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ATOMIC ENERGY COMMISSION
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Docket No. 50-313

R. C. DeYoung, Assistant Director for Pressurized Water Reactor, L
THRU: A. Schwencer, Chief, Pressurized Water Reactors Branch No. 4, Licensing

REPORT OF SITE VISIT TO ARKANSAS NUCLEAR ONE - UNIT 1

Date: November 29 - December 1, 1972

Location: Arkansas Nuclear One
Russellville, Arkansas
and
Arkansas Power and Light Company
Little Rock, Arkansas

Purpose: To review Arkansas Nuclear One - Unit 1 Electrical and Control Installation (See Attached Agenda)

Groups Participating: (See Attached Attendance List)

R. M. Bernero, Project Manager
Pressurized Water Reactors Branch No. 4
Directorate of Licensing

Enclosures:
1. Summary Report
2. Agenda
3. Attendance List

cc: S. H. Hanauer
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ENCLOSURE 1

SUMMARY OF SITE VISIT AND FINAL ELECTRICAL DRAWING REVIEW NOVEMBER 29 - DECEMBER 1, 1972 ARKANSAS NUCLEAR ONE - UNIT 1 DOCKET NO. 50-313

The Arkansas Nuclear One site was visited on November 29 and 30 for review of the electrical and control installations; the final session of the electrical and control drawing review was held at the Arkansas Power and Light Company Little Rock offices on December 1, 1972.

Drawing Review

The items discussed in the drawing review included:

Air-Operated Valves

It appears from electrical schematic review that some engineered safeguards valves need air to operate on Engineered Safeguards Actuation System (ESAS) signal. The applicant agreed to review this matter because the Final Safety Analysis Report (FSAR) says that no air is required for accident response.

Dwg. E-196

We noted that the power < 22% permissive interlock for starting the reactor coolant pumps was not consistent with the < 15% power cited in the FSAR. The applicant agreed to check this.

Dwg. E-209

It was noted that reactor building outlet isolation valves CV-7401 and 7402 derive actuator power from the same breaker. The applicant agreed to examine this.

Dwg. E-216

We noted that the ESAS auxiliary relay contact (42X-5153), used to break the seal-in feature in the open circuit of the letdown cooler isolation valves appears to be wired incorrectly. The applicant agreed to examine this.

Safeguards Valves Torque Switches

Electric-motor-operated valve design incorporates torque switches to cut motive power when the driving torque increases to a certain level. A torque switch bypass is provided only for the first 5% of travel to enable the valve to overcome high starting torque. We noted that, with the existing design, a momentary loss of power or a modest increase in mechanical resistance might disable such a valve in mid stroke. The applicant agreed to investigate this matter.

Dwg. E-232

We noted that Control Rod Drive/Reactor Coolant Pump cooling isolation valve CV-2221 was shown as a motor-operated valve here while Fig. 9-7 of the FSAR shows it as air-operated. The applicant indicated that the valve is air-operated and will correct this drawing.

Core Flooding Tank (CFT) Isolation Valves

The indicator and alarm circuits associated with the motor-operated CFT isolation valves were discussed with respect to the applicant's FSAR response to AEC Question 6.7. The applicant indicated that with his present design the position indication and position alarm functions are activated by separate contacts on the same valve position switch. Based on the applicant's indicated intention to have the power supply breakers to these valves locked open and tagged during normal operations, we stated the following design requirements.

a. Valve position visual indication should be available independent of the actuator power supply.

b. A valve-not-open alarm should be provided to signal if the valve is not fully open when reactor coolant pressure is above a preset value. The sensor for this alarm should be independent of the position indicator (item a.) and the pressure signals should be redundant and independent.

c. The Technical Specifications should require no criticality or prompt shutdown unless both CFT isolation valves are open and the breakers are locked open and tagged.

Decay Heat Removal System (DHRS) Valve Interlocks

The outstanding requirement of automatic closure and anti-opening interlocks for the DHRS isolation valves (AEC Question 9.1) was discussed again. The applicant admitted that Fig. 9-12 in the FSAR incorrectly designates the two valves on either side of the reactor building penetration as the high pressure to low pressure transition and, therefore, the valves to be equipped with these special controls. A third valve, upstream of this pair, exists and this third valve (CV-1050) and the next valve in line (CV-1410) bound the high pressure section and will get the special controls. The third valve (CV-1424) in the low pressure line outside the reactor building will be treated as an ordinary isolation valve.

Dwg. E-280

We noted inconsistencies between designations of the reactor building coolers on this drawing and those shown on Figure 9-6 in the FSAR. The applicant acknowledged these and stated that installed equipment connection reversals have been discovered in the service water system and must be corrected.

Emergency Feedwater System (EFW)

The emergency feedwater system design was discussed in relation to the AEC request for information presently outstanding (Questions 14.11 and 14.12). It was noted that the present design does not meet single failure criteria in such areas as equipment location, power sources, and actuator circuits. We also confirmed that the motor-driven EFW pump is connected to non-essential bus A1; therefore, in the event of loss of off-site power, manual connection to the emergency buses is necessary. In addition, bus A1 is not seismic Category I.

We also noted that FSAR Fig. 7-22 showed the steam supply connection for the EFW pump upstream of the relief valves for steam generator 24A and downstream from the relief valves for steam generator 24B. The applicant agreed to check whether this difference could affect the performance of the EFW pump turbine.

Dwg. E-241

The applicant confirmed that no time delay is built into the control circuits of the reactor building spray pumps other than that required for diesel loading sequence.

Dwg. E-361

It was noted that the engineered safety feature trip output relay contact designation for the reactor building cooler fans 1B and 1D were in error. The applicant agreed to investigate this.

Dwg. E-16

We noted that both pairs of the engineered safety features switchgear room coolers are fed from the same bus (B55). Thus, a failure of this bus would cause loss of cooling capability in both rooms. We indicated that if loss of cooling impaired the proper function of the switchgear the design should be modified to provide independent power sources.

Dwg. E-19

We noted that the filter recirculation bleeder valves (cf. FSAR Fig. 6-10) were powered from the same bus as the fan whose failure they are to protect against. We indicated that the power source for each valve should be shared with the opposite fan.

FSAR Table 8-1

This table shows that the instrument air compressors, all main turbine generator lube oil pumps, and the turning gear motor are prevented from running when an ESAS signal is present. We noted that shutting off these pumps could lead to severe mechanical damage of the main unit and asked the applicant to confirm his intent to operate in this manner. We stated that our concern is not for mechanical damage of their generator, but only to identify all the loads that will be borne by the diesel generator so that we can evaluate its capacity.

SITE REVIEW

The plant installation was reviewed following the attached agenda. The following matters were noted:

Reactor Building Pressure Sensors

The installed reactor building high trip pressure sensors provide an analog output signal rather than a digital signal as indicated by the

FSAR and the as-built Reactor Protection System (RPS) logic drawings. The applicant was informed of this inconsistency and agreed to inform us of his resolution.

Separation of Equipment

Two of the three redundant ESAS reactor coolant pressure sensors were found to be installed on the same instrument rack. Concern was expressed to the applicant about an event such as pipe whip which might lead to the simultaneous failure of both these units. The applicant agreed to consider this.

The doors separating adjacent redundant equipment spaces such as the diesel generator rooms and the 4160V switchgear rooms are not watertight designs. The applicant agreed to reevaluate the potential inleakage rate from piping failures against the door leakage and floor drainage capacities.

We found that the two emergency battery rooms are directly connected by a large ventilation duct since the exhaust fan for one battery room is located within the other battery room. The applicant agreed to reconsider this design.

Raised Floors

The RPS cabinets are located in the rear area of the control room on a raised floor. The cables entering these cabinets run beneath this raised floor with no separation barriers except flexible plastic conduit sleeving. We expressed our concern to the applicant that this cable arrangement is highly vulnerable to common mode failures and appears to violate the applicants own separation criteria as documented in the FSAR. The applicant claimed that safety is not compromised because of the fail safe (upon loss of power) characteristics of the RPS design.

A similar arrangement of cabling under a raised floor was found for the rod drive control cabinets in the computer room above the control room. Here too the separation criteria may be violated.

Overhead Cables in Control Room

We noted that there were many heavy cables in open raceways in the overhead space of the Control Room. These cables were identified as the 48V rod drive control cables each carrying a current of 40-50 amps. We expressed concern that these cables constitute a potential fire source which can cause a loss of the combined control room for both plants. The applicant claimed that the cables are derated and only a limited number of these cables carry current at any one time.

Emergency Coolers in Control Room

The presence of the package emergency cooler in the Control Room was noted. We discussed the potential for damage to cabinets nearby.

Flexible Sheathing on Cables

We noted an apparent lack of conformity to separation criteria in cabinets and panels due to the disposition of cables run in flexible sheathing. The applicant pointed out that the cables in question were not safety related and that the sheathing is added as a conservative design option.

Cable Spreading Room

We noted that the Cable Spreading Room is very densely stacked although the safety related cables were installed in solid steel conduit. We expressed our concern about fire hazards.

Diesel Fuel Supply

We questioned the very limited fuel capacity of the diesel generator day tank (375 gallons, approximately 1-1/2 hours at full power). The applicant noted that the diesel fuel transfer pumps will automatically replenish the day tank from the emergency vault.

Fire Protection System in Diesel Generator Rooms

The sprinkler system for the diesel generator rooms was discussed. Each room has a separate sprinkler manifold supplied by a remotely (Control Room) operated water supply valve. The supply valve is located outside the room and the sprinkler manifold inside the room is equipped with conventional fusible sprinkler heads to prevent inadvertent flooding of the space if the supply valve is opened by mistake.

Steam and Feedwater Lines

A walk-through review was made of the arrangement of the steam and feedwater lines outside containment considering the effects of failure of such pipes. The main steam lines leave containment and pass through the Auxiliary Building high above the new fuel and spent fuel storage areas. The horizontal runs are mounted on shelf-like supports with the line from the south generator (24A) running low and closer to the Reactor Building and the line from the north generator (24B) above and set farther away from the Reactor Building surface. The offset of the two lines permits installation of all the steam relief valves on the top of the steam lines with all of the relief valve exhaust stacks venting up through the roof. Where the 36-inch main steam lines run out through the side of the Auxiliary Building, they both turn downward outside; the north line takes a slight turn so that it runs directly above the south line before it turns downward. The large main steam block valves are located in the vertical runs of the steam lines just below the downward turn; the steam lines are seismic Category I up to and including these valves.

The 24-inch main feedwater lines both enter the Reactor Building through the south penetration room; the lines are about 40 feet apart in that room and the maximum length of the run in the room appears to be no more than 40 feet. The emergency feedwater line for the south generator is in this room, about 10 feet below the main feedwater line for the same generator. The emergency feedwater line for the north generator is in the other penetration room.

AGENDA FOR SITE VISIT
ARKANSAS NUCLEAR ONE - UNIT 1

November 29-30, 1972

1. Control Room

    a. General layout
    b. Nuclear & Reactor Protection instrument arrangement & layout
    c. Rod position indication
    d. Protection System initiation & bypass switch arrangements
    e. Diesel control board
    f. Cabling in control room (separation, loading, etc.)
    g. Radiation monitoring

2. Cable runs & cable spreading area

    a. General layout
    b. Degree of separation
    c. Diverse wiring
    d. Tray or wireway density (packing)
    e. Fire detection & protection

3. Switchgear Rooms

    a. General layout
    b. Physical & electrical separation of redundant units
    c. Potential for damage due to fire, missiles, etc.
    d. Cable installation
    e. Fire detection & protection

4. Battery Installations

    a. General layout
    b. Physical & electrical separation
    c. Potential for damage due to fire, missiles, etc.
    d. Fire detection & protection

5. Diesel Generators

    a. General layout
    b. Physical & electrical separation
    c. Fuel supply system
    d. Fire detection & protection

7. Reactor Building & Auxiliary Building

   a. Protection system instrument arrangement & layout
   b. Potential for instrument damage due to fire, missiles, etc.
   c. Separation of piping & wiring to redundant instruments
   d. Provision for testing protection instruments

ATTENDANCE

AP&L/BECHTEL/B&W/AEC MEETINGS
NOVEMBER 29, 30 & DECEMBER 1, 1972

NAME	COMPANY	TITLE	DATES PRESENT
W. Cavanaugh	AP&L	Project Manager	All
D. Rueter	"	Asst. Engineer	All
J. Grisham	"	Asst. Engineer	All
E. Quattlebaum	"	QA Electrical	29-30
J. McAlister	"	Production Engineer	29
*P. Almond	"	Reactor Technician	29-30
*N. Moore	"	Chief QA	29-30
*R. Toler	"	Asst. Chief Engineer	30
*S. Grimmett	"	Manager, Substation Design	30
*W. Houston	"	Project Supervisor	30
G. Katanics	Bechtel	Project Engineer	29-30
J. Oszewski	"	Licensing Engineer	All
J. Haidinger	"	Elect. Group Supv.	All
W. Kunz	"	Senior Elect. Engr.	All
F. Silberman	"	Instrumentation Leader	29-30
H. Baker	B&W	Assoc. Project Manager	All
*A. Lloyd	"	System Engineer	29-30
*C. Strempke	"	System Engineer	29-30
R. Bernero	AEC	Project Manager	Al
T. Ippolito	"	Elect. & Control Sys.	29-30
J. Calvo	"	Elect. & Control Sys.	All
*V. Brownlee	"	Principal Reactor Insp.	29-30

*Part-time on dates indicated