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APPENDIX 8

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QUESTION 8A.1 (DRL 8.1) In the evaluation of the ability to supply power to engineered safety features from offsite sources, consider the effect of the sudden tripping of the unit. In addition to the effect on system stability, consider coincident failures in the generating station switchyard to assure that none will cause the loss of all offsite power to the station. Consideration should be given to but not be limited to the following: faults, circuit breaker failures, control circuit failures, and battery failures.

ANSWER In the event that the unit is suddenly tripped, 230 KV breakers in the switchyard will separate the unit from the interconnecting network lines. Stability studies show that the network remains stable following unit loss and, therefore, power would continue to be supplied from offsite sources.

The stability studies referred to above were designed to represent conditions of the network under adverse conditions. The computer program and data used were the same as that which have been used to study the Pacific Northwest-Southwest Intertie and the area represented by the Western Systems Coordinating Council. Extensive load flow studies were made to demonstrate the adequacy of the system under adverse conditions.

Failures in the switchyard coincident with loss of unit generation have been considered with respect to their effect on maintenance of offsite power to the station:

Faults--As stated in 8.2.1.3d, circuits can be switched under fault conditions without affecting other circuits; the main buses can be isolated without interrupting any circuit. A fault, therefore, removes one line, or one startup transformer, or one bus. Removal of the faulted element following the unit loss will leave the system stable.

Circuit breaker failure--Either the primary or secondary relaying system will open the breakers on either side of a failed breaker. From the arrangement shown in Figure 8.2-1 it can be seen that a breaker failure will result in the removal of not more than one line. The case would then be similar to that under "Faults".

Control circuit failures--Each circuit breaker will have a primary and secondary (or backup) protection system. If the primary system should fail to function, the secondary system serves as a backup to operate the breakers.

Battery failure--The primary and secondary protection systems will have separate sources of direct current. Failure of one battery or a related component will leave one complete system available to operate the switchgear.

QUESTION 8A.2 (DRL 8.2)

Evaluate the ability of the offsite power to meet General Design Criteria 39 with the proposed single start-up transformer.

ANSWER

Two start-up transformers are now being utilized to provide two offsite power supplies in accordance with General Design Criterion 39. This was accomplished by connecting the transformers to separate sources of 230 kv power in the switchyard. See Figure 8.2-1, Amendment No. 2 of the PSAR.

QUESTION 8A.3 (DRL 8.3)

Describe and evaluate the automatic loading sequence for the emergency diesel generators.

ANSWER

Refer to paragraph 8.2.3.2 and answer to question 8A.4. The emergency diesel generator will automatically start, accelerate to full speed and be ready to accept load within 10 seconds, all initiated by a loss of voltage on the 4160 volt nuclear service buses. In preparation for the automatic loading sequence, all load breakers, bus supply breakers and bus tie breakers connected to the emergency buses are tripped open. The emergency generator breaker will automatically close to energize the 4160 volt nuclear service bus on reaching rated voltage and frequency. Should a safeguards actuation signal be present, circuit breakers will then close automatically to energize the 1st block of emergency loads. On recovery of bus voltage to normal, circuit breakers will close automatically to energize the 2nd block of emergency loads; and likewise for the subsequent blocks of load. If a certain motor or block of load fails to accelerate or the voltage fails to recover within a preset time, the load will be rejected. If the diesel should stall, an underfrequency relay will trip the load, then on recovery of speed and full voltage the load will be re-applied. The control room operator will have complete surveillance of each diesel generator and its load status at all times.

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QUESTION 8A.4 (DRL 8.4) Provide an evaluation of loads (HP) required to be powered in the interest of safety and the relationship of the maximum emergency load that may be placed on each diesel generator to the rating (KW) of the generator.

ANSWER The loads tabulated in section 8.2.3.2 represent the emergency nuclear service loads required for reactor safety. These loads will be applied automatically in the sequence shown on start of the emergency diesel generator and represent the functions of one - 100% nuclear service system.

The sum of the Block 1 loads is approximately 1300 HP which will require a locked rotor inrush of 4.8 Mva. The generator is capable of developing 12.5 Mva inrush.

The sum of the Block 2 loads is 450 HP which will require a locked rotor inrush of 2.7 Mva. This added to the Block 1 steady state load of 1.3 Mva equal 4.0 Mva, well within the 12.5 Mva inrush rating of the generator.

The sum of the Block 3 loads is 650 HP which will require a locked rotor inrush of 3.9 Mva. This added to the Block 1 and 2 steady state load of 1.75 Mva equals 5.65 Mva, still within the 12.5 Mva inrush rating of the generator.

The steady state sum of Block 1, 2 and 3 loads is 2.4 Mva (1920 kw).

The 1000 HP auxiliary feed pump motor is not required on a loss of coolant accident, however, should it be required it can still be started after Blocks 1, 2 and 3 are running. The 1000 HP motor will require a locked rotor inrush of approximately 6.0 Mva. This added to the Block 1, 2 and 3 steady state load of 2.4 Mva equals 8.4 Mva still within the 12.5 Mva inrush rating of the generator. The steady state load is now 3.4 Mva (2800 kw).

The capability and speed of response of the emergency diesel generators is achieved by means of the high speed excitation system and field forcing equipment.

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QUESTION 8A.5 (DRL 8.5) Describe and evaluate the provisions to prevent two diesel generators from being connected together and from being connected to another source of power that is out of phase.

ANSWER Circuit breaker interlocks will be utilized to prevent paralleling of the two emergency diesel generators. In addition, positive interlocking will be provided to prevent automatic closing of the unit auxiliary or start-up transformer supply breakers to the 4160 volt nuclear service bus at a time when it is connected to the diesel generator.

Synchronizing facilities will be provided to permit restoration of offsite power to the nuclear service buses without interuption of power supply to the nuclear service loads.