Consumers Power
POWERING MICHIGAN'S PROGRESS
Palisades Nuclear Plant: 27780 Blue Star Memorial Highway, Covert, MI 49043

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DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT - SUPPLEMENT TO THE JULY 6, 1993 RESPONSE TO INSPECTION REPORT No. 93010

On July 6, 1993, Consumers Power Company submitted a response to Inspection Report 93010. That response was discussed during a conference telephone call between with members of the NRC Region III and Palisades staffs on July 22, 1993. During that conference call, the NRC members clarified several items where they felt that the CPCo response did not fully answer the underlying concerns. It was agreed that a supplemental response to the Inspection Report would be submitted within 60 days; this letter provides that supplement.

We understand the NRC concerns associated with the subject inspection report, which were not fully covered by our July 6, 1993 response, to be as follows:

1. The Emergency Operating Procedures (EOPs) must provide clear and timely instruction for entry into Once through Cooling (OTC), when it is required.

   Operation with closed Power Operated Relief Valve (PORV) block valves, which are not environmentally qualified for the environment following the event, combined with delay in initiating OTC could eliminate the ability to cool the core.

   The Primary Coolant System (PCS) conditions caused by the event may "uncouple" the Steam Generators (SGs) from the Reactor and inhibit initiation of natural circulation.

2. Simulator modeling of containment response does not agree with previous analyses. (Open Item 93010-05)

   Simulator modeling results, which differ from safety analysis results, may provide the operators with improper expectations of plant responses to this and other events which release large amounts of energy to the containment.

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3. Training on the event should be enhanced. (Open Item 93010-03)

   No operator training has been provided on the specific event concerned, steam line break inside the containment with a concurrent failure of the Main Steam Isolation Valve (MSIV) on the opposite steam line (hereinafter, the "event").

   No operator training has been provided on determining operability of instrumentation which may be adversely affected by its environment.

4. An additional concern, not specifically mentioned in the inspection report, is that while the EOPs provide information for correcting the narrow range SG level instruments for potential errors due to adverse containment environment, no similar corrections are provided for the wide range instruments. The wide range instruments are those used to verify that adequate level is available for cooling the core with the steam generators.

Several corrective actions were initiated as a result of the subject inspection report. These actions were discussed in our July 6, 1993 response but, as evidenced by the NRC's continued concerns, not in sufficient detail.

Analysis and Evaluations

The following analyses and evaluations have been completed in order to assure that EOP guidance and training materials for the subject event are appropriate:

1. The corrective actions related to appropriate EOP guidance, event specific operator training, and verification of simulator modeling all must be based on a clear understanding of the expected plant response to the event. Analyses have been performed, using a Consumers Power Company version of the MAAP code, CPMAAP, to provide a best engineering estimate of PCS, SG, and Containment response to the event. These analyses were performed with several varied parameters to determine which parameters had significant effects on the plant response and which did not. Examples of these variations include: Immediate tripping, delayed tripping, and continuous running of the PCPs, variations in the amount of containment cooling equipment available, and variations in the modeled break size. In addition cases were run, using the same parameters, comparing a large steam line break with and without the MSIV failure. These different analyses, all run with the same code changing only a single parameter, allow direct comparisons between cases. That comparison would not be valid if made between analyses done using different codes or different basic assumptions.

   These analyses allow for verification that EOP strategy is appropriate, provide a basis for operator training, and may be used as an alternate calculation method for comparison with simulator modeling. Typical safety analyses are not always appropriate for these uses since their function is simply to demonstrate that the results of particular events will remain within design or regulatory limits. The simplifying and bounding assumptions made in typical safety analyses, while conservative with respect to the analytical goal, often make the results far different from expected plant response.

2. The containment temperature and pressure results of these best engineering estimate analyses have been compared to the environmental qualification testing of the PORVs, the PORV block valves, and the wide range SG level transmitters. The PORVs were successfully tested at conditions exceeding those in the calculated containment response; testing on the block valves and level transmitters, combined with thermal lag calculations imply that there is a high probability of this equipment remaining operable. These items were chosen as the prime equipment, within the containment, to assure core cooling with either the SGs or OTC.

3. The ability to cool the core using delayed once through cooling has been analyzed. This analysis concluded that OTC would be successful with one PORV flow path open and either two charging pumps or one HPSI pump in series with one spray pump. The analysis assumed that OTC was initiated with the SG dry and the PCS above saturation temperature for the setpoint of the secondary safety valves, about 545°F. With two PORV paths or two HPSI pumps available, the initial PCS temperature could be significantly hotter.

4. The ability to cool the core by using AFW, even after SG "dryout", has been analyzed. The results show that a single AFW pump can provide enough makeup flow to maintain natural circulation in the primary coolant system. Again, the availability of additional pumps provides additional margin and more rapid cooling.

5. The potential errors in wide range indicated SG level are included in the existing EOPs, although not through use of a correction curve. Instead, the specified instrument reading which corresponds to the minimum acceptable level for secondary cooling, -84%, has the maximum predicted error included. Engineering Analysis EA-GAW-89-EQ-01, Revision 1, concludes that the maximum expected error for the wide range SG level instruments would be 36%. When a 36% error is added to the minimum actual level of -120%, the specified minimum indicated level, -84%, is attained.

<u>EOP Strategy Review:</u>

The strategy of the EOPs, with respect to initiation of OTC, has been reviewed. The existing strategy is, very briefly, to allow automatic initiation of feedwater, ensured by manual action, with acceptable cooling verified by SG level and PCS conditions. If continued use of the SGs for decay heat removable is not possible, OTC would be initiated.

This current strategy was compared to an alternate strategy of immediately initiating OTC upon observing the symptoms of a steam line break concurrent with the lack of full closed indication on an MSIV. The overriding consideration, of course, is that the chosen strategy be capable of assuring adequate core cooling. Our conclusion is that either method would result in continued core cooling. Additional considerations, discussed below, result in our decision to retain the current strategy.

Immediate Initiation of Once Through Cooling:

The considerations which tended to favor the alternate approach of immediate initiation of OTC were as follows:

a) Early analyses of use of OTC following a loss of all feedwater event, which assumed flow through an area equal to two smaller PORVs similar to those formerly installed at Palisades, concluded that initiation of OTC must occur before SG dryout. Dryout was predicted to occur about 20 minutes into the event. This result, that OTC must be initiated within 20 minutes to be assured of success, was often considered to apply to other events requiring OTC.

   This consideration is no longer appropriate for Palisades. The PORVs now installed at Palisades are significantly larger than those used in the earlier study. As mentioned above, analyses of the currently installed PORVs and flow paths show more capability with a single flow path than the former analyses did with both.

b) The blowdown of both SGs could cause the containment environment to exceed the environmental qualification envelope for electrical equipment preventing verification that AFW is functioning and preventing opening of the PORVs and block valves to achieve OTC.

   This consideration is now less important than it would have been prior to the installation of the new PORVs, which are qualified for the containment environmental conditions resulting from design events, and the new SGs which incorporate flow restrictors in their outlet nozzles. As discussed in the analysis section above, the environmental testing envelope for the PORVs exceeds the predicted containment response for the "event"; the combination of environmental testing and thermal lag calculations indicate that the block valves and the wide range SG level transmitters should survive the "event". Therefore it is highly probable that delaying the initiation of OTC while the successful initiation of AFW is being verified will not add significantly to the risk of failing to maintain core cooling.

Initiation of Once Through Cooling only upon failure Cooling using the Steam Generator:

Those considerations which favor the current EOP strategy are as follows:

a) The current strategy applies to any Excessive Steam Demand Event and does not require a special procedure, or special steps, for the subject event. The design concept of new EOPs is to avoid event based actions with special procedures for each possible event.

Class room training on the "event" is also currently scheduled to be completed prior to the end of 1993. Class room training will include discussion on the following:

a) How a blowdown of both SGs could occur

b) An explanation of why there are differences between safety analyses and simulator modeling of some events

c) Discussions of symptoms, expected plant response, the EOP paths involved, and the potential for significant error or failure of instrumentation located in the containment.

d) Discussions on verification of instrument reading validity and use of alternate instrumentation for this and other events which degrade the containment environment.

When the necessary simulator modeling corrections are completed, the details of those EOPs associated with the "event" will be validated.

Additional simulator training on a full range of steam line break sizes, with and without a concurrent failure of a MSIV, will then be included in the training curriculum. The "event," a large break in one main steam line with a concurrent failure of the opposite MSIV, cannot be exactly modeled on the simulator. What can be modeled, closely simulating the "event," is a combination of the following: a large break in one main steam line, a somewhat smaller break (to emulate the piping flow losses) in the other steam line, and a failure of closed indication on one MSIV.

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b) The current strategy utilizes the defense in depth concept, by relying on the automatically initiated AFW system first. If cooling by AFW cannot be assured, then other cooling methods are employed; condensate pumps if available, and then OTC.

The initiation of OTC would immediately reduce the PCS to saturation pressure, forming voids in the SG tubes and reactor vessel head, and reduce PCS inventory. A subsequent failure of the PORVs or of the HPSI pumps would necessitate returning to cooling by natural circulation and SGs. Reduced PCS inventory, additional PCS voids, and restarting or realignment of equipment used with the SGs add additional failure possibilities which are not encountered with the current strategy.

A very simplistic fault tree analysis of the two choices implied that there would be a reduction in risk of loss of core cooling for the "event" of about an order of magnitude using the current strategy. It is assumed that the early initiation of OTC would adversely affect the failure probability of secondary cooling by a factor of 10, and that delayed initiation of OTC would adversely affect the failure probability of the block valves by the same amount (since the block valves typically fail as is, failures occurring after they are open are inconsequential). Unaffected failure rates were set at 10^{-3} and degraded rates at 10^{-2}. These rates were chosen simply to examine the effects of the two alternate choices. The chosen rates have no analytical basis, but they are not atypical, either. Since either cooling method transfers the decay heat to the containment, other failure rates, including that of the PORVs would be unaffected.

c) The current strategy avoids compounding a steam line break event with a Loss of Coolant event. Such a compound event is not within the design base of the plant.

In summary, the current EOP strategy of using OTC only if cooling using SGs cannot be verified is preferred to immediate initiation of OTC. This choice reduces the risk of loosing the ability to cool the core, does not further compound an already complicated event, and conforms to the approved guidance for CE plant EOPs.

Actions Planned to Address Training Issues of Open Items:

Several actions have been assigned to assure that appropriate operator training on the event is provided.

A comparison is being completed between simulator, CPMAAP, and Safety Analysis calculations for containment response to the event. Those corrections necessary for proper simulator modeling are currently scheduled to be completed prior to the end of 1993.