NORTHEAST UTILITIES

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NORTHEAST UTILITIES SERVICE COMPANY
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October 14, 1982

Docket No. 50-245
A02588

Director of Nuclear Reactor Regulation
Attn: Mr. Dennis M. Crutchfield, Chief
Operating Reactors Branch #5
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Reference: (1) D. M. Crutchfield letter to W. G. Counsil, dated June 23, 1982.

Gentlemen:

Millstone Nuclear Power Station, Unit No. 1
Degraded Grid Protection for Class 1E Power Systems

Reference (1) requested Northeast Nuclear Energy Company (NNECO) to provide additional information regarding degraded grid voltage protection at Millstone Unit No. 1. Our undervoltage protection scheme was to be implemented in two phases. Phase 1 was scheduled to be completed during the 1982 refueling outage, with Phase 2 scheduled for the 1984 refueling outage. Phase 1 consisted of moving the Level 2 (90%) voltage protection to the 4.16 KV buses from the high side (345KV) of the RSST. Phase 2 would completely revamp the Loss of Normal Power (LNP) initiation logic.

A few specific designs were generated; however, for each design, safety concerns were found. All the concerns dealt with plant operation with Phase 1 implemented without having Phase 2 completed. In a telephone conversation on June 3, 1982 the NRC Staff agreed with completion of the entire program during the 1984 refueling outage. The following discussion conveys specific concerns regarding the two-phase completion of this program.

Figure 1 diagrams the Millstone Unit No. 1 auxiliary bus system. The preferred off-site supply is provided by RSST-1. The "X" winding supplies 4.16 KV buses 14A and 14B. The "Y" winding supplies 4.16 KV buses 14C and 14D, which feed 4.16 KV buses 14E and 14F, respectively. With the RSST supplying plant loads, the tie breakers to the gas turbine and diesel generators are open. It should be noted that the breaker between bus 14D and 14G and the breaker between bus 14E and the diesel generator are both pad-locked open to provide separation between the two Class 1E power trains. Because of the asymmetrical bus configuration, the locations of the sensing at the 4.16 KV level were very difficult to determine.

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Figure 2 shows the two general degraded grid voltage protection schemes discussed to complete Phase 1. Each proposal has a unique concern. Both concerns center on the tie breaker between the "X" winding of the RSST and 4.16 KV bus 14A. With the implementation of Proposal #1, one concern arises when fast transfer from the NSST to RSST takes place and the RSST feeder breaker to 4.16 KV bus 14A hangs up. Assuming the accident signal tripped the generator and initiated the fast transfer, the preferred off-site supply would be shed for the failure of one breaker. Recent probability studies show an approximate one out of fifty chance for breaker hang up. For this particular reason the second scheme was proposed. Proposal #2 would require both RSST feeder breakers (buses 14A and 14B) to fail to close decreasing the probability of inadvertent load shedding to one out of twenty-five hundred chances. However, with this proposed scheme, a failure of the RSST feeder breaker to bus 14A would not be recognized thus [illegible] 14A deenergized.

Another inherent problem involved in implementing just Phase 1 during the 1982 outage is that selective tripping cannot be achieved. Consider the scenario with the RSST supplying normal plant loads and a degraded voltage on winding "Y" (Buses 14E and 14F) but not on winding "X" (Bus 14A). If an accident signal occurs, the entire offsite supply will be shed even though bus 14A has an acceptable voltage. Bus 14A powers two 7000 Hp reactor feed pumps, one of which provides high pressure cooling to the reactor vessel. With a degraded voltage on buses 14E and 14F, the present logic would disconnect the reliable offsite supply from the "X" winding to bus 14A, thus tripping the running feed pumps and placing an unnecessary load demand on the gas turbine generator.

As previously indicated, a complete revamp of the LNP initiation logic as well as the installation of an auto-reinstatement of a load shed feature in the event of a tripping of the diesel or gas turbine generators is scheduled to be completed during the 1984 refueling outage. The LNP initiation logic revamp will provide completely independent tripping and load sequencing for the diesel and gas turbine power trains. With these independent tripping schemes, optimum degraded voltage set points can be chosen for the diesel and gas turbine systems.

Another major concern is the selection of the time delay for the degraded voltage relays. The time delay is limited by the fact that the start time of the diesel generator is ten seconds. Some of the large motors supplied by the gas turbine (forty-five second start time) power train have approximately ten second starting times. With the proposed Phase 1 relocation of sensing and a ten second time delay, the motors may not have sufficient time to start. Therefore, the degraded voltage sensing cannot be put on the 4.16 KV level until the LNP initiation logic is separated. This will provide the capability of riding through all motor starts.

Looking at the two proposed Phase 1 schemes from an overall safety analysis aspect, other concerns arise. A Millstone Unit No. 1 Interim Reliability Evaluation Program (IREP) study showed that 86% of the total core melt frequency was LNP induced. Preliminary analysis of the effect of Phase 1 without Phase 2 increased all LNP induced core melt event frequencies by five to ten percent. It should be noted that the remaining fourteen percent of core melt frequency which is not LNP induced, may be increased significantly.

A major advantage of doing both Phase 1 and Phase 2 during the 1984 refueling outage is that the 1982 outage could be used for measurement of the starting times and voltages of all the equipment to be protected. The following is a listing of the equipment to be tested during the 1982 outage. The results will be our basis for the design of both Phase 1 and Phase 2.

Millstone Unit No. 1
Large Class 1E Motors to be Tested for Starting Times & Voltages

4.16 KV Emergency Buses

Bus 14A (1) Reactor Feed Pumps 1A, 1B (M2-10a, M2-10b)

Bus 14C (3) Condensate Pumps 1A, 1B (M2-6a, M2-6b)
Condensate Booster Pumps 1A, 1B (M1-7a, M2-7b)

Bus 14E (5) LPCI/Containment Cooling Pumps 1B, 1D (1502B, 1502D)

Core Spray Pump 1B (1401B)

Emergency Service Water Pumps 1B, 1D (1501-65B, 1501-65D)

Service Water Pump 1C (M4-7C)

Bus 14F (6) LPCI/Containment Cooling Pumps 1A, 1C (1502A, 1502C)

Core Spray Pump 1A (1401A)

Emergency Service Water Pumps 1A, 1C (1501-65A, 1501-65C)

Service Water Pump 1D (M4-7D)

480 V Load Centers

Bus 12E (2) Tubine Building Secondary Closed Cooling Water Pump (M4-15A)

Bus 12F (2A) Instrument Air Compressor M5-4

Turbine Building Secondary Closed Cooling Water Pump (4-15B)

Therefore, in light of the above, the specific information requested by Reference (1) cannot be provided until the design is completed. Since all required modifications are now scheduled to be completed during the 1984 refueling outage, our design is now scheduled for completion in July, 1983. At that time, we will provide the NRC Staff with a schedule for submittal of the information requested in Reference (1).

Additionally, Reference (1) indicates that we have committed to changing one MOV and the condensate transfer pump from AC to DC power to allow the Isolation Condenser System to be AC-independent. We have previously committed to making the Isolation Condenser make-up fill valve (1-IC-10) AC-independent during the 1982 refueling outage and we still intend to do so. However, we have never committed to making the condensate transfer pump AC-independent. Since make-up for the Isolation Condenser can be provided by the diesel-driven fire water pump thereby making the Isolation Condenser System AC-independent, we have never planned to modify the condensate transfer pump to achieve AC-independence.

Based upon the Staff's verbal agreement with the above approach during the June 3, 1982 telephone discussion, the status is summarized as follows:

- o Degraded grid voltage protection modificiations are deferred until the 1984 refueling outage, and

- o Our next planned correspondence on this subject is scheduled for July, 1983.

The absence of NRC Staff response to this letter will result in the above actions.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil
W. G. Counsil
Senior Vice President

J. F. Opeka
By: J. F. Opeka
Vice President
Nuclear Operations

MILLSTONE UNIT 1

AUXILIARY BUS SYSTEM

FIGURE 1

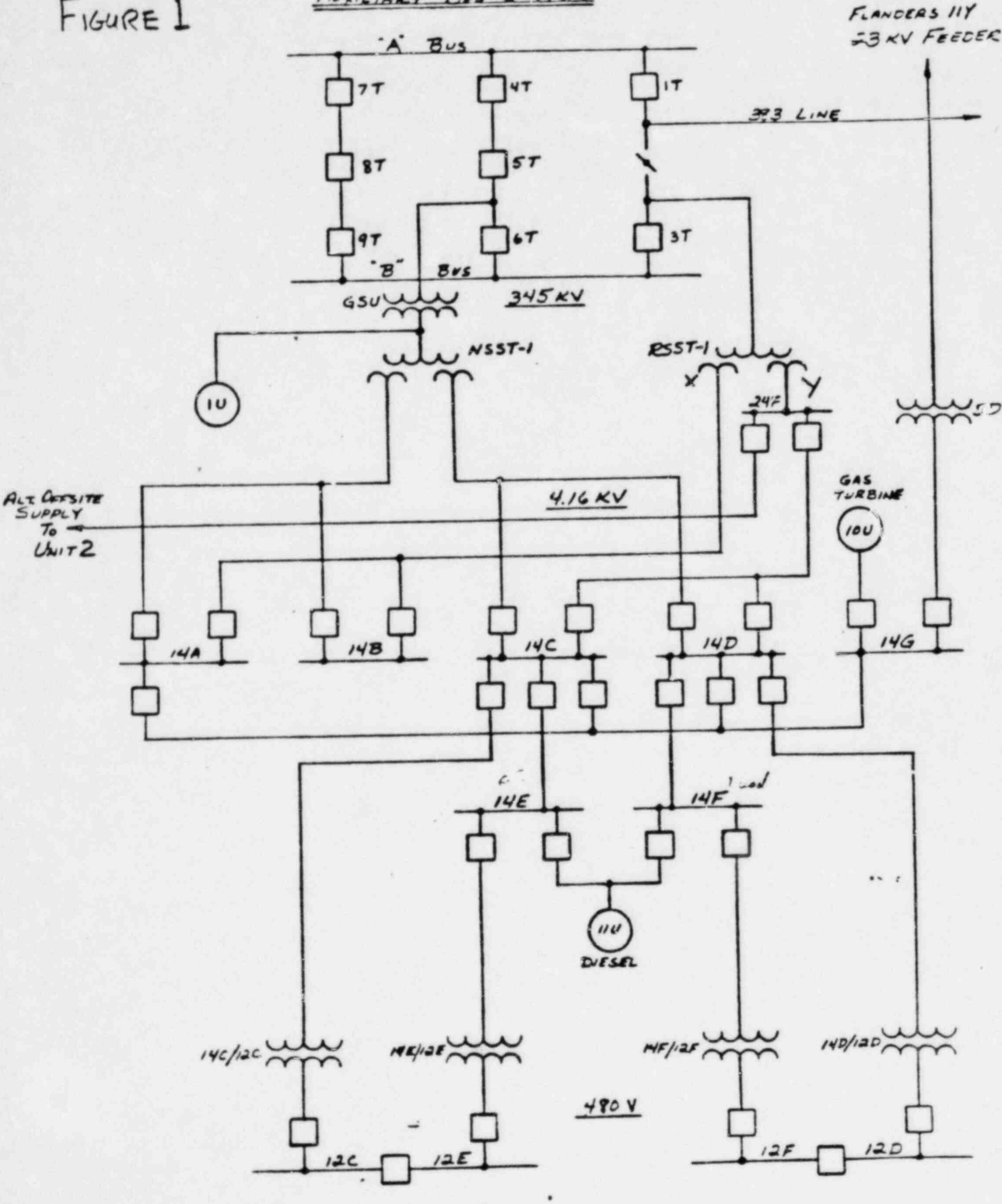
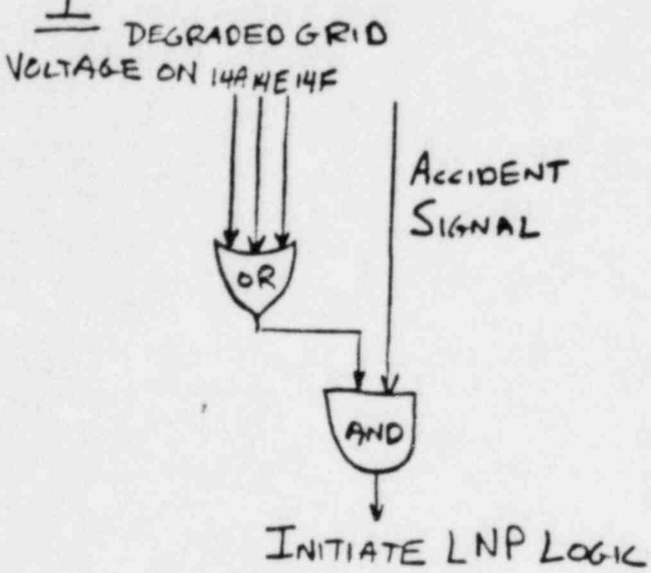


FIGURE 2 - PROPOSED PHASE 1 DEGRADED GRID VOLTAGE PROTECTION SCHEMES PA 80-135

#1



#2