8-12-76

Docket No. 50-133

Pacific Gas and Electric Company
ATTN: Mr. John C. Morrissey
Vice President and General Counsel
77 Beale Street
San Francisco, California 94106

Gentlemen:

RE: HUMBOLDT BAY

Provided herein as Enclosure 1 is a description of events which occurred at Millstone Unit No. 2 during July 1976 relating to plant operation and equipment failures during a degraded grid voltage condition.

On July 27, 1976, all utilities with operating reactor facilities received telephone notification from the NRC of the events at the Millstone Unit No. 2 facility. At that time members of your staff were asked to investigate the vulnerability of your facility to similar degraded voltage conditions and to provide a response by telephone within 24 hours.

As a result of our initial investigation and evaluation of the potential generic implications of the events at Millstone and our preliminary discussions with several licensees, we consider it necessary to require all operating reactor licensees to conduct a thorough evaluation of the problem and to submit formal reports. Therefore, we request that you conduct an investigation of the issue as it affects your facility using the Request for Information detailed in Enclosure 2 as a guide, and provide the analyses and results within 30 days of your receipt of this letter.

The signed original and 39 copies of your response will be necessary.

This request for generic information was approved by GAO under a blanket clearance number B-180225 (R0072); this clearance expires July 31, 1977.

Sincerely,

Robert W. Reid, Chief
Operating Reactors Branch #4
Division of Operating Reactors

Enclosures:
1. Description of Events Millstone Unit No. 2
2. Request for Information

cc w/encls:
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DESCRIPTION OF EVENTS

MILLSTONE UNIT NO. 2

On July 20, 1976, Northeast Nuclear Energy Company (NNECO) reported that, following a trip of Millstone Unit No. 2 on July 5, 1976, several motors powered from 480 volt (v) motor control centers failed to start as required. The failure of the 480 v motors to start was traced to blown control power fuses on the individual motor controllers. These controllers receive control power through 480 v/120 v transformers within the controller.

NNECO's investigation disclosed that, as a result of the plant trip, the grid voltage dropped from 352 kv to 333 kv. This voltage drop, in conjunction with additional voltage drops associated with the transformers involved, reduced the control power and voltage within individual 480 v controllers to a voltage which was insufficient to actuate the main line controller contactors. As a result, when the motors were signalled to start, the control power fuses were blown. Subsequent testing by NNECO showed that the contactors required at least 410 v to function properly.

NNECO concluded that under similar low voltage conditions, the operability of 480 v Engineered Safety Feature equipment could not be assured.

NNECO's immediate corrective action was to raise the setpoint of the Engineered Safeguards Actuation System (ESAS) "loss of power" undervoltage relays to assure that the plant would be separated from the grid and emergency power system (dual) operation would be initiated before the control voltage fell below that required for contactor operation. A trip of the undervoltage relays causes the emergency buses to be de-energized and a load shed signal to strip the emergency buses, the diesel generators to start and power the emergency buses, and required safety related loads to sequence start on the buses.

On July 21, 1976, NNECO reported that the earlier corrective action taken was no longer considered appropriate because during starting of a circulating water pump, the voltage dropped below the new ESAS undervoltage relay setting. This de-energized the emergency buses, caused load shedding to occur, started the diesel generators and began sequencing loads onto the emergency buses in accordance with the design. However, during sequencing of the loads onto the buses, the voltage again dropped below the undervoltage relay setting which caused the load shed signal to strip the buses. The result was energized emergency buses with no loads supplied.

REQUEST FOR INFORMATION

1. Evaluate the design of your facility's Class IE electrical distribution system to determine if the operability of safety related equipment, including associated control circuitry or instrumentation, can be adversely affected by short term or long term degradation in the grid system voltage within the range where the offsite power is counted on to supply important equipment. Your response should address all but not be limited to the following:

   a. Describe the plant conditions under which the plant auxiliary systems (safety related and non-safety related) will be supplied by offsite power. Include an estimate of the fraction of normal plant operating time in which this is the case.

   b. The voltage used to describe the grid distribution system is usually a "nominal" value. Define the normal operating range of your grid system voltage and the corresponding voltage values at the safety related buses.

   c. The transformers utilized in power systems for providing the required voltage at the various system distribution levels are normally provided with taps to allow voltage adjustment. Provide the results of an analysis of your design to determine if the voltage profiles at the safety related buses are satisfactory for the full load and no load conditions on the system and the range of grid voltage.

   d. Assuming the facility auxiliary loads are being carried by the station generator, provide the voltage profiles at the safety buses for grid voltage at the normal maximum value, the normal minimum value, and at the degraded conditions (high or low voltage, current, etc.) which would require generator trip.

   e. Identify the sensor location and provide the trip setpoint for your facility's Loss of Offsite Power (undervoltage trip) instrumentation. Include the basis for your trip setpoint selection.

   f. Assuming operation on offsite power and degradation of the grid system voltage, provide the voltage values at the safety related buses corresponding to the maximum value of grid voltage and the degraded grid voltage corresponding to the undervoltage trip setpoint.

   g. Utilizing the safety related bus voltage values identified in (f), evaluate the capability of all safety related loads, including related control circuitry and instrumentation, to perform their safety functions. Include a definition of the voltage range over which the safety related components, and non-safety components, can operate continuously in the performance of their design function.

h. Describe the bus voltage monitoring and abnormal voltage alarms available in the control room.

2. The functional safety requirement of the undervoltage trip is to detect the loss of offsite (preferred) power system voltage and initiate the necessary actions required to transfer safety related buses to the onsite power system. Describe the load shedding feature of your design (required prior to transfering to the onsite [diesel generator] systems) and the capability of the onsite systems to perform their function if the load shedding feature is maintained after the diesel generators are connected to their respective safety buses. Describe the bases (if any) for retention or reinstatement of the load shedding function after the diesel generators are connected to their respective buses.

3. Define the facility operating limits (real and reactive power, voltage, frequency and other) established by the grid stability analyses cited in the FSAR. Describe the operating procedures or other provisions presently in effect for assuring that your facility is being operated within these limits.

4. Provide a description of any proposed actions or modifications to your facility based on the results of the analyses performed in response to items 1-3 above.