Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

OCT 18 2005

10 CFR 50.4

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Gentlemen:

In the Matter of	)	Docket No. 50-390
Tennessee Valley authority	)	

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - NRC INSPECTION REPORT NO. 05000390/2005013; PRELIMINARY GREATER THAN GREEN FINDING; WATTS BAR NUCLEAR POWER PLANT - SUBMITTAL OF REGULATORY CONFERENCE MEETING PACKAGE

In accordance with NRC Letter dated September 7, 2005, TVA is providing TVA's meeting package one week prior to the NRC Region II Regulatory Conference scheduled for October 25, 2005. This package contains supplemental information related to the subject finding and will be discussed by TVA personnel during the meeting. The meeting package is provided in the enclosure.

There are no regulatory commitments associated with this submittal. If you have any questions concerning this matter, please call me at (423) 365-1824.

Sincerely,

Rebecca N. Mays

for/P. L. Pace
Manager, Site Licensing
and Industry Affairs

Enclosure
cc: See Page 2

IE01

OCT 1 8 2005

Enclosure
cc (Enclosure)

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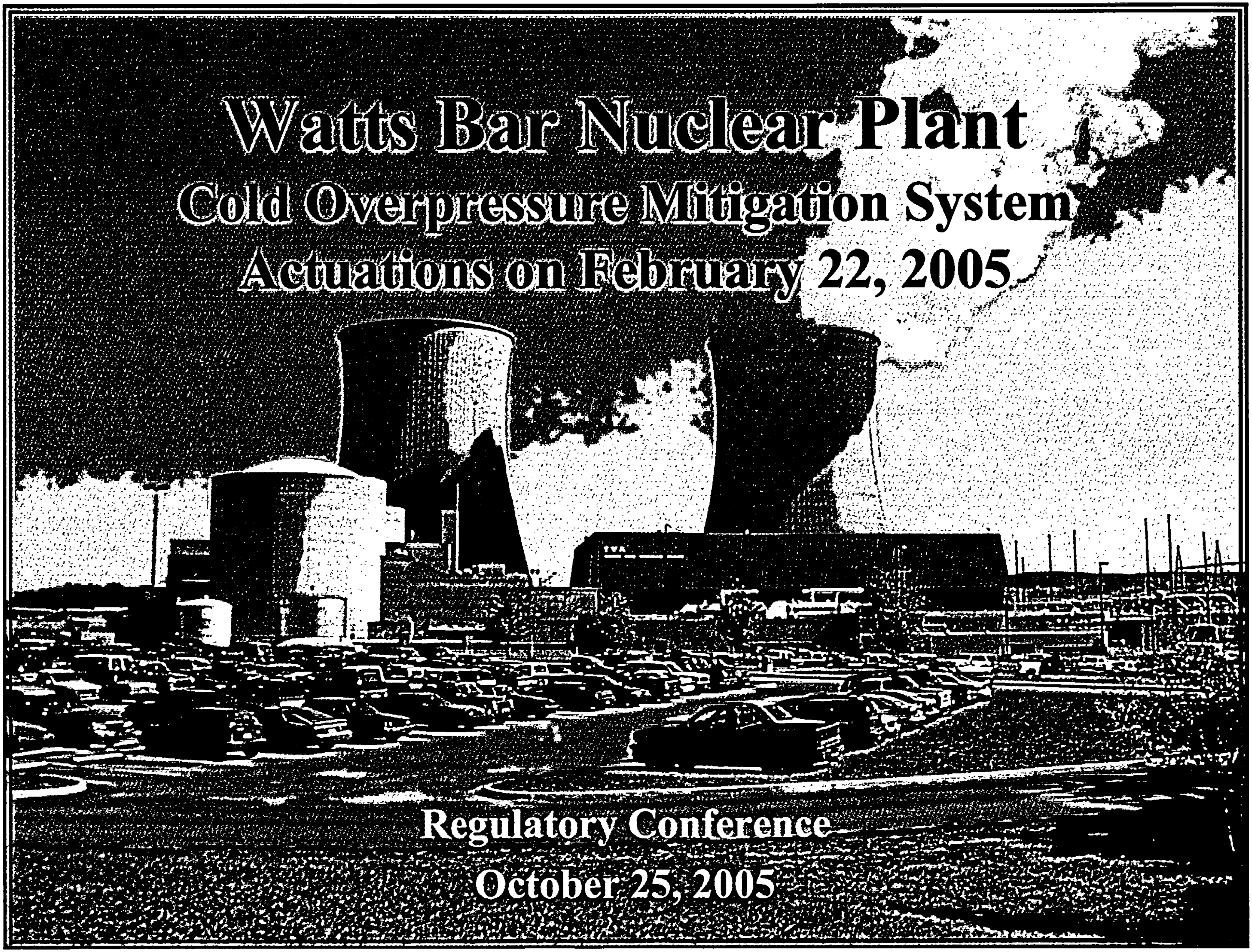
Enclosure


Watts Bar Nuclear Plant
Cold Overpressure Mitigation System
Actuations on February 22, 2005
Regulatory Conference
October 25, 2005

Agenda

• Introduction	M. Skaggs
• Objective Of Presentation	M. Skaggs
• Cold Overpressure Mitigation System Actuations	D. White
• Differences Between The TVA And NRC Risk Analyses	F. Koontz
• Regulatory Summary	P. Pace
• Closing Remarks	M. Skaggs

Introduction and Objective of Presentation

Mike Skaggs
WBN Site Vice President

Introduction
NRC Finding

- "… GO-6, Unit Shutdown from Hot Standby to Cold Shutdown, Section 5.5, Step [1] [e] states, "Slowly RAISE charging to fill Pressurizer at less than 30 gpm." SOI-74.01, Residual Heat Removal, Section 8.11, implemented a flush of the A train RHR heat exchanger bypass during shutdown cooling and contained a note which stated, "The effect on RCS heatup/cool down should be evaluated." Each procedure was not adequately implemented approaching and during solid plant operations on February 22, 2005."

- TVA agrees with the performance deficiency

Objective of Presentation
Five TVA Focus Areas

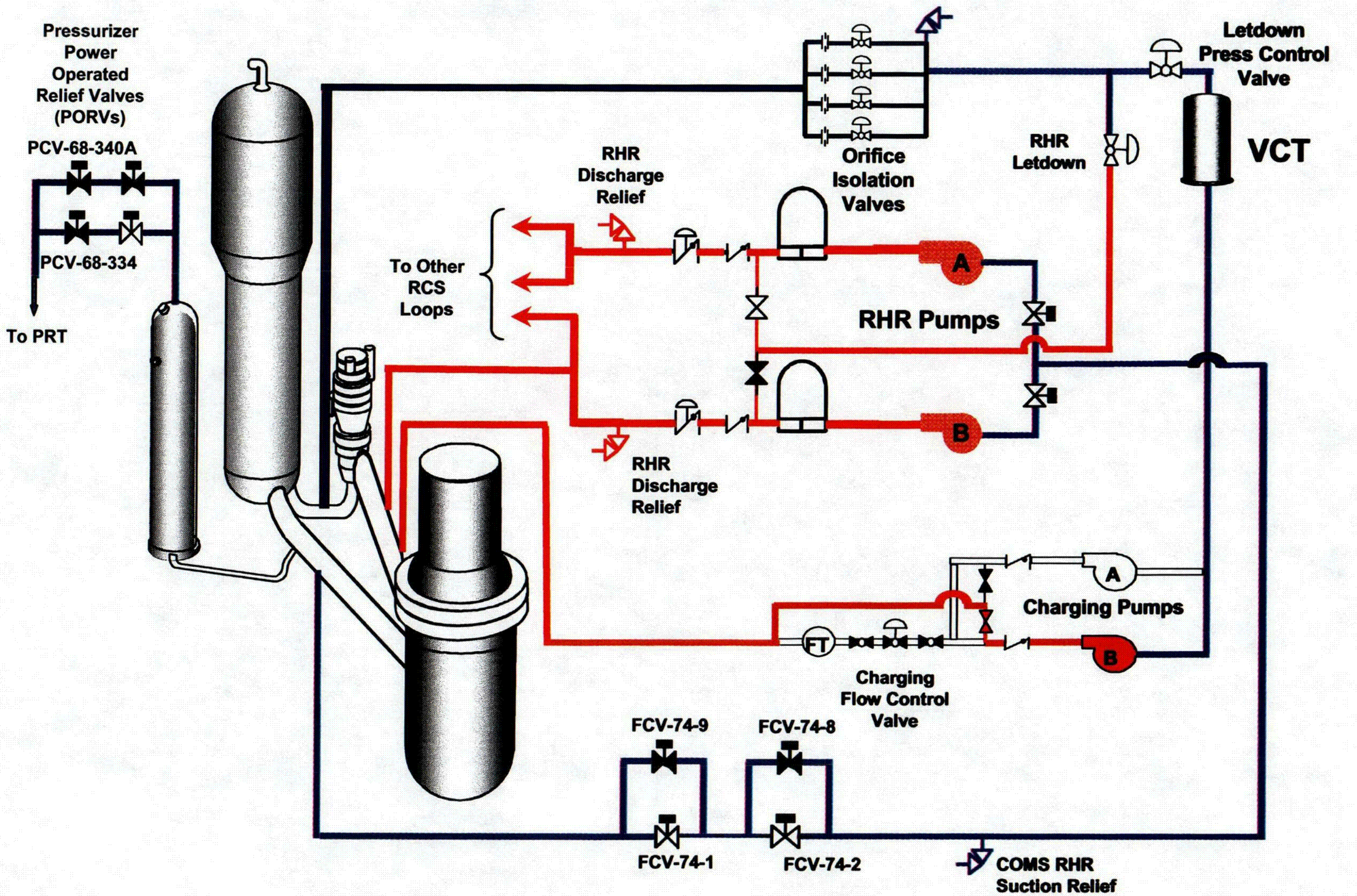
- TVA has identified five key differences between the TVA and NRC analyses
  - There were only 5 Power Operated Relief Valve (PORV) lifts that relieved pressure rather than the 7 shown in the NRC event tree
  - More rigorous mathematical treatment of multiple initiating events (each successive PORV lift) is warranted
  - RHR suction relief valve is more reliable than in NRC's evaluation
  - Two additional RHR Discharge Relief Valves were available to relieve increasing RCS pressure
  - Secondary plant cooling was available to prevent core damage

- In addition – TVA will show our evaluation inputs meet the Manual Chapter 0609 guidance to be "reasonable and realistic"

Cold Overpressure Mitigation System (COMS) Actuations

Dana White
WBN Operations Manager

Simplified Reactor Coolant System Lineup



C01

Event Description
Initial Conditions

- RCS temperature/pressure = 139°F at 288 psig
- Pressurizer level – approaching solid plant operations
- Charging/letdown = 177/154 gpm - Filling the pressurizer at 23 gpm
- Charging Flow Control Valve out of service for modification
- Cooling RCS using both trains of RHR
- Two Reactor Coolant Pumps running
- Secondary Plant Cooling available
  - All four Steam Generators – 75% wide range level
  - Four Steam Generator PORVs available
  - Condensate Storage Tank Level at approximately 290,000 gallons
  - Motor Driven Auxiliary Feedwater Pumps available

Event Description

- COMS designed to protect the reactor vessel from brittle fracture during overpressure transients by limiting Reactor Coolant System (RCS) pressure during low temperature operations

- Tech Spec requirements met:
  - 1B-B Charging Pump was in service
  - Other injection sources were isolated
  - One PORV and the RHR Suction Relief Valve were the operable COMS relief valves

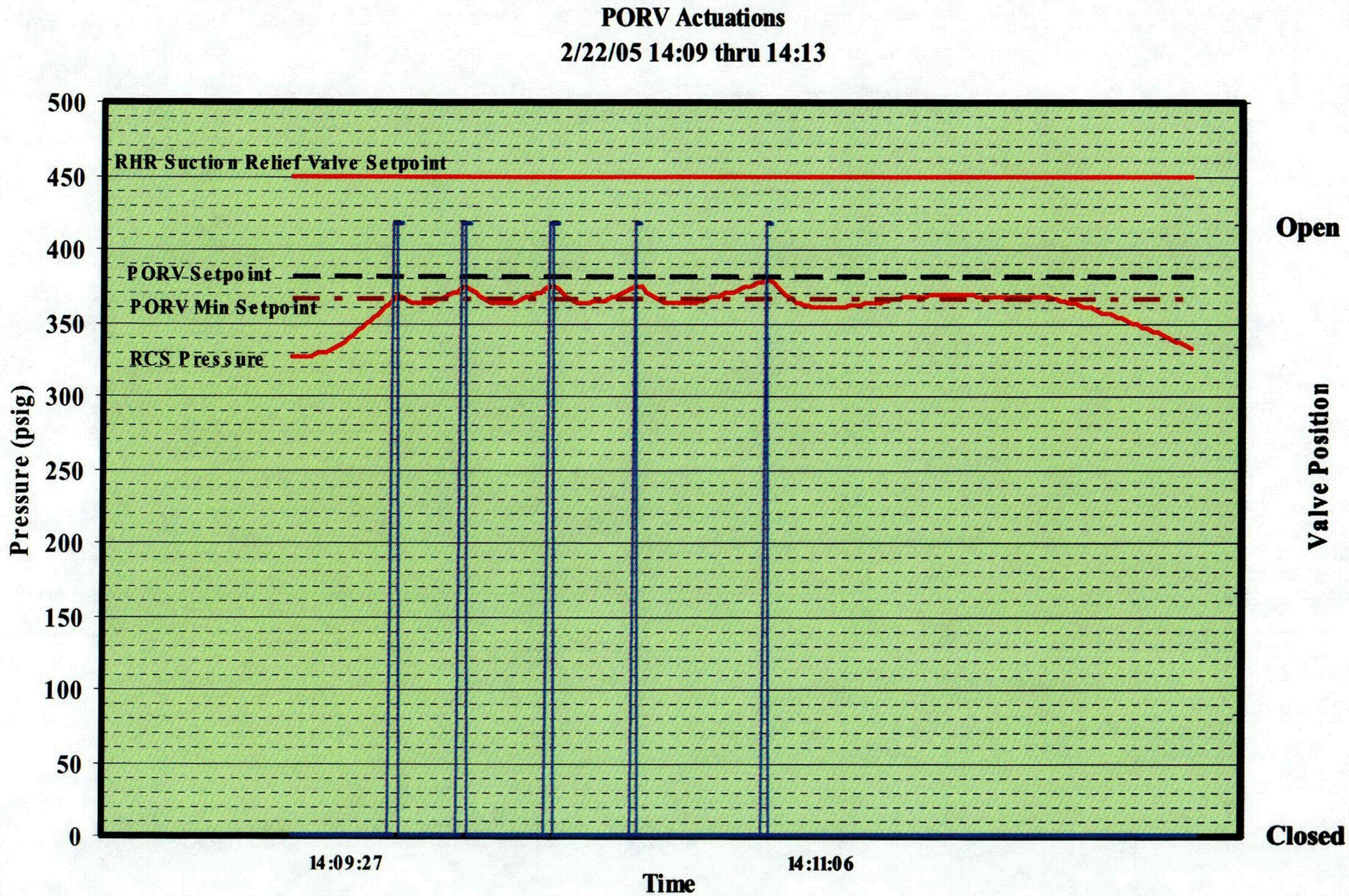
Event Description

- After the Charging Flow Control Valve was made available, the operating crew decided to return to the normal charging alignment for better control during solid water operations

- Charging Flow Control Valve functioned erratically, cycling charging flow and RCS pressure – returned to bypass valve

- The PORV lifted 5 times to relieve pressure over a 1 minute 40 second period while crew removed the Charging Flow Control Valve from service. (RHR suction relief valve setpoint of 450 psig was not reached)

Event Description



C02

Causes and Corrective Actions

- Causes:
  - A lack of sensitivity to and failure to recognize the complexities associated with approach to solid water operations
  - Contributing to this event was the unsuccessful attempt to fix the performance of the Charging Flow Control Valve

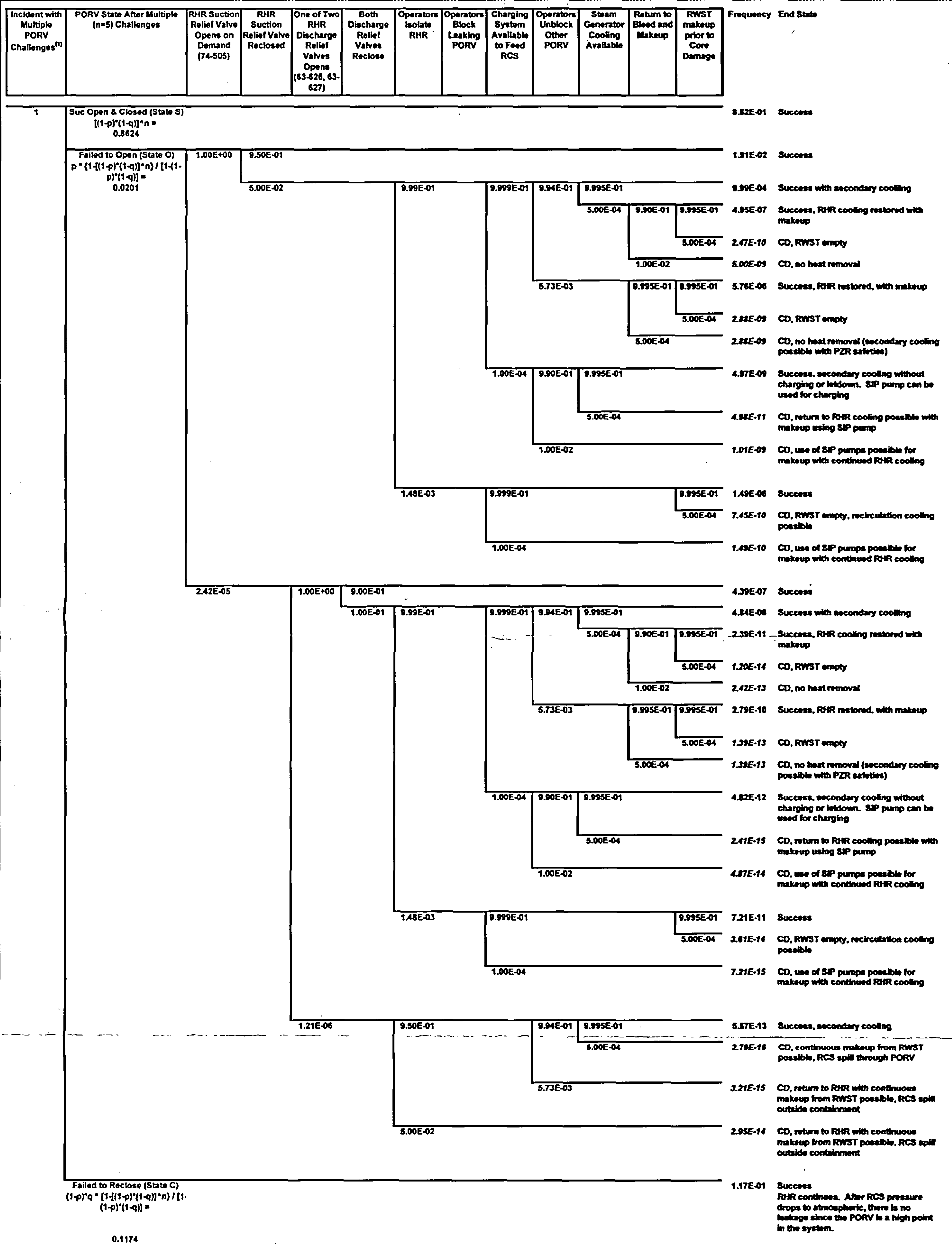
- Corrective Actions:
  - Have revised procedures cautions and controls while approaching solid operations
  - Pre-outage training on this event, COMS and planned system work
  - Pursuing hardware improvements to Charging Flow Control Valve

TVA

Discussion of Differences Between the TVA and NRC Risk Analyses

Frank Koontz
WBN Engineering Specialist

TVA Event Tree



Note:
(1) The following are parameters for PORV fails probability per demand

n	5	n is the number of open (and reseat) challegnes
p	4.27E-03	p is the probability PORV failure to open per challenge
q	2.50E-02	q is the probability PORV failure to reseat per demand

(2) For top event heading, the upper branch is success branch, i.e., the description in heading is true.

Five Key Differences Between the TVA and NRC Analyses

TVA

1. There were only 5 Power Operated Relief Valve (PORV) lifts that relieved pressure rather than the 7 shown in the NRC event tree

2. More rigorous mathematical treatment of multiple initiating events (each successive PORV lift) is warranted

3. RHR Suction Relief Valve failure to open is more reliable than in NRC's evaluation

4. Two additional RHR Discharge Relief Valves were available to relieve increasing RCS pressure

5. Secondary plant cooling was available to prevent core damage

Difference No. 1
5 PORV Lifts Rather Than 7 in NRC Event Tree

- Only one in-service PORV lifted to relieve pressure

- Have shown PORV relieved total of 5 times

- Second PORV available but isolated and not credited for tech spec compliance

- Conclusion: Second PORV does not adversely impact risk analysis and 5 lifts should be limit of analysis

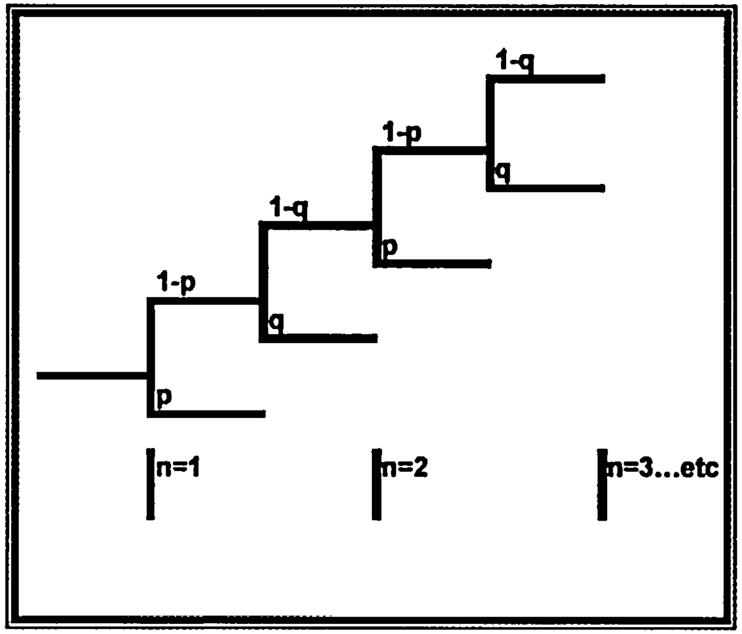
Difference No. 2 - More Rigorous Mathematical Treatment of Each Successive PORV Lift

- Three PORV risk states possible
  - Opens and closes successfully
  - Fails to open
  - Opens but fails to re-close
- Not a straight 5 times multiplier for each lift
- For example - If PORV opens but fails to close 1st time, other four lifts never would have happened
- Second example - the 5th lift would only have happened if the first four lifts cycled successfully

Difference No. 2 - More Rigorous Mathematical Treatment of Each Successive PORV Lift

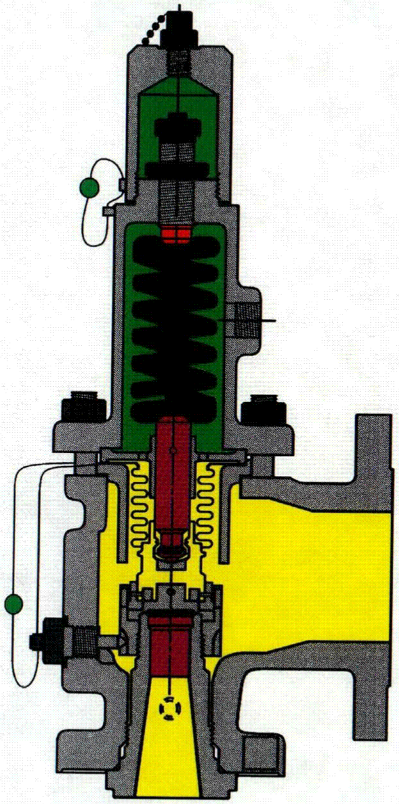
TVA

- Added mathematical rigor developed by ABS consulting
- [(1-p)*(1-q)]^n = opens/closes successfully
- p * {1-[(1-p)*(1-q)]^n} / [1-(1-p)*(1-q)] = fails to open
- (1-p)*q * {1-[(1-p)*(1-q)]^n} / [1-(1-p)*(1-q)] = opens but fails to reclose
- Where
  - n is the number of open (and reseat) challenges
  - p is the probability PORV failure to open per challenge
  - q is the probability PORV failure to reseat per demand



- Conclusion: Straight multiplier for successive lifts is overly conservative

Difference No. 3
Available RHR Suction Relief Valve



- RHR suction valve a 3-inch Crosby model JB-35-TD-WR
- Relief capacity of 900 gpm
- Setpoint - 450 psig
- WBN has not experienced a failure of this type of relief valve or similar Crosby model to relieve
- Reviewed EPIX data - no failures to relieve were identified
- Test results – Valves tested soon after the COMS event - Relieved within or below acceptable setpoint range

C03

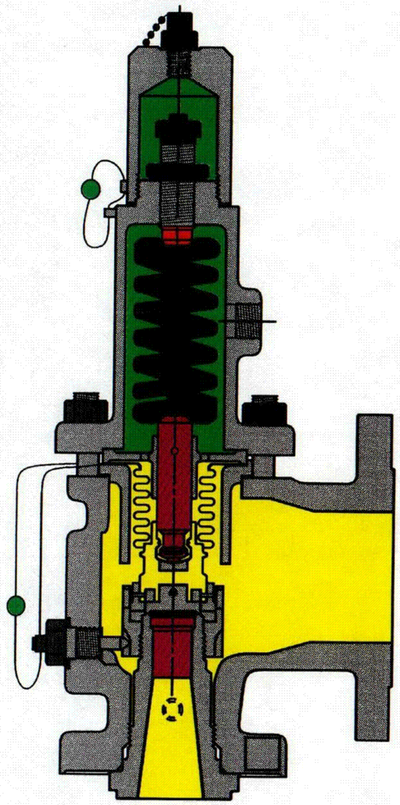
Difference No. 3
Available RHR Suction Relief Valve

- NRC RHR relief valve failure probability 1E-3
  - No specific data in NRC SPAR model for small relief valves
  - NRC selected "similar valve" - pressurizer code safety
  - Pressurizer code safety designed to lift at 2500 psig and 600°F.
  - Pressurizer code safety challenged by adverse conditions

- TVA RHR relief valve failure probability 2.42 E-5
  - TVA used PLG-0500, "Database for Probabilistic Risk Assessment for Light Water Nuclear Power Plants" in IPE
  - NRC staff evaluation of IPE documented in SER dated October 5, 1994
  - SER specifically recognizes PLG-0500, "Database for Probabilistic Risk Assessment for Light Water Nuclear Power Plants"
  - PLG database reviewed by NRC – NUREG/CR5606 – concluded database was extensive and "state of the art"

- Conclusion: WBN value is Current Licensing Basis for this component

Difference No. 4
Two Available RHR Discharge Relief Valves



- Two – 2 inch inlet Crosby Valves – Model No. JB-35-TD-WR
- Setpoint - 600 psig
- WBN has not experienced a failure of this type of relief valve or similar Crosby model to relieve
- Reviewed EPIX data - no failures to relieve were identified
- Test results - Valves tested soon after the COMS event – met acceptance criteria

C04

Difference No. 4
Two Available RHR Discharge Relief Valves

TVA

- FSAR denotes greater than 20 gpm minimum flow capacity but installed valve capability is 400 gpm
- At time of event, two trains of RHR were in service
- Each train had operable Discharge Relief Valve
- Each valve "sees" full RCS pressure and transients
- Each valve capable of relieving Charging Pump discharge
- NRC event trees did not credit this capability
- TVA failure probability 2.42 E-5 from PLG-0500
- Conclusion – WBN value is Current Licensing Basis for this component

Difference No. 5
Available Secondary Plant Cooling

- In the event one of the COMS valves would fail to reseat, a loss of inventory that would impact RHR would be postulated
- Operators would be directed to AOI-14 "Loss of RHR Shutdown Cooling"
- AOI sends the operator to section 3.8 (reactor head on) if RHR cooling cannot be restored
- With an RCP available Section 3.8 Step 2a directs use of steam dumps or Steam Generator PORV to restore cooling
  - Steam Generators at 75% level during event
  - Four Steam Generator PORVs were available
  - Two motor-driven Auxiliary Feedwater Pumps were available
  - Condensate Storage tank was full

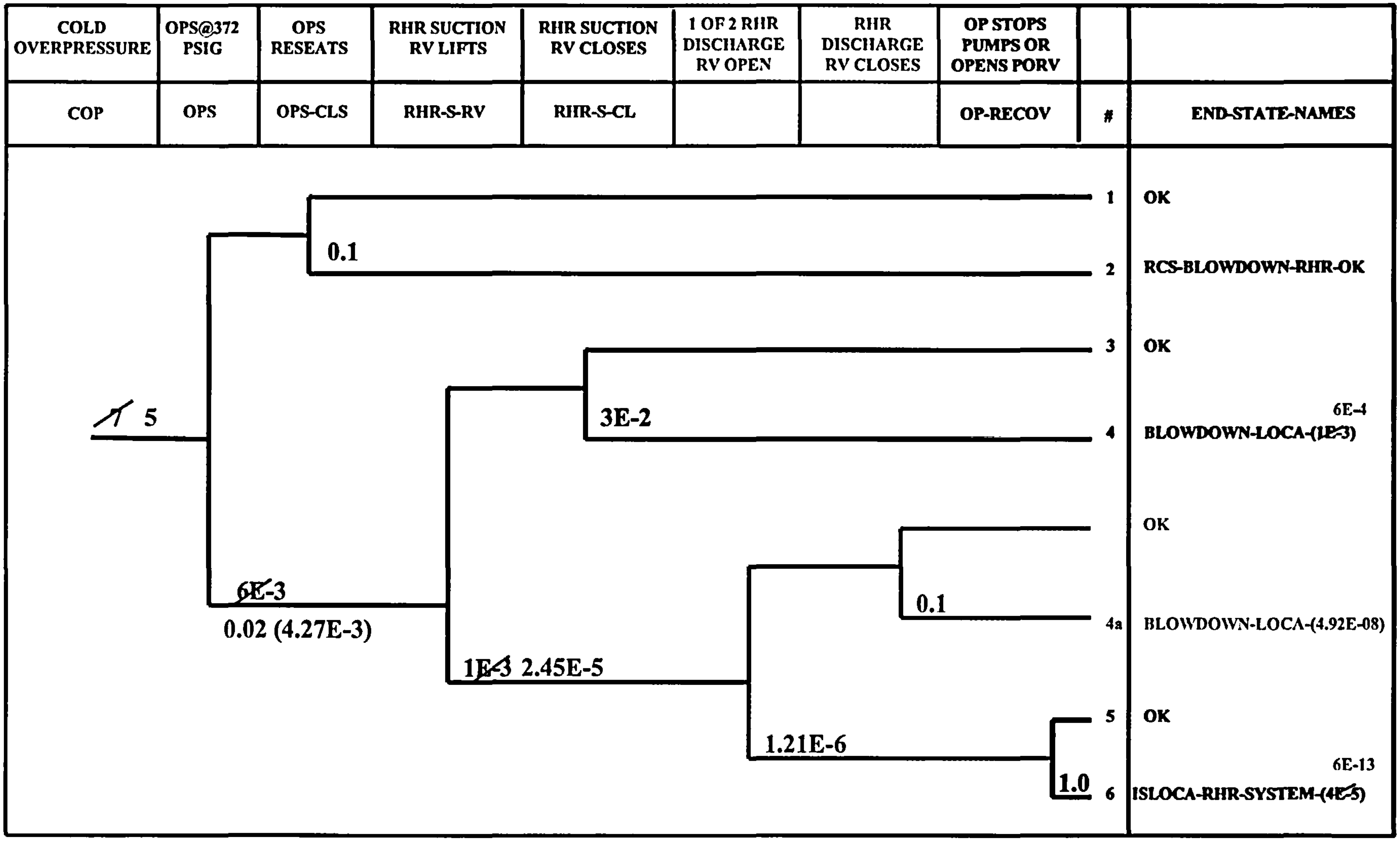
Difference No. 5
Available Secondary Plant Cooling

- NRC did not credit this capability
  - May not normally be available in generic model for shutdown operation
- TVA assumed operator failure probability associated with a moderate to high stress, but procedure driven activity
- Operators had Just-in-Time Training on AOI-14 prior to the outage including use of Secondary Plant cooling
- Tested successfully on WBN Simulator
- AFW /SG PORV cooling was part of WBN's IPE submittal under Generic Letter 88-20 which was approved in SER dated October 5, 1994
- Conclusion: Use of Secondary Plant cooling is consistent with WBN Current Licensing Basis

Summary of Impact on NRC Event Tree

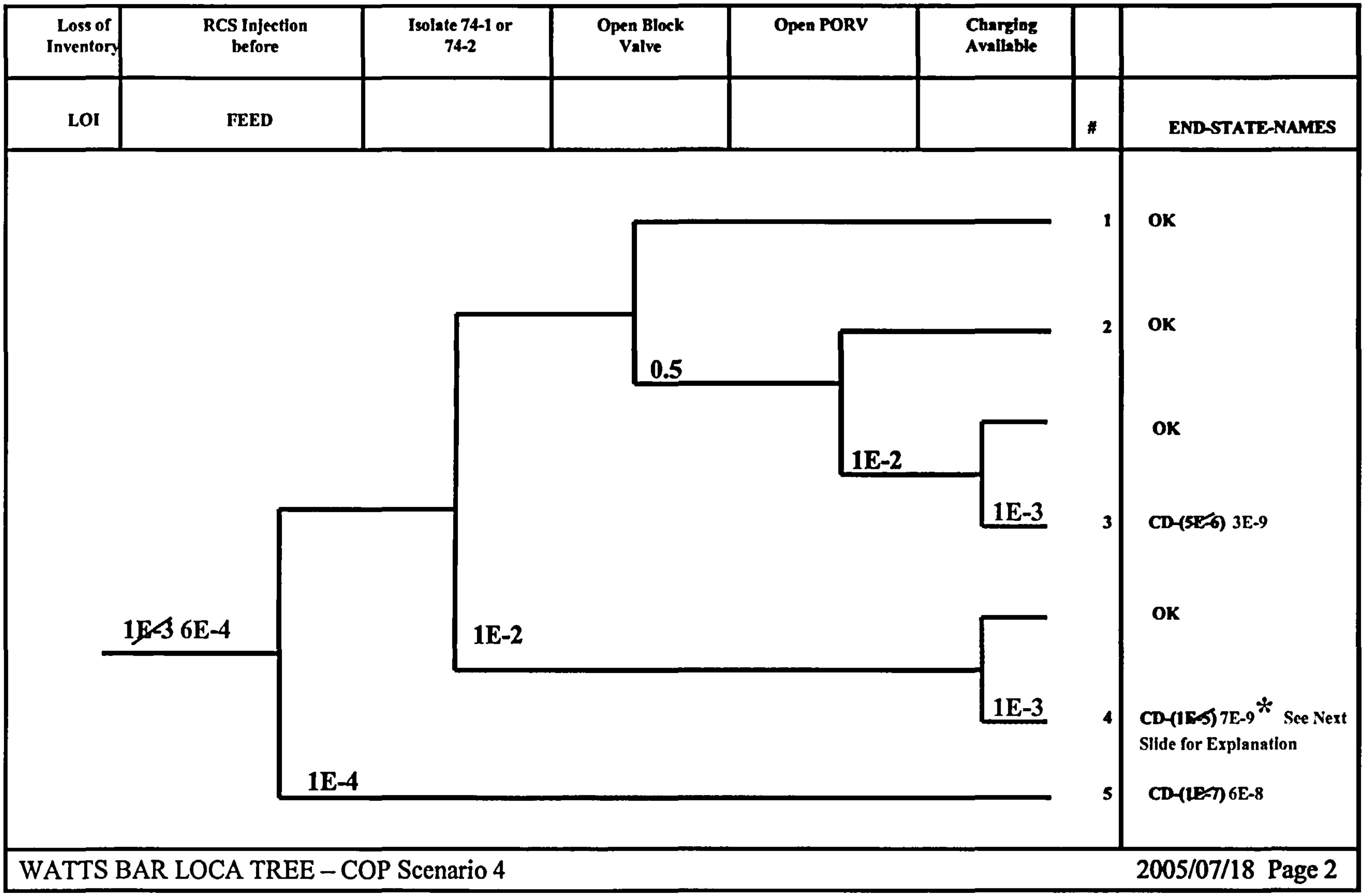
DIFFERENCE NO.	DIFFERENCE DESCRIPTION	ORIGINAL NRC VALUE	"REASONABLE AND REALISTIC" VALUE
1	5 PORV Lifts Vice 7 In The NRC Event Tree	7	5
2	PORV – Rigorous treatment of successive lifts	4.2 E-2	2.01E-2
3	Available RHR Suction Relief Valve	1E-3	2.42E-5
4	Two Available RHR Discharge Relief Valves	N/A	1.21E-6
5	Available Secondary Plant Cooling	N/A	5.0-E-4

"Adjusted" NRC Event Tree

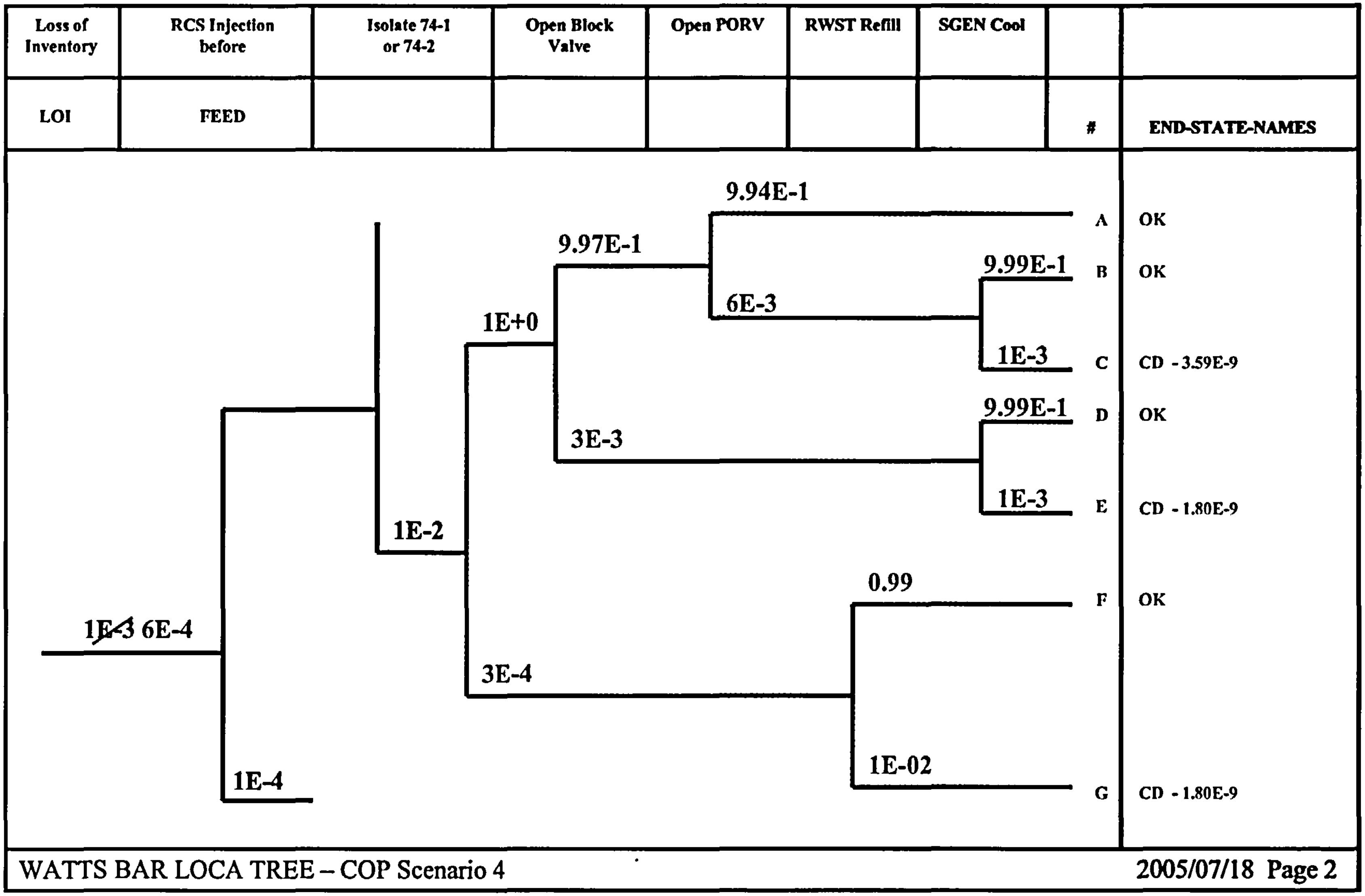


COP-Cold Overpressure

"Adjusted" NRC Event Tree

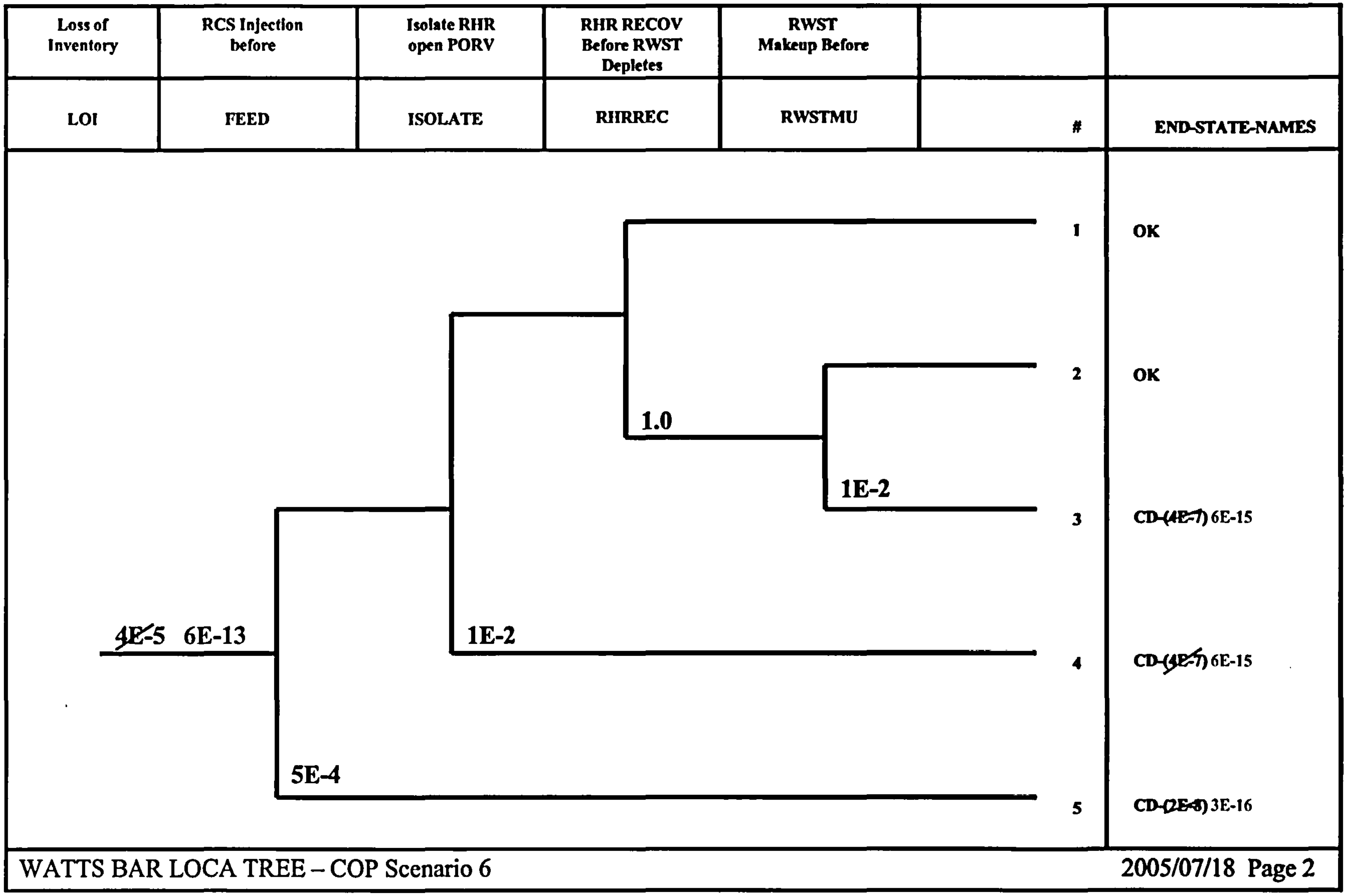


“Adjusted” NRC Event Tree
Expanded 1E-2 Path



Total 7E-09

"Adjusted" NRC Event Tree



NRC Total ICDF ~~2E-5~~ 7E-8

PSA Additional Conservatisms

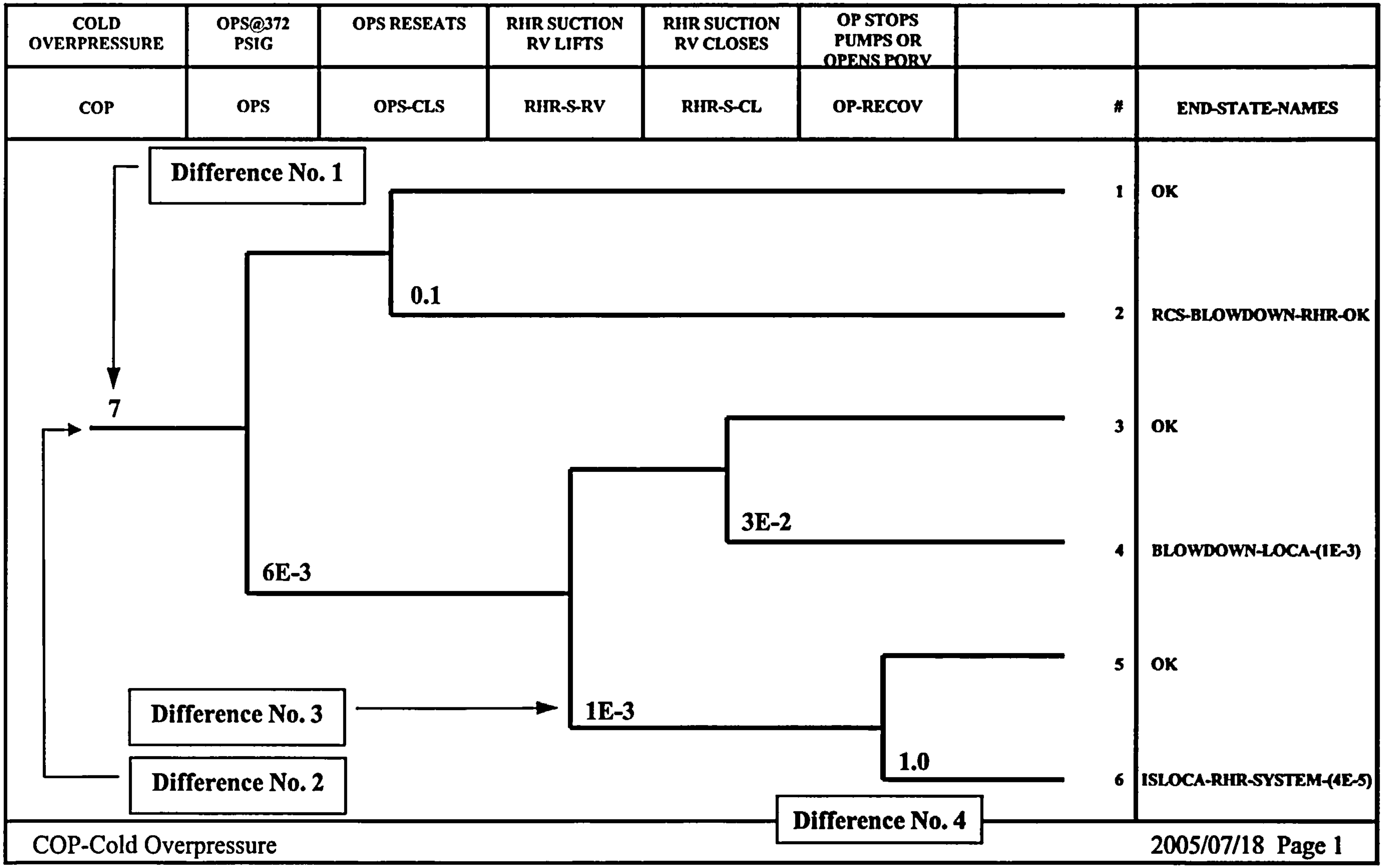
- Letdown Heat Exchanger Relief Valve not credited
- Operator action per AOI-14 to stop charging pump not credited
- Operator action per AOI-14 to open isolated PORV not credited
- Potential for gas relief only on early PORV lifts not credited
- Additional letdown flow based on increasing RCS pressure not credited
- PORV is more reliable than in NRC evaluation

Regulatory Summary

- WBN PSA inputs – "reasonable and realistic"
- WBN used values from event analysis or from Current Licensing Basis which were reviewed and approved by NRC
- Five key differences with NRC evaluation
  1. There were 5 PORV lifts that relieved pressure rather than the 7 in the NRC event tree
  2. More rigorous mathematical treatment of each successive PORV lift is warranted
  3. RHR suction relief valve more reliable than in NRC's evaluation
  4. Two additional RHR discharge relief valves were available to relieve increasing RCS pressure
  5. Secondary plant cooling was available to prevent core damage
- Using "reasonable and realistic" values in NRC event trees provides an adjusted result of 7E-8
- Conclusion – very low safety significance - Green

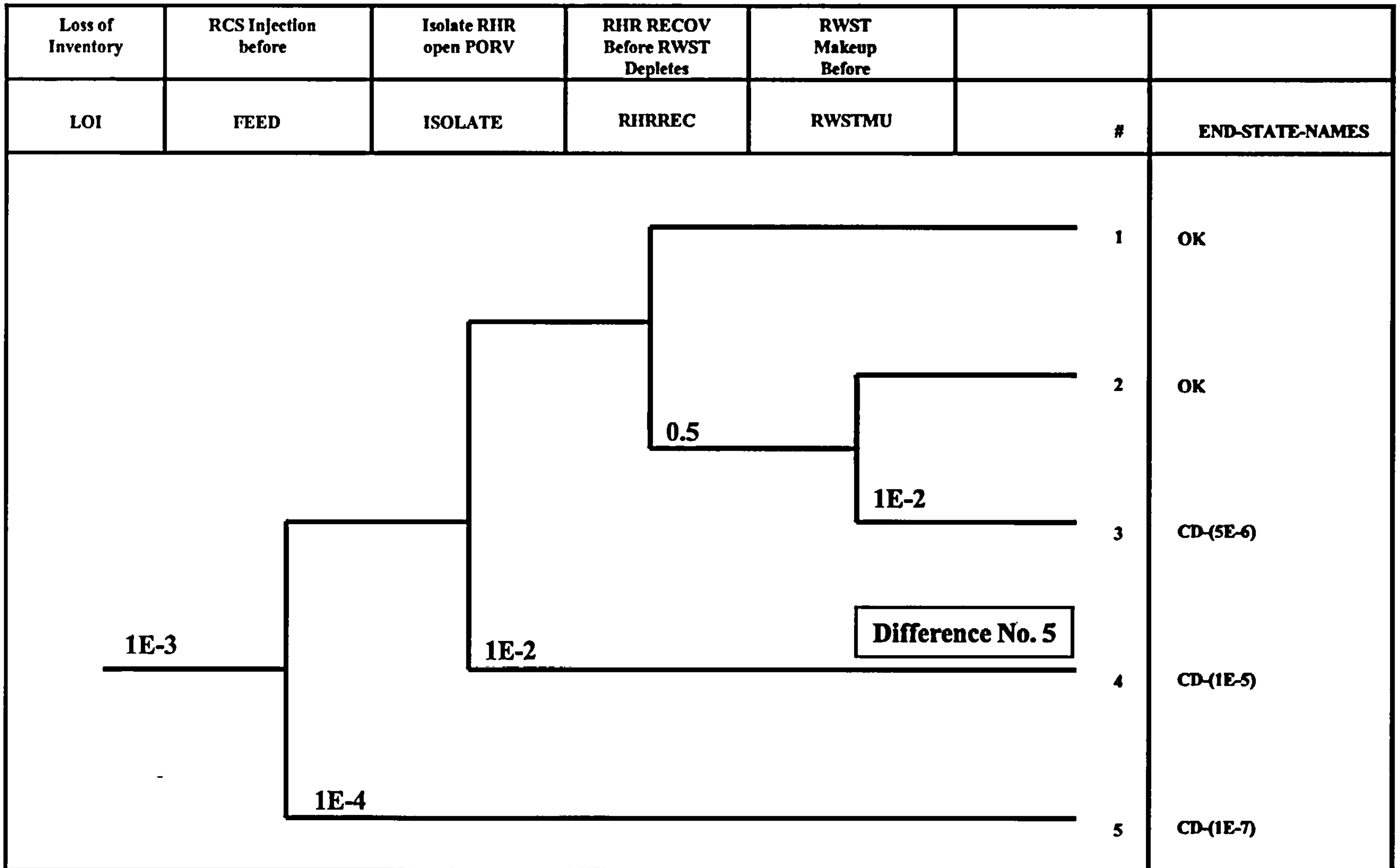
Closing Remarks

NRC Event Tree



NRC Event Tree

TVA



WATTS BAR LOCA TREE – COP Scenario 4 2005/07/18 Page 2

NRC Event Tree