IA-E-106

TO: MILT LEVENSON

DATE: 4/8/79

SUBJECT: OPERATION OF RCP's AT REDUCED SPEED

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OF: TMI-IAG

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Periodically, over the past few days, reduced speed operation of RCP's has been discussed. We understand that Westinghouse has explored accomplishing variable speed operation of the pumps using an MG set and has information on its procurement. General Electric also may have access to such an MG through either Seabrook or Limerick. Based on the foregoing, Bechtel chose to explore use of a skid-mounted diesel generator (DG) to provide reduced speed RCP operation in the event logistics prevented using an MG.

Presently, core circulation may be either forced by RCP at 60 hz or natural. The former method adds about 5 Mw to the RCS, but guarantees flow of water to and from the reactor. The latter adds no heat, but is the subject of some controversy as to its feasibility and effectiveness. The middle ground of reduced flow circulation thus merits consideration, especially in light of the possibility that the 5 Mw of pump heat may hamper transition to a solid secondary system.

Bechtel queries on the feasibility of using DG's for reduced speed RCP operation have resulted in the following:

1. Bingham-Williamette, the pump supplier, unofficially has stated that low speed operation will not be deleterious.

2. Allis-Chalmers, the motor supplier, unofficially states that the motor will function properly, provided that radiation has not harmed the capacitors or lube oil system.

3. DG's suitable for the operation are probably available from either:

   Wabash-Power Equipment Co.
   444 Carpenter Avenue
   Wheeling, Illinois
   (312) 541-5600

   or

   O'Brien Machinery
   Downington, PA
   (215) 269-6240

4. Fairbanks Morse indicates that a UG-8 Woodward governor would be suitable for the service; i.e. it has an adequately wide speed control range to be set anywhere between 200 and 1200 rpm.

5. Skid-mounted DG's of the size required are usually rated at either 2400 volts or 4160 volts. Assuming linear volts/cycle excitation control, a RCP speed of about 420 rpm or 720 rpm would result. (This is about 35% and 60% of present flow.)

6. Although B&W calculations showed higher power requirements than Bechtel's, it appears that a 3000 kw DG would be more than adequate for 35% or 60% flow and that a 2000 kw machine might suffice.

7. Specific questions to Allis-Chalmers indicated no concern about ventilation or critical frequency; however, B&W would have to verify that the oil lift pumps would perform satisfactorily.

8. B&W contacts are: J. E. Thornhill
R. Kennedy
J. Dempsey

9. The TMI-2 6.9 kw buses (FSAR Fig. 8.3-1) are set up such that P-1A could be rigged for low speed operation while P-2A is running at normal speed, provided the 3000 A bus to either auxiliary transformer can be isolated for modification. (The feeder breaker from the other transformer to Bus 2-1 would be racked out.)

10. Voltage regulation would be established based on a linear relationship between voltage and frequency. This allows use of the skid-mounted DG. [redacted]. (If the option is selected, current could easily be calculated.) This also precludes the need for a transformer.

In summary, and subject to B&W verification, we think low frequency operation with a DG is a viable option to significantly reduce pump heat. It also gives a redundant power supply for forced RCS flow while such circulation is desired. Lastly, it provides a "gentle" means of reestablishing flow if natural circulation is unsuccessful. Subject to Bingham verification, this option may allow forced circulation at lower RCS pressures than presently specified.