



UNITED STATES
NUCLEAR REGULATORY COMMISSION

REGION IV

611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

APR 15 1997

EA 97-099

Charles M. Dugger, Vice President
Operations - Waterford 3
Entergy Operations, Inc.
P.O. Box B
Killona, Louisiana 70066

SUBJECT: WATERFORD 3 PREDECISIONAL ENFORCEMENT CONFERENCE

This refers to the public meeting conducted in the Region IV office on April 8, 1997. This meeting related to four apparent violations which were identified during an inspection conducted February 3-28, 1997. The apparent violations were related to the design, operation, and testing of the containment cooling system.

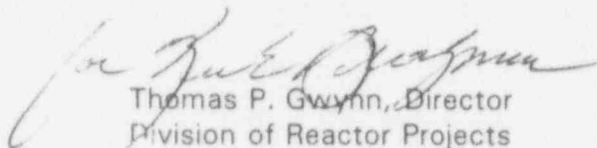
The licensee acknowledged that containment cooling system licensing and design bases were poorly documented and contained inconsistent information. Waterford personnel also indicated that the Technical Specification surveillance test failed to simulate postaccident lineup conditions and the required component cooling water flows for all containment fan coolers could not be achieved. As part of the presentation, the licensee stated that for all the apparent violations little or no actual or potential safety significance existed.

The results of the predecisional enforcement conference are pending and will be issued under Enforcement Action 97-099.

In accordance with Section 2.790 of the NRC's "Rules of Practice," Part 2, Title 10, Code of Federal Regulations, a copy of this letter will be placed in the NRC's Public Document Room.

Should you have any questions concerning this matter, we will be pleased to discuss them with you.

Sincerely,


Thomas P. Gwynn, Director
Division of Reactor Projects

Enclosures:

1. Attendance List
2. Licensee Presentation

9704180195 970415
PDR ADOCK 05000382
Q PDR



cc:

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Washington, D.C. 20005-3502

APR 15 1997

Entergy Operations, Inc.

-4-

bcc to DCD (IE45)

bcc distrib. by RIV:

Regional Administrator
DRP Director
Branch Chief (DRP/D)
Project Engineer (DRP/D)
Branch Chief (DRP/TSS)
Director, WCFO
OE: OWFN-7H5
GSanborn, OE
PAO
SLO

Resident Inspector
DRS-PSB
MIS System
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GEWander:m		PHHarrell		TPGwynn				
04/12/97		04/15/97		04/15/97				

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APR 15 1997

Entergy Operations, Inc.

-4-

bcc to DCD (IE45)

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Regional Administrator
DRP Director
Branch Chief (DRP/D)
Project Engineer (DRP/D)
Branch Chief (DRP/TSS)
Director, WCFO
OE: OWFN-7H5
GSanborn, OE
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04/15/97		04/15/97		04/15/97				

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180023

PREDECISIONAL ENFORCEMENT CONFERENCE ATTENDANCE

LICENSEE/FACILITY	Entergy Operations, Inc. Waterford-3	
DATE/TIME	April 8, 1997. 1 p.m. (CDT)	
CONFERENCE LOCATION	Region IV. Training Conference Room	
EA NUMBER	EA 97-099	
NRC REPRESENTATIVES		
NAME (PLEASE PRINT)	ORGANIZATION	TITLE
GARY SANBORN	NRC REGION IV	ENFORCEMENT OFFICER
JIM DYER	"	DEP. REGIONAL ADMINISTRATOR
Ken Brockman	"	DEPT DIR. DRP
WILLIAM BECKNER	NRC/NRR	DIR PD IV-1
P. HARRELL	NRC	DRP
J. SHACKELFORD	NRC	DRS
J. EDGERLY	NRC	DRP
Werner, Gregory	NRC	Project Engineer
Ian Barnes	NRC	Acting Deputy Director DRS
Lee Keller	NRC	SRI - Waterford

PREDECISIONAL ENFORCEMENT CONFERENCE ATTENDANCE

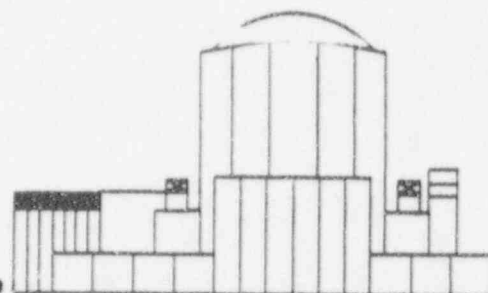
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EA NUMBER	EA 97-099

LICENSEE REPRESENTATIVES

NAME (PLEASE PRINT)	ORGANIZATION	TITLE
CHARLES DUGGER	ENTERGY - W3	V.P. N.S. - W3
EARLY C. EWING	ENTERGY - W3	DIRECTOR NUCLEAR SAFETY + REG. AFFAIRS
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Jerry Yelverton	Entergy Operations	Chief Operating Officer
A.J. WRAPE III	ENTERGY - W3	DIRECTOR, DESIGN ENG.
T.R. LEDNARD	ENTERGY - WF3	General Manager ^{PLANT} Operations
J.W. VINCI	ENTERGY - WF3	PLANT ENCA MANAGER
Dennis Matheny	Entergy - WF3	Operational Manager
JERRY HOLMAN	ENTERGY - W3	MANAGER SAFETY ANALYSIS
Robert Murrell	Entergy - W3	Senior Staff Engr. Licensing
Bruce Proctor	Entergy - W3	Supr. Systems Engineering
Charlotte A. Thomas	ENTERGY - W3	Communications Specialist
Steve Bethay	Entergy Operations	Director, Licensing (Corporate)
Ken E. Quack	Entergy - W3	Systems Engineer



ENTERGY



WATERFORD SES - UNIT3



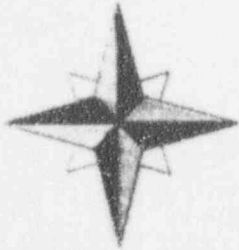
LEADING THE WAY TO EXCELLENCE



**WATERFORD 3
PREDECISIONAL ENFORCEMENT CONFERENCE
April 8, 1997**

**Component Cooling Water (CCW) To
Containment Fan Coolers (CFCs)**

Entergy Operations, Inc.



Waterford 3

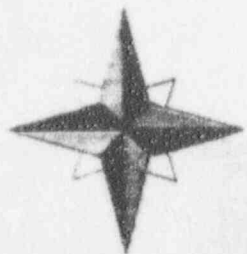
Predecisional Enforcement Conference

Component Cooling Water (CCW)

To

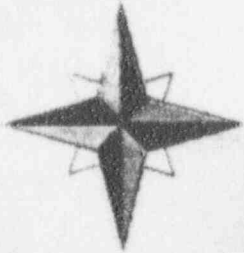
Containment Fan Coolers (CFCs)

April 8, 1997



INTRODUCTION

Chuck Dugger



Agenda

Introduction & Overview

C. Dugger

**Background and Root Cause
Analysis (RCA)**

D. Vinci

Safety Significance

A. Wrape

Corrective Action

A. Wrape

Regulatory Perspective

E. Ewing

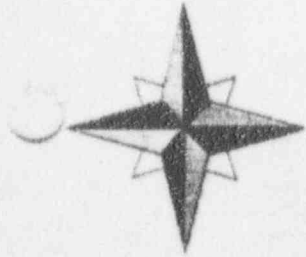
Conclusion

C. Dugger



BACKGROUND AND ROOT CAUSE ANALYSIS (RCA)

Don Vinci



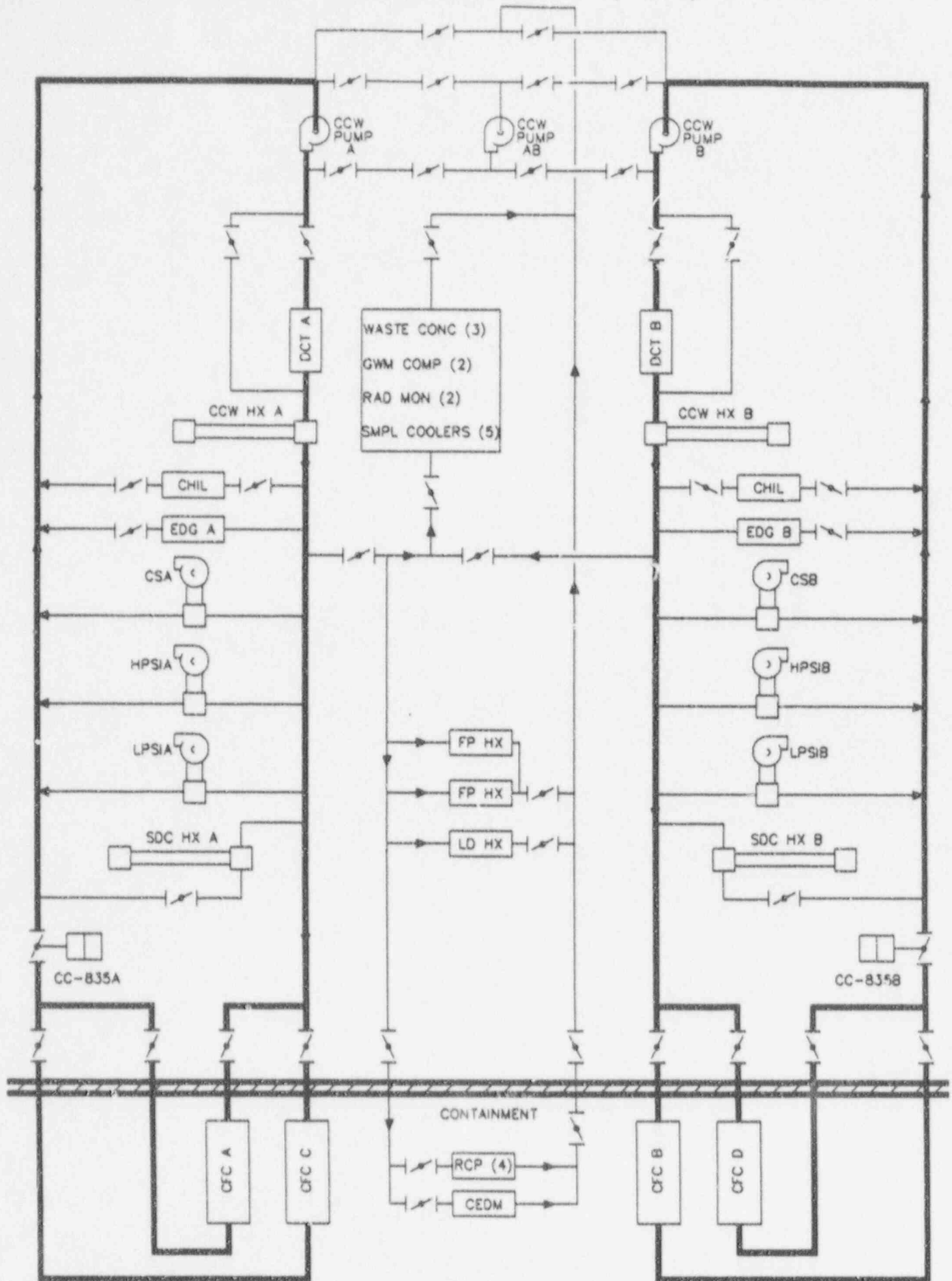
Background and Root Cause Analysis (RCA)

System Overview

Sequence of Events

Causal Factors

COMPONENT COOLING WATER (CCW) SYSTEM

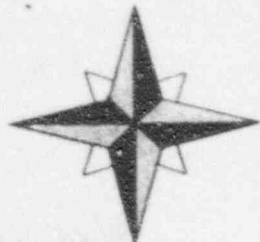




Background and RCA

Problem Statement

- **Poorly Defined Design and Licensing Basis Related to Containment Fan Cooler (CFC) System Since Initial Licensing**
- **Tech Spec Surveillance for CFC Did Not Simulate Post Accident Conditions**



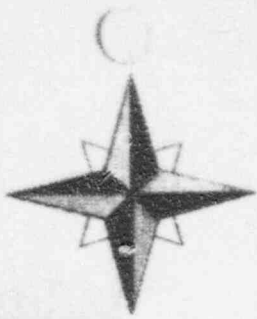
Background and RCA

Sequence of Events

1983-1984 Startup Testing

CFC A	1350	CFC A&C	2708
CFC B	1289	CFC B&D	2715
CFC C	1358		
CFC D	1426		

Acceptance Criteria	1340	2700
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Background and RCA

Sequence of Events

- | | |
|---------------------|---|
| May 1988 | Enforcement Discretion and Emergency TS Change
- Only One CFC Required Per Train |
| January 1991 | MSLB Peak Pressure Analysis Error |
| July 1995 | Essential Chilled Water (CHW) System Flow Degradation Identified
Corrective Action Plan Included Testing on CCW System |



Background and RCA

Sequence of Events

**October
1995
(RF07)**

**Special Test on CCW System Performed (Flow
Balance)**

	STARTUP TEST	RF07 (10/95)
CFC A	1350	1300
CFC B	1289	1200
CFC C	1358	1320
CFC D	1426	1290
ACCEPTANCE CRITERIA	1340	1350



Background and RCA

Sequence of Events

**October
1995
(RF07)**

**Operability Evaluation Completed on Degraded Flow
Condition for CCW System**

- **CFC Minimum Flow of 1100 gpm**
- **1 CFC Fan Per Train**
- **Corrective Action Plan Developed**



Background and RCA

Sequence of Events

**October
1995
(RF07)**

**Satisfactorily Completed Surveillance
Procedure, OP-903-029, SIAS Test**

**CFC Flow Verified ≥ 1325 gpm, But Lineup Did Not
Simulate Post Accident Conditions (Never Did)**

**January-
March 1996**

Cleaned DCT Bundles on Both Trains CCW

- **Management Decision to Schedule Post
Maintenance Flow Balance Test for RF08**



Background and RCA

Sequence of Events

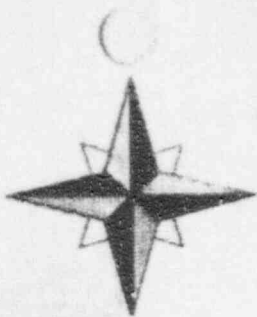
**July
1996**

RCP Seal Forced Outage

- **Initial Decision Not to Perform CCW Flow Balance Test - Test Not Ready and Expected a Short Outage**
- **Decision Not Re-visited**

**August 12,
1996**

**Self Assessment of Ultimate Heat Sink
Questioned if Intent of TS for CFC's Being Met**



Background and RCA

Sequence of Events

**August
1996**

Initial Actions Taken

- Reviewed Past Surveillance Testing
- Investigated Basis for TS Surveillance
- Contacted Other Plants
- Re-Reviewed Operability Evaluation Done RF07
- Requested a Re-Run of Contempt Code to
Determined Impact of Degraded Flow (Initial
Feedback - Little Chance That Model Could
Be Re-Run)
- Determined If Flow Balance Test Can Be
Performed On-Line



Background and RCA

Sequence of Events

**August 23-24, CCW Flow Balance Test Performed as an
1996 Infrequently Performed Test or Evolution (IPTE)**

	STARTUP TEST	RF07 (10/95)	AUGUST 1996
CFC A	1350	1300	1340
CFC B	1289	1200	1250
CFC C	1358	1320	1310
CFC D	1426	1290	1370
ACCEPTANCE CRITERIA	1340	1350	1350



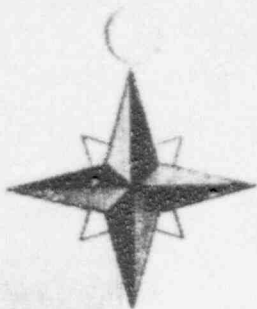
Background and RCA

Sequence of Events

August 1996

**Flow Condition Still Considered Degraded -
Additional Investigation**

- CCW System Flow Model Employed to Compare Actual Test Results (Agreed Within 5%)
- Loop Uncertainties Reviewed (Test Results Within Uncertainty Band)
- Reviewed Possible Bypass Flowpaths (None Credible)
- Reviewed Historical CCW Pump Performance



Background and RCA

Results of Review of TS on CFC's

- **TS Bases Contained No Information on Intent of Surveillance Requirements**
- **No Other TS Surveillance on Safety Related Heat Exchangers Require Flow Balance Test (Including CCW TS Itself)**
- **W3 TS Surveillance Modeled After CE Standard TS's (CE-STs) (NUREG 0212)**
 - ◆ **31 Day Test - Start and Run Fans from Control Room and Verify Flow to Cooler [Intent - Detect System Degradation]**
 - ◆ **18 Month Test - Verify Fans Start on SIAS [Intent - Verify Functionality of System]**
- **W3's Unique Design Required a Change to CE-STs**
 - ◆ **Control Board Handswitch Does Not Start CFC's in Slow Speed, Does Not Provide High Flow Rate Through Flow Control Valve nor Provide Indication of Valve Position**

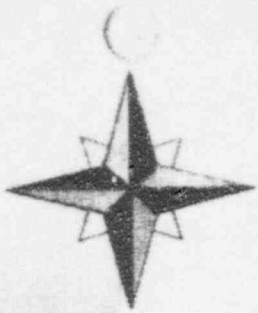


Background and RCA

Results of Review of TS on CFC'S

W3 TS's Altered to Accommodate Design

- ◆ 31 Day Test - Start and Run Fans From Control Room and Verify Flow to Cooler ≥ 625 gpm [Intent - Detect System Degradation]
- ◆ 18 Month Test - Verify Fans Start on SIAS Signal and Verify Flow to Cooler ≥ 1325 gpm [Intent - Verify Functionality of System]
- Startup Test Procedures Demonstrated That Not All of the CFC's Attained ≥ 1325 and Therefore Could Not Support a TS Surveillance Requirement of 1325 gpm in an Accident Flow Lineup



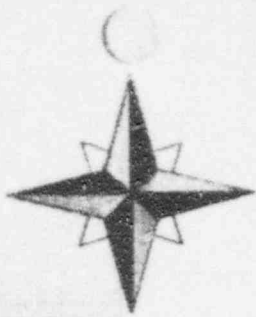
Background and RCA

Sequence of Events

August 1996

Conclusion and Corrective Action Plan

- **CCW System Flow Balance Test was Not the Intent of Surveillance for Verifying CFC Operability**
- **Surveillance Verified CFC's Operability by Assuring that Flow Control Valve Moves to Accident Position During SIAS**
- **System Operability Not in Question**
- **Reconstitute Design Basis and Run GOTHIC Code**
- **Revise Design and Licensing Basis and Submit TS Change to Correct Original Discrepancies and Regain Margin**



Background and RCA

Sequence of Events

**February 1997 Special Inspection - Conducted By Waterford 3
Senior Resident Based on Response to TIA**

- Additional Concerns Relative to Application of Instrument Uncertainty were Raised
- CONTEMPT Code Re-Run With 2 CFC's Running Post Accident - 1100 gpm Each
- 50.59 Completed



Background and RCA

Causal Factors

Original Design Documentation Did Not Establish Adequate Design Basis for CFC's

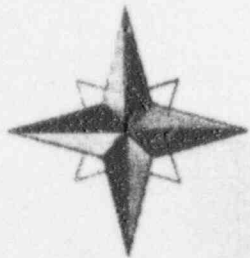
Resulted In:

- ◆ **Failure to Maintain Adequate Design Control**

Licensing Basis and TS Surveillance Intent for CFC's are Unclear

Resulted In:

- ◆ **Failure to Establish Adequate Surveillance Test Procedure**
- ◆ **Failure to Maintain At Least One CFC Operable Per TS's**
- ◆ **Failure to Implement Timely Corrective Actions Following Identification of Design Basis Deficiencies**



SAFETY SIGNIFICANCE

AI Wrape

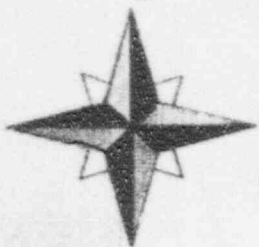


Safety Significance

October 1995 Operability Evaluation Performed Using GOTHIC Code

Key Assumptions Were:

- **1100 gpm Flow To CFCs**
- **2600 gpm Flow To SDCHX**
- **1 CFC Per Train Operable**



Safety Significance

October 1995, Operability Evaluation Results:

GOTHIC Analysis Demonstrated:

- **Still Within Design Pressure of 44 psig**
- **Pressure at 24 Hours Exceeded Value of Record By Small Delta of 3.1 psi**
- **Negligible Impact on Offsite Dose**
- **No Safety Significance**



Safety Significance

Use of GOTHIC For Operability Was Judgment Based On Technical and Thoughtful Factors

- **Widely Used By Industry For Containment Pressure Analysis**
- **Qualified Under Numerical Applications, Inc. QA Program Which Fully Conforms to 10CFR50 Appendix B**
- **Extensive Qualification By Comparison to Analytical Problems and Experimental Data**
- **Personnel are Trained and Have Experience in Using GOTHIC**
- **GOTHIC Model Benchmarked Against CONTEMPT**



Safety Significance

NRC Reviewed CONTEMPT Analysis, NRC SER, July 1981, Section 6.2.1.1

- “Additionally the staff has performed confirmatory analyses on the applicant’s DBA LOCA and two MSLB cases utilizing the computer code CONTEMPT-LT/28. Each of the confirmatory analyses was performed with the applicant’s assumptions and initial conditions, which were reviewed for adequate conservatism, including the assumption of most severe single active failure.”**
- “All the peak values of the NRC’s confirmatory analyses are lower than the applicant’s values. In addition, the staff’s confirmatory DBA LOCA pressure response showed a decrease to less than 50% of the calculated peak at 24 hours”**
- “Based on these confirmatory analysis results, and review of the applicant’s analysis, the staff finds acceptable the applicant’s analysis....”**

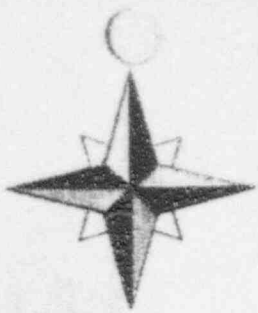


Safety Significance

February 1997 Design Basis Changed

Key Assumptions Were:

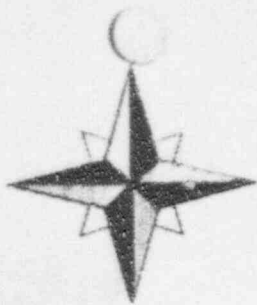
- **1100 gpm Flow To CFC**
- **2550 gpm Flow To SDCHX**
- **2 CFCs Per Train Operable**



Safety Significance

Design Basis Results Were:

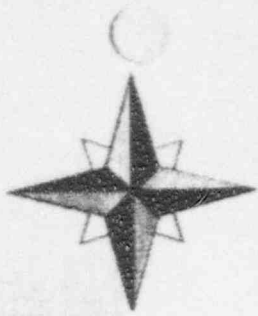
- **CONTEMPT Analysis Demonstrated:**
 - ◆ **Peak Pressure Less Than Design Pressure of 44 psig, 43.57 psig**
 - ◆ **Pressure at 24 Hours Post LOCA Significantly Less Than 1/2 Peak, 13.80 psig**
 - ◆ **No Impact on Design Basis Offsite Dose**
- **Administrative Requirement For 4 CFCs**
- **No Reduction In Safety Margin**



Safety Significance

CFC Timing Discrepancy

- MSLB Analysis CFC Delay Time Is 8 sec
- Actual CFC Delay Time Is 19.5 sec
- Impact Offset By Greater Spray Flow
- Existing FSAR Analysis Has Higher Peak Pressure
- Impact Of Change Is Small, .03 psi



Safety Significance

Summary

- **GOTHIC Results Conclusively Demonstrated No Safety Significance**
- **Design Basis Reanalysis Using CONTEMPT Preserved Margin**



CORRECTIVE ACTION

AI Wrape



Corrective Action

Corrective Actions Address Specific Problems

- **October 1995 Evaluation Promptly Established No Safety Significance**
- **Special Testing Confirmed Actual Operational Performance and Provided Baseline for Analysis**
- **Peak Pressure Analysis Completed**
- **TS Amendment In Preparation**
- **Plan To Do Comprehensive Upgrade Of Design Basis Analysis Using GOTHIC**



Corrective Action

Corrective Actions were Prompt, Once Current Problems Identified

- **October 1995, Special Testing Results,**
 - ◆ **October 1995, Operability Evaluation Completed**

- **March 1996, DCT Cleaning Complete**

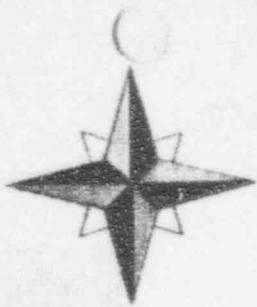
- **August 1996, UHS Independent Team Raised Question**
 - ◆ **August 1996, CR-96-1250 Documented Concern**
 - ◆ **August 1996, Special Test At Mode 1 Performed**



Corrective Action

Corrective Actions were Prompt, Once Current Problems Identified (Continued)

- **January 1997, Waterford 3 Informed About NRC TS Interpretation**
 - ◆ **February 1997, Evaluation Completed to Change Design Basis**



Corrective Action

Comprehensive Corrective Actions to Address Broader Issues

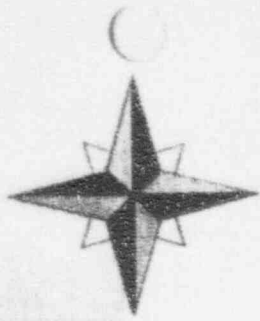
- **Committed to Better Define Original Design and Licensing Basis and Realign Appropriate Procedures**
- **Committed to Significant Upgrade or Rework of Original Design and Licensing Basis**
- **Position Documented in Waterford 3 10CFR50.54(f) Response**



Corrective Action

Design and Licensing Basis Upgrade or Rework Includes:

- **Review and Upgrade of Basis for Design and Testing**
 - ◆ **Containment Isolation Design Basis**
 - ◆ **Ultimate Heat Sink Design Basis**
 - ◆ **Tornado Missile Design Criteria**
 - ◆ **Inservice Testing Basis Reconstitution**
 - ◆ **Emergency Feedwater Flow Design Basis**
 - ◆ **TS LCO Instrument Uncertainty Evaluation Project**



Corrective Action

Design and Licensing Upgrade or Rework Includes:

- **Upgrade Selected DBDs for Safety Significant Systems**
- **Upgrade Selected Mechanical Calculations for Safety Significant Systems**
- **Development Process and Relational Data Base to Establish Links Between Design Basis, Licensing Basis, and Plant Procedures**
- **Review Selected Sections of UFSAR for Accuracy**
- **Full Conversion to New CE-STS**



Corrective Action

Other Significant Corrective Actions to Improve Design Basis Awareness and Verification

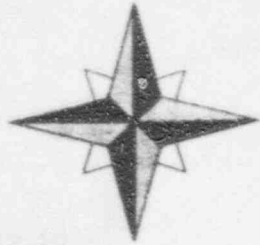
- **Operations, Maintenance, Licensing, and Engineering Design Basis Training**
- **Review of Certain Operations and Maintenance Procedures To Ensure They Incorporate Necessary Design Basis Information and Configuration Controls**
- **Continued Implementation of Self Assessments**



Corrective Action

Reviewed TS Flow Tests to Ensure:

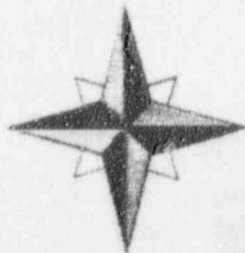
- **Tests Performed in Accident Configuration Where Necessary**
- **Tests Appropriately Verify Applicable Design Basis Values**



Corrective Action

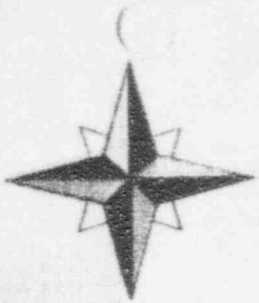
Summary

- **Prompt Corrective Action was Hampered By Misunderstanding of Design and Licensing Basis**
- **Corrective Action To Address Specific Problem Areas of Issue**
- **Corrective Action To Address Broader Issues**



REGULATORY PERSPECTIVE

Early Ewing



Regulatory Perspective

Failure to Establish or Maintain Adequate Design Control

Example 1: CCW Flow To CFCs

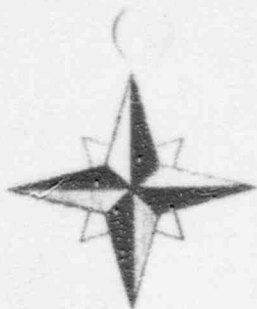
- **Issue Originated From Initial Construction**
- **Issue Was Not Willful**
- **Issue Was Self Identified**
- **Corrective Actions Completed and in Progress Will Establish a Clear Design and Licensing Basis in the SAR, Technical Specifications and Supporting Analyses**
- **Analysis Indicates Little Safety Significance**



Regulatory Perspective

Conclusion

- **The Violation Meets the Criteria for Discretion As an Old Design Issue**



Regulatory Perspective

Failure to Establish or Maintain Adequate Design Control

Example 2: Credited 3 CFCs vs 2 in MSLB Analysis

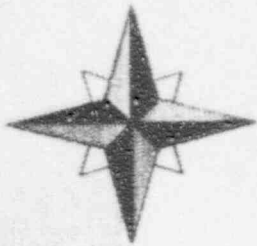
- **Issue Resulted From an Isolated Design Error in 1991**
- **Issue Was Not Willful**
- **Issue Was Self Identified, With Some Help From the Resident, but Would Have Been Identified During Design Bases Review**
- **Analysis Has Been Corrected**
- **Analysis Indicates No Safety Significance**
- **Unrelated to Other Issues**



Regulatory Perspective

Conclusion

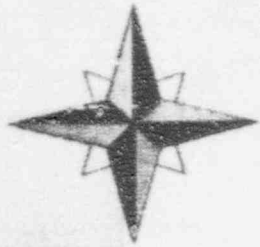
- **The Violation Meets the Criteria for Discretion As an Old Design Issue**
- **Or At a Minimum Meets the Criteria for a Level IV**



Regulatory Perspective

Inadequate Test Procedure for Surveillance 4.6.2.2.b.2

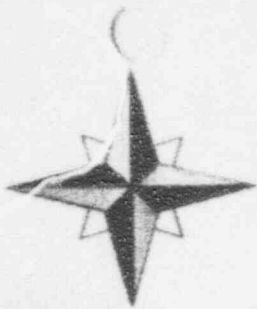
- **Was Self Identified**
- **Issue Was Not Willful**
- **Caused by Interpretations of Poorly Developed Technical Specifications, Unique Plant Design, and Past Operating History Dating to Original Construction**
- **Corrective Actions Will Resolve Issue and Assure Agreement Between SAR, Tech Specs and Test Procedures and Methods.**
- **Little Safety Significance**



Regulatory Perspective

Conclusion

- **The Violation meets the Criteria for Discretion as an Old Design Issue**



Regulatory Perspective

Failure to Maintain at Least One CFC Operable Per Train

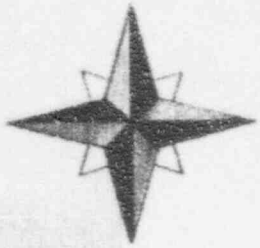
- **Issue Was Self Revealing**
- **Issue Was Not Willful**
- **Caused by Interpretations of Poorly Developed Technical Specifications, Unique Plant Design, and Past Practices**
- **Corrective Actions Were Not Effective**
- **Resulted in Non-Compliance With TS**
- **Analysis Indicates Little Safety Significance**



Regulatory Perspective

Conclusion

- **Corrective Actions Delayed**
- **Corrective Actions were Comprehensive**
- **Is Old Design Issue, Does Not Meet All of the Criteria for Discretion**
- **Was a Failure to Comply With the Action Statement and Required Extensive Analysis**
- **Meets the Criteria for a Level III Violation, Deserving of Mitigation for Comprehensive Corrective Action**



Regulatory Perspective

Failure to Implement Adequate Effective Corrective Action

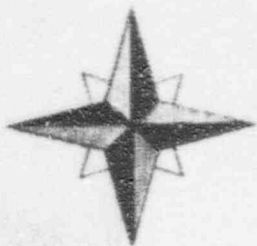
- **Not an Old Design Issue**
- **Not Self Identified**
- **Corrective Actions Verified Operability**
- **Resulted From Belief System Was Operable Based on Interpretation of Spec Which Was Discussed in Previous Violation**
- **Planned Actions Will Resolve Design Basis, Technical Specification, and Verify Valve and Fan Performance and Monitor System for Flow Degradation**
- **No Safety Significance**



Regulatory Perspective

Conclusion

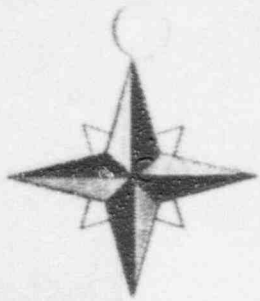
- **Related to an Old Design Issue**
- **Corrective Actions Were Underway**
- **Actions Would Not Be Completed by the End of the Outage Under the Plan of Action**
- **Is a Violation of Regulatory Requirements, With No Safety Significance**
- **Should Be Considered a Level IV Violation**



Regulatory Perspective

Corrective Action

- **Address Specific Design and Licensing Bases Issues**
- **Are Comprehensive in That They Go Beyond the Specifics to Identify Other Similar Issues in Other Systems**
- **Include Improvements to Design and Licensing Bases**
- **Address Regulatory Culture and Conservative Decision Making**



Regulatory Perspective

Safety Significance

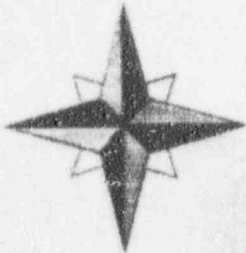
- **No Threat to Containment Design**
- **No Impact on Offsite Doses**
- **No Degradation of Safety Margins**



Regulatory Perspective

Summary

- **Two of the Issues Are Old Design Issues and Qualify for Discretion**
- **One Issue Qualifies As a Level III, With Mitigation**
- **One Issue Qualifies As a Level IV**



CONCLUDING REMARKS

Chuck Dugger