NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

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Docket No. 50-245
B105?8

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

References:
(1) D. M. Crutchfield letter to W. G. Counsil dated, September 30, 1981.
(2) G. Lear letter to D. C. Switzer dated, March 28, 1977.
(3) D. C. Switzer letter to G. Lear dated, May 31, 1977.
(4) D. L. Ziemann letter to D. C. Switzer dated, March 31, 1978.

Gentlemen:

Millstone Nuclear Power Station Unit No. 1
SEP Topic VIII-2, Emergency Onsite Power Systems

In Reference (1), the Staff forwarded the final evaluation of SEP Topic VIII-2, Emergency Onsite Power Systems, for Millstone Unit No. 1. Reference (1) identified the fact that the protective interlocks on the gas turbine generator do not meet the intent of current licensing criteria. It should be noted that there are no criteria relating specifically to gas turbine generators; the NRC has applied criteria for diesel generators for the purpose of this review. Northeast Nuclear Energy Company (NNECO) does not object to the use of diesel generator criteria as guidance, however, it must be recognized that a diesel generator and gas turbine are entirely different machines and thus the specific characteristics of a gas turbine must be considered.

NNECO has reviewed the gas turbine protective interlocks with the philosophy that protective trips should be bypassed under accident conditions unless bypassing the trip would result in destruction of the machine. The results of NNECO's review are as follows.

Presently there are seventeen trips which are not bypassed during emergency operation of the gas turbine generator. Four of the trips are associated with the start-up of the gas turbine, six are associated with the steady-state operation of the gas turbine and seven are associated with the output circuit breaker of the electric generator.

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The four protective trips that are associated with start-up are as follows:

1. If light-off speed (930 rpm) is not reached in 20 seconds (light-off speed is expected in 13 to 16 seconds).

2. If light-off temperature (400oF) is not reached 15 seconds after light-off (light-off temperature is expected 5 to 8 seconds after light-off).

3. If starting air-ignition cut-off speed (3400 rpm) has not been reached 60 seconds after start (expected 15 seconds after light-off).

4. If generator excitation speed (540 rpm electric-generator speed) is not reached in 60 seconds (expected 35 seconds after start).

These trips monitor a series of expected parameters during the starting sequence. It should be noted that the time delays are extended well beyond the expected time for each parameter to allow for variance in component performance and to preclude an unnecessary shutdown of the starting sequence.

NNECO intends to bypass both the light-off speed and generator excitation speed trips under accident conditions. NNECO has concluded however, that the light-off temperature and starting air ignition cut-off speed trips must be retained in order to protect against a potential explosion. Both of these trips indicate a major problem in obtaining light-off and must trip the turbine and stop the fuel supply in order to prevent an explosion if the ignitors were energized at a later time. Bypassing these trips would be of no benefit since if the expected conditions are not met, the result would be an unsuccessful start.

The six protective trips that are associated during the steady-state operation of the gas turbine generator are as follows:

1. High Exhaust Gas Temperature - The trip for emergency operation is set at 1300oF whereas, for normal power operation, it is set at 1200oF. It is anticipated that, for normal operation on a maximum ambient day (105oF) the exhaust gas temperature will not be in excess of 1050oF. For machine operation in the emergency mode on a maximum ambient day, the anticipated exhaust gas temperature is in the range of 1150oF to 1175oF. This gives a margin of 125oF to 150oF between this temperature range and the trip setting of 1300oF.

2. High Lube Oil Temperature

3. High Gas Generator Speed - This trip is set at 7586 rpm, which represents a 3% overspeed condition for the emergency mode of operation. In the emergency mode of operation, because the breakers are closed and loading of the electrical generator starts at approximately 98% of synchronous speed, chances of a spurious gas generator overspeed excursion is very low. Any indications of overspeed would be indicative of an overload condition existing in the gas generator. However, proper setting of the scheduled fuel flow to the gas generator precludes occurrences of such a condition.

4. High Turbine Overspeed - 6050 rpm.

5. High Vibration Jet

6. Low Lube Oil Pressure - 14 lbs.

NNECO intends to bypass the High Lube Oil Temperature trip under accident conditions, however, the remaining 5 trips must be maintained since each protects against severe mechanical damage and hazardous conditions. The High Gas Generator Speed and High Turbine Overspeed trips are analogous to engine overspeed on a diesel generator, and are therefore justified. The High Exhaust Gas Temperature trip protects the unit against melting of mechanical parts. The high vibration trip protects against total mechanical degradation of the gas turbine. Since high vibration in a high-speed rotating piece of equipment is indicative of a severe problem, this trip must be maintained to protect against destructive failure of the machine.

The specific temperature parameters are monitored by a number of thermocouples, which provide a high degree of reliability. Speed sensing is accomplished with a shaft mounted tachometer. For all of the above trips, the addition of another channel to monitor critical parameters so as to provide coincident logic would go beyond the single failure criterion of the unit itself (e.g. - only one starting circuit). Also, the extent of any coincident logic modifications would reach far into the starting sequence and normal operating circuits, potentially making the gas turbine generator less reliable.

The seven protective trips associated with the output breaker of the gas turbine generator are as follows:

1. Loss of excitation.

2. Opening of the exciter breaker.

3. Generator differential.

4. Negative sequence.

5. Reverse power.

6, Generator underspeed

7. Voltage restrained overcurrent.

The generator associated with the gas turbine is inherently the same as that of the diesel generator. NNECO intends to maintain generator differential and voltage restrained overcurrent trips and bypass the remainder as is presently done on the diesel generator.

Regarding the gas turbine annunciator, NNECO reviewed the alarm and control circuitry in response to Reference (2). Reference (1) erroneously stated that the gas turbine generator was not considered in this earlier review. The results of this evaluation of both the diesel and gas turbine were provided in Reference (3). In Reference (4), the Staff indicated that the modifications to the gas turbine proposed by NNECO in Reference (3) were acceptable. As such, no further action on this item is warranted.

We trust the Staff will find the above information and commitments sufficient to resolve the concerns related to the gas tubine generator.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil

W. G. Counsil
Senior Vice President