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SHOREHAM NUCLEAR POWER STATION
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JOHN D. LEONARD, JR.
VICE PRESIDENT - NUCLEAR OPERATIONS

November 19, 1984 SNRC-1104

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Supplementary Information
Qualified Load - TDI Diesel Generators
Shoreham Nuclear Power Station - Unit 1
Docket No. 50-322

Dear Mr. Denton:

Members of my staff participated in a telecon with Mr. R. Caruso and Mr. J. Knox of your staff on October 26, 1984, to discuss various aspects of the newly developed qualified load for our TDI diesels. During this discussion it was requested that certain information be assembled and formally docketed.

Attachment 2 is a list of the questions to which your staff requested formal responses and our responses to those questions.

While we anticipate that you will find these responses acceptable, please do not hesitate to call my office or members of my staff should you require additional information or clarification regarding our reply.

Very truly yours,

Jeffrey S. Smith for
John D. Leonard, Jr.
Vice President - Nuclear Operations

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Attachments

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ATTACHMENT I

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ATTACHMENT 2

Question

1. What effect does inrush current causing very short kW spikes due to starting large motors have on the diesels?

Response:

There is no adverse affect due to inrush current. The phenomena of inrush current (due to starting large motors) causing short duration kW spikes is typical and not unique to the Shoreham diesel generators. In order to minimize the effect of these spikes on the diesels, large motor loads are started in a predetermined sequence. FSAR Table 8.3.1-2 tabulates the various inrush currents and describes the large motor start sequence. Such sequencing allows a spike to occur and to dissipate prior to the start of the next load (spike). When a large motor is started, inrush current is usually 5.5 to 6 times the full load current but the power factor at that instant is approximately .35 and the net effect on the DG is reduced significantly. The inertia of the flywheel minimizes the effect of these spikes on the diesel due to their short duration. These spikes were considered in FAA's analysis and it was determined that they have no adverse effect on the diesel's capability to perform their intended function. In addition, diesel factory test, preoperational test and periodic operational surveillances (see Technical Specifications section 4.8.1.1.2.e) have demonstrated and continue to demonstrate the diesel's capability in this area.

Question

2. Explain why intermittent loads are not included in the development of the qualified load.

Response

By their nature intermittent loads are of short duration and therefore have no adverse effect on the steady state capabilities of the diesels during an accident.

The following is a list of automatically actuated intermittent/noncontinuous loads which are not considered to be part of the qualified load.

A. Diesel Generator Air Compressor

B. Diesel Generator Fuel Oil Transfer Pump

C. Automatically Actuated Motor Operated Valves (MOVs)

The diesel generator air compressors are used to charge the air start receiver tanks which aid in starting the diesels.

Tests have been performed which show that these receiver tanks have the capacity to start the diesels five (5) times without requiring a recharge. Once a diesel starts and is operating the compressors operate to recharge the air start receiver tanks. The compressors only operate for approximately 15 minutes in order to fully recharge the receiver tanks.

The diesel generator fuel oil transfer pumps are operated only when the fuel oil day tank level reaches a predetermined level. Once level is restored, the transfer pump no longer operates. These pumps cycle on and off, approximately every half hour and operate for approximately twelve minutes in order to maintain level in the day tanks, while the engines are operating.

Automatically actuated motor operated valve loads are not continuous loads. Valves are stroked (opened/closed) within the first minute of a LOCA and generally remain in position. Not all valves operate simultaneously, therefore, the actual diesel loads are far lower than the summation loads shown in FSAR table 8.3.1-1. These are short duration loads on the order of one to three minutes.

Question

3. What provisions or design features exist to prevent an operator from manually starting a load which may cause the diesel load to exceed the qualified load.

Response:

Procedures and training will be used to prevent operators from unnecessarily loading the diesels above the qualified load. A change in the Plant Technical Specification (specifying 3300 kW limit) will also be an aid to keep the diesel loads below the qualified load. It is important to note that the probability of operator error is not a function of a diesel engine loading. The operators are trained not to exceed allowable values whatever they may be. Thus setting the qualified load at 3300 kW raises no new issues with respect to operator error.

A postulated load condition due to an operator error is readily detectable. This condition will be corrected quickly, limiting it to a short duration. Furthermore, testing and engineering analysis of these diesels verifies that short duration loads on the order of those shown in the table below will not degrade the reliability of these engines to perform their intended function.

Even in the unlikely event an operator error did overload a diesel to the extent that it caused it to fail, there would still be two (2) diesels available, which is all that is needed for safe shutdown of the plant.

The worst case single load that could be placed on a diesel as a result of an operator error during a LOOP/LOCA for each diesel would be:

			Total kW
DG 101	CRD Pump	206.1 kW	3459.4
DG 102	CRD Pump	206.1 kW	3414.8
DG 103	Service Water Pump	358 kW	3583.5

CRD pumps are tripped automatically on a LOCA. Once the Reactor has been scramed all control rods are inserted, and there is no need for the CRD pumps.

The second service water pump on DG-103 is administratively locked out because it is not required to mitigate a LOCA.

During a LOOP event the worst case single load for each diesel would be:

			Total kW
DG 101	CS Pump	998 kW	3784
DG 102	CS Pump	998 kW	3619
DG 103	RHR Pump	1022 kW	3551

CS pumps are only required for LOCA events; reactor water level is maintained by HPCI during a LOOP. On DG 103, the RHR pump listed is the second RHR pump on that diesel. Each of the other two diesels carries an RHR pump. The second pump on DG 103 is not required to reach cold shutdown following a LOOP because only two out of four RHR pumps are required per SNPS FSAR table 8.3.1-1.

In the unlikely event that any of the above loads were inadvertantly started, it would not cause the diesel to fail, because (1) testing and analysis of the diesels have shown that they can carry these loads without tripping and (2) the condition would only be of short duration because the operator as required by procedure and technical specifications will take immediate steps to reduce load below 3300 kW. Even if the associated diesel was assumed to fail as a result, there would still be two operating diesels. This would be sufficient to enable the plant to achieve a safe shutdown condition.

The following list includes all manually operated equipment connected to emergency diesel generator electrical buses. For the reasons stated below, it is unlikely that any of this equipment would be operated at a time during an accident when the qualified load could be exceeded.

1) Control Rod Drive Pumps

2) 120 V Nonemergency feeds

3) Reactor Protection System Backup Transformer

4) Drywell Cooling System Fans

5) Primary Containment Air Cooler Subfeeds

6) Reactor Water Cleanup Recirculation Pumps

7) Main Turbine Turning Gear

8) Main Turbine Turning Gear Drive

9) Main Turbine Bearing Lift Pumps

10) Feedwater Turbine Turning Gear

11) Feedwater Turbine Turning Gear Oil Pump

12) Reactor Feed Pump Electro Hydraulic Controller Control Transformers

13) Standby Liquid Control Pumps

14) Standby Liquid Control Main Heater

15) Standby Liquid Control Mixing Heater

16) Standby Liquid Control Heat Tracing

17) Refueling Jib Cranes

18) Refueling Platform Assembly

19) Diesel Generator Jacket Water Heaters

20) Diesel Generator Jacket Water Keep Warm Pumps

21) Diesel Generator Lube Oil Heaters

22) Diesel Generator Before and After Lube Oil Pumps

23) Diesel Generator Heaters

24) 4th Service water Pump

25) Spent Fuel Pool Cooling Water Pumps

26) Main Turbine Turning Gear Oil Pump

27) Lighting

28) Battery Charger $\pm$ 24 volts

29) Reactor Protection System M-G Sets

30) Suppression Pool Pump Back Pump

31) Diesel Generator Fuel Oil Transfer Pumps

32) Diesel Generator Air Compressors

33) Motor Operated Valves

34) Non-Operating Motor Operated Valves

35) Reactor Building Closed Loop Cooling Water Circulating Pumps

36) Hydrogen Recombiners

37) Main Steam Isolation Valve-Leakage Control System Heaters and Blowers

By analyses performed in support of those transients and accidents presented in SNPS FSAR chapter 15, the first twenty-nine items are intentionally tripped and are not needed to mitigate the consequences of a design basis LOOP/LOCA for the duration of the accident. Further, operators will not overload the emergency diesels with this equipment because by the time they would be needed to perform their intended function, offsite power would be restored. As the Low Power Licensing Board found, a loss of offsite power for any significant period of time is unlikely (Findings of Fact, numbered forty-four through sixty contained in the Atomic and Safety Licensing Board, Initial Decision ASBLP No. 77-347-01C-OL dated October 31, 1984).

The suppression pool pumpback pump (item 30) is designed to return long term leakage from water processing systems in the reactor building to the suppression pool. Leakage in the short term will be collected in sumps and tanks and the suppression pool pumpback system will not be required to operate until well into the accident scenario.

Items numbered thirty-one through thirty-three are the cyclic loads discussed in response to item two.

The non-operating MOVs (item 34), which are manually operated, constitute a total load of 95.9 kW on DG 101 and 75.3 kW for DG 102. However, these valves would not be operated simultaneously and, therefore, do not constitute a concern for overloading the diesels since the largest load of a single MOV is 40 kW. The plant is designed so that these valves would not have to operate during the first ten minutes of the accident.

The RBCLCW pump (item 35) connected to emergency bus 103 would be manually started after its lock out period elapsed only if either diesel 101 or 102 fails to start and carry load. By design this operator action is precluded during the first ten minutes of the accident.

Based upon the analyses performed and the results presented in section 6.2.5.2 of the SNPS FSAR the Hydrogen Recombiners (item 36) will not be required to perform their intended function until 48 hours after the initiation of the LOCA. Since SNPS primary containment is nitrogen inerted, it is very unlikely that an operator would have to load these units onto an emergency bus, at a time when the qualified load of 3300 kW could be exceeded.

Section 6.5 of the SNPS FSAR describes the MSIV-LCS system and its design bases. Item six (6) in both the specific criteria listed in Section 6.5.1.2 and in the design safety evaluation listed in section 6.5.3 show that, by design, the functional requirements of this system need not be called upon in the first twenty minutes of the LOOP/LOCA scenario. Furthermore, this system need not and should not operate when the pressure between inboard and outboard MSIVs is greater than containment pressure. Clean steam trapped between these valves would help prevent the containment atmosphere from leaking across the inboard valve, since the pressure between the MSIV's is expected to exceed the containment pressure after containment isolation. Therefore, it is unlikely that this system will be actuated at a time when the qualified load could be exceeded.