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CENTRAL FILE

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SUMMARY OF MEETING WITH MONTICELLO REGARDING OBSERVED FUEL FAILURES

A meeting was held at the Monticello plant with Northern States Power (NSP) nuclear personnel, Monticello plant personnel, a General Electric field representative, and NRC-Region III inspectors (see enclosure 1) to discuss and inspect Monticello fuel. Failures were observed in 10 fuel assemblies that were recently dechanneled and inspected but which had been discharged early this year. Most of the day (July 8th) was spent inspecting four of the fuel assemblies (MTO 178, MTO 274, MTO 423, and MTO 337) at the spent fuel pool with a borescope. This included identifying the failure locations, photographing some of the failures, and attempting to videotape the failed fuel rods. No videotapes were obtained because of tape recorder problems. Since the initial inspections were performed using an underwater T.V. camera with poor resolution, some of the borescope observations are different than originally reported by Monticello personnel. Inspection of these four assemblies with the borescope revealed the following.

The assembly with the most damage was MTO 178, which was reconstituted prior to reinsertion during cycle 2. Total exposure was about 12,400 MWD/MTU in two cycles of operation. A series of cracks totaling about 8 feet in length and covering the upper three quarters of the fueled region were observed on a corner rod adjacent to the control blade tip. The crack widths varied, appearing to be as large as 1/8 inch. In several places, cracks starting at different axial locations propagated such that more than one crack could be observed at the same axial location. At one location, the cracks ran into each other resulting in the removal of a diamond shaped piece of cladding about 1/4 inch in width. The edges of the cladding (thickness) at the cracks appeared clean with no visible hydride formations. The surfaces of the fuel exposed seen through the crack openings had a yellow-orange-white appearance, which may have been oxidized fuel (U O) or an oxide of one of the fission products (Cs, Mo, Ru, Te). The cracks extended along the cladding passing beneath the spacers. All rods of the assembly were covered with a uniform iron oxide (rust) coating in the fuel region except for the failed rods which had a dark gray color in the vicinity of the failure. The dark gray color also appeared on the spacers near the failures in the cladding. A typical hydride blister was seen on the cladding.

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Fuel assembly MTO 274 also had a fuel rod (adjacent to the control blade) that had a large number of cracks in various stages of development located between the second and third spacer. The appearance of the cladding edges, the UO fuel and difference in color of the cladding around the cracked region were similar to that observed on fuel rod MTO 178, although not as extensive.

Fuel assembly MTO 423 had one failed fuel rod located in the corner adjacent to the instrument tube. The rod had several cracks located between the fifth and seventh spacers from the bottom of the assembly. One particularly extensive cracked region was observed above the fifth spacer. This was also a reconstituted assembly that had two cycles of operation and an exposure of approximately 12,400 MWD/MTU.

Fuel assembly MTO 337 had a failed fuel rod (adjacent to the blade tip) which had relatively minor hairline cracks located between the fifth and seventh spacers compared to the other assemblies. Burnup on this assembly was about 15,500 MWD/MTU.

I also obtained sketches from John Herrago (Monticello) of the crack locations he identified from his previous inspection of all 10 assemblies. Based on my interpretation of his data, there were 13 corner rods identified as having failures. Eight occurred on the rods adjacent to the blade tips, three occurred in the rods adjacent to the instrument tube and two occurred on the rods adjacent to the control rods. In addition, two failures were observed in rods adjacent to the corner rod. Although failures were observed at all axial locations, it appears the predominance of failures occurred in the upper half of the fuel rods. The assemblies examined, with the exception of MTO 423, appear to have had the worst failures of the 10 bundles.

N. H. Skarshaug, a General Electric field representative, was present during the inspection. He commented that he has seen some 7x7 fuel rods with worst local failures, but has never seen any with cracks this long before. Also, the cracks he has seen in the past did not propagate beyond the spacer grids. He felt the types failures at Monticello were typical of those seen at other plants having fuel of this vintage and attributed the failures primarily to pellet cladding mechanical interactions (PCMI).

On the second day the effects of plant operation with failed fuel, the response of the detection systems, the effects of rod exercise on activity release, and any available data and information that might be helpful in evaluating the problem were discussed. The data obtained consisted of:

Core maps showing location of the ten fuel assemblies and core burnup for cycles 1, 2 and 3. These also showed the location of improved 7x7 and 8x8 fuel assemblies.

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Axial power profiles for each of the ten fuel assemblies.

Control rod position versus exposure for the control rod adjacent to each of these assemblies.

Leaker fuel assemblies discharged after each cycle and their core location and exposure.

Other fuel assemblies discharged each cycle and their location.

Fission gas sample activity at steam jet air ejector from 1973 through 1975.

Power history for 1975.

I /I ratios and I activity in primary coolant from 1973 through 1975.

During discussions of the failures, it was mentioned that GE had experienced some mixup between the 1.13 and 2.95% enrichments during the early fabrication of the 7x7 fuel assemblies. The initial core of Dresden 3 had this fuel, as did half of Monticello. Based on statistical analysis obtained from gamma scanning of Dresden 3 fuel rods, twelve fuel assemblies at Monticello were inspected. There is a possibility, since all of the failed rods were of 1.13% enrichment, that at least a few of these failures might be attributed to this cause.

The effects of rod excercise on off-gas release was also discussed. In the past, Monticello had performed the rod exercise at operating power by inserting all the control rods one notch (6 inches) and then withdrawing them. This exercise takes approximately 20 seconds. To maintain the off-gas activity indicated by the monitor located at the steam jet air ejector (SJAE) at 10 rem/hr (plant alarm set at 12-1/2 rem/hr) it was found that the reactor power had to be reduced at a rate of 10 MWt/day. Recently, they have been reducing reactor operating power to 70% prior to initiation of the rod exercise and found that the reactor power only had to be reduced at a rate of 2-1/2 MWt/day to maintain the same activity level at the SJAE monitor. They have attributed this to the rod exercises and this formed the basis for the recent technical specification change related to rod exercise requested by Monticello.

Monticello has been using the preconditioning procedures recommended by GE since they first came out. Therefore, except for the first part of cycle 1 which was prior to their issuance, these recommendations have been in use. Since the start of cycle 4, the new GE

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computer program has been operable in the plant process computer. Upon demand this program points out what control rods can be moved and the number of motches they may be moved and still remain within the pre-conditioning envelope. In addition, printout of the pre-conditioning LHGR for each node and the actual operating LHGR may be obtained.

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