NRC FORM 658
(9-1999)

U.S. NUCLEAR REGULATORY COMMISSION

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DATE OF MEETING
03/02/2000

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Docket Number(s)	**50-321 AND 50-366**
Plant/Facility Name	**EDWIN I. HATCH NUCLEAR PLANT, UNITS 1 & 2**
TAC Number(s) (if available)	
Reference Meeting Notice	**FEBRUARY 2, 2000**
Purpose of Meeting (copy from meeting notice)	**TO DISCUSS NRC'S CLASSIFICATION OF THE JUNE 1999 HATCH 2 REACTOR TRIP WITH SUBSEQUENT EQUIPMENT FAILURES**

NAME OF PERSON WHO ISSUED MEETING NOTICE	TITLE
L. N. OLSHAN	**PROJECT MANAGER**

OFFICE
NRR

DIVISION
DLPM

BRANCH
PD II-1

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DF03

[redacted]

June 15, 1999
Loss of Condenser Vacuum on Hatch Unit 2

Southern Company

Energy to Serve Your World℠

March 2, 2000

[redacted] *NRC/SNC Meeting*

June 15, 1999 Loss of Condenser Vacuum on Hatch Unit 2

Introduction	All
Event Description	Lewis Sumner
Risk Significance of Event	Anees Farruk
Questions/Summary	All

[redacted] *Purpose of Visit*

- Review Unit 2 Loss of Vacuum Event of June 15, 1999
- Review Event Risk Significance
- Summarize Event

[redacted] *Review of Event*

June 3, 1999

- Lowered flume level for chlorination activities at or below flume level, resulting in consequential quantities of air.

June 15, 1999

- 2010 - Shift observed decrease in condenser vacuum & reduced power to ~ 65%.
- 2025 - Improving condenser vacuum trend was observed and power reduction stopped at 42% by 2045.
- 2108 - Turbine low vacuum annunciator alarmed with power reduction stopped at 29%.
- 2124 - Manual scram inserted, 4-kV buses "C" & "D" failed to auto transfer, & operators entered the appropriate procedures to respond to reactor scram.

[redacted] *Review of Event*

June 15, 1999

- 2125 - Manually initiated RCIC to control RPV water level consistent with plant procedures.
- 2138 - 4-kV "C" bus re-energized.
- 2139 - 4-kV "D" bus re-energized.
- 2154 - "A" recirculation pump restarted.
- 2200 - Attempted to restart "B" recirculation pump & received ground on Unit 1 "D" 600-V bus and other 600-V switchgear.
- 2221 - Operators closed outboard MSIVs due to potential for water flashing to steam in condenser.
- 2225 - Operators directed to break condenser vacuum.
- 2250 - Torus cooling established with "A" loop RHR/RHRSW.
- 2308 - Torus cooling supplemented with "B" loop RHR/RHRSW.

[redacted] *Review of Event*

June 16, 1999

- 0023 - HPCI started for pressure control.
- 0150 - Reactor building leak detection sump alarm received, & leakage from RHRSW vent line identified.
- 0155 - Operators elected to remove "A" RHRSW loop from service (loop remained operable and available).
- 0430 - Proceeding to cold shutdown.
- 1031 - "A" loop of RHR/RHRSW restored to operable status.

[redacted] *Review of Event Risk Significance*

- Nuclear safety was maintained during event.
- Not all equipment worked as expected.
- Operations personnel correctly identified & quickly responded to equipment issues.
- Existing plant procedures already had provisions for response to equipment issues.
- Operators executed plant procedures as trained.
- Operating crew managed the event from initiation to cold shutdown.

[redacted] *Summary*

- Developed several lessons learned.
- Made several changes as the result of event:
  - Plant configuration
  - Training
  - Operating procedures
- Concluded the event did not pose an actual or potential risk to the health and safety of the public.

[redacted]

Hatch Unit 2
Loss of Condenser Vacuum
Risk Significance Analysis

Anees Farruk

PRA Supervisor

Southern Nuclear Operating Company

[redacted] *Risk Analysis Event Scenario*

- Event Scenario:
  - Manual Reactor Scram Due to Loss of Condenser Vacuum (LOCV)
  - Failure of Auto Transfer Busses 4160V 2C & 2D
  - Recovery of Busses 4160V 2C & 2D
  - Availability of Secured RHRSW Loop A
  - Failure of 600 V Bus 1D
  - Failure of Steam Line B Inboard MSIV to Close

Risk Analysis Assumptions

- **Failed Equipment: Failure Event Set as 'TRUE'**
- **Recovery of Failed or Secured Equipment: Used a Random Non-recovery Probability**
- **Successful Equipment: Used a Random Failure Probability**
- **Occurrence of Initiator: Initiator Set as 'TRUE' or Used an Average Annual Frequency Appropriate for the Risk Measure Calculated**
- **Cumulative Equipment Degradation Duration: 25 Days (5/22 - 6/2 and 6/3-6/15/99)**
- **PRA Model: Used the Post-IPE Hatch U2 Average Core Damage Frequency Model**

[redacted] *Risk Analysis Approach*

- **Perform Risk Significance Evaluation of the Initiator and Degraded Condition, and Compare Results to Various Numerical Criteria Published by the NRC Noted Below:**
- **The Following Criteria Published in Draft NRC Management Directive 8.3, "NRC Incident Investigation Procedure", Part I Was Used for Comparing Results of Risk Analysis:**
  - ***Conditional Core Damage Probability (CCDP)***
  - ***Delta Instantaneous Core Damage Frequency ($\Delta ICDF$)***
- **New NRC Oversight Process Performance Indicator for Mitigating Systems:**
  - ***Delta Core Damage Frequency (ΔCDF)***
- **NRC Significance Determination Process Matrix**

[redacted] *Numerical Criteria: Equations*

- **Conditional Core Damage Probability:**

  CCDP = Average Annual CDF From LOCV $|_{\text{LOCV = 1}}$

- **Delta Instantaneous Core Damage Frequency:**

  ΔICDF = Average Annual CDF From All Initiators $|_{\text{DEGRADED CONDITION}}$

  - Average Annual CDF From All Initiators $|_{\text{BASE CASE}}$

- **Delta Core Damage Frequency:**

$$\Delta CDF = \sum_{I=1}^{I=N} \Delta ICDF_I * (\text{Degraded Condition Duration})_I$$

Where N=Number of Discrete (Non-Overlapping) Degradation Condition Periods

[redacted] *PRA Results - Dominant Core Damage Sequence*

- Transient with Stuck Open SRV or Inadvertent Opening of SRV
- Loss of Power Conversion System
- Loss of High Pressure Coolant Injection
- Loss of Primary System Depressurization

[redacted] PRA Results - CCDP

- This Risk Measure Provides an Estimate of Risk Significance of the Loss of Defense-in-depth Caused Subsequent to the Occurrence an Initiating Event
- Conditional Core Damage Probability Assumes Occurrence of LOCV Initiating Event and Initial Unavailability of Failed Equipment
- CCDP Value for the Scenario Was Calculated As ***7.5E-06***
- As Shown in Figure 1, the Hatch U2 LOCV Event Is Classified As ***a Non-risk Significant Event***

PRA Results - CCDP

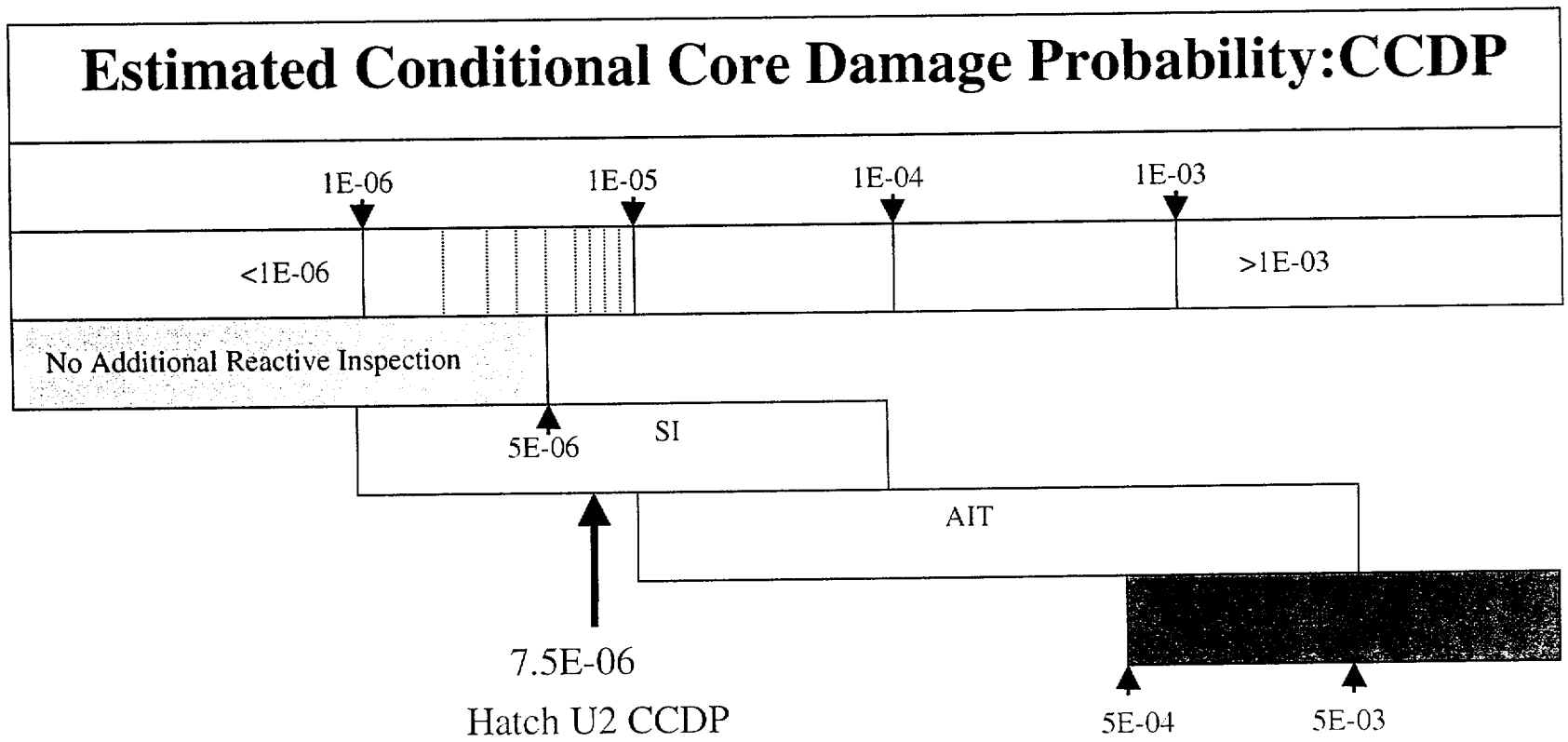


Figure 1

[redacted] PRA Results - ΔICDF

- *Instantaneous Core Damage Frequency (ICDF)* Measure Provides an Estimate of the Core Damage Risk Assuming All Initiating Events Are Likely to Occur at a Random Frequency and the Failed Equipment Is Initially Unavailable when Demanded During an *Entire Year*
- *Delta Instantaneous Core Damage Frequency (ΔICDF)* Measure Provides an Estimate of the Incremental Core Damage Risk Increase Assuming All Initiating Events Are Likely to Occur at a Random Frequency and the Failed Equipment Is Initially Unavailable when Demanded During an *Entire Year*
- ICDF Bounding Value Was Calculated As *6.42E-05/Year* (Base Case CDF = *1.65E-5/Year*)
- ΔICDF Bounding Value Was Calculated As *4.77E-05/Year*
- As Shown in Figure 2, the Hatch U2 LOCV Event Is Classified As *a Non-risk Significant Event*

[redacted] PRA Results - ΔICDF

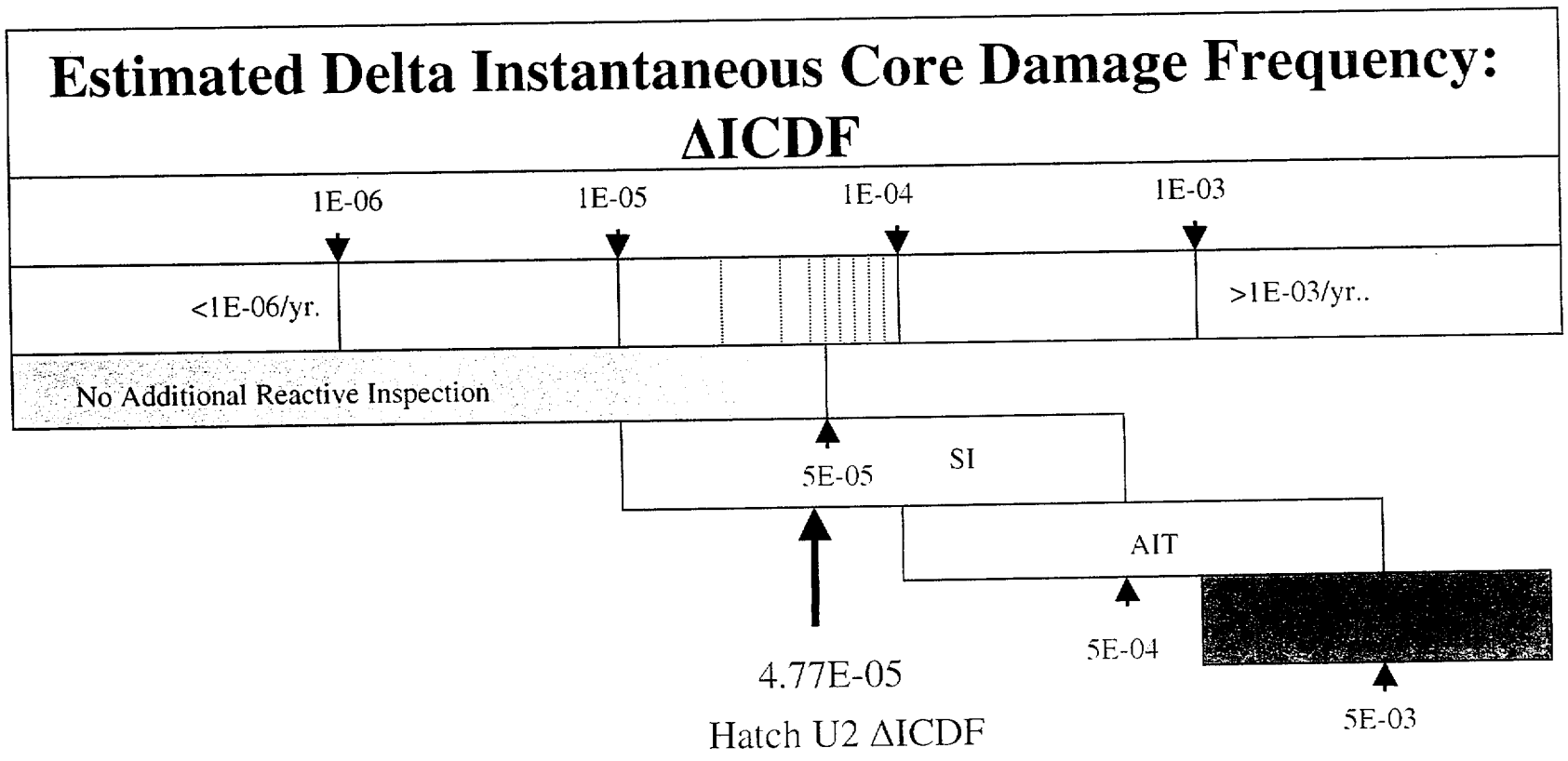
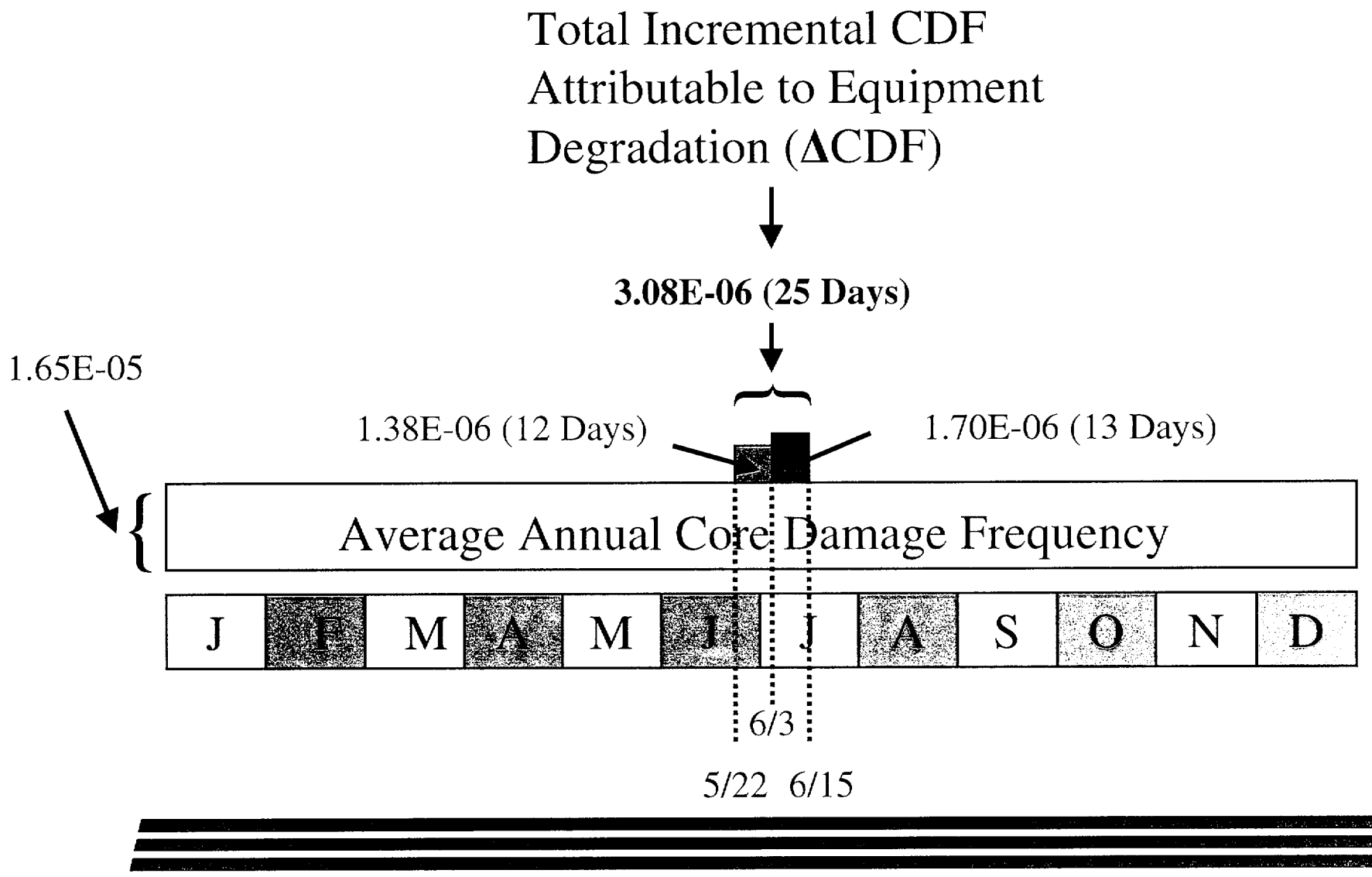


Figure 2

[redacted] PRA Results - Delta CDF

- *Delta Core Damage Frequency (ΔCDF)* **Measure Provides an Estimate of the Incremental Core Damage Risk Increase Assuming All Initiating Events Are Likely to Occur at a Random Frequency and the Failed Equipment Is Initially Unavailable During the Degradation Periods**
- **ΔCDF Value Was Calculated As *3.08E-06***
- **ΔLERF Value Was Calculated As *5.08E-08***
- **As Shown in Figure 3 the Hatch U2 LOCV Event Is Classified Under a Plant Performance Considered *Acceptable (White Region)***

[redacted] PRA Results: ΔCDF



[redacted] PRA Results - ΔCDF

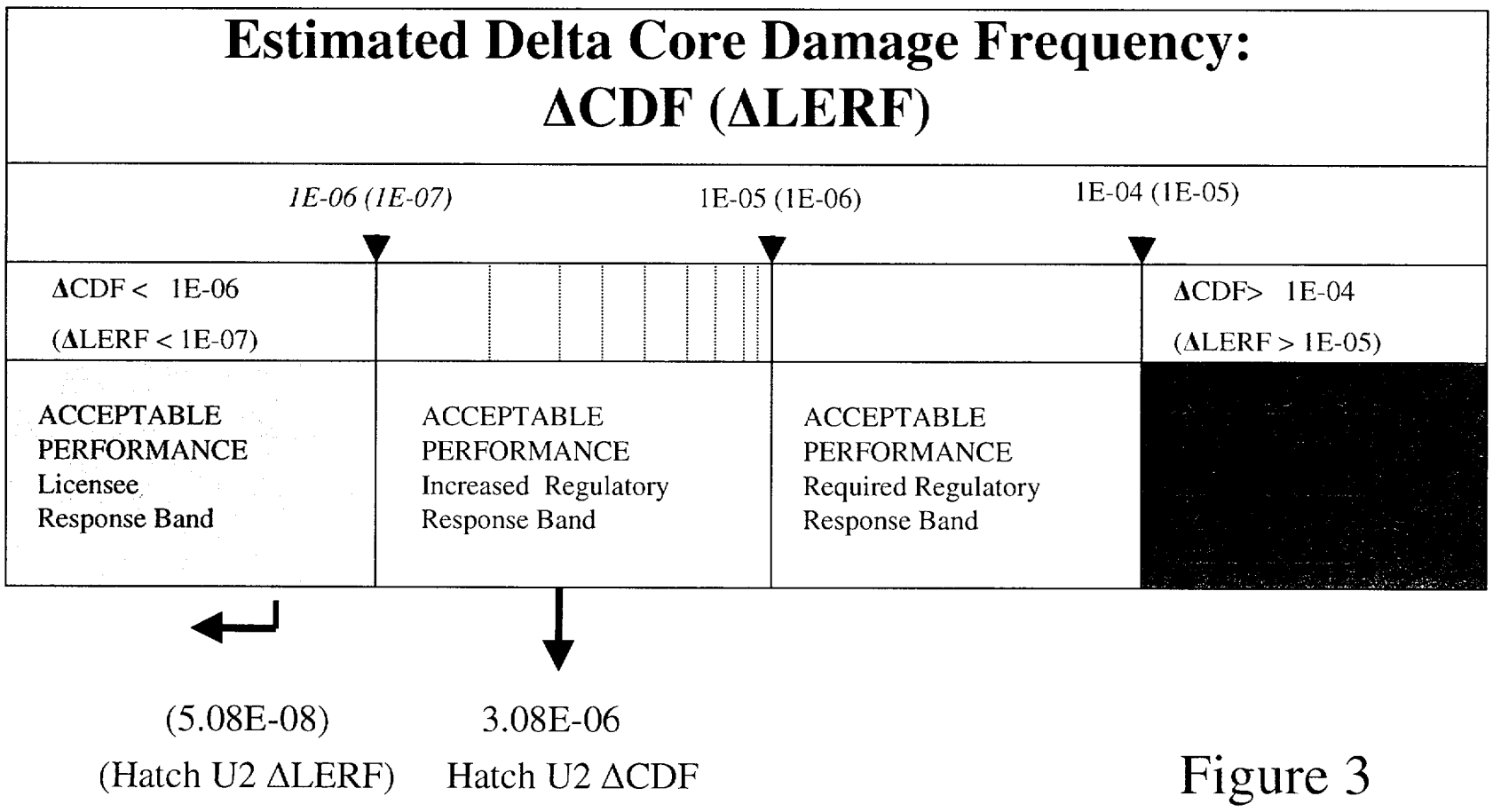


Figure 3

[redacted] PRA Results - SDP Evaluation

- **This Risk Measure Provides a Estimate of the Incremental Risk Increase in Terms of Numerical Values Considered As Surrogate to ΔCDF Assuming All Initiating Events Are Likely to Occur at a Random Frequency and the Failed Equipment Is Initially Unavailable when Demanded During the Degradation Periods**
- **Revised Hatch SDP Sheets Reflecting Post-IPE Model Changes Were Used for the Risk Analysis**
- **Bounding SDP Sheet Evaluation: As Shown in Figure 4 the Hatch U2 LOCV Event + Degraded Condition Is Classified Under a Plant Performance Condition Considered *Acceptable (White Region)***

[redacted] PRA Results - SDP Evaluation

IE Likelihood	Remaining Mitigating Capability Rating: 6	5	4	3	2	1	0
A							
B			★				
C			↑				
D							
E			Hatch U2 LOCV				
F			Performance Condition				
G							
H							

Figure 4

[redacted] *Risk Significance Analysis Conclusions*

- ***CCDP Risk Measure:*** **As Shown in Figure 1, the Hatch U2 LOCV Event Is Classified As a *Non-risk Significant Event***
- ***ICDF Risk Measure*: As Shown in Figure 2, the Hatch U2 LOCV Event Is Classified As a *Non-risk Significant Condition***
- ***New PI Measure:*** **As Shown in Figure 3 the Hatch U2 LOCV Event Is Classified Under a Plant Performance Condition Considered *Acceptable (White Region)***
- ***Bounding SDP Sheet Evaluation:*** **As Shown in Figure 4 the Hatch U2 LOCV Event Is Classified Under a Plant Performance Condition Considered *Acceptable (White Region)***