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JERSEY CENTRAL; OYSTER CREEK UNIT #1, REVIEW OF INSTRUMENTATION, DOCKET #50-219

I&PTB:DRL:DFS - RT-149

On August 30 and 31, a meeting was held with representatives of Jersey Central, General Electric, and Burns and Roe to review the instrumentation and associated schematic diagrams associated with the following:

(a) Core Spray System
(b) Refueling Interlock System
(c) Protection System
(d) Containment Isolation System
(e) Emergency Power System
(f) Rod Block System
(g) Containment Spray System
(h) Auto Relief System

In attendance were: I. Finfrock, OC; M. Lane, GE; E. Nobile, B&R; and O. Parr, T. Ippolito and D. Sullivan, I&PTB.

This was the third and, presumably, final instrumentation review meeting. The first two meetings took place on May 18 and June 20-21, and have been reported in our memoranda, RT-24 and RT-59.

RT-24 reported several deficiencies which have been corrected:

(a) Vulnerability of Core Spray System to a single failure:

The core spray system actuation logic has been completely redesigned and, if it is assumed the core spray piping remains intact during the course of an accident, the system now satisfies the single failure criterion.

In the original design, the pumping trains were switched, one at a time, onto the single diesel generator until success was achieved. The present design electrically splits the two loops such that the pumps in one loop are fed from one emergency bus and those in the second loop are fed from the other emergency bus. Sequencing (in the event of pump failure) is confined to the affected loop.

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On ECCS signal starts both diesel generator sets, energizes both emergency busses and initiates operation of one pumping train in each loop. Thus, the failure of a complete loop cannot affect the other loop, assuming complete independence of both loops. Our review indicates that the independence has been compromised via a single circuit from a motor control center which supplies power to all valves in the core system.

The applicant has agreed to provide duplicate circuits.

There are no other deficiencies in the core spray system. Circuits involving instrumentation, load shedding, load connecting, d.c. control circuits, etc., were reviewed and found to be satisfactory.

(b) Vulnerability of Refueling Interlock System to a single failure:

The Refueling Interlock System has been redesigned to meet the single failure criterion when the mode switch is in the "refuel" position. Rod-blocking redundancy has been added via the selector circuits. Our review indicates that no single failure can allow a loaded hoist to be positioned above the core if more than one rod is withdrawn.

If, during refueling operations, the mode switch is placed in the "Shutdown" position, scram will occur. If placed in the "Run" position, a scram will also occur by action of the "Condenser Vacuum" instrumentation. Placing the switch in the "startup" mode, as occasionally required during refueling operations, negates the redundancy inasmuch as a portion of the total interlock must be bypassed in order to allow the withdrawal of more than one rod. However, this design has been approved for all current BWR reviews and we believe it to be satisfactory in view of the additional administrative controls which would be imposed during such operation.

Our review indicates that the design of the Refueling Interlock System conforms to our current criteria.

RT-59 addressed itself to the following additional deficiencies:

(a) Single failures which could place bypasses in force, or allow them to remain in force:

A deficiency relating to the manual bypassing of the "Dump Volume High Water Level" scram circuits has been corrected. Duplicate circuits now release the bypass.

A second deficiency which would allow the "Condenser Low Vacuum" and "Main Steam Isolation Valve Closure" scram circuits to remain bypassed when reactor pressure is above 600 psi has not been corrected. M. Lane of GE will discuss this further with his management.

(b) Vulnerability of several otherwise redundant containment isolation valves to single failures:

All deficiencies have been corrected. The valve circuits in question have been split between two independent control circuits. We have reviewed the circuits and agree with the applicant that they are satisfactory.

We also reviewed the isolation valve arrangements shown in Table V-1-2. With one possible exception, these arrangements conform to our current criteria: the Normal Ventilation Ducts (Item IV in the table) are isolated by a system which does not meet the single failure criterion. However, these valves isolate the reactor building and not the primary containment. We will need a ruling from RPB #2 on this one.

Otherwise, the containment isolation system is satisfactory.

(c) Emergency Power System design not complete:

The emergency power system design has been completed and, as stated previously, consists of two independent emergency busses. The load shedding and connecting circuits at each bus are independent and are respectively controlled from separate d.c. systems. There is no automatic tie between the emergency busses; i.e., under emergency conditions, the bus tie remains open.

There are two station batteries which feed two independent d.c. bus systems. Either battery can initiate and sustain the required safeguards action.

At present there is only one circuit to the motor control center which provides power to the core spray system valves. This will be corrected.

A multiplicity of 230 and 34 kv lines furnish off-site power to the station through two redundant incoming transformers.

Each diesel generator is started from its own separate instrumentation and stored energy (battery) source. Our review indicated no common mode failure areas.

With the accomplishment of the MCC wiring change, the emergency power system will be satisfactory.

(d) Rod Block System not redundant:

These circuits were not reviewed inasmuch as no new information has been developed regarding the requirements for the system. We must await the results of their "startup accident" analysis before proceeding further.

(e) Containment Spray System design not complete.

The design of the containment spray system is complete and has been reviewed.

There are two independent systems, each with its own spray header. Under accident conditions, one (preferred) system is given the command to start. A successful start terminates the sequence. Failure to start, as sensed by various pump monitors and discharge pressure sensors, sequences the start action to the second system.

Our review indicates that the system is immune to single failures. Each system is powered from one emergency bus and one d.c. source; i.e., they are electrically split as are the core spray systems. Failure of any active component (pump, diesel generator) in the preferred train is sensed, and the command is transferred to the alternate loop. Failure of a monitor is significant only if compounded by the (second) failure of the active component whose performance it monitors. The diesel generator systems are sized to handle the inadvertent actuation of both systems. No valves are required to open.

We believe that the containment spray system design is satisfactory.

The auto relief system was not discussed at the previous meetings and is, therefore, not mentioned in RTs'-24 and 59.

The system involves four valves, three of which must operate. Thus, a simple 2-2 split between the two d.c. busses is not possible.

The present design involves four logic control circuits, one for each valve. Two are energized from one battery source and two from the other. There are two master control circuits, also energized, respectively, from the same two battery sources. All circuits are separately fused (10 amperes). Further upstream, at each of the panelboards fed from the batteries, there are 20-ampere circuit breakers.

The design is such that a voltage loss at either of the two master control circuits is sensed by an undervoltage relay which immediately transfers the dead bus to the other d.c. source. Our analysis shows that such a voltage loss occasioned by a dead short will disable all control circuits if the 20 ampere breakers also open when the 10 ampere fuses are blown. Basically, the issue here is proper (or improper) "fuse coordination." Burns & Roe will experiment with various fuse and breaker ratings to prove out their final, or existing, design.

Otherwise, we believe that the auto relief system design conforms to current criteria.

(We note here that system redundancy precludes the necessity for transfer to the live bus. A solution to the fuse coordination problem may well be the deletion of the transfer capability).

To Summarize:

1. The Rod Block system will be analyzed subsequent to the receipt of answers.

2. The single MCC circuit to the core spray inlet valves, and the nonredundant bypass removal circuit in the protection system are deficiencies which must be corrected.

3. The requirements for the Reactor Building isolation valves should be specified as soon as possible.

4. The fuse coordination problem within the Auto Depressurizing system remains outstanding.

5. Assuming no changes in the "ground rules" relating to core spray system design requirements, the satisfactory conclusion of our review depends only upon the correction of the aforementioned deficiencies.

cc: S. Levine
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