May 2, 2001

Mr. Oliver D. Kingsley, President
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Exelon Generation Company, LLC
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SUBJECT: PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3, SITE-SPECIFIC WORKSHEETS FOR USE IN THE NUCLEAR REGULATORY COMMISSION'S SIGNIFICANCE DETERMINATION PROCESS (TAC NO. MA6544)

Dear Mr. Kingsley:

Enclosed please find the "Risk-Informed Inspection Notebook" which incorporates the updated Significance Determination Process (SDP) Phase 2 Worksheets that inspectors will be using to characterize and risk-inform inspection findings. This document is one of the key implementation tools of the reactor safety SDP in the reactor oversight process and soon will also be publicly available through the Nuclear Regulatory Commission's (NRC's) external website at http://www.nrc.gov/NRC/IM/index.html.

The 1999 Pilot Plant review effort clearly indicated that significant site-specific design and risk information was not captured in the Phase 2 worksheets forwarded to you last spring. Subsequently a site visit was conducted by the NRC to verify and update plant equipment configuration data and to collect site-specific risk information from your staff. The enclosed document reflects the results of this visit.

The enclosed Phase 2 Worksheets have incorporated much of the information we obtained during our site visits. The staff encourages further licensee comments where it is identified that the Worksheets give inaccurately low significance determinations. Any comments should be provided to the Document Control Desk, with a copy to the Chief, Probabilistic Safety Assessment Branch, Division of Systems Safety and Analysis, Office of Nuclear Reactor Regulation.

While the enclosed Phase 2 Worksheets have been verified by our staff to include the site-specific data, we will continue to assess its accuracy throughout implementation and update the document based on comments by our inspectors and your staff.

Sincerely,

/RA/

John P. Boska, Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-277 and 50-278

Enclosure: Risk-Informed Inspection Notebook

cc w/encl: See next page

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RISK-INFORMED INSPECTION NOTEBOOK FOR

PEACH BOTTOM ATOMIC POWER STATION

UNIT 2 & 3

BWR-4, GE, WITH MARK I CONTAINMENT

Prepared by

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NOTICE

This notebook was developed for the NRC's inspection teams to support risk-informed inspections. The "Reactor Oversight Process Improvement," SECY-99-007A, March 1999 discusses the activities involved in these inspections. The user of this notebook is assumed to be an inspector with an extensive understanding of plant-specific design features and operation. Therefore, the notebook is not a stand-alone document, and may not be suitable for use by non-specialists. It will be periodically updated with new or replacement pages incorporating additional information on this plant. All recommendations for improvement of this document should be forwarded to the Chief, Probabilistic Safety Assessment Branch, NRR, with a copy to the Chief, Inspection Program Branch, NRR.

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ABSTRACT

This notebook contains summary information to support the Significance Determination Process (SDP) in risk-informed inspections for the Peach Bottom Atomic Power Station.

The information includes the following: Categories of Initiating Events Table, Initiators and System Dependency Table, SDP Worksheets, and SDP Event Trees. This information is used by the NRC's inspectors to identify the significance of their findings, i.e., in screening risk-significant findings, consistent with Phase-2 screening in SECY-99-007A. The Categories of Initiating Event Table is used to determine the likelihood rating for the applicable initiating events. The SDP worksheets are used to assess the remaining mitigation capability rating for the applicable initiating event likelihood ratings in identifying the significance of the inspector's findings. The Initiators and System Dependency Table and the SDP Event Trees (the simplified event trees developed in preparing the SDP worksheets) provide additional information supporting the use of SDP worksheets.

The information contained herein is based on the licensee's Individual Plant Examination (IPE) submittal, the updated Probabilistic Risk Assessment (PRA), and system information obtained from the licensee during site visits as part of the review of earlier versions of this notebook. Approaches used to maintain consistency within the SDP, specifically within similar plant types, resulted in sacrificing some plant-specific modeling approaches and details. Such generic considerations, along with changes made in response to plant-specific comments, are summarized.

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TABLES

FIGURES

1. INFORMATION SUPPORTING SIGNIFICANCE DETERMINATION PROCESS (SDP)

SECY-99-007A (NRC, March 1999) describes the process for making a Phase-2 evaluation of the inspection findings. In Phase 2, the first step is to identify the pertinent core damage scenarios that require further evaluation consistent with the specifics of the inspection findings. To aid in this process, this notebook provides the following information:

1. Estimated Likelihood Rating for Initiating Events Categories
2. Initiator and System Dependency Table
3. Significance Determination Process (SDP) Worksheets
4. SDP Event Trees.

Table 1, Categories of Initiating Events, is used to obtain the estimated likelihood rating for applicable initiating events for the plant for different exposures times for degraded conditions. This Table follows the format of the Table 1 contained in SECY-99-007A. Initiating events are grouped in frequency bins covering one order of magnitude. The table includes the initiating events that should be considered for the plant and for which SDP worksheets are provided. Categorization of the following initiating events is based on industry-average frequency: transients (Reactor Trip) (TRANS); transients without power conversion system (TPCS); large, medium, and small loss of coolant accidents (LLOCA, MLOCA, and SLOCA); inadvertent or stuck open relief valve (IORV or SORV); anticipated transients without scram (ATWS); interfacing systems LOCA (ISLOCA) and LOCA outside containment (LOC). The frequency of the remaining initiating events vary significantly from plant to plant, and accordingly, they are categorized using the plant-specific frequency obtained from the licensee. These initiating events include loss of offsite power (LOOP) and special initiators caused by loss of support systems.

The Initiator and System Dependency Table shows the major dependencies between frontline and support systems, and identifies their involvement in different types of initiators. This table identifies the most risk-significant systems; it is not an exhaustive nor comprehensive compilation of the dependency matrix, as shown in Probabilistic Risk Assessments (PRAs). This table is used to identify the SDP worksheets to be evaluated, corresponding to inspection findings on systems and components.

To evaluate the impact of an inspection finding on the core-damage scenarios, we developed the SDP worksheets. They contain two parts. The first part identifies the functions, the systems, and the combinations thereof that can perform mitigating functions, the number of trains in each system, and the number of trains required (success criteria) for each the initiator. It also characterizes the mitigation capability in terms of the available hardware (e.g., 1 train, 1 multi-train system) and the operator action involved. The second part of the SDP worksheet contains the core-

damage accident sequences associated with each initiator; these sequences are based on SDP event trees. In the parentheses next to each of the sequences the corresponding event tree branch number(s) representing the sequence is included. Multiple branch numbers indicate that the different accident sequences identified by the event tree are merged into one through the Boolean reduction.

SDP worksheets are developed for each initiating event, including “Special Initiators,” which are typically caused by complete or partial loss of support systems. A special initiator typically leads to a reactor scram and degrades some front-line or support systems (e.g., Loss of Service water in BWRs). The SDP worksheets for initiating events that directly lead to core damage are different. Of this type of initiating events, only the interfacing system LOCA (ISLOCA) and LOCA outside containment (LOC) are included. This worksheet identifies the major consequential leak paths and the number of barriers that may fail to cause the initiator to occur.

For the special initiators, we considered those plant-specific initiators whose contribution to the plant’s core damage frequency (CDF) is non-negligible and/or have the potential to be a significant contributor to CDF given an inspection finding on system trains and components. We defined a set of criteria for their inclusion to maintain some consistency across the plants. These conditions are as follows:

1. The special initiator should degrade at least one of the mitigating safety functions changing its mitigation capability in the worksheet. For example, a safety function with two redundant trains, classified as a multi-train system, degrades to an one-train system, to be classified as 1 Train, due to the loss of one of the trains as a result of the special initiator.

2. The special initiators, which degrade the mitigation capability of the accident sequences associated with the initiator from comparable transient sequences by two and higher orders of magnitude, must be considered.

Following the above considerations, the classes of initiators that we consider in this notebook are:

1. Transients with power conversion system (PCS)available, called Transients (Reactor trip) (TRANS),
2. Transients without PCS available, called Transients w/o PCS (TPCS),
3. Small Loss of Coolant Accident (SLOCA),
4. Inadvertent or Stuck-open Power Operated Relief Valve (IORV or SORV),
5. Medium LOCA (MLOCA),
6. Large LOCA (LLOCA),
7. Loss of Offsite Power (LOOP)
8. Anticipated Transients Without Scram (ATWS).

Section 1.3 lists the plant-specific special initiators addressed in this notebook. Examples of special initiators are as follows:

1. LOOP with failure of 1 Emergency AC (LEAC) bus or associated EDG (LEAC),

2. LOOP with stuck open SORV (LORV),
3. Loss of 1 DC Bus (LDC),
4. Loss of component cooling water (LCCW),
5. Loss of instrument air (LOIA),
6. Loss of service water (LSW).

The worksheet for the LOOP may include LOOP with emergency AC power (EAC) available and LOOP without EAC, i.e., Station Blackout (SBO). LOOP with partial availability of EAC, i.e., LOOP with loss of a bus of EAC, is covered in a separate worksheet to avoid making the LOOP worksheet too large. LOOP with stuck open SORV is also covered in a separate worksheet, when applicable. In some plants, LOOP with failure of 1 EAC bus and LOOP with stuck-open SORV are large contributors to the plant's core damage frequency (CDF).

Following the SDP worksheets, the SDP event trees corresponding to each of the worksheets are presented. The SDP event trees are simplified event trees developed to define the accident sequences identified in the SDP worksheets. For special initiators whose event tree closely corresponds to another event tree (typically, the Transient(Reactor trip) or Transients w/o PCS event tree) with one or more functions eliminated or degraded, a separate event tree may not be drawn.

We considered the following items in establishing the SDP event trees and the core-damage sequences in the SDP worksheets; Section 2.1 gives additional guidelines and assumptions.

1. Event trees and sequences were developed such that the worksheet contains all the major accident sequences identified by the plant-specific IPEs or PRAs. The special initiators modeled for a plant is based on a review of the special initiators included in the plant IPE/PRA and the information provided by the licensee.

2. The event trees and sequences for each plant took into account the IPE/PRA models and event trees for all similar plants. Any major deviations in one plant from similar plants typically are noted at the end of the worksheet.

3. The event trees and the sequences were designed to capture core-damage scenarios, without including containment-failure probabilities and consequences. Therefore, branches of event trees that are only for the purpose of a Level II PRA analysis are not considered. The resulting sequences are merged using Boolean logic.

4. The simplified event-trees focus on classes of initiators, as defined above. In so doing, many separate event trees in the IPEs often are represented by a single tree. For example, some IPEs define four or more classes of LOCAs rather than the three classes considered here. The sizes of LOCAs for which high-pressure injection is not required are some times divided into two classes; the only difference between them being the need for reactor scram in the smaller break size. Some consolidation of transient event tree may also be done besides defining the special initiators following the criteria defined above.

5. Major actions by the operator during accident scenarios are credited using four categories of Human Error Probabilities (HEPs). They are termed operator action =1 (representing an error probability of 5E-2 to 0.5), operator action=2 (error probability of 5E-3 to 5E-2), operator action=3 (error probability of 5E-4 to 5E-3), and operator action=4 (error probability of 5E-5 to 5E-4). An human action is assigned to a category bin, based on a generic grouping of similar actions among a class of plants. This approach resulted in designation of some actions to a higher bin, even though the IPE/PRA HEP value may have been indicative of a lower category. In such cases, it is noted at the end of the worksheet. On the other hand, if the IPE/PRA HEP value suggests a higher category than that generically assumed, the HEP is assigned to a bin consistent with the IPE/PRA value in recognition of potential plant-specific design; a note is also given in these situations. Operator's actions belonging to category 4, i.e., operator action=4, may only be noted at the bottom of worksheet because, in those cases, equipment failures may have the dominating influence in determining the significance of the findings.

The four sections that follow include the Categories of Initiating Events Table, Initiators and System Dependency Table, SDP Worksheets, and the SDP Event Trees for the Peach Bottom Atomic Power Station.

1.1 INITIATING EVENT LIKELIHOOD RATINGS

Table 1 presents the applicable initiating events for this plant and their estimated likelihood ratings corresponding to the exposure time for degraded conditions. The initiating events are grouped into rows based on their frequency. As mentioned earlier, loss of offsite power and special initiators are assigned to rows using the plant-specific frequency obtained from individual licensees. For other initiating events, industry-average values are used, as per SECY-99-007A.

Table 1 Categories of Initiating Events for Peach Bottom Atomic Power Station

Row	Approximate Frequency	Example Event Type	Estimated Likelihood Rating		
I	> 1 per 1-10 yr	Reactor Trip, Loss of Power Conversion System (Loss of condenser, Closure of MSIVs, Loss of feedwater)	**A**	**B**	**C**
II	1 per 10-10^2 yr	Loss of offsite power (LOOP), Inadvertent or stuck open SRVs (IORV or SORV)	**B**	**C**	**D**
III	1 per 10^2 - 10^3 yr	Small LOCA (RCS rupture), Loss of DC Bus (LODC), Loss of 4 kV AC Bus (TAC)	**C**	**D**	**E**
IV	1 per 10^3 - 10^4 yr	Medium LOCA (RCS rupture)	**D**	**E**	**F**
V	1 per 10^4 - 10^5 yr	Large LOCA (RCS rupture), ATWS	**E**	**F**	**G**
VI	less than 1 per 10^5 yr	ISLOCA, LOC, Vessel rupture	**F**	**G**	**H**
			> 30 days	**3-30 days**	**< 3 days**
			Exposure Time for Degraded Condition		

Note:

1. The SDP worksheets for ATWS core damage sequences assume that the ATWS is not recoverable by manual actuation of the reactor trip function or by ARI (for BWRs). Thus, the ATWS frequency to be used by these worksheets must represent the ATWS condition that can only be mitigated by the systems shown in the worksheet (e.g., boration). Any inspection finding that represents a loss of manual reactor trip capability for a postulated ATWS scenario should be evaluated by a risk analyst for consideration of the probability of a successful manual trip.

1.2 INITIATORS AND SYSTEM DEPENDENCY

Table 2 provides the list of the systems included in the SDP worksheets, the major components in the systems, and the support system dependencies. The system involvements in different initiating events are noted in the last column.

Table 2 Initiators and System Dependency Table for Peach Bottom

Affected System		Major Components	Support Systems	Initiating Event Scenarios
Code	Name			
PCS	Power Conversion System	3 MDP, 3 TDP, MOV, MSIV, bypass valves	AC, Div. II & IV DC power (FW control), Div. I & II DC (MSIVs), BOP DC, TBCW, NSW, IA, & N_2	Transient (Rx trip), SLOCA, SORV, MLOCA, LOC, ATWS, LODC, TAC
HPCI	High Pressure Coolant Injection	1 TDP, MOV	Div II & IV DC power, (Late NSW, ESW and AC)	All but LLOCA and LOC
RCIC	Reactor Core Isolation Cooling	1 TDP, MOV	Div I & III DC, (Late NSW, ESW and AC)	Transient (Rx Trip), TPCS, SLOCA, SORV, LOOP, TAC
SRVs / ADS	Safety Relief Valves	11 RV, AOV	Div I & IV DC power, N_2	All but LLOCA, LOC
LPCI	Low Pressure Coolant Injection	4 MDP, MOV	AC, Div I - IV DC, ESW	All
RHR	Residual Heat Removal	4 MDP, MOV, 4 HX	AC, Div I - IV DC, NSW, ESW, HPSW	All
CS	Core Spray	4 MDP, MOV	AC, NSW, ESW, Div I - IV DC	All
AC	AC Power (non-EDG)	Breakers, Transformers	AC, DC	LOOP, TAC
EDGs	AC Power (EDGs)	4 Engine-Generators	Div I - IV DC, ESW, FO transfer, AC, HVAC	LOOP
DC	DC Power	4 batteries, 4 chargers	AC for battery chargers	LODC
FO transfer	EDG fuel oil transfer	MDP	AC	LOOP
tie line	Conowingo tie line	dam, breakers	DC	LOOP

Table 2 (Continued)

Affected System		Major Components	Support Systems	Initiating Event Scenarios
Code	**Name**			
HPSW	High Pressure Service Water	4 MDP, MOV	Div I - IV DC, AC	All
CRD	Control Rod Hydraulic System	2 MDP, MOV, AOV	AC, Div. I & IV DC, TBCW, RBCW, IA	All but LLOCA and LOC
IA	Instrument Air	4 Air comp., Valves	AC, TBCW, RBCW	All but LLOCA & LOC
N_2	N_2 System	Air compressor, valves, N_2 vaporizor	RBCW, AC	All but LLOCA & LOC
SLC	Standby Liquid Control	2 MDP, MOV, Explosive valves	AC	ATWS
cond & RWST xfer	condensate and refueling water storage tank transfer system	MDP	AC	All but LLOCA, LOC
RBCW	Reactor Building Cooling Water	2 MDP, MOV, HX	AC, NSW	All but LLOCA and LOC
TBCW	Turbine Building Cooling Water	2 MDP, MOV, HX	AC, NSW	All but LLOCA and LOC
NSW	Normal Service Water	3 MDP, MOV	AC, DC	All
ESW	Emergency Service Water	4 MDP, MOV	AC, Div II & III DC	All
ECW	Emergency Cooling Water	1 MDP, MOV	AC, DC	All
HVAC	Heating, Ventilation and Air Conditioning	Coolers, Fans	480V AC, RBCW / ECW	LOOP

Table 2 (Continued)

Affected System		Major Components	Support Systems	Initiating Event Scenarios
Code	Name			
CV	Containment Venting	AOV, rupture disk	AC, Div. IV DC	All but LOC and LODC

Notes:

1. Information herein was developed from the Peach Bottom IPE dated August 26, 1992. This IPE applies to both Unit 2 and 3. The licensee's comments were based on the PRA model revision PB 99.

2. The baseline IPE core damage frequency (CDF) from internal events for Unit 2 was 5.5 X 10^{-6} events/Rx year. The PB 99 model CDF values are: Unit 2, 4.4 E-6 events/Rx year, and Unit 3, 4.0 E-6 events/Rx year.

3. Where we have indicated AC in the Support system column, this means that power can be supplied by one or both of the EDG System or the non-EDG AC power system. Typically for Peach Bottom the safety-related AC equipment can be supplied by either, while the non-safety can only be supplied by non-EDG power. The EDGs are only specifically credited in the LOOP Event Tree.

4. There are some differences between Unit 2 and 3 at PB, particularly as far as the divisions of AC and DC power. PB has 24 VDC, 125 VDC, & 250 VDC systems. The 125/250 VDC system consists of two 250 VDC buses and 12 125 VDC distribution panels (only 11 distribution panels in Unit 3), arranged into for divisions. Above we have indicated all of the divisions that apply, but have not provided the details as to the individual units. See Table 3.2.3, System Dependency Matrix, of the IPE for this level of detail.

5. In Peach Bottom (PB) on a station blackout, operator action is needed at 5 hours because HPCI and RCIC will fail due to battery depletion and then the core inventory will boil off, leading to core damage.

6. Containment venting (CV) for PB is a 16" torus hardened pipe vent.

7. At Peach Bottom the Service Water Systems are comprised of the ESW, Emergency Cooling Water (ECW), and NSW Systems. ESW has 2 main pumps and 2 booster pumps. If the normal heat sink for ESW is lost, ECW provides a back-up. ECW also can provide cooling water to EDGs and room coolers in the event of loss of the ESW pumps. If NSW is lost, both ESW and ECW provide a back-up. PB also has a separate HPSW providing cooling to the RHR HXs, giving substantial service water redundancy.

Table 2 (Continued)

8. ESW: For HPCI & RCIC, ESW is needed only if the barometric condenser fails. For Core Spray ESW is needed for both room cooling and motor oil cooling.

9. The RWCU isolation valves are important support components to the SLC system in order to ensure the boron is not removed.

10. The PB IPE did not credit the condensate and refueling water storage tank transfer systems for Late Injection. This has been included since the licensee has subsequently provided such credit and requested that they be included in the worksheets. The major components of the Condensate Storage and Transfer System are: RWST 00T044 (common to both units), Unit 2 CST 20T010, Unit 3 CST 30T010, Torus Dewatering Tank 00T515 (common to both units), Refueling Water Pumps 0AP067 and 0BP067, Condensate Transfer Pumps 0AP006 and 0BP006, and the Condensate Transfer Jockey Pump 00P029 (not credited for LI). All five pumps are common to both units. Also, the system piping is configured in such a way as to permit the water of any tank to supply either unit. This system provides the normal supply to the ECCS keep full system and as such can be used to send water from the tanks to the reactor vessel.

1.3 SDP WORKSHEETS

This section presents the SDP worksheets to be used in the Phase 2 evaluation of the inspection findings for the Peach Bottom Atomic Power Station. The SDP worksheets are presented for the following initiating event categories:

1. Transients (Reactor Trip) (TRANS)
2. Transients without PCS (TPCS)
3. Small LOCA (SLOCA)
4. Stuck Open Relief Valve (SORV)
5. Medium LOCA (MLOCA)
6. LOCA Outside Containment (LOC)
7. Large LOCA (LLOCA)
8. Loss of Offsite Power (LOOP)
9. Anticipated Transients Without Scram (ATWS)
10. Loss of Train A DC Bus (LODC)
11. Loss of 4 kV AC Bus (TAC)
12. Interfacing System and LOCA Outside Containment (ISLOCA/LOC)

Table 3.1 SDP Worksheet for Peach Bottom — Transients (Reactor Trip) (TRANS)

Estimated Frequency (Table 1 Row) _________ **Exposure Time** _________ **Table 1 Result (circle): A B C D E F G H**

<u>Safety Functions Needed</u>:	**<u>Full Creditable Mitigation Capability for Each Safety Function</u>:**
Power Conversion System (PCS)	1/4 steam lines, bypass valves, condenser, 1/2 steam jet air ejector, 1/4 circulation water pump, 1/3 condensate pumps, 1/3 main feed pumps (operator action = 3)
High Pressure Injection (HPI)	HPCI (1 ASD train) or RCIC (1 ASD train)
Depressurization (DEP)	2/11 valves (5 ADS and 6 SRVs) manually opened (operator action = 2)
Low Pressure Injection (LPI)	1/4 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system); or 1/4 LPCS pumps in 1/2 trains (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps and 1/4 RHR HXs in 1/2 trains, plus 1/4 HPSW pumps (1 multi-train system)
Containment Venting (CV)	CV through 16" torus vent - (operator action = 2)
Late Inventory, Makeup (LI)	1/2 CRD pumps <u>or</u> [condensate & RWST transfer system] (operator action = 2) <u>or</u> 1/4 HPSW pumps injecting through the RHR/HPSW crosstie (operator action = 1)

<u>Circle Affected Functions</u>	**<u>Recovery of Failed Train</u>**	**<u>Remaining Mitigation Capability Rating for Each Affected Sequence</u>**	**<u>Sequence Color</u>**
1 TRANS - PCS - CHR - LI (4, 8)			
2 TRANS - PCS - CHR - CV (5, 9)			
3 TRANS - PCS - HPI - LPI (10)			

4 TRANS - PCS - HPI - DEP (11)			
Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event: If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.			

Notes:

1. PB gives the failure to manually initiate ADS HEPs in the 1E-3 to 7E-2 range.

2. The PB PRA gives credit for CRD as an HPI system after 4 hours of HPCI or RCIC operation. This is not included in the above worksheet due to this required 4 hour delay and a lack of more detailed justification.

3. The PB PRA also credits PCS for the CHR function and the condensate pumps for the LPI & LI functions. This credit is provided here only in the PCS function.

4. PB gives failure to vent containment as 1.5 E-3.

5. In the PB IPE credits late injection (LI) of certain systems, after containment failure due to overpressure, as capable of providing sufficient water to prevent core damage. This is not clearly described and justified in the IPE and is not typical of most BWRs. In many cases equipment could be damaged by the escaping steam. LI is credited after successful CV.

6. The PB HEP in the PRA, for LI using HPSW pumps injecting through the RHR/HPSW crosstie, is 6 E-2.

Table 3.2 SDP Worksheet for Peach Bottom — Transients without PCS (TPCS)

Estimated Frequency (Table 1 Row) _________ Exposure Time _________ Table 1 Result (circle): A B C D E F G H

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
High Pressure Injection (HPI)	HPCI (1 ASD train) or RCIC (1 ASD train)
Depressurization (DEP)	2/11 valves (5 ADS and 6 SRVs) manually opened (operator action = 2)
Low Pressure Injection (LPI)	1/4 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system); or 1/4 LPCS pumps in 1/2 trains (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps and 1/4 RHR HXs in 1/2 trains, plus 1/4 HPSW pumps (1 multi-train system)
Containment Venting (CV)	CV through 16" torus vent - (operator action = 2)
Late Inventory, Makeup (LI)	1/2 CRD pumps or [condensate & RWST transfer system] (operator action = 2) or 1/4 HPSW pumps injecting through the RHR/HPSW crosstie (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 TPCS - CHR - LI (3, 7)			
2 TPCS - CHR - CV (4, 8)			
3 TPCS - HPI - LPI (9)			

4 TPCS - HPI - DEP (10)			

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event: If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. The TPCS initiator includes MSIV closure, Loss of condenser/vacuum, turbine trip without bypass, and loss of FW.
2. PB gives the failure to manually initiate ADS HEPs in the 1E-3 to 7E-2 range.
3. PB credits recovery of FW/PCS for CHR. This may be considered if appropriate.
4. PB gives the HEP for failure to vent containment as 1.5 E-3.
5. The PB HEP in the PRA, for LI using HPSW pumps injecting through the RHR/HPSW crosstie, is 6 E-2.

Table 3.3 SDP Worksheet for Peach Bottom — Small LOCA (SLOCA)

Estimated Frequency (Table 1 Row) _________ **Exposure Time** _________ **Table 1 Result (circle): A B C D E F G H**

<u>Safety Functions Needed</u>:	**<u>Full Creditable Mitigation Capability for Each Safety Function</u>:**
Early Containment Control (EC)	Passive operation of SP with no bypass, 1/2 vacuum breakers remain closed in 4/4 lines (1 multi-train system)
Power Conversion System (PCS)	1/4 steam lines, bypass valves, condenser, 1/2 steam jet air ejector, 1/4 circulation water pump, 1/3 condensate pumps, 1/3 main feed pumps (operator action = 3)
High Pressure Injection (HPI)	HPCI (1 ASD train) or RCIC (1 ASD train)
Depressurization (DEP)	2/11 valves (5 ADS and 6 SRVs) manually opened (operator action = 2)
Low Pressure Injection (LPI)	1/4 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/ 4 LPCS pumps in 1/2 trains (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps and 1/4 RHR HXs in 1/2 trains, plus 1/4 HPSW pumps (1 multi-train system)
Containment Venting (CV)	CV through 16" torus vent (operator action = 2)
Late Inventory, Makeup (LI)	1/2 CRD pumps <u>or</u> 1/3 Condensate pumps <u>or</u> [condensate & RWST transfer system] (operator action = 2) <u>or</u> 1/4 HPSW pumps injecting through the RHR/HPSW crosstie (operator action = 1)

<u>Circle Affected Functions</u>	**<u>Recovery of Failed Train</u>**	**<u>Remaining Mitigation Capability Rating for Each Affected Sequence</u>**	**<u>Sequence Color</u>**
1 SLOCA - CHR - LI (3, 7, 11)			
2 SLOCA - CHR - CV (4, 8, 12)			
3 SLOCA - PCS - HPI - LPI (13)			

4 SLOCA - PCS - HPI -DEP (14)			
5 SLOCA - EC (15)			

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. Failure of EC/ Suppression Pool (SP) could be due to downcomer vent pipe failures, vacuum breaker failures, or inadequate SP level. The PB IPE credits LI after a failure of EC but sufficient justification is not provided and this is not typical of most BWRs. This is not credited in these worksheets.

2. PB gives the failure to manually initiate ADS HEPs in the 1E-3 to 7E-2 range.

3. PB also credits PCS for the CHR, LPI & LI functions. This credit is provided here only in the PCS and LI functions.

4. PB gives failure to vent containment as 1.5 E-3.

5. The PB HEP in the PRA, for LI using HPSW pumps injecting through the RHR/HPSW crosstie, is 6 E-2.

Table 3.4 SDP Worksheet for Peach Bottom — Stuck Open Relief Valve (SORV)

Estimated Frequency (Table 1 Row) _________ **Exposure Time** _________ **Table 1 Result (circle): A B C D E F G H**

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
Power Conversion System (PCS)	1/4 steam lines, bypass valves, condenser, 1/2 steam jet air ejector, 1/4 circulation water pump, 1/3 condensate pumps, 1/3 main feed pumps (operator action = 3)
High Pressure Injection (HPI)	HPCI (1 ASD train) or RCIC (1 ASD train)
Depressurization (DEP)	2/11 valves (5 ADS and 6 SRVs) manually opened (operator action = 2)
Low Pressure Injection (LPI)	1/4 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/4 LPCS pumps in 1/2 trains (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps and 1/4 RHR HXs in 1/2 trains, plus 1/4 HPSW pumps (1 multi-train system)
Containment Venting (CV)	CV through 16" torus vent - (operator action = 2)
Late Inventory, Makeup (LI)	1/2 CRD pumps or 1/3 Condensate pumps or [condensate & RWST transfer system] (operator action = 2) or 1/4 HPSW pumps injecting through the RHR/HPSW crosstie (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 SORV - CHR - LI (3, 7, 11)			
2 SORV - CHR - CV (4, 8, 12)			
3 SORV - PCS - HPI - LPI (13)			

<table>
<tr><td>4 SORV - PCS - HPI -DEP (14)</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="5">Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.</td></tr>
</table>

Notes:

1. This initiator includes both a stuck open relief valve (SORV) and an inadvertently open relief valve (IORV).

2. PB gives the failure to manually initiate ADS HEPs in the 1E-3 to 7E-2 range.

3. PB gives failure to vent containment as 1.5 E-3.

4. DEP requires 2/11 valves. This would be the SORV plus one more.

5. The PB HEP in the PRA, for LI using HPSW pumps injecting through the RHR/HPSW crosstie, is 6 E-2.

Table 3.5 SDP Worksheet for Peach Bottom — Medium LOCA (MLOCA)

Estimated Frequency (Table 1 Row) _________ Exposure Time _________ Table 1 Result (circle): A B C D E F G H

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
Early Containment Control (EC)	Passive operation of SP with no bypass, 1/2 vacuum breakers remain closed in 4/4 lines (1 multi-train system)
High Pressure Injection (HPI)	HPCI (1 ASD train)
Depressurization (DEP)	2/11 valves (5 ADS and 6 SRVs) auto or manually opened (operator action = 2)
Low Pressure Injection (LPI)	1/4 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/ 2 LPCS trains with 2/2 LPCS pumps per train (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps and 1/4 RHR HXs in 1/2 trains, plus 1/4 HPSW pumps in the SP cooling mode (1 multi-train system)
Containment Venting (CV)	CV through 16" torus vent - (operator action = 2)
Late Inventory, Makeup (LI)	1/2 CRD pumps or 1/3 Condensate pumps or [condensate & RWST transfer system] (operator action = 2) or 1/4 HPSW pumps injecting through the RHR/HPSW crosstie (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 MLOCA - CHR - LI (3, 8)			
2 MLOCA - CHR - CV (4, 9)			
3 MLOCA - LPI (5, 10)			

4 MLOCA - HPI - DEP (11)			
5 MLOCA - EC (12)			
Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event: If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.			

<u>Notes</u>

1. Failure of EC/ Suppression Pool (SP) could be due to downcomer vent pipe failures, vacuum breaker failures, or inadequate SP level.

2. PB gives the failure to manually initiate ADS HEPs in the 1E-3 to 7E-2 range.

3. PB gives failure to vent containment as 1.5 E-3.

4. The PB IPE credits LI after a failure of EC but sufficient justification is not provided and this is not typical of most BWRs. As a result the PB IPE contains the sequence MLOCA - EC - LI, which is not a typical BWR sequence. At PB it appears in the ET as a core damage sequence, but at a low value of 4xE-9. This worksheet does not give credit for LI to prevent core damage on EC failure.

5. The PB HEP in the PRA, for LI using HPSW pumps injecting through the RHR/HPSW crosstie, is 6 E-2.

Table 3.6 SDP Worksheet for Peach Bottom — LOCA Outside Containment (LOC)

Estimated Frequency (Table 1 Row) __________ **Exposure Time __________** **Table 1 Result (circle): A B C D E F G H**

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
Depressurization (DEP)	Assumed successful due to LOCA
Low Pressure Injection (LPI)	1/4 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/ 2 LPCS trains with 2/2 LPCS pumps per train (1 multi-train system)
Late Inventory, Makeup (LI)	1/3 Condensate pumps (operator action = 2) or 1/4 HPSW pumps injecting through the RHR/HPSW crosstie (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 LOC - LPI			
2 LOC - LI			

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. The LOCs modeled for Peach Bottom that constitute at least 1% of total CDF are Main Steam Line Break, Main Feedwater Line Break, and HPCI line break. Also considered is the smaller RWCU line break. The LOC initiator frequency is 8.4E-7. The breaks can potentially be isolated by operator action. Successful operation of both LPI and LI is required to prevent core damage. Due to simplicity of the two sequences here, there is no event tree for this worksheet.
2. The LPI systems available (from those listed above) depend on the location of the break and the resultant environmental effects of the break.
3. The PB HEP in the PRA, for LI using HPSW pumps injecting through the RHR/HPSW crosstie, is 6 E-2.
4. This worksheet is not typical for BWRs in that most other plant PRAs assume that an unisolated LOC A outside containment will lead to core damage and cannot be mitigated by LPI and LI.

Table 3.7 SDP Worksheet for Peach Bottom — Large LOCA (LLOCA)

Estimated Frequency (Table 1 Row) ________ Exposure Time __________ Table 1 Result (circle): A B C D E F G H

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
Early Containment Control (EC)	Passive operation of SP with no bypass, 1/2 vacuum breakers remain closed in 4/4 lines (1 multi-train system)
Low Pressure Injection (LPI)	1/4 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/ 2 LPCS trains with 2/2 LPCS pumps per train (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps and 1/4 RHR HXs in 1/2 trains, plus 1/4 HPSW pumps in the SP cooling mode (1 multi-train system)
Containment Venting (CV)	CV through 16" torus vent (operator action = 2)
Late Inventory, Makeup (LI)	1/3 Condensate pumps (operator action = 2) or 1/4 HPSW pumps injecting through the RHR/HPSW crosstie (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 LLOCA - CHR - LI (3)			
2 LLOCA - CHR - CV (4)			
3 LLOCA - LPI (5)			

4 LLOCA - EC (6)			
Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event: If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.			

Notes:

1. Failure of EC/ Suppression Pool (SP) could be due to downcomer vent pipe failures, vacuum breaker failures, or inadequate SP level.

2. PB gives failure to vent containment as 1.5 E-3.

3. The PB IPE credits LI after a failure of EC but sufficient justification is not provided and this is not typical of most BWRs. As a result the PB IPE contains the sequence LLOCA - EC - LI, which is not a typical BWR sequence. At PB it appears in the ET as a core damage sequence, but at a low value. This worksheet does not give credit for LI to prevent core damage on EC failure.

4. The PB HEP in the PRA, for LI using HPSW pumps injecting through the RHR/HPSW crosstie, is 6 E-2.

Table 3.8 SDP Worksheet for Peach Bottom — Loss of Offsite Power (LOOP)

Estimated Frequency (Table 1 Row) __________ Exposure Time __________ Table 1 Result (circle): A B C D E F G H

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
DC Batteries (B)	1/4 DC batteries (1 multi-train system)
Emergency Power (EAC)	1/4 EDGs per unit (1 multi-train system) or Conowingo tie line (operator action = 1)
Recovery of LOOP in 2 hrs (RLOOP 2 h)	(operator action = 0) not credited
Recovery of LOOP in 5 hrs (RLOOP 5 h)	(operator action = 1)
High Pressure Injection (HPI)	HPCI (1 ASD train) or RCIC (1 ASD train)
Depressurization (DEP)	2/11 valves (5 ADS and 6 SRVs) manually opened (operator action = 2)
Low Pressure Injection (LPI)	1/4 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/4 LPCS pumps in 1/2 trains (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps and 1/4 RHR HXs in 1/2 trains, plus 1/4 HPSW pumps in the SP cooling mode (1 multi-train system)
Containment Venting (CV)	CV through 16" torus vent - (operator action = 2)
Late Inventory, Makeup (LI)	1/2 CRD pumps or 1/3 Condensate pumps or [condensate & RWST transfer system] (operator action = 2) or 1/4 HPSW pumps injecting through the RHR/HPSW crosstie (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 LOOP - CHR - LI (1, 2, 5)			
2 LOOP - CHR - CV (1, 2, 6)			

3 LOOP - HPI - LPI (1, 2)			
4 LOOP - HPI - DEP (1, 2)			
5 LOOP - EAC - HPI (7) [SBO sequence]			
6 LOOP - EAC - RLOOP-5h (8) [SBO sequence]			
7 LOOP - B (9)			

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. PB models all of their LOOP sequences as dual unit LOOP since this is more significant. The total LOOP initiating event frequency is 0.059 events per reactor year.

2. For sequences in the above worksheet, the numbers in parentheses refer to the corresponding sequence in the ETs. For the LOOP ET there are some transfers to the TPCS ET. These are indicated by (1), and (2). All of the sequences in the TPCS event tree apply here, i.e., LOOP-CHR-LI, LOOP-CHR-CV, LOOP-HPI-DEP, and LOOP-HPI-LPI.

3. There is in this worksheet one core damage sequence (LOOP - B), which represents a LOOP followed by loss of all batteries, that is not typically in BWR LOOP worksheets. This is included because it is in the PB IPE.
4. In Peach Bottom (PB) on a station blackout, operator action is needed to recover offsite power at 5 hours because HPCI and RCIC will fail due to battery depletion and then the core inventory will boil off, leading to core damage. The PB PRA now identifies CD as occurring at 5 hours on an SBO.

5. The RLOOP actions in PB include recovery of either offsite power or an EDG. The failure events imply failure to recover either offsite power or an EDG. For several of the PB sequences the model also considers the possibility of cross tie between units 2 & 3 per procedure SE11as a mechanism of recovering AC power. This action is modeled as SE-11 which is “Cross tie emergency power (AC buses or battery chargers) or 1/3 ESW pumps or 1/1 ECW pump.” Thus RLOOP in the above sequences can also be considered to include failure of any attempt at cross tie. However, this does not appear to impact any of the dominant sequences in our table. Note that the dominant PB sequence in the IPE is LOOP - (RLOOP-10h) - SE11 - DEP. This is functionally the same as sequence LOOP - HPI - DEP noted above since the failure to recover AC power in 10 hrs [(RLOOP-10h) - SE11] leads to a failure of HPI.

6. Similarly, the IPE credits recovery of AC power at 1, 2, or 4 hours, but these don’t seem to impact the dominant sequences. These recovery times become important for SORVs in conjunction with the LOOP, as outlined in the PB IPE Table 3.1.2.1.5-1. They also do not credit in the PRA a shorter recovery time as most BWRs do. Thus failure of HPI on SBO leads directly to CD with no allowance for some shorter recovery of offsite power time.

7. The recovery of AC at 5 hours has HEPs in the 0.1 to 1.0 range.

8. On a LOOP, one EDG is required for each Unit making a total of 2 EDGs. PB also takes credit for additional offsite power received from the Conowingo tie line.

9. PB gives failure to vent containment as 1.5 E-3.

10. The PB HEP in the PRA, for LI using HPSW pumps injecting through the RHR/HPSW crosstie, is 6 E-2.

Table 3.9 SDP Worksheet for Peach Bottom — Anticipated Transients Without Scram (ATWS)

Estimated Frequency (Table 1 Row) __________ **Exposure Time** __________ **Table 1 Result (circle): A B C D E F G H**

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
Over-pressure Protection (OVERP)	11/13 SRVs-RVs open (1 multi-train system)
Recirculation Pump Trip (RPT)	Manual or automatic trip of recirc pumps (1multi-train system)
Inhibit ADS (INH)	Operator inhibits ADS (operator action = 2)
Reactivity Control (SLC/LC)	Operators lower level to TAF, manually inject with 1/2 SLC pumps, and then raise level (operator action = 1)
High Pressure Injection (HPI)	HPCI(1 ASD train)
Depressurization (DEP)	2/11 SRVs open (operator action = 2)
Low Pressure Injection (LPI)	1/4 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system); or 1/4 LPCS pumps in 1/2 trains (1 multi-train system)
Overfill of Rx Vessel (OVRFL)	(operator action = 1)
Containment Heat Removal (CHR)	1/4 RHR pumps and 1/4 RHR HXs plus 1/4 HPSW pumps in the SP cooling mode (1 multi-train system)
Containment Venting (CV)	CV through 16" hardened torus vent - (operator action = 2)
Late Inventory, Makeup (LI)	1/2 CRD pumps or 1/3 Condensate pumps or [condensate & RWST transfer system] (operator action = 2) or 1/4 HPSW pumps injecting through the RHR/HPSW crosstie (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 ATWS - OVERP (15)			
2 ATWS - RPT (14)			

3 ATWS -INH (13)			
4 ATWS - SLC/LC (12)			
5 ATWS - HPI - DEP (11)			
6 ATWS - HPI - LPI (10)			
7 ATWS - HPI - OVRFL (9)			
8 ATWS - CHR - CV (4, 8)			
9 ATWS - CHR - LI (3, 7)			

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:
If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. For simplicity this worksheet considers only full ATWS initiators. Additionally, we have combined the ATWS initiator with failure of Alternate Rod Insertion (ARI) and Manual Rod Insertion (MRI).

2. On an MSIV closure ATWS all SRVs will open due to the pressure transient. The success criterion for OVERP is 11/13 SRVs to open. On a turbine trip ATWS, the success criterion is all bypass valves plus 7/13 SRVs. Note that the bypass valves are equivalent to 4 SRVs.

3. PB credits FW for HPI. This is not credited here, per the NRC generic guideline for notebooks to not credit PCS in ATWS scenarios.

4. In the ATWS sequence, PB has HEP values of 2xE-3 to 2.7xE-2 for depressurization by ADS.

5. For PB in the ATWS scenarios, INH varies as high as 6.5 E-2. DEP is in the E-3 to E-2 range. SLC/LC and OVRFL are both given high HEPs between 0.1 and 1.0.

6. For Peach Bottom, overfill of the Rx Vessel is identified as leading to core damage due to flushing out of the boron and reactor re-criticality. This can happen either at high pressure with HPCI or after depressurization with the condensate pumps, LPCI or LPCS.

7. The PB HEP in the PRA, for LI using HPSW pumps injecting through the RHR/HPSW crosstie, is 6 E-2.

Table 3.10 SDP Worksheet for Peach Bottom — Loss of Train A DC Bus (LODC)

Estimated Frequency (Table 1 Row) __________ **Exposure Time** __________ **Table 1 Result (circle): A B C D E F G H**

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
Power Conversion System (PCS)	1/4 steam lines, bypass valves, condenser, 1/2 steam jet air ejector, 1/4 circulation water pump, 1/3 condensate pumps, 1/3 main feed pumps (operator action = 2)
High Pressure Injection (HPI)	HPCI (1 ASD train)
Depressurization (DEP)	2/11 valves (5 ADS and 6 SRVs) manually opened (operator action = 2)
Low Pressure Injection (LPI)	1/3 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system); or 1/3 LPCS pumps in 1/2 trains (1 multi-train system)
Containment Heat Removal (CHR)	1/3 RHR pumps and 1/3 RHR HXs in 1/2 trains, plus 1/3 HPSW pumps (1 multi-train system)
Containment Venting (CV)	CV failed due to loss of DC
Late Inventory, Makeup (LI)	1/1 CRD pumps or [condensate & RWST transfer system] (operator action = 2) or 1/3 HPSW pumps injecting through the RHR/HPSW crosstie (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 LODC - PCS - CHR (3, 5)			
2 LODC - PCS - HPI - LPI - LI (6)			
3 LODC - PCS - HPI - DEP (7)			

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event: If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. The overall LODC initiator frequency is 3.5 E-3 events/Rx-year; this is based on four times the frequency (of 8.7 E-4events/Rx-year) for each individual 125VDC bus loss in the PB PRA. For Unit 2 the worksheet modeled is loss of the 2A 125VDC distribution panel bus.

2. The only special initiators at Peach Bottom that contribute at least 1% to CDF are Loss of a DC bus and Loss of a 4 KV AC bus.

3. Loss of a DC bus could result in an automatic Rx trip and degrades mitigation capability. If an automatic reactor trip does not occur, an immediate manual shutdown is required. Further, since some DC loads are cross-connected between units, some Unit 3 loads are lost and a shutdown of Unit 3 may also be required. The LODC impacts ability to: control 4 KV AC breakers, start EDGs, provide control room instrumentation, initiate some ECCS. PB modeled the loss of the Train A DC bus, which causes the loss of the most equipment. The loss of the other DC buses does not appear in the dominant sequences.

4. Major equipment affected/lost is: RCIC, 1 RHR pump per unit, 1 CS pump per unit (and the CS loop A auto initiation logic), 1 HPSW pump per unit, 1 EDG (# E1), 1 CRD pump, and the torus hardened vent. See the IPE page 3.1-117 for specific equipment lost.

5. Since the CV function is lost, late injection (LI) per se is not required. However, PB does credit typical LI injection systems for this event. Thus failure of both LPI and LI is needed for CD.

6. The PB HEP in the PRA, for LI using HPSW pumps injecting through the RHR/HPSW crosstie, is 6 E-2.

7. The credit for operator action for PCS has been reduced from 3 to 2 here due to potential complicating problems in the PCS resulting from the LODC.

Table 3.11 SDP Worksheet for Peach Bottom — Loss of 4 kV AC Bus (TAC)

Estimated Frequency (Table 1 Row) __________ **Exposure Time** __________ **Table 1 Result (circle): A B C D E F G H**

Safety Functions Needed:	**Full Creditable Mitigation Capability for Each Safety Function:**
Power Conversion System (PCS)	1/4 steam lines, bypass valves, condenser, 1/2 steam jet air ejector, 1/4 circulation water pump, 1/3 condensate pumps, 1/3 main feed pumps (operator action = 3)
High Pressure Injection (HPI)	HPCI (1 ASD train) or RCIC (1 ASD train)
Depressurization (DEP)	2/11 valves (5 ADS and 6 SRVs) manually opened (operator action = 2)
Low Pressure Injection (LPI)	1/3 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system); or 1/2 LPCS pumps in 1/1 trains (1 single train system)
Containment Heat Removal (CHR)	1/3 RHR pumps and 1/3 RHR HXs in 1/2 trains, plus 1/3 HPSW pumps (1 multi-train system)
Containment Venting (CV)	CV through 16" torus vent - (operator action = 2)
Late Inventory, Makeup (LI)	1/1 CRD pumps or [condensate & RWST transfer system] (operator action = 2) or 1/3 HPSW pumps injecting through the RHR/HPSW crosstie (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 TAC - PCS - CHR - LI (4, 8)			
2 TAC - PCS - CHR - CV (5, 9)			
3 TAC - PCS - HPI - LPI (10)			

4 TAC - PCS - HPI - DEP (11)			

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:

If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. The overall TAC initiator frequency is 3.5 E-3 events/Rx-year; this is based on four times the frequency (of 8.7 E-4events/Rx-year) for each individual 4 KV AC bus loss.

2. For this worksheet, please refer to the Transient (Rx trip) event tree.

3. The only special initiators at Peach Bottom that contribute at least 1% to CDF are Loss of a DC bus and Loss of a 4 KV AC bus.

4. There are four divisions of emergency power at PB for each Unit. Each of the four emergency 4 KV buses (E12, E22, E32, & E42 for U2) is supplied by an EDG and provides power to 1 of 4 divisions of safety equipment. Loss of any of the four buses has a similar effect on the plant. PB has modeled loss of Division A (Bus E12) in their IPE.

5. Major equipment affected/lost is: 1 RHR pump, 1 CS pump (plus the Loop A CS injection valve), 1 HPSW pump, 1 CRD pump, and 1 SLC pump. See page 3.1-119 for specific equipment lost.

6. No specific pathways for a plant trip were identified, but in 1983 the spurious de-energization of a 4 KV bus caused problems with condenser water level requiring a rapid plant shutdown. Therefore loss of one 4 KV AC bus is assumed to lead to a turbine trip from one of a number of possible causes.

7. The PB HEP in the PRA, for LI using HPSW pumps injecting through the RHR/HPSW crosstie, is 6 E-2.

Table 3.12 SDP Worksheet for Peach Bottom — Interfacing System and LOCA Outside Containment (ISLOCA/LOC)

Estimated Frequency (Table 1 Row) ________ Exposure Time __________ Table 1 Result (circle): A B C D E F G H	
Initiation Pathways:	**Mitigation Capability: Ensure Component Operability for Each Pathway**
ISLOCA PATHWAYS:	
LPCI Injection Lines	Two lines each with one testable check valve, one NC MOV and one NO MOV.
Core Spray Injection Lines	Two lines each with one testable check valve, one NC MOV and one NO MOV.
RHR Drop Line	One line with two MOVs in series
LOC PATHWAYS:	
HPCI steam Line	One steam line with two NO MOVs
RWCU System Lines	
Feedwater Lines	Two FW lines each with two check valves
Main Steam Lines	Four main steam lines each with two MSIVs

Circle Affected Component in Pathways	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Pathway**	**Sequence Color**

Identify any operator recovery actions that are credited to directly restore the degraded equipment or initiating event:
If operator actions are required to credit placing mitigation equipment in service or for recovery actions, such credit should be given only if the following criteria are met: 1) sufficient time is available to implement these actions, 2) environmental conditions allow access where needed, 3) procedures exist, 4) training is conducted on the existing procedures under conditions similar to the scenario assumed, and 5) any equipment needed to complete these actions is available and ready for use.

Notes:

1. The initiation pathways and the applicable components in the pathways are based on licensee inputs supplemented by generic insights based on NRC studies on ISLOCA.

2. This worksheet contains pathways for both ISLOCA and LOC. Licensees typically analyze these events separately.

3. This worksheet is different from the other worksheets, in that ISLOCA is typically an unmitigated initiating event in most PRAs. Therefore the right side of the worksheet contains valves, whose failure may lead to an ISLOCA or LOC rather than mitigating systems to address an event in progress. As such, it is not intended to be referenced by the last column of Table 1.2, Initiators and System Dependency Table.

4. The LOCs modeled for Peach Bottom that constitute at least 1% of total CDF are Main Steam Line Break, Main Feedwater Line Break, and HPCI line break. Also considered is the smaller RWCU line break. The LOC initiator frequency is 8.4E-7. The breaks can be isolated by operator action. Credit is taken for mitigation of LOC and is covered in Table 3.6 above.

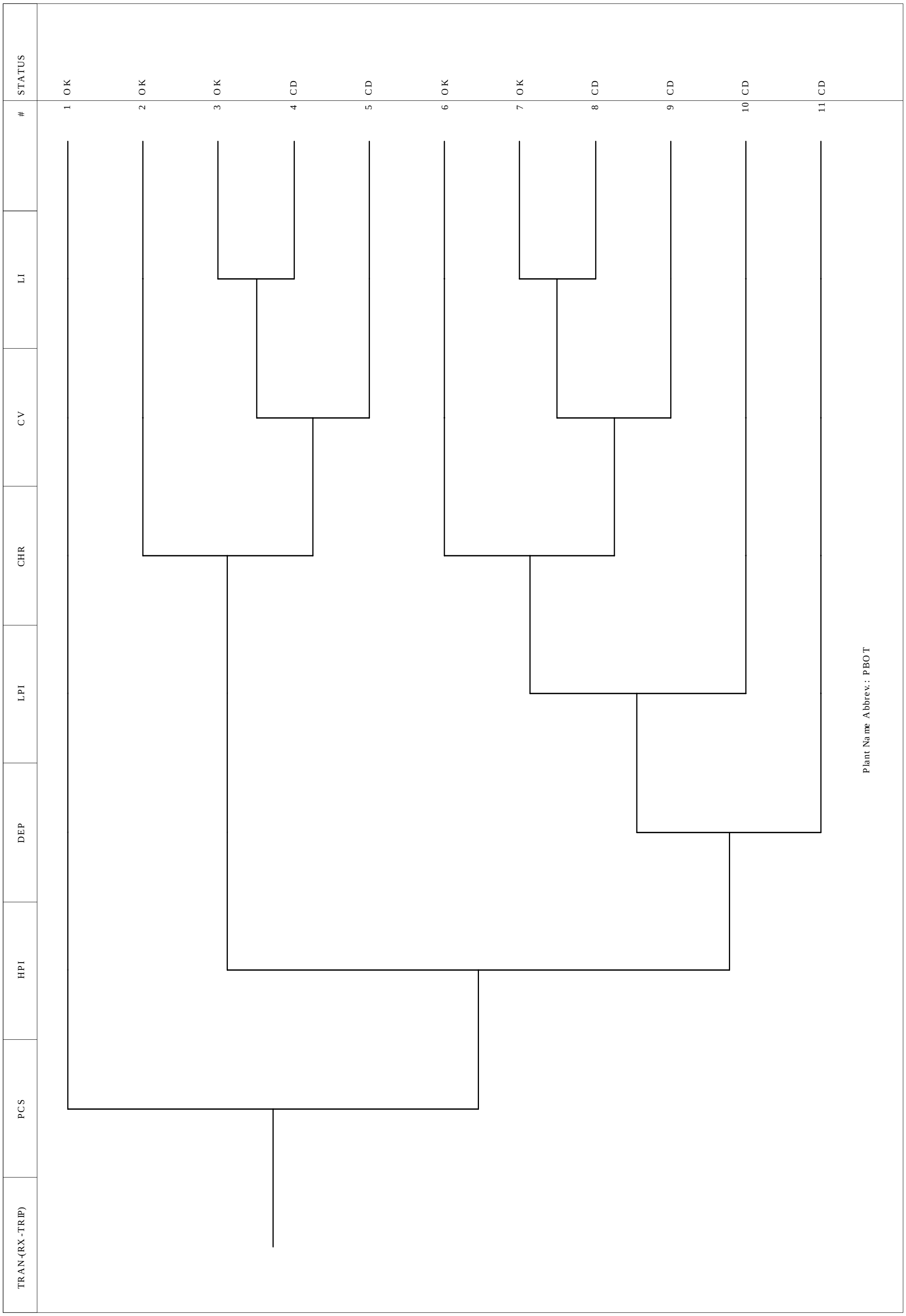
5. The ISLOCA initiating event frequency for the PB IPE is 7.3 E-7 events per reactor-year.

1.4 SDP EVENT TREES

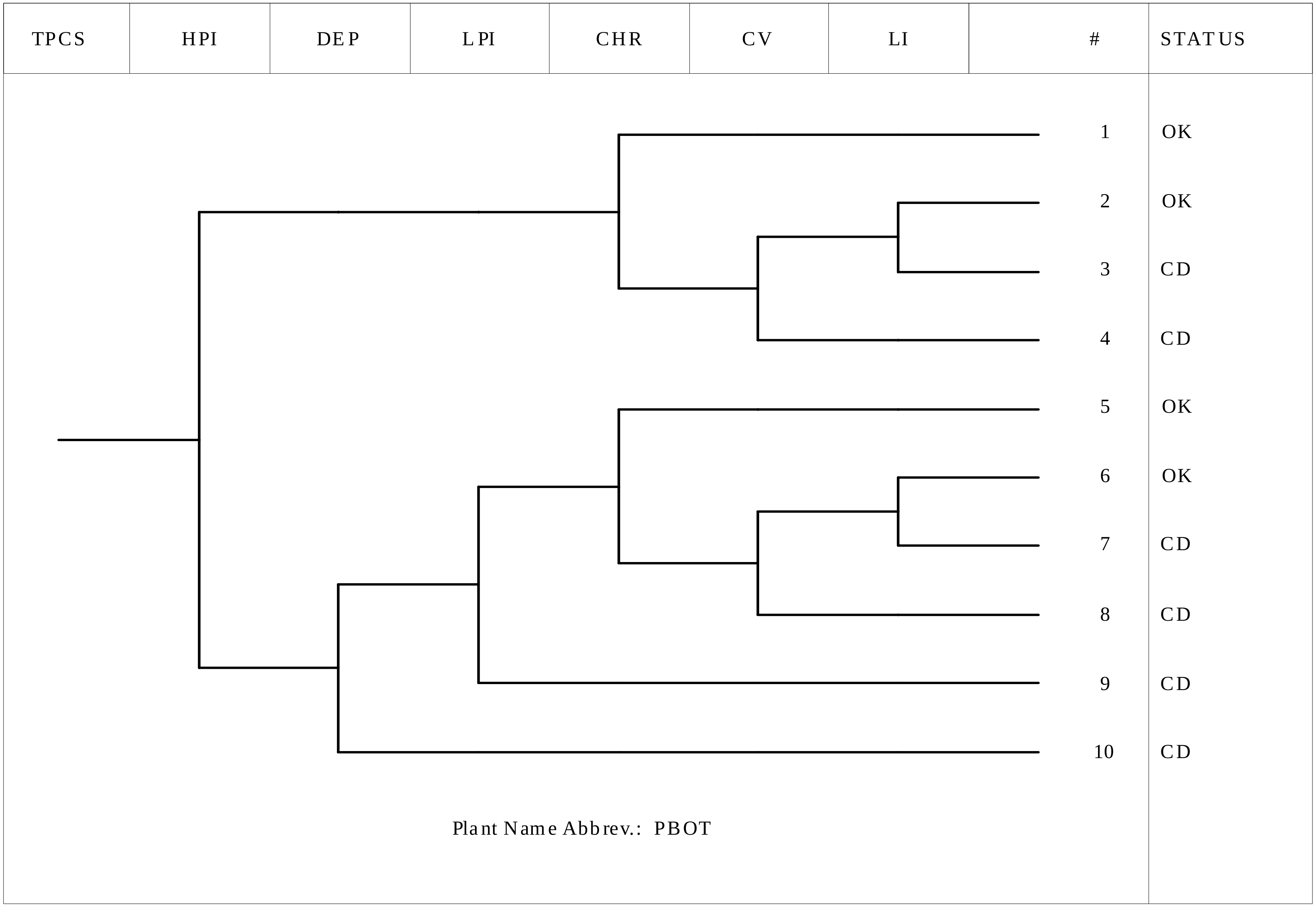
This section provides the simplified event trees called SDP event trees used to define the accident sequences identified in the SDP worksheets in the previous section. The event tree headings are defined in the corresponding SDP worksheets.

The following event trees are included:

1. Transients (Reactor Trip) (TRANS)
2. Transients without PCS (TPCS)
3. Small LOCA (SLOCA)
4. Stuck Open Relief Valve (SORV)
5. Medium LOCA (MLOCA)
6. Large LOCA (LLOCA)
7. Loss of Offsite Power (LOOP)
8. Anticipated Transients Without Scram (ATWS)
9. Loss of Train A DC Bus (LODC)


TRAN-(RX-TRIP)
PCS
HPI
DEP
LPI
CHR
CV
LI
#
STATUS
1 OK
2 OK
3 OK
4 CD
5 CD
6 OK
7 OK
8 CD
9 CD
10 CD
11 CD
Plant Name Abbrev.: PBOT

-42-


TPCS
HPI
DEP
LPI
CHR
CV
LI
#
STATUS
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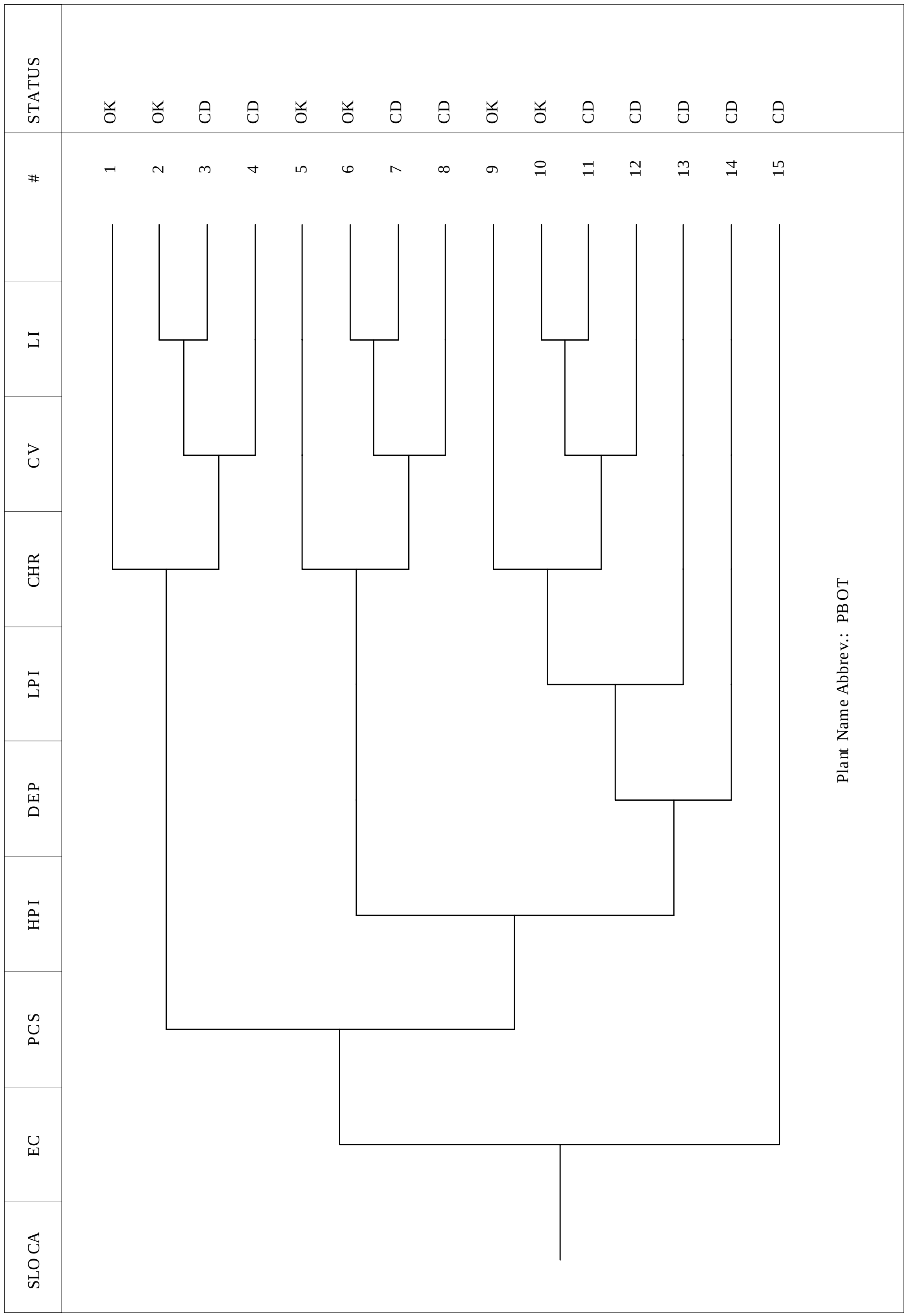
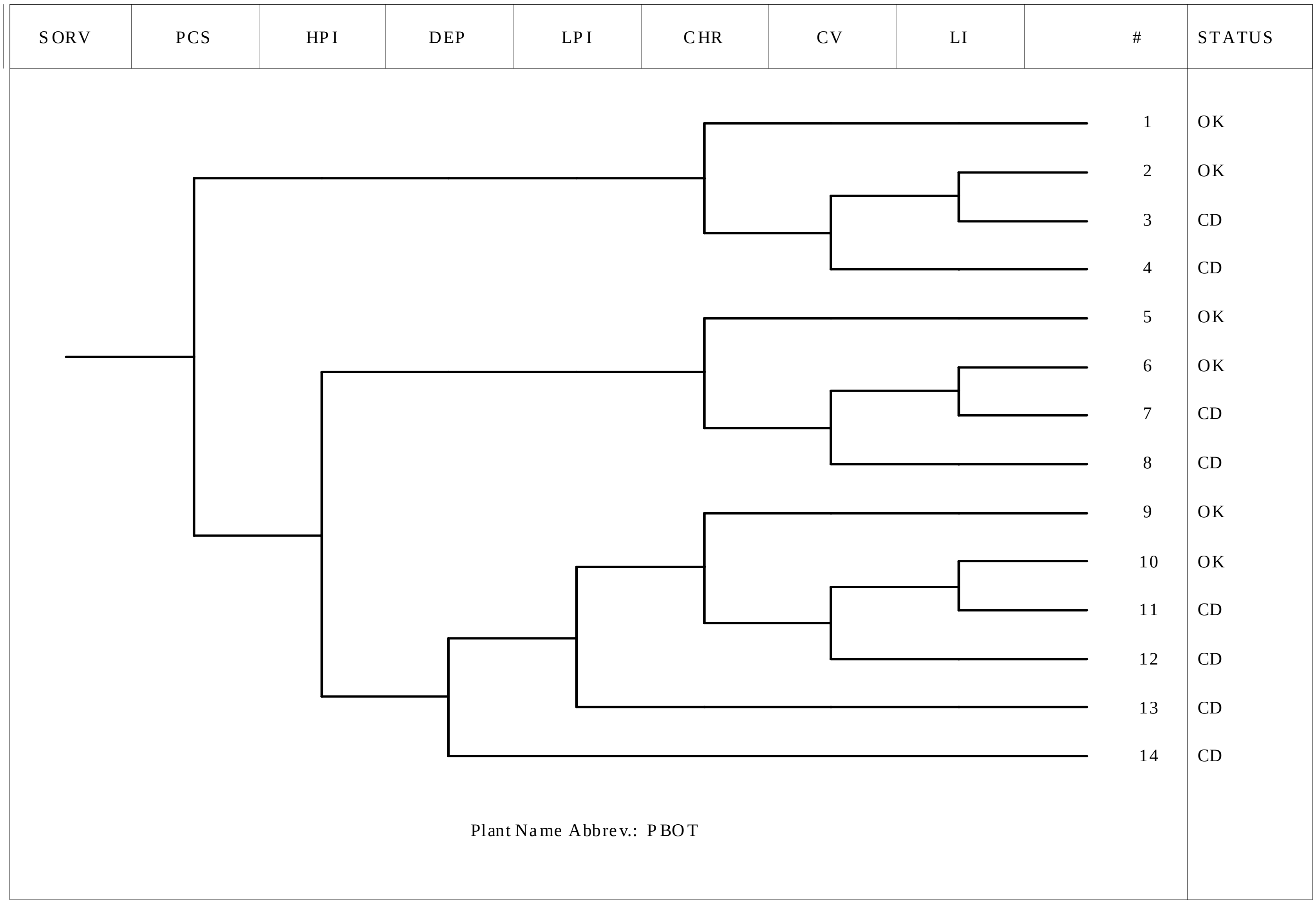
2 OK
3 CD
4 CD
5 OK
6 OK
7 CD
8 CD
9 CD
10 CD
Plant Name Abbrev.: PBOT



SLOCA
EC
PCS
HPI
DEP
LPI
CHR
CV
LI
#
STATUS
1 OK
2 OK
3 CD
4 CD
5 OK
6 OK
7 CD
8 CD
9 OK
10 OK
11 CD
12 CD
13 CD
14 CD
15 CD
Plant Name Abbrev.: PBOT

-44-


SORV
PCS
HPI
DEP
LPI
CHR
CV
LI
#
STATUS
1 OK
2 OK
3 CD
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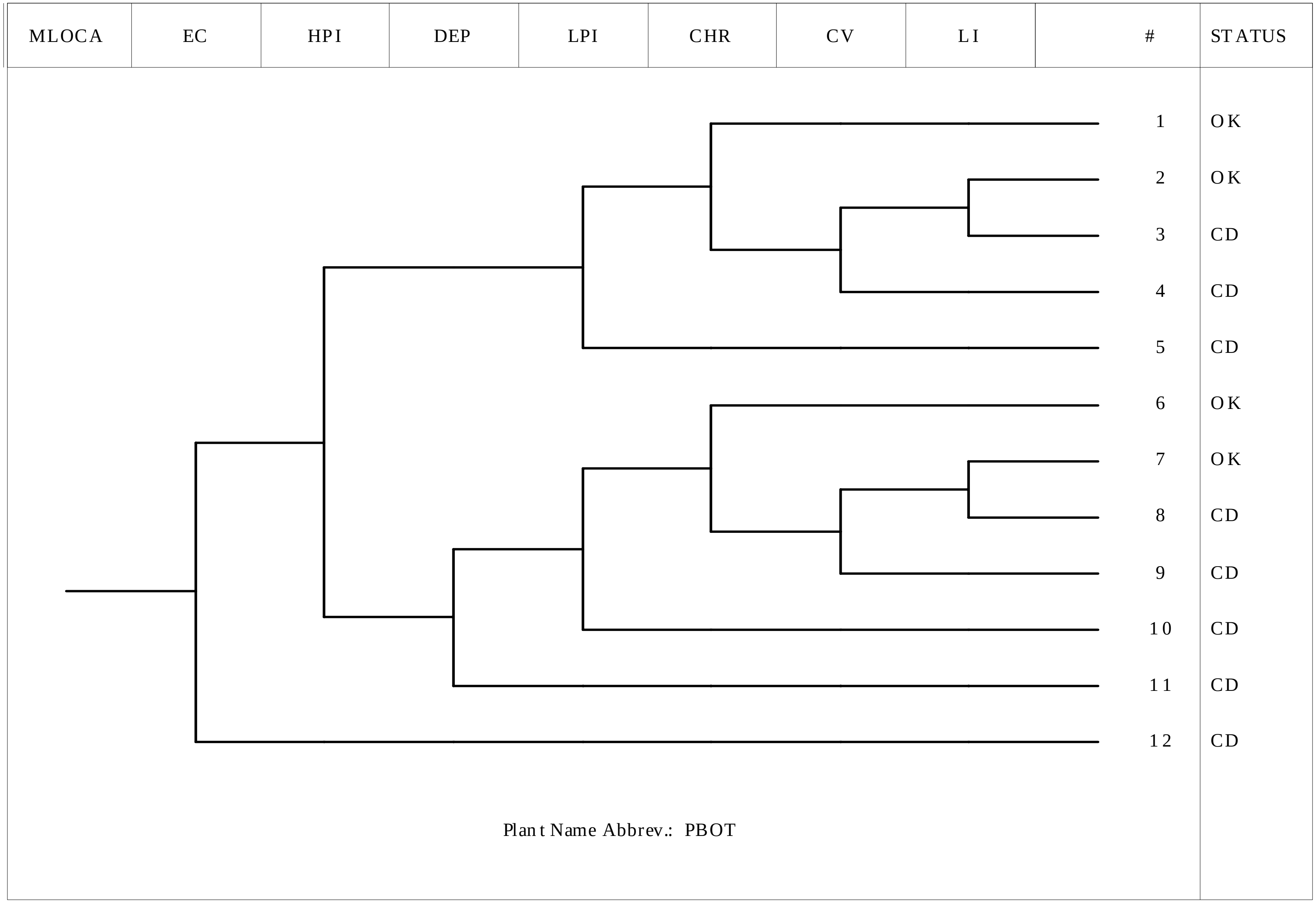
7 CD
8 CD
9 OK
10 OK
11 CD
12 CD
13 CD
14 CD
Plant Name Abbrev.: PBOT


MLOCA
EC
HPI
DEP
LPI
CHR
CV
LI
#
STATUS
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4 CD
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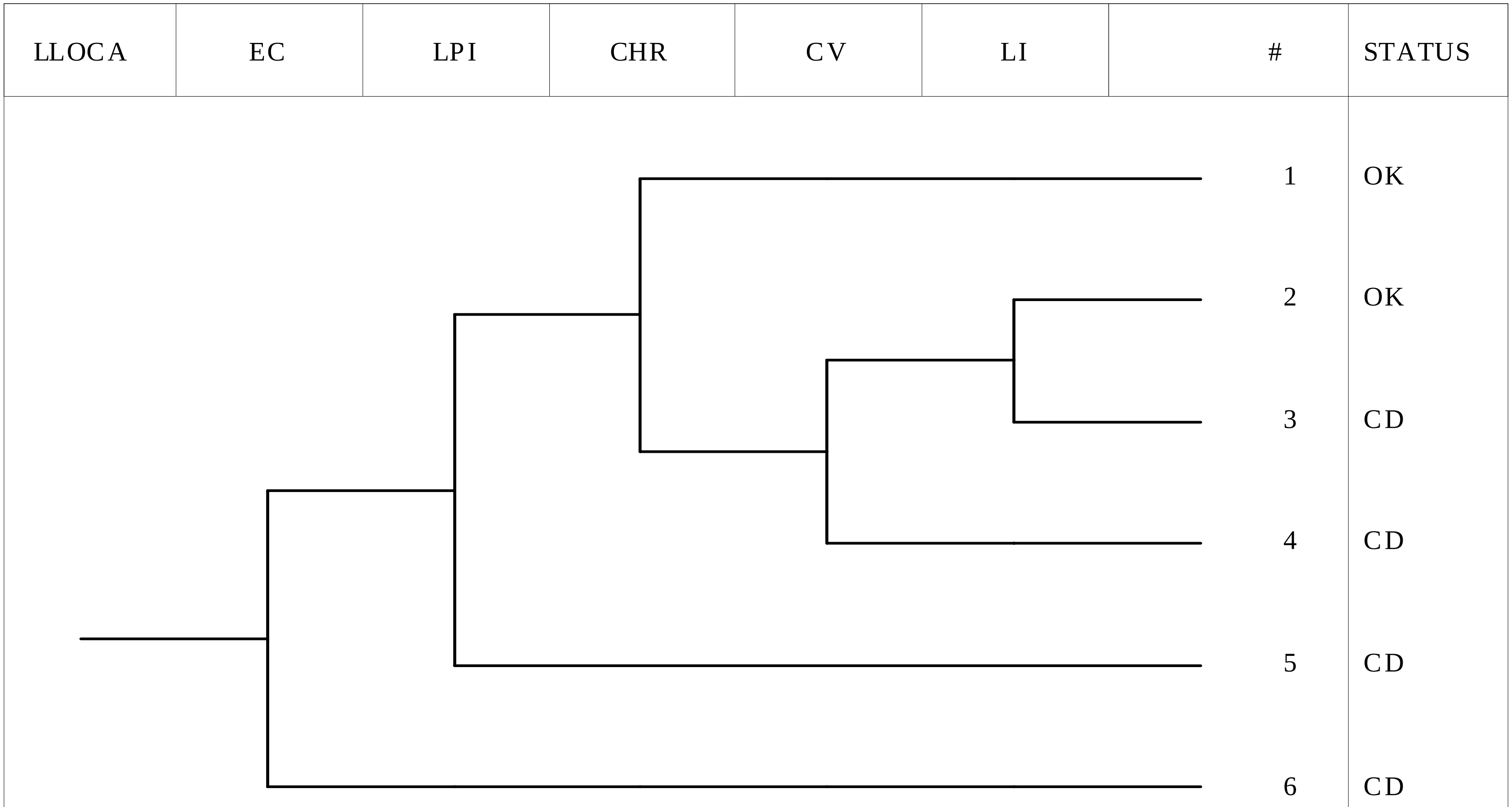
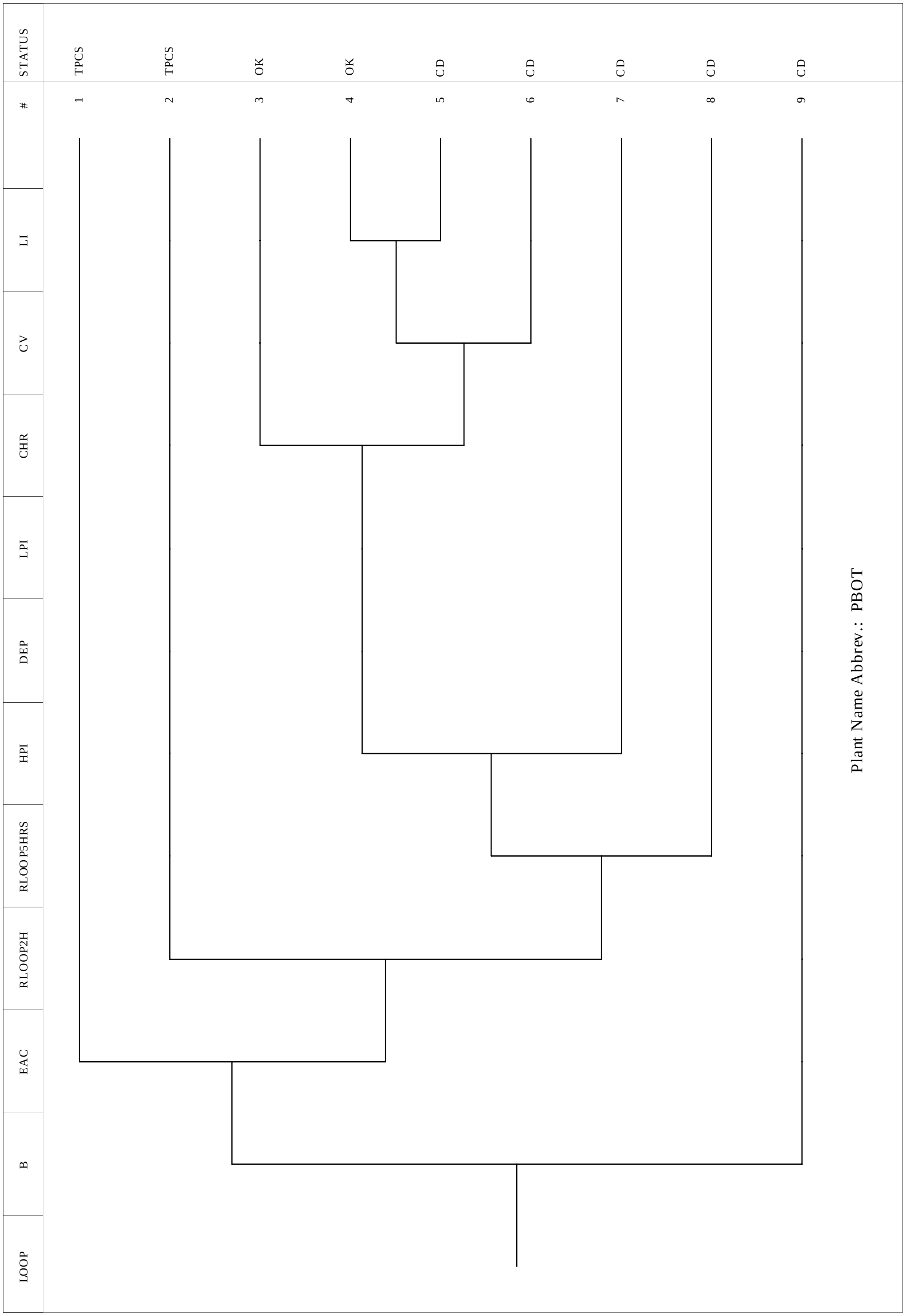
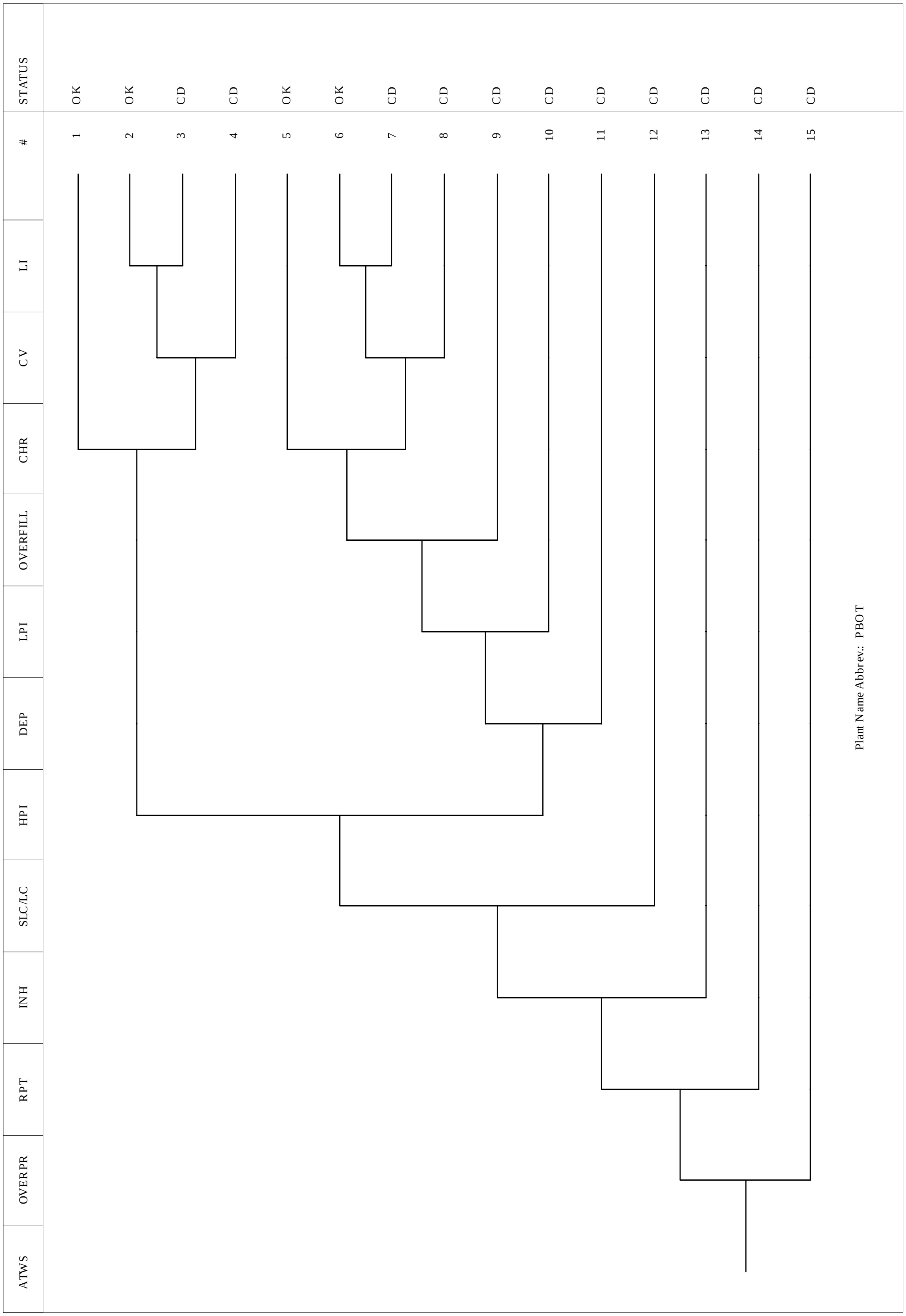
7 OK
8 CD
9 CD
10 CD
11 CD
12 CD
Plant Name Abbrev.: PBOT

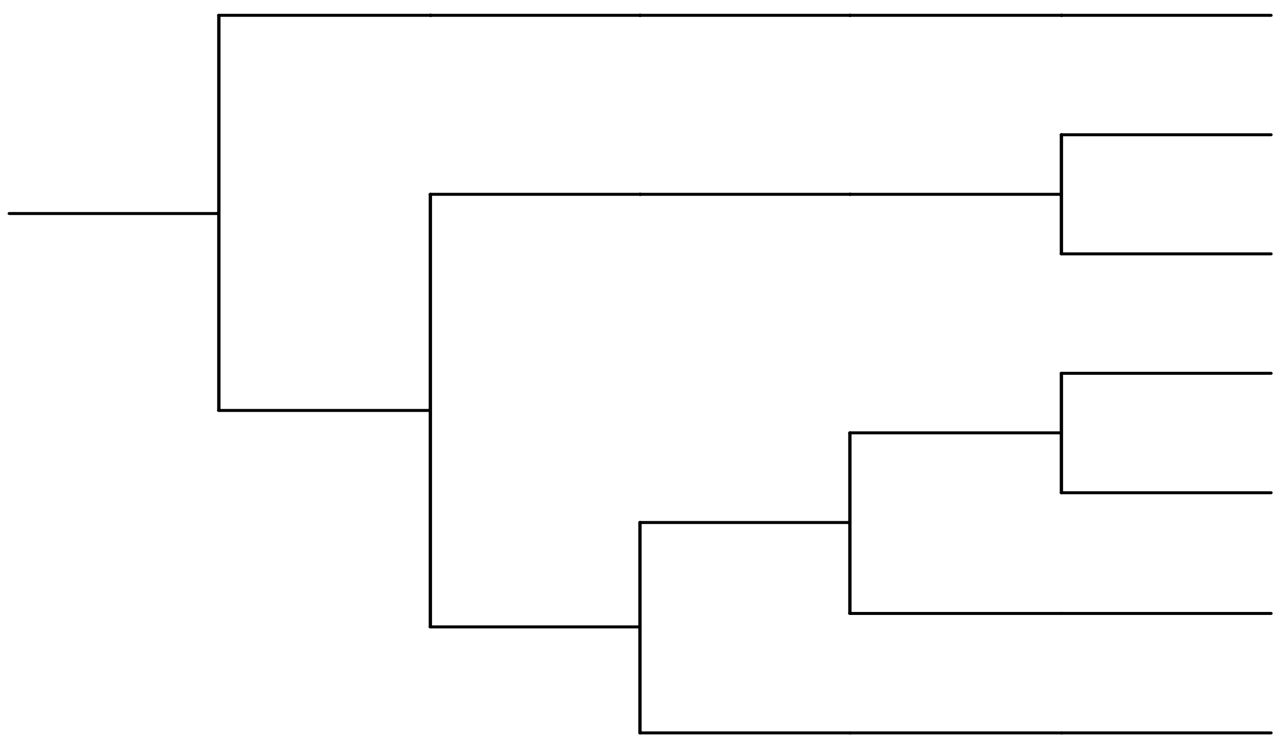


Plant Name Abbrev.: PBOT



STATUS
#
LI
CV
CHR
LPI
DEP
HPI
RLOOP5HRS
RLOOP2H
EAC
B
LOOP
TPCS 1
TPCS 2
OK 3
OK 4
CD 5
CD 6
CD 7
CD 8
CD 9
Plant Name Abbrev.: PBOT


STATUS
#
LI
CV
CHR
OVERFILL
LPI
DEP
HPI
SLC/LC
INH
RPT
OVERPR
ATWS
1 OK
2 OK
3 CD
4 CD
5 OK
6 OK
7 CD
8 CD
9 CD
10 CD
11 CD
12 CD
13 CD
14 CD
15 CD
Plant Name Abbrev.: PBOT



LODC	PCS	HPI	DEP	LPI/LI	CHR	#	STATUS
						1	OK
						2	OK
						3	CD
						4	OK
						5	CD
						6	CD
						7	CD

Plant Name Abbrev.: PBOT

2. RESOLUTION AND DISPOSITION OF COMMENTS

This section is composed of two subsections. Subsection 2.1 summarizes the generic assumptions that were used for developing the SDP worksheets for the BWR plants. These guidelines were based on the plant-specific comments provided by the licensee on the draft SDP worksheets and further examination of the applicability of those comments to similar plants. These assumptions which are used as guidelines for developing the SDP worksheets help the reader better understand the worksheets' scope and limitations. The generic guidelines and assumptions for BWRs are given here. Subsection 2.2 documents the plant-specific comments received on the draft version of the material included in this notebook and their resolution.

2.1 GENERIC GUIDELINES AND ASSUMPTIONS (BWRs)

Initiating Event Likelihood Rating Table

1. Assignment of plant-specific IEs into frequency rows:

Transient (Reactor trip) (TRANS), transients without PCS (TPCS), small, medium, and large LOCA (SLOCA, MLOCA, LLOCA), inadvertent or stuck-open SRVs (IORV), anticipated transients without scram (ATWS), interfacing system LOCA (ISLOCA), and LOCA outside containment (LOC) are assigned into rows based on consideration of industry-average frequency. Plant-specific frequencies can be different, but are not considered. Plant-specific frequencies for LOOP and special initiators are used to assign these initiating events.

2. Inclusion of special initiators:

The special initiators included in the worksheets are those applicable for the plant. A separate worksheet is included for each of the applicable special initiators. The applicable special initiators are primarily based on the plant-specific IPEs. In other words, the special initiator included are those modeled in the IPEs unless it is shown to be a negligible contributor. In some cases, in considering plants of similar design, a particular special initiator may be added for a plant even if it is not included in the IPE if such an initiator is included in other plants of similar design and is considered applicable for the plant. Except for the interfacing system LOCA (ISLOCA) and LOCA outside containment (LOC), if the occurrence of the special initiator results in a core damage, i.e., no mitigation capability exists for the initiating event, then a separate worksheet is not developed. For such cases, the inspection focus is on the initiating event and the risk implication of the inspection finding can be directly assessed. For ISLOCA and LOC, a separate worksheet is included noting the pathways that can lead to these events.

3. Inadvertent or stuck open relief valve as an IE in BWRs:

Many IPEs/PRAs model this event as a separate initiating event. Also, the failure of the SRVs to re-close after opening can be modeled within the transient tree. In the SDP worksheet, these events are modeled in a separate worksheet (and, are not included in the transient worksheets) considering both inadvertent opening and failure to re-close. We typically consider a single valve is stuck or inadvertently open. The frequency of this initiator is generically estimated for all BWR plants. This IE may behave similar to a small or medium LOCA depending on the valve size, and the mitigation capability is addressed accordingly.

4. LOCA outside containment (LOC):

A LOCA outside of containment (LOC) can be caused by a break in a few types of lines such as Main Steam or Feedwater. LOC is treated differently among the IPEs. Separate ETs are usually not developed in the IPEs for LOCs. Thus, credit is usually not taken for mitigating actions. LOC sequences typically have a core damage frequency in the E-8 range. As such, LOCs are included

together with ISLOCAs in a separate summary type SDP worksheet. Plant specific notes are included to explain how the particular IPE has addressed LOCs.

Initiating Event and System Dependency Table

1. Inclusion of systems under the support system column:

This table shows the support systems for the support and frontline systems. Partial dependency, which usually is a backup system, is not expected to be included. If included, they should be so noted. The intent is to include only the support system and not the systems supporting the support system, i.e., those systems whose failure will result in failure of the system being supported. Sometimes, some subsystems on which inspection findings may be noted have been included as a support system, e.g., EDG fuel oil transfer pump as a support system for EDGs.

2. Coverage of system/components and functions included in the SDP worksheets:

The Initiators and System Dependency Table includes systems and components which are included in the SDP worksheets and those which can affect the performance of these systems and components. One to one matching of the ET headings/functions to that included in the Table was not considered necessary.

SDP Worksheets and Event Trees

1. Crediting of non-safety related equipment:

SDP worksheets credit or include safety-related equipment and also, non-safety related equipment as used in defining the accident sequences leading to core damage. In defining the success criteria for the functions needed, the components included are typically those covered under the Technical Specifications (TS) and the Maintenance Rule (MR). No evaluation was performed to assure that the components included in the worksheets are covered under TS or MR. However, if a component was included in the worksheet, and the licensee requested its removal, it may not have been removed if it is considered that the components is included in either TS or MR.

2. No credit for certain plant-specific mitigation capability:

The significance determination process (SDP) screens inspection findings for Phase 3 evaluations. Some conservative assumptions are made which result in not crediting some plant-specific features. Such assumptions are usually based on comparisons with plants of similar design and to maintain consistency across the SDP worksheets of similar plant designs.

3. Crediting system trains with high unavailability

Some system component/trains may have unavailability higher than 1E-2, but they are treated in a manner similar to other trains with lower unavailability in the range of 1E-2. In this screening approach, this is considered adequate to keep the process simple. An exception is made for steam-

driven components which are designated as automatic steam driven (ASD) train with a credit of 1, i.e., an unavailability in the range of !E-1.

4. Treating passive components (of high reliability) same as active components:

Passive components, namely isolation condensers in some BWRs, are credited similar to active components. The reliability of these components are not expected to differ (from that of active components) by more than an order of magnitude. Pipe failures have been excluded in this process except as part of initiating events where appropriate frequency is used. Accordingly, a separate designation for passive components was not considered necessary.

5. Defining credits for operator actions:

The operator's actions modeled in the worksheets are categorized as follows: operator action=1 representing an error probability of 5E-2 to 0.5; operator action=2 representing an error probability of 5E-3 to 5E-2; operator action=3 representing an error probability of 5E-4 to 5E-3; and operator action=4 representing an error probability of 5E-5 to 5E-4. Actions with error probability > 0.5 are not credited. Thus, operator actions are associated with credits of 1, 2, 3, or 4. Since there is large variability in similar actions among different plants, a survey of the error probability across plants of similar design was used to categorize different operator actions. From this survey, similar actions across plants of similar design are assigned the same credit. If a plant uses a lower credit or recommends a lower credit for a particular action compared to our assessment of similar action based on plant survey, then the lower credit is assigned. An operator's action with a credit of 4, i.e., operator action=4, is noted at the bottom of the worksheet; the corresponding hardware failure, e.g., 1 multi-train system, is defined in the mitigating function.

6. Difference between plant-specific values and SDP designated credits for operator actions:

As noted, operator actions are assigned to a particular category based on review of similar actions for similar design plants. This results in some differences between plant-specific HEP values and credit for the action in the worksheet. The plant-specific values are usually noted at the bottom of the worksheet, when available.

7. Dependency among multiple operator actions:

IPEs or PRAs, in general, account for dependencies among multiple operator actions that may be applicable. In this SDP screening approach, if multiple actions are involved in one function, then the credit for the function is designated as one operator action considering the dependency involved.

1. Crediting late injection (LI) following failure of containment heat removal (CHR), i.e., suppression pool cooling:

Following successful high or low pressure injection, suppression pool cooling is modeled. Upon failure of suppression pool cooling, containment venting (CV) is considered followed by late

injection. Late injection is credited if containment venting is successful. Further, LI is required following CV success. The suction sources for the LI systems credited are different from the suppression pool. HPCI, LPCI, and CS are not credited in late injection. No credit is given for LI following failure of CV. The survival probability is low and such details are not considered in the screening approach here.

9. Combining late injection (LI) with low pressure injection (LPI) or containment venting (CV):

In some modeling approaches, LI is combined with LPI or CV. In the SDP worksheet approach here, these functions are separate. As discussed above, LPI and LI use different suction sources, and CV and LI may be two different categories of operator actions. In these respects, for some plants, SDP event trees may be different than the plant-specific trees.

10. Crediting condensate trains as part of multiple functions: power conversion system (PCS), low pressure injection (LPI), and late injection (LI):

Typically, condensate trains can be used as an LPI and LI source in addition to its use as part of the power conversion system. However, crediting the same train in multiple functions can result in underestimation of the risk impact of an inspection finding in the SDP screening approach since it does not account for these types of dependencies in defining the accident sequences. To simplify the process and to avoid underestimation, condensate train is not credited in LPI, but may be credited in LI.

11. Modeling vapor suppression success in different LOCA worksheets:

Vacuum breakers typically must remain closed following a LOCA to avoid containment failure and core damage. Some plants justify that vapor suppression is not needed for SLOCA. These sequences typically have low frequency and are not among the important contributors. However, an inspection finding on these vacuum breakers may make these sequences a dominant contributor. Accordingly, success of vapor suppression is included in the SDP worksheets. It is included for all three LOCA worksheets (LLOCA, MLOCA, and SLOCA); for plants presenting justification that they are not needed in a SLOCA appropriate modifications are made.

12. ATWS with successful PCS as a stable plant state:

Some plants model a stable plant state when PCS is successful following an ATWS. Following our comparison of similarly designed plants, such credits are not given.

13. Modeling different EDG configurations, SBO diesel, and cross-ties:

Different capabilities for on-site emergency AC power exist at different plant sites. To treat them consistently across plants, they are typically combined into a single emergency AC (EAC) function. The dedicated EDGs are credited following the standard convention used in the worksheets for equipment (1 dedicated EDG is 1 train; 2 or more dedicated EDGs is 1 multi-train system). The use of the swing EDG or the SBO EDG requires operator action. The full mitigating capability for emergency AC could include dedicated Emergency Diesel Generators (EDG), Swing EDG, SBO

EDG, and finally, nearby fossil-power plants. The following guidelines are used in the SDP modeling of the Emergency AC power capability:

1. Describe the success criteria and the mitigation capability of dedicated EDGs.

2. Assign a mitigating capability of “operator action=1" for a swing EDG. The SDP worksheet assumes that the swing EDG is aligned to the other unit at the time of the LOOP (in a sense a dual unit LOOP is assumed). The operator, therefore, should trip, transfer, re-start, and load the swing EDG.

3. Assign a mitigating capability of “operator action=1" for an SBO EDG similar to the swing EDG. Note, some of the plants do not take credit for an SBO EDG for non-fire initiators. In these cases, credit is not given.

4. Do not credit the nearby power station as a backup to EDGs. The offsite power source from such a station could also be affected by the underlying cause for the LOOP. As an example, overhead cables connecting the station to the nuclear power plant also could have been damaged due to the bad weather which caused the LOOP. This level of detail should be left for a Phase 3 analysis.

14. Recovery of losses of offsite power:

Recovery of losses of offsite power is assigned an operator-action category even though it is usually dominated by a recovery of offsite AC, independent of plant activities. Furthermore, the probability of recovery of offsite power in “X” hours (for example 4 hours) given it is not recovered earlier (for example, in the 1st hour) would be different from recovery in 4 hours with no condition. The SDP worksheet uses a simplified approach for treating recovery of AC by denoting it as an operator action=1 or 2 depending upon the HEP used in the IPE/PRA. A footnote highlighting the actual value used in the IPE/PRA is provided, when available.

15. Mitigation capability for containment heat removal:

The mitigation capability for containment heat removal (CHR) function is considered dominated by the hardware failure of the RHR pumps. The applicable operator action is categorized as an operator action with a credit 4, i.e., operator action=4. For this situation, the function is defined as 1 multi-train system since the operator action involved is considered routine and reliable, and is assigned a credit of 4. No other operator action in the worksheets is generically assigned this high credit.

16. Crediting CRD pumps as an alternate high pressure injection source:

In many plants, CRD pumps can be used as a high pressure injection source following successful operation of HPCI or RCIC for a period of time, approximately 1 to 2 hours. In some plants, CRD system is enhanced where it can be directly used and does not need the successful operation of other HPI sources. In the worksheets, if the CRD pumps require prior successful operation of HPCI or RCIC as a success criteria, then CRD is not credited as a separate high pressure injection

source. If the CRD can be used and does not require successful operation of HPCI or RCIC, then it is credited as a separate success path within the HPI function.

2.2 RESOLUTION OF PLANT-SPECIFIC COMMENTS

This section documents the comments received on the material included in this report and their resolution.

Plant Specific Comments

The licensee supplied written comments in the form of a mark-up to the draft Notebook. This section summarizes the response to those comments. The licensee referenced an updated PRA for Peach Bottom Units 2 & 3, as Peach Bottom model revision PB 99. They have also indicated that the inspection notebook should apply to both Units 2 & 3.

Changes to Table 1, System Dependency Table

The licensee suggested that a column be added to list the top events and to relate these to each system. They also suggested that the systems be ordered alphabetically. These formatting comments are considered reasonable but were not implemented at this time.

Made changes to provide additional information on support systems and major components.

Added a few more clarifying notes to the Table.

Changes to Worksheets

The PB PRA gives credit for CRD as an HPI system after 4 hours of HPCI or RCIC operation. The licensee recommended that credit be given for CRD in HPI in the Trans (Rx trip) worksheet, however this is not included due to this required 4 hour delay and a lack of more detailed justification.

Added clarifying detail to PCS mitigation capability, late inventory, HEP values, notes to worksheets, and a few other miscellaneous comments.

The licensee recommended that the LOOP sheet be modified by adding credit for the Conowingo tie line. Per generic resolution NRC is not adding credit for other offsite power lines. However, this was added as a note to the worksheet.

The licensee recommended that the minimum bypass leakage for drywell to suppression pool vacuum breakers be specified. This would be useful but was not available.

In several cases the licensee requested that condensate and the RHR/HPSW injection paths be credited for LPI in addition to LI. Generically the NRC is not crediting these flow paths in both places because it will tend to give results that underestimate risk when compared with the IPE. This credit could be considered, if appropriate in Phase 3 analyses.

Added an ATWS - DEP core damage sequence to the ATWS worksheet and ET based on licensee recommendation.

REFERENCES

1. NRC SECY-99-007A, Recommendations for Reactor Oversight Process Improvements (Follow-up to SECY-99-007), March 22, 1999.

2. PECO Energy Company, "Peach Bottom, Unit 2 – Individual Plant Examination Report," August, 1992.

3. PECO Energy Company comments on inspection notebook, consisting of a mark-up of the draft notebook, no date on mark-up.