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

OCT 2 1977

Docket No. 50-313

MEMORANDUM FOR: Don K. Davis, Acting Chief, Operating Reactors Branch #2, DOR

FROM: R. P. Snaider, Project Manager, Operating Reactors Branch #2, D

SUBJECT: DESIGN ERROR AT ARKANSAS NUCLEAR ONE - UNIT 1 (ANO-1) AND SUMMARY OF 9/13/77 MEETING WITH ARKANSAS POWER & LIGHT COMPANY (AP&L) AND BECHTEL

BACKGROUND

On Tuesday, September 6, 1977, I&E Region IV informed DOR of an ANO-1 design error which could possibly have significant safety implications. The error was discovered by AP&L and Bechtel personnel while performing studies related to impact of ANO-2 upon maximum temperature rating for the future (upon ANO-2 licensing) joint use of the emergency cooling pond. Upon the re-rating of the pond from 120°F to 129°F, it was found that greater capacity would be necessary for emergency cooling systems utilized to cool electrical equipment rooms vital to plant safety in the event or either a Loss-of-Coolant-Accident (LOCA) concurrent with a loss of offsite power or a sustained loss of offsite power. When this situation was examined at ANO-1, it was found that there were no emergency safety-grade cooling systems for the areas in question, which are:

(1) South electrical equipment room

(2) North electrical equipment room

(3) South charger room

(4) North charger room

Equipment contained in these rooms includes the following: station emergency batteries, battery chargers, inverters (instrumentation power supply), Motor Control Centers (MCC) for ECCS motor-operated valves, and MCCs for other motors important to safety.

An initial, very conservative analysis by AP&L and Bechtel indicated that little time would be available to take corrective action if power to the existing non-safety-grade chillers, powered from off-site (or station generator) power through the auxiliary and/or start-up transformers, were lost for an extended period of time. AP&L requested until Friday September 9 to perform a refined analysis which, unlike the calculations mentioned above, would take into account available heat sinks and would

also provide a more realistic assessment of equipment actually energized in the affected rooms under postulated initiating event conditions. I&E allowed them this time for a new analysis, based upon the low probability of an initiating event occuring in the short interim period.

On September 9, DOR, which had taken responsibility for the review effort, called AP&L to receive and discuss the revised analysis. This analysis, as expected, showed results vastly different from previous cursory examination, with calculated delays of approximately 2 days prior to the limiting area exceeding the design maximum continuous duty ambient air temperature rating for the equipment. However, AP&L requested, and the NRC staff agreed to, additional time to quantify heat loads, temperature profiles and ventilation capabilities. This decision was based on low initiation event probability, the revised analysis noted above, the realization that operation for a limited period of time at temperatures above the manufacturer's recommended maximum continuous duty rating would not be detrimental to the equipment in question, and the availability of large ventilation fans, at a minimum, from the immediately adjacent ANO-2 construction site.

A meeting was scheduled to take place in Bethesda on Tuesday, September 13, 1977, at which representatives of AP&L and Bechtel were to present the results of the latest analysis and were to provide plans for the proposed interim and long-term repair programs. The summary of the meeting is presented below.

MEETING SUMMARY

A list of attendees is attached (Attachment 1).

AP&L provided drawings of the affected rooms, showing major equipment and ventilation equipment. Attachment 2 provides calculated results of the in-depth analysis, which took into account heat loads through walls from adjacent rooms and heat loads from cable losses, room lighting and panel lighting. The North and South switchgear rooms are included because the service water cooler capacity will be affected by the decreased emergency cooling pond capability when ANO-2 becomes operational. AP&L will address this study later.

Although the air temperature of the North and South charger rooms will exceed the manufacturer's recommended maximum continuous duty ambient rating, the NRC staff feels that the equipment will continue to function in the interval until power to the chillers is restored, especially since the maximum temperature increase will be only 9°F above the recommended (South charger room). AP&L has been asked to provide information with regard to equipment capability to withstand higher temperature.

A major portion of the discussion was devoted to the methods by which Bechtel calculated room heat loads and temperature increases. The analysis appeared to have been very thorough, with such diverse inputs as heat transfer through thick concrete walls and increased ventilation supply air temperature because of operating diesels, having been considered. The NRC staff was generally satisfied with the analysis, with exceptions, in the form of requested additional information, stated below.

AP&L and Bechtel discussed their preliminary plans for interim and long-term solutions. The interim plan is to provide one seven-ton capacity, non-safety-grade, direct expansion cooling unit. This would be housed in the turbine building with cooling lines directed to individual coolers located in the North and South Charger rooms. It would be powered from a swing MCC (capable of being powered from either the red or green safety power divisions) located in the South charger room. Actual unit startup would be manual. The present estimate is that approxmately three months would be required for obtaining and installing this equipment. AP&L is also investigating the use of circulating fans in electrical equipment rooms to prevent air stagnation. As noted on Attachment 2, these rooms will reach the maximum continuous ambient temperature rating after 24 hours. The fans would be continuously running and would be powered from emergency power sources.

It was determined by AP&L that nothing being proposed for the interim fix would interfere with compliance with either the security or fire protection plans.

The permanent solution presently proposed by AP&L involves the addition of two fully qualified chiller packages, each supplying only rooms of one division of emergency power and each therefore powered by that division. Projected lead time to equipment delivery is one year, with installation additional. The NRC staff stressed that necessary tie-ins should be accomplished whenever an opportunity existed. AP&L noted that the ANO-1 diesels have sufficient spare capacity to handle the additional chillers.

The following commitments were made:

(1) AP&L will provide five copies of each drawing used.

(2) As part of report to be completed by 9/20/77, AP&L will

identify that equipment which would be most limiting if run at higher than recommended maximum continuous duty air temperature limits. The NRC desires either a time limit at maximum expected temperatures or an intermittent rating for the most limiting equipment.

(3) AP&L will investigate the addition of permanent temperature monitoring systems in the affected areas.

(4) In response to an NRC request for more background on the cause of the design error, AP&L will, by 9/20/77, provide an expected date for submittal of such data.

(5) AP&L will verify the minimum allowable temperature for the affected areas.

(6) AP&L will provide specific surveillance for use during the periods between now and the implementation of the interim solution and between the interim solution and final solution. The NRC staff stated that AP&L should, at a minimum, monitor temperatures in the affected areas and prepare procedures defining specific actions to be taken if designated maximum temperatures are exceeded.

(7) AP&L will submit detailed information on the proposed interim and final solutions to the NRC for review.

Richard P. Snaider, Project Manager
Operating Reactors Branch #2
Division of Operating Reactors

Attachments
1. List of Attendees
2. Calculation Sheet

cc: See next page

ATTENDEES LIST

NRC

R. Snaider
D. Tondi
S. Rhow
J Burdoin
W. Butler
M. Chiramal
F. Nolan (I&E)

AP&L

D. Crabtree
D. Morgan
R. Lane
D. Rueter

Bechtel Power Corp.

J. Grill
G. Borsteins
E. Smith
H. Hall
G. Smith

CALCULATION SHEET

DATE

DESIGN BY J GRILL DATE 9-12-77 CHECKED BY SHEET NO 13

PROJECT ARKANSAS NUCLEAR ONE - UNIT 1 JOB NO 6600-1

SUBJECT AUXILIARY BLDG CALCULATION NO FILE NO.

ELECTRICAL EQPT ROOMS SUMMARY SHEET	NORTH SWGR. ROOM (GREEN)	NORTH CHRGR. ROOM (GREEN)	NORTH ELEC. ROOM #149	SOUTH SWGR. ROOM (RED)	SOUTH CHRGR. ROOM (RED)	SOUTH ELEC. ROOM #104
NORMAL ROOM COOLING	CHW COOLER	VENT. FAN	COND. AIR	CHW. COOLER	COND. AIR	VENT. FAN
EMERGENCY RM. COOLING	S.W. COOLER	VENT. FAN	NONE	S.W COOLER	VENT. FAN	NONE
OUTSIDE AIR TEMP. MAX.	-	95°F	95°F	-	95°F	95°F
EMER. EQPT. HEAT (WATTS)	(LATER)	7,875	2,815	(LATER)	13,880	3,383
INITIAL HEAT AFTER LOCA (BTU/HR)	(LATER)	27,000	15,600	(LATER)	47,400	11,550
INITIAL ROOM TEMP. (MAX.)	85°F	104°F	95°F	85°F	104°F	104°F
INITIAL CONC. WALL TEMP. (MAX.)	-	-	95°F	-	-	94°F CENTER
ROOM TEMP. 1 HR AFTER LOCA	104°F	127°F	100°F	104°F	131°F	104°F
ROOM TEMP. 24 HR AFTER LOCA	104°F	127°F	104°F	104°F	131°F	104°F
MAX ROOM TEMP TIME AFTER LOCA	104°F	127°F	114°F 140 ± HRS.	104°F	131°F	118°F 170 ± HRS.
EQPT. CONTINUOUS DUTY AMBIENT RATING	104°F	122°F	104°F	104°F	122°F	104°F

MEETING SUMMARY DISTRIBUTION

Docket
NRC PDR
Local PDR
ORB #2 Reading
NRR Reading
B. C. Ruscne
E. G. Case
V. Stello
K R. Goller
D. Eisenhut
T. J. Carter
A. Schwencer
G. Lear
R. Reid
W. Butler
B. Grimes
R. Baer
L. Shao
Project Manager -
Attorney, OELD -
OI&E (3)
R. Diggs
NRC Participants (Major)
R. Fraley, ACRS (16)
T. B. Abernathy, DTIE
J. B. Buchanan
Licensee