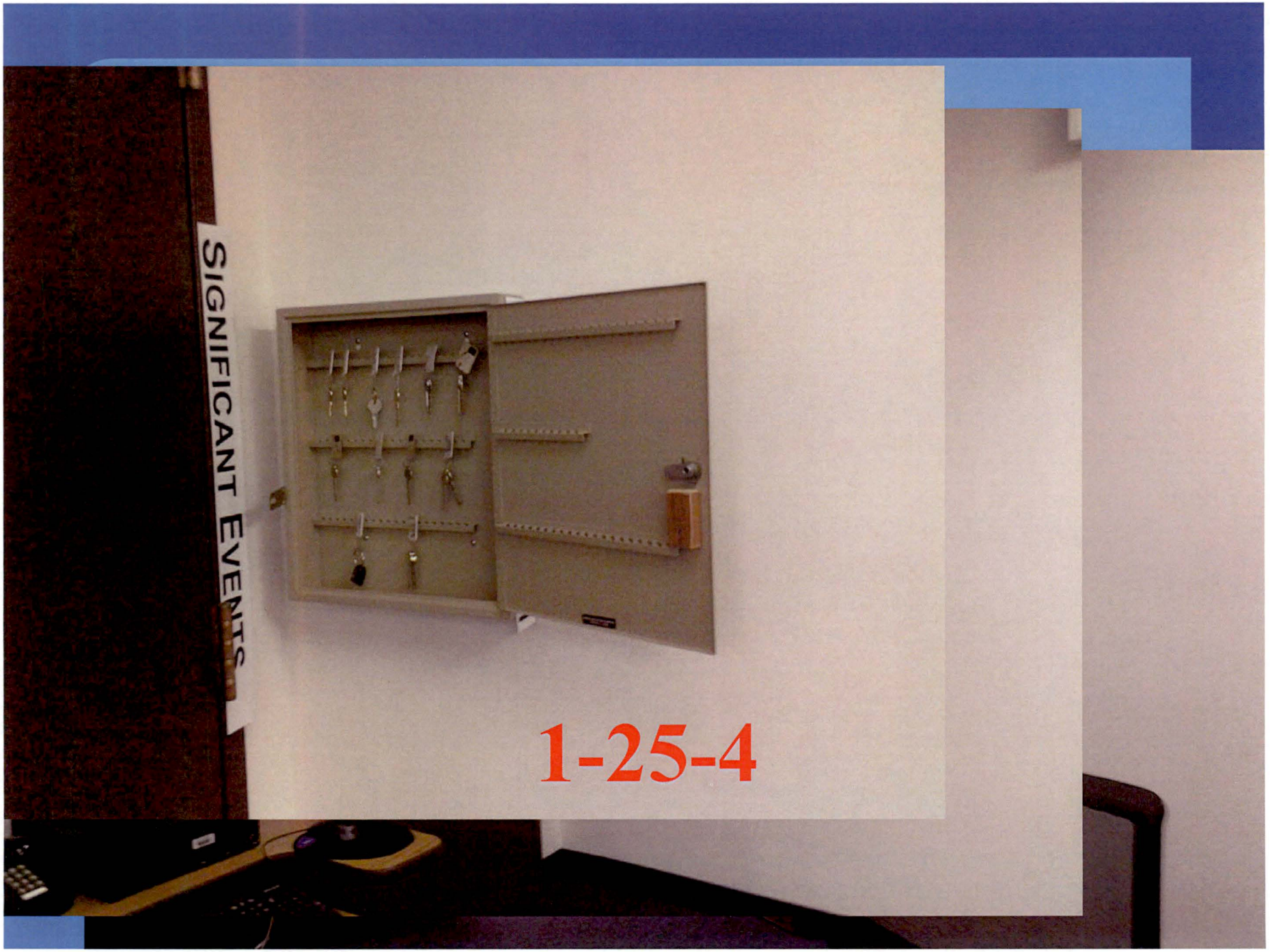
upplying 480VAC to Key Components



Off-Site Release Mitigation Strategies

- Spray scrubbing of fission products and control of radioactive material runoff - 4303.01P011

- MOU with Hickory Point Fire Department to assist with spray scrubbing using a ladder truck
- Control of Radioactive Material Runoff


SIGNIFICANT EVENTS
1-25-4

OBJECTIVES: DB430301
Extensive Damage Mitigation Guide

In accordance with referenced plant procedures and training materials:

1. Given CPS No. 4303.01, state the symptom(s) for entering CPS No. 4303.01.
2. Given CPS No. 4303.01, describe the Prompt Action to be taken when using CPS No. 4303.01.
3. Given CPS No. 4303.01, describe Technical Support Center (TSC) Actions when using CPS No. 4303.01.
4. Given CPS No. 4303.01, describe Mitigating Strategies when using CPS No. 4303.01.
    a. Discuss Dose Concerns when performing CPS No. 4303.01P017 Spent Fuel Pool Makeup from Fire Protection

OBJECTIVES: DB430301
Extensive Damage Mitigation Guide

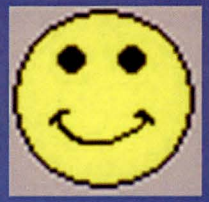
In accordance with referenced plant procedures and training materials:

5. State the Location and Discuss the use of the following B.5.b Equipment.
   a. Satellite Phones
   b. MABAS Radio
   c. Self Reading Pocket Dosimeters (SRPD/SIPD)
6. State the Location of B.5.b. Procedures
7. Discuss CPS No. 3822.04C003 Quarterly B.5.b. Equipment Checklist.

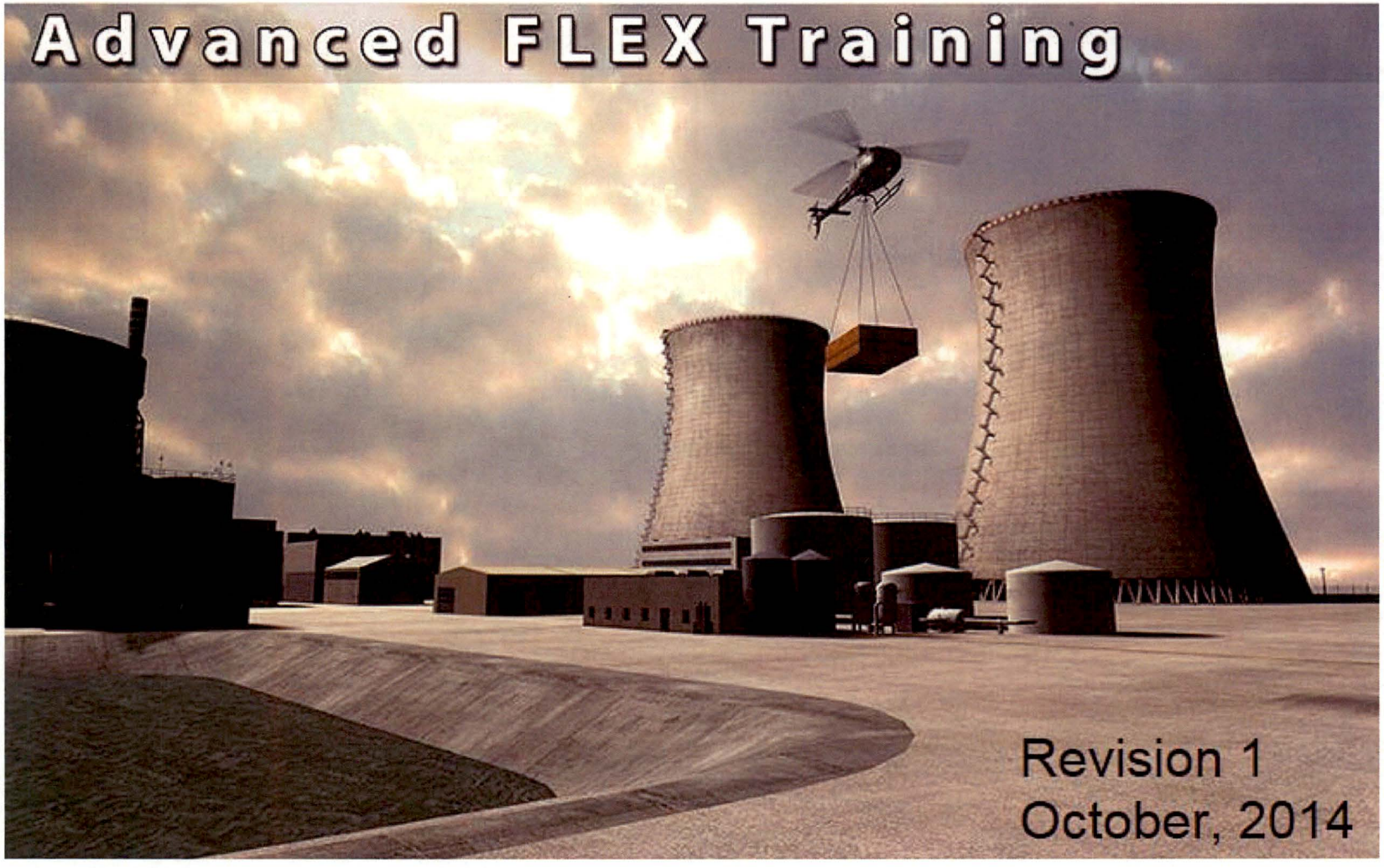
Questions? Comments?

Please provide feedback on today's lesson!

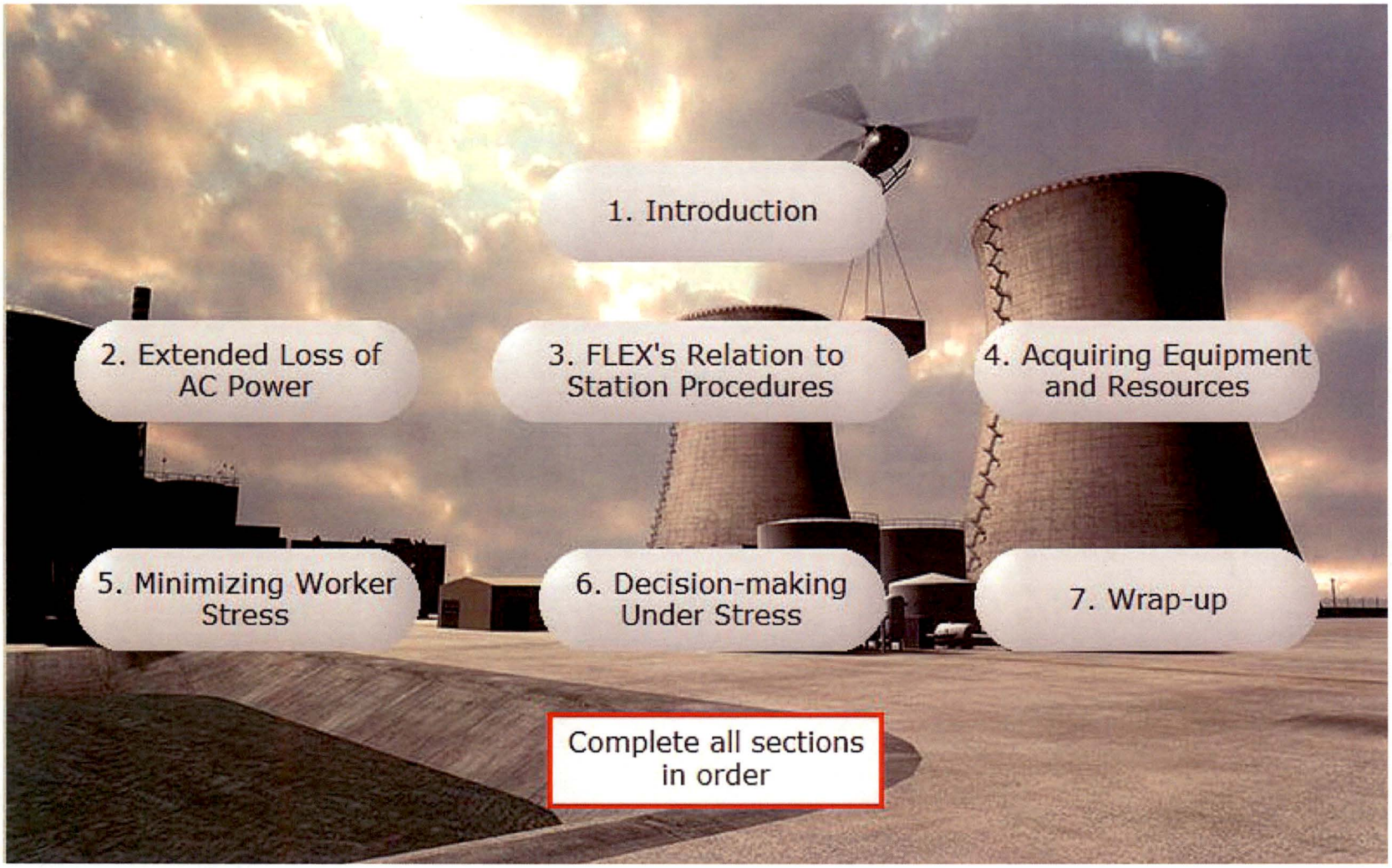
Thanks!



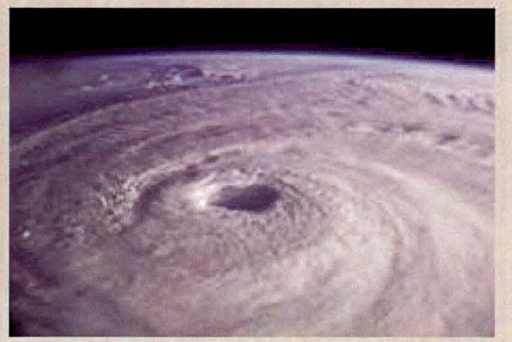
Advanced FLEX Training



Revision 1
October, 2014


1. Introduction
2. Extended Loss of AC Power
3. FLEX's Relation to Station Procedures
4. Acquiring Equipment and Resources
5. Minimizing Worker Stress
6. Decision-making Under Stress
7. Wrap-up
Complete all sections in order

Responding to BDBEEs



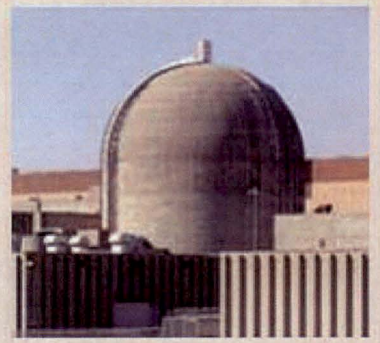
NEI 12-06 [Rev. 0]

DIVERSE AND FLEXIBLE COPING STRATEGIES (FLEX) IMPLEMENTATION GUIDE

August 2012

Responding to BDBEEs

Responding to BDBEEs



Content of This Course

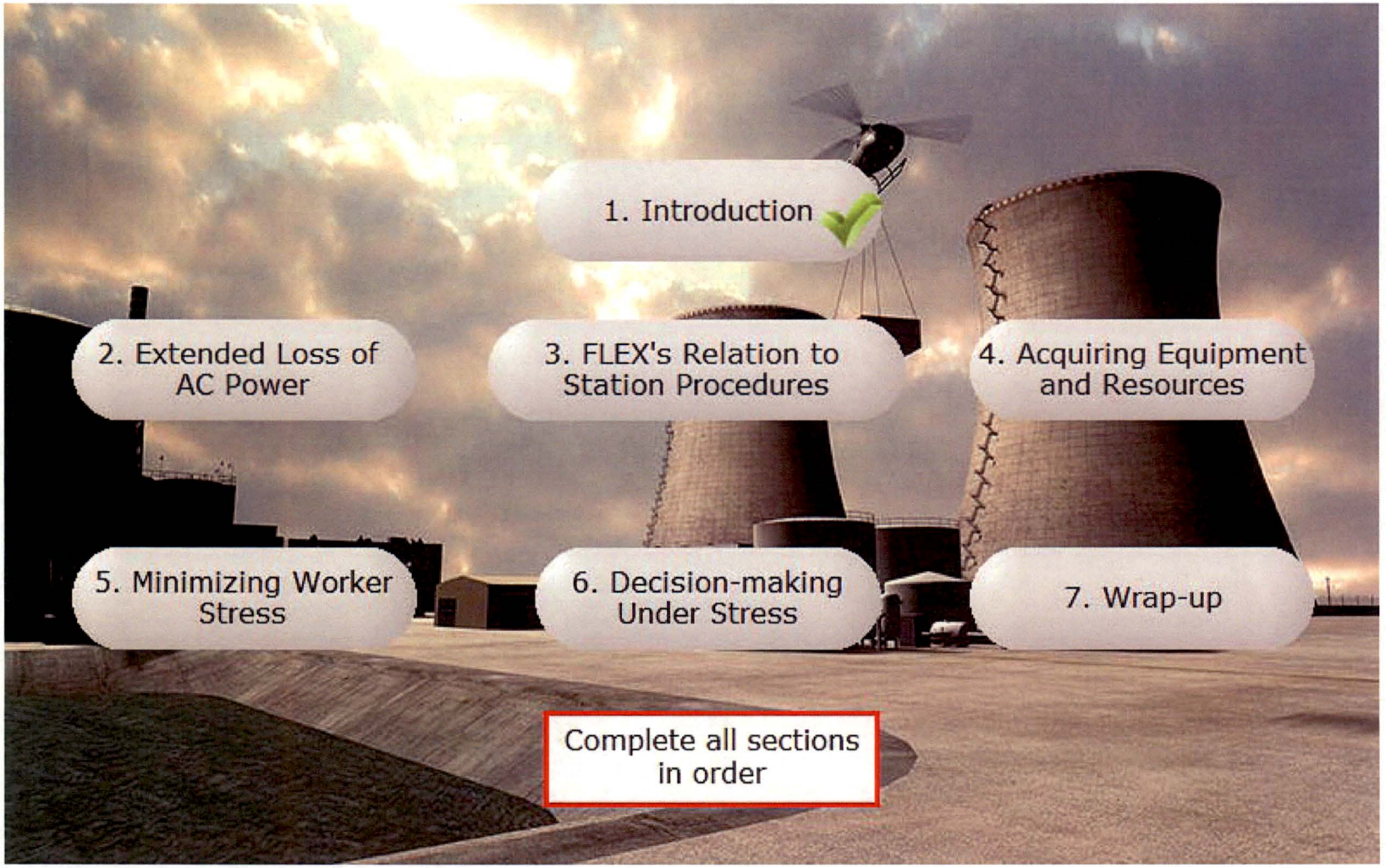
This training will include the following:

- The conditions for which FLEX is designed to protect our plants.
- How the FLEX guidelines fit into existing plant procedures for dealing with emergencies.
- How long it will take to receive requested equipment or resources from either the National SAFER Resource Centers (NSRCs) or other utilities and stations.
- How you, as a leader, can help reduce the stress workers feel when responding to a beyond-design basis event.
- What you can do to minimize the negative impact of stress on the decisions you make.

Follow the "Additional Reading" link above for:

- Course learning objectives
- FLEX-related reference documents

As you complete each section of this course, a checkmark will appear at the top of the page on the appropriate tab.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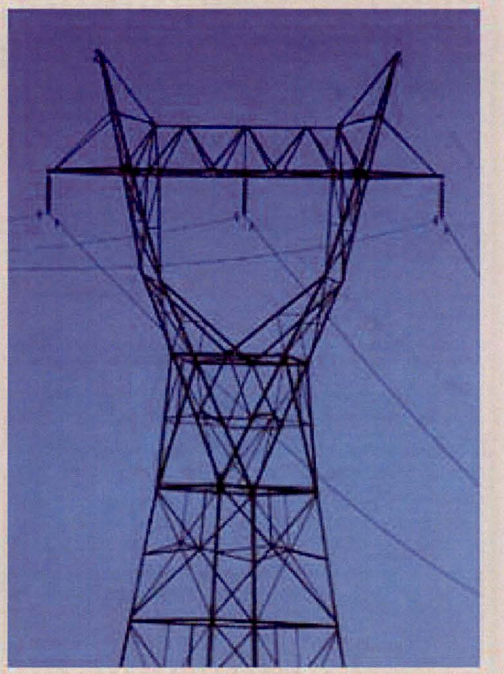
7. Wrap-up
Complete all sections in order

Extended Loss of AC Power

FLEX is being implemented specifically to mitigate the effects of an extended loss of AC power (ELAP).

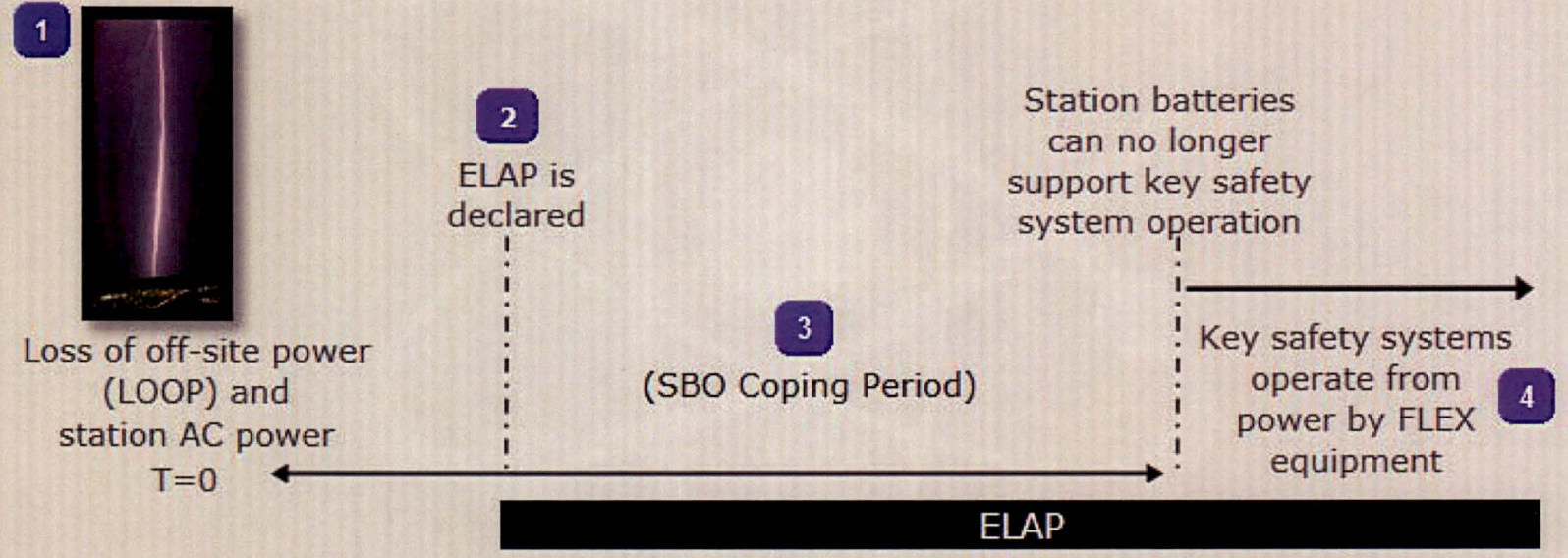
An ELAP is a loss of off-site power (LOOP) AND a loss of station AC power sources resulting in a station blackout (SBO) where:

- all AC power sources with the exception of station batteries and inverters are lost, AND
- the loss of AC power will extend beyond the time when unit batteries can supply sufficient power to maintain key safety functions.



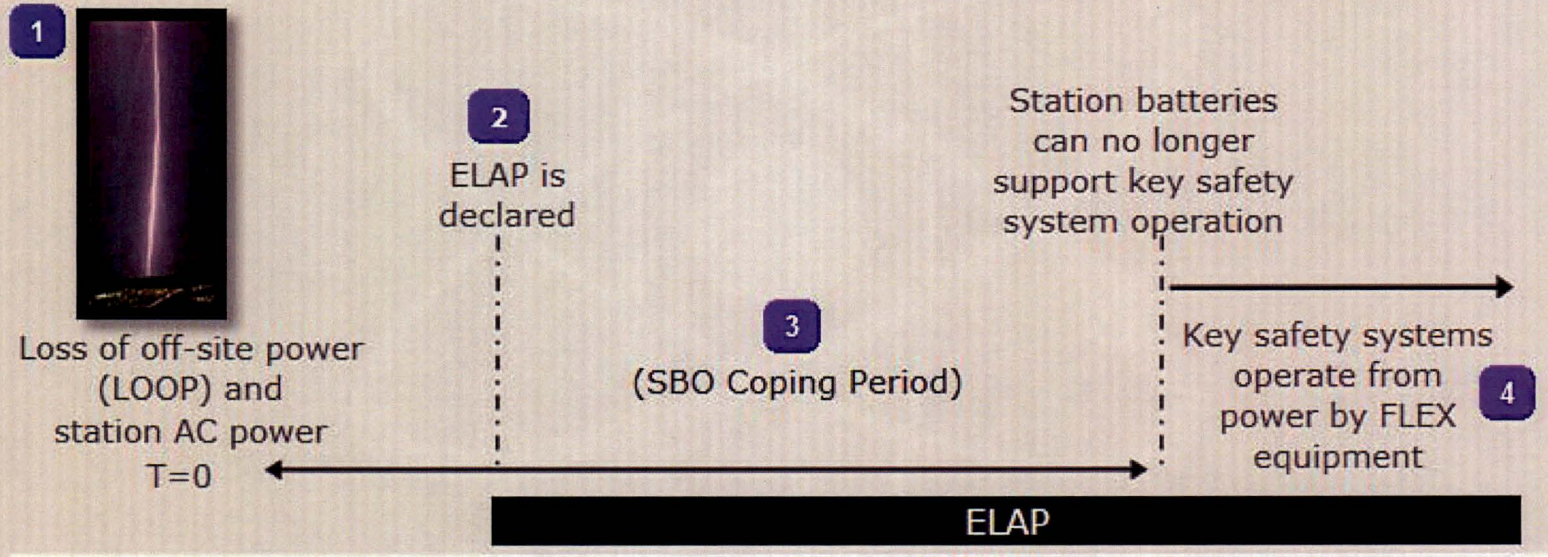
Extended Loss of AC Power

Click each number for more information.



Extended Loss of AC Power

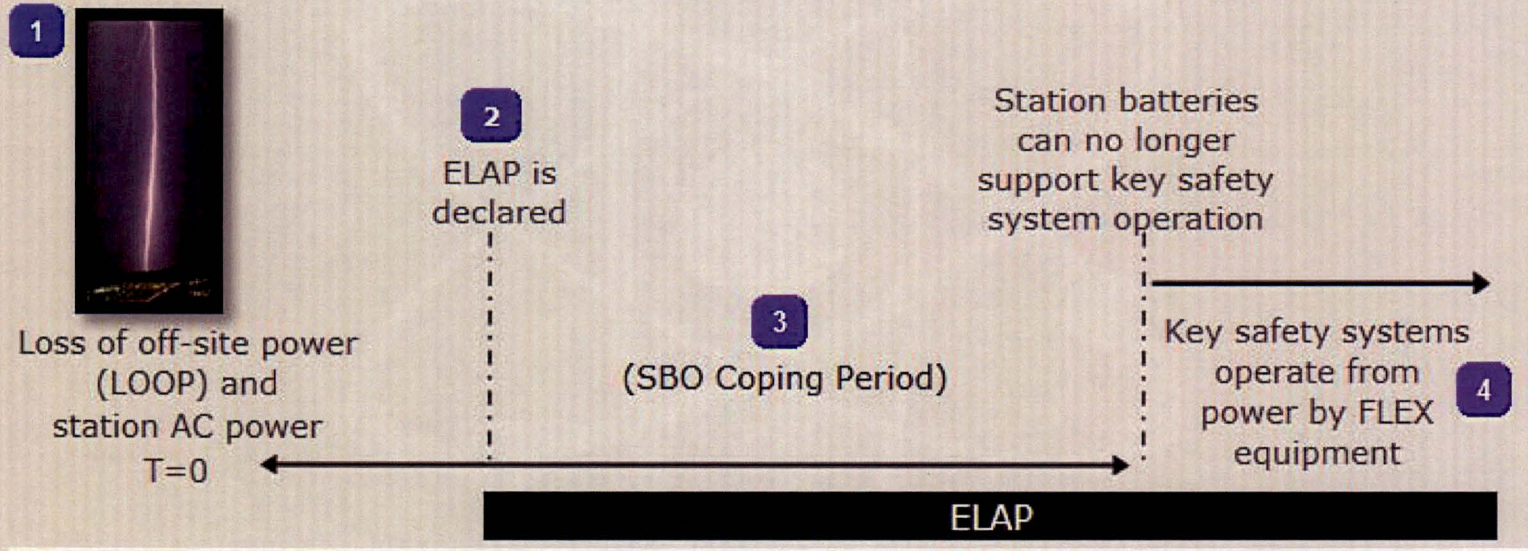
Click each number for more information.



1. No specific event is assumed by the FLEX strategies. Instead, it is assumed that any beyond design basis external event (BDBEE) will result in an extended loss of all AC power (ELAP) and the loss of normal access to the plant's ultimate heat sink. Other key assumptions relate to the plant's operating history and conditions at the time of the event and other conditions related to the event itself.

Extended Loss of AC Power

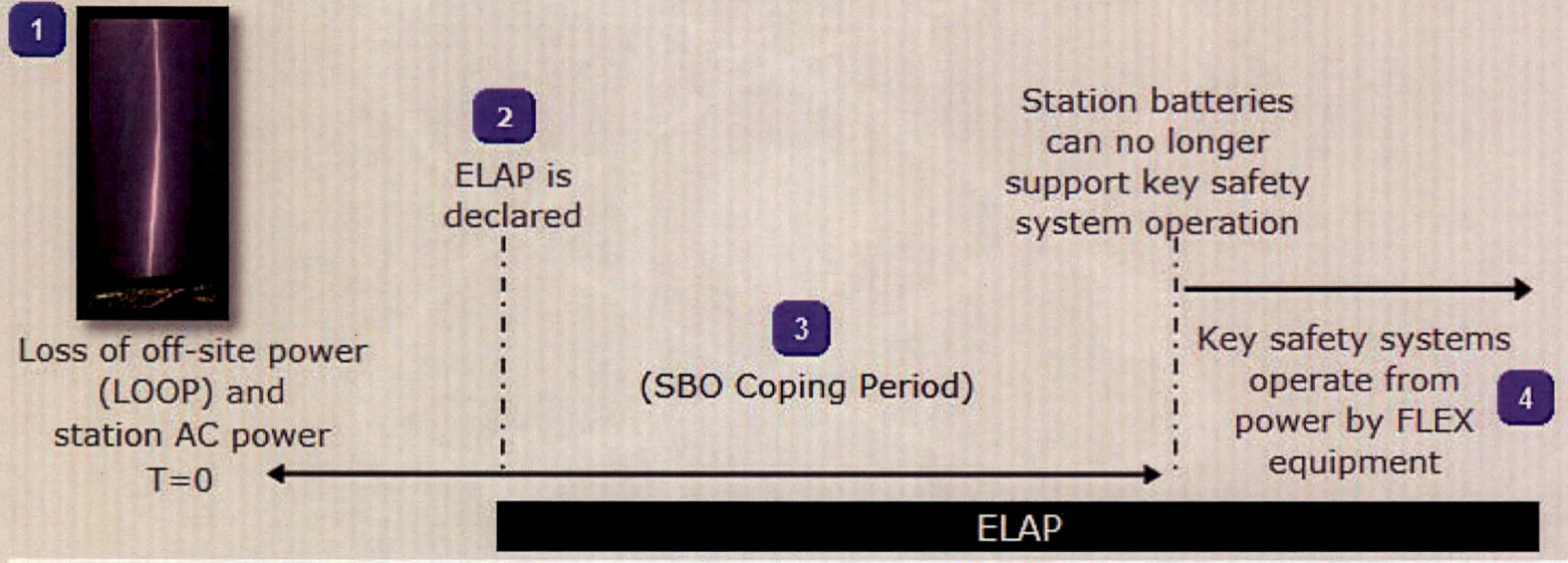
Click each number for more information.



2. An ELAP is declared when it has been determined that power will be unavailable beyond the time that key safety functions can be maintained by station batteries.

Extended Loss of AC Power

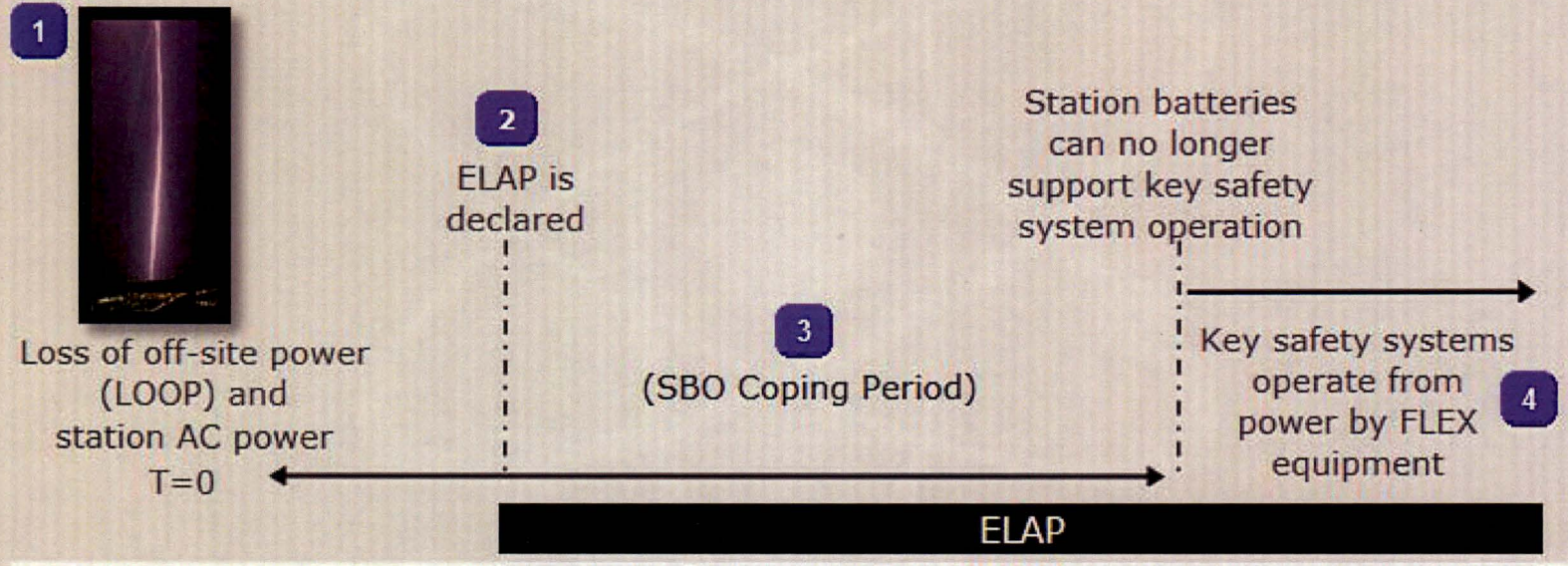
Click each number for more information.



3. The "SBO coping period" is the period of time that station batteries can maintain key safety functions operational.

Extended Loss of AC Power

Click each number for more information.



4. ELAP is defined as a station blackout (loss of off-site and on-site AC power sources) that will last beyond the time where unit batteries can provide power to support key safety functions. FLEX strategies are intended to be implemented prior to depleting the station batteries.

Extended Loss of AC Power

An ELAP will result in:

- a loss of all plant auxiliaries not supplied by battery power.
- degradation of plant lighting, ventilation, and communications.
- depletion of station batteries at a rate based on load.
- a loss of normal access to the ultimate heat sink (the heat sink remains intact but the motive force to provide flow from it is lost with no prospect for recovery).

FLEX Strategies Assumptions

Assumptions going into FLEX Strategies include:

Click on each link below to see the associated assumptions.

- Initial plant conditions
- Initial event conditions
- Reactor transient bounding conditions
- Sources of reactor coolant inventory loss
- Spent fuel pool conditions
- Instrumentation and controls
- Event response actions

Reference NEI 12-06 Section 3.2.1

Initial Plant Conditions

- The reactor has been at 100% power for 100 days up until the event or shortly before the event.
- At the time of the event, reactor and supporting systems were within normal operating ranges for the plant condition.
- All plant equipment is operating, in standby or available as described in the plant design and licensing basis.

Reactor Transient Bounding Conditions

- The reactor automatically trips as designed.
- The main steam system decay heat removal functions as designed.
- Primary relief valves operate in a normal manner.
- No other failures, other than those causing the ELAP/LUHS event, occur.

The Event

- No specific initiating event is used.
- No additional events, including security events, or failures occur immediately prior to or during the event.

AC Power

- A LOOP affecting all units (no prospect for recovery for an extended period).
- All installed on-site ac power and SBO alternate AC power are assumed not available and not imminently recoverable.
- Installed electrical distribution system, including inverters and battery chargers, remain available provided they are protected.

Cooling Sources Available (if contained in robust structures)

- plant makeup water tanks and systems.
- the ultimate heat sink
- the fire protection system ring header as a water source

Available Equipment (if stored in robust structures)

- Fuel for FLEX equipment
- Permanent plant equipment.
- Other equipment
  - portable ac power sources
  - back up dc power
  - spare batteries
  - equipment for station blackout and advanced accident mitigation (B.5.b).

Sources of Reactor Coolant Inventory Loss

- Normal system leakage
- Losses due to letdown system operation
- Losses due to reactor coolant pump seal leakage based on design
- Losses due to BWR recirculation pump seal leakage
- BWR inventory loss due to operation of steam-driven systems, safety relief valve (SRV) cycling, and reactor pressure valve (RPV) depressurization.

Spent Fuel Pool Conditions

- All boundaries of the spent fuel pool (SFP) are intact.
- Any sloshing that may occur does not preclude access to the SFP area.
- SFP cooling system and piping is intact.
- SFP heat load is at the design maximum.

Instrumentation and Controls

Minimum set of parameters to be monitored/controlled has been determined. Typically these are:

PWRs
- Steam generator (S/G) level & pressure
- Reactor coolant system (RCS) pressure & temperature
- Containment pressure
- Spent fuel pool level

BWRs
- Reactor pressure vessel (RPV) level and pressure
- Containment pressure
- Suppression pool level and temperature
- Spent fuel pool level

Event Response Actions

Response actions will be prioritized based on available equipment, resources, and time constraints. The initial coping response actions will be performed by available site personnel post-event.

Knowledge Check 1

An extended loss of AC power (ELAP) is different from a loss of off-site power (LOOP) in which of the following ways?

Check all that apply and then click the Check Answer button.

- ☐ The duration of an ELAP can be longer than the licensing basis coping capability of the plant and by definition, a LOOP cannot.
- ☐ In addition to losing off-site power, in an ELAP, on-site ac power is also lost.
- ☐ An ELAP assumes that AC power will not be restored until the SBO coping period is exceeded.
- ☐ An ELAP causes all AC and DC power to be lost but a LOOP only assumes AC power is lost.

Check Answer

Knowledge Check 1

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- ☑ An ELAP assumes that AC power will not be restored until the SBO coping period is exceeded.
- ☐ An ELAP causes all AC and DC power to be lost but a LOOP only assumes AC power is lost.

Check Answer

That's correct. An ELAP assumes that both off-site and on-site AC power sources are lost and that neither will be restored in a short time. A loss of off-site power (LOOP) only assumes that off-site AC sources are lost but that on-site AC sources are still available. There are no specific assumptions in a LOOP related to the length of time the power will remain unavailable

Knowledge Check 2

One assumption of the FLEX strategies is that an ELAP:

Check the correct answer and then click the Check Answer button.

- ○ will only affect one unit of a multi-unit site at a time
- ○ will affect all auxiliary loads
- ○ will result in a loss of normal access to the ultimate heat sink
- ○ batteries will deplete based on the maximum calculated safety system load

Check Answer

Knowledge Check 2

One assumption of the FLEX strategies is that an ELAP:

Check the correct answer and then click the Check Answer button.

- ○ will only affect one unit of a multi-unit site at a time
- ○ will affect all auxiliary loads
- ◉ will result in a loss of normal access to the ultimate heat sink
- ○ batteries will deplete based on the maximum calculated safety system load

Check Answer

That's correct. An ELAP assumes that normal access to the ultimate heat sink will be lost. It also assumes that ALL plants on a multi-plant site are affected and that station batteries will deplete at a rate based on the load they actually carry.

Knowledge Check 3

Select all of the following that reflect assumed initial plant conditions for the FLEX strategies.

Check all that apply and then click the Check Answer button.

- ☐ Reactor operated for 100 days at 100% power just prior to the event.
- ☐ The reactor core is near end-of-life.
- ☐ Only safety-related systems are operational.
- ☐ All plant equipment is normally operating or available in its design standby state.
- ☐ Reactor system temperatures are high in the operating band and pressures and levels are low in the operating bands.
- ☐ Reactor and supporting systems are within normal operating ranges for temperature, pressure, and level.
- ☐ The plant is on shutdown cooling.

Check Answer

Knowledge Check 3

Select all of the following that reflect assumed initial plant conditions for the FLEX strategies.

Check all that apply and then click the Check Answer button.

- [x] Reactor operated for 100 days at 100% power just prior to the event.
- [ ] The reactor core is near end-of-life.
- [ ] Only safety-related systems are operational.
- [x] All plant equipment is normally operating or available in its design standby state.
- [ ] Reactor system temperatures are high in the operating band and pressures and levels are low in the operating bands.
- [x] Reactor and supporting systems are within normal operating ranges for temperature, pressure, and level.
- [ ] The plant is on

Check Answer

That's correct, the assumptions are that the plant operated for 100 days at 100% power up until or just before the event and that at the time of the event, all systems were operating by design and parameters of the reactor and support systems were within their normal ranges.

Knowledge Check 4

Which of the following reflect assumed initial event conditions for the FLEX strategies?

Check all that apply and then click the Check Answer button.

- ☐ A design-basis tornado struck the station causing a loss of off-site power and damage to the emergency diesel fuel oil storage tank.
- ☐ No specific event is identified as the cause of the event.
- ☐ Damage to the station inverters causes the availability of AC power from the station batteries to be lost.
- ☐ Other events may occur immediately prior to or during the event if they are within the design basis of the plant.
- ☐ Permanent plant equipment within robust structures is available.
- ☐ Motive force for flow from the ultimate heat sink is lost.
- ☐ Cooling and makeup water in robust systems or structures are available.

Check Answer

Knowledge Check 4

Which of the following reflect assumed initial event conditions for the FLEX strategies?

Check all that apply and then click the Check Answer button.

- ☐ A design-basis tornado struck the station causing a loss of off-site power and damage to the emergency diesel fuel oil storage tank.
- ☑ No specific event is identified as the cause of the event.
- ☐ Damage to the station inverters causes the availability of AC power from the station batteries to be lost.
- ☐ Other events may occur immediately prior to or during the event if they are within the design basis of the plant.
- ☑ Permanent plar
- ☑ Motive force fo
- ☑ Cooling and ma

Check Answer

That's correct, no specific initiating event is used. The initial condition is assumed to be a LOOP resulting from an external event with no prospect of recovery for an extended period. In addition, all installed sources of on-site AC power are assumed to not be available. Station batteries remain available. Cooling and makeup water inventories contained within robust structures remain available. The motive force for flow from the ultimate heat sink is lost with no prospect of recovery.

Key Points / Summary

An ELAP is a loss of off-site power (LOOP) AND a loss of station AC power sources resulting in a station blackout (SBO) where all AC power sources with the exception of station batteries and inverters are lost, AND the loss will extend beyond SBO coping period.

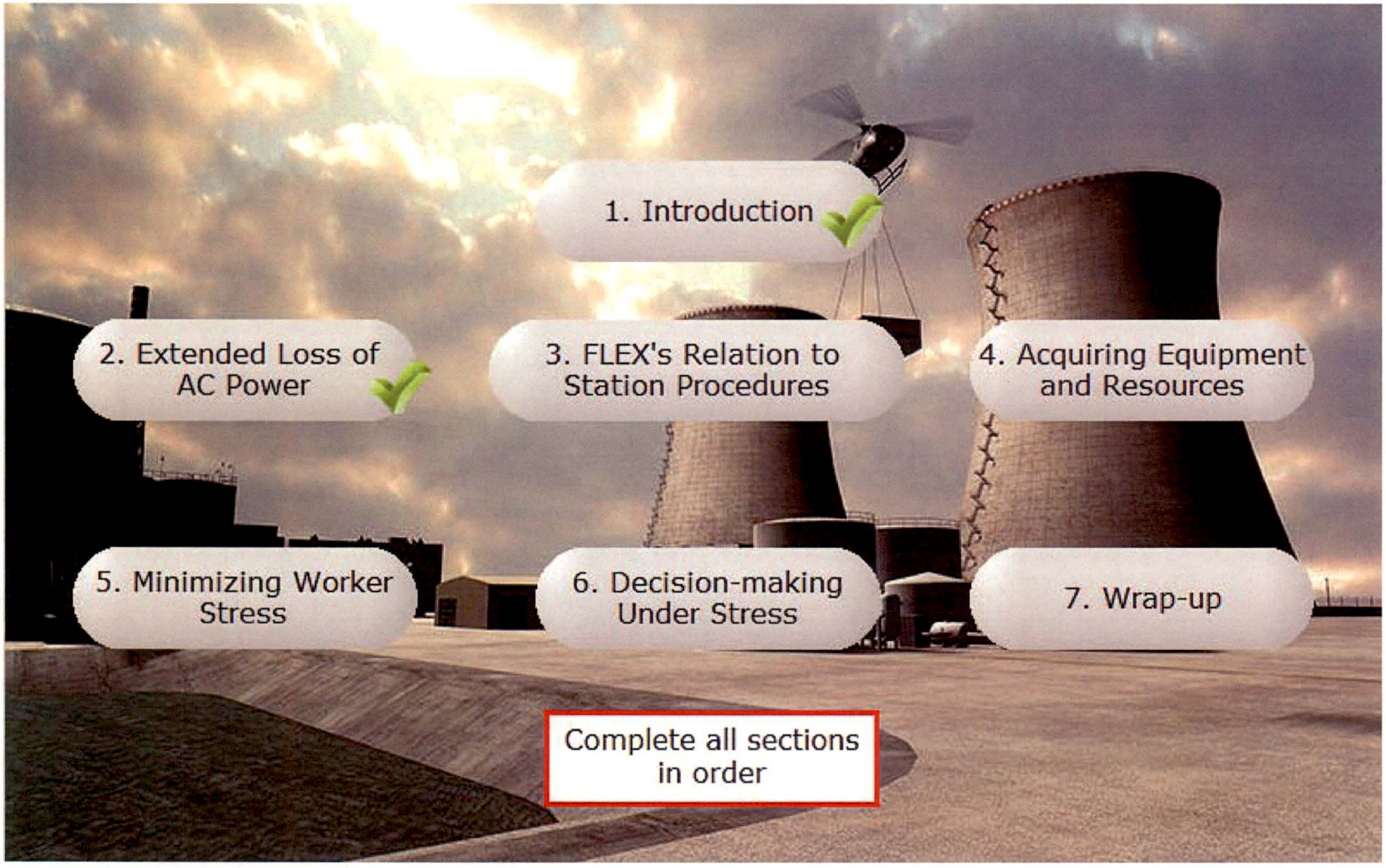
The SBO coping period is the period of time key safety functions can be maintained by the station batteries during a station blackout.

An ELAP is declared once it is determined that AC power will be unavailable beyond the station's SBO coping period.

An ELAP will result in:

- a loss of all plant auxillaries not supplied by battery power
- degradation of plant lighting, ventilation, and communications
- depletion of station batteries at a rate based on load
- a loss of nomal access to the ultimate heat sink

Assumptions going into FLEX Strategies include conditions related to the plant, event, reactor transient, reactor coolant losses, spent fuel pool and instrumentation and controls as well as actions taken in response to the event.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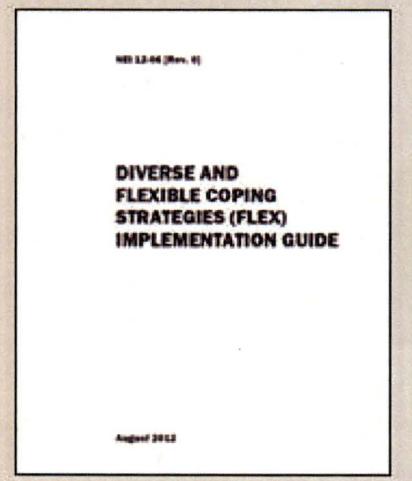
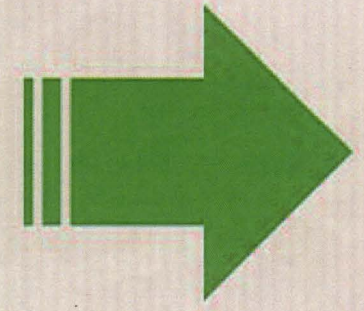
6. Decision-making Under Stress
7. Wrap-up
Complete all sections in order

FLEX's Relationship to Station Procedures

FLEX's Relationship to Station Procedures



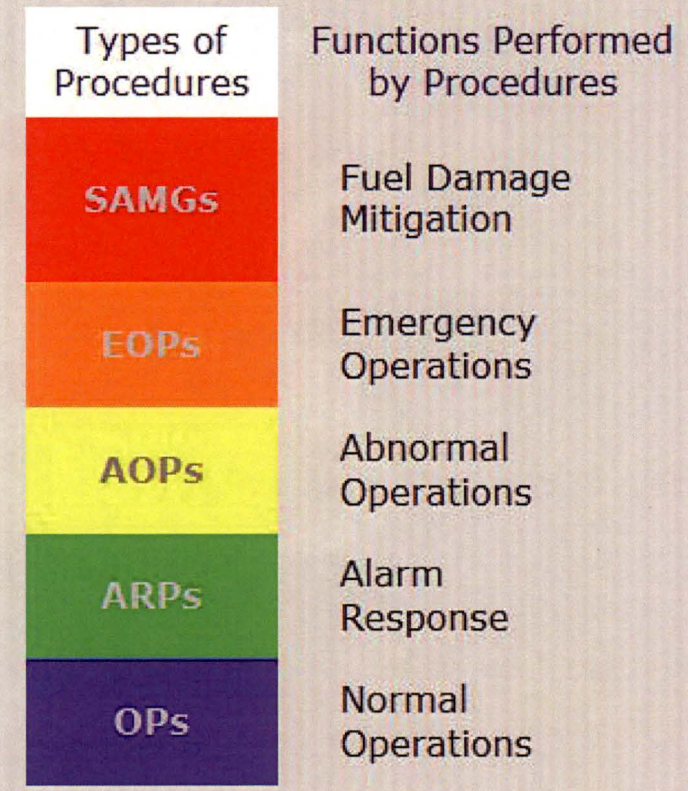


FLEX Guidance Integration

Now let's look at how FLEX guidance is integrated into existing plant procedures.

First, we'll look at the protections provided by existing procedures. This diagram shows the typical plant operating procedure hierarchy. Each set of procedures in the hierarchy has a goal.

Click on each procedure level for more information.



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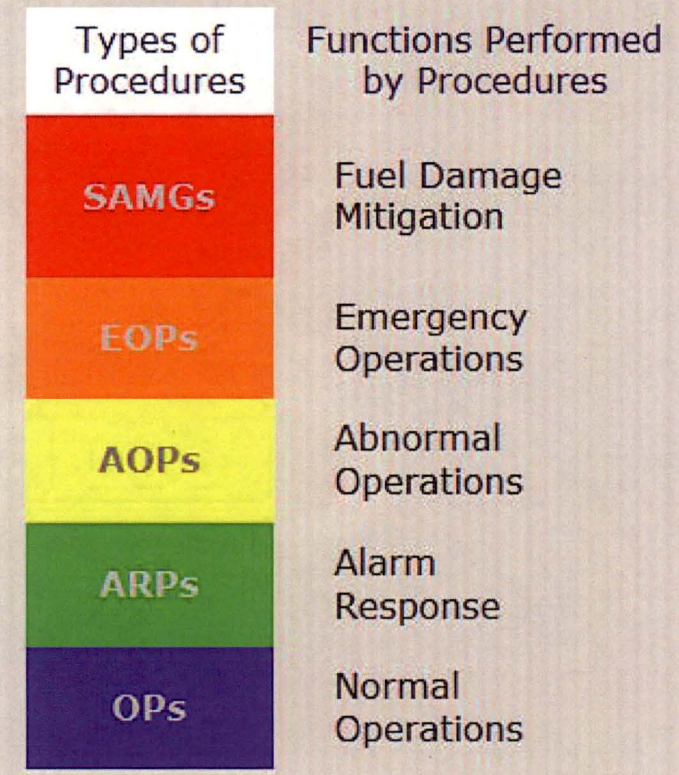
First, we'll look at the protections provided by existing procedures. This diagram shows the typical plant operating procedure hierarchy. Each set of procedures in the hierarchy has a goal.

Click on each procedure level for more information.

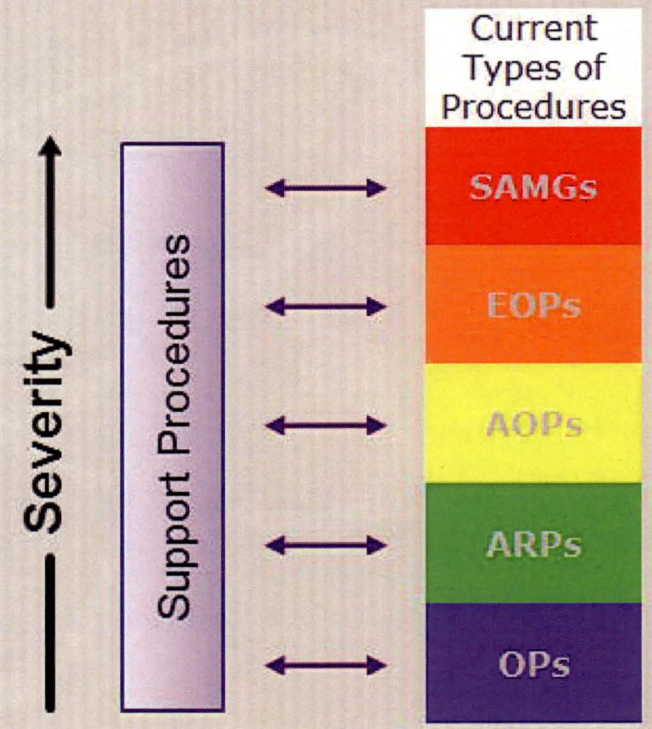
- SAMGs- mitigate fuel damage in the event that key safety functions are not maintained or restored.
- EOPs- return the plant to a safe condition from a design basis accident.
- AOPs or ARPs- restore the plant to normal operating conditions.
- OPs- maintain the plant in normal operating conditions.



FLEX Guidance Integration

In existing procedure structures, entry into specific procedure types and transitions from one procedure type to another are based on plant conditions and provide functional integration of the procedures in the operating procedure hierarchy.

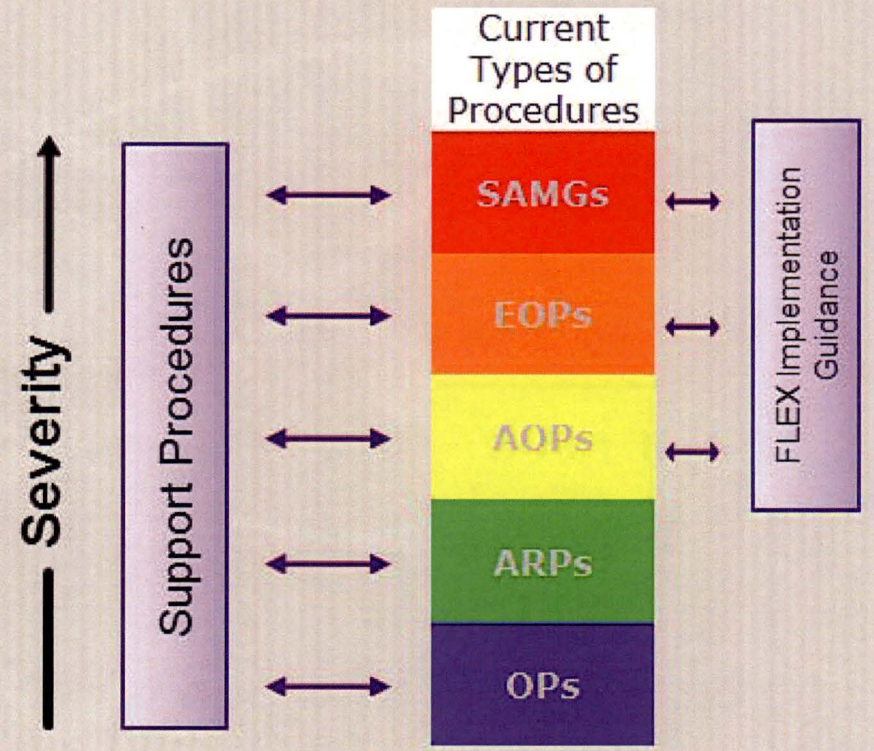
Other procedures support the execution of the strategies contained within these operating procedures. These "support procedures" are used in parallel with, and without exiting the operating procedures.



FLEX Guidance Integration

The FLEX strategies are designed to protect the fuel by enabling a plant to cope with the consequences of a BDBEE. Guidance for implementing FLEX is either incorporated directly into AOPs and EOPs or those procedures will direct the use of FLEX through FLEX Support Guidelines (FSGs). The FSGs are implemented without exiting the controlling procedure.

If fuel damage does occur, station-specific SAMG strategies will be implemented. Although not specifically incorporated into the SAMGs, the capability provided by FLEX equipment will provide support to implementing SAMG strategies and returning the plant to a safe condition.



Knowledge Check 5

Which of the following are true statements regarding the implementation of FLEX?

Check all that apply and then click the Check Answer button.

- ☐ When implemented, FLEX guidance becomes the controlling document for responding to an event.
- ☐ FLEX guidance is implemented in parallel with the station's procedures for abnormal and emergency operations and response.
- ☐ FLEX guidance supports only the EOP strategies.
- ☐ Station operating procedures such as AOPs and EOPs direct the implementation of FLEX when appropriate.

Check Answer

Knowledge Check 5

Which of the following are true statements regarding the implementation of FLEX?

Check all that apply and then click the Check Answer button.

- ☐ When implemented, FLEX guidance becomes the controlling document for responding to an event.
- ☑ FLEX guidance is implemented in parallel with the station's procedures for abnormal and emergency operations and response.
- ☐ FLEX guidance supports only the EOP strategies.
- ☑ Station operating procedures such as AOPs and EOPs direct the implementation of FLEX when appropriate.

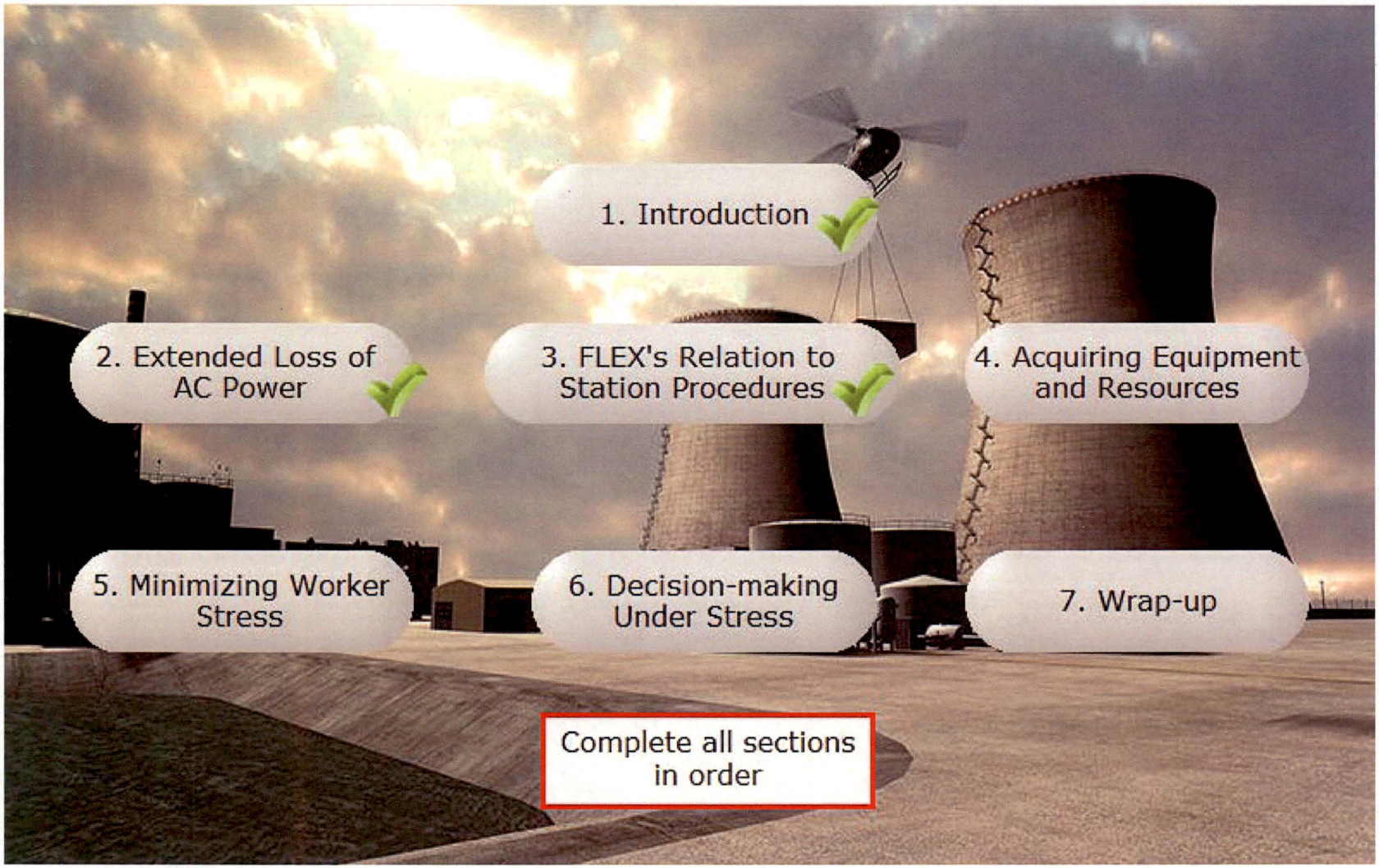
Check Answer

That's correct. FLEX is used as directed by, and in parallel with, station operating procedures.

Key Points / Summary

In this section you learned:

- FLEX provides defense in depth to prevent fuel damage. By maintaining the critical safety functions of core cooling and fuel pool cooling, FLEX will help a plant to avoid the need to implement the SAMGs.
- Guidance for implementing FLEX is incorporated directly into the operating procedures or is provided in support procedures called FLEX Support Guidelines (FSGs). Like other support procedures, the FSG are implemented without exiting the controlling operating procedure.
- Although FLEX is not incorporated into the SAMGs, FLEX equipment can be used to support the implementation of the SAMGs.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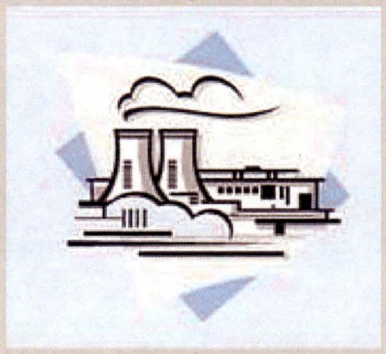
Complete all sections in order

Acquiring Equipment and Resources



FLEX Equipment

A primary function of FLEX is to ensure that equipment needed to support the operation of key safety functions is available. Some FLEX equipment is stored on-site and some is stored at National SAFER Resource Centers (NSRCs). Installation of on-site FLEX equipment will begin once an ELAP is declared. Additional and redundant equipment from the NSRCs will be delivered later.

Acquisition of FLEX equipment:

- Each NSRC has five sets of FLEX equipment. Typically four sets are available for site support and one is out of service for scheduled maintenance.
- Each station has a SAFER (Strategic Alliance for FLEX Emergency Response) response plan, referred to as a "playbook" that, among other things, lists all equipment that the NSRC will deliver to the site. The NSRC has a list of the equipment in each site's playbook as well.
- The purpose of the equipment is to provide electrical power and pumping capacity, and other resources as needed, to ensure that key safety functions (core cooling, spent fuel pool cooling and containment integrity) are maintained.
- Equipment to support personnel habitability such as ventilation and lighting is included as well.

FLEX Power Sources

- Medium voltage generators
  - 4160 VAC generators
- Low voltage generators
  - 480 VAC generators
- Distribution transformers
  - 4160 VAC electrical distribution breakers & cable
  - Standard cable and electrical connections

FLEX Pumping Capabilities

- High pressure injection pumps (1500psi/60gpm)
- Low pressure/medium flow pumps (150psi/2500gpm)
- SG Makeup/RPV Makeup Pump (500psi/500gpm)
- Low pressure/high flow pumps (150psi/5000gpm)
- Standard hoses, mechanical connections & modules

Other FLEX Resources

- On-site diesel fuel transfer
- Air lift fuel containers
- Portable diesel fuel tanks with pumps
- Portable exterior lighting

FLEX Habitability

- Mobile boration
- RO unit/water purification
- Water storage
- Portable air compressor
- Ventilation fans
- 4KV to 6.9KV step-up transformer and cables
- 480 VAC to 600 VAC step-up transformer & cable
- Extra 1MW 4160 VAC generators and cables

- Portable submersible pump
- 2500/5000gpm suction booster pumps

Timeline for NSRC Equipment Delivery

Click on each time button to learn more

Event occurs

0 hrs

Request for FLEX equipment made to NSRC

≈2 hrs

NSRC staffed

≈3 hrs

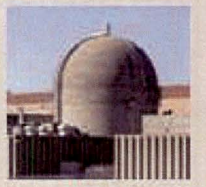
Transport arrives at NSRC staging area

≈9-18 hrs

Equipment arrives at site staging area

≈22 hrs

First delivery of FLEX equipment



≈24 hrs

First FLEX equipment operational

≈72 hrs

All equipment delivered

Time

Resources from Others

Emergency response support from other utilities or vendors can also be made available to a station. These requests will usually be made through INPO.

- Upon notification of an event, the INPO Industry Response Center (IRC) will activate.
- IRC staffing is similar to that of site EROs and includes an Emergency Director, Operations, Technical, Radiation Protection, and Logistics Coordinators and others.

Resources from Others

Resources available from other stations and vendors during a beyond-design-basis external event might include:

- Physical resources:
  - plant or system specific parts or components held by other utilities/stations
  - additional FLEX-related equipment beyond that held by the NSRC
  - unique equipment available only from vendors
- Technical/operational assistance:
  - engineering design and evaluation assistance
  - maintenance or labor support
  - radiological protection support
- Although no specific timeline for delivery of resources from other utilities or vendors exists, all nuclear facility operators have committed to provide assistance to any station challenged beyond the capabilities of its on-site emergency response organization.

Knowledge Check 6

Which of the following are examples of FLEX equipment and resources provided by an NSRC?

Check all that apply and then click the Check Answer button.

- ☐ Portable decontamination buildings
- ☐ Vans and busses for transporting station personnel on and off site
- ☐ 4160 VAC generators
- ☐ High pressure injection pumps
- ☐ Labor services to assist in routine plant activities
- ☐ Lighting towers

Check Answer

Knowledge Check 6

Which of the following are examples of FLEX equipment and resources provided by an NSRC?

Check all that apply and then click the Check Answer button.

- ☐ Portable decontamination buildings
- ☐ Vans and busses for transporting station personnel on and off site
- ☑ 4160 VAC generators
- ☑ High pressure injection pumps
- ☐ Labor services to assist in routine plant activities
- ☑ Lighting towers

Check Answer

That's correct. NSRCs provide equipment for cooling the reactors and spent fuel pools and maintaining containment integrity. Generators, injection pumps, and lighting towers support maintaining those functions. The NSRCs do not provide labor services other than those specifically associated with setting up and starting FLEX equipment. Decontamination buildings and vans and busses for personnel transportation are outside the scope of equipment provided by the NSRCs

Knowledge Check 7

A request for FLEX equipment was made to the NSRC. *Drag each activity into the box that reflects the timeframe it should be complete. Then click the Check Answer button.*

Check Answer

Request for FLEX equipment made to NSRC

0-4 hrs

5-18 hrs

19-24 hrs

25-72 hrs

Time

Knowledge Check 7

That's correct. The key activities to note are that the first FLEX equipment should be operational within 24 hrs. and the remaining should be on-site within 72 hrs.

Check Answer

Request for FLEX equipment made to NSRC

0-4 hrs

Equipment arrives at site staging area

5-18 hrs

19-24 hrs

All equipment delivered

25-72 hrs

Time

Knowledge Check 8

When resources or support from other utilities or stations are requested, the requesting station should expect them to arrive within how many hours of the request?

Check the correct answer and then click the Check Answer button.

- ○ Within 8 hours of the request
- ○ Within 12 hours of the request
- ○ Within 24 hours of the request
- ○ Within 72 hours of the request
- ○ No pre-established time commitment

Check Answer

Knowledge Check 8

When resources or support from other utilities or stations are requested, the requesting station should expect them to arrive within how many hours of the request?

Check the correct answer and then click the Check Answer button.

- ○ Within 8 hours of the request
- ○ Within 12 hours of the request
- ○ Within 24 hours of the request
- ○ Within 72 hours of the request
- ◉ No pre-established time commitment

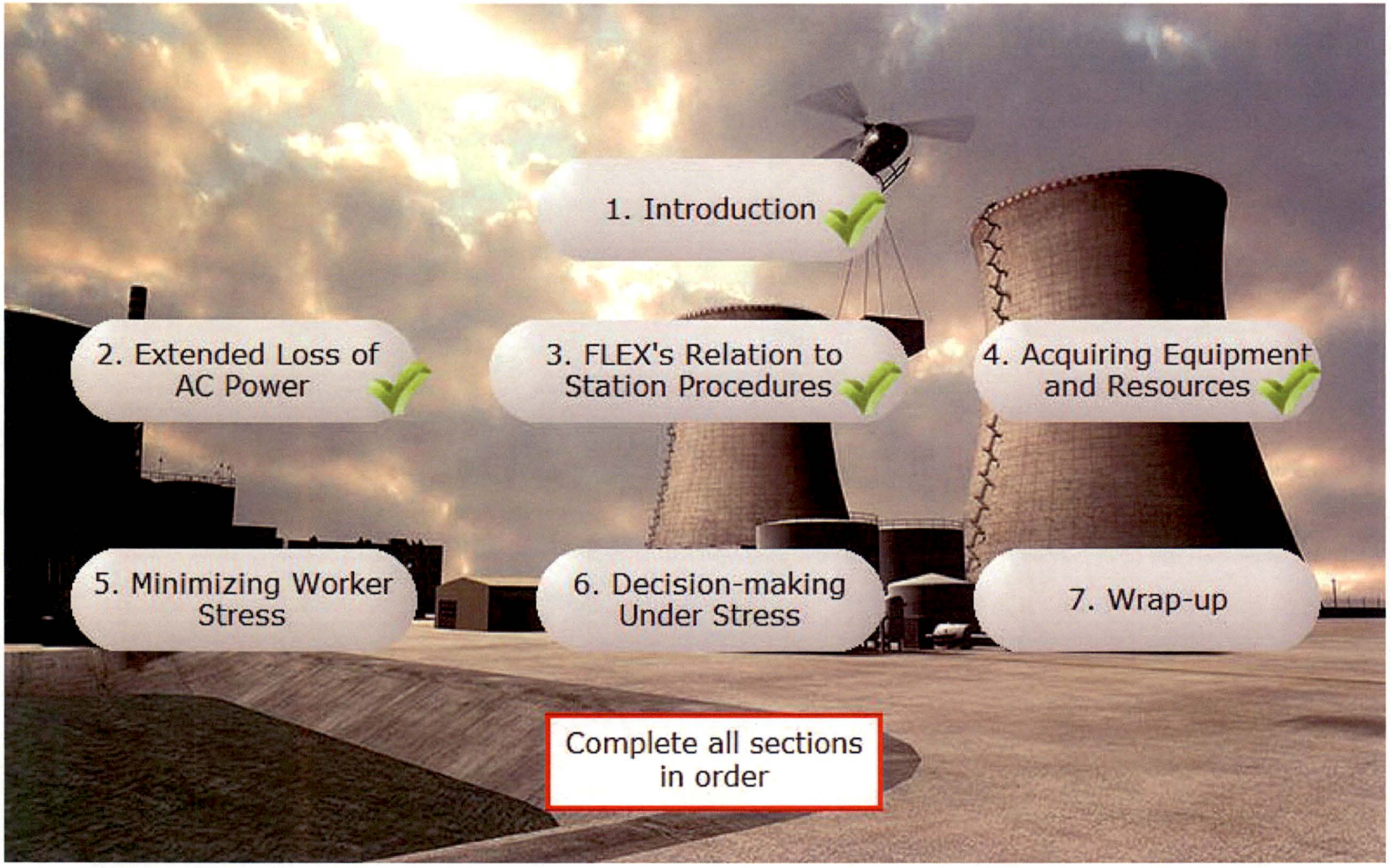
Check Answer

That's correct. All utilities agree to help one another in a significant event but there is no time requirement for responses.

Key Points / Summary

In this section you learned:

- The types of equipment provided by the NSRCs include equipment for:
  - generating power
  - moving water
  - maintaining habitability
  - other functions such as storing, treating and borating water, providing compressed air, heat exchange, and flood protection
- One telephone call starts FLEX equipment moving from an NSRC to a station. The first equipment should be on-site and operable within 24 hours of the call. All FLEX equipment can be expected to be on-site within 72 hours of the call.
- All nuclear facility operators have committed to provide assistance to any station challenged beyond the capabilities of its on-site emergency response organization. This assistance is normally requested through INPO.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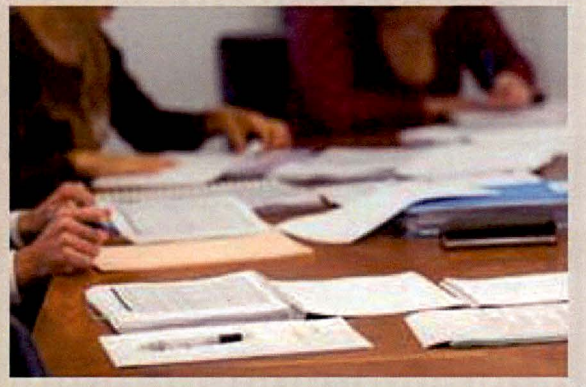
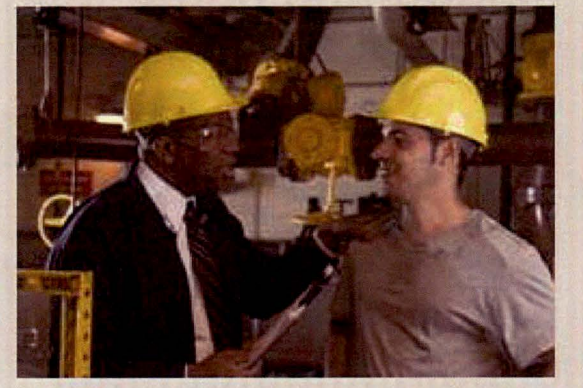
Minimizing Worker Stress

Minimizing Worker Stress

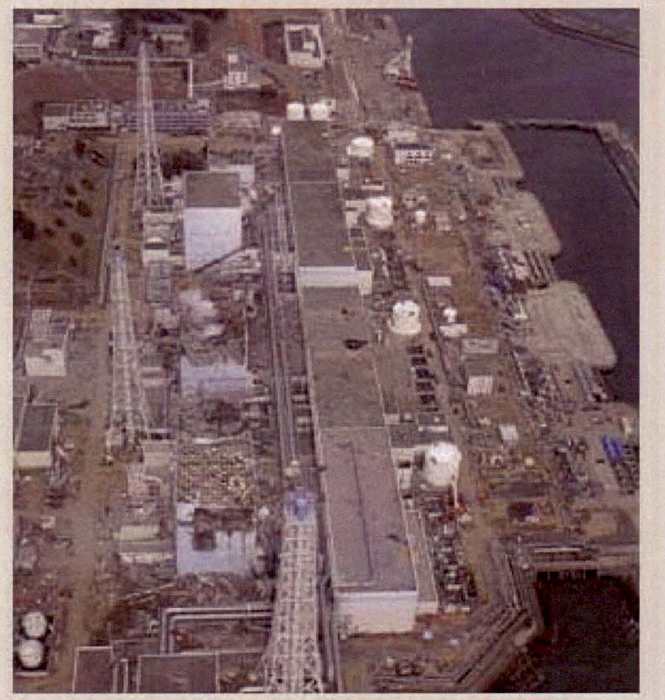




Preparing for Potential Events

Managers and supervisors can help better prepare workers to deal with the stress associated with significant events by doing the following:

- ensuring that emergency roles, responsibilities, and functions are clearly understood
- ensuring that workers are trained on their emergency functions
- ensuring workers have a clear purpose and goals and strategies to achieve those goals
- encouraging and expecting workers to watch out for each other



Preparing for Potential Events

Managers and supervisors can help prepare workers to deal with the stress by ensuring they know the signs of stress:

Mental Signs of Stress

- limited attention span and difficulty concentrating
- difficulty remembering instructions
- disorientation or confusion and difficulty communicating thoughts
- inability to engage in problem-solving and difficulty making decisions
- inability to relax when off duty
- loss of objectivity
- becoming easily frustrated
- unnecessary risk-taking
- being uncharacteristically argumentative
- refusal to follow orders or to leave the scene

Physical Signs of Stress

- tremors/headaches/nausea
- colds or flu-like symptoms
- tunnel vision/muffled hearing
- difficulty maintaining balance
- unusual clumsiness

Managing Stress During an Event

Managers and supervisors can assist workers with managing stress by:

- observing workers and assessing them for symptoms of stress regularly
- addressing indications of stress as soon as possible
- rotating workers between low-,mid-, and high-stress tasks
- encouraging workers to take advantage of scheduled breaks and rest times

Knowledge Check 9

You are having a discussion with your site vice president (SVP) about the preparedness of your department to handle significant emergencies at your station. He asks you how you plan to ensure your workers' performance will not be negatively affected by stress while responding during an event. *Click the statements below that you would make to assure the SVP that you have properly addressed this concern.*

- ☐ Everyone in the department has been trained on their emergency roles, responsibilities, and functions.
- ☐ You have coached your workers on being flexible and told them that they will be assigned some work that they have never done before. You encouraged them not to worry about unfamiliar duties because you have faith in their abilities.
- ☐ You plan on regularly observing members of your department and assessing them for stress during the event.
- ☐ Workers in your department have been trained on the signs of stress and have been coached to watch out for each other.
- ☐ You have told your workers to focus on the work and not to worry if there is a significant emergency. If they do feel stressed, they should just focus that much more on their work.

Check Answer

Knowledge Check 9

You are having a discussion with your site vice president (SVP) about the preparedness of your department to handle significant emergencies at your station. He asks you how you plan to ensure your workers' performance will not be negatively affected by stress while responding during an event. *Click the statements below that you would make to assure the SVP that you have properly addressed this concern.*

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- [x] You plan on regularly observing members of your department and assessing them for stress during the event.
- [x] Workers in your department have been trained on the signs of stress and have been coached to watch out for each other.
- [ ] You have told y… is a significant eme… much more on their w…

Check Answer

That's correct. It is important that workers are trained on their roles and responsibilities, that they know the signs of stress and watch out for each other, and that you, as their manager, regularly observe and assess them for stress.

Key Points / Summary

Managers and supervisors can help **prepare** workers to deal with the stress associated with significant events by:

- ensuring workers are trained on and clearly understand their emergency roles, responsibilities, and functions
- ensuring workers are given a clear purpose, goals and direction to achieve assigned tasks
- encouraging workers to watch out for each other

Managers, supervisors, and workers need to **recognize the signs of stress:**

Signs of Mental Stress

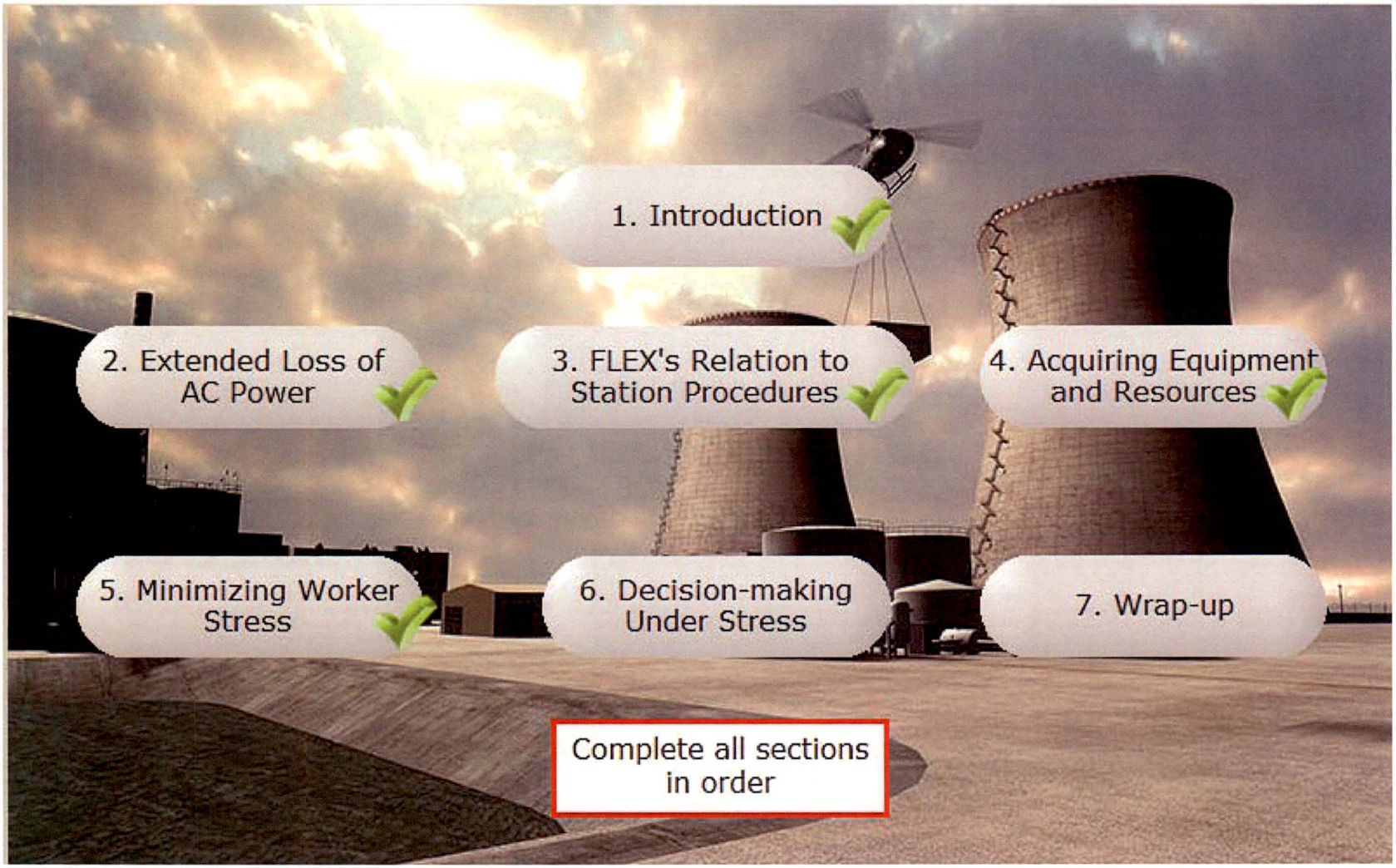
- limited attention span and difficulty concentrating, remembering instructions and engaging in problem-solving
- easily frustrated and argumentative

Signs of Physical Stress

- tremors/headaches/nausea
- muffled hearing
- unusual clumsiness

Managers and supervisors can help workers **deal with stress** by:

- regularly observing workers for symptoms of stress
- taking action when workers exhibit signs of stress
- rotating workers between low-,mid-, and high-stress tasks
- encouraging workers to take advantage of scheduled breaks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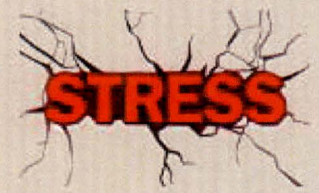
Decision-Making Under Stress

Decision-Making Under Stress

How Stress Affects Decision Making

How does stress affect your ability to make decisions? Click STRESS to find out.



Makes you susceptible to:

- sensory overload
- perception distortion

Which affects your mental state.

Click here to find out how.

You:

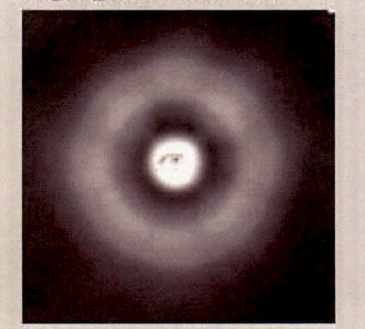
- are less able to focus
- are less tolerant of ambiguity
- feel the need to escape
- tend toward aggression

Which affects your decision making ability.

Click here to find out how.

Stress can cause you to:

- get tunnel vision
- put immediate needs before long-range considerations
- suffer from group think
- make risky choices
- be more likely to engage in conflict

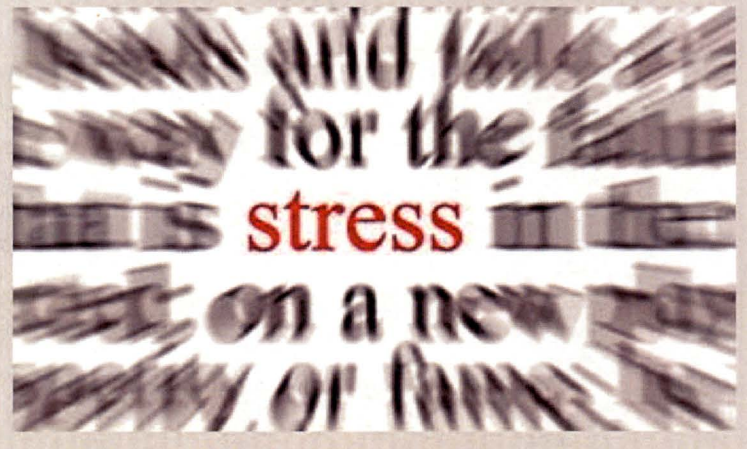


Challenges

Decision-makers will likely face significant challenges during a beyond-design-basis external event. Some of these challenges include:

- limited time
- lack of information
- changing conditions
- conflicting priorities
- rapidly changing needs
- ambiguous needs
- limited resources and people

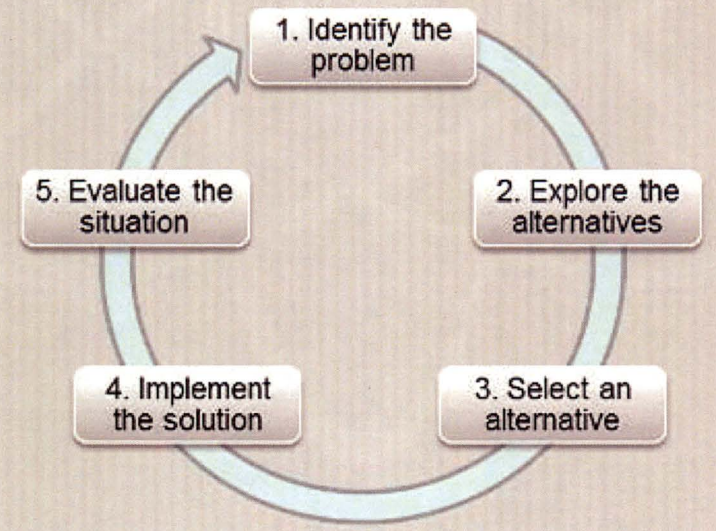
Each of these challenges brings with it another layer of



Problem Solving and Decision-Making Models

Every day, leaders in our industry and others successfully use many problem solving and decision-making models. Most involve the analysis of all potential solutions and the selection of the best based in specific criteria.

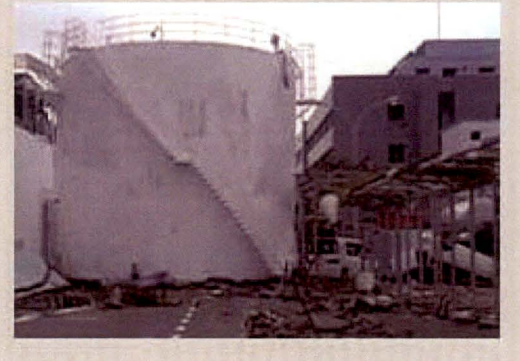
These processes can be time-consuming and might not be practical in some emergency situations.



Problem-Solving/Decision-Making at the Army War College

Rather than a fixed problem solving and decision-making model, let's consider some techniques based on curriculum used at the US Army War College to help leaders make better decisions in even the most challenging of situations; the field of combat.

The techniques presented in the Army War College support military leaders who are required to make decisions in combat situations that are volatile, uncertain, complex, and ambiguous. These techniques will also be effective in conditions that will likely be encountered while responding to a beyond-design-basis event.



Solving Problems and Making Decisions

What can you do to make better decisions under these kinds of conditions? Below are the techniques suggested by the Army War college curriculum:

Click on each for an explanation

- Focus your team on providing relevant information.
- Communicate precisely and listen actively.
- Encourage input and challenge from the team.
- Seek a timely and workable plan, not necessarily a permanent solution.
- Explain the intent and expected outcome of the direction you provide.
- Delegate, including authority to adjust the plan during implementation.
- Use short-term goal setting.

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All the facts related to a situation aren't always necessary to a make a good decision. Only those relevant to the decision are necessary. With a lot going on, you might not have the time needed determine what information is and what is not relevant to the decision needed. This is especially true when you are not physically present or able to observe a situation. In situations like this, use your team to your greatest advantage. Instead of having your team provide you with all the data available, have the team evaluate the situation, determine what is and isn't relevant and provide that information to you.

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- Focus your team on providing relevant information.
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- Delegate, including authority to adjust the plan during implementation.
- Use short-term goal setting.

Don't use buzz words or catch phrases. Make directions as simple, direct, and clear as possible. Ask clarifying questions and seek to understand others' input.

Solving Problems and Making Decisions

What can you do to make better decisions under these kinds of conditions? Below are the techniques suggested by the Army War college curriculum:

Click on each for an explanation

- Focus your team on providing relevant information.
- Communicate precisely and listen actively.
- Encourage input and challenge from the team.
- Seek a timely and workable plan, not necessarily a permanent solution.
- Explain the intent and expected outcome of the direction you provide.
- Delegate, including authority to adjust the plan during implementation.
- Use short-term goal setting.

Encourage diverse perspectives and expertise to be communicated. Consider assigning someone on the team to act as competition to whatever plan is being considered. Such a "devil's advocate" can get the rest of the team to move beyond "that won't happen" to "what if this occurs?"

Solving Problems and Making Decisions

What can you do to make better decisions under these kinds of conditions? Below are the techniques suggested by the Army War college curriculum:

Click on each for an explanation

- Focus your team on providing relevant information.
- Communicate precisely and listen actively.
- Encourage input and challenge from the team.
- Seek a timely and workable plan, not necessarily a permanent solution.
- Explain the intent and expected outcome of the direction you provide.
- Delegate, including authority to adjust the plan during implementation.
- Use short-term goal setting.

In an emergency situation, time is often of the essence. Your goal is to deal with the current situation and although you hope it never happens again, spending time to prevent that now, may not be the best use of your limited resources. Do what needs to be done and leave the corrective actions to prevent recurrence for later.

Solving Problems and Making Decisions

What can you do to make better decisions under these kinds of conditions? Below are the techniques suggested by the Army War college curriculum:

Click on each for an explanation

- Focus your team on providing relevant information.
- Communicate precisely and listen actively.
- Encourage input and challenge from the team.
- Seek a timely and workable plan, not necessarily a permanent solution.
- Explain the intent and expected outcome of the direction you provide.
- Delegate, including authority to adjust the plan during implementation.
- Use short-term goal setting.

To do that, make sure that your team understands your overall purpose with any direction you give, that they are aware of any key tasks that you expect to be included in their actions, and that they understand what "good" or success looks like. With that information rather than just direction with no context, if difficulties are encountered, they will have the ability to respond in a way that you would want them to without always having to come back to you for further direction.

Solving Problems and Making Decisions

What can you do to make better decisions under these kinds of conditions? Below are the techniques suggested by the Army War college curriculum:

Click on each for an explanation

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Detailed plans are great, but need flexibility especially in emergency situations where circumstances are likely to change. Recognize that response actions cannot be micro-managed; when they must change, accept workable solutions from any team member.

Solving Problems and Making Decisions

What can you do to make better decisions under these kinds of conditions? Below are the techniques suggested by the Army War college curriculum:

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- Focus your team on providing relevant information.
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- Use short-term goal setting.

When implementing complex or long-term actions in a changing environment, set up a series of incremental objectives that when complete, will demonstrate the progress that is being made and help maintain momentum.

Knowledge Check 10

Which of the following might indicate that stress is having a negative impact on your ability to solve problems and make decisions?

Check all that apply and then click the Check Answer button.

- ☐ You are becoming argumentative when people don't agree with you.
- ☐ You get disappointed when things don't work out as planned.
- ☐ You miss your family because you have had to remain at the plant for three nights in a row.
- ☐ You are tending to go along with others' decisions even when you don't agree with the solution.
- ☐ You are having difficulty analyzing information that usually is no problem for you.

Check Answer

Knowledge Check 10

Which of the following might indicate that stress is having a negative impact on your ability to solve problems and make decisions?

Check all that apply and then click the Check Answer button.

- [x] You are becoming argumentative when people don't agree with you.
- [ ] You get disappointed when things don't work out as planned.
- [ ] You miss your family because you have had to remain at the plant for three nights in a row.
- [x] You are tending to go along with others' decisions even when you don't agree with the solution.
- [x] You are having difficulty analyzing information that usually is no problem for you.

Check Answer

That's correct. Being aggressive (over-argumentative), going along with a decision you don't agree with, and having difficulty focusing are negative effects of stress. Being disappointed when things don't work out and missing your family when you are away are both normal reactions.

Knowledge Check 11

Which of the following are examples of techniques for making better decisions while in a stressful situation?

Check all that apply and then click the Check Answer button.

- ☐ Bill thinks through problems methodically, then waits a while to let possible solutions "soak".
- ☐ John bounces his ideas off someone whom he has asked specifically to try and poke holes in them.
- ☐ Marty gets as much data from the field information as he can. He wants data, not the opinions of his field workers, figuring that the more data he has, the better decisions he'll make.
- ☐ Ann asks those providing information to also provide their own assessment of the situation.
- ☐ Charlie quickly goes with the first solution that comes to mind.

Check Answer

Knowledge Check 11

Which of the following are examples of techniques for making better decisions while in a stressful situation?

Check all that apply and then click the Check Answer button.

- ☐ Bill thinks through problems methodically, then waits a while to let possible solutions "soak".
- ☑ John bounces his ideas off someone whom he has asked specifically to try and poke holes in them.
- ☐ Marty gets as much data from the field information as he can. He wants data, not the opinions of his field workers, figuring that the more data he has, the better decisions he'll make.
- ☑ Ann asks those providing information to also provide their own assessment of the situation.
- ☐ Charlie quickly

Check Answer

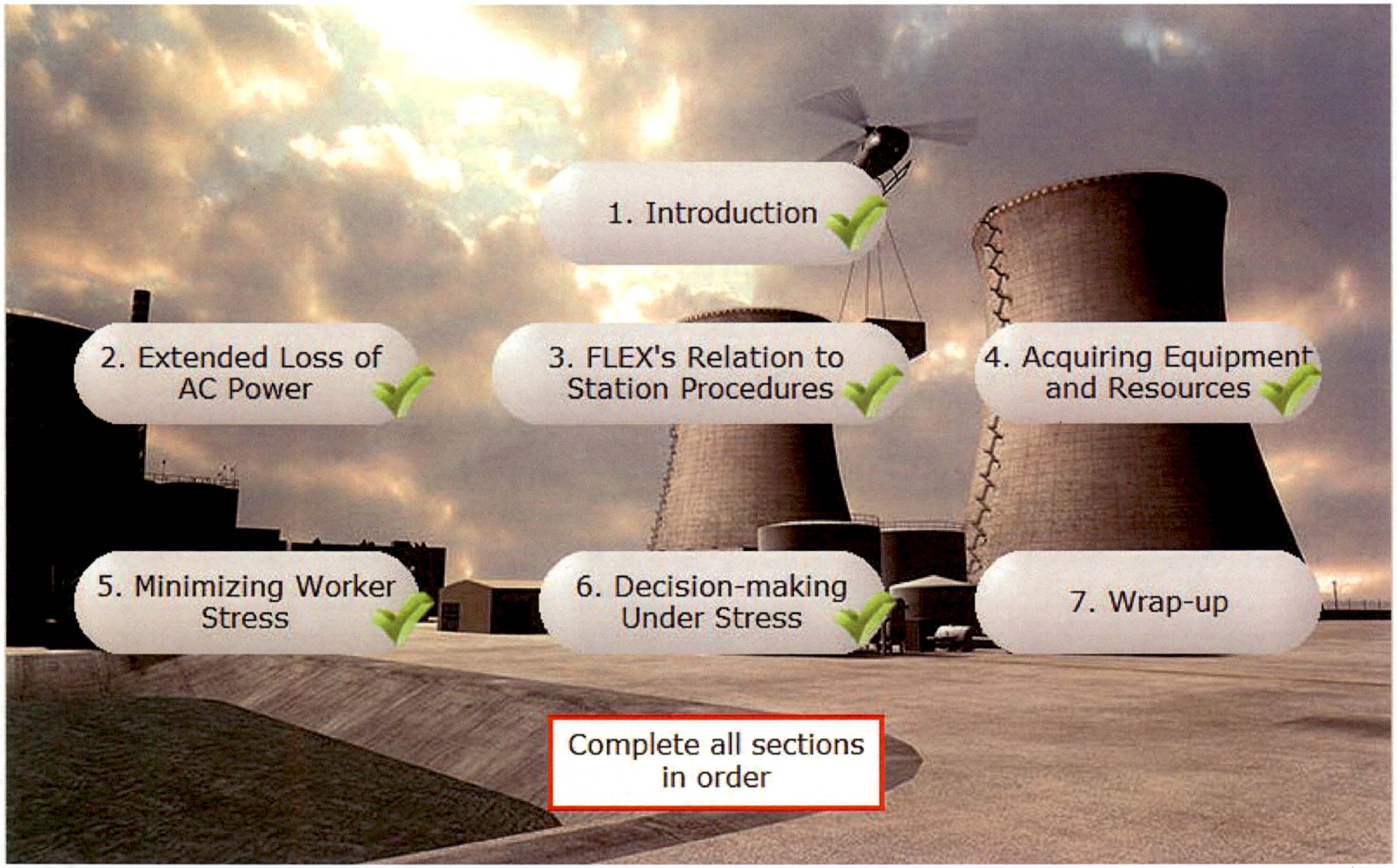
That's correct. John's use of a devil's advocate forces him to not only determine if he has a good decision but to identify any contingency actions that might have to go with his decision as well. Ann requires those providing information and data to give her their assessment of the situation as well.

Key Points / Summary

Stress impacts our ability to make decisions. It allows our senses to be more easily overloaded, distorts our perceptions, contributes to conflict and makes us less able to work productively and effectively.

To improve your ability to make decisions in stressful situations:

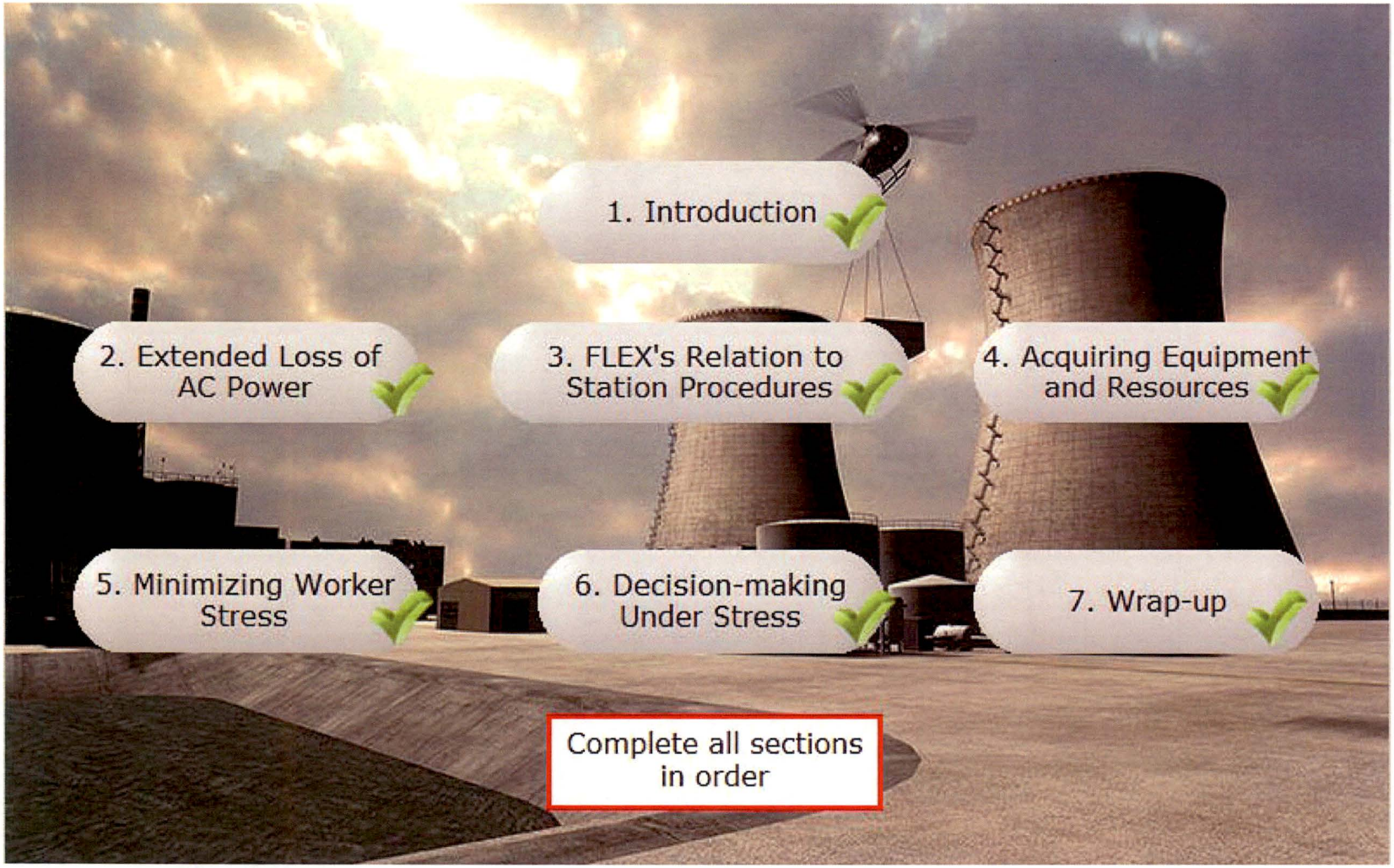
- Focus your team on providing relevant information.
- Communicate precisely and listen actively.
- Encourage input and challenge from the team.
- Seek a timely and workable plan, not necessarily a permanent solution.
- Explain the intent and expected outcome of the direction you provide.
- Delegate, including authority to adjust the plan during implementation.
- Use short-term goal setting.


1. Introduction
2. Extended Loss of AC Power
3. FLEX's Relation to Station Procedures
4. Acquiring Equipment and Resources
5. Minimizing Worker Stress
6. Decision-making Under Stress
7. Wrap-up
Complete all sections in order

FLEX
Responding to Beyond-Design Basis External Events

Congratulations, you have completed the course. During this course you have learned:

- FLEX is an effective response to any event that results in an ELAP and loss of normal access to the ultimate heat sink.
- The FLEX strategies are integrated into existing plant procedure hierarchies providing an additional layer of protection designed to prevent fuel damage and uncontrolled releases of radioactivity.
- Equipment needed to implement the FLEX strategies is now available on-site at each station and from National SAFER Response Centers (NSRCs).
- NSRCs, INPO and other facilities ensure that equipment and resources are readily available to facilities suffering from a beyond-design-basis external event (BDBEE).
- Organizations and individuals must prepare for and manage stress in order to be successful under the stressful conditions of a BDBEE.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7. Wrap-up
Complete all sections in order

Document Based Instruction Guide Template

Course/Program:	Extensive Damage Mitigation / All Training	Course Code:	N-CL-ALL-FLEX-TRACTOR
Title:	Extensive Damage Mitigation Strategy: FLEX Tractor Operation	Guide #:	N-CL-ALL-FLEX-TRACTOR
Author:	David Williams	Revision/Date:	000 / 03/09/15
Revision By:	N/A	Est. Teach Time:	8.0 hrs.
Responsible site:			
Qualified Nuclear Engineer Review (If applicable):		Date:	
Training Supervision Review:		Date:	
Program Owner Approval:		Date:	

PREREQUISITES: None

OBJECTIVES:

1) Using the operator's manual: Describe the function and operation of the features unique to the FLEX Tractor to include:
   a) Manufacturer inspection guide.
   b) Instrument cluster indications.
   c) Driver controls.
   d) Driving: starting, braking, transmission operation, and vehicle loading.
   e) Diesel engine operation cold/hot weather consideration.
   f) Debris removal and front end loader operation.
2) Using the operator's manual: Perform the necessary actions for the deployment and use of the FLEX Tractor.

EVALUATION METHOD & PASSING CRITERIA: A graded exercise utilizing attachments 1 and 2, in a manner designated by the instructor will be conducted. Attachment 3 may be used by the instructor as a guide for setting up the evaluation. **Passing criteria** is a "SAT" rating on attachment 1 with no "1" ratings on attachment 2.

REFERENCES:
1. New Holland T5.115 operators manual
2. SA-AA-127
3. 29CFR1910.178

ATTACHMENTS: *(List any additional attachments here. Copies of the attachments, other than the references, should be attached to the original of the DBIG for retention.) (all included in DBIG)*
1. FLEX TRACTOR: FLEX Tractor Operation Exercise Sheet
2. TQ-AA-223-F050 (attachment 6) Common Fundamentals Scoring Sheet.
3. Driving exercise map. (for reference as a guide only)

COMMITMENTS: None

I. INTRODUCTION

A. **Introduce yourself:**

1. Name
2. Position/responsibilities
3. Background/qualifications

B. **Introduce subject matter**

1. Procedure title/subject matter:
   FLEX TRACTOR Operation.
2. Basis for instruction (check one)
   - ☒ New procedure/subject matter
   - ☐ Revised procedure/subject matter
   - ☐ Existing procedure/subject matter review
   - ☐ Other:

   Comments: **NOTE:** *Comments section provided for amplifying/clarifying remarks (such as new equipment, general aspects of a procedure revision, description of incident/deficient performance, etc.).*

3. Establish relevance, importance, and purpose of topic

   This training is to introduce the knowledge necessary to identify key features and to demonstrate proper techniques for safe operation of the FLEX TRACTOR which may be called upon for implementation of FLEX strategies.

C. **Present Objectives:**

1) Using the operator's manual: Describe the function and operation of the features unique to the FLEX Tractor to include:
   a) Manufacturer inspection guide.
   b) Instrument cluster indications.
   c) Driver controls.
   d) Driving: starting, braking, transmission operation, and vehicle loading.
   e) Diesel engine operation cold/hot weather consideration.
   f) Debris removal and front end loader operation.

2) Using the operator's manual: Perform the necessary actions for the deployment and use of the FLEX Tractor.

II. DESCRIPTION OF PROCEDURE/SUBJECT MATTER

Included for instructor reference.

SOER 10-2:

1. Supervisors did not fulfill their expected oversight roles by becoming engaged in conducting activities.
2. Workers did not fully understand or anticipate the effects of their actions.
3. Risk was not recognized or was inappropriately accepted by individuals or the organization without sufficient engagement of others in decision-making.
4. Repetitive and long-standing issues were tolerated, and the consequences of not addressing them were not recognized.
5. Subtle declines in standards and performance went unnoticed because managers and supervisors were not sufficiently engaged in activities.

IER 11-3:

1. Monitoring plant indications and conditions closely
2. Controlling plant evolutions precisely
3. Operating the plant with a conservative bias
4. Working effectively as a team
5. Having a solid understanding of plant design, engineering principles, and sciences

A. Using a copy of the owner's manual review the manufacturer recommended preoperational inspection checks for identification of key indications for safe operation of the FLEX TRACTOR.

B. Using a copy of the owner's manual review the key driver indications included on the instrument cluster unique to the FLEX TRACTOR.

C. Using a copy of the owner's manual review the controls available for use while operating the FLEX TRACTOR. Note: The power take off (PTO) is not currently being used in conjunction with FLEX actions.

D. Using a copy of the operators manual review the section regarding Driving the FLEX TRACTOR to include Starting, Braking, Transmission Operation, and Vehicle Loading requirements.

E. Using a copy of the owner's manual discuss the unique features of operation of a Diesel Engine during Cold/Hot weather conditions.

F. Using a copy of the operators manual review the section regarding front end loader operation.

G. Perform evaluation per attachments 1 and 2. This satisfies task number 430601.66-Operate the FLEX Tractor

III. REVIEW AND EVALUATION

A. **Summarize the training materials including major changes.**

B. **Ask questions to assess student achievement of objectives.**

C. **Reinforce the relevance, importance, and purpose of the topic.**

D. **Ensure the trainees are aware how the objectives will be evaluated.**

Title: **Extensive Damage Mitigation Strategy:** **Tractor Operation**	**Component ID:** **N-CL-ALL-FLEX-TRACTOR**

Trainee Name: _____ **Date:** _____

Trainee Employee ID Number: _____

Instructor: _____

A. Assessment Criteria

Assessment Criteria	SAT/UNSAT/ NA
Daily Inspection Checklist completed.	
Engine started correctly (NA if tractor is running)	
Securely fastened seat belt	
Avoided operating the industrial tractor near ditches, embankments, and holes.	
Reduced speed when turning, crossing slopes, and on rough, slick, or muddy surfaces.	
Safe operation when using front loader for debris removal. (i.e., did not risk dumping the load on themselves or in an unsafe location)	
Watched where they were going, especially when towing a trailer, on roads, around trees, at intersections, and in high traffic areas.	
Did not permit others to ride. (Exception: Folding seat can be used for instructional purposes only.)	
Operated the industrial truck smoothly, avoided jerky turns, starts and stops.	
Performed hitching operations as recommended by the operator's manual.	
Set brakes securely and use park lock if available when industrial tractor was stopped.	
Never exceeded the rated capacity of the industrial tractor.	
Proper use of safety spotter	
Kept all body parts inside of industrial tractor during operation.	
Ensured the load was stable and secure prior to moving.	
Engine shut off correctly. (NA if not the last student)	

B. Exercise Completion

	SAT	Trainee has satisfactorily performed the assessment criteria.
	UNSAT	Trainee has NOT satisfactorily performed assessment criteria. -Refer to comments

Instructor Comments: Instructor Signature / Date:

Trainee Comments:		
Entered into tracking database by:		Date:

Attachment 2
Common Fundamentals Scoring Sheet

The threshold for failing the evaluation is any rating of "1" in any single fundamental

INDUSTRIAL SAFETY	**3**	**2**	**1**	**N/A**
(SA-AA-0301)	All applicable safety practices were followed including the selection and use of PPE	Not Applicable Satisfactory performance requires full compliance	Did not fully comply with industrial safety procedural requirements	This core work practice is not applicable
REACTOR SAFETY	**3**	**2**	**1**	**N/A**
I.	Maintains the plant IAW procedures Maintain component measurements and clearances within spec. Recognize and adheres to all regulatory requirements and environmental permits Practice effective decision-making consistent with INPO guidelines Understands plant consequences of every action taken Believe instrument response and indication unless proven otherwise Maintains a questioning attitude Raises safety concerns to supervisor	Minor instances of allowing plant parameters to go outside of operational limits, but quickly returns parameter to within limits Minor instances of not understanding plant response	Does not follow procedures Does not exhibit a questioning attitude Does not understand plant response before or after operator action By-passes safety concerns	This core work practice is not applicable
RWP COMPLIANCE	**3**	**2**	**1**	**N/A**
(RP-AA-403)	All requirements of the applicable RWP were met	Not Applicable Satisfactory performance requires full compliance	Did not fully comply with the applicable RWP requirements	This core work practice is not applicable
RADWORK PRACTICES	**3**	**2**	**1**	**N/A**
II. (RP-AA-400)	Work practices in contaminated areas minimized the potential to contaminate clean areas, and good ALARA practices were employed.	Radiological work practices were adequate but opportunities existed to improve contamination control or minimize dose	Contamination was spread due to poor radiological work practices OR the evaluation was terminated due to a failure to apply ALARA practices	This core work practice is not applicable
PROCEDURE USE	**3**	**2**	**1**	**N/A**
(HU-AA-104-101)	All applicable procedures were followed in accordance with their level of use, prerequisites were verified, precautions / limitations were adhered to, and steps were completed / initialed in the correct sequence. The correct revisions were used.	Not applicable Satisfactory performance requires full compliance	Applicable procedures were not followed in accordance with their level of use, OR prerequisites were not verified, OR precautions / limitations were not adhered to, OR steps were not completed / initialed in the correct sequence OR an incorrect revision was used	This core work practice is not applicable
PLACEKEEPING	**3**	**2**	**1**	**N/A**
(HU-AA-104-101)	Placekeeping was properly performed for all procedure steps.	Placekeeping was performed inconsistently	Failure to place keep resulted in a step missed or performed out of sequence.	This core work practice is not applicable

Attachment 2
Common Fundamentals Scoring Sheet

OOPS	3	2	1	N/A
(HU-AA-101)	Stopped and involved supervision in all cases when outside of procedures, parameters, or processes	Knowledge-based error by not applying OOPS in a situation where the probability or consequence of an error was low, without adverse consequence.	Failure to apply OOPS OR evaluation was terminated to prevent personnel injury, damage to equipment, or jeopardizing plant operation.	This core work practice is not applicable
2 MINUTE DRILL	**3**	**2**	**1**	**N/A**
(HU-AA-101)	2 Minute Drill was performed as required and answers to the questions were properly answered.	2 Minute Drill performed as required, however, opportunities exist to improve rigor in answering the 2 Minute Drill questions OR the 2 Minute Drill not performed but errors avoided by proper application of other Core Work Practices	Failure to perform 2 Minute Drill resulted in a TPE failure that could have been prevented by properly answering the 2 Minute Drill questions.	This core work practice is not applicable
THREE-WAY COMMUNICATION	**3**	**2**	**1**	**N/A**
(HU-AA-101)	Used and enforced three way communications consistently.	Minor lapses in using three way communications and/or enforcing three way communications from others.	Failed to use or enforce 3-part communication during a majority of the instances when required.	This core work practice is not applicable
PHONETIC ALPHABET	**3**	**2**	**1**	**N/A**
(HU-AA-101)	Used and enforced use of the phonetic alphabet consistently.	Minor lapses in using the phonetic alphabet and/or enforcing phonetic alphabet use by others.	Failed to use or enforce the phonetic alphabet during a majority of the instances required.	This core work practice is not applicable
INDEPENDENT VERIFICATION	**3**	**2**	**1**	**N/A**
(HU-AA-101)	The trainee requested an independent verification, identified the correct components, and performed / simulated the correct performer actions in all instances where an independent verification was required.	The trainee requested an independent verification each time it was required but did not demonstrate performer actions to the satisfaction of the evaluator. No configuration control issues resulted from these performance gaps.	The trainee's failure to request an independent verification when required would have resulted in a configuration control event	This core work practice is not applicable

Attachment 2
Common Fundamentals Scoring Sheet

CONCURRENT VERIFICATION	3	2	1	N/A
(HU-AA-101)	Requested a CV, identified the correct components, and performed / simulated the correct performer actions in all instances where CV required.	Requested a CV as required in all instances where CV required, but inconsistently or unclearly demonstrate performer actions to expectations. No incorrect component manipulations resulted from these performance gaps.	Failure to request a concurrent verification when required resulted in an attempt to manipulate the wrong plant component or to perform an incorrect action.	This core work practice is not applicable
PEER CHECK	**3**	**2**	**1**	**N/A**
(HU-AA-101)	Peer checks were performed and properly executed each time they were required to be used	Peer checks were used inconsistently or were not always properly executed when performed	Failure to request a peer check when required; attempted to operate wrong plant component or place component in the wrong position	This core work practice is not applicable
FIRST CHECK	**3**	**2**	**1**	**N/A**
(HU-AA-101)	First checks were performed and properly executed each time they were required to be used	First checks were used inconsistently or were not always properly executed when performed	Failure to request a first check resulted in an attempt to operate or work on the wrong plant component.	This core work practice is not applicable
SELF-CHECK	**3**	**2**	**1**	**N/A**
(HU-AA-101)	Self-Check was visibly demonstrated and was used consistently	Occasional lapses in the use of self-check or the visible demonstration of self-check occurred	Failure to use self-check or rigorously perform self-check; attempted to use the wrong plant component or perform an incorrect component manipulation	This core work practice is not applicable
FLAGGING & ROBUST BARRIERS	**3**	**2**	**1**	**N/A**
	Flagging and/or robust operational barriers were used appropriately to minimize the chance of a component mispositioning	Opportunities were missed to use flagging and/or operational barriers to reduce the potential for a component mispositioning.	Attempted to manipulate the wrong plant component that could have been prevented through the proper use of flagging or robust barriers.	This core work practice is not applicable
2-FOOT ZONE RULE	**3**	**2**	**1**	**N/A**
(HU-AA-101)	Risk & awareness of inadvertently bumping components in a 2-foot zone discussed in the PJB or at the job site by 2-Minute Drill.	PJB or 2 Minute Drill not used to prevent inadvertent bumping of components in a 2-foot zone but proper precautions were taken during work in the zone.	Evaluator stopped the TPE due to concerns that trainee performance in a 2-foot zone could lead to a mispositioning	This core work practice is not applicable

Attachment 2
Common Fundamentals Scoring Sheet

FOREIGN MATERIAL	**3**	**2**	**1**	**N/A**
(MA-AA-716-008)	Station approved methods were used to minimize the potential for foreign material to damage equipment.	Some non-preferred methods were used to minimize the potential for foreign material to damage equipment.	Work practices did not prevent or created the potential for foreign material to cause damage.	This core work practice is not applicable
HOUSEKEEPING	**3**	**2**	**1**	**N/A**
(MA-AA-716—026)	Expected housekeeping standards were maintained during the performance of the TPE.	Some lapses in expected housekeeping standards, but did not create a significant industrial safety issue.	Lapses in housekeeping standards during TPE created a significant industrial safety hazard.	This core work practice is not applicable
FIRE PREVENTION	**3**	**2**	**1**	**N/A**
	All fire prevention requirements associated with the task were properly implemented.	Minor gaps in the application of fire prevention requirements, but did not create a significant increase in the probability or consequences of a fire.	Lapses in the application of fire prevention requirements created a significant increase in the probability or the consequences of a fire	This core work practice is not applicable
SECURITY PRACTICES	**3**	**2**	**1**	**N/A**
	All security requirements were met	Some improvements in security work practices were identified, e.g. failing to consistently ensure security doors are closed and latched after entering or exiting an area	A violation of a security rules occurred that required compensatory action by a security officer, e.g. security door left ajar or intentionally propped open	This core work practice is not applicable
CONDITION REPORTING & RESOLUTION	**3**	**2**	**1**	**N/A**
(LS-AA-125)	Initiates Condition Reports for problems and concerns/notifies supervisor Perform thorough and insightful apparent, common and root cause evaluations Identify and implement timely corrective actions to prevent reoccurrence Verify effectiveness of corrective actions Review NERs and take appropriate action	Writes a Condition Report for problems or concerns – does not notify supervisor Evaluations miss some contributing causes of the event	Does not write a Condition Report nor notify supervisor for identified problem or concern	This core work practice is not applicable
SELF ASSESSMENT & CONTINUOUS IMPROVEMENT	**3**	**2**	**1**	**N/A**
(LS-AA-126)	Self-Critical Prevents complacency, identifies opportunities for improvement Reinforces desired behaviors and correct weaknesses Performs benchmarking and review OPEX, institutionalizes best practices Monitor for and take action on adverse performance trends Identify, document, share and act to improve upon lessons learned	Identifies performance not meeting expectations Documents results on correct forms Some resistance to feedback	Does not correct improper behavior Does not accept improvement feedback (defensive, has excuses for inadequate performance)	This core work practice is not applicable

Attachment 2
Common Fundamentals Scoring Sheet

PERSONAL RESPONSIBILITY & ACCOUNTABILITY	3	2	1	N/A
	Own your performance: results and behaviors Report to work on time and fit for duty Maintains safe and professional dress Reports problems to supervisor Work hours within regulator guidelines Expect and be receptive to feedback from field observations Reviews own work – sign to verify quality and content Provides and seeks timely feedback to improve performance Know your developmental areas and take action to improve Ensure your working file reflects your performance Ensure you receive routine formal appraisals	Minor instances of resistance to feedback Can improve on the feedback given to others Reviews own work but minor deficiencies exist	Does not report problems to supervision – accepts substandard performance Extremely resistant to feedback Does not review own work Does not provide performance feedback to others	This core work practice is not applicable
TRAINING & QUALIFICATION	3	2	1	N/A
	Participates in training; comes to learn Reports to training on time and returns from breaks on time Be accountable for your training performance and professional conduct Wears appropriate PPE to training labs Learn the fundamentals Drill to gain proficiency Provide mentoring to those in need Provides meaningful feedback on the quality of training Verify qualification prior to performing work tasks Identify training needs to improve performance Pursues additional skills to broaden qualifications and enhance professional development	Minor instances of being late for class/return from break	Consistently late for class and returning from breaks Performs/assigns an unqualified individual a task Does not participate in training (i.e., will not answer questions, degrades others, etc.) Did not wear appropriate PPE to training labs	This core work practice is not applicable
TEAMWORK	3	2	1	N/A
	Openly communicates and encourages active participation Invite and respect team member input and advice Foster a questioning attitude Share and apply personal lessons learned and industry OPEX Address issues with data and/or technical rationale Constructively challenge ideas, actions & decisions of team members Prevents groupthink and poor decisions by utilizing devil's advocacy, gate keeping, and a what-if mentality Conduct critiques of team performance	Minor instances of inappropriate "push back" Minor instances of not treating all team members with respect	Is not a functioning member of the team (tag along) Challenges group for arguments sake (no technical rationale)	This core work practice is not applicable

Attachment 2
Common Fundamentals Scoring Sheet

WORK MANAGEMENT	3	2	1	N/A
(WC-AA-101, OU-AA-101)	Participate in and be accountable to our work control process Reviews schedule for conflicts, challenge to job duration, preparations and interferences Performs pre-job walk downs to verify required support, preparation and equipment staging Verify equipment is properly taken out of service and isolated Works to the schedule – start and complete each job on time Notifies supervision of a scheduled job delay greater than 10 minutes Notifies WWM or OCC of a scheduled job delay greater than 30 minutes Incorporates lessons learned to improve future job performance	Minor instances of schedule delay Minor instances of pre-job walk down missing discrepancies	Job is delayed and WWM, OCC is not notified Pre job walk down was not performed Equipment taken out of service is not adequately isolated	This core work practice is not applicable

ATTACHMENT 2

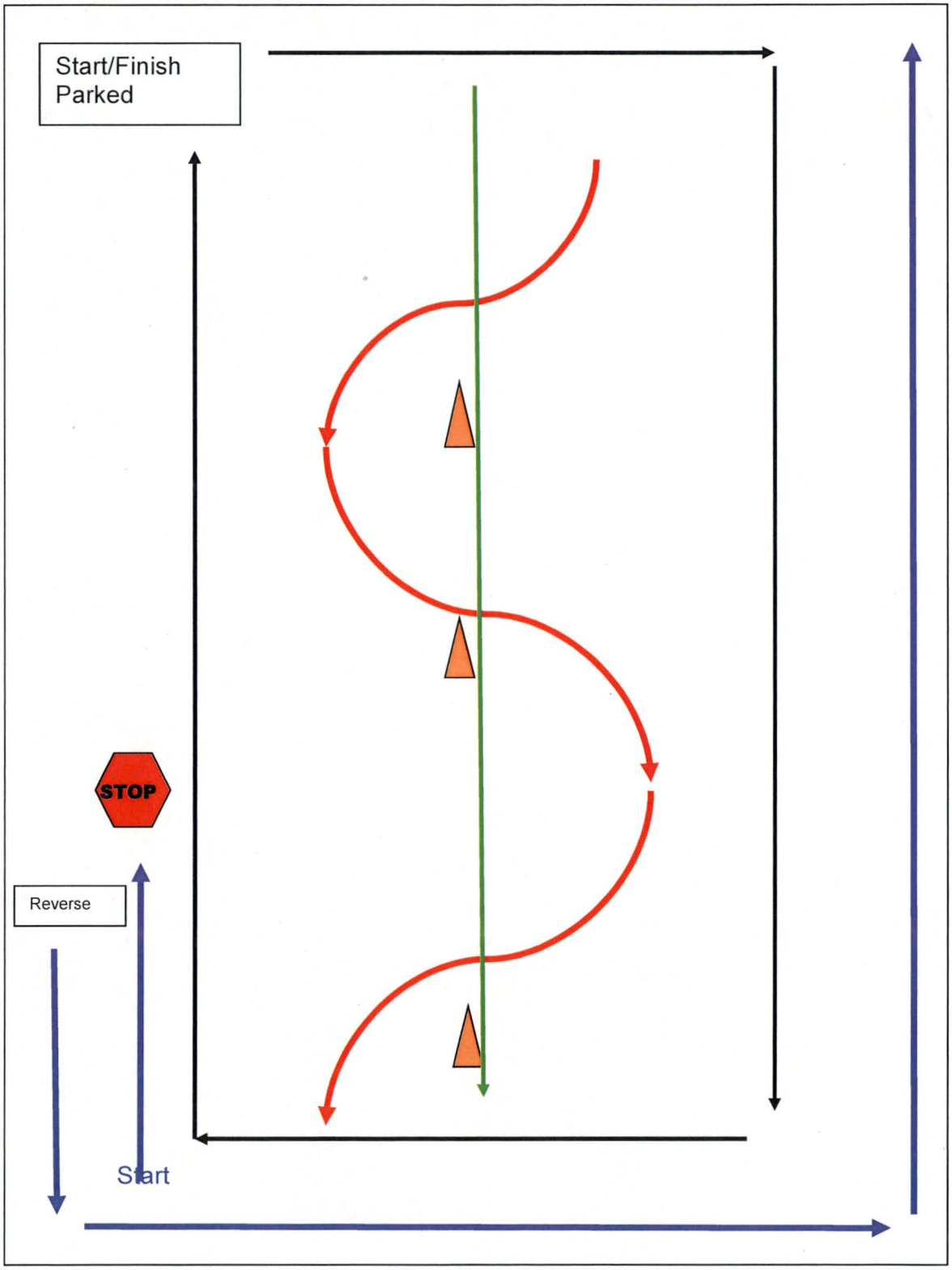
Ratings: 3 = Satisfactory performance
2 = Minimum standards met with opportunities for improvement
1 = Unsatisfactory performance

Any rating of 1 results in a TPE failure; all applicable fundamentals rated 2 or 3 is satisfactory.

NOTES:

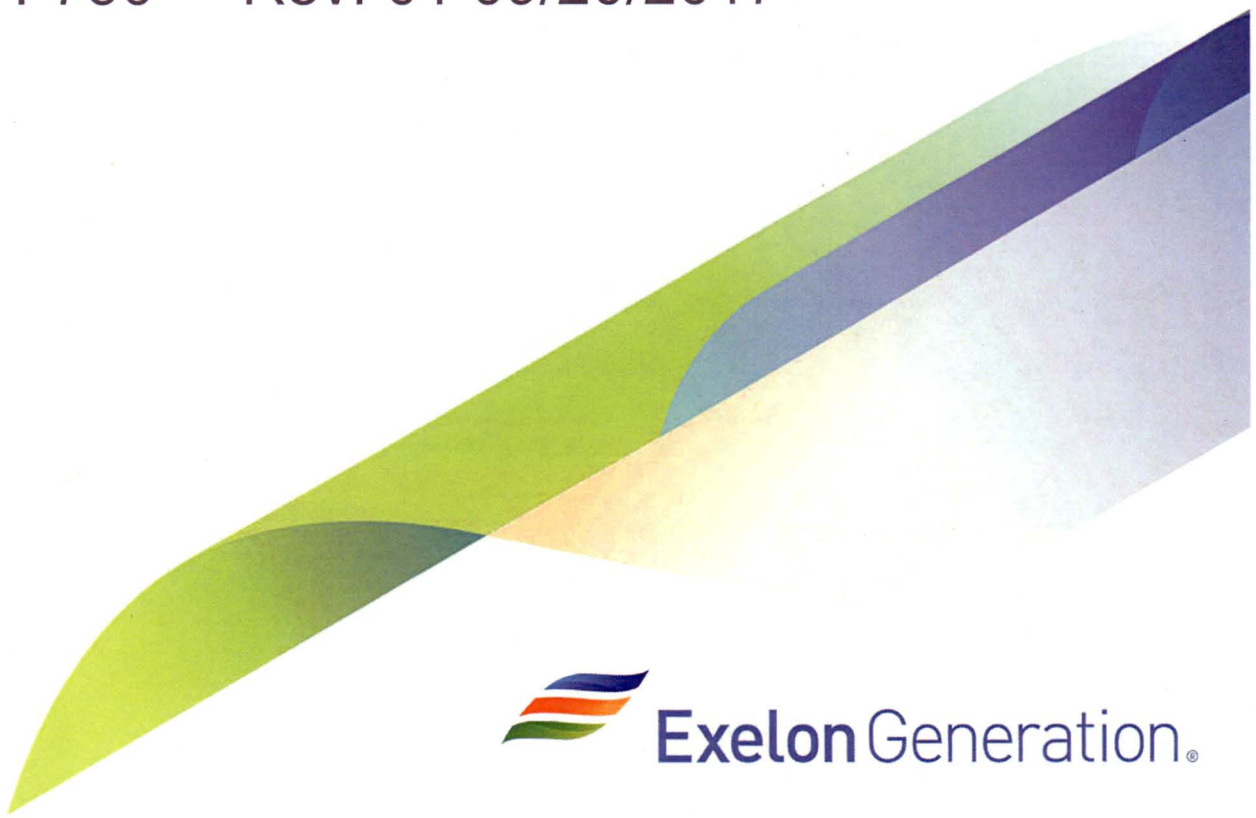
1. See CM-4 in TQ-AA-203 – the common fundamentals in this attachment cannot be changed without a change in the referenced commitment.
2. Attachment 6 may be extracted for use in qualification books or any similar material as long as the content and evaluation standard are preserved.

Utilizing a suitable area in an empty parking lot, or other safe area, set up the driving exam to conduct the FLEX TRACTOR exercise. Utilize the orange construction cones in a layout simular to the map below to conduct the graded exercise from page 1. Enusure use of the attached loader to move/pickup the orange cones(debris) from the travel path is conducted.



FLEX F750 Training Exercise

N-CL-ALL-FLEX-F750 Rev. 01 09/20/2017



Exelon Generation®

OBJECTIVES

- Review the Illinois rules of the road for non-CDL vehicles.
- Describe the function and operation of the features unique to the FLEX F750 to include:
  - Manufacturer vehicle inspection guide.
  - Instrument Cluster indications.
  - Driver Controls.
  - Driving: Starting, Braking, Transmission operation, and Vehicle Loading.
  - Diesel Engine operation Cold/Hot weather consideration
  - Debris removal plow operation
  - B.5.b pump refuel operation
  - Locking differential operation
  - Hydraulic lift gate operation
- Perform the necessary actions to Locate, Operate and Conduct activities necessary for the deployment and use of the FLEX F750.

OPEX

- Over the last several years, several instances of equipment damage have occurred while performing a towing operation using the FLEX F-750 towing the B.5.b pump trailer. The F-750 lift gate has guide rails installed that are in the line of fire of the of the B.5.b pump trailer hitch and may make contact during a sharp turn. This can lead to equipment damage and must be avoided. Due to this risk of equipment damage, the following additional measure MUST be used when performing towing operations for training:

OPEX Cont.

- Do not perform backing evolutions using the FLEX F-750 with the B.5.b pump trailer attached as it poses an unnecessary safety risk.. While transporting the B.5.b pump trailer is permissible using the FLEX F-750, perform towing operations in the forward direction only. Backing operation is to be used only in an emergency situation when no other towing vehicles are available for use.

- Prior to performing towing operations,
  - Perform a Pre-Job Briefing IAW HU-AA-1211
  - Review applicable Operator Fundamentals IAW OP-AA-101-113
  - Review SA-AA-127 for Motor vehicle operation and spotter responsibilities. Additionally:
    - The use of 2 spotters will be utilized when performing towing operations and shall be assigned during the Pre-Job Briefing.
    - Spotters will utilize hands-free communication devices to maintain contact with the vehicle driver in addition to using hand signals.

- Perform an appropriate 2-minute drill at the job site prior to commencing vehicle operation.

What do we use this thing for?

- Currently it is the tool designated for debris removal during an extreme damaging event.
- It is also the portable refueling truck for the B.5.b pump.
- Additionally it may be used for deployment of the emergency generators.

- The F-750 should not be used for deployment of the B.5.b pump unless in an emergency situation with no other options available. The B.5.b pump should be deployed using one of the two F-250s available for towing operation.

Equipment Operator Fundamentals

Monitoring

- Perform detailed rounds to detect actual or potential problems that could hamper plant operation, being attentive to all equipment, not just what logs require.
- Identify degrading parameter and equipment trends.
- Monitor parameters at a frequency based on their importance and historical equipment performance.
- Validate parameters through multiple independent means, if available, avoiding undue focus on any single indicator.

Control

- Operate equipment with approved procedures, clearances, or other documents as appropriate to maintain proper configuration control and reduce the potential for operational events.
- Anticipate the impact of component operation prior to its operation, and then verify that the expected effects occur during and following the operation.
- Maintain systems and parameters within established limits to ensure that systems are not operated outside of the intended design and that operating margins are not eroded.
- Prepare for operational evolutions to ensure that the effects of actions are understood and that abnormal conditions can be addressed.
- Aggressively identify incorrect or inadequate procedures.
- Apply human performance tools effectively when operating plant equipment.
- Know which steps result in undesirable consequences if not performed correctly.
- Ensure changes in system status are logged to help ensure that others understand the changes in plant conditions over time.

Conservatism

- Question conditions and situations that are out of the ordinary, unexpected, or that could erode margins to operating the plant conservatively, and resolve before continuing.
- Maintain system design margins, do not wait to reach limits, and get supervision involved early.
- Understand plant conditions and know the appropriate action to take when control of the plant or component cannot be maintained, including stopping the evolution and involving supervision.
- Maintain nuclear safety as your overriding priority.
- Maintain a low threshold for identifying problems.

Teamwork

- Notify the CR staff prior to initiating and upon completion of actions that affect control room parameters.
- Ensure the CR authorizes/is aware of plant manipulations.
- Ask questions to obtain necessary information.
- Advocate your position when an action is being taken that appears inappropriate or not expected for given conditions.
- Understand your role when performing coordinated evolutions.
- Perform accurate and detailed shift turnovers, including changes in system alignments and component status to ensure that oncoming.

Knowledge

- Maintain integrated plant knowledge.
- Understand the how and why of your actions prior to proceeding.
- Understand system and component purposes and design.
- Before operating a component, confirm an understanding of its function and interactions with other components.
- Regularly review system drawings and diagrams with the intention of refreshing basic knowledge.

WHAT DO I DO NOW?

- Clinton Power Station has been struck by an EF5 Tornado. The TSC Director is implementing actions for deployment of the B.5.b pump, but excessive amounts of debris are blocking the equipment travel path.

LETS Get Started.

Take 10 Minutes and review the
Illinois Rules of the Road
for Non-CDL vehicles.

What are some of the Specifications of the FLEX F750?

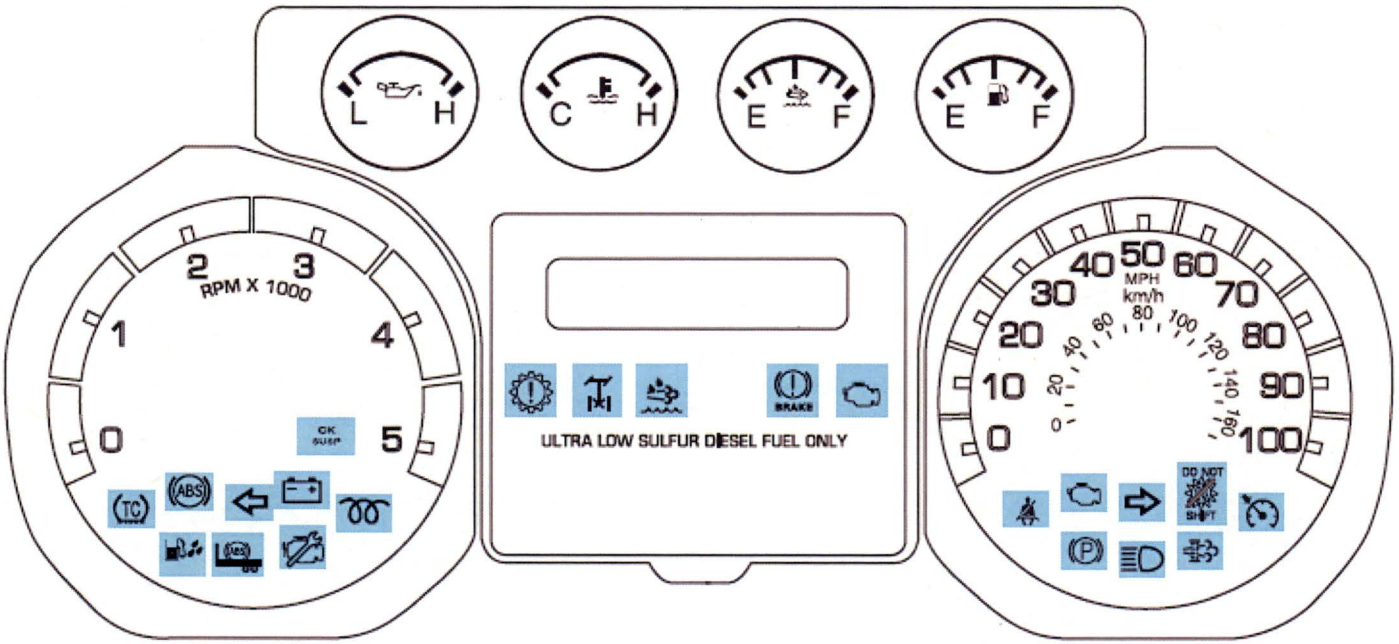
- Ford F-750 4x2 with locking rear differential
- Cummins engine: 260 hp with 660 ft-lbs torque
- Allison-3500 Automatic Transmission
- 33 Feet long (with the plow)
- 25999 GVWR (This is why you do not need a CDL)
- Equipped with ABS Air Brakes
- 2 – 118 gal B.5.b Diesel storage tanks (not for use in the F750)
- PTO driven Fuel Transfer Pump
- Power Lift Gate
- 10 foot wide debris removal plow
- Cost: Sticker ~$84K and another $64K in options added

Manufacturers Recommended Inspection – prior to use.

Review the Manufacturers Recommended Inspection Guide

Starts on page 10 of the Owners Manual.

Instruments and Indications



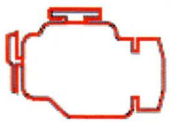
Indications

- Lights you need to know about unique to this truck:

Air Brake System Warning light: <60 psi in air reservoirs

Driving the F750 with this Warning Light on will significantly decrease in braking performance.

Wait To Start light: Diesel engines need the intake air heated for cold weather starts. This indication light means the intake air heater is warming up. The colder it is outside the longer the heater will be energized. When the light goes OUT it is safe to start the F750.



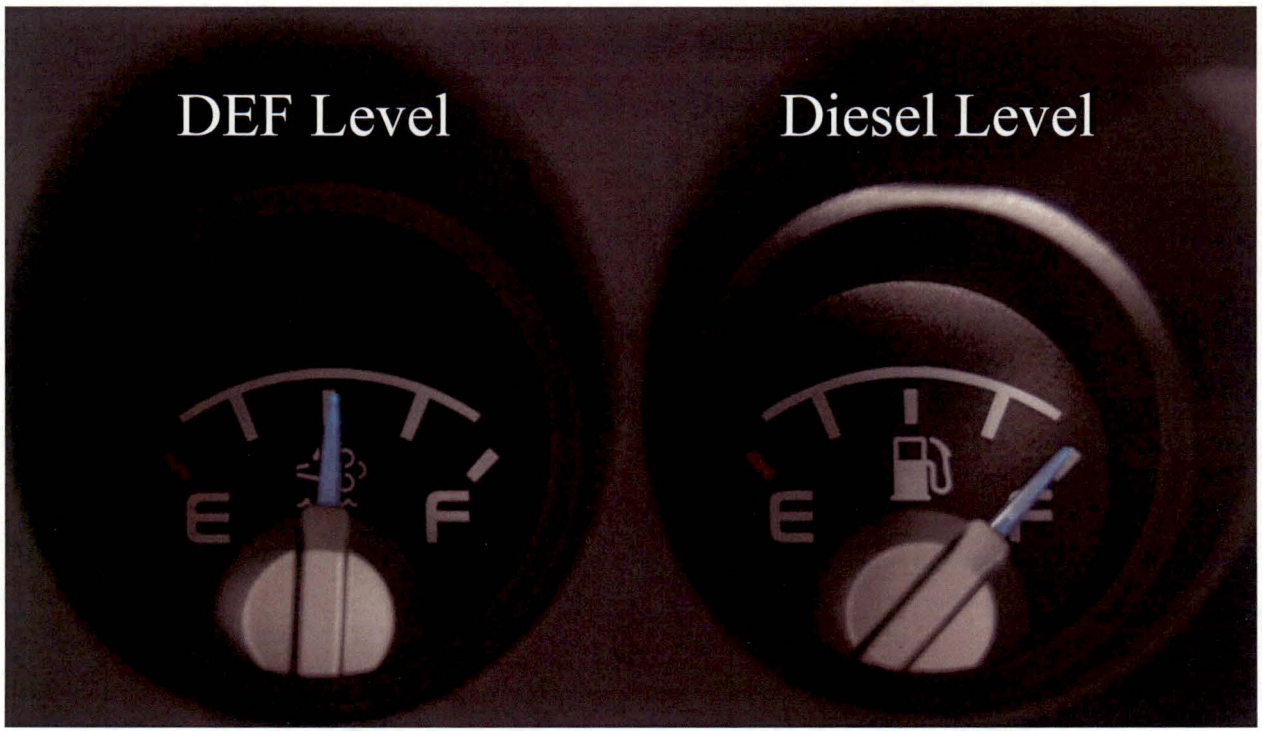
Stop Engine Warning Light: If this light begins flashing the engine may automatically shutdown in as little as 20 seconds. If this occurs the engine may be restarted and run for 30 seconds at a time until the problem is corrected.

Allison Transmission Check light: Transmission check system has detected a problem and my limit the ability of the transmission to shift gears. The shift display indicator my blink depending on the severity.

Indications - continued

- Lights you need to know about unique to this truck:

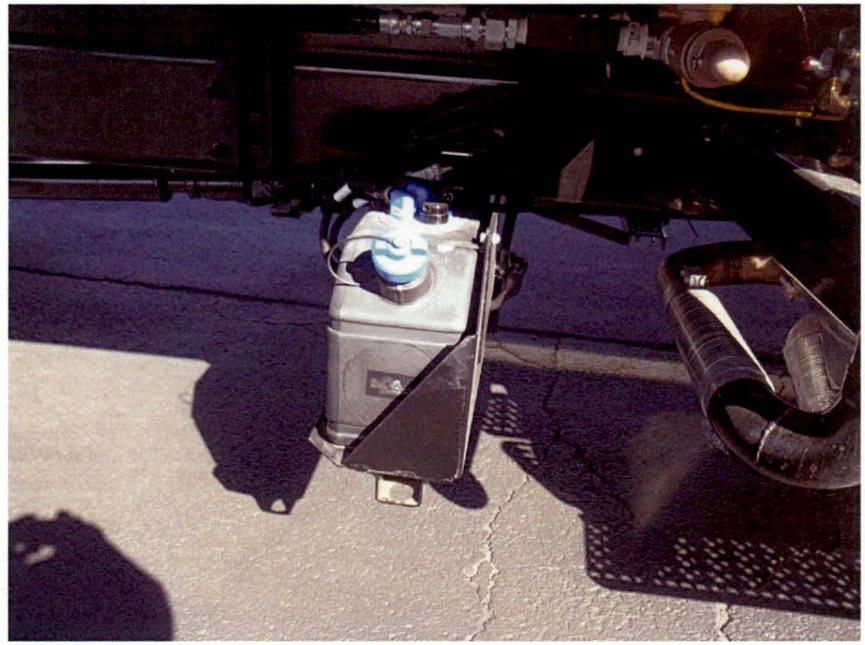
Diesel Exhaust Fluid low light: Illuminates when DEF tank is <0.5 gal. If DEF tank is allowed to empty the engine automatically reduces output power by 40%.



Diesel Exhaust Fluid Tank

5 Gallon DEF fluid (passenger side): Non-hazardous fluid 67.5% DI water and 32.5% Urea.

Use: Sprayed into the exhaust and combines with a catalyst to break down NOx to nitrogen and water.

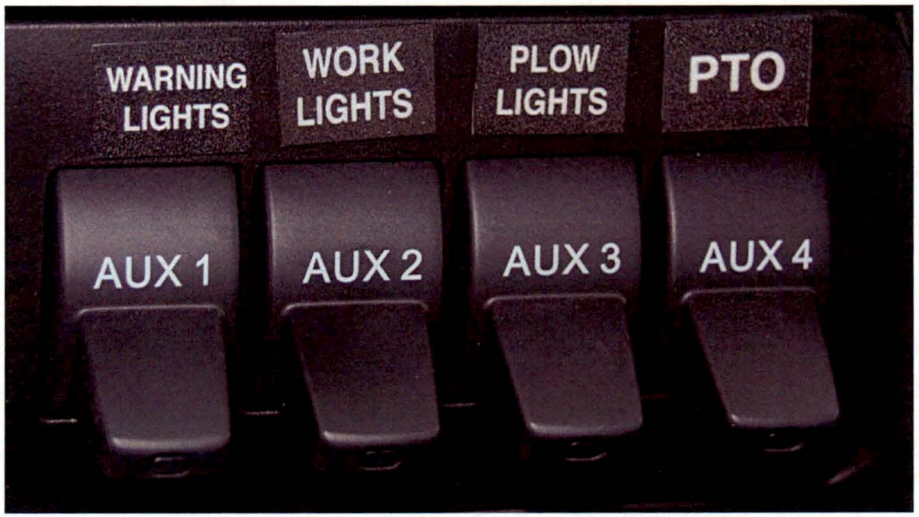


Diesel Tank

- 50 Gallon capacity under the steps of the driver side of the truck.
- Uses regular diesel fuel from the refuel station near the NTD building.
- Do Not Fill the F750 with the RED Diesel from the onboard 118 gal. tanks.

Driver Controls

Upfitter Switches



- Warning Lights are Flashing Yellow lights on the front and rear of the Truck. To be used when performing debris removal activities.
- Work Lights: Fixed White LED lights mounted above truck cab for extra illumination on the sides of the vehicle.
- Plow Lights: Normally on via the Daytime Running Lights of the F750, but may be manually turned on if needed.
- PTO: Turns on the PTO to turn the onboard Fuel Transfer Pump for B.5.b pump refuel operation.

Where is the Gear Shifter?

Allison-3500 Automatic Transmission

Push button controls located near Driver Right Knee.

Panel includes Parking Brake and Trailer Air Brake Supply(not needed)

Transmission is a 6 speed Automatic

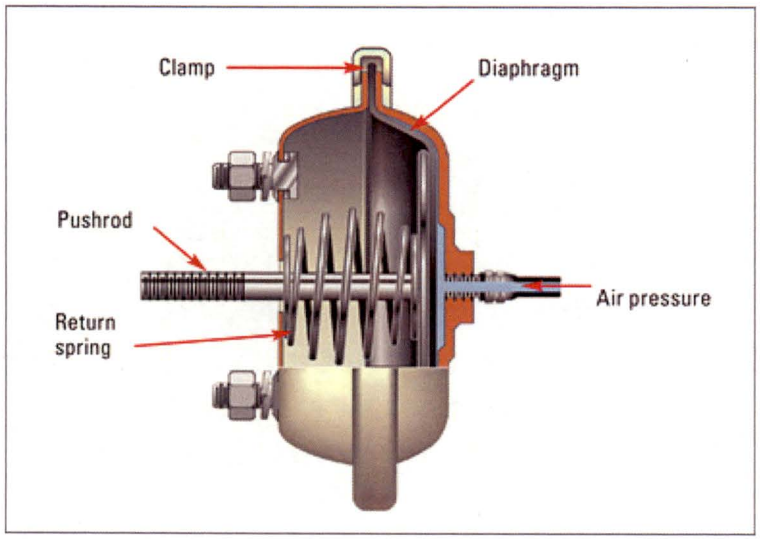
Mode switch will cycle transmission Between Economy and Power Modes

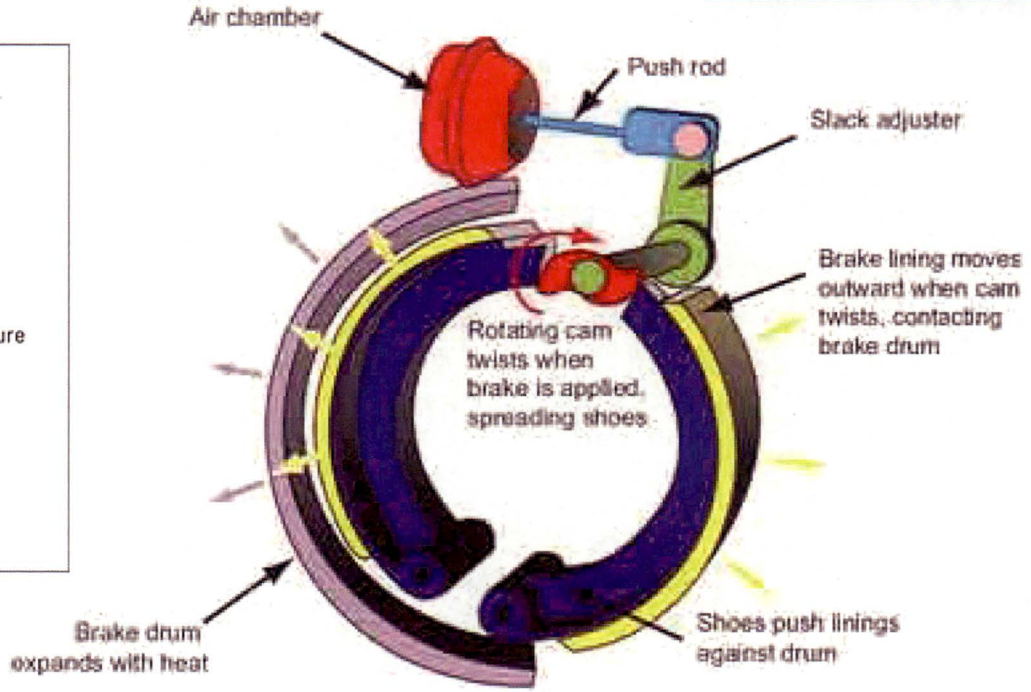
Indicator will display which gear the transmission is in. Up and Down arrows manually select which gear the transmission is in.

THERE IS NO PARK POSITION FOR THIS TRANSMISSION. SELECT NEUTRAL AND ENGAGE THE PARKING BRAKE WHEN GETTING OUT OF THE TRUCK!!

AIR Brakes – Why is it so special?

- Air brakes utilize a release of the air pressure to apply the brakes.
- No AIR = Parking Brakes Applied.
- Normal Pressure 100-120 psi.
- Air Reservoir Low pressure indication and alarm at 60 psi.
- At 30 psi the Parking Brake will automatically apply the Parking Brakes.



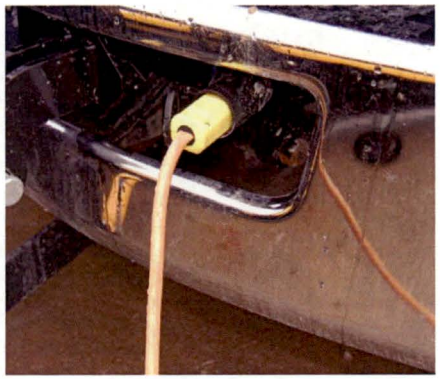


Diesel Engine Starting

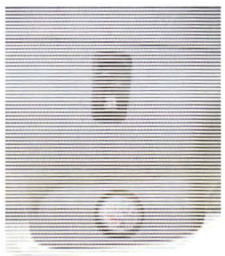
- WARNING NEVER START A DIESEL ENGINE IN THE PRESENCE OF FLAMABLE GASES. ENGINE SPEED COULD INCREASE AND BECOME UNCONTROLABLE, EVEN WITH THE KEY TURNED TO OFF.
- Do not press the accelerator during engine starting or engine damage could occur.
- Turn off all electrical accessories: Headlights, working lights, PTO etc.
- Ensure the transmission is in N – Neutral and Parking Brake is applied (pulled out)
- Turn the key to the ON position; indicator checks, gage checks.
- THIS TRUCK IS EQUIPPED WITH A INTAKE AIR HEATER. NEVER USE STARTING FLUID WHEN STARTING THE FLEX F750.
- When the air intake heater indicator turns off  turn the key to the Start position, when the engine starts release the key.
- IF the engine does not start after 30 seconds of cranking, allow the starter to cool for 2 minutes before attempting again.
- Verify proper indication of oil pressure, air brake pressure is rising (Brake warning light and audible alarm may sound for 30-45 seconds after starting until pressure >70 psi), and all other warning lights are out.
- Allow engine to idle (do not increase RPM if the air intake heater light is on) for 3-5 minutes before operating under full load.

Weather Considerations

Cold Weather:



- Air temperatures below - 4F the engine block heater should be continuously used.
- Cold Weather idling will not heat the engine to its normal Operating temperature. Long periods of idling under these conditions will cause buildup of carbon and rust on valve stems.



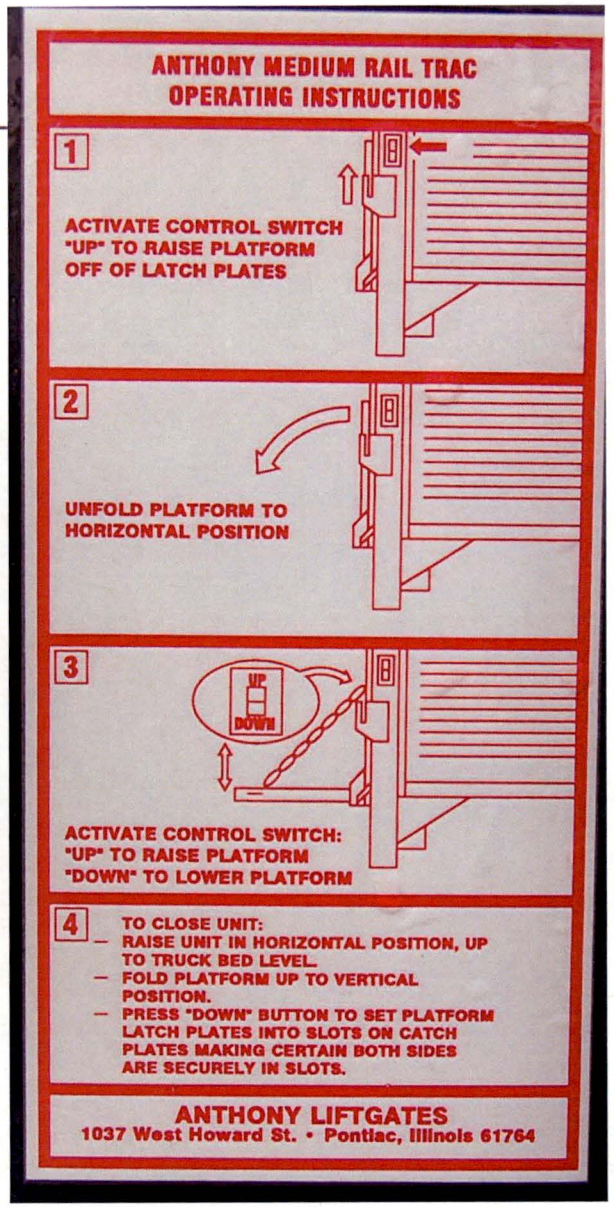
- The FLEX F750 is equipped with an electric Detroit Locking Rear differential. Ensure road conditions require locker use (Deep Snow, Ice, Mud etc). Using the locking differential on dry pavement will cause damage to the rear gear assembly. Control switch is located on the roof section near the electrical voltage meter.

Hot Weather:

- Above normal coolant temperatures may be observed while driving in a transmission gear ratio which lugs the engine. Engine speed should be increased by manually selecting a lower drive gear.

Loading Considerations

- The FLEX F750 is equipped with an Anthony Lift Gate capable of lifting 2500 Lbs. Directions for use are mounted next to the control switch on the back passengers side.



What are all of those hoses for?

FLEX F750 is equipped with 2 Hannay electric rewind fuel dispensing hoses reels.

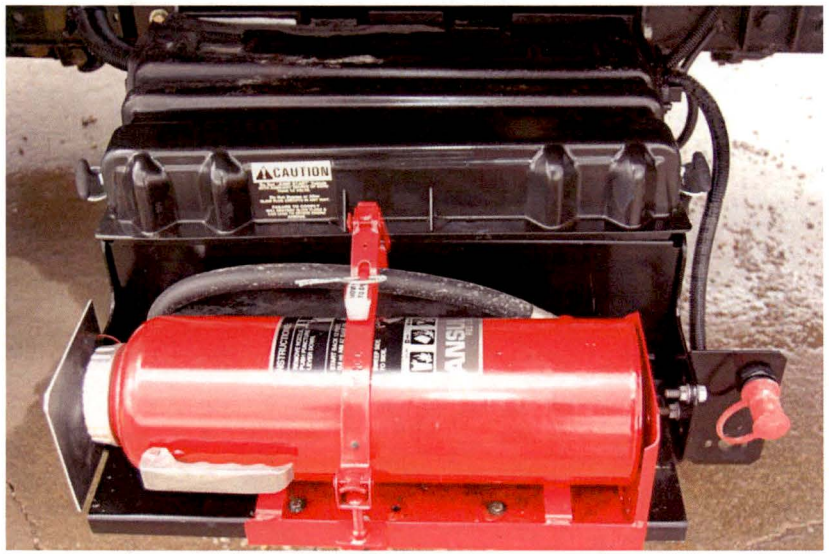
Each reel is plumed into the PTO drive Fuel Transfer Pump.

The removable Fuel Nozzle is in the locker below the Forward hose reel.

FLEX F750 is equipped with 2 Hannay portable hoses reel carts that may be used to deploy an additional 50 feet of fuel transfer hose each.

Power Take Off (PTO) for fuel transfer operation

- FLEX F750 is equipped with a PTO driven Blackmer fuel transfer pump which requires the engine to be in operation for transfer operations.
- There are 2 – 118 gallon fuel storage tanks in the back of the F750.
- Each tank is cross connected to the transfer pump. An Isolation valve is located under the Driver side tank if the Driver side tank is desired to be isolated.
- A PKP Emergency Fire Extinguisher is located under the Driver Side tank in case of Fire.



Meyer Plow Operation

- Equipped with a 10 foot wide Plow for use of debris removal situations.
- Blade location and position utilizes 4 foot long position poles.
- Controlled from the cab of the Truck during operation.

Exelon Generation

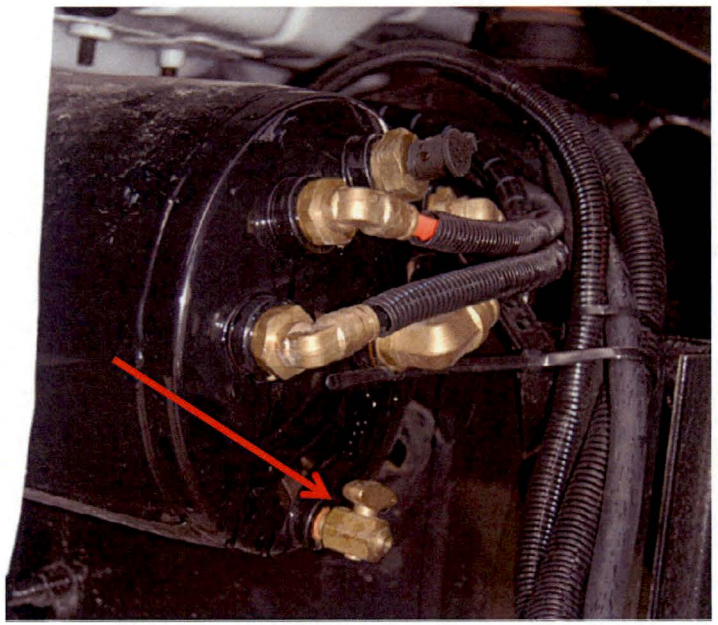
Positionable Beacon Light

- Mounted on top of the Cab. Rotates 360 degrees and tilts up and down. Controlled from the control switch in the cab (near drivers left knee) or remotely from the remote control.

Exelon Generation

What do I do when I am done using the F750?

- Following heavy operation the manufacturer recommends that the engine be allowed to cool at idle running speed for 3-5 minutes.
- Place the transmission in N – Neutral, and set the parking brake (pulled out).
- Lower the Plow to the ground.
- Turn off the Engine.
- Open each Brake Reservoir drain valves (one on each side of the truck) and depressurize the Air Brakes.
- Close the valve when tank is depressurized.



Now Lets Practice.

- Thank you for your classroom participation.

QUESTIONS?

Document Based Instruction Guide

Course/Program:	LORT/EOC/EOI/ILT	Course Code:	N-CL-OPS-DB-FLEX -ELECT
Title:	FLEX ELECTRICAL CONNECTIONS COMMUNICATIONS INSTRUMENTATION AND VENTILATION PROCEDURES	Guide #:	N-CL-OPS-DB-FLEX -ELECT
Author:	Donald Salmi	Revision/Date:	000 / 03/10/15
Revision By:	N/A	Est. Teach Time:	4.0 hrs.
Responsible Site: Clinton			
Qualified Nuclear Engineer Review (If applicable):		Date:	
Training Supervision Review:		Date:	
Program Owner Approval:		Date:	

PREREQUISITES:
1. None

OBJECTIVES: Implement FLEX (ELAP) procedures:

Objective #	Objective Description
430601.01	Implement FLEX (ELAP) procedures
430601.03	Deploy FLEX cables between the AC source and the Control Building West stairwell riser.
430601.04	Deploy FLEX cables between the Control Building West stairwell riser and the target Unit Substation.
430601.05	Connect/Disconnect the cable cam-lock connectors
430601.06	Operate the FLEX diesel generator.
430601.07	Energize a Unit Substation from the Control Building West stairwell riser disconnect switches during an ELAP
430601.08	Energize MCCs from the Unit Substations during an ELAP

Objective #	Objective Description
430601.09	Startup the Division 1 Battery Charger
430601.10	Cross-tie Unit Subs 1L and 1M to supply AB MCC 1E (alternate means).
430601.11	Startup the safety-related Swing Battery Charger and supply DC MCC 1A (alternate means).
430601.12	Deploy the external AC source cable (RRC generator).
430601.13	Deploy the alternate external AC source cable (RRC generator).
430601.30	Setup FLEX ventilation in the RCIC room.
430601.31	Setup FLEX ventilation in the MCR.
430601.32	Setup FLEX ventilation in the Battery rooms
430601.33	Setup FLEX ventilation in the Inverter rooms
430601.34	Setup FLEX ventilation in the Switchgear rooms
430601.35	Setup FLEX ventilation in the RHR Heat Exchanger room.
430601.36	Setup FLEX ventilation on the Fuel Handling floor
430601.37	Setup a sound-powered phone network
430601.38	Operate the Ops Radio in Talk-Around mode
430601.45	Obtain Suppression Pool, Containment, and Drywell temperature readings
430601.46	Repower 120VAC Regulated Distribution Panel E2(F2) for NSPS alternate source
430601.47	Obtain RPV level and pressure readings locally
430601.48	Install FLEX fitting on the DG Starting Air Compressor skid

Objective #	Objective Description
430601.49	Connect air hose between the DG Starting Air Compressor skid and the ADS Backup Air Bottle charging line
430601.50	Supply the ADS Backup Air Bottles from a DG Starting Air Compressor
430601.51	Operate RCIC for RPV injection during an ELAP
430601.52	Shift RCIC suction to an RHR heat exchanger during an ELAP
430601.53	Operate SF for RPV injection during an ELAP
430601.56	Lineup an SF pump for Suppression Pool Cooling during an ELAP
430601.58	Repower Hydrogen Igniter Distribution Panel 1A(1B).
430601.59	Perform manual containment isolation
430601.60	Lineup SX for Spent Fuel Pool makeup during an ELAP
430601.61	Make 1SX016A(B) throttleable
430601.64	Vent H2 from Main generator
430601.65	Installing a MCC panel insert to supply a portable power cart

EVALUATION METHOD & PASSING CRITERIA: Properly perform or simulate FLEX tasks given applicable 4306.01 FLEX/ELAP procedures or conduct simulator/classroom tabletop exercise.

REFERENCES: *(List the procedure/subject matter here. If not readily available through other means such as EDMS, include the revision number or date of the procedure.)*

1. 4306.01, Clinton ELAP Flowchart
2. 4306.01C001, FLEX Cable Deployment
3. 4306.01P001, FLEX Electrical Connections
4. 4306.01C002, FLEX Hose Deployment
5. 4306.01P002, FLEX UHS Water Supply
6. 4306.01C003, BDBEE Damage Assessment
7. 4306.01P003, FLEX Suppression Pool Cooling
8. 4306.01P004, FLEX Low Pressure RPV Makeup
9. 4306.01P005, FLEX RCIC Operation
10. 4306.01P006, FLEX Suppression Pool Makeup
11. 4306.01P007, FLEX Spent Fuel Pool Makeup
12. 4306.01P008, FLEX Diesel Fuel Oil Supply
13. 4306.01P009, FLEX ADS Air Supply
14. 4306.01P010, FLEX Ventilation
15. 4306.01P012, FLEX Communications
16. 4306.01P019, FLEX Dewatering
17. 4306.01P021, FLEX Main Generator Venting

ATTACHMENTS: None

COMMITMENTS: None

I. INTRODUCTION

A. Introduce yourself:

1. Name
2. Position/responsibilities
3. Background/qualifications

B. Introduce subject matter

1. Procedure title/subject matter:
   N-CL-OPS-DB- FLEX-ELECT: FLEX electrical connections, communications, instrumentation, and ventilation procedures
2. Basis for instruction (check one)
   - ☒ New procedure/subject matter
   - ☐ Revised procedure/subject matter
   - ☐ Existing procedure/subject matter review
   - ☐ Other:

   Comments: **NOTE:** FLEX/ELAP procedures and equipment are new to the industry and CPS as driven by events following the tsunami impact on the Fukishima plant in Japan.

3. Establish relevance, importance, and purpose of topic

   Due to the Beyond Design Basis External Event (BDBEE) at the Fukishima nuclear power station in Japan; the NRC directed the US nuclear industry to develop procedures, processes, and strategies to cope with a BDBEE. This course will provide Operators with the skills to implement electrical, communication, instrumentation, and ventilations strategies for Clinton Power Station.

C. **Present Objectives:** (list below)

430601.01	Implement FLEX (ELAP) procedures
430601.03	Deploy FLEX cables between the AC source and the Control Building West stairwell riser.
430601.04	Deploy FLEX cables between the Control Building West stairwell riser and the target Unit Substation.
430601.05	Connect/Disconnect the cable cam-lock connectors
430601.06	Operate the FLEX diesel generator.
430601.07	Energize a Unit Substation from the Control Building West stairwell riser disconnect switches during an ELAP
430601.08	Energize MCCs from the Unit Substations during an ELAP
430601.09	Startup the Division 1 Battery Charger
430601.10	Cross-tie Unit Subs 1L and 1M to supply AB MCC 1E (alternate means).
430601.11	Startup the safety-related Swing Battery Charger and supply DC MCC 1A (alternate means).
430601.12	Deploy the external AC source cable (RRC generator).
430601.13	Deploy the alternate external AC source cable (RRC generator).
430601.30	Setup FLEX ventilation in the RCIC room.
430601.31	Setup FLEX ventilation in the MCR.
430601.32	Setup FLEX ventilation in the Battery rooms
430601.33	Setup FLEX ventilation in the Inverter rooms
430601.34	Setup FLEX ventilation in the Switchgear rooms
430601.35	Setup FLEX ventilation in the RHR Heat Exchanger room.
430601.36	Setup FLEX ventilation on the Fuel Handling floor

430601.37	Setup a sound-powered phone network
430601.38	Operate the Ops Radio in Talk-Around mode
430601.45	Obtain Suppression Pool, Containment, and Drywell temperature readings
430601.46	Repower 120VAC Regulated Distribution Panel E2(F2) for NSPS alternate source
430601.47	Obtain RPV level and pressure readings locally
430601.48	Install FLEX fitting on the DG Starting Air Compressor skid
430601.49	Connect air hose between the DG Starting Air Compressor skid and the ADS Backup Air Bottle charging line
430601.50	Supply the ADS Backup Air Bottles from a DG Starting Air Compressor
430601.51	Operate RCIC for RPV injection during an ELAP
430601.52	Shift RCIC suction to an RHR heat exchanger during an ELAP
430601.53	Operate SF for RPV injection during an ELAP
430601.56	Lineup an SF pump for Suppression Pool Cooling during an ELAP
430601.58	Repower Hydrogen Igniter Distribution Panel 1A(1B).
430601.59	Perform manual containment isolation
430601.60	Lineup SX for Spent Fuel Pool makeup during an ELAP
430601.61	Make 1SX016A(B) throttleable
430601.64	Vent H2 from Main generator
430601.65	Installing a MCC panel insert to supply a portable power cart

II. DESCRIPTION OF PROCEDURE/SUBJECT MATTER

Instructions: *Use a copy of the latest revision of the procedure(s)/subject matter for presentation of this section. Present the document covering it to the extent required to meet the objectives. Involve the trainees in discussion and questions to keep them active and interested. Provide adequate guidance to the instructor in this section for instructional activities and content to support achievement of objectives. Sufficient detail must be contained in this section such that there is repeatability of the instruction if the material is presented by an instructor other than the author. Scripted questions should be included in this section of the DBIG to support learning and to check for understanding. Add as many lines/pages as needed. In addition, if only select parts of the reference document are to be taught, indicate the items below. Consider addressing the following items in the training content as applicable:*

- *Why is this task performed?*
- *What does the task accomplish?*
- *What is the importance of the task with respect to plant safety?*
- *What are the consequences of performing the task incorrectly?*
- *How will the plant respond?*
- *What are the bases of procedure precautions, limitations and actions, and pre-requisites?*
- *What steps are critical for completing the task correctly?*

Include Exelon Fundamentals and relevant OPEX including applicable SOER 10-2 must-know OPEX in the training material content

A. OPEX – Fukishima event as described in Nantel training

B. SOER 10-2: An understanding of the events leading to the Fukushima release and the probability of natural disaster placing CPS in the same condition is required for the operator to understand the procedures, strategies, and equipment in place to mitigate such an event.

C. IER 11-3: Solid operator fundamentals are necessary to respond to ELAP events and prevent fuel damage and fission product release to protect the health and safety of the public.

D. Discuss the transition from off-normals to EOP's to FLEX procedures

E. Describe how the 4306.01 flowchart (motherhood document) is set up and used.

F. Discuss which phase of FLEX 4306.01 covers and define 'infinite coping'.

G. These procedures and strategies provide electrical power to essential plant equipment to ensure 'indefinite coping' is achieved.

H. Perform/Simulate/Discuss or conduct a simulator/classroom tabletop exercise to demonstrate execution of FLEX Phase II strategies

III. REVIEW AND EVALUATION

A. **Summarize the training materials including major changes.**

B. **Ask questions to assess student achievement of objectives.**

C. **Reinforce the relevance, importance, and purpose of the topic.**

D. **Ensure the trainees are aware how the objectives will be evaluated.**

Document Based Instruction Guide

Course/Program:	LORT/EOC/EOI/ILT	Course Code:	N-CL-OPS-DB-FLEX-FLUID
Title:	FLEX Water and Fuel Procedures	Guide #:	N-CL-OPS-DB-FLEX-FLUID
Author:	Donald Salmi	Revision/Date:	000 / 03/10/15
Revision By:	N/A	Est. Teach Time:	4.0 hrs.
Responsible Site: Clinton			
Qualified Nuclear Engineer Review (If applicable):		Date:	
Training Supervision Review:		Date:	
Program Owner Approval:		Date:	

PREREQUISITES:
1. None

OBJECTIVES: Implement FLEX (ELAP) procedures:

Objective #	Objective Description
430601.01	Implement FLEX (ELAP) procedures
430601.14	Access the FLEX storage building at the UHS.
430601.15	Operate auxiliary systems in the FLEX storage building (e.g. ac generator for lighting, ventilation)
430601.16	Access the UHS inside the FLEX storage building
430601.17	Deploy the hydraulic FLEX Booster Pumps
430601.18	Connect the FLEX pump discharge to the Unit 2 Division 2 SX supply header
430601.19	Operate the diesel-driven FLEX pump.
430601.20	Fill and vent the Unit 2 Division 2 SX Supply line.
430601.21	Connect FLEX pump water supply to the SX system.

Objective #	Objective Description
430601.22	Fill and vent the Unit 1(2) SX system.
430601.23	Maximize RHR HX flow by isolating unwanted SX flowpaths.
430601.24	Operate the FLEX storage building blast doors
430601.25	Re-locate the FLEX pump during a beyond-design-basis flooding event.
430601.26	Deploy the FLEX pump discharge hose during a beyond-design-basis flooding event
430601.27	Deploy the FLEX pump suction hose during a beyond-design-basis flooding event.
430601.28	Supply UHS water to the plant from a Regional Response Center pump using the primary connection.
430601.29	Supply UHS water to the plant from a Regional Response Center pump using the alternate connection.
430601.39	Connect the portable fuel oil pump to a DG Day Tank drain line
430601.40	Deploy fuel hose from the portable pump to outside grade elevation
430601.41	Deploy fuel hose from the DG Building 762' to outside grade elevation
430601.42	Supply fuel oil to the Ford F-750 truck fuel tanks
430601.43	Supply fuel oil to the FLEX generator
430601.44	Supply fuel oil to the FLEX pump
430601.54	Deploy hose from DG Building 762' manifold to the LPCS or RHR-C injection header connection for FLEX pump injection to the RPV during an ELAP

Objective #	Objective Description
430601.55	Lineup FLEX pump for Suppression Pool Cooling during an ELAP
430601.57	Deploy hose from DG Building 762' manifold to the LPCS or RHR-C injection header connection for FLEX pump injection to the Suppression Pool during an ELAP
430601.62	Deploy hose from DG Building 762' manifold to Fuel Building 755' elevation for Spent Fuel Pool makeup/spray during an ELAP
430601.63	Connect hose nozzle to the Spent Fuel Pool rail for SFP Makeup or Spray

EVALUATION METHOD & PASSING CRITERIA:
Properly perform or simulate FLEX tasks given applicable 4306.01 FLEX/ELAP procedures or conduct simulator/classroom tabletop exercise.

REFERENCES: *(List the procedure/subject matter here. If not readily available through other means such as EDMS, include the revision number or date of the procedure.)*

1. 4306.01, Clinton ELAP Flowchart
2. 4306.01C001, FLEX Cable Deployment
3. 4306.01P001, FLEX Electrical Connections
4. 4306.01C002, FLEX Hose Deployment
5. 4306.01P002, FLEX UHS Water Supply
6. 4306.01C003, BDBEE Damage Assessment
7. 4306.01P003, FLEX Suppression Pool Cooling
8. 4306.01P004, FLEX Low Pressure RPV Makeup
9. 4306.01P005, ,FLEX RCIC Operation
10. 4306.01P006, FLEX Suppression Pool Makeup
11. 4306.01P007, FLEX Spent Fuel Pool Makeup
12. 4306.01P008, FLEX Diesel Fuel Oil Supply
13. 4306.01P009, FLEX ADS Air Supply
14. 4306.01P010, FLEX Ventilation
15. 4306.01P012, FLEX Communications
16. 4306.01P019, FLEX Dewatering
17. 4306.01P021, FLEX Main Generator Venting

COMMITMENTS: None

ATTACHMENTS: None

I. INTRODUCTION

A. **Introduce yourself:**

1. Name
2. Position/responsibilities
3. Background/qualifications

B. **Introduce subject matter**

1. Procedure title/subject matter:
   N-CL-OPS-DB-FLEX-FLUID, FLEX Water and Fuel Procedures.
2. Basis for instruction (check one)
   - ☒ New procedure/subject matter
   - ☐ Revised procedure/subject matter
   - ☐ Existing procedure/subject matter review
   - ☐ Other:

   Comments: **NOTE:** FLEX/ELAP procedures and equipment are new to the industry and CPS as driven by events following the tsunami impact on the Fukishima plant in Japan.

3. Establish relevance, importance, and purpose of topic

   Due to the Beyond Design Basis External Event (BDBEE) at the Fukishima nuclear power station in Japan; the NRC directed the US nuclear industry to develop procedures, processes, and strategies to cope with a BDBEE. This course will provide Operators with the skills to implement water and fuel strategies for Clinton Power Station.

C. **Present Objectives:** (list below)

430601.01	Implement FLEX (ELAP) procedures
430601.14	Access the FLEX storage building at the UHS.
430601.15	Operate auxiliary systems in the FLEX storage building (e.g. ac generator for lighting, ventilation)
430601.16	Access the UHS inside the FLEX storage building
430601.17	Deploy the hydraulic FLEX Booster Pumps
430601.18	Connect the FLEX pump discharge to the Unit 2 Division 2 SX supply header
430601.19	Operate the diesel-driven FLEX pump.
430601.20	Fill and vent the Unit 2 Division 2 SX Supply line.
430601.21	Connect FLEX pump water supply to the SX system.
430601.22	Fill and vent the Unit 1(2) SX system.
430601.23	Maximize RHR HX flow by isolating unwanted SX flowpaths.
430601.24	Operate the FLEX storage building blast doors
430601.25	Re-locate the FLEX pump during a beyond-design-basis flooding event.
430601.26	Deploy the FLEX pump discharge hose during a beyond-design-basis flooding event
430601.27	Deploy the FLEX pump suction hose during a beyond-design-basis flooding event.
430601.28	Supply UHS water to the plant from a Regional Response Center pump using the primary connection.
430601.29	Supply UHS water to the plant from a Regional Response Center pump using the alternate connection.
430601.39	Connect the portable fuel oil pump to a DG Day Tank drain line

430601.40	Deploy fuel hose from the portable pump to outside grade elevation
430601.41	Deploy fuel hose from the DG Building 762' to outside grade elevation
430601.42	Supply fuel oil to the Ford F-750 truck fuel tanks
430601.43	Supply fuel oil to the FLEX generator
430601.44	Supply fuel oil to the FLEX pump
430601.54	Deploy hose from DG Building 762' manifold to the LPCS or RHR-C injection header connection for FLEX pump injection to the RPV during an ELAP
430601.55	Lineup FLEX pump for Suppression Pool Cooling during an ELAP
430601.57	Deploy hose from DG Building 762' manifold to the LPCS or RHR-C injection header connection for FLEX pump injection to the Suppression Pool during an ELAP
430601.62	Deploy hose from DG Building 762' manifold to Fuel Building 755' elevation for Spent Fuel Pool makeup/spray during an ELAP
430601.63	Connect hose nozzle to the Spent Fuel Pool rail for SFP Makeup or Spray

II. DESCRIPTION OF PROCEDURE/SUBJECT MATTER

Instructions: *Use a copy of the latest revision of the procedure(s)/subject matter for presentation of this section. Present the document covering it to the extent required to meet the objectives. Involve the trainees in discussion and questions to keep them active and interested. Provide adequate guidance to the instructor in this section for instructional activities and content to support achievement of objectives. Sufficient detail must be contained in this section such that there is repeatability of the instruction if the material is presented by an instructor other than the author. Scripted questions should be included in this section of the DBIG to support learning and to check for understanding. Add as many lines/pages as needed. In addition, if only select parts of the reference document are to be taught, indicate the items below. Consider addressing the following items in the training content as applicable:*

- *Why is this task performed?*
- *What does the task accomplish?*
- *What is the importance of the task with respect to plant safety?*
- *What are the consequences of performing the task incorrectly?*
- *How will the plant respond?*
- *What are the bases of procedure precautions, limitations and actions, and pre-requisites?*
- *What steps are critical for completing the task correctly?*

Include Exelon Fundamentals and relevant OPEX including applicable SOER 10-2 must-know OPEX in the training material content

A. OPEX – Fukishima event as described in Nantel training

B. SOER 10-2: An understanding of the events leading to the Fukushima release and the probability of natural disaster placing CPS in the same condition is required for the operator to understand the procedures, strategies, and equipment in place to mitigate such an event.

C. IER 11-3: Solid operator fundamentals are necessary to respond to ELAP events and prevent fuel damage and fission product release to protect the health and safety of the public.

D. Discuss the transition from off-normals to EOP's to FLEX procedures

E. Describe how the 4306.01 flowchart (motherhood document) is set up and used.

F. Discuss which phase of FLEX 4306.01 covers and define 'infinite coping'.

G. These procedures and strategies provide water and fuel to essential plant equipment to ensure 'indefinite coping' is achieved

H. Perform/Simulate/Discuss or conduct a simulator/classroom tabletop exercise to demonstrate execution of FLEX Phase II strategies

III. REVIEW AND EVALUATION

A. **Summarize the training materials including major changes.**

B. **Ask questions to assess student achievement of objectives.**

C. **Reinforce the relevance, importance, and purpose of the topic.**

D. **Ensure the trainees are aware how the objectives will be evaluated.**

Document Based Instruction Guide

Course/Program:	LORT/EOC/EOI/ILT	Course Code:	N-CL-OPS-DB430601-FLEX
Title:	FLEX	Guide #:	N-CL-OPS-DB430601-FLEX
Author:	Donald Salmi	Revision/Date:	000 / 01/28/15
Revision By:		Est. Teach Time:	4.0 Hrs.

Qualified Nuclear Engineer Review (If applicable):		Date:	
Training Supervision Review:		Date:	
Program Owner Approval:		Date:	

1. PREREQUISITES: None

2. OBJECTIVES: Given applicable CPS FLEX procedures, recall the following:

Objective #	Objective Description	SRO	RO	EO	ILT
DB430601.01.01	Demonstrate knowledge of the entry condition for 4306.01 (ELAP).	X	X	X	X
DB430601.01.02	Demonstrate knowledge of the Time Critical Actions requirements associated with CPS 4200.01 and 4306.01 in regards to an ELAP event.	X	X		X
DB430601.01.03	Explain why ADS Depressurization is Inhibited during ELAP conditions per CPS 4306.01	X	X		X
DB430601.01.04	Explain why RPV Pressure is maintained 150-250psig during ELAP conditions per CPS 4306.01 and the EOPs.	X	X		X
DB430601.01.05	Identify the RCIC Interlocks which are defeated during an ELAP per CPS 4306.01 (4410.00C001).	X	X		X
DB430601.01.06	Demonstrate knowledge of the (primary/alternate/RRC) Electric Power Strategies used for 4306.01.	X	X	X	X

Objective #	Objective Description	SRO	RO	EO	ILT
DB430601.01.07	Demonstrate knowledge of the color coding scheme of 480vac electrical cables used for 4306.01 Electric power strategies.	X	X	X	X
DB430601.01.08	Demonstrate knowledge of the manual breaker operations required on 480 Vac Unit Substation breaker in support of 4306.01 electric power strategies.	X	X	X	X
DB430601.01.09	Demonstrate knowledge of the FLEX Water Strategies used for 4306.01.	X	X		X
DB430601.01.10	Demonstrate knowledge of the FLEX Water Strategy used when a Lake Flooding event is present per 4306.01.	X	X		X
DB430601.01.11	Demonstrate knowledge of the Instrumentation power Strategies used for 4306.01.	X	X		X
DB430601.01.12	Demonstrate knowledge of how to determine RPV Level and pressure readings locally per 4303.01P015.	X	X	X	X
DB430601.01.13	Demonstrate knowledge of the RPV Makeup from RCIC flow path used for 4306.01.	X	X	X	X
DB430601.01.14	Describe control logic failure modes of the RCIC and RHR systems with respect to their core cooling	X	X		X
DB430601.01.15	Demonstrate knowledge of a RCIC Black-start used for 4306.01.	X	X		X
DB430601.01.16	Demonstrate knowledge of the RPV Makeup from SF flow path used for 4306.01.	X	X		X
DB430601.01.17	Demonstrate knowledge of the RPV Makeup flow path from FLEX pump flow paths used for 4306.01.	X	X	X	X
DB430601.01.18	Demonstrate knowledge of the RPV Makeup from B.5.b pump from CY flow path used for 4306.01.	X	X	X	X
DB430601.01.19	Demonstrate knowledge of the Suppression Pool Cooling flow path used for 4306.01.	X	X		X

Objective #	Objective Description	SRO	RO	EO	ILT
DB430601.01.20	Demonstrate knowledge of why Suppression Pool level band is maintained 23' 0"- 23'9" during ELAP conditions per 4306.01.	X	X		X
DB430601.01.21	Demonstrate knowledge of the Suppression Pool Makeup flow path used for 4306.01.	X	X	X	X
DB430601.01.22	Demonstrate knowledge of the Ventilation Strategies used for 4306.01.	X	X	X	X
DB430601.01.23	Demonstrate knowledge of the Communication Strategies used for 4306.01.	X	X	X	X
DB430601.01.24	Demonstrate knowledge of the Fuel Oil makeup Strategies used for 4306.01.	X	X	X	X
DB430601.01.25	Demonstrate knowledge of the ADS Air flowpaths used for 4306.01	X	X	X	X
DB430601.01.26	Demonstrate knowledge of the Hydrogen Control Strategy used for 4306.01.	X	X		X
DB430601.01.27	Demonstrate knowledge of the SFP Level instrumentation used to support 4306.01 actions.	X	X	X	X
DB430601.01.28	Demonstrate knowledge of the SFP Makeup from SX flowpath used for 4306.01.	X	X	X	X
DB430601.01.29	Demonstrate knowledge of the SFP Spray from FLEX pump flow path used for 4306.01.	X	X	X	X
DB430601.01.30	Demonstrate knowledge of the Debris removal components for FLEX events.	X	X		X
DB430601.01.31	Demonstrate knowledge of Flex Equipment out-of-service administrative requirements per CC-CL-118.	X	X		X
DB430601.01.32	Demonstrate knowledge of control logic failure modes with respect to FLEX Phase 1 and 2 core cooling flow paths	X	X		X

EVALUATION METHOD & PASSING CRITERIA: Given and IAW applicable CPS FLEX procedures, trainees will correctly enter 4306.01 in class room activities or simulator scenarios and correctly execute associated checklists.

REFERENCES: *(List the procedure/subject matter here. If not readily available through other means such as EDMS, include the revision number or date of the procedure.)*

1. 4306.01, Clinton ELAP Flowchart
2. 4306.01C001, FLEX Cable Deployment
3. 4306.01P001, FLEX Electrical Connections
4. 4306.01C002, FLEX Hose Deployment
5. 4306.01P002, FLEX UHS Water Supply
6. 4306.01C003, BDBEE Damage Assessment
7. 4306.01P003, FLEX Suppression Pool Cooling
8. 4306.01P004, FLEX Low Pressure RPV Makeup
9. 4306.01P005, FLEX RCIC Operation
10. 4306.01P006, FLEX Suppression Pool Makeup
11. 4306.01P007, FLEX Spent Fuel Pool Makeup
12. 4306.01P008, FLEX Diesel Fuel Oil Supply
13. 4306.01P009, FLEX ADS Air Supply
14. 4306.01P010, FLEX Ventilation
15. 4306.01P012, FLEX Communications
16. 4303.01P015, ALTERNATE METHODS FOR OBTAINING ESSENTIAL PARAMETER VALUES
17. 4306.01P019, FLEX Dewatering
18. 4306.01P021, FLEX Main Generator Venting
19. 4200.01, Loss of AC Power

ATTACHMENTS:

A. Control Logic Failure Modes with Respect to FLEX Phase 1 and 2 Core Cooling Flow Paths (included in DBIG)

I. INTRODUCTION

A. **Introduce yourself:**

1. Name
2. Position/responsibilities
3. Background/qualifications

B. **Introduce subject matter**

1. Procedure title/subject matter:
   FLEX procedures – CPS 4306.01; Extended Loss of AC Power
2. Basis for instruction (check one)
   - ☒ New procedure/subject matter
   - ☐ Revised procedure/subject matter
   - ☐ Existing procedure/subject matter review
   - ☐ Other:

   Comments: **NOTE:** FLEX/ELAP procedures and equipment are new to the industry and CPS as driven by events following the tsunami impact on the Fukishima plant in Japan.

3. Establish relevance, importance, and purpose of topic: FLEX is required to be implemented at each site prior to starting up following refueling outages. Operators require training on the procedures, strategies, and equipment used to protect the fuel in the event leading to an extended loss of AC power.

C. **Present Objectives:** (list below)

Objective #	Objective Description	SRO	RO	EO	ILT
DB430601.01.01	Demonstrate knowledge of the entry condition for 4306.01 (ELAP).	X	X	X	X
DB430601.01.02	Demonstrate knowledge of the Time Critical Actions requirements associated with CPS 4200.01 and 4306.01 in regards to an ELAP event.	X	X		X
DB430601.01.03	Explain why ADS Depressurization is Inhibited during ELAP conditions per CPS 4306.01	X	X		X
DB430601.01.04	Explain why RPV Pressure is maintained 150-250psig during ELAP conditions per CPS 4306.01 and the EOPs.	X	X		X
DB430601.01.05	Identify the RCIC Interlocks which are defeated during an ELAP per CPS 4306.01 (4410.00C001).	X	X		X
DB430601.01.06	Demonstrate knowledge of the (primary/alternate/RRC) Electric Power Strategies used for 4306.01.	X	X	X	X
DB430601.01.07	Demonstrate knowledge of the color coding scheme of 480vac electrical cables used for 4306.01 Electric power strategies.	X	X	X	X
DB430601.01.08	Demonstrate knowledge of the manual breaker operations required on 480 Vac Unit Substation breaker in support of 4306.01 electric power strategies.	X	X	X	X
DB430601.01.09	Demonstrate knowledge of the FLEX Water Strategies used for 4306.01.	X	X		X
DB430601.01.10	Demonstrate knowledge of the FLEX Water Strategy used when a Lake Flooding event is present per 4306.01.	X	X		X
DB430601.01.11	Demonstrate knowledge of the Instrumentation power Strategies used for 4306.01.	X	X		X
DB430601.01.12	Demonstrate knowledge of how to determine RPV Level and pressure readings locally per 4303.01P015.	X	X	X	X
DB430601.01.13	Demonstrate knowledge of the RPV Makeup from RCIC flow path used for 4306.01.	X	X	X	X

Objective #	Objective Description	SRO	RO	EO	ILT
DB430601.01.14	Describe control logic failure modes of the RCIC and RHR systems with respect to their core cooling	X	X		X
DB430601.01.15	Demonstrate knowledge of a RCIC Black-start used for 4306.01.	X	X		X
DB430601.01.16	Demonstrate knowledge of the RPV Makeup from SF flow path used for 4306.01.	X	X		X
DB430601.01.17	Demonstrate knowledge of the RPV Makeup flow path from FLEX pump flow paths used for 4306.01.	X	X	X	X
DB430601.01.18	Demonstrate knowledge of the RPV Makeup from B.5.b pump from CY flow path used for 4306.01.	X	X	X	X
DB430601.01.19	Demonstrate knowledge of the Suppression Pool Cooling flow path used for 4306.01.	X	X		X
DB430601.01.20	Demonstrate knowledge of why Suppression Pool level band is maintained 23' 0"- 23'9" during ELAP conditions per 4306.01.	X	X		X
DB430601.01.21	Demonstrate knowledge of the Suppression Pool Makeup flow path used for 4306.01.	X	X	X	X
DB430601.01.22	Demonstrate knowledge of the Ventilation Strategies used for 4306.01.	X	X	X	X
DB430601.01.23	Demonstrate knowledge of the Communication Strategies used for 4306.01.	X	X	X	X
DB430601.01.24	Demonstrate knowledge of the Fuel Oil makeup Strategies used for 4306.01.	X	X	X	X
DB430601.01.25	Demonstrate knowledge of the ADS Air flowpaths used for 4306.01	X	X	X	X
DB430601.01.26	Demonstrate knowledge of the Hydrogen Control Strategy used for 4306.01.	X	X		X

Objective #	Objective Description	SRO	RO	EO	ILT
DB430601.01.27	Demonstrate knowledge of the SFP Level instrumentation used to support 4306.01 actions.	X	X	X	X
DB430601.01.28	Demonstrate knowledge of the SFP Makeup from SX flowpath used for 4306.01.	X	X	X	X
DB430601.01.29	Demonstrate knowledge of the SFP Spray from FLEX pump flow path used for 4306.01.	X	X	X	X
DB430601.01.30	Demonstrate knowledge of the Debris removal components for FLEX events.	X	X		X
DB430601.01.31	Demonstrate knowledge of Flex Equipment out-of-service administrative requirements per CC-CL-118.	X	X		X
DB430601.01.32	Demonstrate knowledge of control logic failure modes with respect to FLEX Phase 1 and 2 core cooling flow paths	X	X		X

II. DESCRIPTION OF PROCEDURE/SUBJECT MATTER

Instructions: *Use a copy of the latest revision of the procedure(s)/subject matter for presentation of this section. Present the document covering it to the extent required to meet the objectives. Involve the trainees in discussion and questions to keep them active and interested. Provide adequate guidance to the instructor in this section for instructional activities and content to support achievement of objectives. Sufficient detail must be contained in this section such that there is repeatability of the instruction if the material is presented by an instructor other than the author. Scripted questions should be included in this section of the DBIG to support learning and to check for understanding. Add as many lines/pages as needed. In addition, if only select parts of the reference document are to be taught, indicate the items below. Consider addressing the following items in the training content as applicable:*

- *Why is this task performed?*
- *What does the task accomplish?*
- *What is the importance of the task with respect to plant safety?*
- *What are the consequences of performing the task incorrectly?*
- *How will the plant respond?*
- *What are the bases of procedure precautions, limitations and actions, and pre-requisites?*
- *What steps are critical for completing the task correctly?*

Include Exelon Fundamentals and relevant OPEX including applicable SOER 10-2 must-know OPEX in the training material content

A. OPEX – Fukishima event as described in Nantel training

B. SOER 10-2: An understanding of the events leading to the Fukushima release and the probability of natural disaster placing CPS in the same condition is required for the operator to understand the procedures, strategies, and equipment in place to mitigate such an event.

C. IER 11-3: Solid operator fundamentals are necessary to respond to ELAP events and prevent fuel damage and fission product release to protect the health and safety of the public.

D. Discuss the transition from off-normals to EOP's to FLEX procedures

E. Describe how the 4306.01 flowchart (motherhood document) is set up and used.

F. Discuss which phase of FLEX 4306.01 covers and define 'infinite coping'.

G. Group activity – trainees will review 4306.01 strategy legs and present to the class how these strategies will be implemented.

H. Discuss Attachment 'A' (LORT/ILT)

III. REVIEW AND EVALUATION

A. **Summarize the training materials including major changes.**

B. **Ask questions to assess student achievement of objectives.**

C. **Reinforce the relevance, importance, and purpose of the topic.**

D. **Ensure the trainees are aware how the objectives will be evaluated.**

Attachment 'A'

Clinton Power Station

Control Logic "Failure" Modes with Respect to FLEX Phase 1 and Phase 2 Core Cooling Flow Paths

Prepared By: P. K. Ryan

Reviewed By: Mark McClure

Approved By: Dale Shelton

Control Logic Failure Modes with Respect to FLEX Phase 1 and 2 Core Cooling Flow Paths

Background

INPO IER L1-13-10, "Nuclear Accident at the Fukushima Daiichi Nuclear Power Station," Recommendation 4, states the following:

> **Validate that personnel understand the failure modes of all control logic in core cooling systems and that operators and emergency response personnel monitor system status and can respond to restore core cooling if lost early in the accident sequence.**

It is understood that this recommendation applies to the core cooling equipment/flow paths that are used in the FLEX core cooling strategy for Phase 1 (installed plant equipment) and Phase 2 (on-site portable equipment).

In the interest of maintaining core cooling equipment and flow paths in operation, in addition to the actual "failure" of a control logic (or interlock), this paper will assess the impact of actual control logic/interlock actuation as a result of an anticipated actual plant condition (such as a high drywell pressure and high containment pressure).

By reviewing the control logic failure modes, as well as the impact of real actuations, an overall picture of actions needed to protect and/or restore core cooling equipment during the execution of the Clinton Phase 1 and 2 FLEX core cooling strategies can be developed.

FLEX Core Cooling Strategies

The FLEX core cooling flow paths are depicted on the two attached one-line diagrams. In summary, RCIC is used to inject to the RPV for Phase 1. For Phase 2:

1. the Division 1 (primary) or Division 2 (alternate) Low Pressure Coolant Injection (LPCI) flowpath while the RHR loop is operating in the FLEX Suppression Pool Cooling mode, and
2. direct injection into the RPV from the FLEX pump using hose connections on the Low Pressure Core Spray (LPCS) or the LPCI-C injection headers.

Phase 1:

A failure of the control logic for the RCIC speed control system is the functional equivalent of a loss of power (DC) to the control logic. The end result is the inability of the control system to automatically control the speed/flow of the RCIC turbine/pump. In this failure situation, the RCIC system could be operated manually in accordance with 4303.01P013, RCIC MANUAL

OPERATION WITHOUT DC CONTROL POWER. This procedure provides the guidance for manually throttling the steam flow to RCIC to maintain pump discharge pressure greater than RPV pressure and verifying that RPV level is responding as expected.

EOP-1 RPV LEVEL CONTROL specifies RCIC as a primary injection system and provides allowance for bypassing trip signals that could otherwise preclude its use. 4410.00C001, DEFEATING RCIC INTERLOCKS contains the direction for defeating certain RCIC isolation signals to help maintain the operation of RCIC under emergency conditions:

- RCIC Area Temperature Isolation Signals
- RCIC Suction Transfer
- Low RCIC Steam Supply Pressure Isolation
- RCIC Level 8 Isolation

Additionally, Clinton will implement the additional defeats provided in EPG/SAG Rev. 3 from the BWROG. These defeats include:

- RCIC Exhaust Diaphram High Pressure Isolation
- RCIC High Exhaust Pressure Trip
- RCIC Stm Flow High

Phase 2:

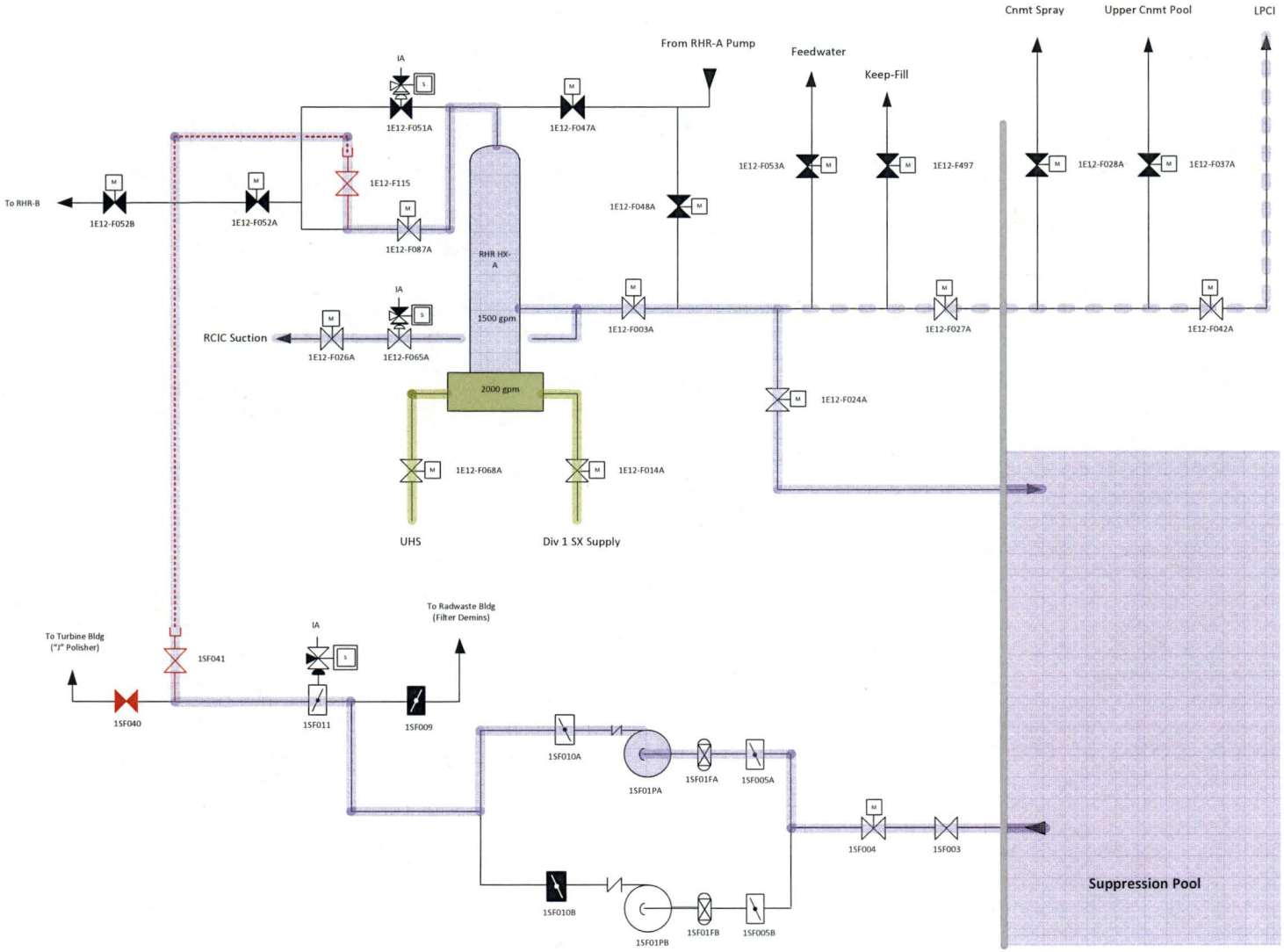
As shown in Attachment 1, the 'A' and 'B' RHR systems are being used for RPV injection flow paths (core cooling) in addition to their containment cooling function. Specifically, water from a Suppression Pool Cleanup and Transfer (SF) pump is being provided to the RHR systems at a connection on the previously abandoned Steam Condensing Mode piping on the inlet to the RHR heat exchangers. With a FLEX pump providing cooling water to the heat exchanger, this flowpath is able to remove decay heat from the suppression pool, and provide the 'preferred' RPV makeup system using the associated LPCI piping and valves. This is the preferred RPV makeup system because the suppression pool water will be relatively clean for many hours of operation.

While the RHR system provides the preferred method for RPV makeup during an extended loss of AC power event, there are two methods shown in Attachment 2 for supplying ultimate heat sink water to the reactor from a FLEX pump. These two methods use hose connections on the LPCS and LPCI-C injection headers. The injection valves (1E21-F005 and 1E12-F042C) are **easily accessible for manual operation, and therefore these two RPV makeup methods are not susceptible to control logic failures.** They are always available should the suppression pool supply become unavailable due to control logic failures.

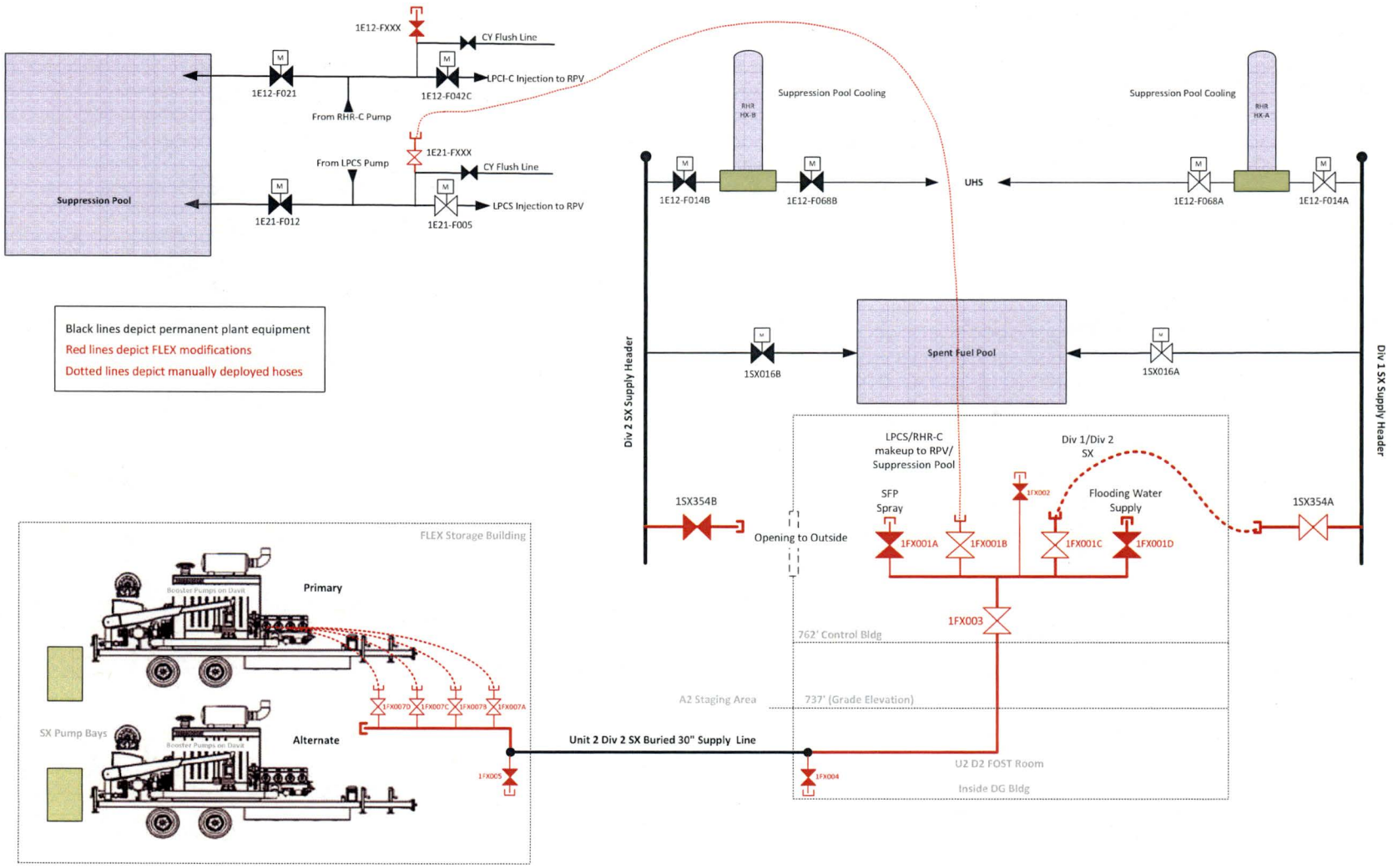
Even though this 'ultimate' RPV makeup sytem exists in Clinton's FLEX strategy, this paper will analyze the control logic and interlocks that could affect the 'preferred' method of RPV makeup. The paper will also consider the affect of logic system actuations that would otherwise be proper if power was available to an RHR pump. For example, several hours into the event the logic for the Containment Spray mode of RHR can be expected to be met. The valves that realign for Containment Spray, in the absence of an RHR pump, have the affect of interrupting the suppression pool cooling method that was established using the SF pump and RHR heat exchanger.

Wherever it was deemed appropriate, compensatory actions were included in the FLEX Support Guides (FSGs) to allow the 'preferred' method for RPV makeup to continue even when control logic failures or logic system actuations functioning as designed have complicated the establishment of the required valve lineup.

Attachment 1
FLEX Suppression Pool Cooling



Attachment 2
FLEX RPV Makeup



Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
Controls and Interlocks		
RH A (B) Full Flow Test Valves F024A and F024B		
Full Flow Test Valves F024A and F024B can not be opened if Shutdown Cooling Suction Valve F006A or F006B are not fully closed to prevent possible draining of the RPV to the suppression pool.	1E12-F024A(B) is used in the FLEX Suppression Pool Cooling lineup.	1E12-F024A(B) can be accessed to operate manually if required
RH A (B) Containment Outboard Isolation Valves F027A and F027B		
The RH containment outboard isolation valves are interlocked such that the associated Containment Spray Shutoff Valve F028A (B) and LPCI from RH Shutoff Valve F042A (B) must be fully closed before an isolation valve can be opened. This interlock prevents inadvertent LPCI injection or containment spray during RH System testing.	1E12-F027A(B) is used in the FLEX Suppression Pool Cooling and RPV Makeup lineups.	• The step for opening 1E12-F027A(B) in 4306.01P004 LOW PRESSURE RPV MAKEUP identifies this interlock. • 1E12-F027A(B) can be accessed to operate manually if required
RH A(B) Containment Spray A(B) Shutoff Valves F028A and F028B		
1. RH can be opened only if the associated Containment Outboard Isolation Valve F027A (B) is fully closed. This prevents inadvertent flow to a containment spray header during valve stroke testing.	1E12-F028A(B) needs to remain shut.	The valve is not repowered in the FLEX electrical lineup.
2. RH A(B) Containment Spray A(B) Shutoff Valves F028A and F028B are interlocked closed:		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
a. If a LPCI initiation is present without a CS initiation signal. (Manual CS Initiation Button will initiate CS sequence with LPCI Initiation signal)		
b. High Drywell Pressure signal required to initiate CS by manually opening F028A(B)		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
LPCI From RH Shutoff Valves F042A, F042B, and F042C		
1. The LPCI injection valves, F042A, B, and C, open automatically if a sealed-in LPCI initiation signal is present, the associated valve control switch is not in CLOSE, a CS initiation signal is NOT present, and reactor pressure is less than 472 psig.	The ability to open 1E12-F042A(B) needs to be maintained for RPV makeup.	Included a note in 4306.01P001 FLEX ELECTRICAL CONNECTIONS to alert the MCR that ECCS injection valves may open upon energization.
2. If a LPCI initiation signal is present when a valve control switch is taken to CLOSE, the valve closes and an override annunciator actuates in the MCR indicating that manual operation is required to open it for injection.		No impact on RPV makeup strategy.
3. The valve closes with a sealed-in CS initiation signal present ensuring full flow to the spray headers to protect the containment against overpressurization.		Disabled the Containment Spray system in 4306.01P003 FLEX SUPPRESSION POOL COOLING by raising the Containment Pressure setpoint.
RH Heat Exchanger Bypass Valves F048A and F048B		
1. F048A and B are normally open in standby, and will automatically open if closed upon LPCI initiation to ensure full flow for 10 minutes to the reactor vessel for makeup during a LOCA.	1E12-F048A(B) needs to remain shut for both the core cooling and suppression pool cooling flowpaths. Flowpath through the HX needs to be maintained for RPV makeup, while in the FLEX	The RPV makeup flowpath is maintained through the HX (1E12-F003A(B) and Steam Condensing Mode piping on the HX inlet). 1E12-F048A(B) needs to be kept
2. F048A and B automatically close if ALL the following conditions are satisfied		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
a. CS initiation signal present and 10 minute LOCA timer has timed out, and	suppression pool cooling lineup.	shut by turning off the breaker or by manual operation. This is specified in 4306.01P003 FLEX SUPPRESSION POOL COOLING. The 10 minute time delay will have timed out long before the FLEX suppression pool cooling is established.
b. Same loop RH Heat Exchanger Inlet Valve F047A(B) fully open, and		
c. Same loop RH Heat Exchanger Outlet Valve F003A (B) fully open.		
3. If containment spray is manually initiated before the 10-minute LPCI signal seal-in timer times out, F048A and B cycle until the timer times out. Opening of F048B is delayed for 90 seconds on automatic initiation to allow time for containment spray train A to reduce containment pressure.	Not applicable	Manual Containment Spray actuation is not a FLEX related action.
RH Pump Minimum Flow Recirc Valves F064A, F064B and F064C.		
1. The RH pump minimum flow valves are open in the standby lineup. Following the start of a pump, they automatically close when pump discharge flow reaches 1100 gpm. Thereafter, they open whenever RH pump discharge flow is less than 1100 gpm for 8 seconds, and re-close when pump discharge flow reaches 1100 gpm.	Applicable	A check valve isolates the minimum flow line from the pressurized piping.
RH Heat Exchanger SSW Inlet and Outlet Valves F014A, F014B, F068A & F068B		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
Each of these valves automatically opens on a containment spray initiation. Loop A valves open immediately and loop B loop valves are delayed for 90 seconds. They cannot be closed when a containment spray initiation signal is present. They also open automatically on a manual containment spray initiation if drywell pressure is 1.68 psig.	Applicable	These valves are opened from their control switches. The Containment Spray function is disabled and manual operation is specified if required in 4306.01P003 FLEX SUPPRESSION POOL COOLING.

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
Automatic Isolations		
1. Group 2 - RH A(B) to Containment Pool Cooling Shutoff Valves F037A and F037B close from the	Not Applicable	Valves are only open during outages.
• RPV Level <Low Level 3 (8.9") or		
• High Drywell pressure (1.68 psig)		
• RH Heat Exchanger Rm Temp High >144.5 °F		
2. Group 3 - Shutdown Cooling Inboard and Outboard Isolation Valves F009 & F008, RH to Feedwater Shutdown Cooling Return Valves F053A and F053B, and Reactor Head Spray Valve F023 automatically close from the following Group 3 Isolation logic signals:	Not Applicable	Valves only open during outages.
• RPV Level <Low Level 3 (8.9") or		
• RPV Pressure >104 psig.		
• RH Heat Exchanger Rm Temp High >144.5 °F		
3. Group 11 - The LPCI and CS initiation signals are used to initiate Group 11.	Applicable	The Containment Spray function is disabled and manual operation is specified if required in 4306.01P003 FLEX SUPPRESSION POOL COOLING.
a. RH A (B) Full Flow Test Valves F024A(B) and RH C Full Flow Test Valve F021 automatically close from the following Group 11 Isolation logic signals:		
• High Drywell pressure (1.68 psig)		
• RPV water Level 1 (-145.5")		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
b. The LPCI and CS initiation signals automatically close F024A and F024B; however either valve may be opened with a LPCI signal present to allow for suppression pool cooling. An alarm sounds to alert the operator that the valve is not fully open.		
4. Group 20 - RH B Radwaste First (Second) Isolation Valves F049(F040) and the RH Heat Exchanger First (Second) Sample Valves F060A(B), F075A(B) automatically close from the following Group 20 Isolation logic signals:	Not Applicable	Valve is normally shut and confirmed in 4306.01P003 FLEX SUPPRESSION POOL COOLING.
• RPV Level <Low Level 3 (8.9") or		
• High Drywell pressure (1.68 psig)		
• RH Heat Exchanger Rm Temp High >144.5 °F		
LPCI/LPCS Initiation Logic		
1. If in SDC, as level decreases, F008 and F009 isolate (close) on Level 3 and the RH pump in shutdown cooling trips. RH must then be manually placed in the LPCI mode by opening F004A and re-starting the RH pump.	Not Applicable	Valves not used in FLEX strategies
2. Initiated by a Low reactor water level (<Level 1) and/or High Drywell Pressure High (>1.68 psig) in a combined "one-out-of-two-twice" logic. Or Manual Initiation by arming and depressing the "LPCS/LPCI A" pushbutton.	Applicable	High Drywell Pressure is expected due to RR Pump seal leakage.
3. LPCS Pump starts immediately.	Not Applicable	No 4.16 KV power

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
4. RH Pump A starts after a five-second time delay, which is initiated from the time Bus 1A1 is powered.	Not Applicable	No 4.16 KV power
5. Other than shutdown cooling valves, all other air and motor operated valves change position to establish the LPCI valve lineup as follows:		
a. RH Hx Bypass Valves F048A OPEN. (open signal for 10 minutes)	Applicable	• Valve needs to remain shut to avoid "short cycling" to the suppression pool. • Suppression Pool Cooling requires the valve to be shut, but the 10 minute delay has no impact.

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
b. RH Full Flow Test Valve F024A and LPCS Full Flow Test Valve F012 CLOSE.	Applicable	• 1E12-F024A needs to open for Suppression Pool Cooling and throttled for RPV makeup during suppression pool cooling operation. • 1E12-F024A can be accessed to operate manually if required • 1E21-F012 needs to be closed for RPV makeup from a FLEX pump and open for suppression pool makeup • 1E21-F012 can be accessed to operate manually if required
c. RH to Containment Spray Valves F028A CLOSE.	Not Applicable	The valve is not repowered in the FLEX electrical lineup.
d. RH to Containment Outboard Isolation Valves F027A OPEN.	Applicable	• Valve needs to open for RPV makeup. • Valve can be accessed to operate manually if required

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
6. LPCI injection valve F042A and LPCS injection valve F005 open when vessel pressure is less than 472 psig.	Applicable	• 1E12-F042A needs to open for RPV makeup during suppression pool cooling operation. • 1E21-F005 needs to be open for RPV makeup from a FLEX pump, but can be opened manually.
7. The LPCI initiation signal seals in upon actuation and must be manually reset when the initiating signal(s) clear using the Division 1 manual reset button.	Applicable	LPCI/LPCS signal will persist
RHR-A Containment Spray Initiation Logic		
1. CS initiates, if LPCI/LPCS logic has been actuated for >10 minutes AND Drywell Pressure High (>1.68 psig) in one-out-of-two logic AND Containment Pressure High (>7.6 psig) in a one-out-of-two logic. Or, Manual Initiation by arming and depressing CNTMT SPRAY A manual initiation pushbutton AND Drywell Pressure High (>1.68 psig) in one-out-of-two logic.	A Containment Spray Initiation signal is regarded as an unacceptable impediment to establishing and maintaining a Suppression Pool Cooling lineup during this event. The FLEX Suppression Pool Cooling lineup requires the 1E12-F024A to be open and 1E12-F028A to be shut.	Containment Spray is effectively disabled by raising the containment pressure setpoint at the ATM. Should the Containment Spray automatic initiation occur before the ATM setpoint is raised, the signal can be reset and the valves repositioned after raising the
2. RH Pump A starts immediately and 1E12-F024A, RHR Test Valve To Suppr Pool-SHUT (directly from LPCI/LPCS logic).		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
3. Automatic initiation of CS can be delayed by repeatedly depressing the divisional delay timer reset pushbutton BEFORE the 10-minute containment spray delay timer times out.		setpoint.
4. Division 1 VG Low Level 2 or High Drywell Pressure Load Driver starts SX Pump A.		
5. RH valves change position to establish the containment spray lineup as follows:		
a. 1E12-F028A, RHR A To CNMT Spray A Shutoff Valve-OPEN		
b. 1E12-F014A, SSW Inlet RHR A Hx Valve-OPEN		
c. 1E12-F068A, RHR A Hx SSW Outlet Valve-OPEN		
d. 1E12-F003A, RHR A Hx Outlet Valve-NORMALLY OPEN - DOES NOT RECEIVE OPEN SIGNAL		
e. 1E12-F047A, RHR A Hx Inlet Valve-NORMALLY OPEN - DOES NOT RECEIVE OPEN SIGNAL		
f. 1E12-F048A, RHR A Hx Bypass Valve-SHUT		
g. 1SX082A, RHR A Hx MU Cond Inlet Valve-SHUT		
h. 1E12-F024A, RHR A Test Valve To Suppr Pool-SHUT		
LPCI B/C Initiation Logic		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
1. If in SDC, as level decreases, F008 and F009 isolate (close) on Level 3 and the RH pump in shutdown cooling trips. RH B must then be manually placed in the LPCI mode by opening F004B and re-starting the RH B pump.	Not Applicable	Valves not used in FLEX strategies
2. Initiated by a Low reactor water level (<Level 1) and/or High Drywell Pressure High (>1.68 psig) in a combined "one-out-of-two-twice" logic. Or Manual Initiation by arming and depressing the "LPCI B/C" pushbutton.	Applicable	High Drywell Pressure is expected due to RR Pump seal leakage.
3. RH Pump C starts immediately.	Not Applicable	No 4.16 KV power
4. RH Pumps B start after a five-second time delay, which is initiated from the time Bus 1B1 is powered.	Not Applicable	No 4.16 KV power
5. Other than shutdown cooling valves, all other air and motor operated valves change position to establish the LPCI valve lineup as follows:		
a. RH Hx Bypass Valves F048 B OPEN. (open signal for 10 minutes)	Applicable	• 1E12-F048A(B) needs to remain shut to prevent short cyling to the suppression pool. • Suppression Pool Cooling requires the valve to be shut, but the 10 minute delay has no impact.

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
b. RH Full Flow Test Valves F024B and F021 CLOSE.	Applicable	• 1E12-F024B needs to open for Suppression Pool Cooling and throttled for RPV makeup during suppression pool cooling operation. • 1E12-F024B can be accessed to operate manually if required • 1E12-F021 needs to be closed for RPV makeup from a FLEX pump and open for suppression pool makeup • 1E12-F021 can be accessed to operate manually if required
c. RH to Containment Spray Valves F028B CLOSE	Not Applicable	The valve is not repowered in the FLEX electrical lineup.
d. RH to Containment Outboard Isolation Valves F027B OPEN.	Applicable	• Valve needs to open for RPV makeup. • Valve can be accessed to operate manually if required

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
6. LPCI injection valves F042 B and C open when vessel pressure is less than 472 psig.	Applicable	• 1E12-F042B needs to open for RPV makeup during suppression pool cooling operation. • 1E12-F042C needs to be open for RPV makeup from a FLEX pump, but can be opened manually.
7. The LPCI B/C initiation signal seals in upon actuation and must be manually reset when the initiating signal(s) clear using Division 2 reset button.	Applicable	LPCI B/C signal will persist
RHR-B Containment Spray Initiation Logic		
1. CS initiates, if LPCI B/C logic has been actuated for >10 minutes AND Drywell Pressure High (>1.68 psig) in one-out-of-two logic AND Containment Pressure High (>7.6 psig) in a one-out-of-two logic. Or, Manual Initiation by arming and depressing CNTMT SPRAY B manual initiation pushbutton AND Drywell Pressure High (>1.68 psig) in one-out-of-two logic.	A Containment Spray Initiation signal is regarded as an unacceptable impediment to establishing and maintaining a Suppression Pool Cooling lineup during this event. The FLEX Suppression Pool Cooling lineup requires the 1E12-F024B to be open and 1E12-F028B to be shut.	Containment Spray is effectively disabled by raising the containment pressure setpoint at the ATM. Should the Containment Spray automatic initiation occur before the ATM setpoint is raised, the signal can be reset and the valves repositioned after raising the setpoint.
2. RH Pump B starts and 1E12-F024B, RHR Test Valve To Suppr Pool-SHUT (directly from LPCIB/C logic).		
3. CS Loop B actuates after a 89 second delay if containment pressure is still high.		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
4. Automatic initiation of CS can be delayed by repeatedly depressing the divisional delay timer reset pushbutton BEFORE the 10-minute containment spray delay timer times out.		
5. Division 2 VG Low Level 2 or High Drywell Pressure Load Driver starts SX Pump B.		
6. RH valves change position to establish the containment spray lineup as follows:		
a. 1E12-F028B, RHR B To CNMT SprayB Shutoff Valve-OPEN		
b. 1E12-F014B, SSW Inlet RHR B Hx Valve-OPEN		
c. 1E12-F068B, RHR B Hx SSW Outlet Valve-OPEN		
d. 1E12-F003B, RHR B Hx Outlet Valve-NORMALLY OPEN DOES NOT RECEIVE OPEN SIGNAL		
e. 1E12-F047B, RHR B Hx Inlet Valve-NORMALLY OPEN DOES NOT RECEIVE OPEN SIGNAL		
f. 1E12-F048B, RHR B Hx Bypass Valve-SHUT		
g. 1SX082B, RHR B Hx MU Cond Inlet Valve-SHUT		
h. 1E12-F024B, RHR B Test Valve To Suppr Pool-SHUT		

Document Based Instruction Guide

Course/Program:	ILT/LORT/NLO	Course Code:	N/A
Title:	Intro to FLEX Procedures	Guide #:	N-CL-OPS-DB8029
Author:	Mark McClure	Revision/Date:	000 / 07/30/14
Revision By:	N/A	Est. Teach Time:	2.0 hours

Qualified Nuclear Engineer Review (If applicable):		Date:	
Training Supervision Review:		Date:	
Program Owner Approval:		Date:	

PREREQUISITES:

None

OBJECTIVES:
In accordance with draft FLEX procedures and training materials:

.1.1 Given CPS No. 4306.01, state the Symptom(s) for entering CPS No. 4306.01.

.1.2 Given CPS No. 4306.01, describe the Prompt Action to be taken when using CPS No. 4306.01.

.1.3 Given CPS No. 4306.01, describe the Subsequent Actions when using CPS No. 4306.01.

.1.4 Given CPS No. 4306.01, describe the Mitigating Strategies for:
- .1. Supporting Infrastructure
- .2. Core Cooling
- .3. Containment Integrity
- .4. Spent Fuel Cooling

EVALUATION METHOD & PASSING CRITERIA:

Satisfactory performance for objectives will be demonstrated through active participation and correctly responding to Check for Understanding questions administered as during the presentation.

REFERENCES: *(List the procedure/subject matter here. If not readily available through other means such as EDMS, include the revision number or date of the procedure.)*

1. SOER 10-2, Engaged, Thinking Organizations
2. IER 11-3, Weaknesses in Operator Fundamentals
3. NRC Order EA-12-049, ORDER TO MODIFY LICENSES WITH REGARD TO REQUIREMENTS FOR MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS. (BDBEE)
4. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide.
5. EC 392342, EC 392335, EC 392333, EC 392336, EC 392339, EC 392340 (others)
6. NRC Order EA-12-051, Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation.
7. CPS No. 4306.01, Extended Loss of AC POWER/Loss of UHS (draft).
8. 4306.01P001, FLEX Electrical Connections.
9. 4306.01P002, FLEX UHS Water Supply.
10. 4306.01P003, FLEX Suppression Pool Cooling.
11. 4306.01P004, FLEX Low Pressure RPV Makeup.
12. 4306.01P005, FLEX RCIC Operation.
13. 4306.01P006, FLEX Suppression Pool Makeup.

ATTACHMENTS:

None (student copies of the Draft FLEX procedures above)

I. INTRODUCTION

A. Introduce yourself:

1. Name
2. Position/responsibilities
3. Background/qualifications

B. Introduce subject matter

1. Procedure title/subject matter:

2. Basis for instruction (check one)
   - ☒ New procedure/subject matter
   - ☐ Revised procedure/subject matter
   - ☐ Existing procedure/subject matter review
   - ☐ Other:

   Comments: **NOTE:** *Comments section provided for amplifying/clarifying remarks (such as new equipment, general aspects of a procedure revision, description of incident/deficient performance, etc.).*

3. Establish relevance, importance, and purpose of topic

➢ Off Normal procedure that addresses CPS response to beyond design basis events.

The Clinton FLEX strategies were developed in conjunction with other Mark III containment design plants to implement the coping strategies outlined in NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide. These satisfy the NRC Order EA-12-049, ORDER TO MODIFY LICENSES WITH REGARD TO REQUIREMENTS FOR MITIGATION STRATEGIES FOR BEYOND-DESIGN-BASIS EXTERNAL EVENTS. (BDBEE)

The core cooling and containment strategies and timelines were modelled using the EPRI Modular Accident Analysis Program (MAAP) to demonstrate their effectiveness in preventing core damage and maintaining the containment below design pressure.

Present Objectives: (list below)

In accordance with draft FLEX procedures and training materials:

.1. Given CPS No. 4306.01, state the Symptom(s) for entering CPS No. 4306.01.

.2. Given CPS No. 4306.01, describe the Prompt Action to be taken when using CPS No. 4306.01.

.3. Given CPS No. 4306.01, describe the Subsequent Actions when using CPS No. 4306.01.

.4. Given CPS No. 4306.01, describe the Mitigating Strategies for:
   .1. Supporting Infrastructure
   .2. Core Cooling
   .3. Containment Integrity
   .4. Spent Fuel Cooling

II. DESCRIPTION OF PROCEDURE/SUBJECT MATTER

A. Overview of procedure (discussion)

1. The Extended Loss of AC Power/Loss of UHS procedure follows the general format of an Off Normal procedure, however it is only a guide, and the normal rules for verbatim procedure compliance do not apply. The individual in command and control must carefully select which actions to take based on actual conditions.
2. This procedure is subordinate to the EOPs and SAGs. The system configurations that this procedure and the associated FLEX Support Guides provide should be used to accomplish the objectives of the EOPs and SAGs.
3. Some actions in the associated documents may need to be performed by persons that do not possess the formal qualifications for those acts due to limited resources and time critical nature of the tasks. For example, mechanical and electrical connections may be made by Operations personnel.

If a BDBEE is experienced it important to think about actions taken to stabilize the plant and notify others for assistance. This would apply SOER 10-2:

- Workers did not fully understand or anticipate the effect of their actions.

- Breakdowns in the fundamentals have contributed to these consequential events.

B. Discuss the following areas of the CPS 4306.01 (draft) procedure:

1. Symptoms [1.0]
2. PROMPT ACTION [3.0]
3. SUBSEQUENT ACTIONS [4.0]
4. Mitigating Strategies [6.4]

C. Review the following draft FLEX support procedures with class (as needed):

1. 4306.01P001, FLEX Electrical Connections.
2. 4306.01P002, FLEX UHS Water Supply.
3. 4306.01P003, FLEX Suppression Pool Cooling.
4. 4306.01P004, FLEX Low Pressure RPV Makeup.
5. 4306.01P005, FLEX RCIC Operation.
6. 4306.01P006, FLEX Suppression Pool Makeup

III. REVIEW AND EVALUATION

A. **Summarize the training materials including major changes.**

B. **Ask questions to assess student achievement of objectives:**

1. State the FLEX timelines for alignment of:
   a. Conduct of DC Load shedding [1 hour]
   b. Restoring AC power to Unit Sub 1A and assoc. MCCs. [6 hr]
   c. Commencing Supp. Pool Cooling [8 hr]
2. State the level band (and reason for) the Supp Pool during a FLEX event.
   [23'-23'9"] [provides most heat capacity benefit w/o overflow into DW]

C. **Reinforce the relevance, importance, and purpose of the topic.**

D. **Ensure the trainees are aware how the objectives will be evaluated.**

Document Based Instruction Guide

Course/Program:	Generic Basic FLEX / EP	Course Code:	N-AN-EP-BASIC-FLEX
Title:	Basic Flex Training - classroom	Guide #:	NA
Author:	INPO	Revision/Date:	0/3/19/2018
Revision By:	Susanne Alfieri	Est. Teach Time:	1
Responsible site:	Corporate		
Qualified Nuclear Engineer Review (If applicable):		Date:	
Training Supervision Review:	G. Gutgesell *G Gutgesell per telecon*	Date:	*3/21/2018*
Program Owner Approval:	J Baker J. L. Baker	Date:	3/21/2018

PREREQUISITES:
1. None
2.
3.

OBJECTIVES:
1. Lessons learned from the accident at Fukushima
2. Objectives of the new FLEX strategies being implemented to keep US nuclear plants safe during events similar to those at Fukushima.
3. Implementing the three phases of FLEX
4. Responding to a beyond design basis accident
5. Recognizing and managing stress during a beyond-design-basis external event (BDBEE)

EVALUATION METHOD & PASSING CRITERIA: Read and sign (per INPO)

REFERENCES: *(List the procedure/subject matter here. If not readily available through other means such as EDMS, include the revision number or date of the procedure.)*
1.
2.

ATTACHMENTS: (List any additional attachments here. Copies of the attachments, other than the references, should be attached to the original of the DBIG for retention.)
1.
2.

COMMITMENTS:

1.

I. INTRODUCTION

A. **Introduce yourself:**

1. Name
2. Position/responsibilities
3. Background/qualifications

B. **Introduce subject matter**

1. Procedure title/subject matter:

2. Basis for instruction (check one)
   - ☐ New procedure/subject matter
   - ☐ Revised procedure/subject matter
   - ☒ Existing procedure/subject matter review
   - ☐ Other:

   Comments: **NOTE:** *Comments section provided for amplifying/clarifying remarks (such as new equipment, general aspects of a procedure revision, description of incident/deficient performance, etc.).*

3. Establish relevance, importance, and purpose of topic

C. **Present Objectives:** (list below)

1. See first page and presentation
2.
3.

II. DESCRIPTION OF PROCEDURE/SUBJECT MATTER

Instructions: *Use a copy of the latest revision of the procedure(s)/subject matter for presentation of this section. Present the document covering it to the extent required to meet the objectives. Involve the trainees in discussion and questions to keep them active and interested. Provide adequate guidance to the instructor in this section for instructional activities and content to support achievement of objectives. Sufficient detail must be contained in this section such that there is repeatability of the instruction if the material is presented by an instructor other than the author. Scripted questions should be included in this section of the DBIG to support learning and to check for understanding. Add as many lines/pages as needed. In addition, if only select parts of the reference document are to be taught, indicate the items below. Consider addressing the following items in the training content as applicable:*

- *Why is this task performed?*
- *What does the task accomplish?*
- *What is the importance of the task with respect to plant safety?*
- *What are the consequences of performing the task incorrectly?*
- *How will the plant respond?*
- *What are the bases of procedure precautions, limitations and actions, and pre-requisites?*
- *What steps are critical for completing the task correctly?*

Include Exelon Fundamentals and relevant OPEX including applicable SOER 10-2 must-know OPEX in the training material content

A.

B.

C.

III. REVIEW AND EVALUATION

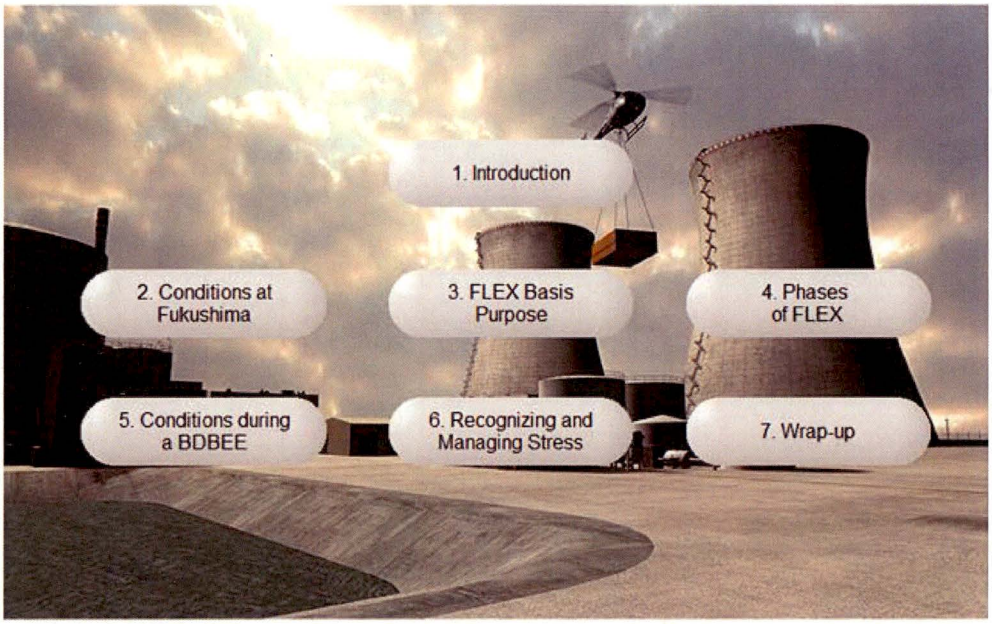
A. **Summarize the training materials including major changes.**

B. **Ask questions to assess student achievement of objectives.**

C. **Reinforce the relevance, importance, and purpose of the topic.**

D. **Ensure the trainees are aware how the objectives will be evaluated.**


Basic FLEX Training
REV.0
October, 2013


1. Introduction
2. Conditions at Fukushima
3. FLEX Basis Purpose
4. Phases of FLEX
5. Conditions during a BDBEE
6. Recognizing and Managing Stress
7. Wrap-up

Earthquake and Tsunami
March 11, 2011

Facts:

- 15,880 dead
- 2,994 missing
- 6,135 injured
- 128,931 buildings destroyed

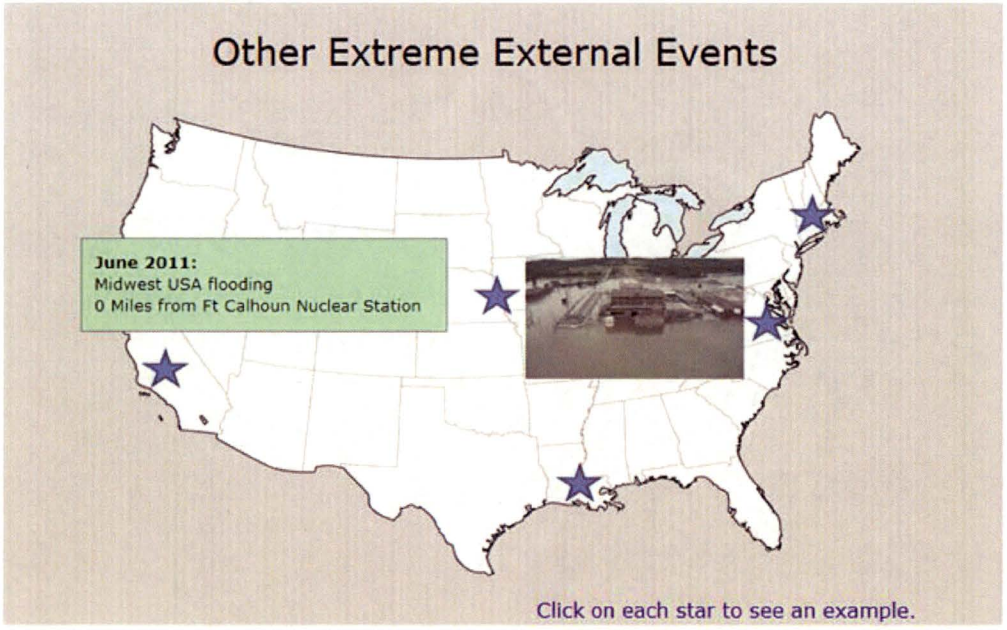
Click to Watch Video

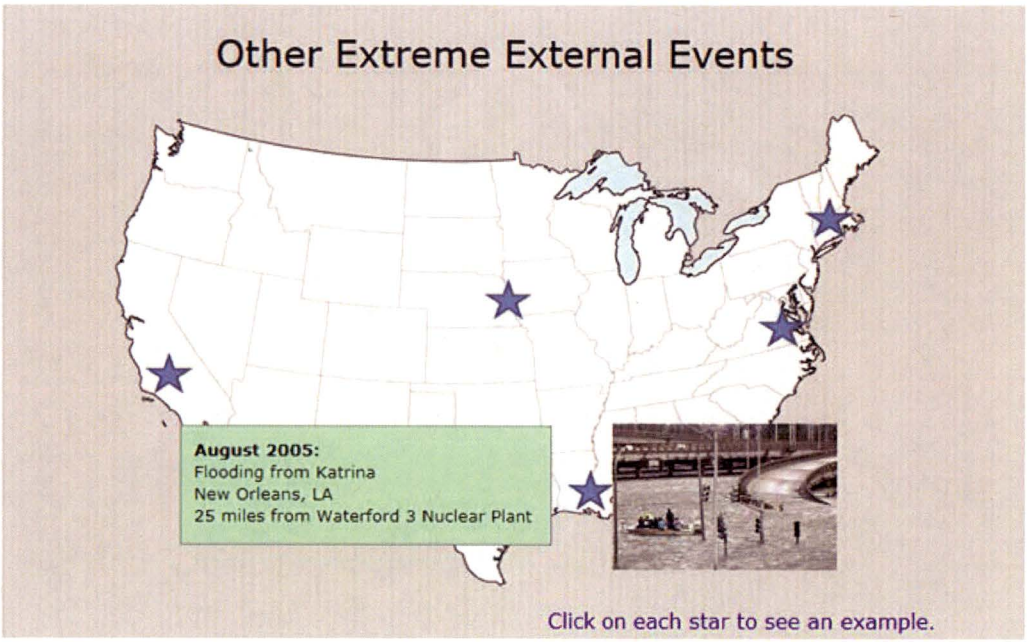
Click "Close" on the video screen when done.

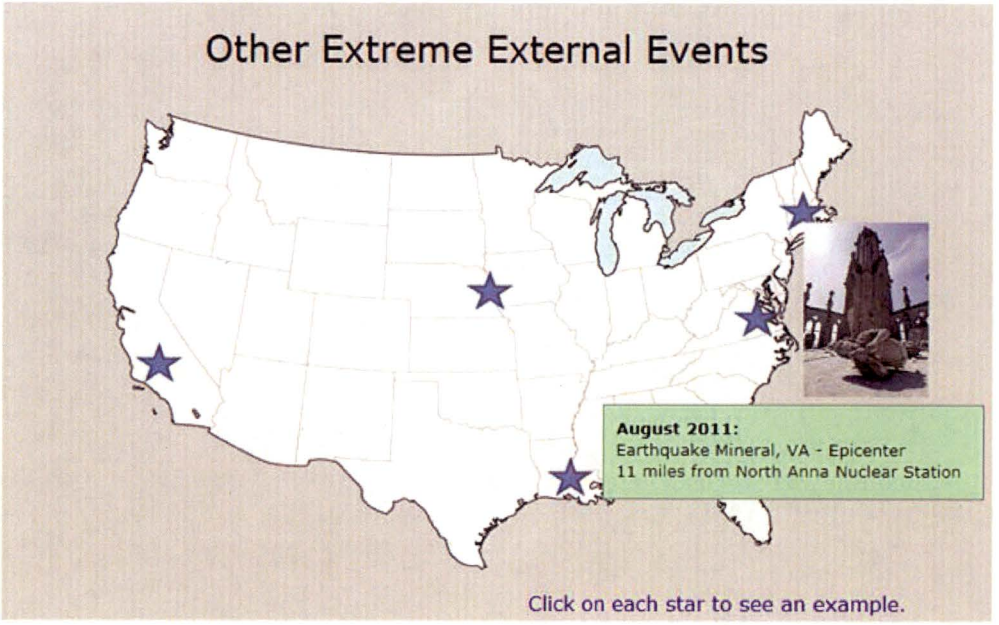
Other Extreme External Events

Click on each star to see an example.


Other Extreme External Events
October 1989:
"World Series" Earthquake
Santa Cruz, CA- epicenter
170 Miles from Diablo
Click on each star to see an example.


Other Extreme External Events
June 2011:
Midwest USA flooding
0 Miles from Ft Calhoun Nuclear Station
Click on each star to see an example.


Other Extreme External Events
August 2005:
Flooding from Katrina
New Orleans, LA
25 miles from Waterford 3 Nuclear Plant
Click on each star to see an example.


Other Extreme External Events
August 2011:
Earthquake Mineral, VA - Epicenter
11 miles from North Anna Nuclear Station
Click on each star to see an example.

Other Extreme External Events

Click on each star to see an example.

Content of This Course

This training will include the following:

- The lessons learned from the accident at Fukushima
- The objectives of the new FLEX strategies being implemented to keep US nuclear plants safe during events similar to those at Fukushima.
- Implementing the three phases of FLEX
- Responding to a beyond-design-basis accident
- Recognizing and managing stress during a beyond-design- basis external event (BDBEE)

As you complete each section of this course, a checkmark will appear at the top of the page on the appropriate tab

Follow the "Additional Reading" link above for:

- Course learning objectives
- FLEX-related reference documents

Extreme Conditions

Extreme Conditions

Extreme Conditions

Extreme Conditions

Extreme Conditions

Extraordinary Working Conditions

- No electrical power
- No lighting
- Lack of system status indications
- Limited ability to communicate
- Flooded areas
- Debris blocking passage
- High radiation levels
- Need to continuously wear:
  - anti-contamination clothing
  - respirators

Mental/Emotional Impact

- Fear from continuing aftershocks
- Fear for their own safety and life
- Fear and anxiety for the health and safety of their families and communities
- Confusion and lack of understanding of plant system status
- Stress from no planned path of recovery
- Fear of an unknown future

Use the arrows to view more quotes.

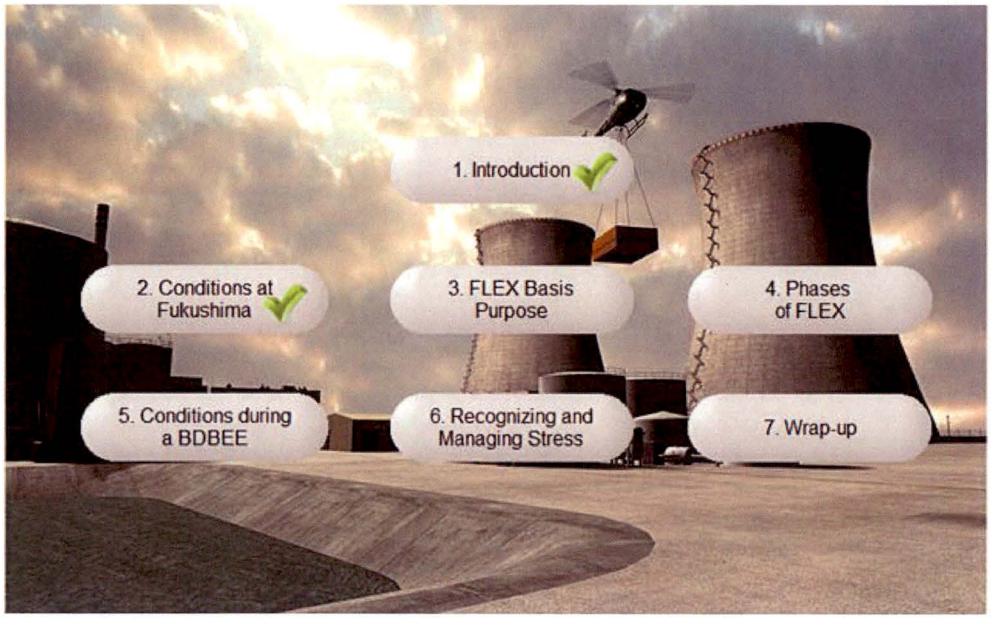
"It was dark in the Main Control Room and at the site, and I was full of anxiety about whether or not my family was safe and if the outside condition was okay as we could not watch the news."

"Although we had received various training, we could not use what we had learned in the training in that situation. We were watching limited available data in a situation in which our hands were tied."

"Before the parameters became available, I felt as if I had lost all my five senses."

"I called for staff who could go to the vent. Even relatively young operators raised their hands. I was moved to tears. I organized teams with shift supervisors assigned to each. As the members had to go to a place with high dose under unknown conditions in full equipment, I did not include young operators on the teams."

"I had to go to the Main Control Room next by rotation. As I prepared to die, I asked my father at home to take care of my wife and daughter if anything should happen to me."

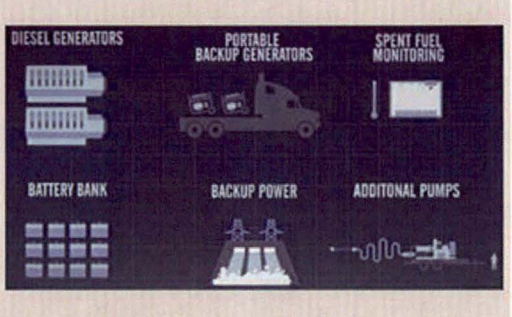


The Lessons of Fukushima

- Extreme external events do happen.
- We must be prepared for these kinds of events.

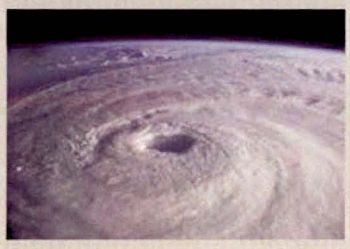
NEI 12-06 and FLEX

In response to the Fukushima accident, the nuclear industry began an initiative to develop guidance for nuclear power plants outlining how to respond to similar events. The document describing the strategies is NEI 12-06. The strategies it describes are also referred to as simply the "FLEX" strategies.



NEI
NUCLEAR ENERGY INSTITUTE

Goal of FLEX



FLEX provides for flexibility in responding to the conditions regardless of the event or cause.

US Nuclear Industry Event Response Framework

NSRC

NSRC: National SAFER Response Centers (NSRCs) maintain and transport additional FLEX equipment to established staging areas and affected nuclear facilities when requested, and assist with installation and initial operation of that FLEX equipment.

Unaffected Facilities: Unaffected nuclear facilities provide support such as technical assistance, labor assistance, and equipment when requested.

Unaffected Facility

INPO® Institute of Nuclear Power Operations

INPO

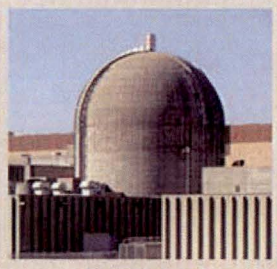
INPO: INPO is responsible for assisting as needed in the acquisition of equipment available through an NSRC or from other unaffected nuclear facilities, utilities, or vendors.

Click on each to see their roles and responsibilities related to FLEX implementation.

The Objectives of FLEX

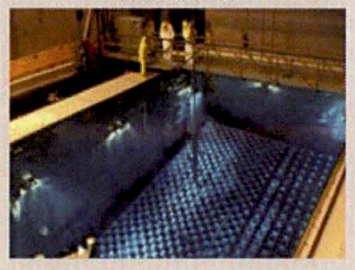
To enable a plant to restore and maintain its key safety functions of:

Core cooling



Containment integrity

SFP cooling



Assumptions of FLEX Strategies

All units on a site suffer a loss of:

All off-site and on-site AC Power Sources

Normal Access to the Ultimate Heat Sink more>>

This means that although the water will still be available for cooling and the structure that contains it will remain intact, there is no way to move the water (normally a pump) to either the core or fuel pool in order to cool the fuel.

FLEX will be implemented on a multi-unit site if even just one unit suffers an extended loss of all AC power.

Knowledge Check 1

Which two of the following are lessons learned from the accident at Fukushima?

Check your selections and then click the Check Answer button.

- ☐ The FLEX strategies are designed to address specific combinations of external events.
- ☐ We must prepare for events that exceed the design of our plants.
- ☐ A plant's design basis should account for all combinations of events.
- ☐ Nuclear power plants should not be built in areas subject to earthquakes and tsunamis.
- ☐ Extreme external events, although unlikely, do happen and can challenge our safety-related systems.

Check Answer

Knowledge Check 1

Which two of the following are lessons learned from the accident at Fukushima?
Check your selections and then click the Check Answer button.

- ☐ The FLEX strategies are designed to address specific combinations of external events.
- ☑ We must prepare for events that exceed the design of our plants.
- ☐ A plant's design basis should account for all combinations of events.
- ☐ Nuclear power plants should not be built in areas subject to earthquakes and tsunamis.
- ☑ Extreme external events, although unlikely, do happen and can challenge our safety-related systems.

Check Answer

That's correct. We learned that although extremely unlikely, beyond-design-basis events can occur. We must prepare for them because the loss of safety-related systems due to a beyond-design-basis external event can present significant challenges to a nuclear plant.

Knowledge Check 2

Select the correct word for each blank from the drop-down list in the following sentence. When done, click the Check Answer button.

FLEX strategies are based on the following two assumptions. They are

- loss of [ ] and
- loss of normal access to the [ ]

Check Answer

Reactivity Control	Station
AC power	Control Room
Cooling	Vital Switchgear
System Indications	Ultimate Heat Sink
Containment	Station Batteries

Knowledge Check 2

Select the correct word for each blank from the drop-down list in the following sentence. When done, click the Check Answer button.

FLEX strategies are based on the following two assumptions. They are

- loss of ✔ ac power nd
- loss of normal access to the ✔ ultimate heat sink

Check Answer

That's correct. Flex strategies assume that beyond-design basis external event results in losing all AC power and normal access to the ultimate heat sink.

Knowledge Check 2

Select the correct word for each blank from the drop-down list in the following sentence. When done, click the Check Answer button.

FLEX strategies are based on the following two assumptions. They are

- loss of ✔ ac power nd
- loss of normal access to the ✔ ultimate heat sink

Check Answer

That's correct. Flex strategies assume that beyond-design basis external event results in losing all AC power and normal access to the ultimate heat sink.

Key Points / Summary

Our lessons learned from the Fukushima event were that:

- Extreme external events do occur and can significantly challenge the safety of our plants.
- We must be prepared for these kinds of extreme events.

The objectives of FLEX are to:

- maintain core cooling
- maintain spent fuel pool cooling
- maintain containment integrity

The FLEX strategies are based on two assumptions:

- Offsite and on-site AC power sources are lost.
- Normal access to the ultimate heat sink is lost.

What is FLEX?

It is a three-phase approach that ensures a nuclear plant has the power and equipment needed to maintain the key safety functions of:

- Core cooling
- Spent fuel pool cooling
- Containment integrity

Click the picture to view an introduction to FLEX.

The Three FLEX Phases

Phase 1 → Phase 2 → Phase 3

Click on each phase for more information.

The Three FLEX Phases

Phase 1 | Phase 2 | Phase 3

Click on each phase for more information.

Phase 1: When an event resulting in an extended loss of AC power occurs, installed equipment is initially relied upon to maintain key safety functions. For example, installed Terry turbines will drive pumps that maintain reactor cooling during Phase 1. The duration of Phase 1 is based upon site-specific time studies that were used to determine how long installed equipment can maintain the operation of key safety functions.

The Three FLEX Phases

Phase 1 | Phase 2 | Phase 3

Click on each phase for more information.

Phase 2: FLEX Phase 2 involves the transition from using installed equipment to on-site FLEX equipment to maintain key safety functions. For example, during Phase 2, a portable pump may be connected to plant systems to maintain reactor cooling, replacing the function of the installed Terry turbine. All stations maintain needed on-site FLEX equipment and have modified their systems to include standard connection points for the installation of FLEX equipment. FLEX equipment includes:

- generators and cables
- pumps and hoses
- fans
- communications equipment
- portable ventilation equipment & lighting

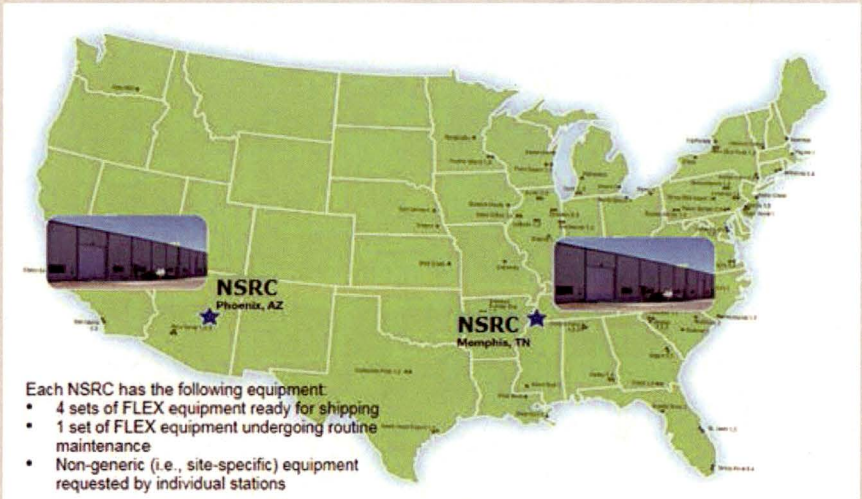
The Three FLEX Phases

Phase 1 | Phase 2 | Phase 3

Click on each phase for more information.

Phase 3: During Phase 3 additional equipment is shipped by truck or air from an NSRC to the affected station. The first delivery will reach the station within 24 hours of the request and all remaining equipment should arrive within three days. NSRC personnel will assist in setting up and connecting the equipment to station systems and with initial starting and operation of the equipment. Standard connectors are used on FLEX equipment so it will be compatible with plant system connection points, simplifying its installation.

National SAFER Response Centers (NSRCs)



Each NSRC has the following equipment:
- 4 sets of FLEX equipment ready for shipping
- 1 set of FLEX equipment undergoing routine maintenance
- Non-generic (i.e., site-specific) equipment requested by individual stations

Knowledge Check 3

Drag the description of equipment used for coping into each of the FLEX phases. Then click the Check Answer button.


On-site FLEX equipment


FLEX equipment from the NSRC


Installed plant equipment

Check Answer

Phase 1
Phase 2
Phase 3

Knowledge Check 3

Drag the description of equipment used for coping into each of the FLEX phases. Then click the Check Answer button.

Phase 1

✓ Installed plant equipment
Phase 2

✓ On-site FLEX equipment
Phase 3

✓ FLEX equipment from the NSRC

Check Answer

That's correct. In Phase 1 installed equipment is relied upon, Phase 2 introduces on-site FLEX equipment, and Phase 3 introduces FLEX equipment delivered from an NSRC.

Knowledge Check 4

The failure of a nearby dam has caused flooding in the plant and an extended loss of AC power. The damage is extensive and power won't be restored for days.

Click on the icon below that indicates who is responsible for delivering equipment to the affected nuclear facility.

INPO Institute of Nuclear Power Operations

INPO

Unaffected Plants

NSRC

Knowledge Check 4

The failure of a nearby dam has caused flooding in the plant and an extended loss of AC power. The damage is extensive and power won't be restored for days.

Click on the icon below that indicates who is responsible for delivering equipment to the affected nuclear facility.

INPO Institute of Nuclear Power Operations

INPO

Unaffected Plants

NSRC

That's correct, a National SAFER Response Center (NSRC) will deliver the equipment to the staging area and then the affected nuclear facility when requested. NSRC personnel will also assist in setting up and starting the equipment.

Knowledge Check 5

Which of the following is true regarding National SAFER Response Centers? Check all that are true and then click the Check Answer button.

- ☐ The NSRCs are fully staffed 24/7/365.
- ☐ Four NSRCs are located across the country; one for each NRC region.
- ☐ NSRCs maintain some non-generic (site-specific) FLEX equipment.
- ☐ NSRC personnel will deliver equipment only to the affected site's off-site staging area.
- ☐ NSRCs maintain adequate FLEX equipment to simultaneously support all nuclear facilities in their region.
- ☐ National SAFER Response Center workers will help set-up and start FLEX equipment at the station.

Check Answer

Knowledge Check 5

Which of the following is true regarding National SAFER Response Centers? Check all that are true and then click the Check Answer button.

- ☐ The NSRCs are fully staffed 24/7/365.
- ☐ Four NSRCs are located across the country; one for each NRC region.
- ☑ NSRCs maintain some non-generic (site-specific) FLEX equipment.
- ☐ NSRC personnel will deliver equipment only to the affected site's off-site staging area.
- ☐ NSRCs maintain adequate FLEX equipment to simultaneously support all nuclear facilities in their region.
- ☑ National SAFER Response Center workers will help set-up and start FLEX equipment at the station.

Check Answer

That's correct. A National SAFER Response Center will deliver FLEX equipment to the affected nuclear facility and will assist in setting up and starting the equipment. Some of the FLEX equipment is non-generic.

Knowledge Check 6

The installation of FLEX equipment to plant systems is simplified by: Check the correct answer and then click the "Check Answer" button.

- ○ including with each piece of FLEX equipment, multiple types and sizes of connections that are frequently used throughout the industry.
- ○ including with the FLEX equipment, detailed instructions for transition from the FLEX equipment connectors to site-specific connections.
- ○ the use of connections on the FLEX equipment that are standard throughout the industry and compatible with plant systems.
- ○ providing each site with an inventory of connectors allowing the transition from FLEX equipment connections to their system connections.

Check Answer

Knowledge Check 6

The installation of FLEX equipment to plant systems is simplified by: Check the correct answer and then click the "Check Answer" button.

- ○ including with each piece of FLEX equipment, multiple types and sizes of connections that are frequently used throughout the industry.
- ○ including with the FLEX equipment, detailed instructions for transition from the FLEX equipment connectors to site-specific connections.
- ◉ the use of connections on the FLEX equipment that are standard throughout the industry and compatible with plant systems.
- ○ providing each site with an inventory of connectors allowing the transition from FLEX equipment connections to their system connections.

Check Answer

That's correct, the use of standard connectors will simplify the transition to FLEX equipment.

Key Points / Summary

FLEX Phases:

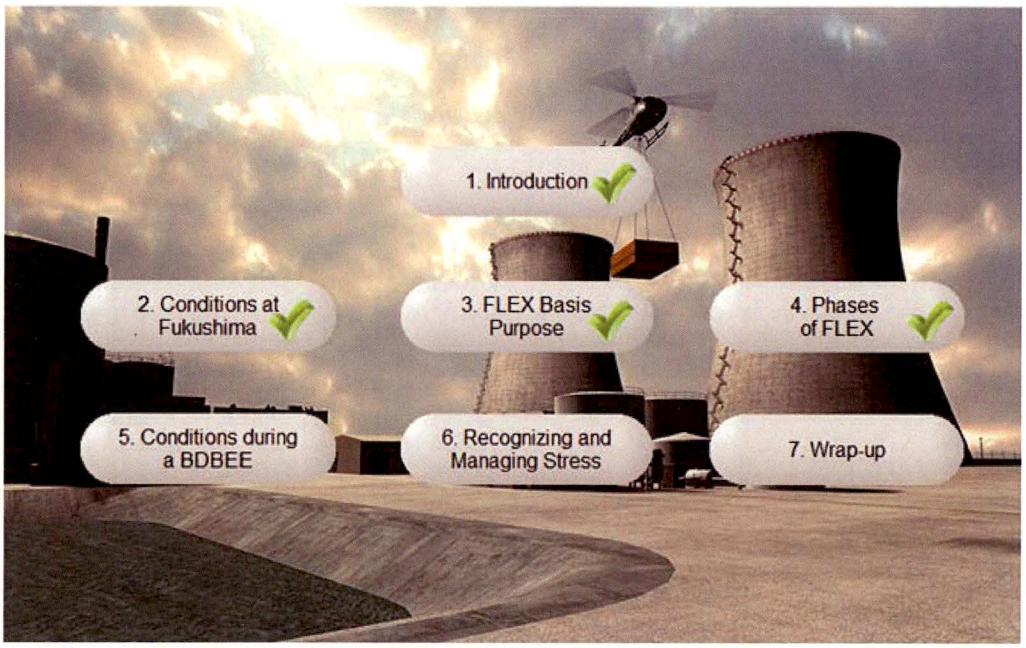
- Phase 1 involves using installed plant equipment to maintain the key safety functions.
- Phase 2 involves the transition to using on-site FLEX equipment to support safety functions.
- In Phase 3, NSRCs deliver additional FLEX equipment to the affected nuclear facility.

Two NSRCs (one in Memphis and one in Phoenix) maintain:

- FLEX equipment and
- Non-generic (site-specific) equipment.

Organizations supporting FLEX:

- INPO assists in the acquisition of equipment and resources.
- NSRCs deliver, set up, and assist in the initial operation of Phase 3 FLEX equipment,unaffected utilities provide resources, support, and equipment.



Earthquake and Tsunami March 11, 2011

Facts:

- 15,880 dead
- 2,994 missing
- 6,135 injured
- 128,931 buildings destroyed

Click to Watch Video

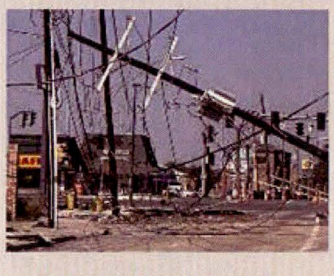
Click "Close" on the video screen when done.

Conditions During a Beyond Design Basis External Event

Beyond **D**esign **B**asis **E**xternal **E**vent

A natural disaster leading to a beyond-design-basis external event will result in:

- Restricted access to or from the site
- Debris blocking area roads and highways



- Damage to power and communications infrastructure

Click the pictures to see how FLEX compensates.

A natural disaster leading to a beyond-design-basis external event will result in:

Although FLEX provides equipment for site debris removal, it does not provide adequate equipment to clear roads in the surrounding areas.

FLEX includes methods to maintain communication between emergency workers and outside organizations as well as among workers on site and in the plant. Methods include satellite phones for external and emergency communications and sound-powered phones for plant communications.

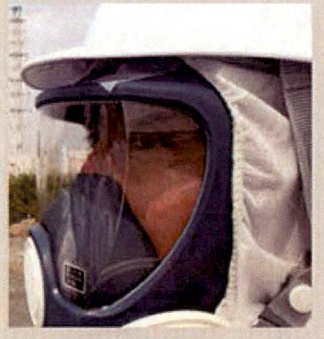
Working Conditions Will Be Altered

- Work/shift schedules (longer hours / different hours)
- Meal schedules (altered due to work requirements)
- Overnight stays at plant
- Limited access to personal communications
- Type of work assigned
- Internal communications (fewer radio channels / runners assigned / handwritten directions)
- Plant/system indications

Workers sleeping at Fukushima

Site Environmental Conditions Will Change

- Temperatures and humidity levels
- Loss of normal plant lighting systems
- Debris within plant areas
- Contamination and airborne radioactivity levels



Challenging Working Conditions

Click the picture to view a Fukushima video.

Knowledge Check 7

Listed below are site environmental and working conditions in which the Fukushima workers found themselves. Select those that would have been **mitigated or prevented** if the FLEX strategies had been implemented at Fukushima prior to the earthquake and tsunami.

Check all that apply and then click the Check Answer button.

- ☐ High airborne radioactivity due to fuel damage.
- ☐ Continued after shocks
- ☐ Inability to get needed equipment to the plant
- ☐ Extremely high radiation fields indicative of fuel damage
- ☐ Damaged roads in the surrounding area
- ☐ Lack of instrumentation for monitoring key safety systems
- ☐ Extensive debris inhibiting movement through the site

Check Answer

Knowledge Check 7

Listed below are site environmental and working conditions in which the Fukushima workers found themselves. Select those that would have been **mitigated or prevented** if the FLEX strategies had been implemented at Fukushima prior to the earthquake and tsunami.

Check all that apply and then click the Check Answer button.

- [x] High airborne radioactivity due to fuel damage.
- [ ] Continued after shocks
- [x] Inability to get needed equipment to the plant
- [x] Extremely high radiation fields indicative of fuel damage
- [ ] Damaged roads in the surrounding area
- [x] Lack of instrumentation for monitoring key safety systems
- [x] Extensive debris inhibiting movement through the site

Check Answer

That's correct. With the exception of the continuing aftershocks and damaged roads in the surrounding areas, FLEX would have mitigated or prevented all of these conditions.

Knowledge Check 8

We know that FLEX will mitigate the conditions listed below. But some will still remain a challenge to workers responding to a BDBEE.

Check all that will still be a challenge and then click the Check Answer button.

- [ ] Loss of normal plant lighting systems
- [ ] Hazardous radiation levels in commonly occupied areas
- [ ] Loss of on-site communications
- [ ] Inadequate heating and cooling of plant spaces
- [ ] Severe radiation levels indicative of fuel damage
- [ ] Movement of personnel and equipment on and off site

Check Answer

Knowledge Check 8

We know that FLEX will mitigate the conditions listed below. But some will still remain a challenge to workers responding to a BDBEE.

Check all that will still be a challenge and then click the Check Answer button.

- [x] Loss of normal plant lighting systems
- [ ] Hazardous radiation levels in commonly occupied areas
- [x] Loss of on-site communications
- [x] Inadequate heating and cooling of plant spaces
- [ ] Severe radiation levels indicative of fuel damage
- [x] Movement of personnel and equipment on and off site

Check Answer

That's correct. Although FLEX will prevent or mitigate many conditions experienced by the workers at Fukushima, challenges such as limited lighting, communications, ventilation, and movement around and to and from the plant may still challenge workers.

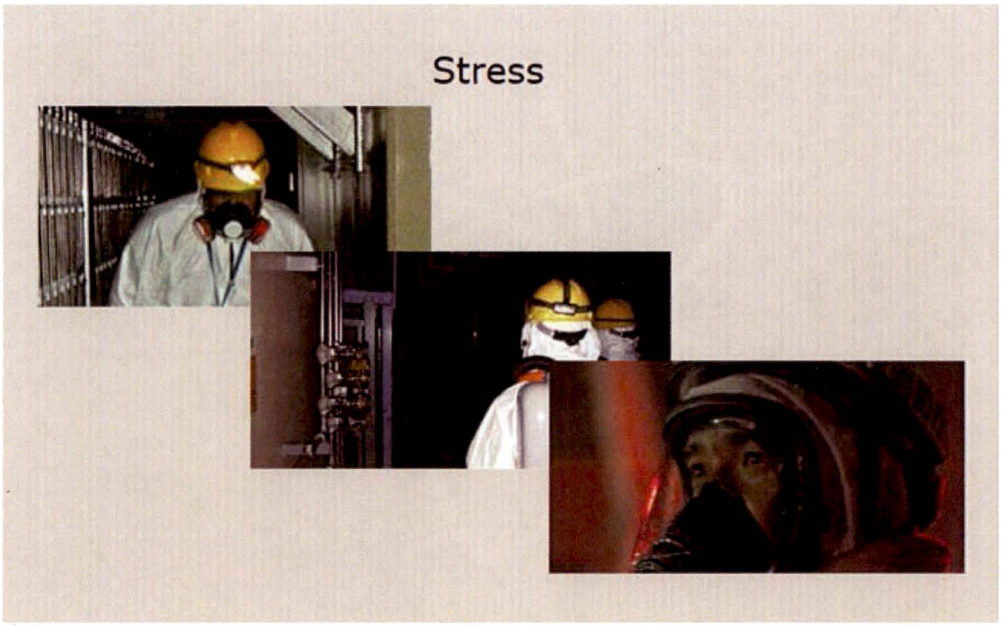
Key Points / Summary

Although conditions following a beyond-design-basis external event will be challenging, FLEX will improve them.

FLEX will provide:

- Satellite phone communications to emergency response personnel and organizations
- A means of on-site communications using sound-powered phones or other methods
- Equipment for debris removal capability
- A means of cooling fuel in the core and spent fuel pool, thus maintaining fuel and containment integrity and limiting radiation releases and contamination
- Alternate sources of lighting (portable lighting, flashlights, and headlamps)
- Indications for key safety functions


1. Introduction
2. Conditions at Fukushima
3. FLEX Basis Purpose
4. Phases of FLEX
5. Conditions during a BDBEE
6. Recognizing and Managing Stress
7. Wrap-up


Stress

Signs of Stress

- difficulty remembering instructions
- difficulty engaging in problem solving
- difficulty making decisions
- headaches or nausea
- frustration
- unnecessary risk taking
- loss of objectivity

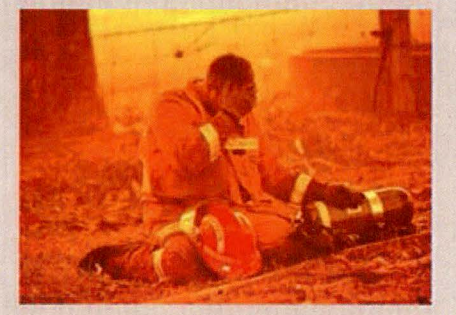
Managing Stress: Organizational Actions

The US Department of Health and Human Services recommends that managers and supervisors take the following actions to prepare to deal with stress:

- Provide appropriate knowledge and skill training for all workers
- Establish a clear chain of command and reporting relationships
- Ensure access to supervisors
- Schedule shifts so that outgoing workers can brief incoming workers
- Ensure necessary supplies and tools are available and operational

Managing Stress: Individual Actions

- Participate in ERO training and be accountable for your performance.
- Keep the chain of command informed
- Participate in turnovers.
- Look out for each other.
- Ensure necessary supplies and tools are available and operational.
- Recognize and heed early warning signs of stress reactions in yourself.
- Accept that you may need help to assess problematic stress reactions.



Manage Stress with HU Tools

Pre-job Brief | **Effective Communications** | **Situational Awareness**

Effective Communications

- Ensure a focus on safety is maintained
- Provide assurance that personnel understand their task assignments clearly
- Ensure the bases for decisions and the expected outcomes are understood

Pre-job Brief

- Ensure effective communications between leaders and workers and provide workers with a clear goal and steps for its achievement
- Ensure workers have needed tools and supplies for the task
- Provide workers with an opportunity to raise concerns
- Ensure workers understand the chain of command for a particular activity

Situational Awareness

- Ensures that challenges to safety are recognized
- Identify unexpected conditions before proceeding
- Enables workers to identify all tools and supplies needed to work as safely and efficiently as possible
- Self Checking and Questioning Attitude are tools for gaining situational awareness

Knowledge Check 9

Which of the following techniques would be helpful in managing stress?

Check all that are and then click the Check Answer button.

- ☐ Ignore your stress until it goes away
- ☐ Provide knowledge and skill training for all workers
- ☐ Smoke because it calms your nerves
- ☐ Don't talk to others about stressful situations
- ☐ Set reasonable work schedules and priorities
- ☐ Look out for each other

Check Answer

Knowledge Check 9

Which of the following techniques would be helpful in managing stress?

Check all that are and then click the Check Answer button.

- ☐ Ignore your stress until it goes away
- ☑ Provide knowledge and skill training for all workers
- ☐ Smoke because it calms your nerves
- ☐ Don't talk to others about stressful situations
- ☑ Set reasonable work schedules and priorities
- ☑ Look out for each other

Check Answer

That's correct. Knowledge and skill training, setting reasonable work schedules and priorities, and looking out for each other are all ways of helping to manage the effects of stress.

Key Points / Summary

Stress affects workers to different degrees. Some might find a stressful situation just a nuisance while others might find it debilitating.

Under significant stress, workers might:
- become forgetful or unable to effectively make decisions
- experience headaches, nausea, or loss of objectivity
- take unnecessary risks

To reduce stress, managers can:
- provide appropriate knowledge and skill training for workers
- establish a clear chain of command
- ensure workers are provided the tools and information to perform assigned tasks

Individual workers should:
- Participate in ERO training and be accountable for your performance
- Keep chain of command informed
- Participate in turnovers and look out for each other
- Ensure necessary supplies and tools are available and operational
- Recognize and heed early warning signs for stress reactions
- Accept that you may need help to assess problematic stress reaction

Congratulations, you have completed the course.
During this course you have learned that:

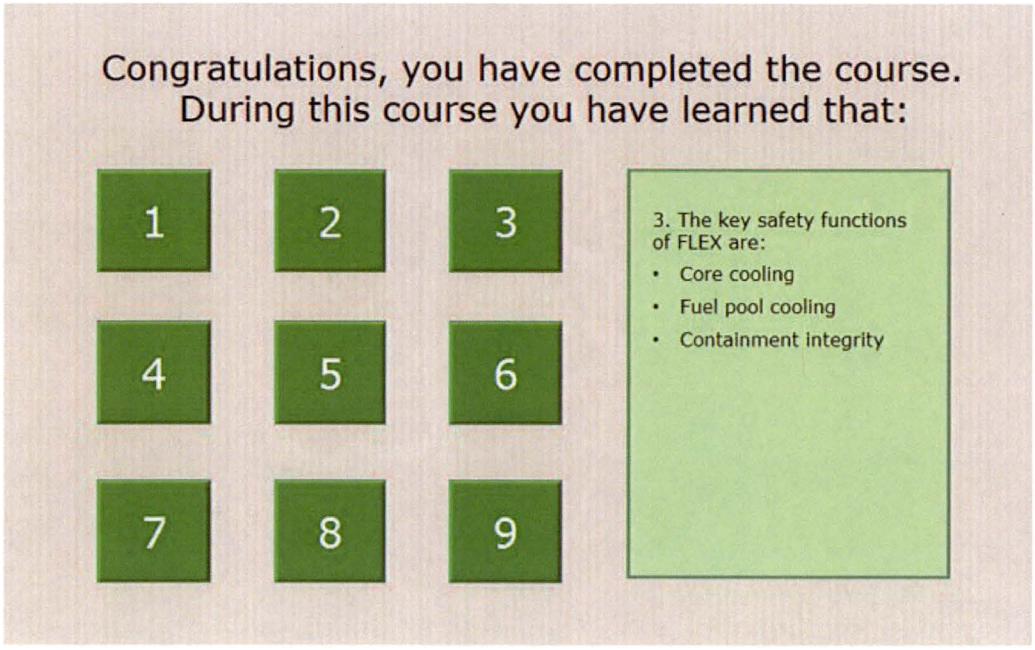
1 2 3
4 5 6
7 8 9

1. Fukushima taught us that although infrequent, external events beyond the design bases of our plants do occur and can present significant challenges to the safety of our plants and so we must be prepared to deal with these kinds of extreme events.

Congratulations, you have completed the course.
During this course you have learned that:

1 2 3
4 5 6
7 8 9

2. FLEX assumes a site will lose all AC power and normal access the ultimate heat sinks to all units on a station. Even under these conditions the FLEX strategies will enable a station to restore and maintain its key safety functions.


Congratulations, you have completed the course.
During this course you have learned that:
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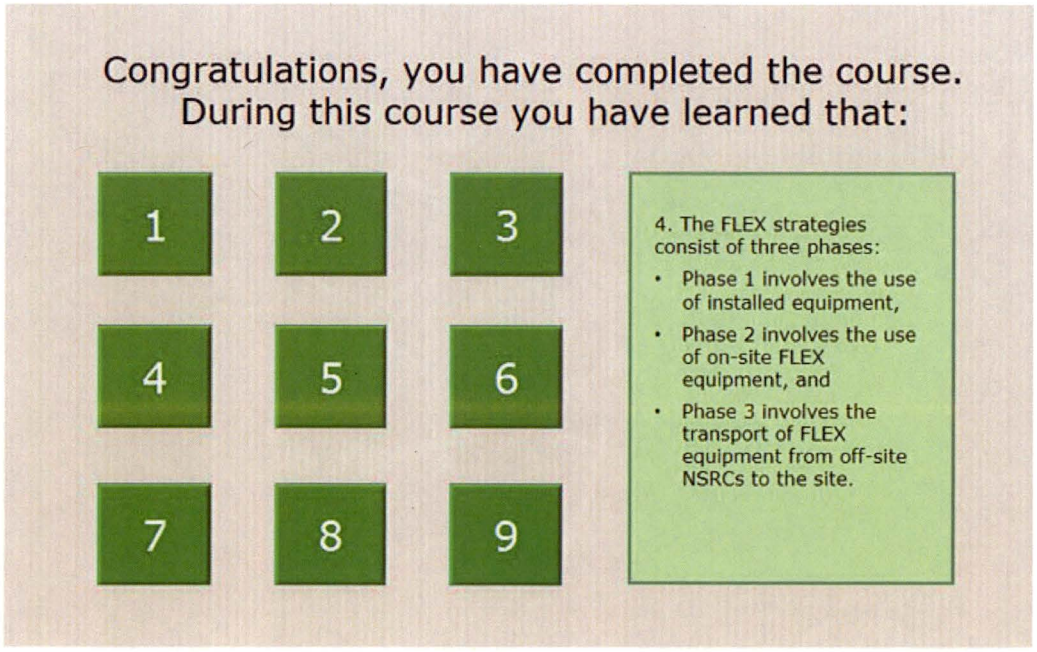
3. The key safety functions of FLEX are:
• Core cooling
• Fuel pool cooling
• Containment integrity


Congratulations, you have completed the course.
During this course you have learned that:
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4. The FLEX strategies consist of three phases:
• Phase 1 involves the use of installed equipment,
• Phase 2 involves the use of on-site FLEX equipment, and
• Phase 3 involves the transport of FLEX equipment from off-site NSRCs to the site.

Congratulations, you have completed the course.
During this course you have learned that:

1	2	3
4	5	6
7	8	9

5. The implementation of FLEX involves the NSRCs, INPO, and individual nuclear facilities.
- The NSRCs provide FLEX equipment to the afflicted facilities.
- INPO assists with the acquisition of equipment and resources from the NSRCs, vendors, or other utilitites.
- Unaffected facilities provide assistance as requested.

Congratulations, you have completed the course.
During this course you have learned that:

1	2	3
4	5	6
7	8	9

6. Workers at Fukushima experienced severe conditions like:
- very high rad and contamination levels due to fuel failures
- little or no lighting
- little or no HVAC
- restricted or no site access
- little/no communications with the outside world.
- no planned recovery path
- no means to cool nuclear fuel

Congratulations, you have completed the course.
During this course you have learned that:

1 2 3
4 5 6
7 8 9

7. To support FLEX, US nuclear utilities have teamed up to establish two National SAFER Response Centers (NSRCs) and purchase 5 sets of FLEX equipment for each.

Congratulations, you have completed the course.
During this course you have learned that:

1 2 3
4 5 6
7 8 9

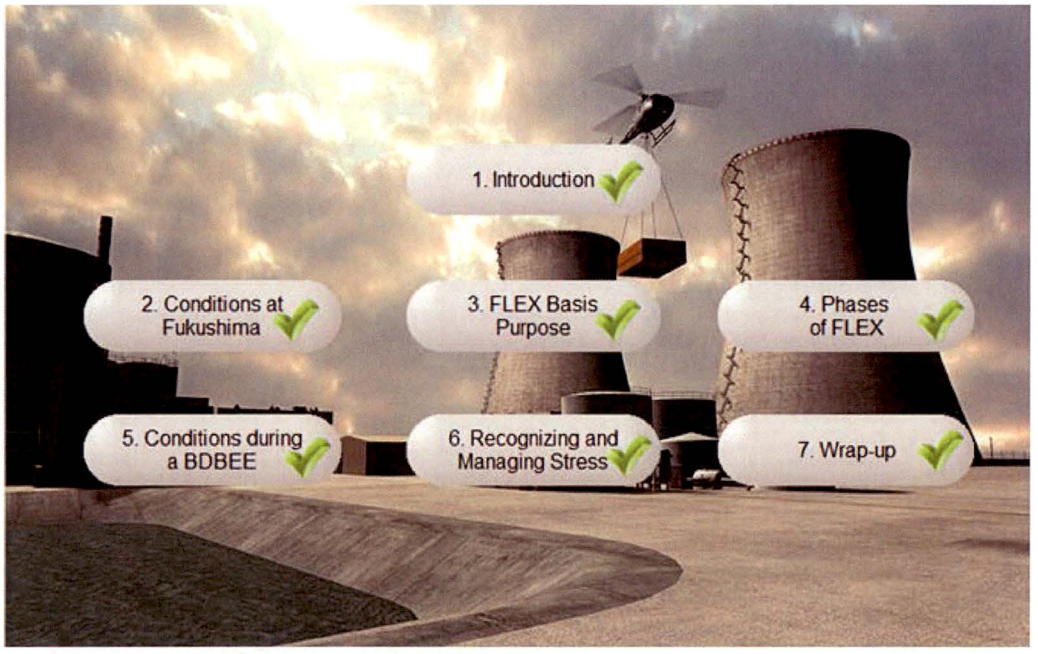
8. Contributors to stress include:
- changes in home and work schedules
- changes in working conditions

Indicators of stress include:
- difficulty remembering instructions, engaging in problem solving, and making decisions
- headaches & nausea
- loss of objectivity & unnecessary risk-taking

Congratulations, you have completed the course.
During this course you have learned that:

1 2 3
4 5 6
7 8 9

9. Methods to manage stress include:
- providing appropriate training to workers
- establishing clear chains of command and access to supervisors
- ensuring availability of needed supplies
- ensuring good communications and turnovers
- individual physical and mental preparation



Clinton Power Station

Control Logic "Failure" Modes with Respect to FLEX Phase 1 and Phase 2 Core Cooling Flow Paths

Prepared By: P. K. Ryan

Reviewed By: Mark McClure

Approved By: Dale Shelton

Control Logic Failure Modes with Respect to FLEX Phase 1 and 2 Core Cooling Flow Paths

Background

INPO IER L1-13-10, "Nuclear Accident at the Fukushima Daiichi Nuclear Power Station," Recommendation 4, states the following:

> **Validate that personnel understand the failure modes of all control logic in core cooling systems and that operators and emergency response personnel monitor system status and can respond to restore core cooling if lost early in the accident sequence.**

It is understood that this recommendation applies to the core cooling equipment/flow paths that are used in the FLEX core cooling strategy for Phase 1 (installed plant equipment) and Phase 2 (on-site portable equipment).

In the interest of maintaining core cooling equipment and flow paths in operation, in addition to the actual "failure" of a control logic (or interlock), this paper will assess the impact of actual control logic/interlock actuation as a result of an anticipated actual plant condition (such as a high drywell pressure and high containment pressure).

By reviewing the control logic failure modes, as well as the impact of real actuations, an overall picture of actions needed to protect and/or restore core cooling equipment during the execution of the Clinton Phase 1 and 2 FLEX core cooling strategies can be developed.

FLEX Core Cooling Strategies

The FLEX core cooling flow paths are depicted on the two attached one-line diagrams. In summary, RCIC is used to inject to the RPV for Phase 1. For Phase 2:

1. the Division 1 (primary) or Division 2 (alternate) Low Pressure Coolant Injection (LPCI) flowpath while the RHR loop is operating in the FLEX Suppression Pool Cooling mode, and
2. direct injection into the RPV from the FLEX pump using hose connections on the Low Pressure Core Spray (LPCS) or the LPCI-C injection headers.

Phase 1:

A failure of the control logic for the RCIC speed control system is the functional equivalent of a loss of power (DC) to the control logic. The end result is the inability of the control system to automatically control the speed/flow of the RCIC turbine/pump. In this failure situation, the RCIC system could be operated manually in accordance with 4303.01P013, RCIC MANUAL OPERATION WITHOUT DC

CONTROL POWER. This procedure provides the guidance for manually throttling the steam flow to RCIC to maintain pump discharge pressure greater than RPV pressure and verifying that RPV level is responding as expected.

EOP-1 RPV LEVEL CONTROL specifies RCIC as a primary injection system and provides allowance for bypassing trip signals that could otherwise preclude its use. 4410.00C001, DEFEATING RCIC INTERLOCKS contains the direction for defeating certain RCIC isolation signals to help maintain the operation of RCIC under emergency conditions:

- RCIC Area Temperature Isolation Signals
- RCIC Suction Transfer
- Low RCIC Steam Supply Pressure Isolation
- RCIC Level 8 Isolation

Additionally, Clinton will implement the additional defeats provided in EPG/SAG Rev. 3 from the BWROG. These defeats include:

- RCIC Exhaust Diaphram High Pressure Isolation
- RCIC High Exhaust Pressure Trip
- RCIC Stm Flow High

Phase 2:

As shown in Attachment 1, the 'A' and 'B' RHR systems are being used for RPV injection flow paths (core cooling) in addition to their containment cooling function. Specifically, water from a Suppression Pool Cleanup and Transfer (SF) pump is being provided to the RHR systems at a connection on the previously abandoned Steam Condensing Mode piping on the inlet to the RHR heat exchangers. With a FLEX pump providing cooling water to the heat exchanger, this flowpath is able to remove decay heat from the suppression pool, and provide the 'preferred' RPV makeup system using the associated LPCI piping and valves. This is the preferred RPV makeup system because the suppression pool water will be relatively clean for many hours of operation.

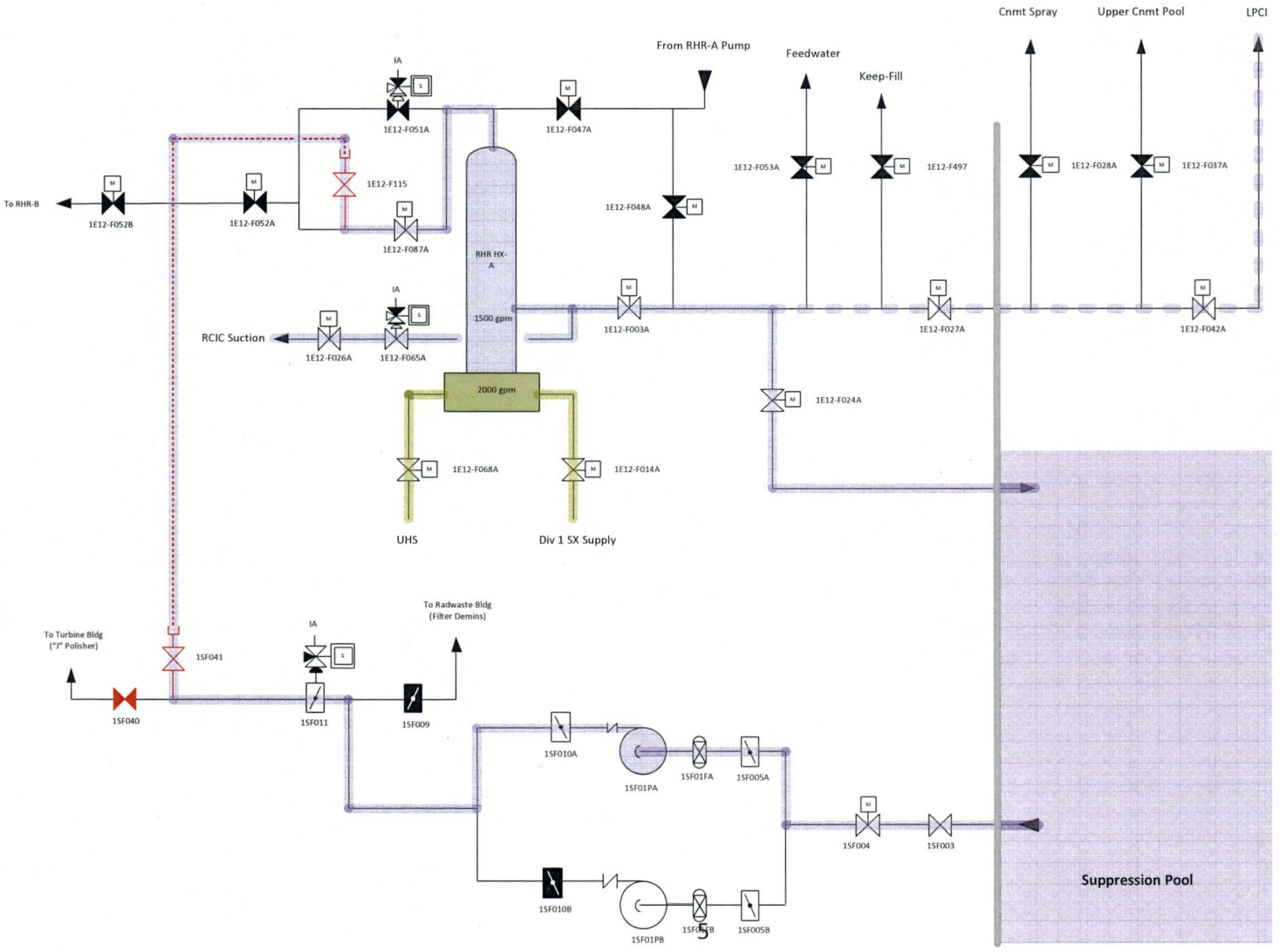
While the RHR system provides the preferred method for RPV makeup during an extended loss of AC power event, there are two methods shown in Attachment 2 for supplying ultimate heat sink water to the reactor from a FLEX pump. These two methods use hose connections on the LPCS and LPCI-C injection headers. The injection valves (1E21-F005 and 1E12-F042C) are **easily accessible for manual operation, and therefore these two RPV makeup methods are not susceptible to control logic failures.** They are always available should the suppression pool supply become unavailable due to control logic failures.

Even though this 'ultimate' RPV makeup sytem exists in Clinton's FLEX strategy, this paper will analyze the control logic and interlocks that could affect the 'preferred' method of RPV makeup. The paper will also consider the affect of logic system actuations that would otherwise be proper if power was available to an RHR pump. For example, several hours into the event the logic for the Containment

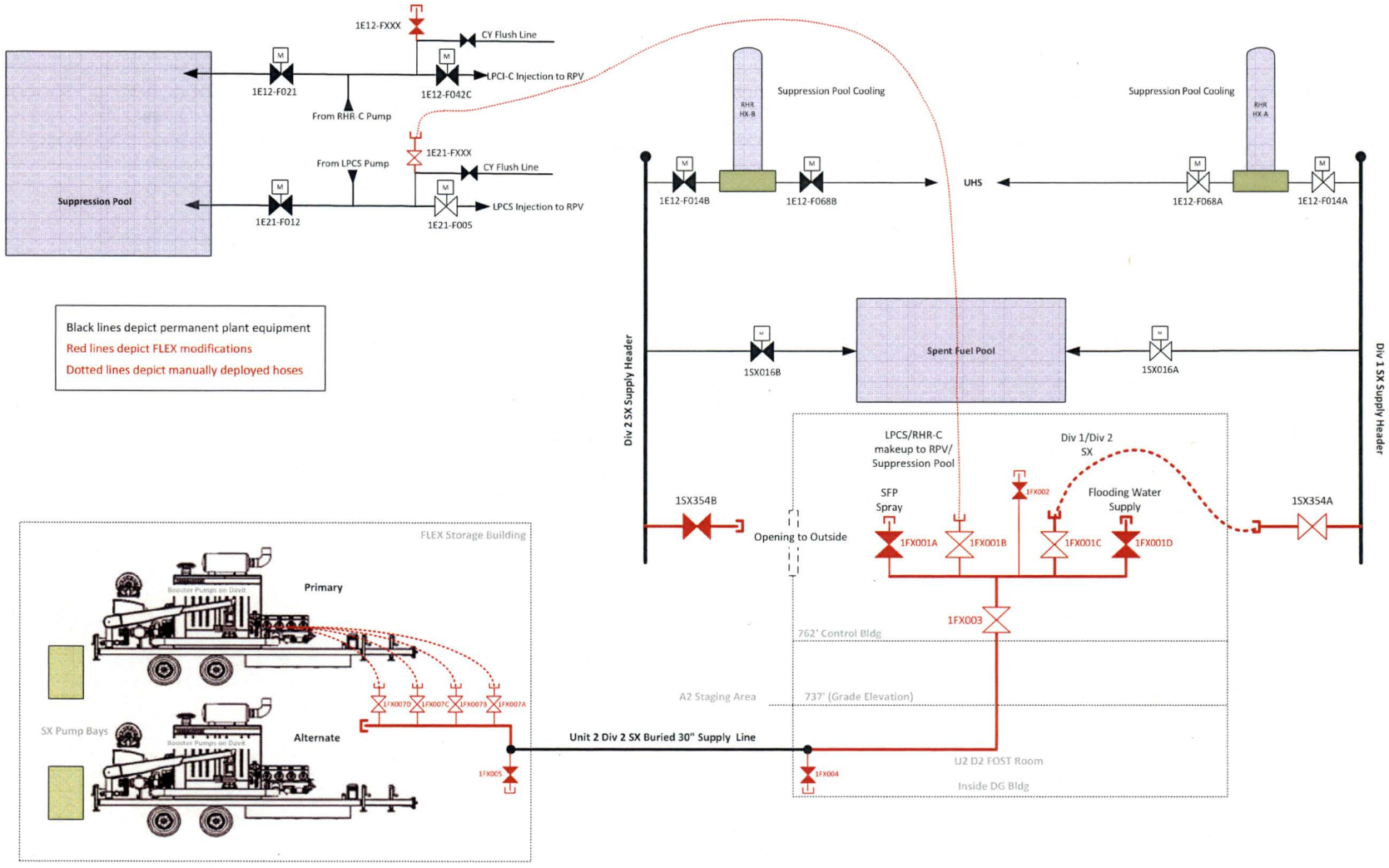
Spray mode of RHR can be expected to be met. The valves that realign for Containment Spray, in the absence of an RHR pump, have the affect of interrupting the suppression pool cooling method that was established using the SF pump and RHR heat exchanger.

Wherever it was deemed appropriate, compensatory actions were included in the FLEX Support Guides (FSGs) to allow the 'preferred' method for RPV makeup to continue even when control logic failures or logic system actuations functioning as designed have complicated the establishment of the required valve lineup.

Attachment 1
FLEX Suppression Pool Cooling



Attachment 2
FLEX RPV Makeup



Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
Controls and Interlocks		
RH A (B) Full Flow Test Valves F024A and F024B		
Full Flow Test Valves F024A and F024B can not be opened if Shutdown Cooling Suction Valve F006A or F006B are not fully closed to prevent possible draining of the RPV to the suppression pool.	1E12-F024A(B) is used in the FLEX Suppression Pool Cooling lineup.	1E12-F024A(B) can be accessed to operate manually if required
RH A (B) Containment Outboard Isolation Valves F027A and F027B		
The RH containment outboard isolation valves are interlocked such that the associated Containment Spray Shutoff Valve F028A (B) and LPCI from RH Shutoff Valve F042A (B) must be fully closed before an isolation valve can be opened. This interlock prevents inadvertent LPCI injection or containment spray during RH System testing.	1E12-F027A(B) is used in the FLEX Suppression Pool Cooling and RPV Makeup lineups.	• The step for opening 1E12-F027A(B) in 4306.01P004 LOW PRESSURE RPV MAKEUP identifies this interlock. • 1E12-F027A(B) can be accessed to operate manually if required
RH A(B) Containment Spray A(B) Shutoff Valves F028A and F028B		
1. RH can be opened only if the associated Containment Outboard Isolation Valve F027A (B) is fully closed. This prevents inadvertent flow to a containment spray header during valve stroke testing.	1E12-F028A(B) needs to remain shut.	The valve is not repowered in the FLEX electrical lineup.
2. RH A(B) Containment Spray A(B) Shutoff Valves F028A and F028B are interlocked closed:		
a. If a LPCI initiation is present without a CS initiation signal. (Manual CS Initiation Button will initiate CS sequence with LPCI Initiation signal)		
b. High Drywell Pressure signal required to initiate CS by manually opening F028A(B)		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
LPCI From RH Shutoff Valves F042A, F042B, and F042C		
1. The LPCI injection valves, F042A, B, and C, open automatically if a sealed-in LPCI initiation signal is present, the associated valve control switch is not in CLOSE, a CS initiation signal is NOT present, and reactor pressure is less than 472 psig.	The ability to open 1E12-F042A(B) needs to be maintained for RPV makeup.	Included a note in 4306.01P001 FLEX ELECTRICAL CONNECTIONS to alert the MCR that ECCS injection valves may open upon energization.
2. If a LPCI initiation signal is present when a valve control switch is taken to CLOSE, the valve closes and an override annunciator actuates in the MCR indicating that manual operation is required to open it for injection.		No impact on RPV makeup strategy.
3. The valve closes with a sealed-in CS initiation signal present ensuring full flow to the spray headers to protect the containment against overpressurization.		Disabled the Containment Spray system in 4306.01P003 FLEX SUPPRESSION POOL COOLING by raising the Containment Pressure setpoint.
RH Heat Exchanger Bypass Valves F048A and F048B		
1. F048A and B are normally open in standby, and will automatically open if closed upon LPCI initiation to ensure full flow for 10 minutes to the reactor vessel for makeup during a LOCA.	1E12-F048A(B) needs to remain shut for both the core cooling and suppression pool cooling flowpaths. Flowpath through the HX needs to be maintained for RPV makeup, while in the FLEX suppression pool cooling lineup.	The RPV makeup flowpath is maintained through the HX (1E12-F003A(B) and Steam Condensing Mode piping on the HX inlet). 1E12-F048A(B) needs to be kept shut by turning off the breaker or by manual operation. This is specified in 4306.01P003 FLEX SUPPRESSION POOL
2. F048A and B automatically close if ALL the following conditions are satisfied		
a. CS initiation signal present and 10 minute LOCA timer has timed out, and		
b. Same loop RH Heat Exchanger Inlet Valve F047A(B) fully open, and		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
c. Same loop RH Heat Exchanger Outlet Valve F003A (B) fully open.		COOLING. The 10 minute time delay will have timed out long before the FLEX suppression pool cooling is established.
3. If containment spray is manually initiated before the 10-minute LPCI signal seal-in timer times out, F048A and B cycle until the timer times out. Opening of F048B is delayed for 90 seconds on automatic initiation to allow time for containment spray train A to reduce containment pressure.	Not applicable	Manual Containment Spray actuation is not a FLEX related action.
RH Pump Minimum Flow Recirc Valves F064A, F064B and F064C.		
1. The RH pump minimum flow valves are open in the standby lineup. Following the start of a pump, they automatically close when pump discharge flow reaches 1100 gpm. Thereafter, they open whenever RH pump discharge flow is less than 1100 gpm for 8 seconds, and re-close when pump discharge flow reaches 1100 gpm.	Applicable	A check valve isolates the minimum flow line from the pressurized piping.
RH Heat Exchanger SSW Inlet and Outlet Valves F014A, F014B, F068A & F068B		
Each of these valves automatically opens on a containment spray initiation. Loop A valves open immediately and loop B loop valves are delayed for 90 seconds. They cannot be closed when a containment spray initiation signal is present. They also open automatically on a manual containment spray initiation if drywell pressure is 1.68 psig.	Applicable	These valves are opened from their control switches. The Containment Spray function is disabled and manual operation is specified if required in 4306.01P003 FLEX SUPPRESSION POOL COOLING.

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
Automatic Isolations		
1. Group 2 - RH A(B) to Containment Pool Cooling Shutoff Valves F037A and F037B close from the	Not Applicable	Valves are only open during outages.
• RPV Level <Low Level 3 (8.9") or		
• High Drywell pressure (1.68 psig)		
• RH Heat Exchanger Rm Temp High >144.5 °F		
2. Group 3 - Shutdown Cooling Inboard and Outboard Isolation Valves F009 & F008, RH to Feedwater Shutdown Cooling Return Valves F053A and F053B, and Reactor Head Spray Valve F023 automatically close from the following Group 3 Isolation logic signals:	Not Applicable	Valves only open during outages.
• RPV Level <Low Level 3 (8.9") or		
• RPV Pressure >104 psig.		
• RH Heat Exchanger Rm Temp High >144.5 °F		
3. Group 11 - The LPCI and CS initiation signals are used to initiate Group 11.	Applicable	The Containment Spray function is disabled and manual operation is specified if required in 4306.01P003 FLEX SUPPRESSION POOL COOLING.
a. RH A (B) Full Flow Test Valves F024A(B) and RH C Full Flow Test Valve F021 automatically close from the following Group 11 Isolation logic signals:		
• High Drywell pressure (1.68 psig)		
• RPV water Level 1 (-145.5")		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
b. The LPCI and CS initiation signals automatically close F024A and F024B; however either valve may be opened with a LPCI signal present to allow for suppression pool cooling. An alarm sounds to alert the operator that the valve is not fully open.		
4. Group 20 - RH B Radwaste First (Second) Isolation Valves F049(F040) and the RH Heat Exchanger First (Second) Sample Valves F060A(B), F075A(B) automatically close from the following Group 20 Isolation logic signals:	Not Applicable	Valve is normally shut and confirmed in 4306.01P003 FLEX SUPPRESSION POOL COOLING.
• RPV Level <Low Level 3 (8.9") or		
• High Drywell pressure (1.68 psig)		
• RH Heat Exchanger Rm Temp High >144.5 °F		
LPCI/LPCS Initiation Logic		
1. If in SDC, as level decreases, F008 and F009 isolate (close) on Level 3 and the RH pump in shutdown cooling trips. RH must then be manually placed in the LPCI mode by opening F004A and re-starting the RH pump.	Not Applicable	Valves not used in FLEX strategies
2. Initiated by a Low reactor water level (<Level 1) and/or High Drywell Pressure High (>1.68 psig) in a combined "one-out-of-two-twice" logic. Or Manual Initiation by arming and depressing the "LPCS/LPCI A" pushbutton.	Applicable	High Drywell Pressure is expected due to RR Pump seal leakage.
3. LPCS Pump starts immediately.	Not Applicable	No 4.16 KV power
4. RH Pump A starts after a five-second time delay, which is initiated from the time Bus 1A1 is powered.	Not Applicable	No 4.16 KV power

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
5. Other than shutdown cooling valves, all other air and motor operated valves change position to establish the LPCI valve lineup as follows:		
a. RH Hx Bypass Valves F048A OPEN. (open signal for 10 minutes)	Applicable	• Valve needs to remain shut to avoid "short cycling" to the suppression pool. • Suppression Pool Cooling requires the valve to be shut, but the 10 minute delay has no impact.
b. RH Full Flow Test Valve F024A and LPCS Full Flow Test Valve F012 CLOSE.	Applicable	• 1E12-F024A needs to open for Suppression Pool Cooling and throttled for RPV makeup during suppression pool cooling operation. • 1E12-F024A can be accessed to operate manually if required • 1E21-F012 needs to be closed for RPV makeup from a FLEX pump and open for suppression pool makeup • 1E21-F012 can be accessed to operate manually if required
c. RH to Containment Spray Valves F028A CLOSE.	Not Applicable	The valve is not repowered in the FLEX electrical lineup.

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
d. RH to Containment Outboard Isolation Valves F027A OPEN.	Applicable	• Valve needs to open for RPV makeup. • Valve can be accessed to operate manually if required
6. LPCI injection valve F042A and LPCS injection valve F005 open when vessel pressure is less than 472 psig.	Applicable	• 1E12-F042A needs to open for RPV makeup during suppression pool cooling operation. • 1E21-F005 needs to be open for RPV makeup from a FLEX pump, but can be opened manually.
7. The LPCI initiation signal seals in upon actuation and must be manually reset when the initiating signal(s) clear using the Division 1 manual reset button.	Applicable	LPCI/LPCS signal will persist
RHR-A Containment Spray Initiation Logic		
1. CS initiates, if LPCI/LPCS logic has been actuated for >10 minutes AND Drywell Pressure High (>1.68 psig) in one-out-of-two logic AND Containment Pressure High (>7.6 psig) in a one-out-of-two logic. Or, Manual Initiation by arming and depressing CNTMT SPRAY A manual initiation pushbutton AND Drywell Pressure High (>1.68 psig) in one-out-of-two logic.	A Containment Spray Initiation signal is regarded as an unacceptable impediment to establishing and maintaining a Suppression Pool Cooling lineup during this event. The FLEX Suppression Pool Cooling lineup requires the 1E12-F024A to be open and 1E12-F028A to be shut.	Containment Spray is effectively disabled by raising the containment pressure setpoint at the ATM. Should the Containment Spray automatic initiation occur before the ATM setpoint is raised, the signal can be reset and the valves repositioned after raising the
2. RH Pump A starts immediately and 1E12-F024A, RHR Test Valve To Suppr Pool-SHUT (directly from LPCI/LPCS logic).		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
3. Automatic initiation of CS can be delayed by repeatedly depressing the divisional delay timer reset pushbutton BEFORE the 10-minute containment spray delay timer times out.		setpoint.
4. Division 1 VG Low Level 2 or High Drywell Pressure Load Driver starts SX Pump A.		
5. RH valves change position to establish the containment spray lineup as follows:		
a. 1E12-F028A, RHR A To CNMT Spray A Shutoff Valve-OPEN		
b. 1E12-F014A, SSW Inlet RHR A Hx Valve-OPEN		
c. 1E12-F068A, RHR A Hx SSW Outlet Valve-OPEN		
d. 1E12-F003A, RHR A Hx Outlet Valve-NORMALLY OPEN - DOES NOT RECEIVE OPEN SIGNAL		
e. 1E12-F047A, RHR A Hx Inlet Valve-NORMALLY OPEN - DOES NOT RECEIVE OPEN SIGNAL		
f. 1E12-F048A, RHR A Hx Bypass Valve-SHUT		
g. 1SX082A, RHR A Hx MU Cond Inlet Valve-SHUT		
h. 1E12-F024A, RHR A Test Valve To Suppr Pool-SHUT		
LPCI B/C Initiation Logic		
1. If in SDC, as level decreases, F008 and F009 isolate (close) on Level 3 and the RH pump in shutdown cooling trips. RH B must then be manually placed in the LPCI mode by opening F004B and re-starting the RH B pump.	Not Applicable	Valves not used in FLEX strategies

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
2. Initiated by a Low reactor water level (<Level 1) and/or High Drywell Pressure High (>1.68 psig) in a combined "one-out-of-two-twice" logic. Or Manual Initiation by arming and depressing the "LPCI B/C" pushbutton.	Applicable	High Drywell Pressure is expected due to RR Pump seal leakage.
3. RH Pump C starts immediately.	Not Applicable	No 4.16 KV power
4. RH Pumps B start after a five-second time delay, which is initiated from the time Bus 1B1 is powered.	Not Applicable	No 4.16 KV power
5. Other than shutdown cooling valves, all other air and motor operated valves change position to establish the LPCI valve lineup as follows:		
a. RH Hx Bypass Valves F048 B OPEN. (open signal for 10 minutes)	Applicable	• 1E12-F048A(B) needs to remain shut to prevent short cyling to the suppression pool. • Suppression Pool Cooling requires the valve to be shut, but the 10 minute delay has no impact.

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
b. RH Full Flow Test Valves F024B and F021 CLOSE.	Applicable	• 1E12-F024B needs to open for Suppression Pool Cooling and throttled for RPV makeup during suppression pool cooling operation. • 1E12-F024B can be accessed to operate manually if required • 1E12-F021 needs to be closed for RPV makeup from a FLEX pump and open for suppression pool makeup • 1E12-F021 can be accessed to operate manually if required
c. RH to Containment Spray Valves F028B CLOSE	Not Applicable	The valve is not repowered in the FLEX electrical lineup.
d. RH to Containment Outboard Isolation Valves F027B OPEN.	Applicable	• Valve needs to open for RPV makeup. • Valve can be accessed to operate manually if required
6. LPCI injection valves F042 B and C open when vessel pressure is less than 472 psig.	Applicable	• 1E12-F042B needs to open for RPV makeup during suppression pool cooling operation. • 1E12-F042C needs to be open for RPV makeup from a FLEX pump, but can be opened manually.

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
7. The LPCI B/C initiation signal seals in upon actuation and must be manually reset when the initiating signal(s) clear using Division 2 reset button.	Applicable	LPCI B/C signal will persist
RHR-B Containment Spray Initiation Logic		
1. CS initiates, if LPCI B/C logic has been actuated for >10 minutes AND Drywell Pressure High (>1.68 psig) in one-out-of-two logic AND Containment Pressure High (>7.6 psig) in a one-out-of-two logic. Or, Manual Initiation by arming and depressing CNTMT SPRAY B manual initiation pushbutton AND Drywell Pressure High (>1.68 psig) in one-out-of-two logic.	A Containment Spray Initiation signal is regarded as an unacceptable impediment to establishing and maintaining a Suppression Pool Cooling lineup during this event. The FLEX Suppression Pool Cooling lineup requires the 1E12-F024B to be open and 1E12-F028B to be shut.	Containment Spray is effectively disabled by raising the containment pressure setpoint at the ATM. Should the Containment Spray automatic initiation occur before the ATM setpoint is raised, the signal can be reset and the valves repositioned after raising the setpoint.
2. RH Pump B starts and 1E12-F024B, RHR Test Valve To Suppr Pool-SHUT (directly from LPCIB/C logic).		
3. CS Loop B actuates after a 89 second delay if containment pressure is still high.		
4. Automatic initiation of CS can be delayed by repeatedly depressing the divisional delay timer reset pushbutton BEFORE the 10-minute containment spray delay timer times out.		
5. Division 2 VG Low Level 2 or High Drywell Pressure Load Driver starts SX Pump B.		
6. RH valves change position to establish the containment spray lineup as follows:		
a. 1E12-F028B, RHR B To CNMT SprayB Shutoff Valve-OPEN		
b. 1E12-F014B, SSW Inlet RHR B Hx Valve-OPEN		
c. 1E12-F068B, RHR B Hx SSW Outlet Valve-OPEN		

Control Logic Item	Applicability to FLEX Strategy	Analysis/Disposition
d. 1E12-F003B, RHR B Hx Outlet Valve-NORMALLY OPEN DOES NOT RECEIVE OPEN SIGNAL		
e. 1E12-F047B, RHR B Hx Inlet Valve-NORMALLY OPEN DOES NOT RECEIVE OPEN SIGNAL		
f. 1E12-F048B, RHR B Hx Bypass Valve-SHUT		
g. 1SX082B, RHR B Hx MU Cond Inlet Valve-SHUT		
h. 1E12-F024B, RHR B Test Valve To Suppr Pool-SHUT		