PALO VERDE
NUCLEAR GENERATING STATION

EMERGENCY PROCEDURE
GENERATION PACKAGE

Arizona Public Service Company
P.O. BOX 21666 • PHOENIX, ARIZONA 85036

The attached program description developed by the PVNGS staff is one that ensures the emergency procedure system is effective and will maintain the high standards necessary to properly mitigate accident conditions.

This program, 2 years in the making, uses an innovative approach to combating major Pressurized Water Reactor accidents. Problem solving techniques, human factors, operational experience, and control room design were elements used to develop the systematic approach to managing accidents described in the attached document.

The PVNGS emergency procedure system uses a balance of symptomatic and event oriented procedures designed to maximize the effectiveness and efficiency of the control room staff. This system concentrates on maintaining vital functions necessary to protect the reactor core and the health and safety of the public.

The Procedure Generation Package ensures the best quality procedures are available and is an indication of the APS commitment to public health and safety.

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This is to acknowledge the contributions of the following in the preparation of the PVNGS Emergency Procedure Generation Package:

John Pollard
Rick Myers
Tom Cannon
Steve McKinney
Herb Coriz
Darol Jurn
George Turner
Dave Strey
Mike Selland
Bob Adney
Ken Carlisle

PVNGS Emergency Procedure Generation Package

Section I. INTRODUCTION

The PVNGS Emergency Procedure Generation Package is designed to enable the development of usable and technically correct procedures to handle emergency conditions at Palo Verde Nuclear Generating Station. The development process for this package is explained in Section II. The remaining sections provide the procedure writers with the information necessary to prepare and implement these procedures.

The PVNGS Emergency Procedure Technical Guidelines provide a step by step guide for preparing Emergency and Recovery Procedures. The Verification Procedure is used to ensure the technical accuracy of the procedures and to ensure the writers follow the PVNGS Emergency Procedure Technical Guidelines and the Writer's Guide. The Validation Procedure ensures the procedures are usable by the operators and that the procedure is able to mitigate the accident for which it was designed. The Writer's Guide delineates the procedure format and provides the specific writing instructions used to prepare the procedures. The training description explains how operators are trained in the use of the Emergency and Recovery Procedures.

Section II. DESCRIPTION OF DEVELOPMENTAL PROCESS

The process of developing the PVNGS Emergency Procedures was started with a tabletop discussion by experienced Operations Department Supervisors. Using procedures from operating plants and the Combustion Engineering Generic Guidelines, an outline of the PVNGS Emergency Procedure Technical Guideline was generated. This outline was then applied to a simulator walkdown for feasibility during various anticipated operational occurrences and design basis accidents. The results, of the simulator process were applied to the outline, and brainstormed into a workable Procedure Technical Guide. This guide was then reviewed via tabletop discussion to determine the best course of action for PVNGS. By control room walk-throughs and simulation, and using the previously developed procedure Technical Guide, the Generic Technical Guidelines were converted into a Plant Specific Technical Guideline. Based on human factors, staffing, control room design, and operator knowledge, a procedure writers guide was then developed. At this point the Emergency Procedure and Recovery Operations Procedures were drafted and further walk-throughs were performed to determine the adequacy of operator actions using the procedures. This analysis resulted in recommendations which were then discussed and if necessary, incorporated into the final procedures.

Section II. DESCRIPTION OF DEVELOPMENT PROCESS
cont.

During this time a separate task analysis was performed by an independent consultant to determine the adequacy of control room indications and controls, and human factors design of control boards. The results of this task analysis were recommendations for control board design changes, which were taken into consideration during the development of the Emergency Procedure and Recovery Operations Procedures.

Each procedure will be subjected to a validation and verification process. These processes are designed to ensure the adequacy of the procedure in four major areas of concern. These concerns are 1) adequacy of operator actions, 2) adequacy of control room indications and controls, 3) technical accuracy of procedure action and information steps, and 4) operability and utility. The process of validation and verification will be performed any time a major change is incorporated into the Emergency Procedure or a Recovery Operations Procedure.

The verification and validation procedures were developed by comparing NUREG-0899, Guidelines for EOP's and EOPIA Review Group Guidelines for Procedure Verification and CE Emergency Procedure Guidelines to form a workable outline. The outline was then walked down in the control room and simulator to determine the most effective means of implementation. At this point the verification and validation procedures were drafted, reviewed for objectivity, and then tested on the simulator. The simulator test served to pre-verify and validate the Emergency Procedure and Recovery Operations Procedures as well as test the effectiveness of the validation and verification systems. Results of the test and feedback from the personnel performing the tests were then incorporated as appropriate. The final emergency and recovery procedure validation documents were then generated.

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SECTION III

PVNGS EMERGENCY PROCEDURE TECHNICAL GUIDELINE

PVNGS EMERGENCY PROCEDURE
TECHNICAL GUIDELINES

DN-4810A/0527A
5200A/0566A
5204A/0566A

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DEFINITIONS AND ABBREVIATIONS

Control Room Supervisor(CRS)	- One of the Senior Reactor Operators who will direct the actions of the control room staff.
Emergency Procedure Generation Package	- This is a group of procedures and documents used - in the development and implementation of the PVNGS Emergency and Recovery Operations Procedures.
Emergency Response Team	- Those operators and support personnel which are dedicated to the mitigation of plant accidents, they will include the onshift operators and when activated the Technical Support Center and Emergency Operations Facility personnel.
Primary Operator	- That Control Room Operator dedicated to Control Boards B01 through B04 during execution of the EP (Primary does not imply a hierarchy or seniority, only area of responsibility).
Secondary Operator	- That Control Room Operator dedicated to Control Boards B05 through B07 during execution of the EP (Secondary does not imply a hierarchy or seniority, only area of responsibility).
Safety Function	- A function specifically required to keep the plant in a safe condition so that public health and safety will not be endangered.
Source Document	- A document which requires that certain concepts or actions take place within the EP or RO's.
AO	- Abnormal Operating Procedure
CEN-152	- Combustion Engineering Emergency Procedure Guidelines
CR	- Control Room
EER	- Engineering Evaluation Request - A request of PVNGS Engineering Department for information or analysis.
EP	- Emergency Operations Procedure
ESD	- Excess Steam Demand

DEFINITIONS AND ABBREVIATIONS (CONT'D

ESF	- Engineered Safety Features
FRP	- Functional Recovery Procedure
FSAR	- Final Safety Analysis Report
FW	- Feedwater
GOP	- General Operating Procedure
LCTS	- Licensed Commitment Tracking System
LOCA	- Loss of Coolant Accident
LOF	- Loss of Feedwater
LORF	- Loss of RCS Flow
LOSC	- Loss of Secondary Coolant
MSIV	- Main Steam Isolation Valve
NUREG-0899	- Guidelines for the Preparation of Emergency Operating Procedures
PVNGS	- Palo Verde Nuclear Generating Station
PZR	- Pressurizer
RCS	- Reactor Coolant System
RO	- Recovery Operation
RT	- Reactor Trip
SER	- Safety Evaluation Report (NUREG-0857)
S/G	- Steam Generator
SGTR	- Steam Generator Tube Rupture
SIAS	- Safety Injection Actuation Signal

I. INTRODUCTION

This document is divided into three major sections; Emergency Procedure System Conceptual Development, Emergency Procedure (EP) and Recovery Operations (RO) Action Step Development, and Appendices which support the Recovery Operations.

The purposes of this document are as follows:

First, to satisfy the requirement of NUREG-0899 for Plant Specific Technical Guidelines.

Second, to supply an active EP support document which will give the reasons behind all of the actions in the EP and RO's. In some instances it is just as important to know why something was done as actually performing the action itself. This document is intended for use by the Emergency Response Team when a procedure step is questioned. Supplying the source documents alleviates doubt or confusion incurred when performing an action. Knowing the source document for procedure steps will aid the Emergency Response Team in developing procedures for unforeseen or unusual occurrences.

Third, to satisfy Section 12.3 of CEN-152 so that CEN-152 can be used as a Generic Technical Guideline as noted in NUREG-0899.

Fourth, to supply the results of the task analysis for operator performance and knowledge. This is divided into two areas. For each step of the procedure the required knowledge is specified and special considerations are defined to enable the system to be implemented properly.

Since this document is intended for use by the Emergency Response Team, Procedure Writers, Training, and others; the format is such that it compares PVNGS procedures to other source documents to record where requirements are satisfied. This format lends itself most usable for this comparison.

The comparison will be arranged into two major sectons; the first being a comparison of the concepts contained in the PVNGS EP and where the concepts originated, the second being a procedure by procedure comparison of major action steps and their source documents, and the Appendices' development.

The comparison of each procedure major action step to source documents will be done in the following format:

PROCEDURE:	Name and number.
STEP:	The EP will be broken down into minor steps, i.e., 1.1, 1.2, etc. while the RO's will be broken down into major steps, i.e., 1.0, 2.0, 3.0, etc.
OBJECTIVE:	This will explain what is to be done in the step including actions taken by the operators.
BASIS:	This will explain why the action is to be taken.
SOURCE DOCUMENT:	This will give the document where the requirement for the action is found.
DEVIATION:	This will explain what deviation, if any, is made from the source document.
REQUIRED KNOWLEDGE:	This will explain what the operators and CRS should know in order to meet the objective. Special considerations, if any, will be outlined for the REQUIRED KNOWLEDGE.

It is not a requirement that all concepts or actions contained in the PVNGS procedures have a source document due to the fact that it is intended for the PVNGS procedures to exceed the requirements set down in the source documents. For those steps which do not have source documents the reason the step has been incorporated into the procedure is explained in the Basis Statement.

The final part of this document is a development guide for each of the standard appendices, which are attached to the EP to supplement Recovery Operations. An exception to this will be appendices which apply solely to the Functional Recovery Procedure, in which case the appendix development will be found with the comparison of the procedure action steps.

Source Document
SER 11/81 TMI REQ I.C.1
Page 22-5

II. EMERGENCY PROCEDURE PACKAGE CONCEPTUAL DEVELOPMENT

After a review of the concepts which are to be the basis of the PVNGS Emergency Procedure Package, seven major concepts have been identified. Some of these concepts are required by source documents while others are included in order to make the EP as useful as possible. The overall objective of any EP is to prevent a degraded core condition and to maintain containment integrity and thus protect the health and safety of the public. Other objectives of the EP are to reduce stress on the control room personnel and provide an interface to the Emergency Plan.

The concepts used throughout the EP are:

A) Initiation Determination
B) Safety Functions
C) Communication
D) Division of Responsibility
E) Diagnosis of Plant Conditions
F) Recovery to Stable Conditions
G) EP Implementation

A. INITIATION DETERMINATION

The PVNGS Emergency Procedure will be initiated whenever a Reactor Trip occurs, a valid Plant Protection System signal exists, or a condition exists which the Control Room Supervisor, or Reactor Operators have determined warrants manually tripping the Reactor. The control room staff can implement this procedure system for any unusual event or major plant upset in any plant mode. This concept gives a clearly defined entry level into the Emergency Procedure. By making this a clear decision stress is reduced on the control room staff.

Source Document
CEN 152
NUREG-0809 3.1

B. SAFETY FUNCTIONS

One of the most important concepts in the Emergency Procedure Package is the Safety Function approach. The Safety Function concept will be incorporated into several sections of the Emergency Procedure Package including:

1) The standard post trip actions which are designed to monitor and maintain Safety Functions.
2) The diagnostic section of the EP which gives the CRS a second check of Safety Function status and an overview of related Safety Functions.
3) The initial actions and plant status point sections directs the control room staff to maintain Safety Functions.
4) The FRP which has a Safety Function monitoring section, a degraded Safety Function assessment, and a restoration section.

To support the Safety Function Concept there are several ways to achieve operator awareness of Safety Functions:

1) Success Path - These are the modes of equipment operation necessary to maintain a Safety Function. If a Safety Function is challenged the Success Path methodology will be utilized to ensure Safety Function maintenance. The Success Path methodology will be incorporated into the Functional Recovery Procedure.

2) Standard Post Trip Actions - The same actions will be performed by the control room staff to maintain Safety Functions and hence core integrity upon entry into the EP. These actions will be in the form of both a written procedure and flowcharts, which illustrate the written procedure in pictorial format. To supplement the operator's knowledge of required actions, the flowcharts will be permanently mounted on the control boards. The flowcharts will contain the key determinants and required corrective actions for the performance of a Safety Function status check.

The Safety Functions as defined at PVNGS will be as follows with deviations from CEN-152 as noted:

Safety Function	Deviation
1) Reactivity Control- Ensures the Reactor is shutdown with sufficient shutdown margin.	No Deviation
2) RCS Inventory & Pressure Control- Ensures a sufficient quantity of water, at a pressure above saturation to cover the core & facilitate core heat removal.	CEN-152 breaks this into 2 separate Safety Functions, one for inventory and one for pressure. Since Pressure Control & Inventory Control affect each other to a large degree and have similar success paths, they have been combined in one Safety Function.
3) Heat Removal- Ensures heat is removed from the core to one of several final heat sinks to maintain acceptable core temperature and subcooled margin.	This combines 2 Safety Functions addressed in CEN-152: Core Heat Removal, and RCS Heat Removal. Since both of these Safety Functions are necessary to cool the core it was decided to combine the two to perform a better evaluation ofthe entire heat removal process.
4) Containment Integrity- Ensures an isolated containment is maintained with internal conditions which do not threaten the ability to prevent a release of radioactivity.	This is a combination of all CEN-152 Safety Functions dealing with containment integrity; isolation, temperature and pressure control, and combustible gas control. All affect the same structure and can lead to the same result, a release of radioactivity due to a containment breach.
5) Indirect Radioactivity Release- Ensures radioactive material is not present outside containment to eliminate risk to the safety of the public.	No Deviation.

6) Vital Auxiliaries- Ensures that equipment necessary to support the other five Safety Functions is operating and responding properly.	No Deviation

Source Document
CEN 152
NUREG-0809 2.1
2.4
3.3.2
FSAR 13.5.2.1-D

Note
Source Documents apply generally to all Safety Functions.

C. COMMUNICATIONS

Instructions to maintain communications between the control room staff members, and between the Control Room and Technical Support Center will be incorporated into the EP system.

One of the most important reasons communications are emphasized is that it puts the control room staff into a team mode instead of several individuals working on separate problems.

While performing and after completion of the Safety Function Post Trip Actions Flowchart, each operator will be directed to inform the CRS and the other operator of problems or abnormal conditions he has encountered.

Upon entry into any Recovery Operation the CRS is directed to take action in accordance with the Emergency Classification Procedure.

Each Recovery Operation will have sections for Primary and Secondary Operator actions and these sections will include both operators actions so that each is informed as to what the other is doing.

Overall the emphasis on communications will alleviate some of the stresses imposed on the operators and keep the control room staff working as a team.

Source Document
None

D. DIVISION OF RESPONSIBILITY

This concept deals with the effective utilization of the control room staff to ensure the following:

1) All Safety Functions are monitored and maintained.
2) Avoids two operators doing the same evolution, thereby reducing confusion due to overlap. This also concentrates manpower to provide more attention to each Safety Function and avoid missing key indicators.
3) Minimizes physical conflicts.
4) Reduces stress by defining assigned tasks.
5) Minimizes travel and lost time.

The control room staff for the PVNGS Emergency Procedure will consist of two Control Room Operators and one Control Room Supervisor, this staffing lends itself to a good split of the control room boards. The two operators, designated Primary and Secondary, will maintain the Safety Functions while the CRS initiates an event diagnostic.

Even though there are two operators with different designations they will both receive the same training so that either is able to perform as Primary or Secondary Operator. Additionally the CRS will understand each operator's duties so that he can direct the maintenance of Safety Functions as required.

Source Documents:
NUREG 0899 - 5.8

E. DIAGNOSIS OF PLANT CONDITIONS

A diagnosis of the initiating event will be done by the CRS in the EP. He will use a Diagnostic Flowchart which requires checking all key parameters at least once. The first section of the flowchart will be a Safety Function monitoring section. The CRS will obtain the necessary information. This serves two purposes 1) Acts as a second independent check of Safety Functions and 2) Allows the operators to perform their assigned tasks undistracted. The diagnostic will lead the CRS to recommended procedures to mitigate the problem. The diagnostic flowchart will aid the CRS in indentifying major types of Safety Analysis events. It ensures the CRS evaluates the entire situation prior to making a decision.

The selected procedures will provide a second check of the parameters which led to that procedure.

This method minimizes the possibility of inappropriate action caused by failure to consider all appropriate parameters and hastily drawing a conclusion under pressure.

The diagnosis directs the CRS to assess the entire plant condition prior to making vital decisions. The diagnostic ensures, by its aids and methods, that the CRS has enough information to fulfill this task. As well as performing the diagnostic, the CRS will serve as the Control Room Team Leader.

The diagnostic chart does not guarantee the correct identification of a particular accident. It does ensure that the CRS will have a better overall understanding of the occurence and is therefore better equipped to make a decision.

Source Documents:
CEN-152

F. RECOVERY TO STABLE CONDITIONS

After the Diagnostic has been performed the CRS will have identified what Recovery Operation or Abnormal Operating Procedure should be used to place the plant in a stable condition. The Recovery Operation Procedure shall contain a verification section which will ensure the correct procedure has been selected. There are certain parameters which are key indicators of a specific single event, if these parameters are not responding as anticipated the operator will be referenced to the Functional Recovery Procedure. Also for a given event there are indications which should not be present. If one of these do exist the Recovery Operation will direct the operators to the Functional Recovery Procedure.

After a Recovery Operation has been selected the operators will be directed to continue to maintain Safety Functions.

The action steps for each operator will be shown on each operator's procedure so that the operator will always know what his counterpart is doing.

At convenient points in the RO's, a Plant Status Point section shall be incorporated. This check provides the staff with a method to assess present plant conditions. This will prevent the control room staff from over-focusing on one problem and not noticing another problem which has arisen since entry into the RO. This section also directs the operators to maintain Safety Functions.

Operators will continue to maintain Safety Functions when they have no specific RO action to perform. The RO's designated for use in the PVNGS Emergency System are as follows with deviations from source documents as noted.

RO	Deviation
1) Reactor Trip- This procedure will describe the actions required when an uncomplicated reactor trip occurs, to prepare for a normal shutdown or restart.	No Deviation.
2) Excessive Steam Demand- This procedure will describe the actions required to stabilize the RCS and maintain RCS heat removal following an excessive steam demand occurrence or a feed water control failure resulting in a MSIS on high SG level. An excessive steam demand could be a steam line break down stream of the MSIV's, a failure of a Main Steam Control Valve, inadvertent opening of a Atmospheric Dump valve, or failure of the Steam Bypass Control System.	The CEN-152 Steam Line Break Guideline has been broken down into two PVNGS Documents; one for an Excessive Steam Demand and one for a Loss of Secondary Coolant since the actions are significantly different for the two.

3)	Loss of Secondary Coolant- This procedure will describe the actions required to stabilize the RCS and maintain heat removal following a break in the main steam line upstream of the MSIV, a break of the S/G vessel, or a break of the feedwater lines downstream of the FW check valves.	See Excessive Steam Demand
4)	Loss of RCS Flow- This procedure will describe actions necessary to recover the plant following a total loss of RCS flow. Emphasis will be placed on ensuring adequate natural circulation is present.	No Deviation
5)	Loss of Feed Water- This procedure describes the actions to be taken for a total loss of normal feed water. A Loss of Feed Water is defined as system failure upstream of the Feedwater Check Valves or failure of the Feed Control System resulting in low S/G level.	No Deviation
6)	S/G Tube Rupture- This procedure describes the actions to be taken to prevent a radioactivity release to the environment and to maintain adequate core cooling for a S/G tube leak of sufficient magnitude that it causes a SIAS.	PVNGS S/G Tube Rupture RO procedure covers a tube leak which causes a Safety Injection System Actuation. For tube leaks which do not cause a SIAS an AO will be used since the actions for the two conditions are significantly different.
7)	LOCA- This procedure describes the actions to be taken to minimize core damage and radioactivity releases during a LOCA which raises containment pressure above 5 psig.	The CEN-152 LOCA Guideline has been broken down into two PVNGS documents one for a small LOCA and one for a large LOCA since the actions are significantly different for the two. For ease of decision of which LOCA procedure to use if 5 psig in containment is attained it will be designated a large LOCA.

8) Small LOCA- This procedure describes the actions to be taken to minimize core damage and radioactivity releases during a LOCA which does not raise containment pressure above 5 psig.	Same as for LOCA.
9) Blackout- This procedure describes the actions to be taken to maintain core cooling and restore the plant to a normal operating mode following a loss-of-offsite power, a failure of both Emergency Diesel Generators, and a Turbine Trip.	CEN-152 does not address a Blackout. Blackout is required SER 11/81 Task A-44 pg. C11.
10) Functional Recovery Procedure- The Functional Recovery Procedure will be entered if one of the following exist: a) The Diagnostic is unclear. b) A Multiple Event is suspected. c) A Recovery Operation does not sufficiently handle the situation.	Deviations from CEN-152 include the addition of sections for: a) A prolonged blackout. b) A preferred Success Path restoration section. c) A Safety Function monitoring section for non-degraded Safety Functions.

G. EP IMPLEMENTATION

In order to properly use the EP and RO's the control room staff must be properly trained in the implementation of the system. As explained in the introductions each procedure step will have a required knowledge section. In addition to the required knowledge and special considerations, outlined here are the general knowledge requirements which will be used throughout the system. The topics used to implement the EP and RO system are as follows:

1. Communication
2. CR layout
3. Use of flowcharts
4. Principles of team work
5. Use of IE indicator and multiple indicators
6. Verification of Engineered Safety Features Actuation (ESFAS)
7. RPS setpoint and the need for ESFAS
8. Procedure layout
9. Interface with other procedures

A discussion of each topic follows:

1) Communication - This is a major conceptual block of the EP System. To properly implement this concept the CR Staff should use the following guidelines:

   a) As a minimum the operators will communicate with the CRS when directed to by procedure.
   b) It is the responsibility of the operators to notify and bring the CRS up to date concerning any unusual trending of parameters.
   c) It is the responsibility of the sender to ensure that the receiver understands the message.

2) Control Room Layout - This is a sub-topic of the Division of Responsibility Concept. The CR staff must know the following:

   a) Which section of the CR boards each operator is responsible for.
   b) An operator may take actions on a board ajacent to his if he informs the other operator and he does not neglect his own boards.
   c) The location of all indicators for parameters used in the EP system.

3) Use of Flowcharts - The flowcharts are provided to be used as a rapid reference and to ensure completion of all steps. They are not intended to describe how to perform an action, but to remind the operator to complete that action. The CR staff should use the following guidelines when using flowcharts:

a) Whenever possible, class IE indicators should be used to make decisions on the flowchart. This does not imply that operators cannot use non-class indicators.
b) When answering questions about the S/G's, both S/G's should be checked. The decision should be answered YES, if the condition is true for one or both S/G's.
c) Plant conditions may change due to automatic plant response. The decisions, on the flowchart, should be answered YES for conditions which are presently true, or have been true during the course of the event.

4) Principles of Team Work - To support the Division of Responsibilty Concept the principles of Team Work build upon existing operating practices and are highlighted by the following:

   a) Even though there are two operators designated primary and secondary, their training will be identical so that either operator can fill the primary or secondary role.
   b) The EP system is set up so that the CRS will double check the Safety Functions and maintain an overview of the entire plant.

5) Use of class IE indicators and multiple indicators - This topic ensures that the CR staff will not be mislead by a defective instrument by complying with the following:

   a) When taking readings use class IE vice non-class IE indicators since they have a higher reliabiltity.
   b) When multiple channels of a parameter are readily available check all channels in order to minimize faulty readings.

6) Verification of Engineered Safety Features Actuation - This is a major conceptual block of the EP System in that proper verification ensures no equipment malfunction inadvertently compromises Safety Functions. Operators must be taught the importance of communication in that both the Primary and Secondary Operators verify the proper actuation of the ESFAS System. Operators must know and understand their function in each role as follows:

   a) The Secondary Operator verifies actuation using the plant annunciators and the initiation relay lights on B05. He reports the actuated signals to the CRS and Primary Operator.
   b) The Primary Operator verifies there are no alarms on the Safety Equipment Status System which indicates the failure of an ESFAS device to properly actuate. SIAS and CSAS are also verified using class IE flow indicators on B02.

   Details of this process (a and b) are as follows:

1. ESFAS Initiation Relay Indicating Lights - Are provided for each ESFAS signal, on B05. The red initiation relay indicating lights go off to indicate a trip condition on that channel. A selective two of four coincidence of these channels is necessary to actuate the ESFAS devices. Once the trip is initiated, on that channel, the initiation relay indicating light will remain out until reset at the PPS cabinet. The Auxiliary Feedwater Actuation Signal (AFAS) is an exception. These indicator lights will cycle on and off as steam generator level cycles between the AFAS trip and reset setpoints. If AFAS is blocked by a difference in pressure between the Steam Generators the light will remain on.
2. ESFAS Annunciator Windows - Provide indication of both trip paths in each train of ESFAS functions. These windows are split on the horizontal, with the upper half indicating a trip of the 1 and 3 trip path, and the lower half indicating the trip on the 2 and 4 trip path. Both halves of the annunciator must be on to indicate an actuation of that ESFAS train.
3. Safety Equipment Status System (SESS) - Displays exception alarms to denote an inoperable component, a white light, or a component which has failed to actuate after receiving an actuation signal, a blue light. The SESS displays alarms on both a system and component level.
4. Actuated Device Checklists - Are used, when time permits, to verify the condition of each component actuated by the ESFAS signal.

7) RPS setpoints and the need for ESFAS - Proper operator response in anticipation of a safety system actuation signal, or in the event a system does not actuate upon demand, can greatly enhance the mitigation process. For this reason operators must know how ESFAS signals are generated. The operators must be able to determine the need for an Engineered Safety Features Actuation by comparing the indicators on B05 to the ESFAS setpoints. A two of four coincidence of like parameters is necessary for automatic actuation.

SIAS/CIAS	RCS pressure below the indicated variable setpoint OR CTMT pressure above 5 psig.
CSAS	CTMT pressure above 10 psig.
RAS	Refueling water tank level below 10%.
MSIS	Either steam generator pressure below the indicated variable setpoint, or level above 94% narrow range, or CTMT pressure above 5 psig.
AFAS	The respective steam generator level below 25% wide range.

8) Procedure layout - The RO procedures divide responsibilities among the operators, as the EP does. Both Primary and Secondary Operator actions are written on a common sheet, divided in two vertical columns, so that each operator may see the other operator's instructions as well as his own. The CRS instruction steps are synchronized with operator actions. The CRS will direct the completion of each step in recovering the plant. The operators will coordinate their activities so that all team members are on the same step. The operators must also understand how actions in one system affect other systems and how to coordinate these interactions to stabilize plant parameters. For this reason both Primary and Secondary Operator actions are used side by side.

9) Interface with other procedures - Each RO incorporates a check to ensure the correct procedure has been selected, this process may direct the use of another procedure in place of the one selected. If more than one Safety Function is compromised the Functional Recovery Procedure would be implemented. The only simultaneous use of another procedure is the Emergency Plan Classification used by the CRS and the Natural Circulation Cooldown. Due to the scope of Natural Circulation Cooldown it was better addressed as a separate procedure referenced only as needed. This referencing does not impact Safety Function monitoring. The EP Standard Appendices are designed to supply the operators with all the supplemental information they may need until they are ready to proceed to a general operating procedure.

III. EMERGENCY PROCEDURE AND RECOVERY OPERATIONS ACTION STEP DEVELOPMENT AND KNOWLEDGE REQUIREMENTS

This section will break down all major steps of the Emergency Procedure and Recovery Operation Procedures for the purpose of comparison to their source documents. The format is as described in the introduction. The last page of each Recovery Operation comparison is a list of steps found in CEN-152 but not in the PVNGS Recovery Operation and the reason for the step not being included. Required knowledge for proper step completion or operator understanding is identified as it applies to each step.

III. ACTION STEP DEVELOPMENT AND KNOWLEDGE REQUIREMENT.

A. EMERGENCY PROCEDURE

PROCEDURE: EP 41EP-1ZZ01

STEP: OBJECTIVE

OBJECTIVE: This statement will define when the EP will be used and what the EP will accomplish.

BASIS: This statement is included to ensure the CRS knows he is using the correct procedure, and defines the scope of the procedure.

SOURCE DOCUMENT: NUREG-0899 5.4
Procedure Format

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: When to implement the EP, and the arrangement and locations of PVNGS Procedures.	The CRS may be required to implement the EP during events which have not yet initiated an automatic safety signal but may warrant a manual reactor trip. This procedure may be implemented any time Safety Functions are comprised reguardless of plant mode.

PROCEDURE: EP 41EP-1ZZ01

STEP: 1.1

OBJECTIVE: The objective of this step is to direct the operators to maintain Safety Functions.

BASIS: Maintaining Safety Functions will ensure core integrity, containment integrity and ensure the plant is in a safe condtion by performing Standard Post Trip Actions.

SOURCE DOCUMENT: CEN-152
NUREG-0899

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should understand:	The CRS should expect to receive reports from the operators concerning the Functions.
The safety function concept;	
The actions each operator will perform;	The CRS should be alert to indications that an operator is in trouble or not responding.
Each operator's area of responsibility;	
The communication techniques needed to direct the control room staff;	
The principles of team work needed to coordinate the actions of the control room staff.	

PROCEDURE: EP 41EP-1ZZ01

STEP: 1.2

OBJECTIVE: The objective of this step is to determine the initiating event for entry into a Recovery Operation Procedure.

BASIS: A diagnosis is performed so that the CRS will be better equipped to determine what the initiating event was, and ensure the CRS is made aware of all key plant parameters.

SOURCE DOCUMENT: CEN-152, Section 2.0 and 3.0

DEVIATION: None

REQUIRED KNOWLEDGE

The CRS should know:
Not to rely on the operator to provide the information necessary to complete the Diagnostic Flowchart, but to personally check the indicators.

To use Class IE and multiple indicators, where possible, to complete the Diagnostic Flowchart;

SPECIAL CONSIDERATIONS

The CRS may ask the operators questions; however he must be careful not to distract the operators from the Safety Functions.

The Diagnostic Flowchart provides a second check of Safety Functions.

PROCEDURE: EP 41EP-1ZZ01

STEP: 1.2

REQUIRED KNOWLEDGE (Cont.)

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
	The CRS must evaluate the effects of changing conditions on the Diagnostic and make appropriate changes in previously completed decisions.
To answer questions affirmatively for conditions which are presently true or which have been true during the event;	The CRS may be required to implement an Abnormal Operations or Alarm Response Procedure to supplement the EP prior to implementing a Recorvery Operations Procedure.
To use both S/G's to answer decisions about the S/G's.	
The location and relationship of control room procedures; When to implement the Functional Recovery Procedure;	
Where to enter the Diagnostic Flowchart;	
Where to circle chosen answers;	
How to handle the flowchart while moving about the Control Room;	

PROCEDURE: EP 41EP-1ZZ01

STEP: 1.2

REQUIRED KNOWLEDGE: (Cont.)

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
How to initiate and verify all ESFAS functions;	
All ESFAS setpoints and variable setpoint controls;	
How to determine if any ESFAS setpoints have been exceeded;	
How to identify ESFAS actuation and all RCS trip setpoints;	
How to manually trip the reactor and verify the trip;	
How to determine CEA position;	
The significance of more than one CEA not fully inserted;	
How to read the reactor power log scale indicators;	
How to Emergency Borate, 41A0-1ZZ01;	
How to determine first out trips on the Reactor and Turbine Trip Annunciators;	
How to determine if the Turbine and Generator are tripped and how to manually initiate a Turbine-Generator trip;	
How to identify component and system alarms using the annunciator system;	

PROCEDURE: EP 41EP-1ZZ01

STEP: 1.2

REQUIRED KNOWLEDGE: (Cont.)

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
How to determine RCS sub-cooling and what limits apply;	
How to determine reactor vessel level;	
How to determine if an RCP is running and how to stop an RCP;	
How to identify a loss of all RCS forced flow;	
RCP operating limits;	
How to operate the Radiation Monitoring System;	
How to identify a loss of all AC condition;	
How to identify a power-supply alarm;	
The setpoint and consequences of pressurizer low level heater cutout;	
How to determine the availability of:	
Steam Bypass Control System (SBCS);	
Nuclear Cooling Water (NC);	
Turbine Cooling Water (TC);	
Plant Cooling Water (PW);	
Circulating Water (CW);	
Instrument Air (IA).	

PROCEDURE: EP 41EP-1ZZ01

STEP: 2.1

PROCEDURE: EP 41EP-1ZZ01

OBJECTIVE: The objective of this step is to ensure the Primary Operator is aware of RCS subcooling and takes actions to control subcooling as necessary.

BASIS: This a standard post accident trip step to ensure adequate fluid conditions surround the core.

SOURCE DOCUMENT: CEN-152, Section 2.0
EER 82-RC-01D - RCS Subcooling

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to determine RCS subcooling; How to control RCS pressure; How to verify RCS heat removal; How to initiate Safety Injection.	This step will be performed whenever the operator is required to maintain Safety Functions throughout any of the EP or RO's.

PROCEDURE: EP 41EP-1ZZ01

STEP: 2.2

OBJECTIVE: The objective of this step is to ensure the Primary Operator verifies proper system response on low pressurizer pressure and takes all actions required in a SIAS condition.

BASIS: This step ensures adequate RCS subcooling by initiating Safety Injection, RCP's are controlled in such a way as to aid plant recovery during a LOCA condition, and containment integrity is maintained.

SOURCE DOCUMENT: CEN-152, Section 2.0
TECHNICAL SPECIFICATIONS
EER 82-RC-015 - RCP Operation
EER 82-SI-018 - SI Flow Curves

DEVIATION: CEN-152 uses a range of 1700# to 2350#, 41 EP-1ZZ01 breaks this down into 2 ranges since actions are significantly different for each range. 1700 # as a division point is covered in Step 2.2. Normal operating range 2100-2350 is covered by Step 2.3.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to stop RCP's;	
How to verify HPSI and LPSI flows using a pressure vs. flow graph;	
RCP operation limits with or without seal injection and/or cooling flow.	

PROCEDURE: EP 41EP-1ZZ01

STEP: 2.3

OBJECTIVE: The objective of this step is to ensure the Primary Operator takes action as appropriate to maintain RCS pressure within the normal operations band. Valves used may be more conservative than the Setpoint Index to give the operator values easier to read on control room indicators.

BASIS: This step ensures proper RCS subcooling and prevents lifting a PZR relief. Valves used may be more conservative for ease of operation.

SOURCE DOCUMENT: CEN-152, Section 2.0
SETPOINT INDEX 13-J-ZZI-002 - Control points
CE- Task 430, Natural Circulation Cooldown, Section 5.3.5.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know:	
How to verify PZR heaters OFF/ON;	
How to verify PZR Spray OFF/ON;	
How to manually control PZR spray and heaters including auxiliary spray operation;	
Automatic and manual operation of the PZR Pressure Control System.	

PROCEDURE: EP 41EP-1ZZ01

STEP: 2.4

OBJECTIVE: The objective of this step is to ensure the Primary Operator is aware of any gross RCS abnormality by recognizing when core differential temperature is not correct for plant conditions.

BASIS: This step ensures the RCS is capable of maintaining proper removal of heat from the core. The limit is based on natural circulation.

SOURCE DOCUMENT: CEN-152, Section 2.0
CENPSD-154
CE-Task 430, Natural Circulation Cooldown, Final Report.

DEVIATION: CEN-152 calls for a 10°F differential temperature and assumes the RCP's are running. 41EP-1ZZ01 assumes natural circulation maintaining less than full power differential temperature; A table will be provided showing PWR vs. DELTA T for RCP's or natural circulation.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATION
The operator should know: How to determine core differential temperature and compare it to a normal graph.	The operator should be able to determine what the DELTA T would be for an abnormal RCP configuration (i.e. one in each loop).

PROCEDURE: EP 41EP-1ZZ01

STEP: 2.5

OBJECTIVE: The objective of this step is to ensure the Primary Operator is aware of and maintains PZR level.

BASIS: This step ensures sufficient inventory is present in the RCS to achieve proper decay heat removal and to avoid solid pressurizer operation. Values used may be more conservative than level control band for ease of operator use.

SOURCE DOCUMENT: CEN-152
Setpoint Index 13-J-ZZI-002

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know:	
The automatic and manual operation of the PZR Level Control System;	
The setpoint and consequences of PZR low level heater cutout;	
How to determine charging, letdown, and seal injection flows and how they compare to a normal operating plant;	
How plant response varies from normal for solid PZR conditions.	

PROCEDURE:	EP 41EP-1ZZ01
STEP:	2.6
OBJECTIVE:	The objective of this step is to ensure the operator takes action to verify at least one train of safety equipment operable and functioning.
BASIS:	This step ensures maintenance of vital auxiliaries and that no Safety Function is inadvertently compromised by equipment failing to respond to a safety signal.
SOURCE DOCUMENT:	CEN-152, Section 2.0
DEVIATION:	This step does not include a turbine/generator trip verification since this is the responsibility of the Secondary Operator and covered in Step 3.4.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to operate the SEAS system and how to determine and correct abnormalities to ensure one train of safety equipment is operable and responding to system demands.	Since some of the items covered by SEAS are the responsibility of the Secondary Operator, communications and coordination must be used to correct SEAS abnormalities.

PROCEDURE:	EP 41EP-1ZZ01
STEP:	2.7
OBJECTIVE:	The objective of this step is to ensure proper operation of Safety Injection and Containment Spray, and to correct problems as necessary.
BASIS:	This step ensures proper flow for ESF pumps following a SIAS or CSAS, and that RCS inventory is maintained and CTMT integrity is maintained.
SOURCE DOCUMENT:	CEN-152, Section 2.0 EER 82-SI-018 - SI Flow Rates.
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to verify containment spray flow; How to verify safety injection flow using a pressure vs. flow graph; General operation of the systems and how to correct abnormalities.	This step should also evaluate the conditions which require a SIAS or CSAS.

PROCEDURE: EP 41EP-1ZZ01

STEP: 2.8

OBJECTIVE: The objective of this step is to direct the Primary Operator to communicate with the CRS any system abnormalities and trends.

BASIS: This step ensures proper communications are taking place to support and reinforce the team concept.

SOURCE DOCUMENT: None

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: The proper method of control room communications.	The operator must be aware that it is the senders responsibility to ensure that a message is understood by the receiver.

PROCEDURE: EP 41EP-1ZZ01

STEP: 2.9

OBJECTIVE: The objective of this step is to ensure the Primary Operator continuously monitors Safety Functions until directed otherwise by the CRS.

BASIS: This step ensures Safety Functions are constantly maintained.

SOURCE DOCUMENT: CEN-152, Section 2.0

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: To repeat the flowchart until otherwise directed.	

PROCEDURE: EP 41EP-1ZZ01

STEP: 3.1

OBJECTIVE: The objective of this step is to direct the Secondary Operator to verify the reactor tripped, and shutdown margin by verifying CEA positions.

BASIS: This step ensures the Reactivity Control Safety Function is achieved to reduce core output.

SOURCE DOCUMENT: CEN-152, Section 2.0
Technical Specification 3/4.1.3, 3/4.1.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: How to determine CEA positions; How to determine if the Reactor is tripped; How to manually trip the Reactor; Criteria for CEA insertion, shutdown margin, and emergency boration.	Emergency boration is the responsibility of the Primary Operator, the Secondary Operator must ensure he knows when boration is required, and to inform the Primary Operator

PROCEDURE: EP 41EP-1ZZ01

STEP: 3.2

OBJECTIVE: The objective of this step is to ensure the Secondary Operator observes Reactor power level and takes actions, as necessary, to lower reactor power.

BASIS: This step ensures the Reactor is shutdown and is a second check of the Reactivity Control Safety Function.

SOURCE DOCUMENT: CEN-152 Fig 2-1, Section 2.0
Technical Specification 3/4.1.1

DEVIATION: None

REQUIRED KNOWLEDGE

The operator should know:

How to read a log scale;

How to determine the value of source level power;

How to manually operate CEDMC's;

The consequences of excessive core output for plant conditions.

SPECIAL CONSIDERATIONS

Emergency boration is the responsibility of the Primary Operator; the Secondary Operator must ensure he knows when boration is required, and to inform the Primary Operator

PROCEDURE:	EP 41EP-1ZZ01
STEP:	3.3
OBJECTIVE:	The objective of this step is to ensure ESF actuation signals exist as appropriate for plant conditions, to manually initiate required functions, and to inform the CRS of ESF status.
BASIS:	This step ensures proper operation of all Engineered Safety Features by comparing plant parameters to ESF setpoints. This ensures proper system response for all Safety Functions.
SOURCE DOCUMENT:	ESF Setpoints per Technical Specification table 3.3-4 CEN-152, Section 2.0
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: How to determine if an ESF setpoint is exceeded; How to determine an ESFAS actuation; How to manually initiate an ESF System	This is a general training requirement. Manual initiation of an ESF system may require coordination with the Primary Operator.

PROCEDURE: EP 41EP-1ZZ01

STEP: 3.4

OBJECTIVE: The objective of this step is to ensure the turbine/generator has been tripped or to manually trip it.

BASIS: This step ensures a failure of the turbine trip system does not cause an excessive RCS cooldown.

SOURCE DOCUMENT: CEN-152 Fig 2-1, Section 2.0

DEVIATION: This step does not include the check of station auxiliary transfer to offsite; this check is done by the CRS in the diagnostic Step 1.2.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: How to identify and verify a turbine/generator trip; How to manually trip the turbine/generator.	The Operator should be aware of the consequences of a Turbine Trip failure.

PROCEDURE: EP 41EP-1ZZ01

STEP: 3.5

OBJECTIVE: The objective of this step is to ensure the Secondary Operator will take actions to maintain steam generator water level. Valves used will ensure adequate core cooling is maintained while allowing the operator time to respond to all Safety Functions.

BASIS: This step ensures maintainance of an operable Steam Generator to remove heat from the RCS, and maintains adequate core cooling.

SOURCE DOCUMENT: CEN-152
Setpoint Index 13-J-ZZI-002

DEVIATION: None

REQUIRED KNOWLEDGE

The operator should know:

S/G level limitations;

Operation of MFW/AFW Control Systems in manual or auto;

Effects of FW flow on RCS pressure/temperature;

How to determine condenser availability;

How to operate Atmospheric Dump Valves (ADV);

Limitations on ADV's without IA;

Correlation between ADV position and steam flow.

SPECIAL CONSIDERATIONS

The values for level give the operator a wide range to work with, it is preferable to maintain level within its normal band.

PROCEDURE: EP 41EP-1ZZ01

STEP: 3.6

OBJECTIVE: The objective of this step is to ensure adequate RCS heat removal and stabilize plant temperature, or if possible maintain temperatures within normal limits.

BASIS: This step provides a check that the S/G's are actually removing decay heat from the RCS.

SOURCE DOCUMENT: CEN-152, Section 2.0

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: How to balance heat removal and to stabilize RCS temperature; Limits on RCS pressure/temperature changes; How to determine RCS subcooling; Relationship between RCS temperature and S/G pressure - especially the possible lifting of S/G Safety Valves; S/G safety valve setpoints; S/G safety valve indications.	The operator must consider the relationship between S/G radioactivity and radioactivity release through the S/G safeties, ADV's or steam bypass system.

PROCEDURE: EP 41EP-1ZZ01

STEP: 3.7

OBJECTIVE: The objective of this step is to ensure the Secondary Operator is aware of radiological conditions within the plant and containment and initiates an isolation as necessary.

BASIS: This step ensures that the health and safety of the public is maintained by isolating radiological hazards.

SOURCE DOCUMENT: FSAR 6.2.4 and 7.3.1.1.10.1 - Containment Isolation
Technical Specification 3.3.3.1 - Radiation Monitoring

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: How to read the Radiation Monitoring System; How to manually initiate a Containment Isolation, CREVAS, FBEVAS, CPIAS; How to ensure buildings isolate as appropriate; How to ensure the gland exhauster shifts to the "thru filter mode".	The Operator must be aware of the consequences of a failure of one of the isolation systems to function.

PROCEDURE: EP 41EP-1ZZ01

STEP: 3.8

OBJECTIVE: The objective of this step is to direct the Secondary Operator to communicate with the CRS any system abnormalities and trends.

BASIS: This step ensures proper communications are taking place to support and reinforce the team concept.

SOURCE DOCUMENT: None

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: The proper method of control room communications.	The operator must be aware that it is the sender's responsibility that a message is understood by the receiver.

PROCEDURE: EP 41EP-1ZZ01

STEP: 3.9

OBJECTIVE: The objective of this step is to ensure the Secondary Operator continuously monitors Safety Functions until directed otherwise by the CRS.

BASIS: This step ensures Safety Functions are constantly maintained.

SOURCE DOCUMENT: CEN-152, Step 2.0

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: To repeat the flowchart until otherwise directed.	

B. REACTOR TRIP 41RO-1ZZ01

PROCEDURE:	RT 41RO-1ZZ01
STEP:	OBJECTIVE
OBJECTIVE:	This statement will define when this RO will be used and what is to be accomplished by this procedure.
BASIS:	This statement is included to ensure the CRS knows he is using the correct procedure, amd defines the scope of the procedure.
SOURCE DOCUMENT:	NUREG-0899 CEN-152
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: When to use this particular RO, and the arrangement and location of all PVNGS Procedures.	The CRS should be aware that the EP 41EP-1ZZ01 must be implemented prior to use of this procedure.

PROCEDURE: RT 41RO-1ZZ01

STEP: 1.0

OBJECTIVE: The objective of this step is to verify that the diagnostic section of the EP correctly identified the event and, if necessary, direct the CRS to another procedure if conditions indicate a problem beyond the scope of this RO. Additionally, this step directs the operators to maintain Safety Functions.

BASIS: This step is to ensure that the diagnostic was correct and that Safety Functions are being maintained.

SOURCE DOCUMENT: CEN-152
R.T. Recovery Action Steps 2.0 and 3.0

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain Safety Functions. In addition to the above, the CRS should know: How to verify the reactor is shutdown; The normal post trip plant response and how to read these parameters on the control boards; Those conditions which if exist would lead to the use of another procedure.	Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.

PROCEDURE: RT 41RO-1ZZ01

STEP: 2.0

OBJECTIVE: The objective of this step is to direct entry into the PVNGS Emergency Plan for event classification and required notifications.

BASIS: This step ensures that action is taken to implement the PVNGS Emergency Plan, to gain additional support for the control room staff, and to ensure that the safety of the public and site personnel is maintained.

SOURCE DOCUMENT: NUREG-0654 Appendix 1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.
How to maintain Safety Functions:	
In addition to the above the CRS should know:	The CRS must not allow event classification and notification to impact on the recovery operation.
How to classify emergency events and who to notify.	

PROCEDURE: RT 41RO-1ZZ01

STEP: 3.0

OBJECTIVE: The objective of this step is to stabilize those plant parameters which are expected to fluctuate during the event.

BASIS: This step is to ensure that parameters expected to fluctuate during a RT are stabilized. This prevents them from challenging Safety Functions, and ensures operations are within limits and commitments.

SOURCE DOCUMENT: CEN-152 RT Recovery Action Steps 2, 4, 5, 6, & 7
CE-Task 430, Natural Circulation Cooldown
EER 82-RC-010, RCS Subcooling
SER 11/81 7.3.2, AFAS Override
FSAR 6.2.4.3, CIAS Verifications
PP 19078, AFAS Level Control

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to verify subcooling; How to initiate SI; How to stabilize and maintain PZR level; How to stablilze and maintain PZR pressure; How to maintain proper heat removal; How to maintain operable Steam Generators.	Pressurizer level should be carefully monitored since it normally decreases to or near the PZR heater cutoff level following a reactor trip. The CRS should be aware of cooldown rate and pressurizer spray cycling Technical Specifications.

PROCEDURE: RT 41RO-1ZZ01

STEP: 4.0

OBJECTIVE: The objective of this step is to ensure proper safety system response and to determine if ESFAS signals can be reset. Additionally the operators are directed to maintain Safety Functions. Restoration of equipment will be done within guidelines and operational limits.

BASIS: This step ensures proper operation of ESFAS equipment which are required to maintain Safety Functions. This step also allows control of safety equipment to prevent excessive RCS cooldown or loss of PZR pressure.

SOURCE DOCUMENT: CEN-152 RT Recovery Action Steps 2 & 3
Setpoint Index 13-J-ZZI-002
PP 19249, SIAS Reload Buses

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	The CRS mut be aware that
How to maintain Safety Functions; How to verify ESFAS; How to reset ESFAS;	when an ESFAS is required at least one train of ESF equipment is essential to maintain Safety Functions and that 2 trains are preferred.
How to control operating ESF equipment; In additon tothe above the CRS must know:	The CRS must be aware of how resetting Safety Systems will impact plant response.
How to determine when an ESFAS can be reset; How to use the Emergency Procedure Diagnostic Flow chart.	Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01

PROCEDURE: RT 41RO-1ZZ01

STEP: 5.0

OBJECTIVE: The objective of this step is to ensure all major plant parameters are evaluated and the plant is responding in an anticipated manner.

BASIS: This step ensures there is not a second unknown event and ensures Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152 RT Recovery Action Steps 2, 4, 5, 6 and 7

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

How to maintain Safety Functions;

In addition to the above the CRS shouldknow:

How to determine the cause of a Reactor Trip;

How to determine if the core is being adequately cooled.

SPECIAL CONSIDERATIONS

A proper evaluation for cause of a Reactor Trip may require an inspection by personnel outside the Control Room

The CRS should be able to recognize conditions indicative of RCS voiding.

PROCEDURE:	RT 41RO-1ZZ01
STEP:	6.0
OBJECTIVE:	The objective of this step is to recover plant systems to an operable status. Forced RCS flow will be reestablished, and the secondary plant equipment is shutdown.
BASIS:	This step will ensure that the preferred mode of core heat transport is employed and ensures there is no equipment damage following a Reactor Trip. Plant stabilization is standardized for ease of recovery and procedure interface.
SOURCE DOCUMENT:	CEN-152 RT Recovery Action Steps 2 & 8 RCP Vendor Technical Manual, N001 602-205
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to start RCP's; How to perform a secondary plant equipment status check; In addition to the above the CRS should know: How to determine if RCP restart criteria is met; What RCP combination to use.	The CRS must realize that even though natural circulation is a reliable method of heat removal, forced flow is the desired method.

PROCEDURE: RT 41RO-1ZZ01

STEP: 7.0

OBJECTIVE: The objective of this step is to evaluate this plant to determine if a plant restart is possible.

BASIS: This is the exit step from the procedure and directs the staff to enter a GOP once plant conditions have stabilized, as directed by station management.

SOURCE DOCUMENT: CEN-152 RT Recovery Actions Step 8

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The PVNGS GOP's arrangement and the conditions required to enter each GOP.	
In addition to the above the CRS should know:	
The proper interface with station management.	

Steps found in CEN-152 RT Recovery Guideline but not in PVNGS Reactor Trip Recovery operation are as follows with reasons noted:

CEN-152 STEP	REASON FOR NOT BEING INCLUDED
1	The standard post trip actions in the form of Safety Function monitoring are continuously maintained in the EP, 41EP-1ZZ01. Safety Functions are monitored in Steps 1.0, 5.0 of this procedure.

C. EXCESSIVE STEAM DEMAND 41RO-1ZZ02

PROCEDURE: ESD 41RO-1ZZ02

STEP: OBJECTIVE

OBJECTIVE: This statement will define when this RO will be used and what is to be accomplished by this procedure.

BASIS: This statement is included to ensure the CRS knows he is using the correct procedure, and defines the scope of the procedure.

SOURCE DOCUMENT: NUREG-0999
CEN-152

DEVIATION: The scope of the Steam Line Break Recovery Guideline in CEN-152 covers a steam line break from the last feedwater check valve to the turbine stop valves. PVNGS will cover a system break between the last feedwater check and MSIV's in the Loss of Secondary Coolant Recovery Procedure. The excessive steam demand covers everthing downstream of the MSIV's and a Failure of the Feedwater Control System resulting in a MSIS on high S/G level.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know:	The CRS should be aware that
When to use this particular RO, and the arrangement and location of all PVNGS Procedures.	the EP 41EP-1ZZ01 must be implemented prior to use of this procedure.

PROCEDURE:	ESD 41RO-1ZZ02
STEP:	1.0
OBJECTIVE:	The objective of this step is to verify the diagnostic section of the EP correctly identified the event, and if necessary, direct the CRS to another procedure when conditions indicate a problem beyond the scope of this RO. Additionally, this step directs the operators to maintain Safety Functions.
BASIS:	This step ensures that the diagnostic was correct and that Safety Functions are being maintained.
SOURCE DOCUMENT:	CEN-152 SLB Recovery Action Steps 2, 3, 4, 5, and 6
DEVIATION:	CEN-152 break identification Figure 7.4 is incorporated into the EP diagnostic, 41EP-1ZZ01 STep 1.2. Appropriate verification for the scope of Excessive Steam Demand, as defined by the objective, is incorporated in this step.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain Safety Functions. In addition to the above the CRS should know: How to verify the Reactor is shutdown; The normal post trip plant response during an Excessive Steam Demand event and how to read these parameters on the control boards	Safety Function maintenance is Part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.

PROCEDURE: ESD 41RO-1ZZ02

STEP: 2.0

OBJECTIVE: The objective of this step is to direct entry into the PVNGS Emergency Plan for event classification and required notifications.

BASIS: This step ensures that action is taken to implement the PVNGS Emergency Plan, to gain additional support for the control room staff and to ensure the safety of the public and site personnel is maintained.

SOURCE DOCUMENT: NUREG-0654 Appendix 1

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

How to maintain Safety Functions.

In addition to the above the CRS should know:

How to classify emergency events and who to notify.

SPECIAL CONSIDERATIONS

Safety Function maintenance is Part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.

The CRS must not allow event classification and notification to impact on the recovery operation.

PROCEDURE: ESD 41RO-1ZZ02

STEP: 3.0

OBJECTIVE: The objective of this step is to take actions aimed at isolating the source of excessive steam demand by evaluating plant conditions after closure of turbine stop valves and MSIV's. If symptoms indicate a loss of secondary coolant operators will be referred to the appropriate procedure. If symptoms indicate a MSIS on high S/G level operator actions are aimed at maintaining S/G level and feedwater control.

BASIS: This step ensures that an excessive RCS cooldown does not take place by verifying steam demand termination, and proper feedwater control.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action Steps 8 and 19

DEVIATION: If a MSIS does not isolate the problem the operator is then referred to the Loss of Secondary Coolant Procedure.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Safety Function maintenance is Step 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.
How to maintain Safety Functions;	
How to close or verify closed the turbine stop valves/MSIV's;	
How to stabilize RCS temperature with a MSIV closure.	
In addition to the above the CRS should know:	
How to determine if conditions indicate a Loss of Secondary Coolant;	
How to determine the valve fault or system leak.	

PROCEDURE: ESD 41RO-1ZZ02

STEP: 4.0

OBJECTIVE: The objective of this step is to stabilize those plant parameters which are expected to fluctuate during this event.

BASIS: This step ensures that parameters expected to fluctuate during an ESD are stabilized and operations are within limitations and commitments. This prevents an inadvertent challenging of Safety Functions.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action Steps 10, 12, 13, 16, 17, 19, 20, 21, and 22

FSAR 6.2.43, CIAS verification for charging
SER 11/81 7.3.2, AFAS override
EER 82-RC-015 - RCP Trip
PP 19249 - Reload buses after SIAS

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to maintain pressurizer level;	
How to maintain RCS pressure;	
How to manipulate the Safety Injection System;	
How to maintain the S/G in an operable status and remove RCS heat at a proper rate.	
In addition to the above the CRS should know:	
How to decide if continued RCP operation is permissible;	
How to verify adequate natural circulation if necessary and minimize voiding;	
How to verify proper ESFAS response if necessary.	

PROCEDURE: ESD 41RO-1ZZ02

STEP: 5.0

OBJECTIVE: This step evaluates all major plant parameters and ensures the plant is responding in an anticipated manner.

BASIS: This step ensures that there is not a second unknown event and Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action Steps 5, 12, 15 and 16

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know: How to maintain Safety Functions.

In addition to the above the CRS should know:

How to determine the cause of the Excessive Steam Demand;

How to determine if the core is being adequately cooled.

SPECIAL CONSIDERATIONS

A proper evaluation of the cause of an Excessive Steam Demand may require inspection by personnel outside the Control Room.

The CRS should be able to recognize conditions indicative of RCS voiding.

Safety Function maintenance is Steps 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.

PROCEDURE:	ESD 41RO-1ZZ02
STEP:	6.0
OBJECTIVE:	This step provides the operators with reset criteria for safety systems so the plant can be restored to a more preferred lineup.
BASIS:	This step ensures an evaluation is made and reset criteria are met prior to restoring safety systems to normal. Setpoints may be conservative to allow for ease of operator action.
SOURCE DOCUMENT:	CEN-152, 5.0 Recovery Action Steps 11, 12, 15, and 16 SLB Recovery Action Steps 13, 14 and 18 RCP Vendor Technical Manual, N001 602-205 EER 82-RC-010, Subcooling
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The location, content, and how to perform supporting appendices. In addition to the above the CRS should know: How to determine if plant conditions warrant resetting safety signals.	The CRS must be aware of how resetting safety systems impact plant conditions.

PROCEDURE: ESD 41RO-1ZZ02

STEP: 7.0

OBJECTIVE: The objective of this step is to restore or maintain forced flow or verify natural circulation when forced flow cannot be maintained.

BASIS: This step restores plant flow to a more controllable and preferred lineup, or verifies natural circulation to maintain adequate core cooling.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action 11
CE-Task 430, Natural Circulation Cooldown

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to restore RCP support systems	
RCP start criteria, limitations, expected flows, temperatures, differential pressures, and starting transients.	
How to verify natural circultation;	
Location and use of supporting appendices.	
In addition to the above the CRS should know:	The primary concern of the CRS is to ensure the core is being cooled and if not promptly take actions to increase core cooling and/or RCS heat removal.
How different support system failures affect RCP operation;	
How to read and interpret core exit thermocouple instruments;	
How and when to interface with Inadequate Core Cooling in the Functional Recovery Procedure.	

PROCEDURE: ESD 41RO-1ZZ02

STEP: 8.0

OBJECTIVE: The objective of this step is to ensure proper shutdown of secondary plant equipment and to align secondary equipment for entry into a General Operating Procedure.

BASIS: This step provides equipment protection by ensuring proper secondary plant shutdown. Plant stabilization is standardized for ease of operator response and procedural interface.

SOURCE DOCUMENT: CESSAR 15.4.2.2 - Shifting to Auxiliary Feedwater.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The location, content, and how to perform supporting appendixes; How to operate secondary plant equipment; How to verify proper system response. In addition to the above the CRS should realize the consequences of improper equipment shutdown.	The degree to which the Secondary Operator should be instructed to shutdown secondary equipment should be based on how soon plant restart criteria can be met.

PROCEDURE: ESD 41RO-1ZZ02

STEP: 9.0

OBJECTIVE: The objective of this step is to ensure adequate water inventory for varying plant conditions.

BASIS: This step maintains RCS heat removal utilizing atmospheric dump valves and ensures adequate water inventory to support RCS cooldown in this mode of operation.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action 23

DEVIATION: Setup 23 is divided between 9.0 and 10.0.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know;	
How to use and maintain the water inventory record and the location and operation of indicators to support it.	
In addition to understanding the above the CRS should know:	Excessive use of water can jeopardize plant cooldown. If the nature of the problem requires a plant cooldown it should be started as soon as possible.
The basis for CST level;	
When to shift auxiliary feedwater pump suctions;	
How and when to interface with other procedures.	

PROCEDURE:	ESD 41RO-1ZZ02
STEP:	10.0
OBJECTIVE:	This step evaluates plant conditions and equipment status and is the exit step from this procedure.
BASIS:	This is the exit step from this procedure and directs the control room staff to enter a General Operating Procedure as appropriate for plant conditions.
SOURCE DOCUMENT:	CEN-152 SLB Recovery Action 23
DEVIATION:	Step 23 is divided between 9.0 and 10.0.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to interface with other procedures.	

Steps found in CEN-152 SLB Recovery Guideline but not in PVNGS Excess Steam Demand Recovery operation are as follows with reasons noted:

CEN-152 STEP	REASON FOR NOT BEING INCLUDED
1	The standard post trip actions in the form of Safety Function monitoring are continuously maintained in the EP, 41EP-1ZZ01 and monitored throughout this procedure.
7	PVNGS procedure scope includes the determination of the faulted Steam Generator in the Loss of Secondary Coolant Recovery Procedure, step 3.0.
7, 9	PVNGS procedure scope includes the isolation of the Steam Generators and declaration of the faulted Steam Generator in the Loss of Secondary Coolant Recovery Procedure, step 3.0 and 4.0.
18	Operation of containment spray will be covered in the Loss of Secondary Coolant Recovery procedure, step 8.0 as it is not expected to occur within the scope of the PVNGS Excess Steam Demand Procedure.
24 thru 35	Plant cooldown is addressed as an Abnormal Operating Procedure or a General Operating procedure as appropriate. This is to allow proper interface with other operating procedures.

D. LOSS OF SECONDAY COOLANT 41RO-1ZZ03

PROCEDURE: LOSC 41RO-1ZZ03

STEP: Objective

OBJECTIVE: This statement will define when this RO will be used and what is to be accomplished by this procedure.

BASIS: This statement is included to ensure the CRS knows he is using the correct procedure and defines the scope of the procedure.

SOURCE DOCUMENT: CEN-152
NUREG-0899

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	The CRS should be aware
When to use this procedure and the arrangement and location of all PVNGS Procedures.	that the EP, 41EP-1ZZ01 must be implemented prior to use of this procedure.

PROCEDURE: LOSC 41RO-1ZZ03

STEP: 1.0

OBJECTIVE: This step verifys that the diagnostic section of the EP correctly identified the event. This step may direct the CRS to another procedure if conditions indicate a problem beyond the scope of this RO. This step also directs Safety Functions to be maintained.

BASIS: This step ensures that the diagnostic was correct and that Safety Functions are maintained.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action Steps 2, 3, 4, 5 and 6

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Safety Functions maintained is Part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01
How to maintain Safety Functions.	
In addition to the above the CRS should know:	
How to verify the Reactor shutdown;	
The normal post trip response during a loss of secondary coolant event and how to verify these parameters on the control boards.	
How to determine if use of another procedure is warranted	

PROCEDURE: LOSC 41RO-1ZZ03

STEP: 2.0

OBJECTIVE: This step directs entry into the PVNGS Emergency Plan for event classification and required notifications.

BASIS: This step ensures that action is taken to implement the PVNGS Emergency Plan, to gain additional support for the control staff and to ensure the safety of the public and site personnel is maintained.

SOURCE DOCUMENT: NUREG-0654, Appendix 1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know; How to maintain Safety Functions. In addition to the above the CRS should know: How to classify emergency events and who to notify.	Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01. The CRS must not allow event classification and notifications to impact on the recovery operation.

PROCEDURE: LOSC 41RO-1ZZ03

STEP: 3.0

OBJECTIVE: This step identifies the affected Steam Generator. If both Steam Generators are affected the worst Steam Generator is declared the faulted S/G.

BASIS: This step provides a method to determine the faulted Steam Generator.

SOURCE DOCUMENT: CEN-152
SLB Recovery Actions 7 and 9

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to maintain Safety Functions;	
Location and operation of control board indications;	
How to determine the faulted Steam Generator.	
How to stabilize plant parameters;	
How to control temperature using atmospheric dumps;	
The reasons safety valves are not to be challenged;	
How to manually initiate safety signals;	
In addition to the above the CRS should know:	
How to maintain adequate RCS heat removal;	
What conditions indicate inadequate core cooling exists;	
How to determine if use of another procedure is warranted.	

PROCEDURE: LOSC 41RO-1ZZ03

STEP: 4.0

OBJECTIVE: This step isolates the faulted Steam Generator.

BASIS: This step ensures proper isolation of the faulted Steam Generator to minimize inventory loss and thereby minimize RCS cooldown.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action 8

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	The CRS must be aware that if, after isolating the faulted Steam Generator, the symptoms shift to the isolated Steam Generator, the leak is downstream of the MSIV's.
How to maintain Safety Functions;	
How to isolate Steam Generators;	
The location and content of supporting appendices.	
How to override AFAS to minimize RCS cooldown and what levels to maintain.	

PROCEDURE:	LOSC 41RO-1ZZ03
STEP:	5.0
OBJECTIVE:	The purpose of this step is to stabilize those plant parameters which are expected to fluctuate during this event. To facilitate recovery action secondary equipment will be shutdown.
BASIS:	This step normalizes plant parameters to prevent an inadvertent challenging of Safety Functions. Secondary equipment is properly shutdown to prevent equipment damage, and facilitate plant stabilizations. Operations will be within specifications and commitments.
SOURCE DOCUMENT:	CEN-152 SLB Recovery Action Steps 12, 13, 14, 15, 16, 18, 19, 20, 21, 22 Setpoint Index 13-J-ZZ1-002 CESSAR 15.4.2.2 - Shifting FW to AFW FSAR 6.2.4.3 - CIAS Verifications SER 11/81 7.3.2 - AFAS Override PP 19078 - AFAS Throttling
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: Operation and control of the Auxiliary Feedwater System; The meaning of the term "recovery", as used in this procedure; The affect of feeding and steaming steam generators on primary temperature and pressure and PZR level; How and when to throttle SI; How to verify natural circulation.	The CRS should be aware that subcooling margin is indicative of heat removal and pressure control. Loop transit time when in natural circulation slows plant response to about 10 minutes.

PROCEDURE: LOSC 41RO-1ZZ03

STEP: 6.0

OBJECTIVE: This step evaluates all plant parameters and verifies the plant is responding in an anticipated manner. This step also directs Safety Functions to be monitored.

BASIS: This step ensures Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action Steps 5, 12, 15, 16

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Parameters will be reported to the CRS on an "as requested" basis.
How to coordinate primary temperature and PZR level recovery with heat removal;	
How to maintain Safety Functions;	
How to read and interpret control board indications and controls:	
In addition to the above the CRS should know:	
How to verify adequate core cooling.	

PROCEDURE: LOSC 41RO-1ZZ03

STEP: 7.0

OBJECTIVE: This step ensures proper system response to Safety System Actuation Signals.

BASIS: This step ensures Safety Functions are not compromised by equipment failure.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action Step 17
PP 19249 - SIAS - Reloading Busses

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to verify safety signals;	
The content and location of supporting appendices	
In addition to the above the CRS should know:	
How to distribute verification appendixes for effective utilization of personnel while maintaining Safety Function parameters.	

PROCEDURE: LOSC 41RO-1ZZ03

STEP: 8.0

OBJECTIVE: This step returns safety equipment to a more preferred line-up in preparation for entry into a General Operating Procedure.

BASIS: This step provides for evaluation and reset of ESFAS signals to a more preferred line-up.

All setpoints may be more conservative than those in Technical Specifications for ease of operator action.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action Steps 17 and 18

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
Location and content of supporting appendices.	
In addition to the above the CRS should know:	
How to determine if plant conditions warrant resetting criteria.	

PROCEDURE: LOSC 41RO-1ZZ03

STEP: 9.0

OBJECTIVE: This step restores plant support equipment and evaluates water inventory.

BASIS: This step ensures adequate water available for any plant evolution, and that containment equipment is restored.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action Step 23

DEVIATION: Step 11.0 evaluates plant status and auxiliary equipment. Step 12.0 addresses cooldown.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to restore, control, and maintain plant support systems including NC and IA;	
How to restore CTMT ventilation;	
How to interpret CTMT indications.	

PROCEDURE: LOSC 41RO-1ZZ03

STEP: 10.0

OBJECTIVE: This step restores plant flow to a more controllable and preferred line-up.

BASIS: This step ensures RCP operation is in the most advantageous mode for RCS heat removal.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action Steps 11 and 12
RCP Vendor Technical Manual N001-602-205

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: RCP operation prerequisites, RCP post start indicators, RCP restart criteria, RCP operational limitations and precautions; How to interpret CTMT indications.	

PROCEDURE: LOSC 41RO-1ZZ03

STEP: 11.0

OBJECTIVE: This step directs all plant parameters to be evaluated and Safety Functions to be maintained.

BASIS: This step ensures all plant parameters are evaluated and are responding as anticipated. Safety Functions are verified to ensure they are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152
SLB Recovery Action Steps 2, 5, 12, 15, 16, and 23

DEVIATION: Cooldown is addressed in step 12.0.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know;	Reports to the CRS will be
How to read and interpret control room indications;	on an "as requested" basis.
How to maintain Safety Functions.	
In addition to the above the CRS should know;	
How to determine if the plant is responding as anticipated;	
In the event Shutdown Margin is not met to direct emergency boration initiated.	

PROCEDURE:	LOSC 41RO-1ZZ03
STEP:	12.0
OBJECTIVE:,	This step informs station management of plant status, and directs cooldown as appropriate for plant conditions.
BASIS:	This step ensures stations management is aware of plant status and cooldown is in the most advantageous mode for plant status.
SOURCE DOCUMENT:	CEN-152, SLB Recovery Action Step 23
DEVIATION:	Plant evaluation is done in Step 11.0, water inventory is evaluated in Step 9.0.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to maintain Safety Functions;	
How to interface with other procedures.	
In addition to the above the CRS should know:	
How to determine the appropriate method of cooldown and how to interface with station management.	

Steps found in CEN-152 SLB Recovery Action Guidelines but not in PVNGS Loss of Secondary Coolant Recovery Operation are as follows with the reasons noted:

CEN-152 Step	Reason For Not Being Included.
1	The standard post trip actions in the form of Safety Function monitoring are continuously maintained in the EP.
10	Stopping RCP's is addressed in 41EP-1ZZ01 in accordance with EER 82-RC-015.
24 thru 35	CEN-152 provides direction for cooldown. PVNGS addresses cooldown by directing the CRS to the appropriate Abnormal Operating Procedure.

E. LOSS OF RCS FLOW 41RO-1ZZ04

PROCEDURE: LORF 41RO-1ZZ04

STEP: OBJECTIVE

OBJECTIVE: This statement will define when this RO will be used and what is to be accomplished by this procedure.

BASIS: This statement is included to ensure the CRS knows he is using the correct procedure, and defines the scope of the procedure.

SOURCE DOCUMENT: NUREG-0899, 5.4.3
CEN-152, 9.0

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: When to use this procedure and the arrangement and location of all PVNGS Procedures.	The CRS should be aware that the EP, 41EP-1ZZ01 must be implemented prior to use of this procedure.

PROCEDURE: LORF 41RO-1ZZ04

STEP: 1.0

OBJECTIVE: This step maintain Safety Functions and verifies the diagnostic section of the EP correctly identified the event. This step directs the CRS to another procedure when conditions indicate a problem beyond the scope of this RO.

BASIS: This step ensures that the diagnostic was correct and that Safety Functions are being maintained.

SOURCE DOCUMENT: CEN-152
8.0, Recovery Action Steps 2, 3, 4, and 5

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01
How to maintain Safety Functions.	
In addition to the above, the CRS should know:	
How to verify the Reactor is shutdown;	
The normal post trip plant response and how to read these parameters on the control boards.	

PROCEDURE: LORF 41RO-1ZZ04

STEP: 2.0

OBJECTIVE: The objective of this step is to direct entry into the PVNGS Emergency Plan, for event classification and required notifications.

BASIS: This step is to ensure that action is taken to implement the PVNGS Emergency Plan, to gain additional support for the control room staff, and to ensure the safety of the public and site personnel is maintained.

SOURCE DOCUMENT: NUREG-0654

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain Safety Functions.	Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.
The CRS should know: How to classify emergency events and who to notify.	The CRS must not allow event classification and notification to impact on the Recovery Operation.

PROCEDURE: LORF 41RO-1ZZ04

STEP: 3.0

OBJECTIVE: This step is to stabilize and restore those plant parameters which are expected to fluctuate during this event.

BASIS: This step ensures that plant parameters which are expected to fluctuate during a loss of RCS flow are stabilized and prevents them from challenging Safety Functions. Restoration and stabilization is within specification and commitments.

SOURCE DOCUMENT: CEN-152, Loss of Forced Flow Recorvery Steps 11, 12, and 13.
Setpoint Index 13-J-ZZ1-002
EER 82-RC-010, RCS Subcooling
FSAR 6.2.4-3, CIAS-Verifications
SER 11/81 7.3.2, AFAS Override
PP 19078, AFAS Level Control

DEVIATION: None.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	The CRS must maintain an overview of operations, directing specific operations, if necessary, but avoiding focusing on a single problem to the extent that the overview is lost.
How to determine RCS subcooled;	
The operation of the Pressurizer Level and Pressure Control System;	
Limitations on pressurizer level and pressure and RCS subcooling;	The Secondary Operator must coordinate with the Primary Operator to stabilize RCS pressure, temperature, and subcooling.
The relationship between RCS temperature and steam generator pressure, especially the possibility of lifting S/G safety valves;	The Primary Operator must communicate with the Secondary Operator and coordinate their actions.
The limitation on RCS temp changes;	
The operation of FW controls in manual and automatic using MFW or AFW;	

PROCEDURE: LORF 41RO-1ZZ04

STEP: 3.0 (Cont'd.)

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The effects of FW flow on RCS temperature, pressure, and natural circulation flow;	
Limitations on S/G level;	
How to determine condenser availability;	
How to operate the SBCS in manual and auto, with and without Condenser Vacuum; How to operate the Atmospheric Dump Valves;	

PROCEDURE: LORF 41RO-1ZZ04

STEP: 3.0 (Cont'd.)

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The relationship between S/G activity and radioactive release through the Atmospheric Dump Valves and S/G Safeties;	
The relationship between atmpospheric dump valve position and steam flow;	
The limitations on atmospheric dump valve operation without Instrument Air available;	
How to manually start a Charging Pump;	
How to initiate pressurizer auxiliary spray and Tech. Spec. limits on auxiliary spray use.	

PROCEDURE: LORF 41RO-1ZZ04

STEP: 4.0

OBJECTIVE: This step verifies natural circulation flow is established and maintained.

BASIS: This step ensures adequate core cooling and heat transport is maintained.

SOURCE DOCUMENT: CEN-152,
9.0, Recovery Action Steps 8, 9, and 10
CE-TASK 430, Natural Circulation Cooldown

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to recognize natural circulation flow indications;	
The factors which effect natural circulation flow;	
How to optimize natural circulation flow conditions;	
How to use the Natural Circulation Appendix.	

PROCEDURE: LORF 41RO-1ZZ04

STEP: 5.0

OBJECTIVE: This step evaluates all plant parameters and verifies the plant is responding in an anticipated manner. This step also directs Safety Function monitored.

BASIS: This step ensures there is not a second unknown event and Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152, 9.0, Recovery Action Steps 4, 8, 9, and 10

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Safety Functions maintenance is part 2.0 and 3.0 of Emergency Procedure 41EP-1ZZ01.
How to maintain Safety Functions;	
How to coordinate primary temperature and PZR level recovery with heat removal;	
How to read and interpret control board indications and controls.	Parameters will be reported to the CRS on an "as requested" basis.
In addition to the above the CRS should know:	
How to verify adequate core cooling.	

PROCEDURE: LORF 41RO-1ZZ04

STEP: 6.0

OBJECTIVE: This step determines the cause of the loss of RCS Flow and provides the CRS direction to other procedures as conditions warrant.

BASIS: This step ensures the plant is returned to a more preferred line-up as soon as conditions permit.

SOURCE DOCUMENT: CEN-152, 9.0, Recovery Action Steps 14

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Safety Functions mainten- is part 2.0 and 3.0 of the Emergency Procedure.
How to maintain Safety Functions;	
The power supply to the RCPs and how to determine if power is available;	
How to restore electric power;	
How to recognize a loss of Nuclear Cooling Water;	
Limitations associated with Nuclear Cooling Water and Seal Injection, and RCP operations;	
How to locate a referenced AO procedure;	
What options are available if forced flow cannot be restored.	

PROCEDURE: LORF 41RO-1ZZ04

STEP: 7.0

OBJECTIVE: This step restores forced flow.

BASIS: This step restores the RCS to a more controllable and preferred line-up ensuring RCS heat transport is in the most advantageous mode.

SOURCE DOCUMENT: CEN-152, 9.0, Recovery Action Step 6.
Vendor Tech Manual N001 602-205

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	The Primary Operator must coordinate restoring cooling water with the Secondary Operator.
The required conditions to start an RCP and the starting limitations for RCP motors;	
The normal nuclear cooling water flows for a running RCP;	
The expected changes in RCS temperatures and steam generator pressures when forced flow is restored;	
How to override a CIAS and open IA and NC CTMT isolation valves;	
The effects of opening these valves on containment isolation;	
How to determine the status of NC;	
How to establish proper RCP seal injection and bleedoff flows;	
The normal RCP cooling water flows and temperatures.	

PROCEDURE: LORF 41RO-1ZZ04

STEP: 7.0 (Cont'd.)

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
RCP starting duty interlocks associated with starting an RCP;	
Required conditions for starting an RCP;	
How to start an RCP and indications of a properly operating RCP;	
The effects of starting an RCP on RCS pressure and temperature;	
The limits on RCP cooling water, pressure, flows, and temperature during restoration;	
The interlocks associated with the RCP Oil Lift Pumps, the indication of proper lift pump operation, and how to start the RCP Oil Lift Pumps;	The Primary Operator will start the RCPs under the direction of the CRS. The Primary Operator must coordinate starting the RCP's with the Secondary Operator.
The effects of starting an RCP on electric power supplies.	
Which sprays can supply PZR sprays.	

PROCEDURE: LORF 41RO-1ZZ04

STEP: 8.0

OBJECTIVE: This step directs secondary equipment shutdown and plant stabilization.

BASIS: This step ensures equipment safety is maintained and provides for ease of plant stabilization and procedure interface.

SOURCE DOCUMENT: CESSAR 15.4.2.1.2

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
What equipment will be shutdown and the final operating configuration of the secondary plant;	
How to maintain Safety Functions.	Safety Functions maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01
In addition to the above the CRS should know:	
How to ensure shutdown of secondary equipment is consistent with estimated plant restart.	

PROCEDURE	LOSS OF RCS FLOW 41RO-1ZZ04
STEP:	9.0
OBJECTIVE:	This step verifies proper safety system response and provides operators with reset criteria for safety systems so that the plant can be restored to a normal lineup.
BASIS:	Setpoints may be more conservative than those in Technical Specifications for ease of operator response. This step ensures an evaluation of safety systems is made and reset criteria is met prior to restoring safety systems to normal. Setpoints may be more conservative for ease of operator action.
SOURCE DOCUMENT:	CEN-152, 9.0, Recovery Action Steps Technical Specifications 3/4.3.1 PP 19249 - Restoring SIAS equipment
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to determine if a safety signal is to be actuated and the requirements for resetting each safety signal.	
In addition to the above the CRS should know: System response to restoring safety equipment to standby.	The CRS must be aware of the overall effect on the plant when safety equipment is restored.

PROCEDURE: LORF 41RO-1ZZ04

STEP: 10.0

OBJECTIVE: This step evaluates all major plant parameters and ensures the plant is responding in an aniticipated manner.

BASIS: This step ensures there is not a second unknown problem and Safety Functions are not inadvertently compromised

SOURCE DOCUMENT: CEN-152, 9.0, Recovery Action Step 4, 8, 9, and 10.

DEVIATION: None

REQUIRED KNOWLEDGE

The Operators should know:

The proper operation of the RCP seal bleedoff isolations;

The operation of the RCP Lift Oil Pumps and interlocks;

The limits on condenser vaccum and how to determine condenser availability;

How to determine the Auxiliary Steam source;

The limits on CST level and its design basis;

The backup feedwater source provided by RMWT;

How to read CETS and the relationship of CETS to adequate core cooling;

How to maintain Safety Functions.

SPECIAL CONSIDERATIONS

The CRS must evaluate the plant as a whole and ensure proper plant response.

Safety Functions maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.

PROCEDURE: LOSS OF RCS FLOW 41RO-1ZZ04

STEP: 11.0

OBJECTIVE: This is the exit step from this procedure and directs the CRS to the Natural Circulation Cooldown Procedure or a GOP as appropriate.

BASIS: This step ensures the operators have the necessary procedures referenced for continuing plant evolutions.

SOURCE DOCUMENT: CEN-152, 9.0, Recovery Action Step 14

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The PVNGS GOP's arrangement and the conditions required to enter each GOP. In addition to the above the CRS should know: The proper interface with station management.	

Steps found in CEN-152 loss of Forced Circulation Recovery Guideline but not in PVNGS Loss of RCS Flow Recovery Operation are as follows with the reasons as noted:

CEN-152, 9.0 Step	Reason For Not Being Included.
1	The standard post trip actions in the form of Safety Function monitoring are continuously maintained in the EP, 41EP-1ZZ01 Section 2.0 and 3.0 and are maintained throughout this procedure.
7	CEN-152 requires going to the Reactor Trip Procedure when forced flow is restored. PVNGS Loss of Forced Flow stands by itself to minimize procedure overlap.
15 thru 35	CEN-152 steps pertaining to a natural circulation cooldown. PVNGS provides these instructions in an Abnormal Operating Procedure, 41AO-1ZZ13, Natural Circulation Cooldown.

F. LOSS OF FEEDWATER 41RO-1ZZ05

PROCEDURE:	LOF, 41RO-1ZZ05
STEP:	OBJECTIVE
OBJECTIVE:	This statement will define when this RO will be used and what is to be accomplished by this procedure.
BASIS:	This statement is included to ensure the CRS knows he is using the correct procedure, and defines the scope of the procedure.
SOURCE DOCUMENT:	CEN-152 NUREG-0899
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: When to use this procedure and the arrangement and location of all PVNGS Procedures.	The CRS should be aware that the EP, 41EP-1ZZ01 must be implemented prior to use of this procedure.

PROCEDURE: LOF 41RO-1ZZ05

STEP: 1.0

OBJECTIVE: This step verifies the diagnostic section of the EP correctly identified the event and, if necessary, directs the CRS to another procedure when conditions indicate a problem beyond the scope of this procedure. This step directs the operators to maintain Safety Functions.

BASIS: This step ensures that the diagnostic was correct and that Safety Functions are maintained.

SOURCE DOCUMENT: CEN-152
8.0, Recovery Action Steps 2, 3, 4, 5 and 6

DEVIATION: PVNGS refers the CRS to a Loss of Secondary Coolant Procedure instead of Steam Line Break Recovery.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain Safety Functions. In addition to the above, the CRS should know: How to verify the Reactor is shutdown; The normal post trip plant response and how to read these parameters on the control boards; Those conditions which if exist would lead to the use of another procedure.	Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01

PROCEDURE: LOF 41RO-1ZZ05

STEP: 2.0

OBJECTIVE: The objective of this step is to direct entry into the PVNGS Emergency Plan for event classification and required notifications.

BASIS: This step is to ensure that action is taken to implement the PVNGS Emergency Plan, to gain additional support for the control room staff, and to ensure the safety of the public and site personnel is maintained.

SOURCE DOCUMENT: NUREG-0654 Appendix I

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

How to maintain Safety Functions.

In addition to the above the CRS should know:

How to classify emergency events and who to notify.

SPECIAL CONSIDERATIONS

Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.

The CRS must not allow event classification and notification to impact on the recovery operation.

PROCEDURE: LOF 41RO-1ZZ05

STEP: 3.0

OBJECTIVE: This step maintains Safety Functions, evaluates Steam Generators, and provides guidance for a dry steam generator condition.

BASIS: This step ensures Safety Functions are maintained and provides guidance for maintaining a heat sink available.

SOURCE DOCUMENT: CEN-152
8.0, Recovery Action Steps 7
EER - 82-AF-021 - Auxiliary Feed Flow
CE-TASK 430, Natural Circulation Cooldown

DEVIATION: The PVNGS procedure does not stop redundant Auxiliary Feed Pumps, but directs operators to throttle flow.

REQUIRED KNOWLEDGE

The operators should know:

How to determine if a Steam Generator is dried out, and the location and operation of steam generator feed flow, steam flow, and level indications;

How to choose which Steam Generator to feed if they are both dry;

How to reinitiate flow to the Steam Generator.

In addition to the above the CRS must know:

The considerations of steam generator design in relation to water hammer and thermal stress when feedwater flow is restored.

SPECIAL CONSIDERATIONS

The concern is the effects of cold feedwater on feedlines, nozzles, and the tube bundle. The operators must realize that an indicated level above zero ensures tube coverage sufficient to remove decay heat and that if auxiliary feed has been initiated to a Steam Generator it should not be overridden or throttled until a recovering indicated level is achieved.

PROCEDURE: LOF 41RO-1ZZ05

STEP: 4.0

OBJECTIVE: This step maintains Safety Functions and restores flow to the Steam Generators. This step provides operator guidance for maintaining Steam Generators and auxiliary feed operation within limitations and specifications and evaluating steam generator intergrity.

BASIS: This step ensures at least one Steam Generator is maintained for RCS Heat Removal and that operations are within limitations and commitments.

SOURCE DOCUMENT: CEN-152
8.0, Recovery Action Steps 7, 8 and 16
CE TASK - 430, Natural Circulation Cooldown, Section 5.3.5
EER 82-AF-021, Auxiliary Feed Flow
SER 11/81 7.3.2, AFAS Override
PP 109078 AFAS Level Control

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

The location and content of supporting Appendices;

How to start and align the Auxiliary Feedwater System;

The start criteria for the Auxiliary Feedwater System;

The order of preference for using Auxiliary Feed Pumps;

What is an acceptable rate to feed a Steam Generator;

The effects of the Auxiliary Feed System on plant response;

How to read and interpret steam generator levels and trends;

The meaning of "recovering";

SPECIAL CONSIDERATIONS

The CRS must know to direct chemistry to have perform sampling to aid in his evaluation of the Steam Generators, and to determine if a tube leak exists.

The rate at which S/G level is restored and steam flow, greatly affects RCS pressure and inventory control.

PROCEDURE: LOF 41RO-1ZZ05

STEP: 4.0 (Cont'd.)

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The effects of steam generator level restoration on RCS pressure and level.	

PROCEDURE: LOF 41RO-1ZZ05

STEP: 5.0

OBJECTIVE: This step restores plant parameters to as close to hot standby conditions as possible for plant circumstances and verifies safety signals.

BASIS: This step ensures plant parameters expected to fluctuate during a loss of feedwater are stabilized to facilitate plant recovery.

SOURCE DOCUMENT: CEN-152
8.0, Recovery Action Steps 9, 15, 18 and 19
Stepoint Index 13-J-ZZ1-002
FSAR 6.2.4.3, CIAS - Verification
PP 19249, SIAS Reload Buses

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

The operations of the SBCS both manual and automatic;

How to determine SBCS availability;

How to restore SBCS to an operable status;

How to operate Atmospheric Dump Valves and the concerns of plant cooldown on the Atmospheric Dump Valves;

What steam generator pressure to maintain;

How to coordinate steaming with the Primary Operator;

The reasons Safety Valves are not to be challenged;

The operation of the Pressurizer Level Control System including manual operation

SPECIAL CONSIDERATIONS

Extended hot standby operations on the Atmospheric Dump Valves depletes the water inventory available for a cooldown operation.

RCS heat removal rate greatly affects the rate at which level can be restored

The operators must realize the difference in plant response and the special considerations of plant operation should the Pressurizer go solid on safety injection flow.

The CRS must be able to evaluate plant conditions to determine the time before restart criteria can be met. This will aid the CRS as to his decision relating to shutting down plant equipment and recommendations to station management.

PROCEDURE: LOF 41RO-1ZZ05

STEP: 5.0 (Cont'd.)

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
of all components, letdown control, and manual control of the setpoints;	
How to determine leak rate by comparison of charging and letdown;	
How to coordinate level recovery and RCS heat removal with the Secondary Operator;	
The Pressurizer Pressure Control System including manual operation of all system components and setpoint control;	
How to determine subcooled margin;	
The necessary actions if pressure is less than 1700 psia or greater than 2250 psia;	
When, why, and how to throttle safety injection flow, and the concerns and methods of solid plant operations;	
The plant restart criteria.	

PROCEDURE: LOF 41RO-1ZZ05

STEP: 6.0

OBJECTIVE: This step evaluates all plant parameters and verifies the plant is responding in an anticipated manner. This step also directs Safety Functions monitored.

BASIS: This step ensures Safety Functions are not inadvertently compromised and that a second undiagnosed event is not present.

SOURCE DOCUMENT: CEN-152
8.0, Recovery Action Steps 2, 5, 7, 8 and 16

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	The CRS must be aware of what actions to take if subcooling is out of range.
How to determine subcooled margin for varying plant pressures and temperatures;	The CRS must be concerned with maintaining an adequate water inventory.
The location and operation of the Radiation Monitoring Computer;	This step may require interfacing with Auxiliary Operators or other in-plant support groups to determine the exact cause of the loss of feedwater.
The location and operation of the CST level indication;	
The location and operation of the RMWT level indication;	
How to determine what safety signals exist based on alarms, actuation indication, and system response;	The main concern of the CRS is to ensure adequate core cooling exists and if not to take the appropriate actions to correct the problem.
How to determine the cause of the loss of feedwater;	Parameters will be reported on an "as requested" basis.
How to interface with other in-plant organizations to obtain the required information in determining the cause of the loss of feedwater event;	
How to read and interpret core exit thermocouple readings;	

PROCEDURE: LOF 41RO-1ZZ05

STEP: 6.0 - Continued

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
In addition to the above the CRS should know: How to determine if adequate core cooling exists.	

PROCEDURE: LOF 41RO-1ZZ05

STEP: 7.0

OBJECTIVE: This step aligns plant equipment to minimize loss of water inventory and attempts to locate and isolate the fault.

BASIS: This step conserves water inventory and ensures equipment safety.

SOURCE DOCUMENT: CEN-152
8.0, Recovery Action Steps 4, 15 and 16

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	The main concern of this step is to minimize damage to equipment due to flooding.
The operation and flowpath of the Heater Drain System, Feedwater System and Condensate System;	
How to determine leak location based on flooding location or limited reports and how to isolate given areas of the systems;	
What actions to take if a rupture of the system cannot be isolated;	
How to maintain RCS temperature, feed pump operation, and condensate pump operation including how to stop and isolate components;	
In addition to the above the CRS should know:	
How to coordinate in-plant personnel to ensure flooding is stopped.	

PROCEDURE: LOF 41RO-1ZZ05

STEP: 8.0

OBJECTIVE: This step restores safety equipment to a more preferred lineup, or to standby as appropriate. Setpoints may be more conservative than those in Tech. Specs.

BASIS: This step ensures reset criteria will be met prior to restoring safety systems to normal.

SOURCE DOCUMENT: CEN-152
8.0, Recovery Action Steps 9 and 10
Tech. Specs, Table 3.3-4

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

The resetting criteria for safety signals.

How to determine if plant conditions warrant resetting safety signals.

The operation of the indications and controls necessary to evaluate plant conditions as listed: subcooling, pressurizer level and pressure, safety injection flow, steam generator level and pressure, containment pressure, and reactor vessel level;

How to interface with supporting Appendices

SPECIAL CONSIDERATIONS

The CRS must be aware of how resetting Safety Systems impacts plant parameters.

PROCEDURE: LOF 41RO-1ZZ05

STEP: 9.0

OBJECTIVE: This step restores or maintains forced RCS flow as conditions warrant.

BASIS: This step ensures the preferred mode of core heat transport is employed.

SOURCE DOCUMENT: CEN-152, 8.0, Recovery Action Step 11
RCP Vendor Technical Manual N001-602-205

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The operation, valve lineup and controls of the Nuclear Cooling System and the Instrument Air System and how it effects RCP operation;	
The operation and control of seal bleedoff, how seal bleed-off interfaces with other systems and RCP requirements of the seal bleedoff system;	
How to restore seal injection, normal valve lineup;	
The operation, control, and interlocks of RCP Oil Lift Pumps;	
The RCP start criteria and limitations, expected flows, and temperatures, and starting transients effection electrical distribution.	
In addition to the above the CRS should know:	
How to restore flow and the effects of various loop configurations.	

PROCEDURE LOF 41RO-1ZZ05

STEP: 10.0

OBJECTIVE: This step provides direction to determine the exact cause of the loss of feedwater.

BASIS: This step provides the CRS with the information on which to base cooldown decisions and minimizes inventory loss.

SOURCE DOCUMENT: CEN-152
8.0, Recovery Action Step 4

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know:	
How to interface with other departments to obtain the required assistance.	At this point the CRS will use all resources available to determine the reason for the loss of feedwater.

PROCEDURE: LOF 41RO-1ZZ05

STEP: 11.0

OBJECTIVE: This step verifies water inventory and directs operator actions if insufficient water is available.

BASIS: This step ensures enough water is available for varying plant conditions and evolutions.

SOURCE DOCUMENT: CEN-152
8.0, Recovery Action Step 17
SER 11/81 IIE 1.1 GS-4
FSAR 10.4-11

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The basis for CST level; How to shift auxiliary feed-pump suction; How to control hotwell level manually; How to return water to the CST; The start criteria and how to start the Condensate Pumps; How to use and maintain the Water Inventory Record.	Excessive use of water can jeopardize plant cooldown. If the nature of the problem requires a plant cooldown it should be started as soon as possible.

PROCEDURE:	LOF 41RO-1ZZ05
STEP:	12.0
OBJECTIVE:	This step evaluates all plant parameters and verifies the plant is responding in an anticipated manner.
BASIS:	This step ensures Safety Functions are.not inadvertently compromised.
SOURCE DOCUMENT:	CEN-152 8.0, Recovery Action Step 2, 5, 12, and 17
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: How to make a comprehensive analysis of plant conditions based on plant parameters and trends.	

PROCEDURE:	LOF 41RO-1ZZ05
STEP:	13.0
OBJECTIVE:	This step directs secondary plant shutdown for ease of stabilization and procedure interface.
BASIS:	This step ensures equipment is not neglected and damaged.
SOURCE DOCUMENT:	CESSAR 15.4.2.1.2 - Transfer of FW to AFW
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The location and content of supporting appendices.	The CRS must direct equipment shutdown based on indications and system response.

PROCEDURE: LOF 41RO-1ZZ05

STEP: 14.0

OBJECTIVE: This step provides the method to refill a dry Steam Generator.

BASIS: This step ensures refill of a dry Steam Generator is performed in the safest and most conservative method.

SOURCE DOCUMENT: EER 82-SG-001 - Refilling Dry S/G

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS shold know: How to interface with other departments to gain the needed support, and how to interface with other procedures.	The operator must understand the effects of cold feedwater on hot steam generator components and take whatever steps are necessary to minimize the transient.

PROCEDURE:	LOF 41RO-1ZZ05
STEP:	15.0
OBJECTIVE:	This is the exit step from this procedure and provides guidance for when to terminate this procedure.
BASIS:	This is the exit step and ensures parameters are recovered prior to exiting this procedure.
SOURCE DOCUMENT:	CEN-152 8.0 Recovery Action Step 20
DEVIATION:	Water inventory was addressed in 11.0.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators shold know: How to interface with other procedures.	

Steps found in CEN-152 Loss of Feedwater but not in PVNGS Loss of Feedwater Recovery Operations are as follows with the reasons as noted:

CEN 152 STEP	Reason For Not Being Included
1	The standard post trip actions in the form of Safety Function monitoring are continuously maintained in the E.P., 41EP-1ZZ01 and are addressed throughout this procedure.
21 thru 26	Alternatives for failure of the Auxiliary Feedwater System are addressed in the Functional Recovery Procedure, 41RO-1ZZ10.

G. STEAM GENERATOR TUBE RUPTURE 41RO-1ZZ06

PROCEDURE:	SGTR 41RO-1ZZ06
STEP:	OBJECTIVE
OBJECTIVE:	This statement will define when this RO will be used and what is to be accomplished by this procedure.
BASIS:	This statement is included to ensure the CRS knows he is using the correct procedure, and defines the scope of the procedure.
SOURCE DOCUMENT:	NUREG-0899, CEN-152
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: When to use this procedure, and the arrangement and location of all PVNGS Procedures.	The CRS must be aware that the EP, 41EP-1ZZ01 must be implemented prior to use of this procedure.

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 1.0

OBJECTIVE: This objective of the step is to verify the diagnostic section of the EP correctly identified the event, and if necessary, direct the CRS to another procedure when conditions indicate a problem beyond the scope of this RO. Additionally, this step directs the operators to maintain Safety Functions.

BASIS: This step ensures that the diagnostic was correct and that Safety Functions are being maintained.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Steps 2, 3, 4, 5, and 6

DEVIATION: Flowchart identification of S/G tube rupture is performed in the E P, 41EP-1ZZ01, Step 1.2. Appropriate verification is performed in this step.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Safety Function maintenance is Part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.
How to maintain Safety Functions;	
In addition to the above, the CRS should know:	
How to verify the Reactor is shutdown;	
The normal post trip plant response during a steam generator tube rupture event and how to read these parameters on the control boards;	
Those conditions which, if exist, would lead to the use of another procedure.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 2.0

OBJECTIVE: The objective of this step is to direct entry into the PVNGS Emergency Plan for classification of the event and required notifications.

BASIS: This step is to ensure that action is taken to implement the PVNGS Emergency Plan, to gain additional support for the control room staff, and to ensure the safety of the public and site personnel is maintained.

SOURCE DOCUMENT: NUREG-0654 Appendix I

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.
How to maintain Safety Functions.	
In addition to the above, the CRS should know:	The CRS must not allow event classification and notification to impact on the recovery operation.
How to classify emergency events and who to notify.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 3.0

OBJECTIVE: This step stabilizes plant parameters and lowers RCS temperature so the affected Steam Generator can be isolated.

BASIS: This step prevents inadvertent release of radioactive materials to the environment due to lifting Steam Generator Relief Valves.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Steps 7, 16, 17, and 23.
Setpoint Index 13-J-ZZ1-002
EER 82-RC-0101, Subcooling

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

The operation of the Pressurizer Pressure Control and Level Control Systems, and manual operation of all system components;

How to recognize voiding in the RCS;

How to determine leak rate by comparison of flows;

The operation of the Safety Injection System;

The requirements to throttle Safety Injection, when and how to throttle Safety Injection;

How to determine subcooled margin for varying plant plant conditions;

The concerns and methods of of solid plant operations;

The operation of the SBCS both manual and automatic;

SPECIAL CONSIDERATIONS

Pressure can be rapidly lowered by increasing heat removal.

The operators must realize the differences in plant response and the special considerations of plant operation, should the Pressurizer go solid on safety injection flow.

Extended Hot Standby operations on the Atmospheric Dump Valves depletes the water inventory available for a cooldown operation. Every effort should be made not to steam the affected S/G

Natural circulation cooldown will cause steam generator temperature to rise once isolated. Level increase due to leakage will increase pressure. Ensure the Steam Generator is adequately cooled prior to isolation.

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 3.0 (Cont'd.)

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
How to determine SBCS availability;	
How to restore SBCS to an operable status;	
How to operate the Atmospheric Dump Valves;	
The concerns of plant cooldown on the Atmospheric Dump Valves and radioactivity release if the affected SG is steamed to the atmosphere;	
How to reduce pressure while still maintaining subcooled margin;	
Desired RCS temperature to ensure Secondary Safety Valves will not lift;	
How to start and place in service the Auxiliary Feedwater System, prerequisistes for the system and the effects of the system on other plant parameters;	
How to read and interpret steam generator levels and trends;	
The meaning of the term "recovering";	
How to stop the Main Feedwater Pump without losing steam generator level control.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 4.0

OBJECTIVE: This step evaluates and determines which Steam Generator has the tube rupture.

BASIS: This step ensures a heat sink for RCS heat removal is maintained.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Steps 8, 10, 11, 12, and 25.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to use the Radiation Monitoring System and how to evaluate this information to determine the affected Steam Generator;	
The location and how to override Steam Generator Sample Valves;	
How to interface with supporting Appendices	
How and when to communicate information to in-plant personnel to obtain necessary support.	
In addition to the above the CRS should know;	
How to interface with the Chemistry Section to verify S/G activity.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 5.0

OBJECTIVE: This step directs the complete isolation of the affected Steam Generator.

BASIS: This step minimizes the release of radioactive materials to the environment.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Steps 9, 12, and 19.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	The CRS must be aware that blowdown is available to lower level in the affected Steam Generator.
How to determine the faulty S/G by verifying all S/G parameters;	
How to perform supporting Appendices;	
How to coordinate the activities of Auxiliary Operators.	
In addition to the above the CRS should know:	
How to coordinate plant personnel and how to receive the desired reports.	

PROCEDURE:	SGTR 41RO-1ZZ06
STEP:	6.0
OBJECTIVE:	This step evaluates all plant parameters to verify the plant is responding in an anticipated manner. This step also directs Safety Functions to be maintained.
BASIS:	This step ensures no second undiagnosed problem is present and that Safety Functions are maintained.
SOURCE DOCUMENT:	CEN-152, 6.0 Recovery Action Steps 5, 7, 10, 20, 21, and 34.
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain Safety Functions The location and operation of containment pressure, temp. and humidity indication; The location and operation of the Radiation Monitoring Computer; How to determine vacuum pump exhaust mode of operation; How to determine subcooled margin for varying plant conditions and what actions to take to correct an insufficient margin; How to read and interpret core exit thermocouple readings. In addition to the above the CRS should know: How to determine if adequate core cooling exists; How to verify natural circulation; How to determine RCS leak rate.	Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01. Parameters will be reported on an "as requested" basis.

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 7.0

OBJECTIVE: This step verifies shutdown margin and RCS boron concentration.

BASIS: This step ensures shutdown requirements are met.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Steps 22
PVNGS Technical Specifications 3/4 1.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to compute boron additions and the Technical Specifications associated with shutdown margin;	
How to calculate shutdown margin;	
How to ensure operations are within Technical Specification guidelines;	
In addition to the above the CRS should know:	
. The consequences of cooldown with insufficient shutdown margin.	

PROCEDURE:	SGTR 41RO-1ZZ06
STEP:	8.0
OBJECTIVE:	This step directs restoring forced flow when possible or verifying natural circulation as required.
BASIS:	This step ensures the most advantageous method of RCS heat transport is employed and maintained.
SOURCE DOCUMENT:	CEN-152, 6.0 Recovery Action Steps 14, 15, and 32 RCP Vendor Technical Manual N001 602-205 PP 19249 SIAS, Reloading Busses
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The operation and how to restore nuclear cooling water flow to containment equipment and the location and operation of the Containment HVAC System; The RCP start criteria and limitations, expected flows, temperatures, and starting transients; The RCP Oil Lift Pump operation and interlocks; The RCP seal injection criteria and the operation and control of seal bleedoff; How seal bleedoff interfaces with other systems; In addition to the above the CRS should know: The most advantage out pump combinations for plant conditions.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 9.0

OBJECTIVE: This step evaluates all plant parameters to verify the plant is responding in an anticipated manner.

BASIS: This step ensures Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Steps 5 and 26.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to evaluate Safety Signals;	
How to verify ventilation system lineups;	
How to read and interpret control board indications and controls.	
In addition to the above the CRS should know:	
How to verify adequate core cooling.	
How to verify natural circulation,	
How to estimate the size of the leak.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 10.0

OBJECTIVE: This step provides for lowering level in the ruptured Steam Generator.

BASIS: This step is to prevent overfilling the ruptured Steam Generator to the point of flooding the steam lines or safety valves.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Steps 10 and 19.
P&ID's 13-M-SGP-002, 13-M-SCP-006

DEVIATION: PVNGS design does not provide for blowdown to Radwaste, blowdown is to the Demineralizer Package or Condenser.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Lowering S/G level may pose radiation hazards to in-plant personnel.
How to lower steam generator level	
The operation and lineup of the Blowdown System.	
In addition to the above the CRS should know:	
How to insure in plant personnel are aware of increased radiation hazards and that ALARA principles are maintained.	

PROCEDURE:	SGTR 41RO-1ZZ06
STEP:	11.0
OBJECTIVE:	This step initiates an RCS cooldown, and provides for monitoring and controlling parameters affected by a cooldown.
BASIS:	This step ensures adequate RCS heat removal and cooldown is performed within the limits of plant conditions, and guidelines.
SOURCE DOCUMENT:	CEN-152, 6.0 Recovery Action Steps 20, 21, 24, 31, 32 35, 36, and 37. EER 82-RC-010, Subcooling CE Operating Curves V-CE-20294, April 18, 1983
DEVIATION:	None

REQUIRED KNOWLEDGE

The operators should know:

How to determine the cool-down rate on the Steam Generators;

How to maintain steam generator levels in various modes of operation;

The operation of the Auxiliary Feedwater System;

How to operate the Steam Bypass Control System and the Atmospheric Dump Valves;

How to coordinate steaming with the Primary Operator;

How, when, and why to reset the P.P.S setpoints;

What actions to take should an AFAS or MSIS occurr;

How to coordinate the cooldown to ensure RCS subcooled margin is maintained.

SPECIAL CONSIDERATIONS

Primary plant pressure must be lowered below steam generator pressure as this could cause back leakage and dilute the Primary System.

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 11.0 (Cont'd.)

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
In addition to the above the CRS should know: How to use a feed and bleed method to cool the ruptured S/G and any special consideration this involves.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 12.0

OBJECTIVE: This step directs automatically initiated safety signals to be verifed for proper system response.

BASIS: This step ensures equipment failure does not inadvertently compromise Safety Functions.

SOURCE DOCUMENT: FSAR 6.2.4-1, 7.3

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to verify safety signal actuation and the consequences of a systems failure to respond. To ensure at least one train of safety equipment is operating in response to the signal.	

PROCEDURE:	SGTR 41RO-1ZZ06
STEP:	13.0
OBJECTIVE:	This step prevents inadvertent release of radioactivity.
BASIS:	This step ensures measures are taken to minimize the release of radioactive materials to the environment.
SOURCE DOCUMENT:	CEN-152, 6.0 Recovery Action Step 26. Technical Specifications 3/4.3.3.
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The operation of the Radiation Monitoring System.	
In addition to the above the CRS should know:	
How to interface with Alarm Response Procedures.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 14.0

OBJECTIVE: This step directs plant surveys to be performed to determine the extent of contamination spread in order to minimize unnecessary exposure to personnel.

BASIS: This step is to prevent the inadvertent spread of radioactivity and minimize personnel exposure.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Step 25.
SER 11/81 12.1 ALARA

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: How to interface with other departments.	If blowdown is used to lower level, the system must be surveyed, including: sumps, drain tanks, blowdown package, and general area surveys.

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 15.0

OBJECTIVE: This step restores safety equipment to a standby lineup.

BASIS: This step ensures safety equipment is restored to standby when resetting criteria is met.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Step 16, 17, and 18.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: Location and content of supporting appendices; Safety signal reset criteria and the impact restoring safety equipment will have on plant parameters. In addition to the above the CRS should know: How to determine if restoring safety equipment to standby is warranted.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 16.0

OBJECTIVE: This step evaluates all plant parameters and verifies the plant is responding as anticipated.

BASIS: This step ensures plant response does not inadvertently compromise Safety Functions.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Step 5 and 26.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Reports to the CRS will be on an "as requested" basis.
How to compute RCS cooldown rate and the limits on cooldown rate;	
How to read and interpret control room indications.	
In addition to the above the CRS should know:	
How to interpret significant trends.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 17.0

OBJECTIVE: This step verifies that RCS cooldown is progressing within the scope of all limiting conditions.

BASIS: This step ensures RCS heat removal is continued in a controlled manner and release of radioactivity is minimized.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Step 20, 21, 24, 31, 32, 35, 36, and 37.

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

How to determine the cooldown rate on the Steam Generators;

How to maintain steam generator levels in various modes of operation;

The operation of the Auxiliary Feedwater System both manual and automatic;

How to operate Atmospheric Steam Dump Valves;

What steam generator pressure to maintain;

How to coordinate steaming with the Primary Operator;

How, when, and why to reset the P.P.S. setpoints;

What actions to take should an AFAS or MSIS occur;

How to coordinate the cooldown to ensure RCS subcooled margin is maintained.

SPECIAL CONSIDERATIONS

Primary plant pressure must be lowered below steam generator pressure as this could cause back leakage and dilute the primary system.

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 17.0 (Cont'd.)

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
In addition to the above, the CRS should know: How to use a feed and bleed method to cool the ruptured generator and any special consideration this involves.	

PROCEDURE:	SGTR 41RO-1ZZ06
STEP:	18.0
OBJECTIVE:	This step is to ensure Auxiliary Steam remains available.
BASIS:	This step is to ensure the Main Condenser remains available as a heat sink.
SOURCE DOCUMENT:	None
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to start the Auxiliary Boilers and how to shift lineups to ensure steam remains available.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 19.0

OBJECTIVE: This step provides the operators with methods to maintain water inventory control.

BASIS: This step ensures adequate water available for varying plant conditions.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Step 33.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The operation of the Hotwells, Condensate Drawoff system and Conensate Storage and Transfer System. The potential for the spread of contamination with these systems.	If the Hotwells are contaminated, drawoff will contaminate CST.

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 20.0

OBJECTIVE: This step isolates the Condensate System from Units 2 and 3 and the Auxiliary Boiler.

BASIS: This step minimizes the spread of contamination.

SOURCE DOCUMENT: SER 11/81 12.1, ALARA

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: How to minimize the spread of contamination thru cross connecting systems.	If the Auxiliary Boilers are required, Units 2 and 3 may want to shift Auxiliary Steam for their Unit to an inplant supply to prevent becoming contaminated.

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 21.0

OBJECTIVE: This step shuts down secondary plant equipment, to facilitate plant stabilization and procedure interface.

BASIS: This step minimizes the potential for damage to secondary plant equipment.

SOURCE DOCUMENT: CESSAR 15.4.2.1.2 shifting FW to AFW

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The location and content of supporting appendices; How to shutdown secondary plant equipment. In addition to the above the CRS should know: How to direct the implementation of this appendix based on plant conditions.	

PROCEDURE:	SGTR 41RO-1ZZ06
STEP:	22.0
OBJECTIVE:	This step directs notification of Radwaste Operators to lower levels in the Holdup System.
BASIS:	This step ensures adequate storage capability in Radwaste for subsequent cleanup operations.
SOURCE DOCUMENT:	None
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know:	
How to interface with other support groups.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 23.0

OBJECTIVE: This step lowers safety injection tank pressure.

BASIS: This step ensures SIT pressure is maintained within limits for varying plant conditions.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Steps 29 and 39. Technical Specification 3/4.5.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The Operators should know: How and when to lower the SIT pressure.	Nitrogen may be injected into the RCS if SIT pressure is not lowered at the proper pressure.

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 24.0

OBJECTIVE: This step restores power to the SIT isolation valves.

BASIS: This step allows for isolation of the SIT tanks.

SOURCE DOCUMENT: Technical Specification 3/4.5.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How and when to restore power to the control valves.	SIT operability is governed by Tech. Spec. 3/4.5.1.

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 25.0

OBJECTIVE: This step isolates the Safety Injection Tanks.

BASIS: This step ensures the nitrogen inventory contained in the SIT's is not introduced to the RCS at low pressures.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Steps 29 and 39
PVNGS Technical Specifications 3/4.5.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	SIT operability is governed by Tech. Spec. 3/4.5.1.
How and when to isolate the SITs.	

PROCEDURE:	SGTR 41RO-1ZZ06
STEP:	26.0
OBJECTIVE:	This step places shutdown cooling in service.
BASIS:	This step ensures adequate core cooling at lower temperatures and pressures.
SOURCE DOCUMENT:	CEN-152, 6.0 Recovery Action Steps 28, 30, 38, 40 FSAR 5.4.7.1.1.
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The criteria for placing the Shutdown Cooling System in service;	
How to interface with 41OP-1S101 Shutdown Cooling Operating Procedure.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 27.0

OBJECTIVE: This step evaluates all plant parameters to verify the plant is responding as anticipated.

BASIS: This step ensures no unanticipated problem exists and Safety Functions are maintained.

SOURCE DOCUMENT: CEN-152, 6.0 Recovery Action Steps 5 and 33.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to evaluate safety signals;	
How to verify ventilation system lineups;	
How to read and interpret control board indications and controls;	
In addition to the above the CRS should know:	
How to verifyadequate core cooling.	

PROCEDURE: SGTR 41RO-1ZZ06

STEP: 28.0

OBJECTIVE: This is the exit step from this procedure and requires interfacing with station management to determine corrective action.

BASIS: This is the exit step from this procedure.

SOURCE DOCUMENT: None

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to interface with station management to determine course of action.	

Steps found in CEN-152 Steam Generator Tube Leak Recovery Guideline but not in PVNGS Steam Generator Tube Rupture Recovery operation are as follows with reasons noted:

CEN-152 STEP	REASON FOR NOT BEING INCLUDED
1	The standard post trip actions in the form of Safety Functions monitoring are continuously maintained in the EP, 41EP-1ZZ01 and throughout this procedure.
13	PVNGS stops RCP's on a SIAS per EER 82-RC-015. If SI does not occur pump operation is in accordance with operation curves per V-CE-20294 April 18, 1983.

H. LOSS OF COOLANT ACCIDENT 41RO--1ZZ07

PROCEDURE: LOCA 41RO-1ZZ07

STEP: OBJECTIVE

OBJECTIVE: This statement will define when this RO will be used and what is to be accomplished by this procedure.

BASIS: This statement is included to ensure the CRS knows he is using the correct procedure, and defines the scope of the procedure.

SOURCE DOCUMENT: CEN-152
NUREG-0899

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: When to use this particular RO, and the arrangement and location of all PVNGS Procedures.	The CRS should be aware that the EP, 41EP-1ZZ01, must be implemented prior to use of this procedure.

PROCEDURE:	LOCA 41RO-1ZZ07
STEP:	1.0
OBJECTIVE:	The objective of this step is to verify the diagnostic section of the EP correctly identified the event, and if necessary, direct the CRS to another procedure when conditions indicate a problem beyond the scope of this RO. Additionally, this step directs the operators to maintain Safety Functions.
BASIS:	This step ensures that the diagnostic was correct and that Safety Functions are being maintained.
SOURCE DOCUMENT:	CEN-152, 5.0 Recovery Action Steps 2, 3, 4, 5, and 6
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain Safety Functions. In addition to the above, the CRS should know: How to verify the Reactor is shutdown, The normal post trip plant response and how to read these parameters on the control boards. Those conditions which, if exist, would lead to the use of another procedure.	Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.

PROCEDURE:	LOCA 41RO-1ZZ07
STEP:	2.0
OBJECTIVE:	The objective of this step is to direct entry into the PVNGS Emergency Plan for event classification and required notifications.
BASIS:	This ensures that action is taken to implement the PVNGS Emergency Plan, to gain additional support for the control room staff, and to ensure the safety of the public and site personnel is maintained.
SOURCE DOCUMENT:	NUREG-0654
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain Safety Functions. In addition to the above the CRS should know: How to classify emergency events and who to notify.	Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01. The CRS must not allow event classification and notification to impact on the recovery operation.

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 3.0

OBJECTIVE: This step records the time of day to establish a time base and lists all time critical actions which must be performed.

BASIS: This step ensures a time base is established so that all time critical actions can be performed within time requirements.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Step 7

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

The Technical Specifications relative to a LOCA;

The safety analysis and basis for cooling line-up requirements and time considerations to shift lineups including: why cooldown must begin within one hour, why simultaneous hot and cold leg injection is necessary, how to determine and when to initiate long-term cooling modes, how and when to place hydrogen recombiners in service, and how to maintain Safety Functions.

SPECIAL CONSIDERATIONS

The CRS must be aware of the time dependent actions and that this step provides a ready list of those actions and the time from which they are to be based. The CRS should make every effort to ensure that time-related events are completed within the specified times.

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 4.0

OBJECTIVE: This step verifies safety system response to safety signals.

BASIS: This step is a quick check to ensure Safety Functions are not inadvertently compromised by equipment failure.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 8, 9, and 17
FSAR 6.2.4.3, CIAS verification
PP 19249, SIAS Reload Busses

DEVIATION: PVNGS does not have a PORV

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The operation of the SESS; How to verify safety signals by using alarms, actuation indications, and component response for safety injection, containment spray system, and containment isolation.	The CRS must be aware of all indications available to verify component activation and system response.

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 5.0

OBJECTIVE: This step maintains S/G level and pressure under control and within limitations.

BASIS: This step ensures a heat sink remains available for RCS heat removal and that operations are within guidelines and specifications.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Step 22
PP 19078, AFAS Level Control
SER 11/81 7.3.2, AFAS Throttling

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

How to maintain Safety Functions:

How to ensure steam generator availability;

Why Safety Valves are not to be lifted;

What level should be maintained in the Steam Generators, and cooldown limits and precautions for Steam Generators.

SPECIAL CONSIDERATIONS

If the Steam Generators are dry on the primary side, consideration should be given to feed rates based on cooldown limits on the Steam Generator.

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 6.0

OBJECTIVE: This step restores forced flow if possible.

BASIS: This step ensures the most preferred method of RCS heat transport will be employed and that operations are within guidelines and specifications.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Step 11
N001 602-205 Vendor Tech Manual
Setpoint Index 13-J-ZZ1-002
EER 82-RC-010, Subcooling

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to determine subcooled margin for varying plant conditions;	
Operation and control of the Pressurizer Pressure and Level Control Systems;	
Operation and control of RCP support systems including IA, NC, seal bleed off, seal injection, oil lift pumps;	
When to override CTMT penetrations;	
RCP start criteria and interlocks and expected transients and indications on pump start.	
In addition to the above the CRS should know:	
How to utilize the best pump combinations for plant conditions.	

PROCEDURE:	LOCA 41RO-1ZZ07
STEP:	7.0
OBJECTIVE:	This step verifies natural circulation when RCP start criteria cannot be met.
BASIS:	This step ensures RCS heat removal is maintained and that any RCS voiding is identified and minimized.
SOURCE DOCUMENT:	CEN-152, 5.0 Recovery Action Step 12 CE-TASK 430, Natural Circulation Cooldown EER 82-RC-010, Subcooling
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The location and content of supporting appendices;	
What actions to take if natural circulation is not established or insufficient core cooling exits.	

PROCEDURE:	LOCA 41RO-1ZZ07
STEP:	8.0
OBJECTIVE:	This step provides pressurizer level control maintenance.
BASIS:	This step ensures pressure control and inventory control are maintained by providing for HPSI throttling or SIAS resetting as appropriate. Operations will be within limitations and guidelines.
SOURCE DOCUMENT:	CEN-152, 5.0 Recovery Action Steps 13 and 14
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The operation of the Safety Injection System; How and when to throttle SI flow, and the concerns and methods of solid plant operations; How to verify reactor vessel level using core exit thermocouples and the Core Level Monitoring System.	Operators must understand plant operations and limitations with a solid Pressurizer.

PROCEDURE:	LOCA 41RO-1ZZ07
STEP:	9.0
OBJECTIVE:	This step places the Hydrogen Monitors in service.
BASIS:	This step ensures hydrogen concentration in containment is monitored.
SOURCE DOCUMENT:	FSAR 6.2.5.2.1.
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
. How to maintain Safety Functions.	
How to place the Hydrogen Monitors in service;	
What values of hydrogen concentration should be expected and applicable limits and corrective actions.	

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 10.0

OBJECTIVE: This step will ensure action is taken to prevent an inadvertent release of radioactive material, and that an assessment of core damage is performed.

BASIS: This step ensures the safety of the public and site personnel is maintained, and that containment integrity is maintained.

SOURCE DOCUMENT: CEN-152. 5.0 Recovery Action Step 33
SER 11/81 II:B.3

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
Operation of the post accident radiation monitoring equipment;	
How to determine fuel damage;	
How to operate the radiation monitoring equipment.	

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 11.0

OBJECTIVE: This step will minimize containment equipment exposure to a hydrazine, and spray environment.

BASIS: This step provides for equipment concerns and ensures CSAS is not reset until criteria is met. Values used in this step are more conservative than FSAR requirements.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Step 34
FSAR Table 3E-1
Technical Specifications 3.3-4
EER 82-HP-006

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The location and operation of containment instrumentation; The operation of the Hydrogen Monitoring System; How to determine if the resetting criteria have been satisfactorily met.	If containment parameters start to trend up after CSAS is reset, CSAS may need to be reinitiated.

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 12.0

OBJECTIVE: This step will verify water inventory status.

BASIS: This step ensures adequate water remains available for varying plant conditions.

SOURCE DOCUMENT: CEN-152, Section 5.0 Step 24 and 28

DEVIATION: Step 14.0 evaluates plant and equipment status
Step 19.0 addresses plant cooldown

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain the Water Inventory Record and how to ensure adequate water remains available for varying plant conditions.	

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 13.0

OBJECTIVE: This step directs radioactive surveys and that boundaries be established as necessary.

BASIS: This step ensures action is taken to minimize personnel exposure and the spread of contamination. This step ensures ALARA concepts are enforced.

SOURCE DOCUMENT: SER 11/81 12.1.5, ALARA

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
Operation of the post accident radiation monitoring equipment;	
How to determine fuel damage and how to operate the radiation monitoring equipment;	
The concepts of ALARA.	

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 14.0

OBJECTIVE: This step evaluates all plant parameters to verify plant response is as anticipated.

BASIS: This step ensures Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 5, 12, 15, and 17.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to maintain Safety Functions;	
How to read and interpret control room indications and controls;	
How to verify adequate core cooling and natural circulation.	
In addition to the above, the CRS should know:	
What actions to direct in event of inadequate core cooling or if natural circulation is lost.	

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 15.0

OBJECTIVE: This step directs shutdown of secondary equipment.

BASIS: This step ensures equipment is not neglected and damaged.

SOURCE DOCUMENT: CESSAR 15.4.2.1.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to use supporting appendices, and operation and control of secondary plant equipment.	The operator should not allow shutting down secondary plant equipment to interfere with maintenance of Safety Functions.

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 16.0

OBJECTIVE: This step directs Charging Pumps stopped or pump suction realigned as necessary for plant conditions.

BASIS: This step ensures Charging Pumps are not damaged due to loss of suction and prevents the RCS from being diluted by charging pump suction solely from a non-borated source.

SOURCE DOCUMENT: CESSAR 6.3.3.4
CEN-152, 5.0 Recovery Action Step 30
Setpoint Index 13-J-ZZ1-002

DEVIATION: PVNGS does not use a concentrated boron source to the Charging Pumps.

REQUIRED KNOWLEDGE

The operators should know:

The precautions, limitations, and operation of the following systems: SI, Charging, Letdown, and Boric Acid Makeup.

SPECIAL CONSIDERATIONS

The CRS must realize that if RCP's are running, seal injection should be maintained.

PROCEDURE:	LOCA 41RO-1ZZ07
STEP:	17.0
OBJECTIVE:	This step verifies proper system and equipment response to a Recirculation Actuation Signal. This step also directs the operator to stop the Charging Pumps at time of RAS to prevent Charging Pump or RCP seal damage by water from the CTMT Recirculation Sump.
BASIS:	This step ensures RCS inventory control is not jeopardized by a failure in the RAS actuation or SI system response, and that the Charging Pump or RCP seals are not damaged by water from the CTMT Recirculation Sump.
SOURCE DOCUMENT:	CEN-152, 5.0 Recovery Action Steps 31 and 32
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The location and content of supporting appendices;	
What action to take if SI pumps loose suction;	
The reason SI Pump Minimum Flow Recirculation Valves are closed.	

PROCEDURE:	LOCA 41RO-1ZZ07
STEP:	18.0
OBJECTIVE:	This step verifies proper system and equipment response to safety signals.
BASIS:	This step ensures Safety Functions are not inadvertently compromised by equipment failure.
SOURCE DOCUMENT:	FSAR Table 6.2.4-1, 7.2, Actuation Lists FSAR 6.2.4.3 - CIAS Verifications
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The location and content of supporing appendices;	
To ensure Safety Functions are maintained during performance of verification checks;	
To report to the CRS when appendices are completed.	

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 19.0

OBJECTIVE: This step will begin plant cooldown, and verify water inventory.

BASIS: This step will ensure adequate water remains available for varying plant parameters and plant cooldown is initiated within guidelines.

SOURCE DOCUMENT: CEN-152. 5.0 Recovery Action Steps 24, 26, and 28

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

The operation and control of the Steam Bypass Control System;

How to operate the Atmospheric Dump Valves;

The special problems involved if a steam generator tube leak exists;

Cooldown limits on the Steam Generators.

SPECIAL CONSIDERATIONS

The CRS must be aware of how a loss of loop seal in the Steam Generator effects plant response and the concerns of cooling down with a steam generator tube rupture.

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 20.0

OBJECTIVE: This step will evaluate plant parameters to verify the plant is responding in an anticipated manner.

BASIS: This step ensures Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 5, 17, and 27

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain Safety Functions; How to read and interpret control room indications and controls; How to verify adequate core cooling; How to verify natural circulation. In addition to the above, the CRS should know: To question unanticipated responses or indications.	

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 21.0

OBJECTIVE: This step will establish hot and cold leg injection.

BASIS: This step is to prevent boron precipitation.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Step 36

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The safety analysis concerns of boron precipitation; How to establish simultaneous hot and cold leg injection, and the effects this will have on plant response.	This step must be performed within the time criteria established in step 3.0.

PROCEDURE:	LOCA 41RO-1ZZ07
STEP:	22.0
OBJECTIVE:	This step will isolate the SIT's.
BASIS:	This step will prevent nitrogen injection into the primary system providing the SIT's are not already empty at this point.
SOURCE DOCUMENT:	CEN-152, 5.0 Recovery Action Step 42 EER 82-51-007, SIT Isolation
DEVIATION:	This step does not place pressure restrictions on SIT isolation as CEN-152 does but provides a convenient step location for SIT isolation.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to direct the closing of SIT valve breakers;	
How to isolate the SIT's;	
Technical Specification requirements for SIT operability.	

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 23.0

OBJECTIVE: This step evaluates all plant parameters to verify plant response is as anticipated.

BASIS: This step ensures Safety Functions are not inadvertently compromised and operator actions are sufficient to mitigate the accident.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 17, 27, 40, and 46

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to maintain Safety Functions;	
Post LOCA plant response;	
How to evaluate indications and trends to ensure the plant is responding properly.	
In addition to the above, the CRS should know:	
To question any unexpected indications and to direct actions be taken as appropriate.	

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 24.0

OBJECTIVE: This step will evaluate the plant to determine the method of long-term cooling.

BASIS: This step ensures the preferred method of core heat transport is employed.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 37, 38, 41, 43 and 44
CESSAR 6.3.3.4 - SDC Entry Requirements FSAR Appendix 6A.58 - Monitoring During Long Term Cooling

DEVIATION: RCS pressure per CESSAR 6.3.3.4 is used as the determining factor to enter shutdown cooling vice pressurizer level as described by CEN-152, 5.0-37.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The precautions, limitations, and start criteria for the shutdown cooling system;	
How to reduce RCS pressure;	
HPSI operation and line-up;	
How to interface with the Shutdown Cooling Operating Procedure 41OP-1SI01;	
How to ensure adequate core cooling for varying plant conditions.	

PROCEDURE:	LOCA 41RO-1ZZ07
STEP:	25.0
OBJECTIVE:	This step will place the Hydrogen Recombiners in service. If Hydrogen Recombiners are not placed in service Backup Purge Units will be placed in service.
BASIS:	This step will ensure hydrogen concentration inside containment will remain below the explosive level.
SOURCE DOCUMENT:	FSAR 6.2.5 SER 10175 6.2.5, Recombiner and Purge Unit Operations.
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The operation of the Hydrogen Recombiners, how and when to place them in service, and what effect they will have on containment hydrogen concentration.	The Backup Purge Unit must be placed in service within 8 days if the Hydrogen Recombiners are not placed in service.

PROCEDURE: LOCA 41RO-1ZZ07

STEP: 26.0

OBJECTIVE: This is the exit step from this procedure.

BASIS: This step ensures interface with station management for long-term planning.

SOURCE DOCUMENT: None

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	The CRS should consult station management prior to entering a different procedure.
How to maintain plant conditions;	
How to interface with other PVNGS Procedures.	
In addition to the above, the CRS should know:	
How to interface with station management.	

Steps found in CEN-152 LOCA Recovery Guidelines but not in PVNGS LOCA Recovery Operations are as follows with reasons noted:

CEN-152 STEP	REASON FOR NOT BEING INCLUDED
1	The standard post trip actions in the form of Safety Function monitoring are continuously maintained in the EP 41EP-1ZZ01 and throughout this procedure.
10	RCP's are stopped in a SIAS condition per EER 82-RC-015 operation during an on SIAS condition is per V-CE-20294 operating curves.
20, 21, 23, 29, 35	These steps pertain to a small LOCA situation and are addressed in, 41RO-1ZZ08, Small LOCA Procedure.

I. SMALL LOSS OF COOLANT ACCIDENT 41RO-1ZZ08

PROCEDURE: Small LOCA 41RO-1ZZ08

STEP: Objective

OBJECTIVE: This statement will define when this RO will be used and what is to be accomplished by this procedure.

BASIS: This statement is included to ensure the CRS knows he is using the correct procedure, and defines the scope of the procedure.

SOURCE DOCUMENT: CEN-152
NUREG-0899

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: When to use this particular procedure and the arrangement and location of all PVNGS Procedures.	The CRS should be aware that the EP, 41EP-1ZZ01 must be implemented prior to use of this procedure.

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 1.0

OBJECTIVE: The objective of this step is to verify the diagnostic section of the EP correctly identified the event and, if necessary, direct the CRS to another procedure when conditions indicate a problem beyond the scope of this RO. Additionally, this step directs the operators to maintain Safety Functions.

BASIS: This step is to ensure that the diagnostic was correct and that Safety Functions are being maintained.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 2, 3, 4, 5 and 6.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain Safety Functions. In addition to the above, the CRS should know: How to verify the Reactor is shutdown; The normal post trip plant response and how to read these parameters on the control boards; Those conditions which if exist would lead to the use of another procedure.	Safety Functions maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 2.0

OBJECTIVE: The objective of this step is to direct entry into the PVNGS Emergency Plan, for event classification and required notifications.

BASIS: This step ensures that action is taken to implement the PVNGS Emergency Plan, to gain additional support for the control room staff, and to ensure the safety of the public and site personnel is maintained.

SOURCE DOCUMENT: NUREG-0654 Appendix I

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Safety Functions maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.
How to maintain Safety Functions.	
In addition to the above the CRS should know:	The CRS must not allow event classification and notification to impact on the recovery operation.
How to classify emergency events and who to notify.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 3.0

OBJECTIVE: This step is a check of common failure modes in an attempt to quickly isolate the small LOCA. This step determines the leak rate and maintains Safety Functions.

BASIS: This step ensures Safety Functions are maintained and minimizes RCS inventory depletion.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 8 and 9
LLIR II D.3, Sonic Position Indication

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to maintain Safety Functions.	
In addition to the above the CRS should know:	The determination of the location of the small break should not delay the timely performance of this procedure
How toevaluate plant indications and determine leak location;	
How to evaluate letdown indications, reactor vessel head vent indications, pressurizer safety valve indications, reactor drain tank indications, and component temperatures and differential temperatures.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 4.0

OBJECTIVE: This step will recover the steam generator levels and attempts to stabilize RCS parameters.

BASIS: This step ensures a heat sink for the RCS remains available, operations are within specifications, and other Safety Functions are maintained.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 13, 20, 21, 22, 29 and 32
Setpoint Index 13-J-ZZ1-002
CESSAR C15.4.2.1.2, Transfer to AFW on LOCA EER 82-RC-010, Subcooling

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to ensure the Steam Generators remain available including: why Safety Valves are not to be lifted, what level should be maintained in the Steam Generators, cooldown limits and precautions for the Steam Generators, and how to start and supply auxiliary feedwater to the Steam Generators; The order of preferencefor supplying Auxiliary Feedwater; How to ensure Main Feed Pumps are properly shudown; The operation of the Safety Injection System; How and when to throttle S.I. Flow; The concerns and method of solid plant operations; Operation and control of the PZR pressure and Level Control Systems.	High feed flow rates will effect pressurizer level recovery and pressure control. A moderate feed rate is sufficient to remove decay heat.

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 5.0

OBJECTIVE: This step records the time of the event initiation.

BASIS: This step establishes a time base to ensure all time dependent actions are performed within time requirements.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 7

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

The Technical Specifications relative to a LOCA; The safety analysis and basis for cooling line up requirements and time considerations to shift lineups including: why shutdown cooling must be started within one hour, when and why simultaneous hot and cold leg injection is necessary, and how to determine and when to intiate long term cooling modes.

In addition to the above the CRS should know:

How to co-ordinate time dependent actions.

SPECIAL CONSIDERATIONS

The CRS must be aware of the time dependent actions and ensure they are performed within the required specifications.

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 6.0

OBJECTIVE: The objective of this step is to restore or maintain forced flow or verify natural circulation when forced flow cannot be maintained.

BASIS: This step restores plant flow to a more controllable and preferred lineup, or verifies natural circulation to maintain adequate core cooling.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 11, 12, 15 and 16
CE - Task 430, Natural Circulation Cooldown
RCP Vendor Technical Manual, N001 602-205
EER 82-RC-010, Subcooling

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to restore RCP support systems;	
RCP start criteria, limitations, expected flows, temperatures, differential pressures, and starting transients;	
How to verify natural circulation;	
Location and use of supporting appendices.	
In addition to the above, the CRS shouldknow:	The primary concern of the CRS is to ensure the core is being cooled and if not, to promptly take actions to increase core cooling and/or RCS heat removal.
How different support system failures affect RCP operation;	
How to read and interpret core exit thermocouple instruments;	
How and when to interface with Inadequate Core Cooling in the Functional Recovery Procedure.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 7.0

OBJECTIVE: This step evaluates all plant parameters to verify the plant is responding in an anticipated manner.

BASIS: This step ensures a second unidentified problem does not exist and that Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 5, 12, and 33

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to maintain Safety Functions;	
Location and operation of control room indications and controls.	
In addition to the above the CRS should know:	If inadequate subcooled margin exists the CRS must direct actions to increase the subcooled margin.
How to determine subcooled margin for varying plant pressures and temperatures;	
How to verify shutdown margin and the corrective actions if inadequate margin exists.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 8.0

OBJECTIVE: This step places Hydrogen Monitors in service to monitor conbustible gas inside containment.

BASIS: This step ensures that the containment atmosphere is monitored so that corrective action can be taken prior to containment integrity being challenged.

SOURCE DOCUMENT: FSAR 6.2.5.2.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to place the Hydrogen Monitoring System in service both Train A and B.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 9.0

OBJECTIVE: This step verifies Safety System Actuation and system response, and resets containment spray when reset criteria can be met.

BASIS: This step ensures Safety Functions are not inadvertently compromised by equipment failure and operations are within specifications and guidelines. Additionally, this step ensures containment equipment exposure to an adverse environment is minimized and reset criteria is met prior to stopping CS.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 8, 17, and 34
Technical Specifications 3.3.4
FSAR 6.2.4-3, Safety Signal Verification and Table 3E-1
EER 82-HP-006
PP 19249, SIAS Reloading Busses

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The location and content of supporting appendices;	
To ensure Safety Functions are maintained during performance of verification checks;	
To report to the CRS when Appendices are completed.	
The location and operation of containment instrumentation;	If containment parameters start to trend up after CSAS is reset, CSAS may need to be reinitiated.
The operation of the Hydrogen Monitoring System;	
How to determine the resetting criteria have been satisfactorily met.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 10.0

OBJECTIVE: This step will ensure action is taken to prevent an inadvertent release of radioactive material, and that on assessment of core damage is performed.

BASIS: This step ensures the safety of the public and site personnel is maintained, and that containment integrity is maintained.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Step 33
SER 11/81 II:B.3

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
Operation of the post accident radiation monitoring equipment;	
How to determinefuel damage;	
How to operate the radiation monitoring equipment.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 11.0

OBJECTIVE: This step evaluates plant conditions and verifies the plant is responding as anticipated.

BASIS: This step ensures the effectiveness of the procedure and ensures Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 5, 12, 27 and 33

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Reports to the CRS will be on an "as requested" basis.
How to maintain Safety Functions.	
In addition to the above the CRS should know:	
How toevaluate plant indications to ensure anticipated response and to question any unexpected indications.	

PROCEDURE:	SMALL LOCA 41RO-1ZZ08
STEP:	12.0
OBJECTIVE:	This step will restore equipment to a more preferred lineup and shutdown secondary plant equipment to facilitate plant stabilization.
BASIS:	This step ensures equipment is not neglected or damaged.
SOURCE DOCUMENT:	CESSAR 15.4.2.1.2, Shifting FW to AFW
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The location and content of supporting appendices; How to shutdown secondary equipment.	

PROCEDURE:	SMALL LOCA 41RO-1ZZ08
STEP:	13.0
OBJECTIVE:	This step restores safety equipment to a standby lineup.
BASIS:	This step ensures safety equipment is restored to standby when resetting criteria is met.
SOURCE DOCUMENT:	Technical Specification 3/4.3.3-4 CEN-152, 5.0 Recovery Action Step 14
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: Location and content of supporting appendices; Safety Signal reset criteria and the impact restoring Safety equipment will have on plant parameters. In addition to the above, the CRS should know: How todetermine if restoring safetyequipment to standby is warranted.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 14.0

OBJECTIVE: This step provides alternative methods to maintain auxiliary steam available in order to maintain condenser vacuum.

BASIS: This step ensures auxiliary steam remains available to maintain condenser vacuum. This minimizes inventory loss by steaming to the condenser.

SOURCE DOCUMENT: None

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The operation of the Auxiliary Boilers;	
How to start and place in operation the Auxiliary Boilers;	
The importance of maintaining auxiliary steam and how to cross-tie the Auxiliary Steam System.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 15.0

OBJECTIVE: This step verifies adequate inventory for varying plant conditions and provides a method for monitoring water inventory.

BASIS: This step ensures adequate water inventory is available for varying plant conditions.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 28 and 45.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The location and content of supporting appendices. In addition to the above the CRS should know: How to determine if enough water is available for the planned evolution.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 16.0

OBJECTIVE: This step evaluates plant parameters and verifies the plant is responding in an anticipated manner.

BASIS: This step ensures adequacy of operator actions and ensures Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 5, 12, 27, and 33.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain Safety Functions; In addition to the above, the CRS should know: How to evaluate plant indications to ensure anticipated responses occur and to question any unexpected indications.	Reports to the CRS will be on an "as requested" basis.

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 17.0

OBJECTIVE: This step directs a cooldown to be started using the appropriate cooldown procedure.

BASIS: This step ensures a plant cooldown is begun within specifications and limitations in order to ensure an adequate condensate supply.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 24 and 26.

DEVIATION: Auxiliaries are addressed in Step 16, condensate inventory is addressed in Step 15.

REQUIRED KNOWLEDGE

The operators should know:

The operation and control of the Steam Bypass Control System;

How to operate the Atmospheric Dump Valves;

The special problems involved if steam generator tube leakage exists;

The cooldown limits on the Steam Generators.

SPECIAL CONSIDERATIONS

The CRS must be aware of the concerns of cooling down with steam generator tube leakage.

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 18.0

OBJECTIVE: This step will minimize RCS voiding, and provide for determination of voiding and corrective action if voiding exists.

BASIS: This step ensures operators take action to minimize RCS voiding and maintain RCS subcooling.

SOURCE DOCUMENT: CEN-152, 11, 15, and 16.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The indications of RCS voiding;	
How to confirm voiding by various indications;	
The effects of voiding on plant response;	
How to collapse a bubble in the vessel head.	
In addition to the above the CRS should know:	
How to determine if a bubble in the head exists and is adversely affecting core cooling;	
When a bubble in the head is expected and what actions to take to collapse a bubble.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 19.0

OBJECTIVE: This step directs hot and cold leg injection as required by plant parameters.

BASIS: This step ensures adequate core cooling is maintained, and that boron precipitation is avoided.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Step 36.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to establish simultaneous hot and cold leg safety injection, both Train A and B. In addition to the above the CRS should know: The safety analysis concerns of boron precipitation	If the criteria to reset SIAS has already been met, this step may be omitted.

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 20.0

OBJECTIVE: This step evaluates plant parameters and verifies the plant is responding in an anticipated manner.

BASIS: This step ensures the adequacy of operator actions and ensures that Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 5, 12, 23, 27, 39, and 46.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	Reports to the CRS will be on an "as requested" basis.
How to maintain Safety Functions.	
In addition to the above the CRS should know:	
How to evaluate plant indications to ensure anticipated response and to question any unexpected indications.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 21.0

OBJECTIVE: This step places Hydrogen Recombiners in service as needed.

BASIS: This step is to prevent a hydrogen explosion and thereby ensures containment integrity is maintained.

SOURCE DOCUMENT: FSAR 6.2.5.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: The operation of the Hydrogen Recombiners; How and when to place them in service; The safety analysis aspects of operation of the Hydrogen Recombination System.	. If hydrogen concentration indicated by the Hydrogen Monitors does not approach the limits the recombiners may not be required.

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 22.0

OBJECTIVE: This step selects the mode for long term core cooling.

BASIS: This step ensures proper actions for long term core heat removal.

SOURCE DOCUMENT: CEN-152, 5.0 Recovery Action Steps 37, 38, 42, and 44. CESSAR 6.3.3.4.4

DEVIATION: PVNGS will use RCS pressure as described in CESSAR 6.3.3.4.4 as the determining condition for successful initiation of shutdown cooling.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: How and when to place shutdown cooling in service and the precautions and limitations associated with the system. In additon to the above the CRS should know: How to interface this procedure with the Shutdown Cooling Operating Procedure 41OP-1SI01.	

PROCEDURE: SMALL LOCA 41RO-1ZZ08

STEP: 23.0

OBJECTIVE: This is the exit step from this procedure.

BASIS: This step ensures interface with station management for long-term planning.

SOURCE DOCUMENT: None.

DEVIATION: None.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operator should know: How to maintain plant conditions; How to interface with other PVNGS procedures. In addition to the above, the CRS should know: How to interface with station management.	The CRS should consult station management prior to entering a different procedure.

Steps found in CEN-152, LOCA Recovery Guideline but not in the PVNGS Small LOCA Recovery Operation are as follows with reasons noted:

CEN-152 STEP	REASON FOR NOT BEING INCLUDED
1	The standard post trip actions in the form of Safety Functions monitoring are continuously maintained in the EP 41EP-1ZZ01 and throughout this procedure.
10	CEN-152 addresses RCP's at 1300 PSIA, PVNGS stops RCP's at the SIAS setpoint or when the Pressurizer empties.
30-31	Conditions pertinent to a RAS are not addressed for a small LOCA if RAS occurs operators are directed to LOCA procedure 41RO-1ZZ07.
23 and 35	MSIS setpoints resetting is addressed in the cooldown procedure.
29-43	Specific conditions regarding shutdown cooling and SIT isolation are addressed in 41OP-1SI01. Shutdown Cooling Procedure or the Cooldown Procedure, 41OP-1ZZ10 or Natural Circulation Cooldown 41AO-1ZZ13.

J. BLACKOUT 41RO-1ZZ09

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: OBJECTIVE

OBJECTIVE: This statement will define when this RO will be used and what is to be accomplished by this procedure.

BASIS: This statement is included to ensure the CRS knows he is using the correct procedure, and defines the scape of the procedure.

SOURCE DOCUMENT: NUREG-0899

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: When to use this procedure, and the arrangement and location of all PVNGS Procedures.	The CRS must be aware that the EP, 41EP-1ZZ01 must be implemented prior to use of this procedure.

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 1.0

OBJECTIVE: The objective of this step is to verify the diagnostic section of the EP correctly identified the event, and if necessary, direct the CRS to another procedure when conditions indicate a problem beyond the scope of this RO. Additionally, this step directs the operators to maintain Safety Functions.

BASIS: This step ensures that the diagnostic was correct and that Safety Functions are being maintained.

SOURCE DOCUMENT: None

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to maintain Safety Functions. In addition to the above, the CRS should know: How to verify the reactor is shutdown; The normal post trip response in a blackout situation.	Safety Function maintenance is Part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 2.0

OBJECTIVE: The objective of this step is to direct entry into the PVNGS Emergency Plan for event classification and notification.

BASIS: This step ensures that action is taken to implement the PVNGS Emergency Plan, to gain additional support for the control room staff, and to ensure the safety of the public and site personnel is maintained.

SOURCE DOCUMENT: NUREG-0654

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

How to maintain Safety Functions.

In addition to the above the CRS should know:

How to classify emergency events and who to notify.

SPECIAL CONSIDERATIONS

Safety Function maintenance is Part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.

The CRS must not allow event classification and notification to impact on the recovery procedure.

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 3.0

OBJECTIVE: This step addresses the special actions required to maintain Safety Functions during a station blackout.

BASIS: This step will ensure action is taken to mitigate the effects of a blackout on maintenance of Safety Functions.

SOURCE DOCUMENT: CE Blackout Evaluation dated Nov. 30, 1981 Section 3.7.
Technical Specifications 3.8.2.2 and 3.8.2.4
Reg Guide 1.6.2.

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

How to minimize RCS inventory loss;

How to isolate bleedoff;

How to minimize the effects of RCS leakage, ambient heat loss, and cooling on the time to saturation;

How to maintain RCS heat removal to maintain S/G pressure less than the safety valve setting;

How to manually initiate CIAS and MSIS;

The consequences of an inadvertent restoration of SBCS, feed system, or other safety or non-safety systems.

SPECIAL CONSIDERATIONS

RCS heat removal affects pressurizer level, repeated level changes cool the Pressurizer and decrease the time until the RCS saturates.

PROCEDURE:	BLACKOUT 41RO-1ZZ09
STEP:	4.0
OBJECTIVE:	This step will direct restoring power to at least one class 4.16 KV Bus.
BASIS:	This step ensures at least one train of vital auxiliaries is restored.
SOURCE DOCUMENT:	CE Blackout Evaluation dated Nov. 30, 1981 Section 4.1 and 4.2. FSAR 13.5.2.1 Vendor Technical Manual, Load Sequencer J-104
DEVIATION:	Diesel Generator Breakers are not blocked open as the diesels are restored if possible. Recovery of class 4.16 KV is performed as a function of automatic load sequencing. Priority loads not sequenced are addressed individually in the following steps.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to verify diesel generator parameters, and clear interlocks which could block the Diesel Generator from closing in on the bus;	
How to verify Diesel response to an actuation signal;	
How to determine the problem with the Diesel to restore it to service;	
How to interface with supporting appendices;	
How to load ESF Buses without compromising the source.	
In addition to the above the CRS should know:	Before implementing the Functional Recovery Procedure, the CRS should contact the load dispatcher to determine when off-site power can be restored.
How to determine if Diesel Generators are not available;	
How to expidite restorations on at least one diesel;	
How to minimize load on the batteries to increase their life:	

How to interface with the
Functional Recovery Procedure.

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 5.0

OBJECTIVE: Once power is restored this step will restore pressurizer pressure control.

BASIS: This step ensures prompt operator action to maintain subcooling.

SOURCE DOCUMENT: CE Blackout Evaluation dated Nov. 30, 1981 Section 4.3B. FSAR 6.2.4.3 CIAS - Verify Charging and Seal Injection.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to operate Pressurizer heaters;	
How to ensure pressure is recovered and the level requirements to operate pressurizer heaters;	
Charging system operation and control;	
The operation and control of auxiliary spray;	
How to maintain pressure with auxiliary spray;	
The expected pressure changes with different charging system line ups;	
How to ensure adequate subcooled margin.	

PROCEDURE:	BLACKOUT 41RO-1ZZ09
STEP:	6.0
OBJECTIVE:	This step will verify diesel operation is within limits and that essential lighting is restored.
BASIS:	This step restores loads not sequenced on while ensuring the Diesels are not overloaded.
SOURCE DOCUMENT:	CE Blackout Evaluation dated Nov. 30, 1981 Section 4.2. PP 19249, SIAS - Reload Busses
DEVIATION:	CE Step 4.2 is broken into serveral steps in the PVNGS procedure.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: The diesel limitations; How to use supporting appendices to verify proper loading and sequencing of loads. In addition to the above the CRS should know: How and when to restore systems which have been load shed.	When all loads have been sequenced on, the operators may restore some non-sequenced loads providing operations are within limits.

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 7.0

OBJECTIVE: This step cross-connects EW to supply NC priority loads.

BASIS: This step ensures component cooling to priority containment loads.

SOURCE DOCUMENT: CE Blackout Evaluation dated Nov. 30, 1981 Section 4.3D.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The operation of the EW and NC systems;	
What loads EW is capable of supplying;	
How to cross-connect the EW and NC system, and the concerns of maintaining RCP seals cooled.	

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 8.0

OBJECTIVE: This step will prepare the unit for restoration of off-site power.

BASIS: This step ensures all loads are removed to ensure the source power is not compromised by a large load transient.

SOURCE DOCUMENT: CE Blackout Evaluation dated Nov. 30, 1981 Section 4.1.

DEVIATION: Diesel Generator Breakers are blocked open only if all attempts to restore the diesels have failed.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The 13.8 KV distribution system including 525 KV SW YD supply and 4.16 KV transfer controls;	
How to determine fault conditions exist;	
How to systematically perform this step.	
In addition to the above the CRS should know:	
How to coordinate with SOC to restore off-site power.	

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 9.0

OBJECTIVE: This step will restore off-site power to plant busses.

BASIS: This step ensures systematic loading of off-site power to ensure it is not compromised.

SOURCE DOCUMENT: CE Blackout Evaluation dated Nov. 30, 1981 Section 4.2.
FSAR 13.5.2.1 - Blackout
PP 17952 - Blackout

DEVIATION: Specific equipment addressed in 4.2 is energized in the following steps.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to recognize normal transients and indications of normal operation when energizing busses, transformers, load centers, and MCC's; How to restore NC, TC, and PW. In addition to the above the CRS should know: How to coordinate with the other units to restore their intermediate busses.	

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 10.0

OBJECTIVE: This step evaluates all plant parameters and verifies plant response is as anticipated and Safety Functions are maintained.

BASIS: This step ensures Safety Functions are not inadvertently compromised.

SOURCE DOCUMENT: SER 11/81 7.3.2 AFAS Override

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to maintain Safety Functions;	
How to read and evaluate control room indications and controls;	
How to verify proper trending of parameters;	
How to verify adequate core cooling and natural circulation flow.	
In addition to the above the CRS should know:	
To question any unexpected indication and to direct actions to correct problems with Safety Function parameters	

PROCEDURE:	BLACKOUT 41RO-1ZZ09
STEP:	11.0
OBJECTIVE:	This step reenters the EP to perform the plant diagnostic.
BASIS:	This step ensures a second undiagnosed problem is not present.
SOURCE DOCUMENT:	None
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to implement the Emergency Procedure.	

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 12.0

OBJECTIVE: This step will restore safety systems to a preferred lineup when reset criteria can be met.

BASIS: This step ensures resetting criteria are met prior to restoring safety systems and systems are restored after a Blackout.

SOURCE DOCUMENT: FSAR 13.5.2.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to evaluate plant conditions to determine if resetting safety signals is warranted;	
How to interpret class and non-class instrumentation including: pressurizer level and pressure trends, subcooling and heat removal, containment parameters;	
The effects of resetting safety signals on plant response.	

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 13.0

OBJECTIVE: This step will restore forced flow.

BASIS: This step ensures RCS heat transport is in the preferred mode.

SOURCE DOCUMENT: FSAR 13.5.2.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to verify seal injection flow to the RCP; The operation, control, and interlocks associated with RCP Oil Lift Pumps; The precautions, limitations, and start criteria for the RCP's, and the expected transients, voltage, current, and differential pressures for a normal pump start.	

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 14.0

OBJECTIVE: This step will place the Turbine on the Turning Gear.

BASIS: This step is to minimize the possibility of turbine damage.

SOURCE DOCUMENT: FSAR 13.5.2.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
The operation of the Turbine Generator in relation to turning gear operation, shaft bow, and misalignment;	
How and when to place the Turning Gear in operation;	
The impact on plant operations if the Turning Gear is not used when the Turbine stops.	

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 15.0

OBJECTIVE: The object of this step is to place plant equipment in a more reliable lineup.

BASIS: This step minimizes equipment damage.

SOURCE DOCUMENT: FSAR, 9.1.3.3.1.1, 13.5.2.1.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know:	
How to interface with in-plant support personnel to ensure proper response;	
The operation of the fuel pool cooling system;	
The Technical Specifications associated with fuel pool operation.	

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 16.0

OBJECTIVE: This step will ensure support organizations recover their equipment.

BASIS: This step ensures support equipment is placed in a safe conditions.

SOURCE DOCUMENT: Technical Specifications 3/4 4.6 and 3/4 4.7.
FSAR 13.5.2.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to maintain Safety Functions and stabilize plant parameters.	
The CRS should know:	
How to coordinate activities with support orginizations.	

PROCEDURE: BLACKOUT 41RO-1ZZ09

STEP: 17.0

OBJECTIVE: This step will shutdown the Emergency Diesel Generators.

BASIS: This step returns the electrical distribution system to a preferred lineup.

SOURCE DOCUMENT: FSAR 13.5.2.1

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to transfer 4.16 KV buses to off-site power; How to shutdown the Emergency Diesel Generators, and restore the electrical distribution system to a normal shutdown lineup. In addition to the above the CRS should know: The Technical Specifications associated with uses of power sources.	

PROCEDURE:	BLACKOUT 41RO-1ZZ09
STEP:	18.0
OBJECTIVE:	This step will restore power to the Water Reclamation Facility (WRF).
BASIS:	This step ensures power is restored to the WRF.
SOURCE DOCUMENT:	FSAR 13.5.2.1
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to interface with the WRF Operations Department to ensure power is restored properly.	Power voltage spikes could damage WRF computers.

PROCEDURE:	BLACKOUT 41RO-1ZZ09
STEP:	19.0
OBJECTIVE:	This step will restore the Nuclear Cooling System to a normal lineup.
BASIS:	This step restores containment equipment cooling to a more preferred lineup.
SOURCE DOCUMENT:	FSAR 13.5.2.1
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to restore the Nuclear Cooling Water System lineup without compromising RCP operations; The location and operation of the NC/EW cross-connect valves, and how to verify proper operation by checking component flows and temperatures.	

PROCEDURE:	BLACKOUT 41RO-1ZZ09
STEP:	20.0
OBJECTIVE:	This step verifies plant operation is within Technical Specification limits.
BASIS:	This step ensures plant is operating within Limiting Conditions for Operations.
SOURCE DOCUMENT:	Tech Spec 3/4.8.
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know:	
Section 8 of the Technical Specifications;	
Other Technical Specifications that may be affected by a station blackout.	

PROCEDURE:	BLACKOUT 41RO-1ZZ09
STEP:	21.0
OBJECTIVE:	This step maintains plant parameters or completes other procedures being performed in conjunction with this procedure.
BASIS:	This is the exit step from this procedure and ensures other procedures being performed in conjunction with this procedure are completed.
SOURCE DOCUMENT:	FSAR 13.5.2.1
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to interface with other PVNGS Procedures.	

K. FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

PROCEDURE: FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

STEP: OBJECTIVE

OBJECTIVE: This step will define when this RO will be used and what is to be accomplished by this procedure. Included in the scope of this procedure will be guidelines to maintain the plant in a safe condition in the event Safety Functions are degraded, the diagnostic is not clear, several malfunctions occur at once, or equipment failure keeps operators from using the EP, an RO, or AO.

BASIS: This statement is included to ensure the CRS knows he is using the correct procedure.

SOURCE DOCUMENT: NUREG-0899, 5.4.3
CEN-152 10.0

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: That the Emergency Procedure 41EP-1ZZ01 must be used prior to entry into the Functional Recovery Procedure.	

PROCEDURE: FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

STEP: 1.0

OBJECTIVE: The objective of this step is to indicate actions which should have taken place prior to entry into this procedure.

BASIS: This statement ensures that standard post trip actions have taken place and Safety Functions are being maintained.

SOURCE DOCUMENT: CEN-152 10.0 FRG Action Steps 1 & 2

DEVIATION: This step performs a check of overall Safety Function and does not evaluate individual Success Paths. Success Path evaluation takes place in Step 5.0.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know:	
That the EP, 41EP-1ZZ01 must be in use prior to the FRP;	
What conditions could lead to the FRP;	
The arrangement of the FRP;	
The content and location of appendices;	
The actions the operators will be required to perform.	

PROCEDURE: FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

STEP: 2.0

OBJECTIVE: The objective of this step is to direct entry into the PVNGS Emergency Plan for event classification and required notifications.

BASIS: This statement is to ensure that action is taken to implement the PVNGS Emergency Plan, to gain additional support for the control room staff, and to ensure the safety of the public and site personnel is maintained.

SOURCE DOCUMENT: MUREG-0654 Appendix 1

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

How to maintain Safety Functions.

In addition to the above the CRS should know:

How to classify emergency events and who to notify.

SPECIAL CONSIDERATIONS

Safety Function maintenance is part 2.0 and 3.0 of the Emergency Procedure 41EP-1ZZ01.

The CRS must not allow event classification and notification to impact on the recovery operation.

PROCEDURE:	FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10
STEP:	3.0
OBJECTIVE:	The objective of this step is to recover AC power to a Unit which is experiencing a prolonged blackout with loss of both Diesel Generators.
BASIS:	This step ensures actions are taken to restore essential AC power to a blacked out unit in order to maintain Safety Functions.
SOURCE DOCUMENT:	CE Blackout Evaluation dated Nov. 30, 1981, Sections 3.8 and 4.0.
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: When actions under this step are required; How to contact SRP SOC, and be able to explain in detail his exact electrical configuration and what he needs from SRP; To continue efforts to restore a D/G and offsite power; How to line up another unit's D/G to supply his ESF loads and which D/G to use; How to line up a temporary power supply to supply ESF loads; Long term load management and its effect on Safety Functions.	The CRS must maintain one ESF Switchgear in a configuration in which it could readily accept power from either the switchyard or a Diesel Generator.

PROCEDURE:	FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10
STEP:	4.0
OBJECTIVE:	The objective of this step is to gain enough information to decide which Safety Functions are degraded. The device used for Safety Function assessment will for the most part be the Emergency Response Facility Data Aquisition and Display System (ERFDADS).
BASIS:	This step provides for Safety Function assessment in order to determine which if any Safety Functions are degraded. The use of ERFDADS will minimize physical conflict between the CRS and operators, and also provide the needed information in the most usable form.
SOURCE DOCUMENT:	CEN-152 10.0 FRG Action Steps 3 & 4 NUREG-0660
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know: How to gain access to the information available from ERFDADS/QSPDS in order to evaluate Safety Functions; How to do the Safety Function review using control board indications.	

PROCEDURE: FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

STEP: 5.0

OBJECTIVE: The objective of this step is to restore degraded Safety Functions and to maintain a high awareness of the Success Paths which are serving the Safety Functions.

BASIS: This step provides for recovering degraded Safety Functions to adequate Success Paths as well as a monitoring and maintenance program for all Success Paths.

SOURCE DOCUMENT: CEN-152 10.0 FRG Action Steps 6 & 8
NUREG-0737

DEVIATION: The Success Paths identified differ from CEN-152 in that Inventory and Pressure Control have been combined, as have all trees involving Containment. In addition, assessment trees are included for Vital Auxiliaries and Indirect Radioactivity Release.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know:	The CRS must realize that if Reactivity Control Safety Function is degraded he may not be able to control other Safety Functions.
How to evaluate information provided to him to determine which if any, Safety Functions are degraded;	
How to prioritize degraded Safety Functions;	
The Success Path methodology for Safety Function restoration.	

PROCEDURE: FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

STEP: 6.0

OBJECTIVE: The objective of this step is to gain a high awareness of the Success Paths which are in service and to determine if specific plant parameters are responding as required.

BASIS: This step ensures that once all Safety Functions are on a Success Path they will be constantly monitored; additional guidance is given to ensure detection of Inadequate Core Cooling or a Degraded Core Condition.

SOURCE DOCUMENT: CEN-152 10.0 FRG Action Steps 6 & 8
NUREG-0737

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know:	
To determine which Success Paths are in service and if they are responding as required;	The CRS should be familiar with abnormal equipment lineups used in the FRP.
The content and scope of the Degraded Core Assessment Procedure.	

PROCEDURE: FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

STEP: 7.0

OBJECTIVE: The objective of this step is to provide a definite plan of action in the overall long term plant recovery. This section addresses continued Safety Function monitoring, problem determination, and recovery plan development.

BASIS: This step advises the control room staff of the general areas of concern in performing a plant recovery.

SOURCE DOCUMENT: CEN-152 10.0 FRG Action Step 8

DEVIATION: None

REQUIRED KNOWLEDGE

The CRS should know:

When to turn the problem determination over to the EOF/TSC staff;

To recognize when event determination begins to overburden the control room staff.

SPECIAL CONSIDERATIONS

Although the CRS is turning the problem determination over to the EOF/TSC he is still responsible for plant safety and maintenance of Safety Functions.

PROCEDURE:	FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10
STEP:	APPENDIX C
OBJECTIVE:	The objective of this Appendix is to give the control room staff a standardized method to determine which Safety Functions, if any, are degraded.
BASIS:	This step ensures that all key plant parameters are evaluated and indicates which parameters effect each Safety Function.
SOURCE DOCUMENT:	CEN-152 10.0 FRG Action Step 2
DEVIATION:	The success paths identified differ from CEN-152 in that Inventory and Pressure Control have been combined, as have all trees involving the Containment. In addition, assessment trees are included for Vital Auxiliaries and Indirect Radioactivity Release.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The CRS should know:	
How to obtain all the information required for completion of Appendix C;	
How to retrieve the required data using either ERFDADS/QSPDS or control board indications.	

PROCEDURE: FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

STEP: APPENDIX D

OBJECTIVE: The objective of this Appendix is to provide the control room staff guidance in regaining control of the Reactivity Control Safety Function.

BASIS: This Appendix ensures the control room staff is aware of all methods available to maintain the Reactivity Control Safety Function.

SOURCE DOCUMENT: CEN-152 10.0 Reactivity Control Assessment Tree and Reactivity Control Success Paths.

DEVIATION: None

REQUIRED KNOWLEDGE

The operators should know:

How to perform all the actions required in this Appendix and when a Success Path is meeting the acceptance criteria.

In addition to the above the CRS should know:

How to to determine which is the preferred Success Path for any given plant condition.

SPECIAL CONSIDERATIONS

The CRS must realize that if the Reactivity Control Safety Function is degraded he may not be able to control other Safety Functions.

PROCEDURE:	FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10
STEP:	APPENDIX E
OBJECTIVE:	The objective of this Appendix is to provide the control room staff guidance in regaining control of the RCS Inventory and Pressure Control Safety Function.
BASIS:	This Appendix ensures the control room staff is aware of all methods available to maintain the RCS inventory and Pressure Control Safety Function.
SOURCE DOCUMENT:	CEN-152 10.0 RCS Inventory and RCS Pressure Control Assessment Trees and Success Paths.
DEVIATION:	RCS Inventory and RCS Pressure Control have been combined since they have similar sets of Success Paths.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to perform all the actions required in this Appendix and when a Success Path is meeting the acceptance criteria. In addition to the above the CRS should know: How to determine which is the preferred Success Path for any given plant condition.	

PROCEDURE: FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

STEP: APPENDIX F

OBJECTIVE: The objective of this Appendix is to provide the control room staff guidance in regaining control of the RCS Heat Removal Safety Function.

BASIS: This Appendix ensures the control room staff is aware of all methods available to maintain the RCS Heat Removal Safety Function.

SOURCE DOCUMENT: CEN-152 10.0 RCS and Core Heat Removal Assessment Trees and Success Paths.

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to perform all the actions required in this Appendix and when a Success Path is meeting the acceptance criteria.	
In addition to the above the CRS should know:	
How to determine which is the preferred Success Path for any given plant condition.	

PROCEDURE:	FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10
STEP:	APPENDIX G
OBJECTIVE:	The objective of this Appendix is to provide the control room staff guidance in regaining control of the Containment Integrity Safety Function.
BASIS:	This Appendix ensures the control room staff is aware of all methods available to maintain the Containment Integrity Safety Function.
SOURCE DOCUMENT:	CEN-152 10.0 Containment Isolation and Containment Temperature and Pressure Control Assessment Trees and Success Paths.
DEVIATION:	Containment Isolation and Containment Temperature and Pressure Control Safety Functions have been combined since they affect the same structure.

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to perform all the actions required in this Appendix and when a Success Path is meeting the acceptance criteria. In addition to the above the CRS should know: How to determine which is the preferred Success Path for any given plant condition.	

PROCEDURE: FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

STEP: APPENDIX H

OBJECTIVE: The objective of this Appendix is to provide the control room staff guidance in regaining control of the Indirect Radioactivity Release Safety Function.

BASIS: This Appendix ensures the control room staff is aware of all methods available to maintain the Indirect Radioactivity Release Safety Function.

SOURCE DOCUMENT: None

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to perform all the actions required in this Appendix and when a Success Path is meeting the acceptance criteria. In addition to the above the CRS should know: How to determine which is the preferred Success Path for any given plant condition.	

PROCEDURE: FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

STEP: APPENDIX I

OBJECTIVE: The objective of this Appendix is to provide the control room staff guidance in regaining control of the Vital Auxiliaries Safety Function.

BASIS: This Appendix ensures the control room staff is aware of all methods available to maintain the Vital Auxiliaries Safety Function.

SOURCE DOCUMENT: None

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to perform all the actions required in this Appendix and when a Success Path is meeting the acceptance criteria. In addition to the above the CRS should know: How to determine which is the preferred Success Path for any given plant condition.	

PROCEDURE:	FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10
STEP:	APPENDIX J
OBJECTIVE:	The objective of this Appendix is to provide the control room staff guidance in regaining electrical power to the unit from a temporary source.
BASIS:	This Appendix ensures the control room staff is aware of all lineups in the event a Blackout occurs with loss of both Diesel Generators.
SOURCE DOCUMENT:	Blackout Evaluation Report V-CE-15617 Dec. 11, 1981 Section 3.8 and 4.0.
DEVIATION:	None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know:	
How to perform all the actions required in this Appendix.	
In addition to the above the CRS should know:	
How to manage electrical loads so as not to overload the temporary generator.	

PROCEDURE: FUNCTIONAL RECOVERY PROCEDURE 41RO-1ZZ10

STEP: APPENDIX K

OBJECTIVE: The objective of this Appendix is to maintain a set of logs for all the Success Paths in use for any given plant condition.

BASIS: This Appendix ensures the control room staff maintains a high awareness of those Success Paths which are maintaining Safety Functions.

SOURCE DOCUMENT: None

DEVIATION: None

REQUIRED KNOWLEDGE	SPECIAL CONSIDERATIONS
The operators should know: How to keep the maintenance log sheets using either ERFDADS or control board indication. In addition to the above the CRS should know: How to choose the proper set of log sheets to maintain.	

APPENDICES

Appendices A and B of the Recovery Procedures are the Primary and Secondary Operator actions. The step development, objective, basis, and, documentation directly correlate to the CRS action steps in the body of the procedure. Therefore, the developmental information is included in the procedure and development steps are not repeated here. Appendix C of the Recovery Procedures is a list of precautions and limitations pertinent to the individual procedure. These are collected in one location for operator reference and information. The remaining Standard Appendices are provided to supply detailed information for performing specific tasks without referencing other procedures. For ease of locating and numbering, these Appendices are attached to the Emergency Procedure. This method provides the CRS with a quick, consistent means of providing operators with additional information. This information may not be required for any given set of circumstances and therefore, has not been incorporated into the text of a specific Recovery Procedure. The developmental information for each Appendix is addressed in the following pages. Operators should know the location, content, and how to perform each Appendix.

Appendix

E NATURAL CIRCULATION VERIFICATION

OBJECTIVE:	This Appendix gives the conditions which indicate adequate natural circulation, corrective actions to maintain natural circulation, and provides for monitoring natural circulation, adequate core cooling, and minimizing voiding.
BASIS:	This Appendix provides a consistent method for verifying natural circulation is established and maintained.
SOURCE DOCUMENTS:	CEN-152, Section 9, Step 8, Section 8, Step 12, Section 7, Step 12. CE-TASK 430, Natural Circulation Cooldown ICE 80/15
DEVIATION:	None.

Appendix

F PLANT COOLDOWN CURVE

OBJECTIVE:	This Appendix will provide the operators with an immediately available plant specific cooldown curve.
BASIS:	This Appendix ensures the operators have a plant cooldown curve available for reference.
SOURCE DOCUMENT:	V-CE-20294 April 18, 1983 V-SF-721
DEVIATION:	None.

Appendix

G SECONDARY EQUIPMENT SHUTDOWN CHECKLIST

OBJECTIVE:	This Appendix provides operators with the required information to place the secondary plant in a stable condition.
BASIS:	This Appendix ensures secondary equipment is not neglected and damaged. This Appendix will consistently align equipment for entry into a General Operating Procedure during any Recovery Operation and aid in plant stabilization.
SOURCE DOCUMENT:	Vendor Technical Manual CESSAR 15.4.2.2.2
DEVIATION:	None

Appendix

H WATER INVENTORY

OBJECTIVE:	This Appendix will provide the operators with a method for maintaining the status of water inventory.
BASIS:	This Appendix ensures water inventory will be tracked to provide early detection of possible water shortages for plant evolutions.
SOURCE DOCUMENTATION:	CEN-152
DEVIATION:	None

Appendix

I CROSS CONNECTING THE REACTOR MAKEUP WATER TANK TO THE AUXILIARY FEEDPUMP SUCTION

OBJECTIVE:	This Appendix provides the operators with the information necessary to ensure adequate water is maintained to the Auxiliary Feed Pumps.
BASIS:	This Appendix ensures adequate water remains available to maintain a RCS heat sink.
SOURCE DOCUMENT:	P&ID 13-M-AFP-001 SER 11/81 II.E.1.1 GS-4 FSAR 10.4-11 PP 17884
DEVIATION:	None

Appendix

J VERIFICATION OF SAFETY INJECTION ACTUATION SIGNAL (SIAS)

OBJECTIVE:	This Appendix provides the operator with the information necessary to verify proper SIAS actuation and equipment response.
BASIS:	This Appendix provides the operator with a consistent method of verifying SIAS and ensures equipment failure does not compromise Safety Functions.
SOURCE DOCUMENT:	FSAR 6.2.4-1, 7.3-6, logic 7.3-1a Technical Specification 3.3.2, Table 3.3-4 Vendor Technical Manual - Sequencer J104
DEVIATION:	None

Appendix

K VERIFICATION OF CONTAINMENT ISOLATION ACTUATION SIGNAL (CIAS)

OBJECTIVE:	This Appendix provides the operator with the information necessary to verify proper CIAS actuation and equipment response.
BASIS:	This Appendix provides the operator with a uniform method of verifying CIAS and ensures equipment failure does not compromise Safety Functions.
SOURCE DOCUMENT:	FSAR 6.2.4.3, 6.2.4-1, 7.2-4 Technical Specifications 3.3.2, Table 3.3-4 Vendor Technical Manual J-104
DEVIATION:	None

Appendix

L VERIFICATION OF AUXILIARY FEEDWATER ACTUATION SIGNAL (AFAS)

OBJECTIVE:	This Appendix provides the operators with the information necessary to verify proper AFAS actuation and equipment response.
BASIS:	This Appendix provides the operators with a consistent method of verifying AFAS and ensures equipment failure does not compromise Safety Functions.
SOURCE DOCUMENT:	FSAR 6.2.4-2, 7.3-7 Technical Specifications 3.3.2, Table 3.3-4 SER 11/81 7.3.2.1 (4) PP 1G078 Vendor Technical Manual J-104
DEVIATION:	None

Appendix

M VERIFICATION OF MAIN STEAM ISOLATION SIGNAL (MSIS)

OBJECTIVE:	This Appendix provides the operator with the information necessary to verify proper MSIS actuation and component response.
BASIS:	This Appendix provides the operator with a consistent method of verifying MSIS and ensures equipment failure does not compromise Safety Functions.
SOURCE DOCUMENT:	FSAR 6.2.4-1, logic 7.3-1c Technical Specifications 3.3.6, Table 3.3-4 Vendor Technical Manual J-104
DEVIATION:	None

Appendix

N VERIFICATION OF CONTAINMENT SPRAY ACTUATION SIGNAL (CSAS)

OBJECTIVE:	This Appendix provides the operators with the information necessary to verify proper CSAS actuation and equipment response.
BASIS:	This Appendix provides the operator with a consistent method of verifying CSAS and ensures equipment failure does not compromise Safety Functions.
SOURCE DOCUMENT:	FSAR Table 6.2.4-1, 7.3-4 Technical Specifications 3.3.2, Table 3.3-4 Vendor Technical Manual J-104
DEVIATION:	None

Appendix

O VERIFICATION OF RECIRCULATION ACTUATION SIGNAL (RAS)

OBJECTIVE:	This Appendix provides the operator with the information necessary to verify proper RAS actuation and equipment response.
BASIS:	This Appendix provides the operator with a consistent method of verifying RAS and ensures equipment failure does not compromise Safety Functions.
SOURCE DOCUMENT:	FSAR 6.2.4-1, 7.3-5 CESSAR 6A-4.1.2.2 CEN-152 Technical Specifications 3.3.2
DEVIATION:	None

Appendix

P RESETTING SAFETY INJECTION ACTUATION SIGNAL (SIAS) AND CONTAINMENT ISOLATION ACTUATION SIGNAL (CIAS)

OBJECTIVE:	This Appendix provides the operator with the reset criteria and the instructions necessary to restore the equipment, affected by SIAS and CIAS actuation, to its normal operating or standby status, as applicable.
BASIS:	This Appendix provides the operator with a consistent method to ensure reset criteria can be met and then restore safety systems to their normal operating or standby status.
SOURCE DOCUMENT:	Technical Specifications 3.3.2 PP19249
DEVIATION:	None

Appendix

Q RESETTING AUXILIARY FEEDWATER ACTUATION SIGNAL (AFAS)

OBJECTIVE:	This Appendix provides the operator with the reset criteria and the instructions necessary to restore the equipment, altered by AFAS, to its normal operating or standby status.
BASIS:	This Appendix provides the operator with a consistent method to ensure reset criteria can be met and then restore safety systems to their normal standby lineup.
SOURCE DOCUMENT:	Technical Specifications 3.3.2, Table 3.3-4
DEVIATION:	None

Appendix

R RESETTING MAIN STREAM ISOLATION SIGNAL (MSIS)

OBJECTIVE:	This Appendix provides the operator with the reset criteria and the instructions necessary to restore the equipment, altered by a MSIS, to its normal operating status.
BASIS:	This Appendix provides the operator with a consistent method to ensure reset criteria can be met and then restore safety systems to their normal operational status.
SOURCE DOCUMENT:	Technical Specifications 3.3.2, Table 3.3-4
DEVIATION:	None

Appendix

S RESETTING CONTAINMENT SPRAY ACTUATION SIGNAL (CSAS)

OBJECTIVE:	This Appendix provides the operators with the reset criteria and instructions to restore the Containment Spray System to a normal standby status.
BASIS:	This Appendix provides the operator with a consistent method to ensure reset criteria can be met and then restore CSAS to a normal standby status.
SOURCE DOCUMENT:	EER 82-HP-006 FSAR 6.2.5.2.2 Technical Specifications 3.3.2 PP 19014
DEVIATION:	None

Appendix

T ISOLATING STEAM GENERATOR 1 - CONTROL ROOM VALVE ALIGNMENT CHECKLIST

OBJECTIVE:	This Appendix provides the operator with a systematic method to verify Steam Generator No. 1 is isolated.
BASIS:	This Appendix ensures complete isolation of Steam Generator No. 1 when MSIS has not occurred.
SOURCE DOCUMENT:	P&ID 13-M-SGP-001 13-M-SGP-002 13-M-SGS-002
DEVIATION:	None

Appendix

U ISOLATING STEAM GENERATOR 2 - CONTROL ROOM VALVE ALIGNMENT CHECKLIST

OBJECTIVE:	This Appendix provides the operator with a systematic method to verify Steam Generator No. 2 is isolated.
BASIS:	This Appendix ensures complete isolation of Steam Generator No. 2 when MSIS has not occurred.
SOURCE DOCUMENT:	P&ID 13-M-SGP-001 13-M-SGP-002 13-M-SGS-002
DEVIATION:	None

Appendix

V STEAM GENERATOR 1 - LEVEL REDUCTION

OBJECTIVE:	This Appendix provides the operator with the information necessary to lower the level in Steam Generator No. 1 after it is isolated.
BASIS:	This Appendix provides the operator with the means to ensure main steam piping is not flooded.
SOURCE DOCUMENT:	P&ID 13-M-SGP-001 13-M-SGP-002 13-M-SCP-006
DEVIATION:	None

Appendix

W STEAM GENERATOR 2 - LEVEL REDUCTION

OBJECTIVE:	This Appendix provides the operator with the information necessary to lower the level in Steam Generator No. 2 after it is isolated.
BASIS:	This Appendix provides the operator with the means to ensure main steam piping is not flooded.
SOURCE DOCUMENT:	P&ID 13-M-SGP-001 13-M-SGP-002 13-M-SCP-006
DEVIATION:	None

Appendix

X CONDENSATE, STEAM ISOLATION

OBJECTIVE:	This Appendix will provide the instructions necessary to isolate the condensate and auxiliary steam cross connections between Units.
BASIS:	This Appendix ensures cross contamination of the Units does not occur.
SOURCE DOCUMENT:	P&ID 13-M-ASP-001 13-M-ASP-002
DEVIATION:	None

Appendix

Y RESETTING EMERGENCY DIESEL GENERATORS

OBJECTIVE:	This Appendix provides the operators with the instructions necessary to evaluate and reset a Diesel Generator that has failed to start or tripped.
BASIS:	This Appendix provides the means to rapidly recover a Diesel Generator if needed.
SOURCE DOCUMENT:	Vendor Technical Manual M018
DEVIATION:	None

Appendix

Z DIESEL GENERATOR LOADS AND LIMITS

OBJECTIVE:	This Appendix provides the operator with a list of Diesel loads and load limits.
BASIS:	This Appendix provides the operator with the information necessary to ensure Diesel Generator operations are within limits.
SOURCE DOCUMENT:	Vendor Technical Manual M018 EER 82-DG-026
DEVIATION:	None

Appendix

AA CONTROL ROOM RUNNING EQUIPMENT CHECKLIST

OBJECTIVE:	This Appendix will provide a verification of control room equipment status after a loss of power.
BASIS:	This Appendix ensures equipment is restored to normal after a loss of power.
SOURCE DOCUMENT:	None
DEVIATION:	None

Appendix

BB STA RESPONSIBILITIES

OBJECTIVE:	This Appendix provides the STA with guidance as to what assistance and information the CRS may require.
BASIS:	This Appendix provides an independent second check of the Safety Functions and diagnostic of plant conditions.
SOURCE DOCUMENT:	None
DEVIATION:	None

PVNGS EMERGENCY PROCEDURE GENERATION PACKAGE

SECTION IV

EMERGENCY AND RECOVERY PROCEDURE VERIFICATION

TABLE OF CONTENTS

APPENDICES

1.0 PURPOSE

The purpose of this document is to provide a means to systematically evaluate the Emergency Procedure and supporting Recovery Procedures for written correctness and technical accuracy by ensuring they meet the requirements of generic and specific technical guidelines. This verification will include a comparison of the procedures to generic technical guidelines, PVNGS EMERGENCY Procedure Technical Guidelines, and general procedural characteristics.

The Operations Superintendent will determine the need for verification when an emergency or recovery procedure is written or revised. Validation of the procedure should be performed after the verification process. Small changes to the procedures do not require verification. Small changes are editorial in nature or reflect minor design changes, but do not impact the meaning of the affected part of the procedure. Major changes are those which affect the sequence or intent of operator actions. For example the procedure change required for an additional pump or component that operates in parallel with existing equipment will not require verification. If operation of the pump or component requires changing the sequence of actions or the intent of the procedure, verification is required.

2.0 REFERENCES

2.1 Implementing References

2.1.1 PVNGS Emergency Procedure Technical Guidelines

2.1.2 Generic Technical Guidelines, CEN-152, Rev. 1, Aug 18, 1982

2.2 Developmental References

2.2.1 Emergency Operating Procedures Verification Guideline (Draft), Developed by EOPIA Review Group, Aug 5, 1982

2.2.2 Procedure Format, Content, and Numbering, 70AC-0ZZ01

2.2.3 PVNGS Emergency Procedure Technical Guidelines

2.2.4 Generic Technical Guidelines, CEN-152, Rev. 1, Aug 18, 1982

2.2.5 NUREG-0899, Guidelines for the Preparation of Emergency Operating Procedures

3.0 DEFINITIONS AND ABBREVIATIONS

3.1 Emergency Procedure - As used in this document emergency procedure applies to the single procedure used at PVNGS to handle any emergency situation.

3.2 General Procedural Characteristics - Those qualities of a procedure that enhance its utility.

3.3 Generic Technical Guidelines - Documents that identify the equipment or systems to be operated and a list of steps necessary to mitigate the consequences of transients and accidents and restore safety functions as they apply to a generic plant.

3.4 PVNGS Emergency Procedure Technical Guidelines - A description of the planned method for developing emergency operating procedures from generic technical guidelines including plant specific values and equipment.

3.5 PVNGS - Palo Verde Nuclear Generating Station

3.6 PVNGS Emergency Response Method - As used in this document, this applies to the system used in the control room by the control room staff, to mitigate the consequences of transients and accidents.

3.7 Recovery Procedure - A procedure written to follow the emergency procedure that is designed to recover the plant to a condition of long-term control, plant shutdown, or plant startup.

3.8 Validation - The evaluation performed to determine that the actions specified in the procedure can be performed by the operator to manage emergency conditions.

3.9 Verification - The evaluation performed to confirm the written correctness of the procedure to ensure that the generic and plant specific technical aspects have been properly incorporated.

3.10 Verification Documentation Package - The paperwork involved in documenting the completion of the verification process. For contents see section 5.4.

3.11 Verification Evaluator - The individual(s) responsible for completing the verification process.

3.12 Writer's Guide - Instructions on how to prepare text and visual aids for emergency and recovery procedures.

4.0 RESPONSIBILITIES

4.1 The Operations Superintendent will be responsible for the following:

4.1.1 Evaluating procedures which have been written, rewritten, or changed to determine if a verification is warranted. Minor changes to emergency or recovery procedures do not require verification.

4.1.2 If a verification is warranted, assigning personnel to perform the verification, using the following considerations:

4.1.2.1 Available resources.

4.1.2.2 Operational experience of assigned personnel.

4.1.2.3 Administrative ability of assigned personnel.

4.1.3 Assigning personnel to resolve any comments, upon completion of the verification.

4.1.4 Signing the Verification Results Form and Comment Forms to complete the verification process.

4.2 The verification evaluator(s) will be responsible for completing the following for each procedure reviewed.

4.2.1 Procedural Characteristics Checklist, Appendix A.

4.2.2 Verification Results Form, Appendix C.

4.2.3 Verification Documentation Package, which includes the Verification Results Form and any comments with suggested resolutions recorded on the Comment Form, Appendix B.

5.0 INSTRUCTIONS

5.1 General Procedural Characteristics

5.1.1 The PVNGS Emergency and Recovery Procedures Writer's Guide contains methods by which emergency and recovery procedures are to be written. In order to ensure the written correctness of the procedures, a thorough review of the procedures compared to the writer's guide is necessary.

5.1.2 Certain procedural characteristics enhance the usability of the procedure and aid the user in performing the intended actions in a timely manner. The procedural characteristics of interest are:

5.1.2.1 Reproducability

5.1.2.2 Identification Form

5.1.2.3 Entry Conditions and Indicators

5.1.2.4 Instructional Steps

5.1.2.5 Referencing

5.1.2.6 Procedural Tracking

5.1.3 A review of the procedures for reproducability ensures the procedures will be legible and complete.

5.1.4 A review of the procedures for identification information is necessary to ensure the user can determine what procedure he has, if it is complete, and if it has been approved.

5.1.5 Each procedure should be reviewed to ensure that sound fundamental indicators or appropriate entry conditions are given. This will aid the operator in determining if he has the appropriate procedure.

5.1.6 Instructional steps will be reviewed to ensure they are distinguishable, readable, and easily understood. These steps will also be reviewed for quantity of information supplied. The amount of information supplied should be that required for a qualified operator. This level of detail was initially obtained by development of the procedures using the PVNGS simulator. Changes to the procedures should use the same method.

5.1.7 Procedural referencing should be examined to determine if the referenced information should be included within the procedure and that the referenced procedures are correct, complete, and available for the operator's use.

5.1.8 Procedural tracking capabilities should exist as an aid to the operator. This will allow the operator to maintain his place in the procedure and increase procedure efficiency. In the recovery procedures this is done by a tracking line in the CRS procedure before each major step. In the emergency operations procedure this is done by circling the answer to each question.

5.1.9 Procedural Characteristics Checklist, Appendix A, is provided to aid the evaluator in reviewing the procedures for procedural characteristics and comparing the procedure to the writer's guide.

5.1.10 Discrepancies and suggested resolutions are to be recorded on the Comment Form Appendix B,.

5.2 Comparison to PVNGS Emergency Procedure Technical Guidelines

5.2.1 PVNGS Emergency Procedure Technical Guidelines were developed to aid in the translation from Generic Technical Guidelines to usable emergency and recovery procedures. Plant specific data must be properly incorporated into the procedures to ensure accuracy. These guidelines were developed using the Generic Technical Guidelines, plant specific information, license committments and the PVNGS simulator.

5.2.2 The review of the procedures to PVNGS Emergency Procedure Technical Guidelines will occur in two phases.

5.2.2.1 The first phase is a comparison of the procedure system to that defined in the plant specific technical guidelines. This is to be accomplished by comparing the procedure methodology to that presented in the PVNGS Emergency Procedure Technical Guidelines. Any discrepancies found will be noted, along with any corrective action necessary on the Comment Form, Appendix B.

5.2.2.2 The second phase is a step by step comparison of the procedure to the PVNGS Emergency Procedure Technical Guidelines that pertain to the procedure involved. Discrepancies and suggested corrective actions will be noted on the Comment Form, Appendix B.

5.3 Comparison to Generic Technical Guidelines

5.3.1 Generic Technical Guidelines for PVNGS were developed by Combustion Engineering. These guidelines have been approved by the NRC for use in preparing plant specific technical guidelines.

5.3.2 In order to ensure that the original intent of the generic guidelines has been met, it is necessary to compare each specific procedure to the appropriate generic guideline.

5.3.3 To accomplish this, the reviewer will examine the order of presentation in the generic guideline and compare this to the order or presentation in the procedure.

5.3.4 If the order differs and this difference has not been explained in the PVNGS Emergency Procedure Technical Guidelines, the reviewer will note the discrepancy and suggested resolution on the Comment Form, Appendix B.

5.4 When the review is completed, the reviewer will prepare the Verification Documentation Package, which consists of the following:

5.4.1 Completed Comment Forms with suggested resolutions, to the comments.

5.4.2 Completed Verification Results Form.

5.5 The Verification Documentation Package will then be submitted to the Operations Superintendent.

PROCEDURAL CHARACTERISTICS CHECKLIST

The purpose of this checklist is to aid the reviewer in the evaluation of emergency and recovery procedures when comparing them to the writer's guide for general procedural characteristics. Each of the areas discussed in section 5.1 are represented along with areas which discuss the writer's guide requirements. Some of the questions apply to the procedure as a whole, while others apply to each step of the procedure. For each no answer, the reviewer will make comments with suggested resolutions on the Comment Form, Appendix B. For each "other" answer, the reviewer will explain the reason the question does not apply or why a yes or no answer was not given. These will also be recorded on the Comment Form, Appendix B.

PVNGS EMERGENCY AND RECOVERY
PROCEDURE VERIFICATION

REPRODUCABILITY	YES	NO	OTHER
1. Do proper page margins exist that ensure unobscured access to all information in the procedure?	______	______	______
2. Do graphs, charts, and illustrations contain the following?			
a. Clear Labeling	______	______	______
b. Appropriate Units	______	______	______
c. Readability	______	______	______
d. Limits Emphasized	______	______	______
e. Units Consistent With Control Room Values	______	______	______
3. Does each major section of the procedure 1.0, 2.0, 3.0, etc., appear in all capital letters?	______	______	______
4. Does a triple space exist between all numbered steps?	______	______	______
Each Step			
5. Do all of the written words of a numbered step appear on the same page?	______	______	______

IDENTIFICATION	YES	NO	OTHER
1. Does the procedure conform to the procedure format, content, and numbering, 70AC-0ZZ01, in the following areas?			
a. Title Page	______	______	______
b. Table of Contents (with exceptions noted in the emergency procedure writer's guide)	______	______	______

IDENTIFICATION (cont'd)	YES	NO	OTHER
c. General Procedural Page Information	____	____	____
d. Appendices	____	____	____
e. Cautions	____	____	____
2. Is the title of the procedure explicit in describing the nature of the incident for which the procedure is provided?	____	____	____
3. Does the objective state in a clear concise manner what the procedure is to accomplish and when it is to be used?	____	____	____
4. Does each page of the procedure provide the following identification information?	____	____	____
a. Procedure Number and Title	____	____	____
b. Revision Number	____	____	____
c. Page Number	____	____	____
d. Appendix Page Number (if needed)	____	____	____
5. Is the last page of the procedure identified by marking Page __ of __?	____	____	____
6. For all flow charts, do the following exist?			
a. Consistent Direction of Yes/No Answers?	____	____	____
b. Descriptive Title and Numbered per 70AC-0ZZ01, Sec. 5.0?	____	____	____
7. Does the objective statement and table of contents appear on page 2 of the procedure?	____	____	____

IDENTIFICATION (cont'd)	YES	NO	OTHER
Each Step			
8. Are logic terms emphasized by using all capital letters?	______	______	______
ENTRY CONDITIONS AND INDICATORS			
1. If the procedure being reviewed is the Emergency Procedure or the Functional Recovery Procedure, are appropriate entry conditions specified to let the operator know when the procedure is to be used?	______	______	______
2. If the procedure being reviewed is a Recovery Procedure, does the verification step provide enough information for the operator to determine if he is in the correct procedure, without providing many details that lend to confusion?	______	______	______

INSTRUCTIONS	YES	NO	OTHER
1. Are steps which can be performed at any time or in conjunction with other steps noted?	______	______	______
2. Do instructions which align equipment (e.g., valve alignment list, electrical alignment lists) meet the following criteria?			
a. Each Item Individually Specified	______	______	______
b. Each Item Identified With A Unique Number or Nomenclature	______	______	______
c. Position Specified	______	______	______

INSTRUCTIONS (cont'd)	YES	NO	OTHER
3. Are Cautions placed immediately preceding the step(s) to which they apply and located on the same page?	______	______	______
4. Do Caution statements avoid the use of action statements?	______	______	______
5. Are all Cautions boxed in order to make them easily distinguishable?	______	______	______
6. Do Notes avoid the use of action statements?	______	______	______
7. Are Notes placed on the same page and immediately preceding the step(s) to which they apply?	______	______	______
8. Are Notes easily distinguishable from instructional steps?	______	______	______
9. Can the procedure be performed by the minimum number of operators required to be present by Technical Specifications?	______	______	______
10. Are the instructional steps written for the qualified operator?	______	______	______
Each Step			
11. Are instructions written in short, concise, identifiable steps as opposed to multi-step paragraphs?	______	______	______
12. Are conditional steps expressed such that the condition is stated before the action which is to take place?	______	______	______
13. If calculations are required, is space provided to perform the calculation and are up-to-date formulas provided where needed?	______	______	______

INSTRUCTIONS (cont'd)	YES	NO	OTHER
14. Are steps which have more than one action minimized?	____	____	____
15. Overall, has the proper use of the English language been used?	____	____	____
16. Has seldom used or hard to locate equipment locations been identified? Control room locations are not necessary.	____	____	____
17. Are values given in the procedures listed with the same units as the units read on the control boards?	____	____	____
18. Does the step avoid clutter? Or is the information limited to only what is required for a qualified operator?	____	____	____
19. Are the number of actions listed in each step limited in order to make the procedure usable?	____	____	____
20. Are abbreviations limited to those understood by the operator?	____	____	____
21. When deviations from a setpoint are allowed, are these deviations given as a range of values rather than as a percentage value?	____	____	____
22. Are the instructions written to avoid multiple combinations of "and/or" terms?	____	____	____

REFERENCING	YES	NO	OTHER
1. Are the titles and numbers of all referenced documents clearly identified?	____	____	____
2. Are referenced procedures available?	____	____	____

PVNGS EMERGENCY AND RECOVERY
PROCEDURE VERIFICATION

REFERENCING (cont'd)	YES	NO	OTHER
3. When the procedure references another procedure, is all important information in the referenced procedure included to enable the operator to use the procedure?	______	______	______
4. Examine referenced material. Is the referenced material too detailed to have been easily incorporated into the procedure?	______	______	______
5. Does the referenced procedure have initial conditions that will generally fit the circumstances that will exist when the procedure is referenced?	______	______	______

PROCEDURAL TRACKING	YES	NO	OTHER
1. Is a consistent method available for the operators to keep track of where he is in the procedure?	______	______	______

COMMENT FORM FOR EMERGENCY AND RECOVERY PROCEDURE VERIFICATION

Procedure Reviewed ______________________ Number __________ Rev. # ____

COMMENT NO.	PROCEDURE STEP	COMMENT	SUGGESTED RESOLUTION

REVIEWER ____ DATE __________

OPERATIONS SUPERINTENDENT ____________________________ DATE __________

VERIFICATION RESULTS FORM

PROCEDURE REVIEWED: ____________________ NUMBER: ________________ REV. #: ________

DATE REVIEWED: ____________ REVIEWERS:

____

____

____

Does the reviewer believe this verification document adequately meets the intent of ensuring the procedure being reviewed will properly mitigate the consequences of the incident for which the procedure was written? Yes/No
IF NOT, Describe the areas in which the verfication was inadequate.

The above procedure was reviewed using the PVNGS Verification Procedure. Once the comments have been resolved, I(we) certify that the procedure is in compliance with the writer's guide, PVNGS Emergency Procedure Technical Guidelines and Generic Technical Guidelines.

Consideration should be given to any comments made above. With the Operations Superintendent's signature the verification is completed.

SIGNATURE: ____ DATE ____________

OPERATIONS SUPERINTENDENT __________________________________ DATE ____________

PVNGS EMERGENCY PROCEDURE GENERATION PACKAGE

SECTION V

EMERGENCY AND RECOVERY PROCEDURE VALIDATION

MASTER
5-10-83

PALO VERDE

NUCLEAR GENERATING STATION

EMERGENCY AND RECOVERY PROCEDURE

VALIDATION

TABLE OF CONTENTS

APPENDICES

1.0 PURPOSE

The purpose of the validation is to evaluate Emergency and Recovery procedures to determine if the specified actions within the procedure can be performed by the operators to manage emergency conditions. The validation effort will consist of a walk-through evaluation and/or a simulator evaluation.

The walk-through evaluation will consist of a control room operating team responding to hypothetical accident conditions with observer(s) evaluating the operator's response to determine the adequacy of the procedures. The walk-through evaluation may be performed either in the simulator or in the control room.

The simulator evaluation will be conducted similarily to the walk-through except the event will progress using real time simulation.

After these evaluations a review session will be conducted to determine the adequacy of the procedures and to document any comments, corrective actions necessary, and complete the validation.

The Operations Superintendent will determine the need and extent for validation when an emergency procedure or recovery procedure is written or revised. Small changes to the procedures do not require validation. Small changes are editorial in nature or reflect minor design changes, but do not impact the meaning of the affected part of the procedure. Major changes are those which affect the sequence or intent of operator actions. For example, the procedure change required for an additional pump or component that operates in parallel with existing equipment will not require validation. If operation of the pump or component requires changng the sequence of actions or the intent of the procedure then validation is required.

2.0 REFERENCES

2.1 Implementing References

None

2.2 Developmental References

2.2.1 Emergency Operating Procedures Validation Guidelines (Draft), Developed by EOPIA Review Group, Aug. 5, 1982.

2.2.2 NUREG-0899, Guidelines for Preparation of Emergency Operating Procedures.

3.0 DEFINITIONS AND ABBREVIATIONS

3.1 Emergency Procedure - As used in this document, the emergency procedure applies to the single procedure used at PVNGS to handle any emergency situation.

3.2 Functional Recovery Procedure - A procedure designed to be used after the emergency procedure to maintain safety functions and stabilize the plant when a specific event cannot be diagnosed, or a recovery procedure cannot be implemented as designed.

3.3 Recovery Procedure - A procedure written to follow the emergency procedure that is designed to recover the plant to a condition of long term control, plant shutdown, or plant startup.

3.4 Simulator Evaluation - An evaluation of a procedure using real-time simulation to observe the procedures capability of mitigating accident conditions.

3.5 Walk-through Evaluation - An evaluation of a procedure using a walk-through technique to observe the procedures capability of mitigating accident conditions.

3.6 Validation - The evaluation performed to determine that actions specified in the procedure can be performed by the operator to manage emergency conditions.

3.7 Validation Documentation Package - The paperwork involved in documenting the completion of the validation process. For contents see section 5.4.2.5.

4.0 RESPONSIBILITIES

4.1 The Control Room Supervisor, Primary Operator, and Secondary Operator are responsible for the following:

4.1.1 Performing duties as defined by the Emergency Response Method using the Emergency Procedure and Recovery Procedures.

4.1.2 Participateing in discussions and review of the procedures.

4.1.3 Following the directions of the lead observer in performing the validation.

4.2 The Simulator Instructor is responsible for the following:

4.2.1 Initializeing the simulator as required by the scenario to be run.

4.2.2 Operating the simulator

4.2.3 Playiing the role of all personnel outside the Control Room.

4.2.4 Supporting the validation effort as assigned by the lead observer.

4.3 The lead observer is responsible for the following:

4.3.1 Completing the validation.

4.3.2 Conducting pre-validation briefings and assigning duties as necessary.

4.3.3 Supervising the validation effort.

4.3.4 Conducting review sessions.

4.3.5 Completing all required documentation.

4.4 Observers, if used, will be responsible for the following:

4.4.1 Observing assigned operators perform the procedure.

4.4.2 Preparing comments on the procedures.

4.4.3 Following the directions of the lead observer.

4.5 The Operations Superintendent will be responsible for the following:

4.5.1 Evaluating procedures which have been written or revised to determine if a validation is warranted and to what extent. Minor changes to emergency and recovery procedures do not require validation.

4.5.2 Assigning personnel to perform the validation using the following considerations:

4.5.2.1 Available resources.

4.5.2.2 Operational experience of assigned personnel.

4.5.2.3 Administrative ability of observers.

4.5.3 Assigning personnel to resolve any comments, upon completion of the validation.

4.5.4 Signing the Validation Results Form and the Comment Forms to complete the validation package.

4.5.5 Determining what part(s) of the validation are to be performed, based upon the extent of the revision made.

4.5.6 Making the final determination of validation acceptance.

5.0 INSTRUCTIONS

5.1 The validation process will contain a walk-through evaluation and/or a simulator evaluation. The walk-through evaluation is required in order to validate the procedure. A simulator evaluation may be performed in addition to the walk-through evaluation. This determination will be made by the Operations Superintendent. Below is the recommended sequence for each type of procedure to be evaluated.

5.1.1 Emergency Procedure - A walk-through evaluation and/or a simulator evaluation should be performed for each type of accident up to the point where a recovery procedure is selected.

5.1.2 Functional Recovery Procedure - A walk-through evaluation and/or a simulator evaluation should be performed for each safety function and/or compound Scenarios, using the Emergency Procedure and the Functional Recovery Procedure.

5.1.3 Recovery Procedure - A walk-through evaluation and/or a simulator evaluation should be performed for the type of accident involved.

5.2 Walk-through Evaluation

5.2.1 The lead observer will conduct a pre-validation briefing with the validation team. The following should be discussed:

5.2.1.1 Duties and responsibilities of each member.

5.2.1.2 The sequence of events as they are to be performed.

5.2.1.3 The documentation and support material required in the validation process.

5.2.1.4 The purpose and scope of the validation process.

5.2.1.5 The evaluation to be performed (use Appendix A).

5.2.1.6 The lead observer will ensure each observer has a copy of the procedure to be performed, an Observer Checklist (Appendix B), and necessary copies of the Comment Form (Appendix F).

5.2.2 The operators will walk through the procedure, in the Control Room or simulator, with the observer(s) evaluating each phase.

5.2.3 Any comments generated will be recorded on the Comment Form.

5.3 Simulator Evaluation

5.3.1 The lead observer will conduct a pre-validation briefing with the validation team. The following should be discussed:

5.3.1.1 Duties and responsibilities of each member.

5.3.1.2 The sequence of events as they are to be performed.

5.3.1.3 The documentation and support material required in the validation process.

5.3.1.4 The purpose and scope of the validation process.

5.3.1.5 The evaluation to be performed.

5.3.1.6 The lead observer will ensure each observer has a copy of the procedure to be performed, an Observer Checklist (Appendix B), and necessary copies of the Comment Forms (Appendix F).

5.3.2 The Simulator Instructor will prepare the simulator for the validation by:

5.3.2.1 Establishing the initial conditions.

5.3.2.2 Operating the simulator under the direction of the lead observer.

5.3.3 The lead observer will direct the Simulator Instructor to initalize the simulator.

5.3.4 The event will progress in real-time simulation.

5.3.5 The lead observer may change the Scenario if he feels the change may enhance the validation process and the Operations Superintendent agrees with the change.

5.3.5.1 If the scenario is changed the lead observer will write up a justification as to why the simulator scenario was changed and how the change enhances the validation process. This is to be attached to the documentation package.

5.4 Review Session

5.4.1 Preferably, immediately after the simulator exercise a review session will be held, led by the lead observer.

5.4.2 The following should occur in the review session:

5.4.2.1 All comments made by the observers are discussed and suggested resolutions stated on the Comment Form, Appendix F.

5.4.2.2 Discuss each point as described in the Review Checklist, Appendix C.

5.4.2.3 Discuss the Guidelines for Validation Acceptance, Appendix D.

5.4.2.4 Complete the Validation Results Form, Appendix E.

5.4.2.5 Prepare the Documentation Package, which consists of the following:

- o All completed Comment Forms with suggested resolutions to those comments.
- o Validation Results Form.
- o Documentation of procedure changes.

5.5 The lead observer will return the Documentation Package to the Operations Superintendent.

SCENARIOS

Attached are sample scenarios which may be used when performing the validation process.

The lead observer and the Operations Superintendent will select an appropriate scenario depending upon the type of procedure to be evaluated. This scenario may be one of the sample scenarios, a modification of one of the sample scenarios, or a scenario developed to test the procedure to be evaluated.

PALO VERDE NUCLEAR GENERATING STATION
EMERGENCY AND RECOVERY PROCEDURE VALIDATION

SCENARIOS (Cont'd)

Number 1

Scenario Title: Reactor Trip

Procedure: Reactor Trip 41RO-1ZZ01

Plant Mode: 1   Power Level: 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC: 9

Malfunction: NONE

Malfunction Code: NONE   Variable Setting: NONE

Additional Inputs: Manual Override - Reactor Trip

Description: With the plant at 100% power and all control systems in Normal/Auto the Simulator Instructor manually initiates a Reactor Trip. All CEA's fully insert, the Main Generator trips and all automatic controls respond normally.

Note: Power level and position of control systems may be adjusted by the lead observer to test the procedures with different initial conditions.

PALO VERDE NUCLEAR GENERATING STATION
EMERGENCY AND RECOVERY PROCEDURE VALIDATION

SCENARIOS (Cont'd)

Number 2

Scenario Title Main Turbine Control Valves Fail Open

Procedure Excess Steam Demand 41RO-1ZZ02

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction All MT Control Valves Fail Open

Malfunction Code MSC100 Variable Setting HIGH

Additional Inputs: NONE

Description: With the plant at 100% power and all control systems in Normal/Auto the Main Turbine control valves fail open. The following may actuate: high variable overpower trip, low steam generator press trip, high steam generator level trip, and main steam isolation. Operator or automatic action will isolate the steam generator and terminate the excess steam demand. All control systems respond normally. Operator action will be necessary to: stabilize RCS temperature and initiate AFW to prevent automatic AFW actuation.

Note: Power level and position of control systems may be adjusted by the lead observer to test the procedures with different initial conditions.

PALO VERDE NUCLEAR GENERATING STATION
EMERGENCY AND RECOVERY PROCEDURE VALIDATION

SCENARIOS (Cont'd)

Number 3

Scenario Title Main Steam Rupture Downstream of MSIV's

Procedure Excess Steam Demand 41RO-1ZZ02

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction Main Steam Rupture Downstream of MSIV's

Malfunction Code MSC150 Variable Setting NA

Additional Inputs: NONE

Description: With the plant at 100% power and all control systems in Normal/Auto the Simulator Instructor inserts the malfunction. The following trips may actuate: high variable overpower, low steam generator pressure, high steam generator level, and main steam isolation. Operator or automatic actions will isolate the rupture. All controls will respond normally. Operator actions will be necessary to stabilize RCS temperature and initiate AFW to avoid automatic AFW actuation.

Note: Power level and position of control systems may be adjusted by the lead observer to test the procedures with different initial conditions.

SCENARIOS (Cont'd)

Number 4

Scenario Title Main Steam Rupture Inside Containment

Procedure Loss of Secondary Coolant 41RO-1ZZ03

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction Main Steam Rupture Inside Containment

Malfunction Code MSC140 Variable Setting NONE

Additional Inputs: NONE

Description: With the plant at 100% power and all controls in Normal/Auto the Simulator Instructor inserts the malfunction. The following may actuate: low steam generator pressure trip, high steam generator level trip, high variable overpower trip, main steam isolation, safety injection, and containment spray. Operator action will be necessary to stabilize RCS temperature, identify the leaking steam generator, and initiate AFW to the intact steam generator.

Note: Power level and position of control systems may be adjusted by the lead observer to test the procedures with different initial conditions.

SCENARIOS (Cont'd)

Number 5

Scenario Title Main FW Rupture Inside Containment

Procedure Loss of Secondary Coolant 41RO-1ZZ03

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction Main FW Rupture between SG#2 and FW Checks

Malfunction Code MSC340 Variable Setting NONE

Additional Inputs: NONE

Description: With the plant at 100% power and all controls in Normal/Auto the Simulator Instructor inserts the malfunction. The following may actuate: low steam generator pressure trip, main steam isolation, safety injection, and containment spray. Operator action will be necessary to stabilize RCS temperature, identify the leaking steam generator, and initiate AFW to the intact steam generator.

Note: Power level and position of control systems may be adjusted by the lead observer to test the procedures with different initial conditions.

PALO VERDE NUCLEAR GENERATING STATION
EMERGENCY AND RECOVERY PROCEDURE VALIDATION

SCENARIOS (Cont'd)

Number 6

Scenario Title Loss of All Reactor Coolant Pumps

Procedure Loss of RCS Flow 41RO-1ZZ04

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction NONE

Malfunction Code NONE Variable Setting NONE

Additional Inputs: Manual Override - Loss of all RCP's

Description: With the plant at 100% power and all controls in Normal/Auto the Simulator Instructor will manually initiate a trip of all RCP's. All CEA's insert fully and a Turbine Trip will occur. Operator action will be necessary to stabilize RCS temperature and control Main FW or initiate AFW.

Note: Power level and position of control systems may be adjusted by the lead observer to test the procedures with different initial conditions.

SCENARIOS (Cont'd)

Number 7

Scenario Title Loss of All Main Feedwater

Procedure Loss of Feedwater 41RO-1ZZ05

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction NONE

Malfunction Code NONE Variable Setting NONE

Additional Inputs: Manual Override - Trip both Main Feedwater Pumps

Description: With the plant at 100% power and all controls in Normal/Auto the Simulator Instructor will manually trip both Main Feedwater Pumps. The plant will trip on low steam generator level, all CEA's will fully insert. Aux FW may auto actuate. Operator action will be necessary to stabilize RCS Temp and control steam generator level.

Note: Power level and position of control systems may be adjusted by the lead observer to test the procedures with different initial conditions.

SCENARIOS (Cont'd)

Number 8

Scenario Title Steam Generator #1 Tube Rupture

Procedure Steam Generator Tube Leak 41RO-1ZZ06

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction SG #1 Tube Rupture

Malfunction Code MPS010 Variable Setting 100%

Additional Inputs: NONE

Description: With the plant at 100% power and all controls in Normal/Auto the Simulator Instructor will insert the malfunction. The following may actuate: low pressurizer pressure trip, safety injection, main steam isolation, containment isolation. Operator action will be necessary to lower RCS pressure, prevent filling the ruptured steam generator solid, and stabilize RCS temperature.

Note: Power level and position of control systems may be adjusted by the lead observer to test the procedures with different initial conditions.

SCENARIOS (Cont'd)

Number 9

Scenario Title Reactor Coolant Hot Leg Rupture

Procedure Loss of Coolant Accident 41RO-1ZZ07

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction RCS Hot Leg A Rupture

Malfunction Code MPS030 Variable Setting NONE

Additional Inputs: NONE

Description: With the plant at 100% power and all controls in Normal/Auto the Simulator Instructor will insert the malfunction. Low pressurizer pressure will initiate a plant trip. The following will actuate: safety injection, containment isolation, and containment spray. Operator actions will be necessary to stabilize steam generator level, verify safety system actuation, transfer safety injection suction to recirculation sumps, and initiate long term core cooling.

Note: Power level and position of control systems may be adjusted by the lead observer to test the procedures with different initial conditions.

SCENARIOS (Cont'd)

Number 10

Scenario Title Reactor Coolant Cold Leg Break

Procedure Small Loss of Coolant Accident 41RO-1ZZ08

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction RCS Cold Leg Loop 1B RTD Penetration Leak

Malfunction Code MPS040 Variable Setting 30%

Additional Inputs: NONE

Description: With the plant at 100% power and all controls in Normal/Auto the Simulator Instructor will insert the malfunction. Pressurizer level and pressure will decrease. Operator action will be required to reduce plant power, initiate a plant shutdown or trip, provide RCS cooling, manually initiate or verify auto actuation of safety systems.

Note: Power level and position of control systems may be adjusted by the lead observer to test the procedures with different initial conditions.

PALO VERDE NUCLEAR GENERATING STATION
EMERGENCY AND RECOVERY PROCEDURE VALIDATION

SCENARIOS (Cont'd)

Number 11

Scenario Title Loss of All AC Power

Procedure Blackout 41RO-1ZZ09

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction Loss of All Offsite Power

Malfunction Code MEL010 Variable Setting NONE

Additional Inputs: NONE

Description: With the plant at 100% power and all controls in Normal/Auto the Simulator Instructor will insert the manual overrides and the malfunction. The plant will trip. Safety signals may be initiated but will not actuate. Operator actions are necessary to stabilize RCS temperature and restore power. When desired the Simulator Instructor may remove the manual overrides to allow restoring at least one Emergency Diesel Generator.

Note: Power level and position of control systems may be adjusted by the lead observer to test the procedures with different initial conditions.

PALO VERDE NUCLEAR GENERATING STATION
EMERGENCY AND RECOVERY PROCEDURE VALIDATION

SCENARIOS (Cont'd)

Number 12

Scenario Title Loss of Reactivity Control

Procedure Functional Recovery

Plant Mode 1 Power Level 100%

Additional Initial Conditions: Manual Reactor Trip Pushbuttons Overridden

Simulator Initial Condition IC 9

Malfunction ATWS (failure of PPS to generate a trip)

Malfunction Code CR 180 Variable Setting NONE

Additional Inputs:

Override manual trip pushbuttons as follows:

PPCSI040, R11, F, R11, F, R11, F, R11, X%

Create trip condition with following malfunctions:

SC430; SC440; X%

Description: With the plant at 100% power and all controls in Normal/Auto, the Simulator Instructor will insert a loss of normal feedwater, which will lead to a reactor trip, no CEA's will drop into the core. Operator action will be required to shutdown the reactor.

PALO VERDE NUCLEAR GENERATING STATION
EMERGENCY AND RECOVERY PROCEDURE VALIDATION

SCENARIOS (Cont'd)

Number 13

Scenario Title Loss of RCS Inventory Control

Procedure Functional Recovery 41RO-1ZZ10

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction RCS Rupture with ESF Equipment Failed.

Malfunction Code PS030 Variable Setting NONE

Additional Inputs:

Fail any of the followng ESF components, as desired, by inserting the specified malfunction:

Containment Spray Pump A, PS590; Pump B, PS600, LPSI Pump A, PS610;
Pump B, PS620, Diesel A, EL130; Diesel B, EL140

HPSI Pump A may be tripped after actuation by entering the following override:
ESFB0380, R1, ESFBI240, S1, D, D, R1, S2, X%

HPSI Pump B may be tripped after actuation by entering the following override:
ESFB0380, R2, ESFBI240, S3, D, D, R3, S4, X%

Description: With the plant at 100% power and all controls in Normal/Auto, the Simulator Instructor will initiate a Hot Leg Rupture. The specified components will fail to respond, compromising the Inventory Control Safety Function. This scenario may be repeated with various failures to test different success paths of the Functional Recovery Procedure.

SCENARIOS (Cont'd)

Number 14

Scenario Title Loss of RCS Heat Removal / Inadequate Core Cooling

Procedure Functional Recovery 41RO-1ZZ10

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction Loss of Both Norm Feedwater and Aux Feedwater

Malfunction Code SC430, SC440 Variable Setting NONE

Additional Inputs:

To fail the non-essential AFW Pump insert malfunction SC510.

To fail the turbine-driven essential AFW Pump, after AFAS, insert the following override:

SGFWI010, S12, SGFWI130, S16, X%

To fail the motor-driven essential AFW Pump, following AFAS, insert the following override:

SGFW0230, R3, SGFWI110, S5, D, D, R5, S6, AF178G1, S.0, X%

Description: With the plant at 100% power and all controls in Normal/Auto the Simulator Instructor will initiate a Loss of Normal Feedwater and then a failure of the Auxiliary Feedwater System to respond when called upon by the AFAS-1 or AFAS-2 signal. Operator action will be required to stabilize the plant and restore feedwater.

SCENARIOS (Cont'd)

Number 15

Scenario Title Loss of Containment Integrity

Procedure Functional Recovery 41RO-1ZZ10

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction RCS Hot Leg A Rupture

Malfunction Code PS 030 Variable Setting NONE

Additional Inputs:

Immediately following CIAS, the instructor will insert the following overrides:

AUXB0410, R9, 12%
AUXA0210, R7, 10%
AUXAI080, S2, 8, D, D, R2, 8, S1, 7, X, %

If CPIAS occurs, causing valves to re-close, repeat last override.

Upon correct operator response, insert the following override:

AUXAI080, N1, 7, S2, 8, X%

Description: With the plant at 100% power, with power access purge in progress, the Simulator Instructor will generate a LOCA which will necessitate a CIAS. The power access purge isolation valves will fail to close. Operators will then have to take action to manually isolate containment.

SCENARIOS (Cont'd)

Number 16

Scenario Title Loss of Vital Auxiliaries

Procedure Functional Recovery 41RO-1ZZ10

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction Failure of One Or More Vital Auxiliary Systems

Malfunction Code SC430, SC440 Variable Setting NONE

Additional Inputs:

Essential cooling water pumps may be failed by entering the following malfunctions:

Pump A, PS520
Pump B, PS530

To fail the non-essential AFW Pump, insert the following malfunctions:

SC510

The remaining auxiliaries may be failed after actuation by performing the following overrides:

ESS, CHILL A; ESFA0160, R9, ESFAI100, S1, D, D, R1, S2, X%
ESS, CHILL B; ESFA0160, R10, ESFAI100, S3, D, D, R3, S4, X%
ESS SPRAY A; ESFA0160, R13, ESFAI100, S9, D, D, R9, S10, X%
ESS SPRAY B; ESFA0160, R14, ESFAI100, S11, D, D, R11, S12, X%
CONDENSATE X FOR A; SGFW0230, R1, SGFWI110, S1, D, D, R1, S2, X%
CONDENSATE X FOR B; SGFW0230, R2, SGFWI110, S3, D, D, R3, S4, X%

#1 Turbine AFW A; SGFWI010, S12, SGFWI130, S16, X%
Motor AFW B; SGFW0230, R3, SGFWI110, S5, D, D, N5, S6, AF178G1, S.0, X%

Description: With the plant at 100% power and all controls in Normal/Auto, the Simulator Instructor will initiate a loss of normal feedwater, and following AFAS-1 or 2 signal, will fail a vital auxiliary system(s). Operator action will be requied to restore the system(s).

NOTE: Vital auxiliaries are Aux Feedwater, Condensate Transfer, Essential Chill Water, Essential Cooling Water, and Essential Spray Ponds. Various system failures can be employed to test different success paths.

SCENARIOS (Cont'd)

Number 17

Scenario Title Inadverdent Radioactive Release

Procedure Functional Recovery 41RO-1ZZ10

Plant Mode 1 Power Level 100%

Additional Initial Conditions: NONE

Simulator Initial Condition IC 9

Malfunction SG #2 Tube Rupture with Failure of Condenser Gland Seal Exhaust to Shift to through Filter Mode.

Malfunction Code PS020 Variable Setting 100

Additional Inputs:

Override exhaust filter as follows:

AUXA0010, R16, F, S16, AUXA0130, R11, F, S11, X%

Generate Hi exhaust activity with following malfunction:

NI170, H

Description: With the plant at 100% power and all controls in Normal/Auto, the Simulator Instructor will initiate a tube rupture in #2 Steam Generator. A high activity will be released via the condenser air removal gland seal exhaust vent, but the filter will fail to shift into service. Operator action will be required to terminate the radioactive release.

OBSERVER CHECKLIST INSTRUCTIONS

The observer checklist is provided for use as a guide in evaluating the effectiveness of procedures. The observer should note any deficiencies in the performance of the procedure. Some of the key items which should be observed are described below.

1st Column Title: SUFFICIENT INFORMATION

Does the instruction step provide sufficient information to allow the operator to correctly perform the action?

2nd Column Title: INSTRUCTIONS CLEAR

Is the instruction presented clearly with correct use of abbreviations and equipment nomenclature to allow the operator to quickly understand what is to be done?

3rd Column Title: SEQUENCE CORRECT

Is the instruction presented at the correct time, does it interfere with any previous actions or any actions by others?

4th Column Title: TIMING CORRECT

Does the instruction clearly identify any time limits or frequency of performance for this action or any related actions, and can the actions be completed within the given time limits?

5th Column Title: COMMUNICATIONS

Are the necessary communications prompted by the procedure? Do the communications interfere with the performance of others?

Prior to beginning observation, the checklist heading should be completed and the procedure step numbers entered.

During observation enter a check mark (/) for each column considered satisfactory, or NA for items which are not applicable. For any item which is not satisfactory or is questionable, enter an X and a brief comment to help the observer identify the problem during the review session. The observer is free to make any appropriate comments for purposes of discussion.

PALO VERDE NUCLEAR GENERATING STATION
EMERGENCY AND RECOVERY PROCEDURE VALIDATION

OBSERVER CHECKLIST	PROCEDURE NO:	PROCEDURE TITLE:	POSITION OBSERVED	OBSERVER	DATE

STEP NO.	SUFFICIENT INFORMATION	INSTRUCTIONS CLEAR	SEQUENCE CORRECT	TIMING CORRECT	COMMUNICATIONS	COMMENTS

REVIEW CHECKLIST

The lead observer will conduct a review session with the validation team. Each item listed below should be discussed. If additional comments are generated, they will be placed on the Comment Form along with a suggested resolution to the comment.

_____ 1. Is sufficient information provided in the procedure for a qualified operator to perform each required action?

_____ 2. Is sufficient information available for the operator to correct choices at all decision points?

_____ 3. Does the procedure adequately handle the operator's need for recurrent checks?

_____ 4. Does the operator use system responses or other information not in the procedure to accomplish his task which should be in the procedure?

_____ 5. Were alternate success paths used, not in the procedure, which should be identified?

_____ 6. Are the operators familiar with the labeling, abbreviations, acronyms, and symbols used in the procedure?

_____ 7. Are locations of equipment, controls, or displays that are infrequently used or in out-of-the-way places adequately described?

_____ 8. Do equipment responses correspond to what is in the procedures?

_____ 9. Does the procedure accurately predict what actually happened?

_____10. Does the procedure achieve the expected objective?

_____11. Are the procedures consistent with the manning philosphy?

_____12. When the procedure requires more than one person to perform the procedure, does the procedure define who is responsible for the activity?

_____13. Does the packaging of the procedures enhance the operator's ability to use them?

REVIEW CHECKLIST (Cont'd)

_____14. Does the operator have enough time to accomplish what is required?

_____15. At set points, does the operator have enough time to react?

_____16. When the operator is required to read displays, is there any problem or confusion apparent?

_____17. Can the operator start the equipment when specified?

_____18. Do the procedures instruct the operator to start equipment at the appropriate time?

_____19. Do communications occur at the appropriate points?

_____20. Do required communications take place without interfering with the use of the procedures?

_____21. Is the information provided in the procedures in a form that is easily used by the operator?

GUIDANCE FOR VALIDATION ACCEPTANCE

The validation team must evaluate the procedure on its effectiveness. Below are some considerations to be used to decide if the procedure validation is acceptable.

1. Did the Emergency Procedure adequately lead the operators to an appropriate Recovery Procedure?

2. Did the Recovery Procedure (if used) adequately recover the plant or provide for long term control.

3. Were there any major problems exhibited by the operators when using the procedure?

VALIDATION RESULTS FORM

Procedure Reviewed:_______________________ Number:_____________ Rev. #:_____

Date Reviewed:_______________________ Reviewers:_____________________________
____
____
____
____
____
____

The above procedure was reviewed using the PVNGS Validation Procedure.

Does the reviewer believe this validation document adequately meets the intent of ensuring the procedure being reviewed is a usable document for handling the intended situation? Yes/No IF NOT, describe the areas in which the verification was inadequate.

Consideration should be given to any comments made above. With the Operations Superintendent's signature the validation is completed.

Lead Observer Signature ______________________________ Date_______________

Operations Superintendent______________________________ Date_______________

PVNGS EMERGENCY PROCEDURE GENERATION PACKAGE

SECTION VI

EMERGENCY AND RECOVERY PROCEDURE WRITERS GUIDE

PALO VERDE NUCLEAR GENERATING STATION MANUAL	PROCEDURE NO. 70AC-0ZZ01	
PROCEDURE FORMAT, CONTENT, & NUMBERING	REVISION 3	Page 1 of 187

PREPARED BY: [illegible] DATE 5/4/82

REVIEWS REQUIRED: NUCLEAR SAFETY YES NO OPERATIONS QA YES NO

NUCLEAR SAFETY ANALYSIS REQUIRED: YES NO

TECHNICAL REVIEWER [illegible] DATE 5/4/82

OPERATIONS QA REVIEW [illegible] DATE 5-4-82

DEPARTMENT HEAD Thomas L. Cotton DATE 5/4/82

TWG REVIEW N/A DATE

PLANT REVIEW BOARD CONCURRENCE - - - - - - - - - - - - - - DATE 5-5-82

APPROVED BY: [illegible] DATE 5/5/82

DN-0909A/0123A DATE EFFECTIVE 5-10-82

SAFETY-RELATED

TABLE OF CONTENTS

APPENDICES

TABLE OF CONTENTS (Cont'd)

1.0 PURPOSE

This procedure provides guidance in the prescribed methods of station procedure format, content, and numbering. The instruction section of this procedure deals with the numbering system and general format guidelines. The detailed procedure content guidelines are provided in the form of procedure writer's guides. To meet the needs of the different types of station procedure, the writer's guides have been subdivided as appendices to this procedure. All Station Manual procedures used at PVNGS should conform to the specific format guidelines presented in the appendices and shall utilize the requirements of this procedure for their development.

2.0 REFERENCES

2.1 Implementing References

2.1.1 70AC-0ZZ02, Review and Approval of Station Procedures

2.1.2 10AC-0ZZ01, Control of the Station Manual

2.1.3 73AC-0ZZ01, Safety Related Classification of Structures, Systems, Components, and Spare Parts.

2.2 Developmental References

2.2.1 ANSI N18.7 - 1976, Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants.

2.2.2 70AC-0ZZ02, Review and Approval of Station Procedures.

2.2.3 10AC-0ZZ01, Control of the Station Manual.

3.0 DEFINITIONS AND ABBREVIATIONS

3.1 Writers guide - A document detailing the required format and content for a specific type of procedure.

3.2 Qualified individual - Personnel who have the characteristics or abilities gained through training or experience or both that enable the person to perform a required function.

4.0 RESPONSIBILITIES

Each Department Head is responsible to ensure that personnel in their department follow the guidelines outlined in this procedure.

5.0 INSTRUCTIONS

5.1 Station Manual Organization and Procedure Index

5.1.1 The procedures shall be arranged in the Station Manual per 10AC-0ZZ01, Control of the Station Manual.

5.2 Temporary Procedures

5.2.1 Whenever a need for a temporary procedure arises, the procedure shall follow the instructions as detailed in the writers guide for the type of temporary procedure needed.

5.2.2 The expiration date of the temporary procedure shall be indicated directly below the effective date on the title page.

5.3 Title Page Format Requirements

5.3.1 Each title page shall be similar in format to the title page for this procedure and shall contain the following information:

(1) Title (in capital letters).

(2) Procedure number.

(3) Page 1 of __.

(4) Revision number.

(5) Signature of approving Department Head and date of approval and date effective (and expiration date, if applicable).

(6) "SAFETY RELATED" if the procedure affects safety related systems as described in 73AC-0ZZ01, Safety Related Classification of Structures, Systems, Components, and Spare Parts in Block letters at the top and bottom of the cover sheet.

(7) Word Processing document and disk number (if applicable) (bottom left hand corner).

5.4 Table of Contents

5.4.1 Each procedure shall have a table of contents similar in format to the Table of Contents for its applicable writer's guide and shall contain the following information.

(1) Title (in capital letters).

(2) Procedure number.

(3) Revision number.

(4) Page 2 of __.

(5) A listing of all major sections and appendices and the pages they are located on.

(6) A listing of all "Instructions" or "Detailed Procedure" sub-sections and pages they are located on.

5.5 Procedure Pages

5.5.1 Each procedure page shall be similar in format to the procedure page used in this procedure and contain the following information.

(1) Title (in capital letters).

(2) Procedure number.

(3) Revision number.

(4) Page 1 of __.

(5) A line, approximately 5 typewritten spaces long, directly to the left of the step number to be used for the procedure users initials, when dictated by the applicable writers guide.

5.6 Page Numbering

5.6.1 All pages of a procedure, including appendices, shall be included in the page numbering scheme.

5.6.2 All pages shall be numbered using the "Page __ of __" format.

5.6.3 Procedure pages shall not be subnumbered (e.g., Page 4A, 5C, etc. is not permitted) except for temporary changes to procedures.

5.7 Revision Numbers

5.7.1 New procedures will be drafted as Revision "0". Each time a procedure is updated in the draft stage, the writer will sign and date the new draft's title page. Until the procedure is approved, it will be identified by its revision number and draft date (as shown adjacent to the "Prepared By" signature). The initial approval of a procedure will be Revision "0".

5.7.2 Procedures containing "Open Items" (see Section 5.11.5) will be shown as a lettered revision if the "Open Item" is required to perform the procedure or the presence of the "Open Item" in the procedure adversely affects nuclear safety, personnel safety, or equipment protection. These lettered revisions shall go through the review and approval as described in 70AC-0ZZ02, Review and Approval of Station Procedures. Lettered revision procedures shall not be implemented until the "Open Items" are resolved through the procedure change process described in 70AC-0ZZ02.

5.7.3 All revisions to an approved procedure shall use the next number in sequence (e.g., Rev 1, Rev 2, Rev 3, etc.).

5.7.4 Program/procedure revisions shall be identified by placing a vertical line in the right hand margin adjacent to the revised line(s) for the current revision changes. If it is a total rewrite of the page the vertical line need only appear across from the revision number at the top of the page - See Appendix K for an example.

5.8 Appendices

5.8.1 All supporting documents, figures, graphs, tables, lineups, etc. shall be identified as an appendix to the procedure.

5.8.2 Whenever practical, the appendix should use the procedure page format.

5.8.3. If for reasons of accuracy, clarity, and efficient use of paper, the appendix cannot be put on the procedure page format, the appendix shall have all the information that is given on the procedure page format preferrably at the top or upper right hand corner of the appendix.

5.8.4 All appendices shall be lettered and be included in the procedure page numbering scheme (i.e., Page __ of __).

5.8.5 Appendices shall be assigned a unique page numbering scheme (i.e., Page 1 of 3), in addition to the procedure page numbering scheme if the appendix will be used apart from the procedure such as valve lineups and calibration data sheets.

5.8.6 Data such as recorder tracings, photographs, marked up documents, etc., will be signed, dated, identified with the procedure number, revision number, and step number, and attached to the procedure.

5.8.7 Appendix sheets which detail required data/signoffs and are deemed by the preparer as something that is not to be changed in form or content, are to be labeled as an "Exhibit". If the data/signoff sheets can be changed, as deemed by the preparer, then the form will be labeled "Sample"; this will allow for changes in format and content so long as the original information, as a minimum, is retained. If the appendix is not labeled as "Exhibit" or "Sample", it is assumed to be "Sample".

5.9 Cautions

5.9.1 Cautions are defined as information necessary for plant or personnel safety, such as high temperatures, high voltage, safety limits.

5.9.2 Cautions shall be placed on the same procedure page as the step to which they apply, and shall be placed <u>before</u> the applicable step(s) or sections.

5.9.3 Cautions shall be boxed with all information inside written capitals.

5.9.4 The left side of the caution box will be indented 5 spaces from the body of the previous step and the right side indented 10 spaces from the right hand margin.

5.9.5 All cautions shall be formatted as shown below:

> CAUTION
>
> CAUTIONS SHOULD BE TYPED IN ALL CAPITAL LETTERS.

5.10 Notes

5.10.1 Notes are defined as information that may help to clarify the procedure step(s) or sections.

5.10.2 Notes shall be placed on the same procedure page as the step to which they apply, and shall be placed before the applicable step.

5.10.3 The word NOTE should be written in capitals and underlined.

5.10.4 The left side of the note's message will be indented 5 spaces from the body of the previous step and the right side indented 10 spaces from the right hand margin.

5.10.5 All notes should be formatted as shown below:

NOTE

Notes should be typed in initial capital letters only.

5.11 Procedure Contents

5.11.1 Each type of procedure listed in Appendix B has a writers guide detailing the general format requirements and specific guidlines necessary to provide clear, concise procedures (Appendices E through R).

5.11.2 When a completion block is needed for items such a independent verification, HOLD POINT acceptance, completed by, supervisor review, test acceptance, approval, etc., a space shall be provided adjacent to the applicable step as noted in 5.5.1(5) or, if data sheets are used, the data sheets shall provide for the required initials and/or signatures. All such spaces, excepting reviews and approval signatures, will be keyed to the procedural step requiring the initials or signature.

5.11.3 The procedure writer shall use the instruction section of this procedure and the applicable writers guide to develop a procedure that is correct in content and format.

5.11.4 All procedure writers are encouraged to utilize illustrations, figures, drawings, and other graphic methods to convey the desired message. These shall be displayed in the procedure body or as an appendix to the procedure.

5.11.5 Any portion of an approved procedure that is incomplete, i.e., contains parenthesis with a blank ( ), (later), or a best guess value (275° est.) shall be listed on an "Open Item" appendix to the procedure. This appendix shall list the page number and step that the unknown is located on. A procedure shall not be implemented if the "Open Item" is required to perform the procedure or the presence of the "Open Item" in the procedure adversely affect nuclear safety, personnel safety, or equipment protection. A procedure change shall be made to incorporate the addition of these "Open Items" if the procedure is to be performed per 70AC-0ZZ02, Review and Approval of Station Procedures.

5.11.5.1 The appendix should provide for a signoff for clearance of the open item(s) by the change initiator and provide the document change number it was done under. See Appendix R for an example of this.

5.11.6 Prior to initial approval, all procedures should undergo a walkthrough under conditions that are as close as possible to the actual conditions that the procedure will encounter when in use.

5.11.7 Procedure steps and/or associated notes or cautions pertaining to a step shall not be split between pages.

5.11.8 Procedures will use only one side of a page.

5.11.9 If there is no subject heading necessary for a particular section of a procedure, the writer shall keep the heading number and identify the fact that the section is intentionally left blank.

5.11.10 The maximum number of procedure subsections should be limited to four numbers (i.e., 5.11.3.1 is allowed, but 5.11.3.1.1 should not be allowed).

5.11.10.1 A listing or description of items to be considered by the user can be supplied as a check function. This is not to be used as a substitution for an instruction step in an implementing procedure. An example where and how this is to be used is Section 5.3.1 of this procedure.

5.11.11 When a reference is first introduced, it shall be by reference number and its noun name. For example:

90AC-0ZZ02, Test Conduct.

Not:

Reference 2.3.1

Thereafter, it may be referenced by its number (i.e., 90AC-0ZZ16). This will also be the manner references will be referred to in the section titled "References".

5.11.11.1 References listed as "Implementing" are those referenced in the body of the procedure which provide a method (or methods) to be used to perform or complete the described task. These references, when used, should supply meaningful information as:

60AC-0ZZ01, Stop Work Authority
12AC-0ZZ06, Material Storage
90AC-0ZZ02, Test Conduct and Test Exception

5.11.11.2 References listed as "Developmental" are those references which were used, in whole or part, in the development of the procedure. These references, when used, should supply meaningful information as:

FSAR, Section 17.2.4, Revision 6
10 CFR 50, Appendix J
ASME, Section I, Part PFT Winter '76 Addenda
90PR-0ZZ01, Startup Program (no revision #'s necessary)
13-M-RCP-001, Rev. 6

5.11.12 Activity descriptions as contained in Technical Manuals, Equipment Instruction Manuals, Vendor Data or Specification may be used to provide procedural steps for work activities. This information shall be transcribed into the procedure in the form of instructional steps or an appendix.

5.11.13 Signoffs documenting the completion of Testing, Inspection, Startup, and Shutdown Procedures shall include provisions for the following when used in these procedures or data sheets or in controlling Administrative Control procedures. Personnel performing testing and inspection shall be assumed qualified to a minimum of a Level I per 60AC-0ZZ06, Qualifications of Inspection and Test Personnel.

NOTE

If the acceptance criteria is present in the procedure, then no "Preparation by" signoff is necessary.

5.11.13.1 Prepared by______________________________
signature date

Signoff indicates the acceptance criteria utilized for the performance of activity was prepared by the qualified person whose signature appears on the line.

5.11.13.2 Performed by______________________________
signature & initials date

Signoff by the qualified individual performing the activity indicates that all items of the procedure have been completed or exceptions have been recorded and properly documented. All personnel performing the activity shall sign.

5.11.13.3 Reviewed by______________________________
signature date

Signoff by the qualified individual reviewing the data versus acceptance criteria to determine the success or failure of the procedure and conformance with the procedural requirements.

5.11.13.4 Approved by______________________________
signature date

Signoff by the qualified individual indicating final review, evaluation, and approval of the procedure results.

5.12 Programs

5.12.1 A program is a narrative description from an overall station point of view of how a function or responsibility is to be carried out on a Department level.

5.12.2 A program will be written in the same format as the Administrative Controls Writers Guide (Appendix F), with the exception that Section 5.0 will be entitled "Program Description" rather than "Instructions." As shown in Appendix B, programs will be designated "PR" rather than "AC".

5.13 Procedure and Program Numbering System

5.13.1 All Procedures and Programs will be identified by a unique ten character designator which will categorize each procedure in six ways.

5.13.2 The ten characters of the numbering system are explained below.

Character Order	Type of Character	Information Conveyed	Legend
First	Number (0-9)	Department Responsible for Procedure	See Appendix A
Second	Number (0-9)	Section Responsible for for Procedure	See Appendix A
Third & Fourth	Two Letter ID	Type of Procedure	Per Appendix B
Fifth	Dash (-)	Space holder	None
Sixth	Number (0-9)	Unit(s) and Facilities for which procedure is applicable	Per Appendix C
Seventh & Eighth	Two Letter ID	System Designator	Per Appendix D
Ninth & Tenth	Two Digit Number (01-99)	Sequence number which uniquely identifies the procedure among all others with the same first eight characters	None

5.13.3 Examples of a procedure number and the information that it conveys is shown below:

Procedure Title: Control of CPC Addressable Coefficients

Procedure Number: 72AC-9SB01

```
7 2 AC - 9 SB 01
| |  |     |  |  |
| |  |     |  |  Procedure sequence number is 01, among the
| |  |     |  |  72AC-9SBXX procedures
| |  |     |  Procedure deals with Reactor Protection System
| |  |     Procedure is applicable to Units 1, 2, 3 & Common
| |  Type is Administrative Control
| Responsible section is Nuclear
Responsible Department is Engineering & Technical Services
```

Procedure Title: Circulating Water Operation

Procedure Number: 41OP-1CW01.

```
4 1 OP - 1 CW 01
| |  |     |  |  |
| |  |     |  |  Procedure sequence number
| |  |     |  System designator
| |  |     Procedure applies to Unit 1
| |  Type of procedure, operating
| Responsible section, Unit 1
Responsible Department, Operations
```

PALO VERDE NUCLEAR GENERATING STATION MANUAL	PROCEDURE NO. 70AC-0ZZ01	APPENDIX T Page 1 of 41
PROCEDURE FORMAT, CONTENT & NUMBERING	REVISION 0	Page of

EMERGENCY OPERATIONS PROCEDURE WRITERS GUIDE

PREPARED BY:______________________ DATE__________

REVIEWS REQUIRED: NUCLEAR SAFETY YES NO QUALITY SECTION YES NO

NUCLEAR SAFETY ANALYSIS REQUIRED: YES NO

TECHNICAL REVIEWER______________________ DATE__________

QUALITY SECTION______________________ DATE__________

DEPARTMENT HEAD______________________ DATE__________

TWG REVIEW______________________ DATE__________

APPROVED BY:______________________ DATE__________

DN-0998V/0147V DATE EFFECTIVE__________

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1.0 PURPOSE

The purpose of this writer's guide is to ensure that an Emergency Procedure (EP) and supporting Recovery Operations (RO) procedures are written which are useable by the plant operators to prevent or mitigate plant damage during an emergency condition and that these procedures comply with the requirements of Nu Reg 0899, GUIDELINES FOR THE PREPARATION OF EMERGENCY OPERATING PROCEDURES and CEN-152, COMBUSTION ENGINEERING EMERGENCY PROCEDURE GUIDELINES.

2.0 SCOPE

This writer's guide will provide guidance for writing both the Emergency Procedure (EP) and the supporting Recovery Operations (RO) procedures.

3.0 REFERENCES

3.1 Implementing References

3.1.1 CEN-152 Rev. 01, Combustion Engineering Emergency Procedure Guidelines

3.1.2 70AC-0ZZ01, Procedure Format, Content, and Numbering

3.1.3 Plant Specific Technical Guidelines

3.2 Developmental References

3.2.1 Nug Reg 0899, Guidelines for the Preparation of Emergency Operating Procedures.

3.2.2 CEN-152 Rev. 01, Combustion Engineering Emergency Procedure Guidelines

3.2.3 Institute of Nuclear Power Operations (INPO) Emergency Procedures Writer's Guide

3.2.4 70AC-0ZZ01, Procedure Format, Content, and Numbering

4.0 DEFINITIONS

4.1 Writers Guide

The Writers guide is a set of instructions which directs the translation of technical information contained in the generic and plant specific technical guidelines into procedures that are useful to the operator. The Writers Guide is an important part of the procedure development program to insure the procedures are useable and meet the requirements of NRC and Industry guidelines.

4.2 Technical Guidelines

Technical guidelines represent the translation of engineering data derived from calculations, computer modeling and other sources into information presented in such a way that it can be used to write procedures. There are two types of technical guidelines. One type is generic to a group of reactors. The second type is plant specific.

4.3 Generic Technical Guidelines

Generic Technical Guidelines are prepared for a type of plant design and provide a general outline of the actions which are performed to mitigate the effects of accidents and transients on that type of plant. For PVNGS the Generic Guidelines are prepared by Combustion Engineering and are presented in CEN-152.

4.4 Plant Specific Technical Guidelines

Plant Specific Technical Guidelines are prepared for a particular plant and provide a detailed outline of the actions necessary to mitigate the effects of accidents and transients on that particular plant. The Plant Specific Technical Guidelines combine the information of the Generic Technical Guidelines and information which is specific for the particular plant. At PVNGS the Plant Specific Technical Guidelines are prepared by the plant staff.

4.5 Safety Function

A Safety Function is any condition or action needed to either prevent core damage or, failing to do that, to minimize radiation releases to the general public. The Safety Functions are:

Reactivity Control
RCS Inventory and Pressure Control
RCS Heat Removal
Containment Integrity
Maintenance of Vital Auxiliaries
Indirect Radioactivity Release

4.6 Function Oriented Procedures

Function oriented procedures provide guidance to the operator on how to verify the adequacy of safety functions and to restore and maintain those functions when they are degraded. Function oriented procedures are written in such a way that the operator is able to prevent or mitigate plant damage without diagnosing the specific event.

4.7 Event Oriented Procedures

Event oriented procedures are written to direct the operator's actions to prevent or mitigate plant damage during a specific event. The operator must diagnose plant conditions to determine the specific event in order to implement the appropriate event oriented procedure.

5.0 GENERAL PROCEDURE FORMAT INSTRUCTIONS

The format of the Emergency Procedure and supporting Recovery Operations procedures will be consistent with the requirements of the Procedure Format, Content and Numbering, station procedure 70AC-0ZZ01. These requirements are consistent with the guidelines in Nu Reg 0899, GUIDELINES FOR THE PREPARATION OF EMERGENCY OPERATING PROCEDURES, AND CEN-152, COMBUSTION ENGINEERING EMERGENCY PROCEDURE GUIDELINES. Section 5.0 of Procedure Format, Content and Numbering gives specific instructions and examples for the following:

5.1 Title Page

5.2 Table of Contents

5.3 Procedure Pages

5.4 Page Numbering

5.5 Revision Numbers

5.6 Appendices

5.7 Cautions

5.8 Notes

5.9 Procedure Contents

5.10 Procedure Numbering

6.0 GUIDELINES FOR THE PRESENTATION OF INFORMATION

6.1 Style

Written instructions should use standard English in concise sentences. Standard punctuation and capitalization will be used except for logic terms as described in section 6.6. Each instruction should normally be limited to directing a single action.

6.2 Vocabulary

Information should be presented using the simplest terms possible which are familiar to the operator and consistent with other plant information such as:

Equipment Labeling
Plant Operating Procedures
Plant Drawings

6.3 Abbreviations

Standard terms which are familiar to the operator such as standard engineering units and the abbreviated noun names of equipment as shown on control labels may be used in abbreviated form. Other terms should be used full length followed by the abbreviation the first time they appear in the procedure. Thereafter the abbreviated form may be used.

6.4 Tolerances

When an allowable range of values is to be specified the lower and upper limits should be given. Do not specify a tolerance as a percent or numerical deviation from the midpoint. An example of the proper statement of an allowable tolerance is shown below.

EXAMPLE

Maintain steam generator levels 50 to 80% wide range indication.

6.5 Sequence of Steps

The instructions should presented in the order in which they are to be performed. When a series of steps are to be repeated instructions explaining which steps to repeat should be included.

6.6 Conditional Statements

6.6.1 When the necessity of an action is dependent upon a condition existing the instructions should be in the following form:

IF <u>determining condition</u>

<u>dependent action</u>.

EXAMPLE

2.3.1 IF pressurizer pressure is LESS THAN 2100 psia initiate safety injection.

6.6.2 Most conditional statements in the EP should consist of checks to insure the safety functions are maintained and specify corrective action if they are not. For this purpose the conditional statements should take the following form:

1.1 Verify <u>Desired condition</u>

IF NOT:

1.1.1 Corrective action step 1
1.1.2 Corrective action step 2
as many as needed

EXAMPLE

3.1 Verify all CEA's are inserted fully.

IF NOT:

3.1.1 IF not tripped, MANUALLY TRIP THE REACTOR.

3.1.2 IF more than one CEA is not fully inserted emergency borate the reactor.

6.6.3 When a combination of necessary conditions must be used to verify safety function status the allowable combinations will be identified by using the logic terms AND or OR.

AND should be used to combine one or more conditions which must all be present.

OR should be used to combine one or more conditions which are equally satisfactory. OR will not imply mutual exclusivity but that either or both conditions will be allowable.

EXAMPLE

2.3 Verify pressurizer pressure 2100-2300 psia OR RECOVERING.

The instructions should be written to avoid multiple combinations of AND and OR terms because of possible confusion.

6.7 Method of Emphasis

6.7.1 Logic terms will be emphasized by all capital letters.

6.7.2 Conditions or positions which are principle indications of safety function status should be emphasized using all capital letters.

EXAMPLE 1

2.4 Verify core differential temperature is LESS THAN 57°F.

EXAMPLE 2

2.5 Verify pressurizer level 33-55% OR RECOVERING.

6.8 Cross-Referencing of Procedures

Because of possible confusion the cross-referencing of procedures should be minimized or strictly contolled. To avoid confusion the following guidelines will be used:

The Emergency Procedure (EP) may reference appropriate procedures by listing the procedure title and number on the Diagnostic flowchart.

Recovery Operations (RO) procedures may reference appropriate procedures based on incomplete verification of the event. When referenced the procedure title should be listed followed by the procedure number as shown in the following example.

EXAMPLE

If the above conditions do not exist proceed to the Functional Recovery Procedure, 41RP-1ZZ10.

A procedure may reference another procedure or section of a procedure when the referenced information is a complete operation and is normally used as an implementing reference in other procedures. Examples of this type of reference information are the procedures or sections referenced within the General Operations Procedures. An example of the proper use of procedure references is shown below.

EXAMPLE

When RCS temperature is less than 350°F place the Shutdown Cooling System in operation per 41OP-1SI01, Shutdown Cooling Initiation.

References, other than described above, should be avoided by including the necessary information within the procedure.

6.9 Use of Graphs, Charts and Other Illustrations

Use of graphs and other illustrations is encouraged. Their use can clearly present information which would be difficult to convey in written form. When provided illustrations should incorporate the following principles:

The illustration should be self explainatory with all axes clearly labeled and appropriate units assigned.

The readability of the graph or chart should be consistent with the purpose of the illustration.

Points of particular interest, limits etc., should be indicated and corresponding numerical values assigned.

The units assigned should be consistent with control room indicators.

6.10 Use of Flowcharts

Flowcharts may be provided in the procedures to aid the operator in decision making or to illustrate the relationship of a series of steps which are to be repeated.

The flowcharts should use standard logic symbols and be as simple as possible. To reduce possible error the flowcharts should use a common direction for like decisions. For example all YES answers to decisions would result is a veritical direction of travel to the next action and all NO answers would result in a horizontal travel direction.

The flowcharts should be identified by a descriptive title and numbered as described in 70AC-0ZZ01 section 5.0.

7.0 EMERGENCY PROCEDURE WRITER'S GUIDE

7.1 Purpose of the Emergency Procedure (EP)

The purpose of the EP is to direct the operator's actions to maintain the functions critical to plant safety and identify the appropriate Recovery Operations (RO) procedure during conditions which exceed the settings of the Plant Protection System or other upsets of a major or significant nature.

7.2 Scope of the Emergency Procedure

The EP will direct the operator's actions during any event which exceeds the settings of the Plant Protection System, or threatens to do so at the descretion of the Control Room Supervisor. The EP will provide for maintenance of the safety functions while the appropriate RO procedure is identified using a diagnostic aid. The EP will be used until an RO procedure has been successfully initiated to restore the plant to a stable condition.

CONTROL ROOM PANEL ARRANGEMENT

B01 (ELECTRIC MIMIC BUS)
B02 (ESF SYSTEMS)
B03 (CVCS MIMIC)
B04 (REACTOR REGULATING SYSTEMS)
B05 (PLANT PROTECTION AND CONDENSATE SYSTEMS)
B06 (FEEDWATER, STEAM GENERATOR AND TURBINE GENERATOR SYSTEMS)
B07 (AUXILIARY SYSTEMS)

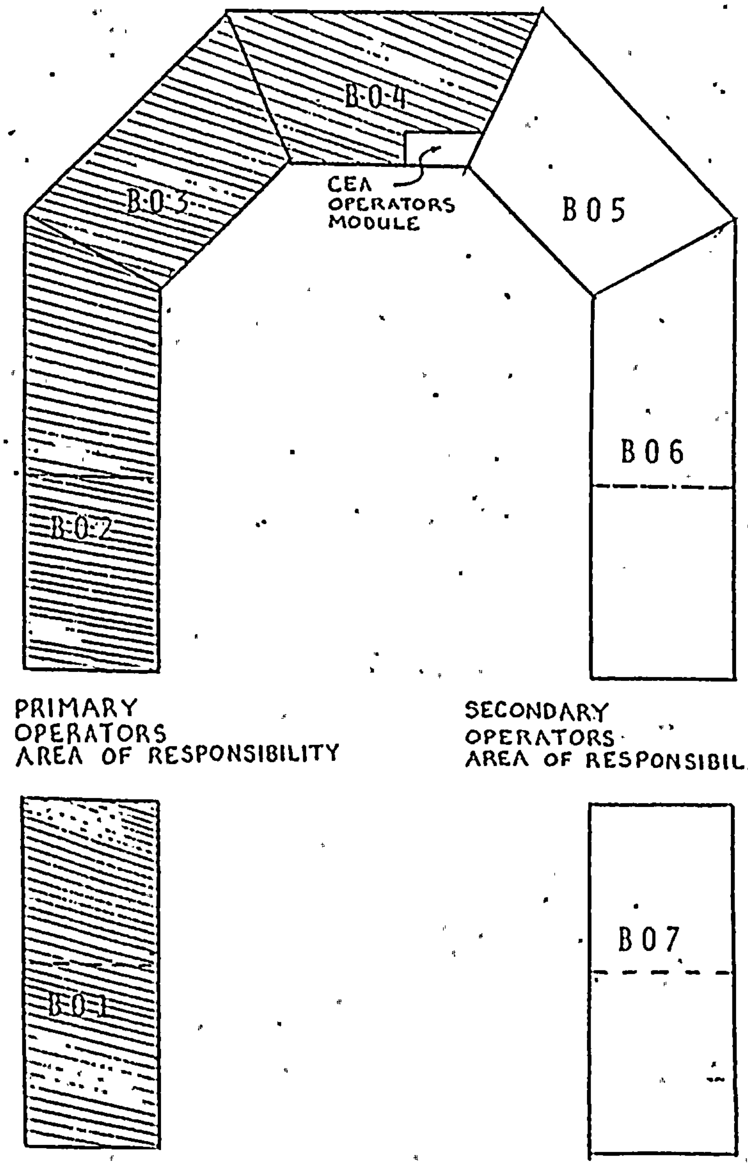

FIGURE 1

7.3 Division of Responsibility

The EP will divide the responsibility for actions between the members of the control room operating staff normally: one (1) supervisor and two (2) operators. Each of these members will be provided instructions in a separate section of the EP.

The supervisor will be titled the Control Room Supervisor (CRS) and normally may be either the Shift Supervisor or the Assistant Shift Supervisor.

The operators will each be responsible for a portion of the control room boards as shown in figure 1. One operator will be designated as Primary Operator and the other as Secondary Operator. These titles reflect the general type of controls for which they are responsible and do not indicate any hierarchy of authority or importance.

7.4 Format of the Emergency Procedure

7.4.1 The general requirements for the Emergency Procedure (EP) format are described in 70AC-0ZZ01, section 5.0.

7.4.2 The EP will be a single functional oriented procedure which is applicable to any condition which exceeds the settings of the Plant Protection System and other upsets of a major or significant nature.

NOTE

Primary Operator and Secondary Operator are titles which indicate the assigned areas of responsiblity.

7.4.3 The EP will consist of both written instructions, in simple sentence form, and flowcharts. The written instructions will be divided into three sections:

Section 1.0 Control Room Supervisor Actions
Section 2.0 Primary Operator's Actions
Section 3.0 Secondary Operator's Actions

Flowcharts will be provided as appendices to aid the operators in diagnosing the event and maintaining safety functions.

7.4.4 Typing Instructions

All procedure pages and appendices shall be typed on standard PVNGS procedure forms. When it is not possible to include appendix material on the standard form the appendix should contain all the information which would be included on the standard form.

The procedure should have a standard PVNGS procedure cover sheet.

The Objective Statement and Table of Contents should appear on page 2 of the procedure.

The Objective Statement will be proceeded by the title <u>OBJECTIVE</u>, in all capital letters and underlined, centered on the page.

The Table of Contents will be proceeded by <u>TABLE OF CONTENTS</u> in all capital letters and underlined, centered on the page.

The Table of Contents will list the major sections of the procedure as they appear, the section and appendices titles will be in all capital letters.

Each major section of the procedure, section 1.0, 2.0, 3.0, etc., will list that sections title in all capitals and underlined.

Triple spacing will be used between all numbered steps.

Use of these requirements is shown in the following example.

EXAMPLE

OBJECTIVE

This procedure is intended for use following a major event. A major event is defined as any automatically initiated plant protective signal, e.g., reactor trip, SIAS, CIAS, CSAS, AFAS or MSIS.

The procedure objective is to minimize and/or prevent core damage during a plant transient or accident. This is accomplished by providing direction to the Control Room staff for monitoring and maintiaining safety functions. These functions ensure core integrity is maintained, while allowing time necessary to properly diagnose the problem and select the proper procedure for recovery.

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1.0 CONTROL ROOM SUPERVISORS ACTIONS

NOTE

Performance of this procedure is required following a major event. A major event is defined as any automatically activated plant protective signal, e.g., reactor trip, SIAS, CIAS, CSAS, AFAS or MSIS.

This procedure may also be used at the discretion of the Control Room Supervisor, if he feels tripping the reactor is warranted.

1.1 Direct the operators to maintain safety functions.

1.2 Determine the proper procedure for recovery by performing the Diagnostic Flow Chart, Appendix A.

1.2.1 Circle the answer to each question on the Diagnostic Flow Chart.

1.2.2 When an action is directed by the Diagnostic Flow Chart immediately direct an operator to perform the action or verify the action was automatically performed.

1.2.3 When the appropriate procedure has been selected implement the procedure.

No portion of a numbered step shall be split between procedure pages.

When possible all subsections of a section will appear on the same page. This may require leaving a blank space at the end of a page to allow the next section to begin on the following page. This blank space is preferable over having the subsections not all on one page.

Any NOTE or CAUTION will appear on the same page as the instruction to which applies and will preceed the instruction.

7.5 Objective Statement

The procedure writer is to provide an objective statement which clearly describes when the EP is to be used and what is intended to be accomplsihed by performance of the procedure. The objective statement will be on the second page of the procedure directly before the Table of Contents.

EXAMPLE

The Emergency Procedure is intended for use during any condition which exceeds the settings of the Plant Protection System settings or which treatens to do so, at the discretion of the CRS. The Objectives of this procedure are to prevent or minimize plant damage and release of radioactivity and to identify the appropriate Recovery Operations procedure during an emergency condition.

7.6 Table of Contents

The Table of Contents will be as described in 70AC-0ZZ01, section 5.4, and section 7.4.4 of this guide.

7.7 Control Room Supervisor (CRS) Actions

NOTE

The CRS actions will be listed in section 1.0 of the EP and a diagnostic flowchart which will provided as Appendix A to the EP.

7.7.1 Written Instructions

The CRS instructions should direct the CRS to have the operators maintain the safety functions. The CRS should be directed to complete the diagnostic flowchart tracking the path that is followed and insuring any actions directed by the flowchart are completed. The CRS should be directed to implement the Recovery Operations procedure when it has been identified.

7.7.2 Diagnostic Flowchart

A diagnostic flowchart should be provided, as an appendix to the EP to aid the CRS in identifying the appropriate RO procedure. The flowchart should be as simple as possible using standard logic symbols and a common direction for like answers. The flowchart should have an entry point which does not require the CRS to categorize the type of event. The flowchart should use a systematic check of major plant parameters to identify the type of event and the appropriate Recovery Operations procedure. The flowchart should provide a method for the CRS to trace his decision path through the flowchart.

To design such a flowchart the procedure writer must put on paper the mental process which an experience operator would use to determine the cause of a plant trip. This process should consist of a series of checks and attendant possibilities followed by additional checks which will narrow the remaining possibilities, until the event has been tentatively identified.

7.8 Primary and Secondary Operator's Actions

NOTE

The Primary and Secondary Operator's actions will be listed in sections 2.0 and 3.0 respectively of the EP, and will be illustrated by flowcharts which are appendices of the EP.

7.8.1 Written Instructions

7.8.1.1 The written instructions should direct each operator in maintaining the safety functions associated with the equipment within his area of responsibilities as shown on figure 1. The instructions should be in simple sentence form and include the actions necessary to restore the

safety functions if degraded. The instructions should also incorporate any communciation required to inform the CRS or the other operator of conditions. The instructions should use logic terms as described in section 6.6 and contain specific values of the parameters to be checked. The detail provided in the written instructions should be appropriate for use by a fully qualified control room operator. The procedure writer must be careful to insure unnecessary details do not cloud the major steps of the instructions, to accomplish this no detailed instructions should be provided for simple operations.

EXAMPLE

No detailed instructions should be provided for:

Starting/stopping a pump
Initiating an ESFAS signal
Operating Atmospheric Dump Values
Transferring electrical busses.

The written instructions should follow the directions given in the Plant specific Technical Guidelines (PSTG). A note explaining any actions which are to be repeated should be provided preceeding the effected instructions.

7.8.1.2 Use of the Emergency Proecedre Guidelines

The Plant Specific Technical Guidelines (PSTG) and CEN-152 standard Post Trip actions are the basis for the operator's actions. The procedure writer must divide the safety function checks and corrective actions listed in the guidelines between the Primary and Secondary Operator's instructions.

7.8.2 Operator Actions Flowchart

Each operator should be provided with a flowchart which illustrates the safety function actions to be performed. These flowcharts should be included as appendices to the EP. Each flowchart should be made as simple as possible using standard logic symbols and a common direction for like answers. The flowchart should show each action in order of the written instructions and include provisions for repetition.

7.9 Personnel Indoctrination

A personnel indoctrination may be included as an appendix to the EP. This indoctrination would contain additional information about the EP and could be useful in training operators to use the EP. Suggested topics which could be included are:

Communications during emergency conditions
Division of responsibilities
Use of Control Room Indication
Use of the EP flowcharts

8.0 RECOVERY PROCEDURE WRITER'S GUIDE

8.1 Purpose of Recovery Operations (RO) Procedures

The purpose of the RO procedures is to direct the operator's actions in maintianing the safety functions while implementing a strategy to recover the plant to a safe condition from which normal operating procedures may be used.

8.2 Scope of the RO Procedures

The RO procedures will direct the operator's actions to place the plant in a stable shutdown condition from which normal plant procedures may be used to either restart the unit or to place the plant in Cold Shutdown, Mode 5.

8.3 Format for Event Oriented Recovery Operations Procedures

8.3.1 The Event Oriented Recovery Operations (RO) procedures will use a format which divides the responsibilities for actions between the members of the control room staff. The procedure body will be used by the Control Room Supervisor (CRS) to

manage overall response to the accident. The Primary Operator and Secondary Operator will use detailed instructions which are provided as appendices of the RO procedure.

The Event Oriented Recovery Operations procedures format is as follows:

A standard PVNGS procedure cover sheet
An Objective Statement
A Table of Contents

Section 1.0 VERIFICATION OF EVENT

Verification of conditions which should exist for the particular event and instructions to follow if these conditions do not exsit.

Verification of conditions which may exist for the particular event.

Verification of conditions which should not exist because they indicate a problem beyond the scope of the RO and instructions to follow if these conditions exist.

Section 2.0 INITIATION OF THE EMERGENCY PLAN

Section 3.0 and all following sections will be the major actions of the procedure.

Appendices A and B will be the Primary and Secondary Operator instructions, respectively. Both operators actions will be listed on the same page in vertical columns separated by a center dividing line. The instructions for both operators will be horizontally aligned for each major section of the procedure. Appendices A and B will be identical except for page numbering an the appendix letter.

Additional appendices will be provided as necessary.

The Recovery Operations procedures will be individually packaged for ease of use. Each procedure will be contained in a folder which will allow the operartor to easily handle the procedure and rapidly find any needed appendix. The Objective Statement and Table of Contents wil be attached to the inside front cover for ease of reference. This information will also be on page two (2) of the procedure. Indexed pockets behind the procedure will be provided on the right side of the opened folder. Each appendix will have a separate pocket with an identifying index tab to allow the operator to rapidly find the appendices. The package will be assembled to prevent the contents from falling out of the package during use.

8.3.2 Typing Instructions

8.3.2.1 Body of the Procedure

All procedure pages and appendices will be typed on standard PVNGS procedure page forms. When it is not possible to include appendix material on the standard form the appendix should contain all the information which is required on the standard form.

The procedure should have a standard PVNGS procedure cover sheet.

The Objective Statement and Table of Contents should appear on page 2 of the procedure.

The Objective Statement will be preceeded by the title OBJECTIVE in capital letters and underlined, centered on the page.

The Table of Contents will be preceeded by TABLE OF CONTENTS in all capital letters centered on the page.

The Table of Contents will list the body of the procedure, as the Control Room Supervisor Action. The section and appendices titles will be listed in all capital letters and separated by double spacing.

Page two (2) of the procedure, containing the Objective Statement and Table of Contents will also appear on the inside front cover of the procedure folder.

All major sections of the procedure will appear in all capital letters.

Triple spacing will separate all numbered steps of the procedure.

Use of these requirements is shown in the following example.

EXAMPLE

OBJECTIVE

This procedure assumes a loss of Secondary Coolant has occurred and prescribes the steps necessary to recover from this accident. Major emphasis is placed on monitoring adequate core cooling, keeping the RCS subcooled and isolating the Steam Generator which has a loss of Secondary Coolant. A loss of Secondary Coolant is defined as a loss (break) downstream of the double check valves in the Economizer line and upstream of the MSIV's.

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_____ 1.0 VERIFICATION OF LOSS OF SECONDARY COOLANT

1.1 The following conditions will exist.

_____ Decreasing pressure in at least one steam generator.

_____ Decreasing RCS pressure.

1.2 If the above conditions do not exist proceed to the Functional Recovery Procedure, 41RO-1ZZ10.

1.3 The following conditions indicate a Loss of Secondary Coolant and may exist.

_____ Increasing continment pressure.

_____ Increasing containment temperature and humidity.

_____ SIAS/CIAS.

_____ MIAS.

_____ AFAS.

_____ Rapid change in RCS temperature.

_____ Pressurizer low level.

1.4 If any of the following conditions exist, proceed to the indicated procedure or to the functional recovery procedure unless the indication is determined to be suspect.

_____ CTMT RAD Hi - Loss of Coolant Accident, 41RO-1ZZ07.

_____ PZR level not recovering - Loss of Coolant Accident, 41RO-1ZZ07.

No portion of a numbered step shall be split between procedure pages.

When possible all subsections of a section will appear on the same page. This may require leaving a blank space at the end of a page to allow the next section to begin on the following page. This blank space is preferable over having the subsections not all on one page.

Any NOTE or CAUTION will appear on the same page as the instruction to which applies and will preceed the instruction.

8.3.2.2 Operator Actions Appendicies

The Operators Actions will be typed in vertical columns divided by a heavy vertical centerline. The paper will be 8.5" long by 14" wide. The information normally appearing on the PVNGS procedure form will be given at the top of the sheet.

The major sections i.e., 1.0, 2.0, 3.0 etc., will be horizontally aligned between each operator's instructions. The first letter of each word in the major section will be capitalized. The subsections, i.e. 1.1, 1.2, 1.3, etc., need not be horizontally aligned.

Triple spacing will be used between all numbered sections. Double spacing will be used to separate a subsection and information listed under that subsection.

Use of these requirements is shown in the following example.

PV216-000 REV.8/82

EXAMPLE

REDUCED FROM 8 1/2 by 14" SIZE

PALO VERDE NUCLEAR GENERATING STATION	Procedure No:	Title:	Rev:		APPENDIX

PRIMARY OPERATOR

1.0 Maintain Safety Functions - Control Room Supervisor (CRS) Verifies Validity of Event.

2.0 Maintain Safety Functions - CRS initiates Emergency Plan.

3.0 Maintain Safety Functions - CRS Determines Which Steam Generator is affected by the Loss of Secondary Coolant.

SECONDARY OPERATOR

1.0 Maintain Safety Functions - Control Room Supervisor (CRS) Verifies Validity of Event.

2.0 Maintain Safety Functions - CRS Initiates Emergency Plan.

3.0 Identify the SG affected by the Loss of Secondary Coolant.

3.1 Provide the CRS with information as requested:

SG with lowest pressure #____
SG with lowest level #____
SG with highest feed flow #____
SG with highest steam flow #____

3.2 If directed by CRS, manually initiate MSIS and close the following valves:

SG-1 SG-HV-41 SG 1 HOT LEG BLOWDOWN STOP VLV., on B07.
SG-HV-43 SG 1 COLD LEG BLOWDOWN STOP VLV., on B07.
SG-HV-200 SG 1 CHEMICAL INJ. ISOL. VLV., on B06.

SG-2 SG-HV-42 SG 2 HOT LEG BLOWDOWN STOP VLV., on B07.
SG-HV-44 SG 2 COLD LEG BLOWDOWN STOP VLV., on B07.
SG-HV-201 SG 2 CHEMICAL INJ. ISOL. VLV., on B06.

3.3 Utilize Atmospheric Steam Dump Valves as necessary to maintain SG pressure below 1253 psia.

8.4 Format for the Functional Recovery Operations Procedure

8.4.1 The Functional Recovery Operations procedure will consist of the procedure body which will be used by the CRS to manage overall response to the accident and several appendices which will be used by the operators under directions from the CRS.

The Functional Recovery Operations Procedure will include:

A standard PVNGS procedure cover sheet
An Objective Statement
A Table of Contents
A Body of Instructions
Supporting Appendices

The Functional Recovery Procedure will be individually packaged for ease of use. The procedure will be contained in a folder which will allow the operartor to easily handle the procedure and rapidly find any needed appendix. The Objective Statement and Table of Contents wil be attached to the inside front cover for ease of reference. This information will also be on page two (2) of the procedure. Indexed pockets behind the procedure will be provided on the right side of the opened folder. Each appendix will have a separate pocket with an identifying index tab to allow the operator to rapidly find the appendices. The package will be assembled to prevent the contents from falling out of the package during use.

8.4.2 Typing Instructions

All procedure pages and appendices shall be typed on standard PVNGS procedure forms. When it is not possible to include appendix material on the standard form the appendix should contain all the information which would be included on the standard form.

The procedure should have a standard PVNGS procedure cover sheet.

The Objective Statement and Table of Contents should appear on page 2 of the procedure.

The Objective Statement will be proceeded by the title <u>OBJECTIVE</u>, in all capital letters and underlined, centered on the page.

The Table of Contents will be proceeded by TABLE OF CONTENTS in all capital letters and underlined, centered on the page.

The Table of Contents will list the major sections of the procedure, section 1.0, 2.0, 3.0, etc., as they appear in the procedure. The section and appendices titles will be listed in all capital letters and separated by double spacing.

Page two (2) of the procedure, containing the Objective Statement and Table of Contents will also appear on the inside front cover of the procedure folder.

All major sections of the procedure will appear in all capital letters.

Triple spacing will separate all numbered steps of the procedure.

Use of these requirements is shown in the following example.

EXAMPLE

OBJECTIVE

This procedure is intended for use following major event. A major event is defined as any automatically initiated plant protective signal, e.g., reactor trip, SIAS, CIAS, CSAS, AFAS or MSIS.

The procedure objective is to minimize and/or prevent core damage during a plant transient or accident. This is accomplished by providing direction to the Control Room staff for monitoring and maintiaining safety functions. These functions ensure core integrity is maintained, while allowing time necessary to properly diagnose the problem and select the proper procedure for recovery.

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1.0 CONTROL ROOM SUPERVISORS ACTIONS

NOTE

Performance of this procedure is required following a major event. A major event is defined as any automatically activated plant protective signal, e.g., reactor trip, SIAS, CIAS, CSAS, AFAS or MSIS.

This procedure may also be used at the discretion of the Control Room Supervisor, if he feels tripping the reactor is warranted.

1.1 Direct the operators to maintain safety functions.

1.2 Determine the proper procedure for recovery by performing the Diagnostic Flow Chart, Appendix A.

1.2.1 Circle the answer to each question on the Diagnostic Flow Chart.

1.2.2 When an action is directed by the Diagnostic Flow Chart immediately direct an operator to perform the action or verify the action was automatically performed.

1.2.3 When the appropriate procedure has been selected implement the procedure.

No portion of a numbered step shall be split between procedure pages.

When possible all subsections of a section will appear on the same page. This may require leaving a blank space at the end of a page to allow the next section to begin on the following page. This blank space is preferable over having the subsections not all on one page.

Any NOTE or CAUTION will appear on the same page as the instruction to which applies and will preceed the instruction.

EMERGENCY PROCEDURE GUIDES AND

CORRESPONDING PROCEDURE STEPS

Plant Specific Technical Guidelines	Procedure
1.________	1.________
2.________	2.________ 3.________ 4.________ 5.________
3.________	6.________ 7.________

FIGURE 2

8.5 Use of the Emergency Procedure Guidelines

8.5.1 The CE Generic Guidelines, CEN-152 and the Plant Specific Technical Guidelines (PSTG) provide the outline for each RO procedure. The strategy for each procedure is given in these guidelines and should be preserved in the RO procedures to maintian validation.

8.5.2 The procedure writer must convert each major step of the guidelines into an instruction step. Each major step in the guidelines may yield one or more actual instruction steps as illustrated in figure 2. These instruction steps will direct the operator in completing the major step from the guidelines. The procedure writer must consider specific plant equipment which must be operated to complete the major step or which may provide additional support to the event strategy.

8.5.3 The list of precautions and the suggestion for placement in each guideline should be considered to provide additional information in the procedure. The information in the precautions may be included within a step or listed as a separate CAUTION as appropriate.

EXAMPLE

Loss of Coolant Accident Guideline Major Step:

Maintain RCS cooling by supplying feedwater to the steam generators and discharging steam to the condenser or atmosphere.

Small Loss of Coolant Accident RO Procedure Instructions:

CAUTION

HIGH FEED FLOW RATE WILL COOL THE RCS EXCESSIVELY WHICH WOULD CAUSE A SAFETY INJECTION ACTUATION. A MODERATE FEED RATE IS SUFFICIENT TO MAINTAIN RCS HEAT REMOVAL, AND WILL NOT AFFECT NATURAL CIRCULATION FLOW.

3.0 MAINTAIN STEAM GENERTOR PRESSURE AND LEVEL

3.1 Direct the secondary operator to start one of the following auxiliary feed pumps to supply feedwater to the steam generators.

Listed in order of preference:

AFN-P01, Non-Class Electrical Driven Pump, if no MSIS
AFB-P01, Class Electric Driven Pump
AFA-P01, Class Steam Driven Pump

3.2 Shutdown the main feedwater pumps.

CAUTION

ATTEMPTING TO REMOVE HEAT FROM THE RCS VIA THE STEAM GENERATORS MAY CREATE VOIDING PROBLEMS IN THE RCS.

CAUTION

STEAM GENERATOR PRESSURE MUST BE MAINTAINED LESS THAN 1253 PSIA TO PREVENT SAFETY VALVE ACTUATION.

3.3 Control Steam Generator pressure below 1253 psia using the Steam Bypass Control System or Atmospheric Dumps.

3.3.1 Monitor Reactor (Rx) vessel level carefully to determine if cooldown is causing voiding and should be delayed until conditions stabilize.

3.4 Slowly restore Steam Generator level to greater than 35% W.R.

8.6 Instructions for Writing Event Oriented Recovery Operations Procedures

8.6.1 Provide an Objective Statement which describes the conditions to which the procedure applies and what the procedure is to accomplish.

EXAMPLE

OBJECTIVE

This procedure assumes that a small Loss of Coolant Accident (LOCA), which is not large enough to cause a Containment Isolation Actuation Signal, has occured. The objectives of this procedure are to: provide adequate core cooling, prevent the release of radioactivity, and to shutdown the plant for repairs.

8.6.2 Verification of Event

From the CE Generic Guidelines (CEN-152) and plant reference documents determine the conditions which may be used to verify that the specific event addressed by the RO exists and any conditions which are likely to indicate a more extensive problem.

The conditions used for verification should be primary or key indications expected to exist because of the specified event or which if they exist indicate a problem beyond the scope of this RO.

Instructions should be provided if the use of a different procedure is indicated, otherwise the operators should be directed to begin their procedure actions.

EXAMPLE

_____ 1.0 VERIFICATION OF LOSS OF SECONDARY COOLANT

1.1 The following conditions will exist.

_____ Decreasing pressure in at least one steam generator.

_____ Decreasing RCS pressure.

1.2 If the above conditions do not exist proceed to the Functional Recovery Procedure, 41RO-1ZZ10.

1.3 The following conditions indicate a Loss of Secondary Coolant and may exist.

- ____ Increasing continment pressure.
- ____ Increasing containment temperature and humidity.
- ____ SIAS/CIAS.
- ____ MIAS.
- ____ AFAS.
- ____ Rapid change in RCS temperature.
- ____ Pressurizer low level.

1.4 If any of the following conditions exist, proceed to the indicated procedure or to the functional recovery procedure unless the indication is determined to be suspect.

- ____ CTMT RAD hi - Loss of Coolant Accident, 41RO-1ZZ07.
- ____ PZR level not recovering - Loss of Coolant Accident, 41RO-1ZZ07.
- ____ S.G. Blowdown Rad level increasing - S.G. Tube Leak, 41RO-1ZZ06.
- ____ Condenser off Gas Rad level increasing - S.G. Tube Leak, 41RO-1ZZ06.

1.5 Provide the operators with their procedure and direct them to complete the procedure thru Step 3.0.

8.6.3 Instructions should refer to the Emergency Plan, as appropriate.

8.6.4 Body of the Instructions

NOTE

The body of the instructions are the actual steps used to recover from the event after verification and intiating the Emergency Plan and usually begin with section 3.0.

8.6.4.1 The body of the instructions will be used by the CRS to manage the overall response to the accident. The level of detail in these instructions should be consistent with this use. A brief statement of the major action to be performed should be given as the section heading. A description of the substeps necessary to accomplish the major action should be listed under the section heading. These substeps should be brief statements of what is to be done without the details of how it is to be done. If the CRS is to direct a particular operator to perform an action this should be stated. These instructions should be derived from the guidelines as described in section 8.5.

EXAMPLE

9.0 RESTORE SUPPORT SYSTEMS

9.1 Restore NC, WC and IA.

9.2 Operate the Containment Air Cooler as available to Lower Containment Temperature and Pressure.

9.3 Direct the Primary Operator to begin and maintain the Water Inventory Record, Appendix H.

8.6.4.2 When necessary for the CRS to direct personnel outside the control room, such as an Auxiliary Operator, the instructions should include sufficient information to insure these actions are efficiently completed. Examples of the types of information which should be provided are: the location of infrequently operated equipment, number of operators and the time needed to complete the action, and any special equipment needed.

8.6.4.3 Safety function checks should be included at appropriate points throughout the body of instructions. The purpose of these checks is to ensure the safety functions are maintained while the operator's attention is focused on the particular event and that any other problems which may develop during the recovery are promptly identified and corrected.

The safety function status checks should be performed as frequently as possible to accomplish the purposes described above. The procedure writer must carefully evaluate the placement of these checks to allow the operators time to complete the checks without interfering with the recovery actions. The safety function checks should be placed in the instructions at natural breaks in the recovery actions. These natural breaks may include points when the operators are waiting for plant response to previous actions before beginning the next stage of recovery.

EXAMPLE

Loss of Secondary Coolant

1.0 VERIFICATION OF LOSS OF SECONDARY COOLANT

2.0 INITIATE THE EMERGENCY PLAN

3.0 IDENTIFY THE AFFECTED STEAM GENERATOR

4.0 ISOLATE THE FAULTY SG

5.0 RCS STABILIZATION

*6.0 PLANT STATUS POINT

7.0 VERIFICATION OF SAFETY SIGNALS

8.0 RESET SAFETY SIGNALS

9.0 RESTORE SUPPORT SYSTEMS

10.0 RESTART RCPS

*11.0 PLANT STATUS POINT

12.0 INFORM DUTY MANAGER

13.0 BEGIN PLANT COOLDOWN

*Safety Function Verification Checks

The location of safety function checks may be more accurately determined during a procedure walkthrough.

The safety function checks should be performed in Plant Status Points where all the safety functions are verified along with other plant conditions which indicate the effectiveness of the recovery actions. The procedure writer must use the guidelines and other plant references to determine what checks are to be used to confirm proper plant response to recovery actions and indications of possible problems.

8.6.4.4 Operator's Instructions

The Primary and Secondary Operator's instructions will be provided as appendices to the RO as described in section 8.3. The operator's instructions must be closely coordinated with the body of the procedure which the CRS uses to manage the overall response to the event. Major step numbering for the operators will be the same as that used for the body of the procedure. The operator's instructions will direct each operator's action for each step of the RO procedure.

If a particular operator has no specific actions in a step he should be instructed to maintain the safety functions and given a brief summary of what is being done in that step. Steps which are dependent on CRS directions should be identified by stating that the action is only to done if directed. Any other communications required should also be built into the instructions.

The operator instructions should be written in detail consistent with the needs of a fully qualified control room operator. Detailed instructions are not required for operations which mainly consist of a single action or operations which are simple and routine in nature.

EXAMPLE

No detailed instructions should be provided for:

Starting/stopping a pump
Initiating an ESFAS signal
Operating Atmospheric Dump Valves
Transferring electrical busses.

The procedure writer should be careful to prevent unnecessary details from clouding the instructions. Equipment numbers should only be included to avoid confusion with similar equipment. When a valve is to be specifically identified it's system designator and number should be listed first, followed by it's noun name as shown on the control label. It is not necessary to list the valve control handswitch number as this information is redundant.

EXAMPLE

SG-HV-41 SG 1 HOT LEG BLOWDOWN STOP VLV.

8.6.4.5 The procedure writer is encouraged to utilize tables, charts, lists or other forms of condensed information in the RO procedures. These types of information may be provided as appendicies to the RO and referenced as appropriate in the body of instructions when the bulk of the information may interfer with the flow of the instruction steps, or if the information is to be used away from the procedure. Types of information which may be provided as appendices are shown in the following example.

EXAMPLE

Lists used to verify actuation of safety systems.

Valve alignment lists.

Equipment status checklists.

8.7 Instructions for Writing the Functional Recovery Operations Procedure.

8.7.1 Provide an Objective Statement which describes the conditions to which the procedure applies and what the procedure is to accomplish.

EXAMPLE

OBJECTIVE

This procedure is to be used under emergency conditions when the specific Recovery Operations procedure cannot be determined or properly applied to existing plant conditions. The objective of this procedure is to prevent or mitigate plant damage and radioactivity release by restoring degraded safety functions.

8.7.2 Body of the Instructions.

The procedure writer should provide instructions to the CRS to determine the status of the safety functions as provided in the Plant Specific Technical Guidelines an CEN-152. The instructions should aid the CRS in directing the operator's actions to maintain the safety functions and restore those safety functions which are in jeopardy. The instructions should provide guidance in restoring unfulfilled safety functions. Alternate means should be suggested for achieving each safety function.

Because this procedure is intended for use under conditions which cannot be defined or clearly categorized the instructions must provide broad guidance and include many possible alternatives. All available resources should be considered; if the operators could rely on normal operation and configurations of safety equipment this procedure would not be needed.

To avoid burdening the operators with a bulk of detailed instructions for each possibility the instructions should provide guidance in the form of possible success paths to achieve each safety function. This guidance may be provided in illustrated form depicting the possible success paths.

This procedure should be written for use by a fully qualified operator trained in the use of this procedure. The procedure writer must be careful to ensure the details or bulk of the instructions do not cloud the concepts which they are to convey.

PVNGS EMERGENCY PROCEDURE GENERATION PACKAGE

SECTION VII

EMERGENCY AND RECOVERY PROCEDURE TRAINING PROGRAM

6193

Arizona Public Service Company

P.O. BOX 21666 • PHOENIX, ARIZONA 85036

PVNGS-JRB-M83-657

DATE: April 26, 1983

TO: Steven R. Frost

Sta.# 1742

Prepared by: A. C. Dressler/K. E. Carlisle

Reviewed by: F. E. Hicks

Approved by: W. F. Fernow

Approved by: J. R. Bynum

SUBJECT: Licensed Operator Training Section Response to Paragraphs 3.4 and 7.2 of NUREG 0899

File: 83-001-762

The attachment to this memorandum represents the Licensed Operator Training Section's response to paragraphs 3.4 and 7.2 of NUREG 0899.

Definitions:

1. NUREG 0899, "Guidelines for the Preparation of Emergency Operating Procedures".
2. Paragraph 3.4, "Training for Initial Implementation of Emergency Operating Procedures".
3. Paragraph 7.2, "Contents of the Procedure Generation Package".

Attachment Title:

Description of method used to train the initial group of Operators in the use of Emergency and Recovery Operations Procedures.

ACD/cgc

cc: J. Vorees

DESCRIPTION OF METHOD USED TO TRAIN THE
INITIAL GROUP OF OPERATORS IN THE USE OF
EMERGENCY AND RECOVERY
OPERATIONS PROCEDURES

Who Will Be Trained

Emergency Operating and Recovery Procedures training will be provided to all License Candidates. Shift Technical Advisors (STA's) will participate in this training while fulfilling the role of STA, during plant emergencies.

Method For Deriving Training Objectives

Objectives are currently derived by instructors' (master performers) evaluation of the following sources:

1. Emergency and Recovery Operations Procedures
2. Station Emergency Plan
3. Chapter 13.2 of the PVNGS FSAR
4. Chapter 15 of the PVNGS FSAR
5. T.M.I. Lessons Learned Implementation Report
6. Post Three Mile Island Training Materials, Volumes I and II
7. NSSS Transient Performance
8. Response of control room staff to plant emergency exercises conducted on the PVNGS plant specific simulator.

The resulting Emergency and Recovery Operations Training Program which was developed to meet these objectives consists of a classroom lecture on a particular procedure followed by a simulator session which incorporates the topics of the classroom lesson. This training is normally conducted during the final four (4) weeks of the eight (8) week simulator course for License Candidates.

When the Emergency and Recovery Procedures are approved, a formal analysis will be conducted to ensure that the objectives match the required tasks. During the analysis, the behaviors, conditions, and standards which are required by the task will be translated into matching terminal objectives, enabling objectives, and entry skills.

These objectives will be written so as to clearly communicate what must be learned and may incorporate the following major elements:

1. Conditions under which a task is to be performed.
2. The performance, behavior, or action which the trainee is expected to demonstrate.
3. The number, proportion, or percentage of correctness which the trainee must meet, the tolerances within which the trainee must work, and the time allowed to perform the task.

Training Prerequisite Identification

Students who participate in Emergency and Recovery Operations Procedures Training are expected to have completed the following Prerequisite Training courses:

1. Nuclear Steam Supply Systems Lectures
2. Balance of Plant System Lectures
3. Nuclear Fundamentals Lectures
4. Four weeks of Simulator Training which incorporates the topics of control board familiarity and normal plant operations.

Deviations from prerequisite training will be made on an individual case by case basis after considering the student's previous experience and training.

Prerequisite testing may be administered to ensure that the students have learned the required entry-level skills from this previous coursework and/or experience.

Matching Objectives To Methods and Media

After the training objectives are fully developed, they will be analyzed using learning strategy analysis to determine the types of strategies required, i.e. signals, chains, multiple discriminations, concepts and principles. These strategies lead directly to scientifically validated teaching tactics. The identified teaching tactics will be analyzed to ensure that the learning consequences are appropriate. Media and presentation technologies will be used as needed to correctly implement these teaching tactics. It is expected that many of these objectives will be performance oriented and therefore be best met using the PVNGS Simulator.

Instructional Materials

The use of lesson plans, student lesson notes, and simulator scenarios will serve to standardize course content, thereby ensuring all students are trained to established course objectives.

The following media are available for use in presenting the information and will be selected to match the previously identified teaching tactics:

1. Simulator Scenarios
2. Student Handouts
3. Station Operating Procedures
4. Emergency and Recovery Operations Procedures
5. Station Emergency Plan
6. Technical Specifications
7. Visual Aids (overheads, slides, chalkboard, white board, video tape, etc.)

Instructor Qualification

Instructors who teach transient and accident training will be examined to the Senior Reactor Operator level. Additionally, Instructors will be evaluated to ascertain the possession of instructional skills conducive to effective training and will receive instructional design and presentation training. The initial group of instructors who have conducted Emergency and Recovery Operations Procedures Training have become familiar with the procedures through the following mechanisms:

1. Attendance at briefings provided by the procedure development team.
2. Providing of simulator support to the procedure development team.
3. Exercising of procedures on the PVNGS simulator.
4. Self-study.

5. Researching material for lesson plans, student lesson notes, and simulator scenario preparation.

Subsequent groups of instructors who teach Emergency and Recovery Operations Procedures Training will receive equivalent training.

Evaluation and Testing

Following simulator training sessions, critiques are conducted by Licensed Operator Training Instructors. Critiques are used to appraise students of their overall performance throughout the training session. Evaluations of student performance on the simulator exercises are entered into the student's training record. In addition to critiques and evaluations of the student's performance on the simulator exercises, written quizzes are given to determine student knowledge of material presented through classroom lectures. Quizzes and evaluations are prepared to match the behaviors, conditions, and standards outlined in the student objectives.

The results of student evalutions and quizzes are used to determine the necessity of additional training on the Emergency and Recovery Operations Procedures. Students who satisfactorily complete this training will be awarded the appropriate certification of course completion. License Candidates must satisfactorily complete this training as a prerequisite for being recommended for Nuclear Regulatory Commission administered license examination. Shift Technical Advisors must satisfactorily complete applicable portions of this training prior to being fully certified to perform the duties of an STA.

Training Evaluation and Revision

During Transient and Accident Training, License Candidates and Instructors are encouraged to submit recommendations concerning the upgrading of Emergency and Recovery Operations Procedures.

Shift Technical Advisors participate in Transient and Accident Training as described in the PVNGS FSAR Section 13.2.1.3.2, and are given the opportunity to submit recommendations concerning the upgrading of Emergency and Recovery Operations Procedures.

These recommendations along with formal instructor evaluation, instructor retraining, and curriculum additions will be factored into the course lesson plans using a formalized procedure (Lesson Development Guidelines - TDI-006; Training Department Instructor and Course Evaluation - TDI-007 (under revision)).

Training Retention and Transfer

The training of License Operator Candidates in the use of Emergency and Recovery Operations Procedues is described in the PVNGS FSAR Section 13.2.1.1.7. This training is implemented through the Cold License Training Procedure (82TR-9ZZ01) and the Hot License Training Procedure (82TR-9ZZ02).

The retraining of Licensed Reactor Operators and Licensed Senior Reactor Operators in the use of Emergency Operations and Recovery Procedures is

described in the PVNGS FSAR Section 13.2.2.1. Retraining is implemented through the Requalification Procedure for Licensed Operator Retraining (82TR-9ZZ03).

The testing which accompanies training and retraining will be used to ensure that knowledge is retained. In addition, operator supervisors will be interviewed on a regular basis to determine if performance evaluations indicate the transfer of training to the work places.