February 27, 2001

Mr. Michael Kansler
Sr. Vice President and Chief
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440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT - SITE-SPECIFIC WORKSHEETS FOR USE IN THE NUCLEAR REGULATORY COMMISSION'S SIGNIFICANCE DETERMINATION PROCESS (TAC NO. MA6544)

Dear Mr. Kansler:

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 risk-informed inspection findings. This document is one of the key implementation tools of the reactor safety SDP in the reactor oversight process and is accessible electronically through the ADAMS Public Electronic Reading Room link at the NRC web site (http://www.nrc.gov).

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 forwarded to the Chief, Probabilistic Safety Assessment Branch, Nuclear Reactor Regulation (NRR). We will continue to assess SDP accuracy and update the document based on continuing experience.

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.

We will coordinate our efforts through your licensing or risk organizations as appropriate. If you have any questions, please contact me at 301-415-1441.

Sincerely,

/RA/

Guy S. Vissing, Senior Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-333

Enclosure: As stated

cc w/encl: See next page

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RISK-INFORMED INSPECTION NOTEBOOK FOR

James A. Fitzpatrick Nuclear Power Plant

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 James A. Fitzpatrick Nuclear Power Plant.

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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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 James A. Fitzpatrick Nuclear Power Plant.

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 James A Fitzpatrick Nuclear Power Plant

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, Inadvertent or stuck open SRV (IORV)	**B**	**C**	**D**
III	1 per 10^{2} - 10^{3} yr	Loss of Safeguard AC Bus (TAC5 & TAC6), Loss of 125V DC Battery Control Boards (TDCA and TDCB)	**C**	**D**	**E**
IV	1 per 10^{3} - 10^{4} yr	Small LOCA (RCS rupture), 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		

Notes:

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).

2. The Fitzpatrick LOOP initiating event frequency in the IPE is 5.7 E-2 events per reactor year. The initiating event frequency for TAC, TDCA, and TDCB in the above table from the IPE is 5 E-3 events per reactor year.

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 for Fitzpatrick

Affected System		Major Components	Support Systems	Initiating Event Scenarios
Code	**Name**			
PCS	Power Conversion System	9 MDP, 2 TDP, MOV, 4 TBV, 8 MSIV, condenser	4160V AC, 600V AC, 120V AC, 125V DC, TBCLCS, IAS, N_2, CW	TRANS (Reactor Trip), SLOCA, IORV, MLOCA, LLOCA, TAC, TDCA, TDCB
HPCI	High Pressure Coolant Injection	MOV, 1 TDP	125V DC, CAC, Act	All but LLOCA & TDCB
RCIC	Reactor Core Isolation Cooling	MOV, 1 TDP	125V DC, HVAC, Act	TRANS (Reactor Trip), TPCS, SLOCA, IORV, LOOP, ATWS, TAC, TDCB
SRVs	Safety Relief Valves	11 SRV, SOV, Relays	N_2, 125V DC, Act	All but LLOCA
N_2	SRV Nitrogen System	Vaporizer, valves, accumulators	AC	All but LLOCA
LPCI	Low Pressure Coolant Injection	4 MDP, MOV	4160V AC, 600V AC, 419V DC, 125V DC, CAC, Act	All
RHR	Residual Heat Removal	4 MDP, 2 HX, MOV	4160V AC, 600V AC, 125V DC, CAC, RHRSW	All
CS	Core Spray	2 MDP, MOV	4160V AC, 600V AC, 125V DC, CAC, Act	All but ATWS
AC	AC Power (non-EDG)	4160V AC, 600V AC, Transformers, buses	125V DC	All
EDGs	AC Power (EDGs)	4 Engine-Generators	DC, HVAC, FO xfer, Act, ESW	LOOP
FO xfer	Fuel Oil Transfer	2 MDP, tanks	AC, DC, Act	LOOP

Table 2 (Continued)

Affected System		Major Components	Support Systems	Initiating Event Scenarios
Code	**Name**			
125 VDC	DC Power 125V DC	2 Batteries, 2 Battery Chargers	None (Short term - 2 hours) Chargers and AC (long term) - 600V AC, 120V AC	TDCA, TDCB
419 VDC	DC Power 419V DC (LPCI)	2 Batteries, 2 Battery Chargers	None (Short term - 2 hours) Chargers and AC (long term) - 600V AC, 120V AC	All
Act	Actuation System	Instrumentation	125V AC, 125V DC, 419V DC	All
ESW	Emergency Service Water	2 MDP, MOV	600V AC, 125V DC, Act	All
HVAC	Heating, Ventilation and Air-Conditioning	EDG Room Ventilation, RCIC Enclosure Ventilation	600V AC, Act	TRANS (Reactor Trip), TPCS, SLOCA, IORV, LOOP, ATWS, TAC, TDCB
CAC	Crescent Area Cooling	10 unit coolers	ESW, Act	All
RBCLCS	Reactor Bldg. Closed Loop Cooling System	3 MDP, 3 HX	SWS, 600V AC, 125V DC	All
CRD	Control Rod Drive	2 MDP, MOV	600V AC, 125V DC, RBCLCS/ESW, IAS	All
RHRSW	RHR Service Water	4 MDP, MOV	4160V AC, 600V AC, 125V DC	All
SWS	Normal Service Water System	3 MDP, Strainers	4160V AC, 600V AC, 125V DC, IAS	All
RPT	Recirc Pump Trip	Instrumentation	125V DC, Act	ATWS
SLC	Standby Liquid Control	2 MDP, 2 explosive valves	600V AC, 120V AC	ATWS

Table 2 (Continued)

Affected System		Major Components	Support Systems	Initiating Event Scenarios
Code	Name			
TBCLCS	Turbine Building Closed Loop Cooling System	3 MDP, 3 HX	SWS, 4160V AC	All
IAS	Instrument & Service Air System	3 Air Compressors	600V AC, 125V DC, TBCLCS, Act	All
CW	Circulating Water	3 MDPs, valves	AC, DC	TRANS (Reactor Trip), SLOCA, IORV
CV	Containment Vent; N_2 ventilation & purge system	MOV	600V AC, 120V AC	All

Notes:

1. Information herein was initially developed from the Fitzpatrick IPE dated August, 1991 and RAI responses dated September 1, 1992**.** Modifications were made based on licensee input received during the Pilot plant process.

2. The baseline Fitzpatrick IPE core damage frequency (CDF) from internal events was 1.9×10^{-6} events/Reactor year and the Large Early Release Frequency (LERF) was 7.8×10^{-7} events/Reactor year. Internal floods were not a significant contributor in the Fitzpatrick IPE.

3. The ‘Initiating Event Scenarios’ column provides a guide as to which worksheets contain credit for a particular system. The ISLOCA/LOC worksheet is not referenced in this column.

4. There are four turbine bypass valves (TBVs) with a total capacity of 25%.

5. DC Power: The IPE Section 3.2.2.7 states that the fully charged 125V DC system has sufficient capacity to supply all its post-LOCA loads for at least 2 hours after the loss of its charger. The 419 VDC system supplies an inverter to produce 600 VAC for the LPCI MOVs.

6. RBCLCS is the normal cooling for the CRD System. ESW can serve as an alternate cooling source for CRD if RBCLCS is unavailable; this is indicated by RBCLCS/ESW in the above table. The CRD system is the only load of RBCLCS that is credited in the IPE.

Table 2 (Continued)

7. ESW cooling is credited only for EDG, CRD, and CAC in the IPE.

8. The HVAC systems credited in the IPE are: CAC, EDG and RCIC. The EDG and RCIC consist only of fans and dampers, while the CAC also includes ESW cooling units. CAC is used to cool RHR, CS, and HPCI equipment.

9. The only loads for the IAS considered in the IPE are for the CRD, condensate, feedwater, MSIVs, and SW Systems.

10. The only loads for the SWS considered in the IPE are: TBCLCS, RBCLCS, CAC, and the steam jet air ejectors.

11. CV: Fitzpatrick has a vent path from the drywell and the suppression pool (SP), but only the SP path is credited in the IPE.

1.3 SDP WORKSHEETS

This section presents the SDP worksheets to be used in the Phase 2 evaluation of the inspection findings for the James A Fitzpatrick Nuclear Power Plant. The SDP worksheets are presented for the following initiating event categories:

1. Transients (Reactor Trip (TRANS)
2. Transients with Loss of PCS (TPCS)
3. Small LOCA (SLOCA)
4. Inadvertent Open Relief Valve (IORV)
5. Medium LOCA (MLOCA)
6. Large LOCA (LLOCA)
7. Loss of Offsite Power (LOOP)
8. Anticipated Transients Without Scram (ATWS)
9. Loss of Safeguard AC Bus 10500 (TAC5)
10. Loss of Safeguard AC Bus 10600 (TAC6)
11. Loss of 125 VDC Battery Control Board A (TDCA)
12. Loss of 125 VDC Battery Control Board B (TDCB)
13. Interfacing System LOCA (ISLOCA) and LOCA Outside Containment (LOC)

Table 3. 1 SDP Worksheet for Fitzpatrick — Transients (Reactor Trip) (TRANS)

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)	Condenser, 1/3 CW pumps, 1/2 condensate pumps, 1/2 condensate booster pumps, 1/2 feedwater pumps, 1/4 TBVs. (operator action = 3)
High Pressure Injection (HPI)	HPCI (1 ASD train) or RCIC (1 ASD train)
Depressurization (DEP)	Depressurize with 2/11 SRVs (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 CS pumps (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps, associated RHR HX and 1/4 RHRSW pumps in 1/2 trains in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/2 CRD pumps or 1/2 condensate pumps (operator action = 2); or 1/4 RHRSW pumps cross-tied to inject via 1/2 LPCI paths (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
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. There are four turbine bypass valves (TBVs) with a total capacity of 25%.

2. The HEP in the Fitzpatrick IPE for DEP is 4.5 E-4.

3. Containment venting (CV) can cause high temperature, humidity, and radiation in the reactor building and can have an effect on the hardware availability. Therefore, this worksheet does not credit LPCI and CS for LI; they may actually be impacted by CV and may not be available. The HEP in the Fitzpatrick IPE for CV is 2.6 E-3.

Table 3. 2 SDP Worksheet for Fitzpatrick — 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)	Depressurize with 2/11 SRVs (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 CS pumps (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps, associated RHR HX and 1/4 RHRSW pumps in 1/2 trains in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/2 CRD pumps (operator action = 2) ; or 1/4 RHRSW pumps cross-tied to inject via 1/2 LPCI paths (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. This event tree and worksheet is for Transient (without PCS). TPCS includes MSIV closure, turbine trip without bypass, and loss of feedwater. It is assumed that no aspects of the PCS are available for safety functions during the transients evaluated in this event tree and worksheet.

2. The HEP in the Fitzpatrick IPE for DEP is 4.5 E-4.

3. Containment venting (CV) can cause high temperature, humidity, and radiation in the reactor building and can have an effect on the hardware availability. Therefore, this worksheet does not credit LPCI & CS for LI, they may actually be impacted by CV and may not be available. The HEP in the Fitzpatrick IPE for CV is 2.6 E-3.

Table 3.3 SDP Worksheet for Fitzpatrick — Small LOCA (SLOCA)

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)	Condenser, 1/3 CW pumps, 1/2 condensate pumps, 1/2 condensate booster pumps, 1/2 feedwater pumps, 1/4 TBVs (operator action = 3)
High Pressure Injection (HPI)	HPCI (1 ASD train) or RCIC (1 ASD train)
Depressurization (DEP)	Depressurize with 2/11 SRVs (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 CS pumps (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps, associated RHR HX and 1/4 RHRSW pumps in 1/2 trains in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/2 CRD pumps or 1/2 condensate pumps (operator action = 2); or 1/4 RHRSW pumps cross-tied to inject via 1/2 LPCI paths (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 SLOCA -PCS - CHR - LI (4, 8)			
2 SLOCA - PCS - CHR - CV (5, 9)			
3 SLOCA - PCS - HPI - LPI (10)			
4 SLOCA - 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 HEP in the Fitzpatrick IPE for DEP is 4.5 E-4.

2. Containment venting (CV) can cause high temperature, humidity, and radiation in the reactor building and can have an effect on the hardware availability. Therefore, this worksheet does not credit LPCI & CS for LI; they may actually be impacted by CV and may not be available. The HEP in the Fitzpatrick IPE for CV is 2.6 E-3.

3. Fitzpatrick stated that injecting via the RHRSW crosstie shouldn't be a high stress operator action, since it occurs late in the accident sequence and it is prescribed in the EOPs. However, it is generically kept as an operator action = 1 in all BWR-4 worksheets.

Table 3.4 SDP Worksheet for Fitzpatrick — Inadvertent Open Relief Valve (IORV)

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)	Condenser, 1/3 CW pumps, 1/2 condensate pumps, 1/2 condensate booster pumps, 1/2 feedwater pumps, 1/4 TBVs (operator action = 3)
High Pressure Injection (HPI)	HPCI (1 ASD train) or RCIC (1 ASD train)
Depressurization (DEP)	Depressurize with 1/11 SRVs (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 CS pumps (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps, associated RHR HX and 1/4 RHRSW pumps in 1/2 trains in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/2 CRD pumps or 1/2 condensate pumps (operator action = 2) ; or 1/4 RHRSW pumps cross-tied to inject via 1/2 LPCI paths (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 IORV -PCS - CHR - LI (4, 8)			
2 IORV - PCS - CHR - CV (5, 9)			
3 IORV - PCS - HPI - LPI (10)			
4 IORV - 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. This worksheet applies to either an inadvertent open relief valve (IORV) or a stuck open relief valve (SORV). A transient initiated by the inadvertent opening of a relief valve will result in steam being discharged to the SP. Should an SRV stick open, plant procedure F-AOP-36 instructs the operators to manually scram the reactor. Should the MSIVs close, the transient development is similar to an SLOCA, but is analyzed separately since the open SRV will eventually lower the reactor pressure sufficiently to require the use of alternate low pressure injection systems.

2. The HEP in the Fitzpatrick IPE for DEP is 4.5 E-4.

3. Fitzpatrick also takes credit for 1/11 TBVs for the CHR function, however this is not credited to avoid double credit for the PCS system in certain sequences.

4. Containment venting (CV) can cause high temperature, humidity, and radiation in the reactor building and can have an effect on the hardware availability. Therefore, this worksheet does not credit LPCI and CS for LI; they may actually be impacted by CV and may not be available. The HEP in the Fitzpatrick IPE for CV is 2.6 E-3.

5. Fitzpatrick stated that injecting via the RHRSW crosstie shouldn’t be a high stress operator action, since it occurs late in the accident sequence and it is prescribed in the EOPs. However, it is generically kept as an operator action = 1 in all BWR-4 worksheets.

Table 3. 5 SDP Worksheet for Fitzpatrick — 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 Suppression Pool, 5/5 vacuum breakers remain closed at onset of LOCA (1 single train system)
High Pressure Injection (HPI)	HPCI (1 ASD train)
Depressurization (DEP)	Depressurize with 2/11 SRVs (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 CS pumps (1 multi-train system)
Containment Heat Removal (CHR)	1/4 RHR pumps, associated RHR HX and 1/4 RHRSW pumps in 1/2 trains in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/2 CRD pumps or 1/2 condensate pumps (operator action = 2); or 1/4 RHRSW pumps cross-tied to inject via 1/2 LPCI paths (operator action = 1)

Affected Sequences (circle affected functions):	Recovery of Failed Train	Remaining Creditable Mitigation Capability 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.			

Notes:

1. The Fitzpatrick IPE (p. 3-14) discusses the failure of EC noted above. They state that the failure probability is about 9 E-5 per demand and, therefore, this is not considered further in the IPE. Nonetheless, the NRC has generically included this in the SDP worksheets for all BWR-4 reactors.

2. The HEP in the Fitzpatrick IPE for DEP is 4.5 E-4.

3. Based on the Fitzpatrick IPE, 1/ 2 CRD pumps is able to maintain adequate reactor level in medium and large LOCAs, as long as core make- up had previously operated for 10 hours.

4. Containment venting (CV) can cause high temperature, humidity, and radiation in the reactor building and can have an effect on the hardware availability. Therefore, this worksheet does not credit LPCI and CS for LI; they may actually be impacted by CV and may not be available. The HEP in the Fitzpatrick IPE for CV is 2.6 E-3.

Table 3.6 SDP Worksheet for Fitzpatrick — 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 Suppression Pool, 5/5 vacuum breakers remain closed at onset of LOCA (1 single train system)
Low Pressure Injection (LPI)	1/4 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/2 CS pumps (1 multi-train system) or
Containment Heat Removal (CHR)	1/4 RHR pumps, associated RHR HX and 1/4 RHRSW pumps in 1/2 trains in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/2 CRD pumps or 1/2 condensate pumps (operator action = 2) ; or 1/4 RHRSW pumps cross-tied to inject via 1/2 LPCI paths (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. The Fitzpatrick IPE (p. 3-14) discusses the failure of EC noted above. They state that the failure probability is about 9 E-5 per demand and, therefore, this is not considered further in the IPE. Nonetheless, the NRC has generically included this in the SDP worksheets for all BWR-4 reactors.

2. The HEP in the Fitzpatrick IPE for DEP is 4.5 E-4.

3. Based on the Fitzpatrick IPE, 1/ 2 CRD pumps is able to maintain an adequate reactor level in medium and large LOCAs, as long as core make-up had previously operated for 10 hours.

4. Containment venting (CV) can cause high temperature, humidity, and radiation in the reactor building and can have an effect on the hardware availability. Therefore, this worksheet does not credit LPCI and CS for LI, they may actually be impacted by CV and may not be available. The HEP in the Fitzpatrick IPE for CV is 2.6 E-3.

Table 3.7 SDP Worksheet for Fitzpatrick — 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:
Emergency AC Power (EAC)	1/4 EDGs (1 multi-train system)
Recovery of LOOP (RLOOP1H)	Recovery of LOOP in 1 hours (operator action = 1)
Recovery of LOOP (RLOOP13H)	Recovery of LOOP in 13 hours (operator action = 2)
High Pressure Injection (HPI)	HPCI (1 ASD train) or RCIC (1 ASD train)
Depressurization (DEP)	Depressurize with 2/11 SRVs (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 CS pumps (1 multi-train system)
Late Containment Heat Removal Suppression Pool Cooling or Spray (CHR)	1/4 RHR pumps, associated RHR HX and 1/4 RHRSW pumps in 1/2 trains in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/2 CRD pumps (operator action = 2) ; or 1/4 RHRSW pumps cross-tied to inject via 1/2 LPCI paths (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 - RLOOP1H - HPI (7) [SBO sequence]			
6 LOOP - EAC - RLOOP13H (8) [SBO sequence]			

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. Based on the licensee's comments, the latest Fitzpatrick station blackout model uses an 8 hour battery coping time and 5 additional hours until core uncovery, hence RLOOP13H is used in the above table for recovery time. Also, RLOOP13H subsumes RLOOP1H in sequence 6.

2. In the Fitzpatrick IPE, 91% of internal events CDF is due to SBO.

3. The HEP in the Fitzpatrick IPE for DEP is 4.5 E-4.

4. Containment venting (CV) can cause high temperature, humidity, and radiation in the reactor building and can have an effect on the hardware availability. Therefore, this worksheet does not credit LPCI and CS for LI; they may actually be impacted by CV and may not be available. The HEP in the Fitzpatrick IPE for CV is 2.6 E-3.

Table 3.8 SDP Worksheet for Fitzpatrick — 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:**
Overpressure Protection (OVERP)	1/11 SRVs successfully open and then close (1 multi-train system)
Recirculation Pump Trip (RPT)	Automatic or manual recirculation pump trip (1 multi-train system)
Reactivity Control (SLC)	1/2 SLC paths or boron injection with CRD pumps (operator action = 2)
Inhibit ADS and Level Control (INH/LC)	Operator inhibits ADS and controls RPV level (operator action = 1)
High Pressure Injection (HPI)	HPCI (1 ASD system) or RCIC (1 ASD system)
Depressurization (DEP)	2/11 SRVs manually opened (operator action = 2)
Low Pressure Injection (LPI)	1/4 RHR pumps in LPCI Mode (1 multi-train system)
Overfill (OVERFL)	Operator prevents overfill by LPI systems (operator action = 2)
Containment Heat Removal (CHR)	1/4 RHR pumps, associated RHR HX and 1/4 RHRSW pumps in 1/2 trains in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/2 CRD pumps (operator action = 2); or 1/4 RHRSW pumps cross-tied to inject via 1/2 LPCI paths (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 ATWS -CHR - LI (3, 7)			
2 ATWS - CHR - CV (4, 8)			
3 ATWS - HPI - OVERFL (9)			
4 ATWS - HPI - LPI (10)			

5 ATWS - HPI - DEP (11)			
6 ATWS - INH/LC (12)			
7 ATWS - SLC (13)			
8 ATWS - RPT (14)			
9 ATWS - OVERP (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. In this worksheet we have combined the ATWS initiator with failure of Alternate Rod Insertion (ARI) and Manual Rod Insertion (MRI).

2. This worksheet conservatively assumes a loss of PCS transient initiated the ATWS. Fitzpatrick does credit use of TBVs for the OVERPR function in an ATWS, but that is not included in this worksheet.

3. OVERFL has been added to this worksheet as a generic BWR-4 addition. The IPE for Fitzpatrick does not clearly justify why this is not a problem for Fitzpatrick.

4. Core Spray has not been credited for ATWS here because the IPE (p. 3-74 and 75) states that EOPs explicitly instruct the operators to isolate the CS System on an ATWS.

5. The IPE contains credit for operator action to control reactor water level on ATWS at different levels depending on the specific scenario. The necessity for such control also depends on the scenario.

Table 3. 9 SDP Worksheet for Fitzpatrick — Loss of Safeguard AC Bus 10500 (TAC5)

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)	Depressurize with 2/11 SRVs (operator action = 2)
Low Pressure Injection (LPI)	1/2 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/1 CS pumps (1 single train system)
Containment Heat Removal (CHR)	1/2 RHR pumps, associated RHR HX in 1/2 trains and 1/2 RHRSW pumps in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/1 CRD pumps or 1/2 condensate pumps (operator action = 2); or 1/2 RHRSW pumps cross-tied to inject via one LPCI path (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 TAC5- CHR - LI (3, 7)			
2 TAC5- CHR - CV (4, 8)			
3 TAC5 - HPI - LPI (9)			
4 TAC5 - 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. Loss of the Safeguard AC Buses 10500 or 10600 results in a manual reactor scram by procedure. The following loads are lost for Bus 10500: RHR pumps 10P-3A and 3B (one from each train), RHRSW pumps 10P-1A and 1C, CS pump 14P-1A, all 600V AC train A safeguards loads except the LPCI inverter, and the inboard MSIVs.

2. The initiating event frequency for TAC5 or TAC6 from the IPE is 5 E-3 events per reactor year. TAC 5 and TAC6 use the same ET labeled as TAC.

3. The HEP in the Fitzpatrick IPE for DEP is 4.5 E-4.

4. Since the MSIVs are assumed to be lost, no credit is given in this worksheet for PCS as such, however credit is given for the condensate for LI.

5. Containment venting (CV) can cause high temperature, humidity, and radiation in the reactor building and can have an effect on the hardware availability. Therefore, this worksheet does not credit LPCI and CS for LI; they may actually be impacted by CV and may not be available. The HEP in the Fitzpatrick IPE for CV is 2.6 E-3.

Table 3. 10 SDP Worksheet for Fitzpatrick — Loss of Safeguard AC Bus 10600 (TAC6)

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)	Depressurize with 2/11 SRVs (operator action = 2)
Low Pressure Injection (LPI)	1/2 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/1 CS pumps (1 single train system)
Containment Heat Removal (CHR)	1/2 RHR pumps, associated RHR HX in 1/2 trains and 1/2 RHRSW pumps in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/1 CRD pumps or 1/2 condensate pumps (operator action = 2); or 1/2 RHRSW pumps cross-tied to inject via one LPCI path (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 TAC 6- CHR - LI (3, 7)			
2 TAC6 - CHR - CV (4, 8)			
3 TAC 6- HPI - LPI (9)			
4 TAC 6- 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. Loss of the Safeguard AC Buses 10500 or 10600 results in a manual reactor scram by procedure. The following loads are lost for Bus 10600: RHR pumps 10P-3C and 3D (one from each train), RHRSW pumps 10P-1B and 1D, CS pump 14P-1B, all 600V AC train B safeguards loads except the LPCI inverter, and the outboard MSIVs.

2. The initiating event frequency for TAC5 or TAC6 from the IPE is 5 E-3 events per reactor year. TAC 5 and TAC6 use the same ET labeled as TAC.

3. The HEP in the Fitzpatrick IPE for DEP is 4.5 E-4.

4. Since the MSIVs are assumed to be lost, no credit is given in this worksheet for PCS as such, however credit is given for the condensate for LI.

5. Containment venting (CV) can cause high temperature, humidity, and radiation in the reactor building and can have an effect on the hardware availability. Therefore, this worksheet does not credit LPCI and CS for LI; they may actually be impacted by CV and may not be available. The HEP in the Fitzpatrick IPE for CV is 2.6 E-3.

Table 3. 11 SDP Worksheet for Fitzpatrick — Loss of 125V DC Battery Control Board A (TDCA)

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)
Depressurization (DEP)	Depressurize with 2/11 SRVs (operator action = 2)
Low Pressure Injection (LPI)	1/2 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/1 CS pumps (1 single train system)
Containment Heat Removal (CHR)	1/2 RHR pumps, associated RHR HX in 1/2 trains and 1/2 RHRSW pumps in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/1 CRD pumps or 1/2 condensate pumps (operator action = 2); or 1/2 RHRSW pumps cross-tied to inject via one LPCI path (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 TDCA - CHR - LI (3, 7)			
2 TDCA - CHR - CV (4, 8)			
3 TDCA - HPI - LPI (9)			
4 TDCA - 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. This special initiator consists of the loss of Battery Control Board BCB-2A. It results in an automatic reactor scram and a loss of reactor feedwater pump control. Thus, the operators are directed to close the MSIVs. As a result, no credit is given here for PCS. Credit is maintained for condensate in LI.

2. The following loads are lost for Battery Control Board BCB-2A: RHR pumps 10P-3A and 3B (one from each train), RHRSW pumps 10P-1A and 1C, CS pump 14P-1A, ADS control power- train A, ECCS logic B, EDG B and D control power, ESW system B control power, one CRD pump, and HPCI MOV motive power.

3. The initiating event frequency for TDCA, and TDCB from the IPE is 5 E-3 events per reactor year.

4. The HEP in the Fitzpatrick IPE for DEP is 4.5 E-4.

5. Containment venting (CV) can cause high temperature, humidity, and radiation in the reactor building and can have an effect on the hardware availability. Therefore, this worksheet does not credit LPCI and CS for LI; they may actually be impacted by CV and may not be available. The HEP in the Fitzpatrick IPE for CV is 2.6 E-3.

Table 3. 12 SDP Worksheet for Fitzpatrick — Loss of 125V DC Battery Control Board B (TDCB)

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)	RCIC (1 ASD train)
Depressurization (DEP)	Depressurize with 2/11 SRVs (operator action = 2)
Low Pressure Injection (LPI)	1/2 RHR pumps in 1/2 trains in LPCI Mode (1 multi-train system) or 1/1 CS pumps (1 single train system)
Containment Heat Removal (CHR)	1/2 RHR pumps, associated RHR HX in 1/2 trains and 1/2 RHRSW pumps in SPC or drywell spray (1 multi-train system)
Containment Venting (CV)	Manual venting through SP vent path (operator action = 2)
Late Injection (LI)	1/1 CRD pumps or 1/2 condensate pumps (operator action = 2); or 1/2 RHRSW pumps cross-tied to inject via one LPCI path (operator action = 1)

Circle Affected Functions	**Recovery of Failed Train**	**Remaining Mitigation Capability Rating for Each Affected Sequence**	**Sequence Color**
1 TDCB - CHR - LI (3, 7)			
2 TDCB - CHR - CV (4, 8)			
3 TDCB - HPI - LPI (9)			
4 TDCB - 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. This special initiator consists of the loss of Battery Control Board BCB-2B. It results in an automatic reactor scram and a loss of reactor feedwater pump control. Thus, the operators are directed to close the MSIVs. As a result, no credit is given here for PCS. Credit is maintained for condensate in LI.

2. The following loads are lost for Battery Control Board BCB-2B: RHR pumps 10P-3C and 3D (one from each train), RHRSW pumps 10P-1B and 1D, CS pump 14P-1B, ADS control power - train B, ECCS logic A, EDG A and C control power, ESW system A control power, one CRD pump, and RCIC MOV motive power.

3. The initiating event frequency for TDCA, and TDCB from the IPE is 5 E-3 events per reactor year.

4. The HEP in the Fitzpatrick IPE for DEP is 4.5 E-4.

5. Containment venting (CV) can cause high temperature, humidity, and radiation in the reactor building and can have an effect on the hardware availability. Therefore, this worksheet does not credit LPCI and CS for LI; they may actually be impacted by CV and may not be available. The HEP in the Fitzpatrick IPE for CV is 2.6 E-3.

Table 3. 13 SDP Worksheet for Fitzpatrick — Interfacing System LOCA (ISLOCA) and LOCA Outside Containment (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 injection lines each with: 1 air-operated check valve (AOV 68 A and B), 1 NO MOV (MOV 27 A and B), and 1 NC MOV (MOV 25 A and B)
Core Spray Injection Lines	Two injection lines each with: one NO valve (14 A and B), 1 air-operated check valve (AOV 13 A and B), 1 NC MOV (MOV 12 A and B), and 1 NO MOV (MOV 11 A and B)
RHR Drop Line	One line with one NO valve (88) and 2 NC MOVs (MOV 17 and 18); splitting into 2 lines each with 1 NC MOV (MOV 15A and B)
LOC PATHWAYS:	
HPCI Steam Line	1 line with 1 NO MOV 15, 1 NC MOV 16 (with a NO bypass MOV 60), and a NC MOV 14
RCIC Steam Line	1 line with 1 NO MOV 15, 1 NC MOV 16, and a NC MOV 131
RWCU System Lines	Not discussed in IPE
Feedwater Lines	2 lines each with 1 NO valve (FWS 29 A and B), 2 check valves (FW A and B, and 111 A and B), and 1 NO MOV (102 A and B)
Main Steam Lines	4 main steam lines each with two 24" 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 and applicable components are defined using generic insights based on NRC studies on ISLOCA. Plant-specific valve arrangements were added based on Figures in the IPE. There did not appear to be any modeling of ISLOCAs or LOC in the Fitzpatrick IPE.

2. This worksheet contains pathways for both ISLOCA and LOC. Licensees typically analyze these events separately. Where available, provide summary information here for each category, such as total accident sequence for ISLOCA and LOC.

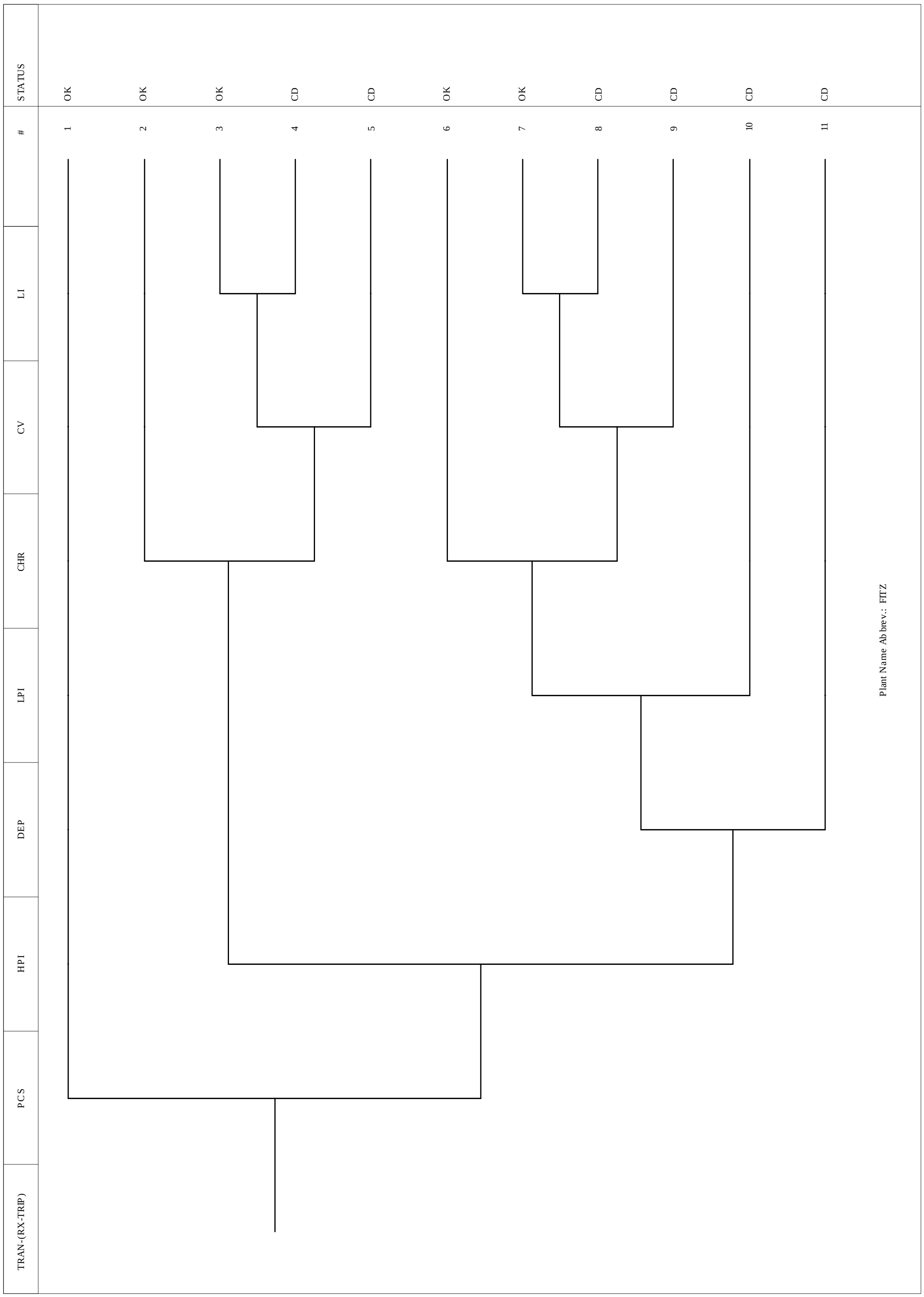
3. This worksheet is different from the other worksheets in that ISLOCA is typically an unmitigated initiating event in most PRAs. Therefore, the right side of the worksheet contains valves whose failure may lead to an ISLOCA or LOC rather than mitigating systems to address an event in progress. As such, it is not intended to be referenced by the last column of Table 2, Initiators and System Dependency Table.

1.3 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. An event tree for the stuck-open PORV is not included since it is similar to the small LOCA event tree. 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 (TPCS)
3. Small LOCA (SLOCA)
4. Inadvertent Open Relief Valve (IORV)
5. Medium LOCA (MLOCA)
6. Large LOCA (LLOCA)
7. Loss of Offsite Power (LOOP)
8. Anticipated Transients Without Scram (ATWS)
9. Loss of Safeguard AC Bus 10500 or 10600 (TAC)
10. Loss of 125V DC Battery Control Board A (TDCA)
11. Loss of 125V DC Battery Control Board B (TDCB)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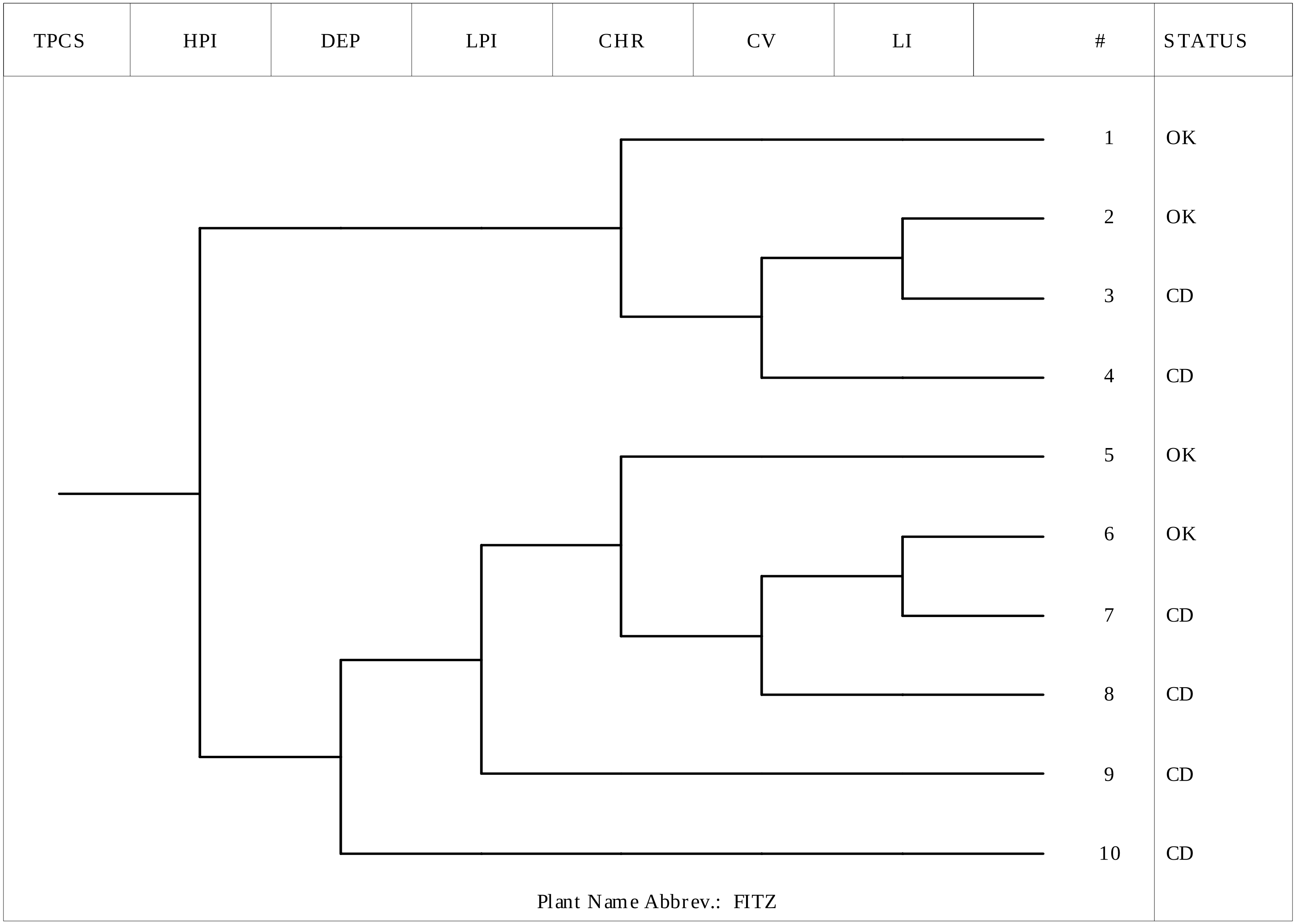
LI
CV
CHR
LPI
DEP
HPI
PCS
TRAN-(RX-TRIP)
Plant Name Abbrev.: FITZ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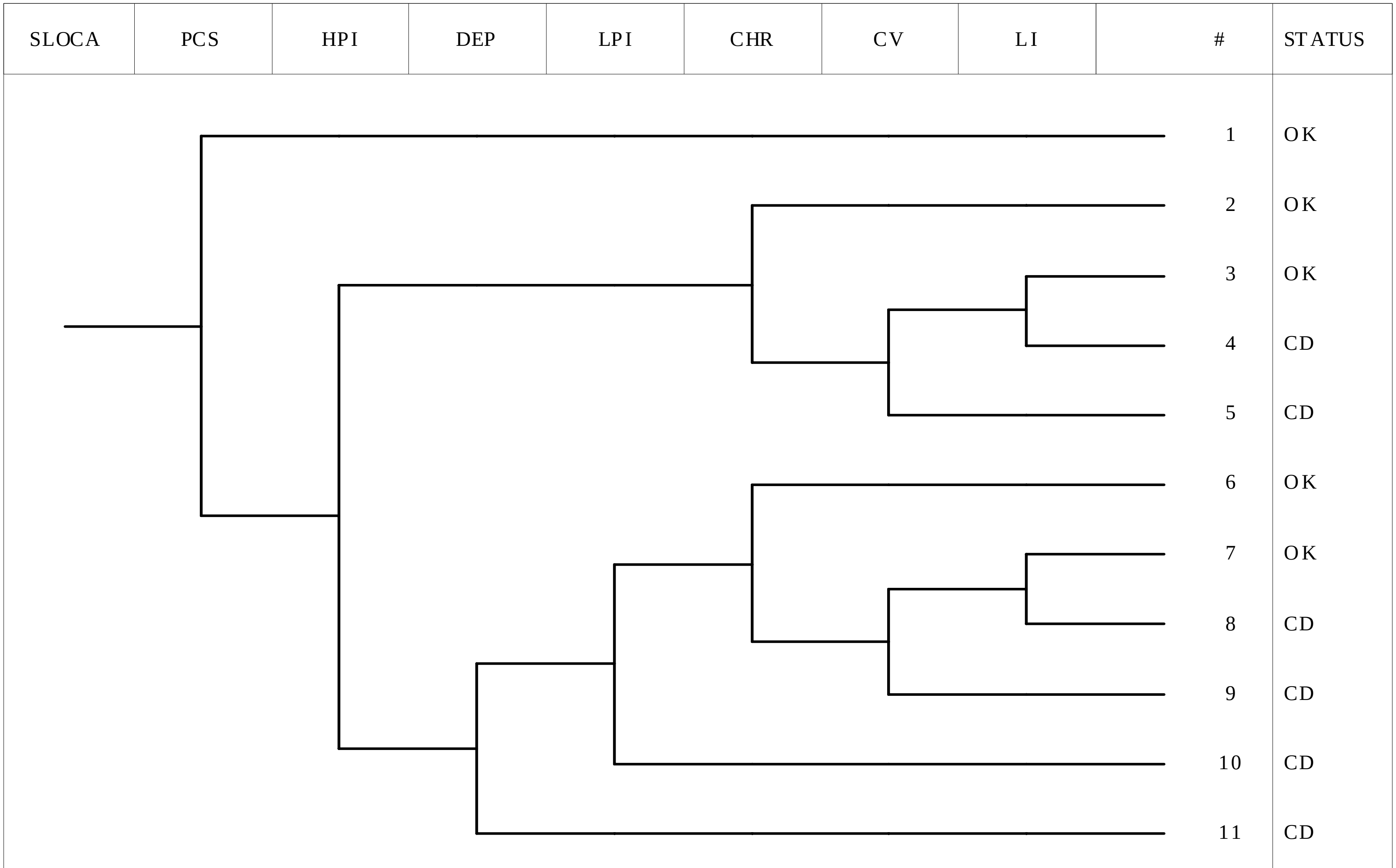

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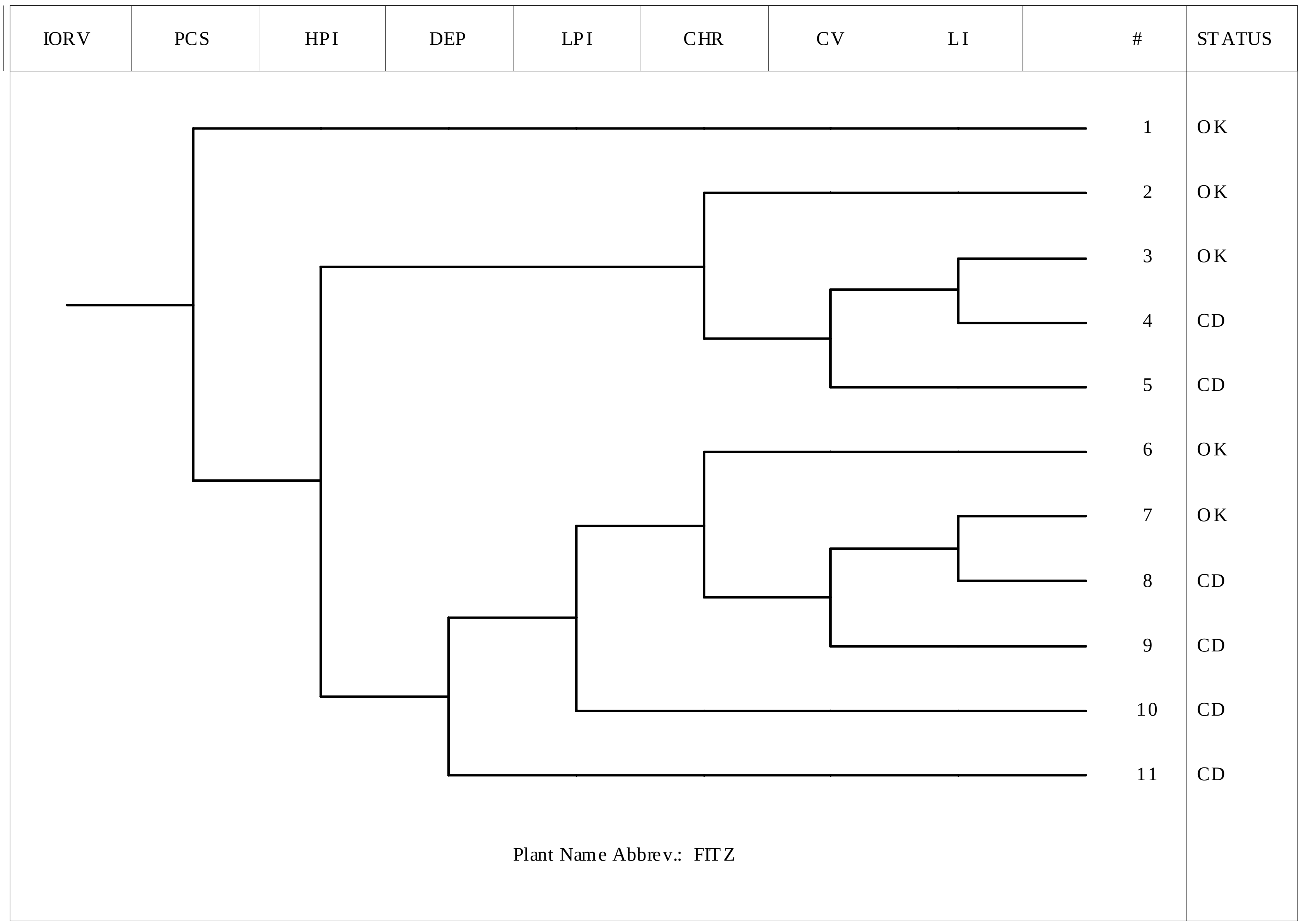
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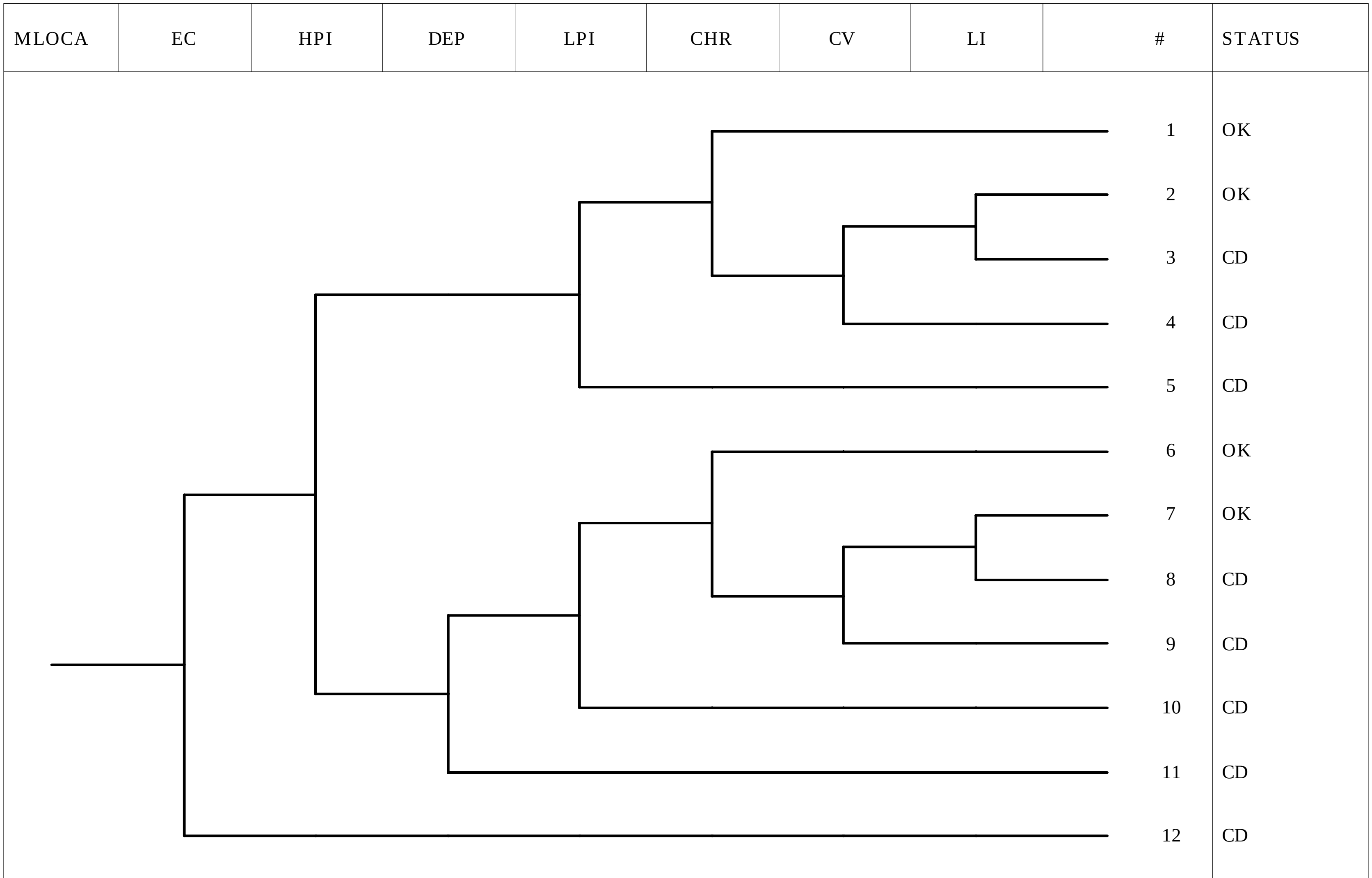

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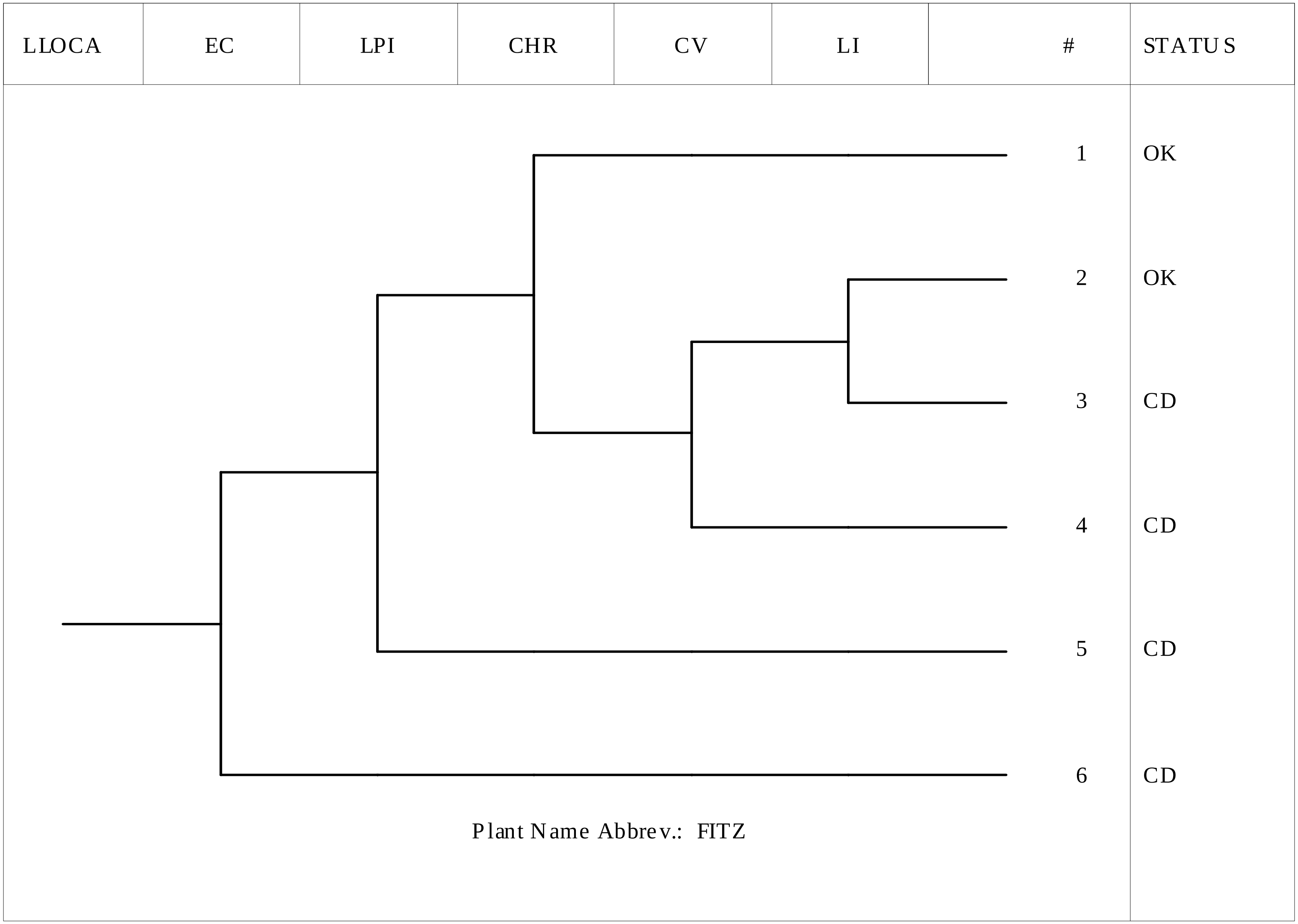
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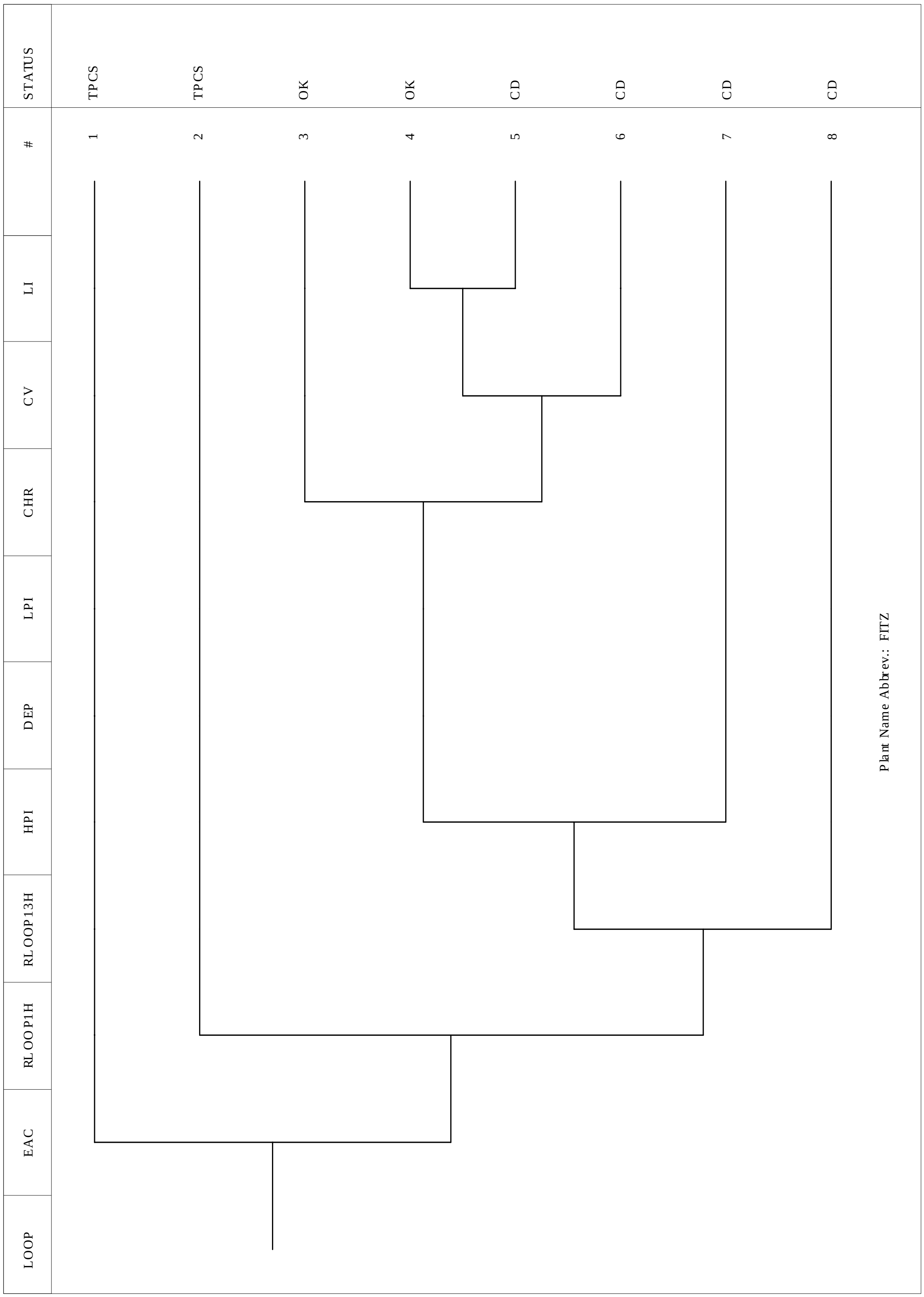
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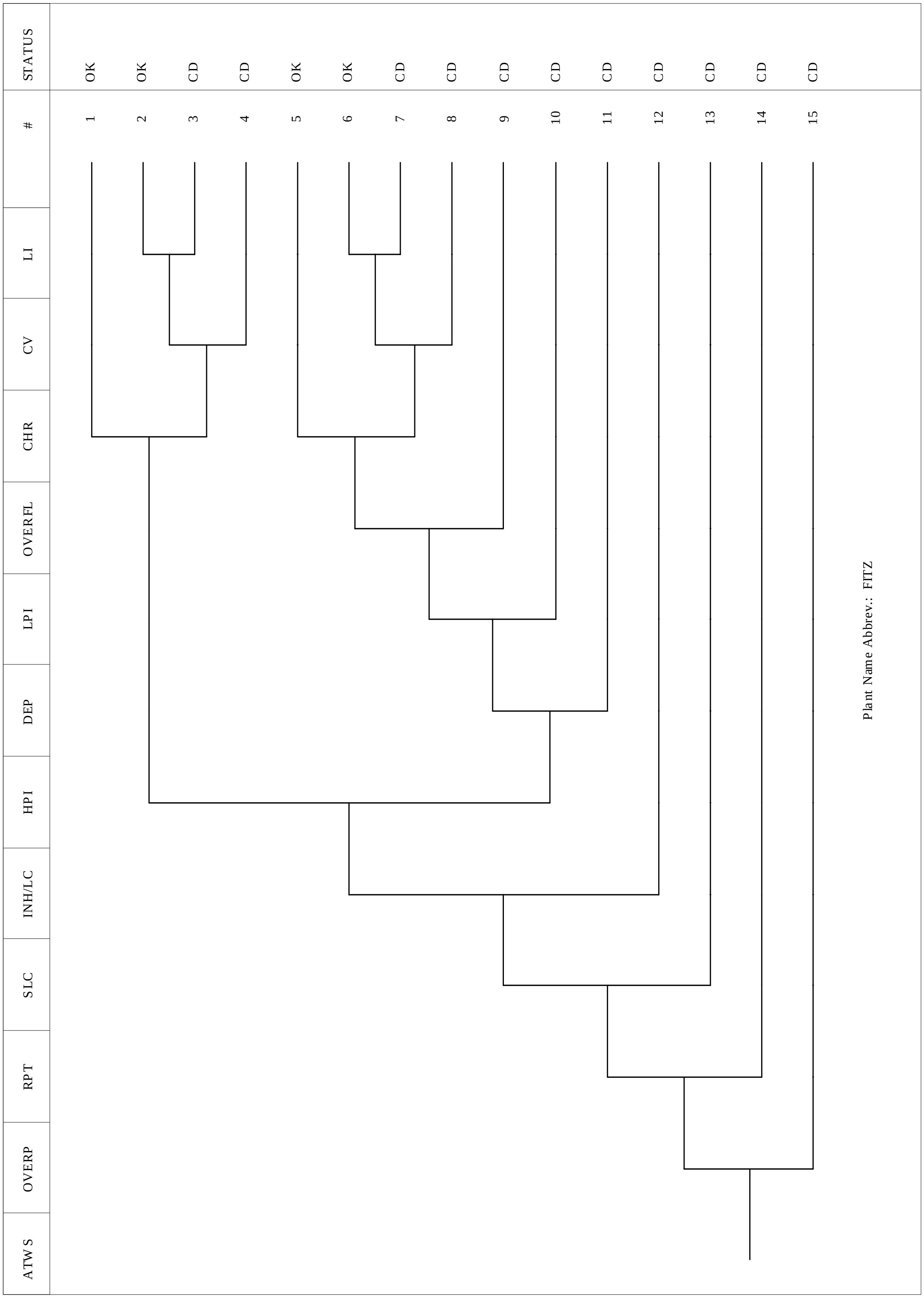
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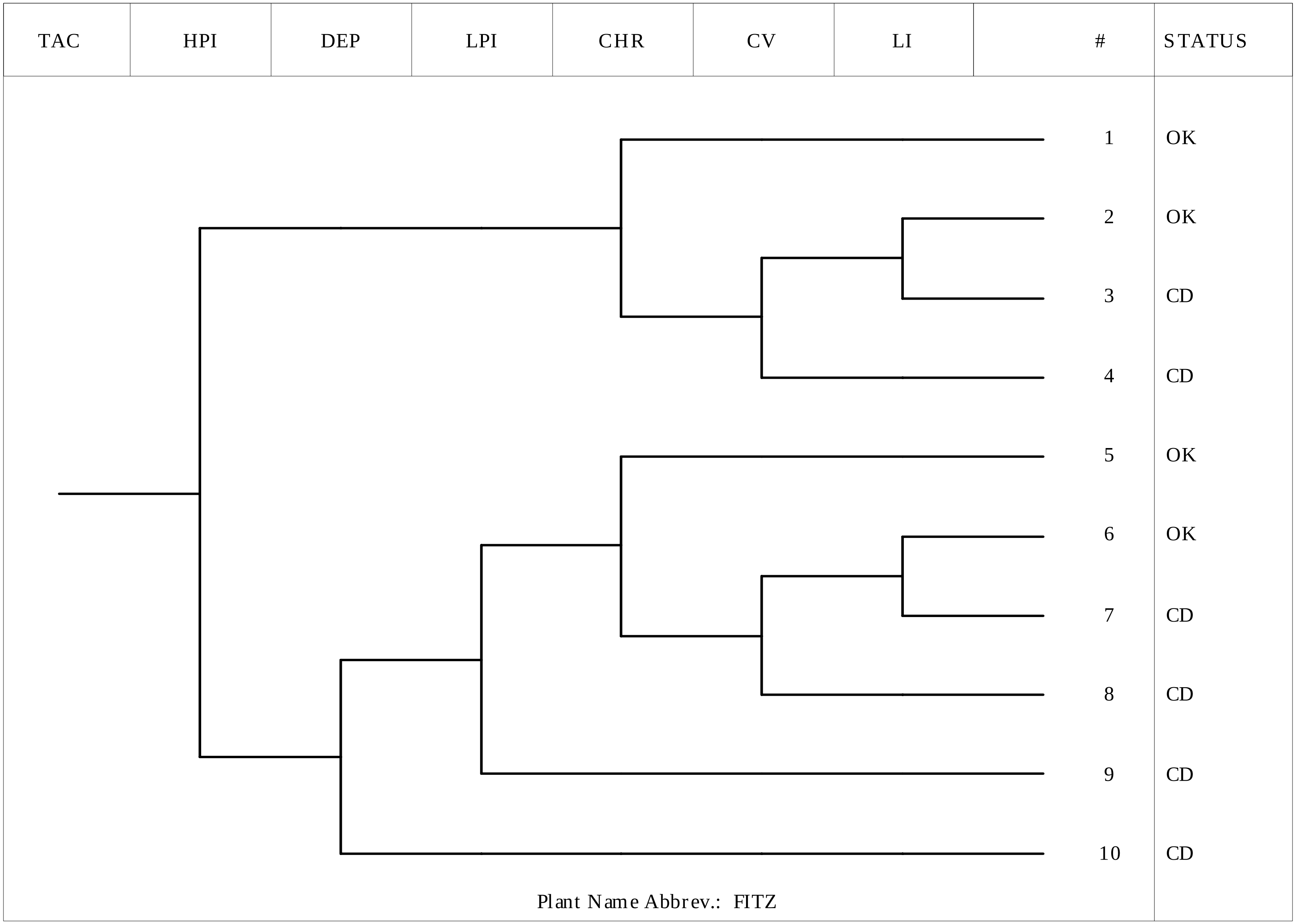
Plant Name Abbrev.: FITZ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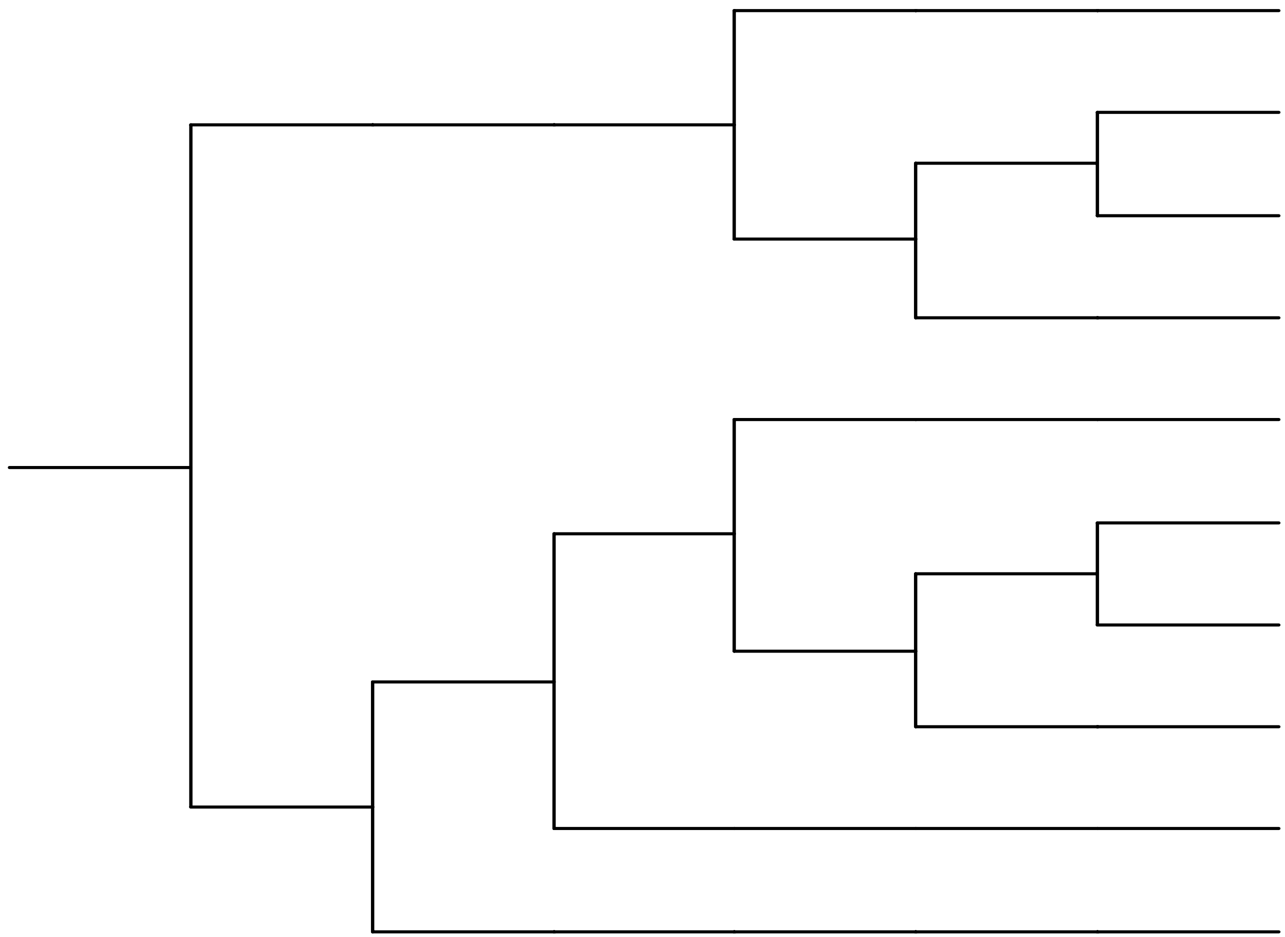
9 CD
10 CD
Plant Name Abbrev.: FITZ

TDCA	HPI	DEP	LPI	CHR	CV	LI	#	STATUS



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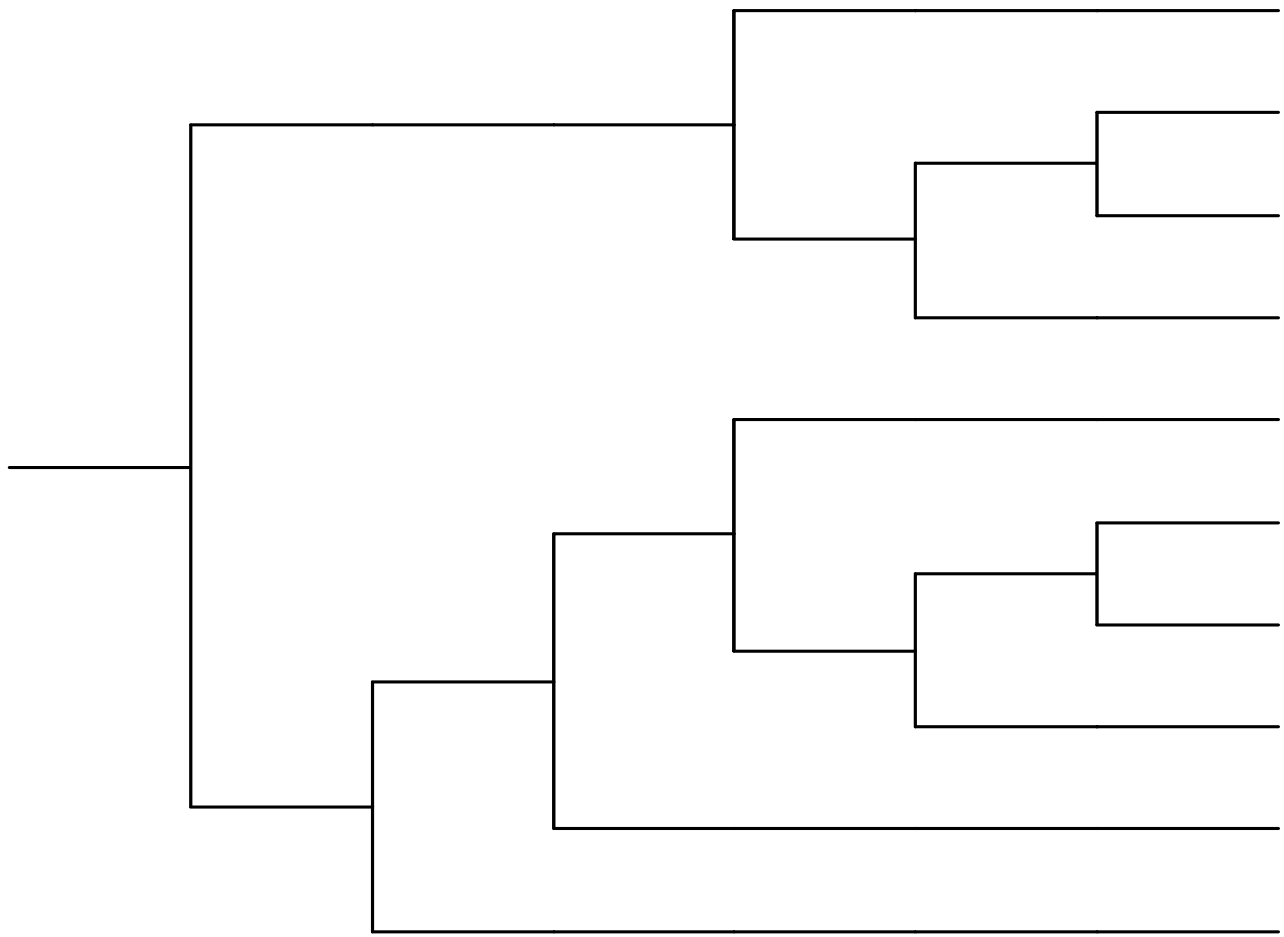
8	CD
9	CD
10	CD

Plant Name Abbrev.: FITZ

TDCB	HPI	DEP	LPI	CHR	CV	LI	#	STATUS



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Plant Name Abbrev.: FITZ

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.

(8) 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

Fitzpatrick was a pilot plant in the risk-informed inspection program. Plant-specific comments were received during the pilot phase of the program and the Inspection Notebook was updated to address those comments. The present update addresses generic resolution of comments received from across the industry and general changes in format. Below, are summarized the important plant-specific comments.

System Dependency Table:

The format was changed to the new standard format. The numbers of major components was added. Lines were added for Fuel Oil transfer, recirculation pump trip, actuation systems, nitrogen system, and containment vent. The support systems were updated. Explanatory notes were added the table. The initiating event scenarios were updated.

SDP Worksheets:

Worksheets were added for TPCS and IORV. Added the special initiator worksheets TAC, TDCA, TDCB. Added a new worksheet for ISLOCA and LOC.

The components for PCS were expanded. The characterization of RHR, LPCI and CS was clarified.

Containment venting and late injection were applied consistently across the events trees and worksheets for the various initiators.

The success criteria for DEP was changed to 2 of 11 SRVs.

In the LPI function, credit was given for LPCI, CS, and cross-tied RHRSW, but not for condensate.

In the LI function, credit was generally given for LPCI, CS, CRD, condensate, and cross-tied RHRSW.

The purpose of the LI function is to provide inventory makeup to compensate for the loss through containment venting. The sources of water should be independent of the suppression pool. A foot note was incorporated cautioning that the impact of containment venting on the systems should be considered.

Credit was not given for PCS/FW use as HPI. Credit was not given for PCS in the TPCS, LOOP, or ATWS scenarios.

The success criteria for early containment control (EC) was updated.

The ATWS worksheet was updated based on generic information.

REFERENCES

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

2. James A. Fitzpatrick IPE dated August, 1991 by the New York Power Authority and RAI responses dated September 1, 1992**.**

3. Comments received from the Fitzpatrick licensee during the pilot plant SDP evaluation process.