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EVALUATION OF SMUD ENRICHMENT CROSSOVER (CDR #151)

The Sacramento Municipal Utility District deficiency report to D. F. Knuth dated August 3, 1973 pertaining to the enrichment crossover during Rancho Seco fuel fabrication was reviewed. Based on the information presented in this memo plus the observations of RO inspectors at the B&W commercial nuclear fuel fabrication plant on July 24-26, 1973, it would appear that the corrective action taken for Rancho Seco fuel was sufficient except for the following possible problem.

To establish that sorted pellets from certain lots were free from suspicion of enrichment crossover, five lots and a part of two additional lots ($\sim 10^6$ pellets) were 100% visually inspected for the proper enrichment code letter. As a result of this visual inspection, four over enriched pellets were found in 2.01% Rancho Seco fuel. Based on the large number of pellets that were visually inspected ($\sim 10^6$), it would appear that over enriched pellets could have escaped detection. With such a large number of pellets inspected, the possibility of human error exists due to personnel boredom, lack of attention, or fatigue from the repetitive nature of such visual inspections. If the neutron scanner had been used for inspection of loaded fuel rods, it would have eliminated any such tendency for human error and would have provided a more fool-proof check.

However, even if the worst case is considered where a few high enrichment pellets (3.05%) are postulated to have escaped detection and are located in low enrichment rods (2.01%), the consequences would be minimal. At any particular time, only a small fraction of the core will be operating near the design limits, thus the probability of a deviating fuel pellet being located in this region is small. In addition, detailed B&W analyses as reported in a meeting with Licensing on August 30, 1973, have shown that the 2.01% enriched assemblies will not experience peaking equivalent to more than 85% of that in the hot assembly in the Rancho Seco core during the first cycle (these assemblies are scheduled to be replaced at the end of the first cycle).

In 1971, there were major mixups of pellets with different enrichment in several GE manufactured cores including Monticello. Based on detailed analyses for Monticello including revised safety analyses, it was concluded that it was safe and prudent to continue operation based on the fact that only a very small fraction of the rods would exceed design limits and that the presence of a small number of deviating fuel rods (with over enriched pellets) would not jeopardize reactor safety nor adversely affect reactor performance. Since the number of pellets involved in the enrichment mixup for Monticello was much higher than could possibly be postulated for Rancho Seco (even in the worst case), these same conclusions should apply.

In summary, based on the above considerations, the corrective action and final resolution taken as a result of the enrichment crossover which occurred during Rancho Seco fuel fabrication is thought to be adequate. We discussed this matter orally with Licensing and they are in agreement with this conclusion. The use of a neutron scanner by B&W for all production fuel rods (for all cores) would be a recommended method of preventing such enrichment crossovers. However, based on the considerable cost involved in buying or renting such equipment, B&W is not expected to utilize such methods on a production basis. We will continue to monitor B&W administrative procedures for enrichment control in subsequent fuel QA inspections.

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