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NRC DOCKET 50-321
OPERATING LICENSE DPR-57
EDWIN I. HATCH NUCLEAR PLANT UNIT 1
ADDITIONAL INFORMATION ON RPS M-G SETS

Gentlemen:

On January 10, 1979, members of the NRC staff met with Georgia Power Company representatives at your offices in Bethesda, Maryland, to discuss a proposed modification to the Reactor Protection System Motor-Generator Sets (RPS M-G Sets). As described in the meeting minutes issued by the NRC dated January 17, 1979, three items of additional information were requested. The following discussions will address each of the three requested items:

1. Trip Setpoints - the values used as trip setpoints vary slightly from the limiting values in the Technical Specifications. However, in each case the proposed design value is on the conservative side of the Technical Specification value such that the associated trip would occur sooner than if the trip value were the same as the Technical Specification value. These values were chosen to allow for the various setpoint tolerances associated with the protective relays.

2. Time Delay - the attached "RPS Modification Setpoint Justification" discusses the basis of the final time delay values which were established. In each case the final time delay value is substantially less than the 6 records discussed in the January 10, 1979, meeting. The attachment goes on to conclude that no equipment damage will occur as a result of the time delays proposed.

3. Alternate Power Supply - our submittal of May 22, 1979, proposed a 30 day limit on continuous use of an alternate feed to power one division Reactor Protection System. The 30 day limit is based on the estimated length of time required to repair a M-G Set, with allowance made for contingencies. We estimate a major repair, such as rewinding a motor, could take up to three weeks, assuming no delivery or material problems. We have added an additional week to allow for potential material or delivery problems which could be associated with a major repair.

In the event that the RPS M-G Set must be removed from operation, power to the RPS would be supplied through an alternate feed. This alternate feed is a high quality supply and contains protective relaying and annunciation in the control room should it become degraded.

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The power is supplied from offsite 230 KV tie lines through startup transformer 2D with startup transformer 2C providing backup. These transformers step the voltage down to 4160-volts and supply essential buses 2E, 2F and 2G. These buses are located in separate rooms in the diesel building and supply power to essential loads required during abnormal operational transients and accidents. The 230 KV systems in the switchyard are protected by undervoltage relays and the frequency of the grid remains between 59.5 and 60.1 hertz. The electrical generators in the grid have frequency protection which is more stringent than the protection provided on the RPS M-G Sets. The frequency throughout the grid is monitored continuously.

Diesel generators 2A and 2C supply Unit 2 essential buses 2E and 2G, respectively. Diesel generator 1B is a shared facility and can supply either Unit 1 essential bus 1F or Unit 2 essential bus 2F. Automatic starting of the diesel generator units supplying Unit 2 will be initiated by undervoltage on essential buses 2E, 2F and 2G (starts diesel associated with that individual bus). This includes a voltage dip to 60 percent of nominal voltage for 60 hertz or more on the essential buses or a failure in any of the redundant trains sensing voltage.

The two essential 600-volt buses 2C and 2D are normally supplied from separate 4160-volt buses 2E and 2G through their own transformers. One spare 4160-600 volt transformer (2CD), supplied from 4160-volt bus 2F, is provided as a spare source for either essential 600-volt bus. The 600-volt essential buses are located in separate rooms in the control building.

The 120-208 volt AC Instrument Power System is an essential power system supplied from the 600-volt essential buses 2C and 2D through two 122.5 KVA, 3 phase essential transformer to essential cabinets 2A and 2B. The RPS contains a manual throw switch which will allow it to receive power from either essential cabinet. The essential cabinet supply essential and nonessential loads. Failure of a nonessential load will not affect the ability of this system to supply the essential loads. All essential equipment involved in this system is designed to Class 1E requirements. In addition, the 4160 volt and 600 volt essential buses have undervoltage annunciation in the control room.

Should a loss of offsite power occur while the RPS is being supplied by the alternate feed, power would be lost to one division of RPS, thus meeting the design objective of the RPS (capability to scram the reactor) as stated in the Technical Specifications. The alternate power supply would subsequently be sequenced onto a 4160-volt bus supplied by a diesel-generator which would start with loss of offsite power, ensuring the capability to monitor the essential functions performed by the RPS following a reactor scram.

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As shown above, the alternate feed to RPS is a well regulated, high quality feed which provides adequate protection for the equipment supplied. We, therefore, believe that a specification which allows the RPS to be supplied from the alternate feed for 30 days is entirely justified.

Yours very truly,

Chas. F. Whitmer

RDB/MRD/mb

Attachment

xc: Mr. Ruble A. Thomas
George F. Trowbridge, Esquire

RPS MODIFICATION SETPOINT JUSTIFICATION

In regards to the proposed set points of 129 VAC for the overvoltage trip, the 110 VAC for the undervoltage trip and the 57.2 HZ for the underfrequency trip being different than the currently approved Technical Specification limits of 132 VAC, 108 VAC and 57 HZ we offer the following. Although the proposed setpoints are slightly different then the currently approved Technical Specification limits each of the proposed setpoints is on the conservative side. The reason for the different settings is to take into account the various tolerances in the protective relays.

We have reexamined the time delays which were preliminarily indicated as 6 seconds for both the undervoltage (UV) and underfrequency (UF) relays. Our purpose was to lower the time delay of the relays to a value which while still preventing unnecessary plant shutdowns due to transient conditions would facilitate the justification of the time delays in respect to the capabilities of the connected equipment. The result of this examination has shown that the minimum time delay for the UV and UF relays could be 2.15 seconds and 2.25 seconds respectively. These time delays will prevent unnecessary plant shutdowns due to any expected transient conditions. In addition the values being much lower than 6 seconds simplify the task of justification in respect to the capabilities of the connected equipment. An examination of the connected loads with respect to the time delays of 2.15 seconds and 2.25 seconds was made and the results are as follows.

Underfrequency Relay: Trip Frequency 57.2 HZ, Time delay 2.25 seconds

The purpose of the underfrequency relay circuitry is to protect the connected load from exposure to low frequency while the RPS MG set coasts to a stop. With prolonged supply voltage interruptions to the drive motor or in any case of motor failure or motor starter failure, the MG set will eventually coast to a stop. The rate of declining frequency at full load conditions as per specification of the MG set is no greater than 1.485 HZ per second. In the case of supply voltage interruptions at full load the equipment connected to the RPS bus will see a minimum frequency of approximately 56 HZ before the UF relay causes the RPS bus to be deenergized. The immediate effect on devices such as relays, contactors and solenoids is an increase in current and consequently heat, due to the change of that portion of impedance due to inductive reactance. It is reasonable to assume that devices such as relays, contactors and solenoids which are rated to operate indefinitely at 5% below 60 HZ will operate without damage at slightly less frequency for 2.25 seconds. In the case of the power supplies for neutron monitoring, process radiation monitoring and off-gas monitoring the reduced frequency causes no harmful effects as these devices are designed with suitable filters (considering the worst case) for frequency ranges of 53 to 63 HZ. A final point should be made in regards to the new underfrequency relay. The existing MG set underfrequency relays deenergized the RPS bus at 54 HZ for many years. Although this relaying had no intentional time delay, an actual time delay was inherent in the system. As the MG set would coast down from rated speed, a similar time delay to the new time delay, would occur before 54 HZ was attained. To our knowledge no components have been adversely effected by operation at frequencys below rated frequency for these small time delays.

In summary a time delay of 2.25 seconds at 57.2 HZ, while still allowing normal system operation during expected transients, will protect the connected loads from any possible damage and in no way will prevent the successful automatic or manual shutdown of the plant.

Undervoltage Relay: Trip Voltage 110 VAC, Time Delay 2.15 Seconds

The primary purpose of the undervoltage relay circuitry is to protect the connected load from exposure to low voltage conditions and to disconnect a malfunctioning MG set due to regulator failure. It should be noted that while the undervoltage relay has a time delay of 2.15 seconds at 110 VAC and below, the relay is instantaneous at 81.6 volts and below. The type of failure due to low voltage that could result in damage to connected equipment is thermal damage to coils and solenoids. This damage could only result from coils and solenoids being energized while not being picked-up or properly seated. It was found that the majority of relays connected to the RPS bus have a drop-out voltage which is much lower than 81.6 volts. Therefore, these devices would be disconnected from the bus immediately at 81.6 volts by the undervoltage relay before they became unseated. The remaining devices which include General Electric contactors and relays as well as Asco solenoids could conceivably become unseated due to low voltage before the undervoltage relay is instantaneous. In this case these devices would draw an increased current for 2.15 seconds. We have contacted the vendors of these devices and have been assured that no thermal damage would occur if the device were unseated for small amounts of time such as 2.15 seconds.

In summary a time delay of 2.15 seconds at 110 VAC, while still allowing normal system operation during expected transients, will protect the connected loads, remove a malfunctioning MG set from service and in no way prevent the successful automatic or manual shutdown of the plant.