UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON, D. C. 20555

March 3, 1989

Docket Nos. 50-382, 50-368, 50-361 and 50-362

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PDC

PDR

LICENSEES: Arkansas Power & Light Company Louisiana Power & Light Company Southern California Edison Company

FACILITIES: Arkansas Nuclear One, Unit 2 Waterford 3 San Onofre. Units 2 and 3

SUBJECT: SUMMARY OF MEETING HELD ON FEBRUARY 27, 1989 WITH THE COMBUSTION ENGINEERING OWNERS GROUP TO DISCUSS SAFETY IMPLICATIONS OF IMPLEMENTING AN AUXILIARY MITIGATING SYSTEM ACTUATION CIRCUITRY (AMSAC) IN ACCORDANCE WITH THE ATWS RULE

On February 27, 1989, in Rockville, Maryland, a meeting was held between NRR and the Combustion Engineering Owners Group (CEOG) to discuss the safety implications of implementing a fully diverse Auxiliary Mitigating System Actuation Circuitry (AMSAC) for initiation of emergency/auxiliary feedwater system (AFS) as specified in the ATWS Rule.

The NRR staff reiterated the importance of meeting the requirements of the ATWS Rule and the immediate need to resolve the (AMSAC) implementation issue for ANO-2, SONGS-2, 3, and for Waterford 3. The CEOG presented its discussion of the functional requirements of the existing auxiliary feedwater actuation system (AFAS), an overview of the AFAS design, and the safety implications of installing a diverse and independent AMSAC at these CE plants. Enclosure 1 is a copy of the presentation slides.

The CEOG emphasized that adding a non-safety grade AMSAC would degrade the reliability of the existing AFAS. The diverse actuation system would create the potential for generating conflicting signals to the ruptured steam generator. an unacceptable condition given a design basis event. According to the owners group, the potential for such a condition can only be eliminated by upgrading the diverse AMSAC to a level which would be as complex and as expensive as the existing actuation system.

In response, the NRR staff questioned the bases for the CEOG safety concern and indicated that the CEOG has not discussed or considered other potentially acceptable options for meeting the intent of the ATWS Rule's requirement for an AMSAC and still provide protection for design basis events. It was suggested that the CEOG seriously consider additional design options beyond those included in the recent exemption requests. One such option would be to design a non-safety grade AMSAC with diverse sensors (such as using high reactor pressure) as the initiation signal. The AMSAC signal will be overridden by the safety AFAS signal in the event of a design basis event such as a steam generator rupture. This CEOG effort to consider additional options should parallel detailed discussions and meetings with NRR staff to result in the Owners Group development of a conceptual design of a diverse AMSAC. Information on such a design should

be provided to the staff expeditiously in a formal submittal with sufficient details to precipitate an NRR decision on the AMSAC implementation and exemption issues for CE plants. The CEOG staff agreed to these suggested actions.

Finally, the NRR staff discussed an option for SCECO and LP&L to withdraw their exemption requests by March 2, 1989. Also, the licensee representatives were reminded of the ATWS Rule scheduler requirements for implementation by the third refueling outage after the July, 1984 date and that extensions must be officially requested and approved to avoid violation of the Rule.

Enclosure 2 is a list of the attendees.

Chester Poslusny, Project Manager Project Directorate - IV Division of Reactor Projects - III, IV, V and Special Projects Office of Nuclear Reactor Regulation

Enclosures: As stated

cc w/enclosures: See next page

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	NRC PDR CPoslusny J. Hannon B. Grimes	NRC PDR Local PDR CPoslusny SNewberry J. Hannon D. Crutchfield B. Grimes ACRS (10)

***SEE PREVIOUS CONCURRENCES:**

PD4/PM*	SICB*	PD4/D MAR
CPoslusny:sr	SNewberry	JCalvo
03/01/89	03/02/89	03/3/89

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G. Knighton	J. Hannon	D. Crutchfield	OGC-Rockville
E. Jordan	B. Grimes	ACRS (10)	T. Martin (Region IV)
PD4 Plant File			

***SEE PREVIOUS CONCURRENCES:**

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CPoslusny:sr	SNewberry	JCalvo
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C-E OWNERS GROUP

(AP&L, LP&L, SCE)

PRESENTATION TO NRC

ON

THE SAFETY IMPLICATIONS

OF INSTALLING A

DIVERSE AUXILIARY FEEDWATER ACTUATION SIGNAL

IN COMPLIANCE WITH 10CFR50.62

(THE ATWS RULE)

FEBRUARY 27, 1989

PURPOSE

REVIEW THE SAFETY IMPLICATIONS OF IMPLEMENTING A FULLY DIVERSE EMERGENCY / AUXILIARY FEEDWATER ACTUATION SYSTEM IN ACCORDANCE WITH THE ATWS RULE

BACKGROUND

- 0 NUMEROUS NRC/CEOG MEETINGS AND CORRESPONDENCE BETWEEN MARCH, 1985 AND JANUARY, 1988
- **O** APPEARED TO HAVE REACHED AGREEMENT SEVERAL TIMES
- **0** PERSONNEL CHANGES ADDED TO RESOLUTION DIFFICULTIES
- O INTERACTION CULMINATED IN JANUARY 11, 1988 NRC LETTER PROVIDING EXEMPTION GUIDANCE

O SAFETY CONCERNS WITH DIVERSE EFAS ARE FUNDAMENTAL TO EXEMPTION REQUEST

PRESENTATION OUTLINE

0 FUNCTIONAL REQUIREMENTS OF EXISTING AUXILIARY FEEDWATER ACTUATION SYSTEM

O OVERVIEW OF HARDWARE DESIGN

0 SAFETY IMPLICATIONS OF DIVERSE AUXILIARY FEEDWATER ACTION SYSTEM

FUNCTIONAL REQUIREMENTS OF EXISTING AFAS

O DESIGN BASIS OF SYSTEM

O EVENTS REQUIRING EFAS

DESIGN BASIS OF AFAS SYSTEM

- O INDEPENDENT MEANS OF MAINTAINING SECONDARY INVENTORY
- **O** SUFFICIENT INVENTORY RESERVE FOR ORDERLY PLANT COOLDOWN FOR DURATION OF DBE
- 0 IDENTIFY SG WITH PRESSURE BOUNDARY RUPTURE
 - OVERCOOLING
 - CONTAINMENT PRESSURE
- **O** ISOLATION OF SG WITH PRESSURE BOUNDARY RUPTURE
 - OVERCOOLING
 - CONTAINMENT PRESSURE
- O CONTROL WATER LEVEL IN INTACT SG FOLLOWING SECONDARY PRESSURE BOUNDARY RUPTURE
 - OVERCOOLING

FUNCTIONAL REQUIREMENTS OF AFAS

- O DETERMINES THAT MAIN FEEDWATER SYSTEM FLOW IS INSUFFICIENT BASED ON LOW STEAM GENERATOR LEVEL
- 0 IDENTIFIES THAT STEAM GENERATOR PRESSURE BOUNDARY IS RUPTURED (LOW STEAM GENERATOR PRESSURE OR DP BETWEEN STEAM GENERATORS)
- **0** STARTS AUXILIARY FEEDWATER PUMPS
- 0 OPENS AND CLOSES VALVES TO PROVIDE A FLOWPATH TO INTACT STEAM GENERATOR
- O INTERACTION WITH MAIN STEAM ISOLATION SIGNAL ON A COMPONENT LEVEL

DESIGN BASIS EVENTS REQUIRING AFAS

O STEAM LINE BREAK

O FEEDWATER LINE BREAK

O EVENTS WITH MAIN STEAM ISOLATION

OVERVIEW OF HARDWARE DESIGN

0 PLANT PROTECTION SYSTEM CONTAINS CIRCUITRY AND EQUIPMENT FOR REACTOR TRIP AND ENGINEERED SAFETY FEATURES ACTUATION SIGNAL (ESFAS)

- **0** ESFAS CIRCUITRY CONSISTS OF:
 - BISTABLES

3

- MATRIX LOGIC MATRIX RELAYS
- TRIP PATH CIRCUIT
 - FINAL ACTUATION LOGIC

BISTABLES

- RECEIVE ANALOG SIGNALS FROM PROCESS MEASUREMENT LOOPS
- COMPARISON OF INPUT SIGNALS TO FIXED OR VARIABLE SETPOINTS
- BISTABLE OUTPUT CHANGES FROM HIGH TO LOW CONDITION
- DEENERGIZES ASSOCIATED BISTABLE TRIP RELAYS

MATRIX LOGIC

- BISTABLE TRIP CHARACTERIZED BY DEENERGIZING THREE ASSOCIATED BISTABLE TRIP RELAYS
- FOUR SETS OF THREE TRIP RELAYS IN FOUR PROTECTION CHANNELS
- SIX LOGIC "ANDS"
- LOGIC "ANDS" CONNECTED IN SERIES WITH TWO SETS OF TWO PARALLEL MATRIX RELAYS
- INDIVIDUAL DC POWER SUPPLIES
- FORMED INTO A LOGIC MATRIX
- SIX SIMILAR LOGIC MATRICES PROVIDED FOR EACH ESFAS

TRIP PATH CIRCUIT

- TRIP PATH CIRCUIT FOR EACH PROTECTIVE FUNCTION
- FORMED BY CONNECTING SIX CONTACTS IN SERIES
- CONTROLS POWER INTERRUPTION TO INITIATION RELAYS

FINAL ACTUATION LOGIC

- MAKES USE OF INITIATION RELAY OUTPUTS OF THE PPS
- EACH ESFAS HAS TWO SEPARATE INITIATION RELAYS
- OUTPUTS OF INITIATION RELAYS GO TO REDUNDANT ACTUATION TRAINS
- TWO-OUT-OF-FOUR LOGIC
- DEENERGIZES PUMP AND VALVE GROUP ACTUATION RELAYS
- CONTACTS FOR USE IN CONTROL SYSTEMS FOR ACTUATED EQUIPMENT

- 0 DIVERSE AFAS DESIGN MUST ENSURE EXISTING AFAS SAFETY FUNCTIONS ARE PRESERVED
- 0 SAFETY CONCERNS DRIVE COMPLEXITY OF DIVERSE AFAS DESIGN
- 0 HOW WILL A DIVERSE AFAS HANDLE A STEAM / FEED LINE BREAK?

- O STEAM LINE BREAK / EXCESS HEAT REMOVAL SCENARIO
- **O EFW FLOW TO A RUPTURED STEAM GENERATOR COULD:**
 - INCREASE RATE OF HEAT REMOVAL BY FEEDING BROKEN GENERATOR
 - DIVERT EFW AWAY FROM INTACT GENERATOR FOR THE LONG TERM COOLDOWN
 - EFW TO BROKEN GENERATOR CAUSES FURTHER INCREASE IN CONTAINMENT PRESSURE
- O CONDITIONS INDICATIVE OF AN ATWS ARE ALSO INDICATIVE OF SOME SECONDARY SYSTEM PIPE BREAKS
- O DIVERSE AFAS MUST INCLUDE LOGIC TO LOCK OUT EFW FLOW TO THE RUPTURED STEAM GENERATOR

- O DESIGN OPTION 1 EQUAL WEIGHT TO BOTH SIGNALS
 - CONTRADICTORY SIGNALS GIVE NO BASIS FOR PREDICTING ACTUAL VALVE POSITION
 - DETRIMENTAL TO PLANT SAFETY
- O DESIGN OPTION 2/3 GIVE PREFERENCE TO ONE AFAS
 - CONTROL GRADE PREFERENCE EQUIVALENT TO REPLACING SAFETY GRADE AFAS WITH NON-SAFETY GRADE SYSTEM
 - SAFETY GRADE PREFERENCE DEFEATS THE PURPOSE OF INSTALLING A DIVERSE AFAS

- 0 DESIGN OPTION 4 ADDITIONAL LOGIC TO CHOOSE BETWEEN VALID AND FAULTY SIGNALS
 - MUST BE SAFETY GRADE
 - WOULD HAVE TO MONITOR SG LEVEL AND DIFFERENTIAL PRESSURE
 - MUST BE AS RELIABLE AS EXISTING AFAS -THEREFORE 3 OR FOUR CHANNELS
 - CONCLUSION EXISTING AFAS WOULD HAVE TO BE DUPLICATED

- O DESIGN NOW INVOLVES A SECOND SAFETY-GRADE AFAS
- O ATWS RULE ASSUMES THAT A COMMON MODE FAILURE DISABLING A REDUNDANT SAFETY SYSTEM IS CREDIBLE
- **O** BACK TO CHOICE BETWEEN CONFLICTING SIGNALS

0 OTHER CONSIDERATIONS

• MSIS / EFAS INTERACTION ON COMPONENT LEVEL MUST BE PRESERVED

COMPLICATED SYSTEMS INTERACTIONS MAY BE INTRODUCED THAT ARE DIFFICULT OR IMPOSSIBLE TO ANALYZE

- IMPLEMENTING A COMPLEX DIVERSE SYSTEM INCREASES THE PROBABILITY OF HUMAN ERROR

CONCLUSIONS

- O A PROVEN / RELIABLE EFAS EXISTS IN THE PLANTS TODAY
- **O** INSTALLATION OF A DIVERSE AFAS MAY INCREASE THE SEVERITY OF CERTAIN EVENTS UNLESS ALL SAFETY CONCERNS ARE ADDRESSED
- O THE COST OF INSTALLING A DIVERSE EFAS IS NOT JUSTIFIED BY THE RESULTING ATWS RISK REDUCTION

CONCLUSIONS

O EXEMPTION REQUEST BASED ON:

SAFETY CONCERNS PRESENTED IN EXEMPTION REQUEST CLARIFIED TODAY

• BENEFIT OF MODIFICATION (RISK REDUCTION)

PRESENTED IN EXEMPTION REQUEST

• COST OF MODIFICATION PRESENTED IN EXEMPTION REQUEST

- UNFAVORABLE VALUE IMPACT RATIO

CEOG/NRR ATWS MEETING FEBRUARY 27, 1989 ROCKVILLE, MARYLAND

Nuclear Regulatory Commission

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1 1

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