Wisconsin Electric POWER COMPANY
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October 12, 1979

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. NUCLEAR REGULATORY COMMISSION
Washington, D. C. 20555

Attention: Mr. William Gammill
Acting Assistant Director
for Operating Reactors Projects

Gentlemen:

DOCKET NOS. 50-266 AND 50-301
ADEQUACY OF STATION DISTRIBUTION SYSTEM VOLTAGES
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

Your letter dated August 8, 1979, requested that we perform additional analyses and tests to demonstrate that the onsite electrical distribution system has sufficient capability to automatically start, as well as operate, all required safety loads. We have addressed the subject of onsite electrical distribution system voltages in three previous letters.

Our letter to Mr. Benard C. Rusche, dated September 17, 1976, provided a description of our onsite distribution system, transmission system operating range and resulting distribution system bus voltages. That letter also listed our expected worst case fault, worst case overload and results of that overload, and described our undervoltage protection system.

Our response to the NRC generic letter of June 2, 1977, was in the form of a Technical Specification change request dated July 28, 1977. In that response, we agreed to make a change in the settings of our undervoltage relays which are used to detect degraded voltage conditions, and to modify our periodic diesel generator test procedure. Included in our response was a detailed description of the multi-layered undervoltage protection system at Point Beach Nuclear Plant.

Our third previous submittal, addressed to Mr. Harold R. Denton and dated August 24, 1979, provided additional time delay and tolerance information to be included in our Technical Specifications, and described the effects of relay failures at the various protection levels.

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The additional analyses requested in your August 8, 1979 letter are provided in Enclosure 1. Results of the verification testing described in Enclosure 2 will be submitted separately after the tests have been completed.

Very truly yours,

C. W. Fay, Director
Nuclear Power Department

Attachments

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ENCLOSURE 1

MINIMUM EXPECTED VOLTAGE ANALYSIS

Since the Point Beach area is characterized by excess generation and high transmission system voltages, it is necessary to assume heavy loading conditions and a circuit breaker failure in order to arrive at the lowest expected grid voltage. A system load flow was run with the following initial conditions:

1979 Summer Heavy Loading
Both Point Beach Units at 100% power

To establish the low voltage conditions, the following assumptions were made:

Point Beach Unit 2 trips while at 100% power;
A stuck breaker causes the Point Beach 345kv bus to split, leaving the weakest line to provide auxiliary power;
The entire Unit 2 auxiliary load transfers to the system auxiliary transformers;
All automatically applied accident loads are placed on the safety related buses.

Unit 2 was chosen as the accident unit because it would see a lower voltage than Unit 1 for similar circumstances.

The combination of heavy auxiliary system loading and minimum expected grid voltage resulted in these bus voltages:

Bus	Nominal Volts	Volts Before Trip	Volts After Trip	(% of Nom.)
B.S. 5	345kv	358.46kv	345.69kv	(100.2%)
H06	13.8kv	13.94kv	12.82kv	(92.9%)
2A01	4.16kv	4.310kv	3.906kv	(93.9%)
2A02	4.16kv	4.314kv	3.91kv	(94%)
2A05	4.16kv	4.306kv	3.906kv	(93.9%)
2A06	4.16kv	4.306kv	3.91kv	(94%)

Since most of the Point Beach safety-related loads are supplied by 480v buses 1(2)B03 and 1(2)B04, the bus voltages for 2B03 and 2B04 were calculated.

For bus 2B03:

Maximum automatic loading < 1500 kVA;
a conservative power factor of 80% was assumed;
transformer regulation at 1500 kVA and 80% P.F. is 4.29%*.

$$\text{2B03 voltage} = \frac{\text{2A05 voltage}}{\text{turns ratio}} - \text{regulation} = 430V \text{ (90\% of Nom.)}$$

A similar calculation for 2B04 results in a bus 2B04 voltage of 431V (90% of Nom.)

*From certified test reports

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The safety-related motors supplied by the 480V buses are rated at 460V, +10%, -20% and would have no difficulty operating at 430V. The only remaining question is whether or not the motor starting contactors will pull in at 108V. An informal test was conducted at Point Beach in 1976 as a result of the Millstone event which showed that our contactors would pull in below 100V and would not drop out until the voltage was reduced to 60-70V. The actual pull-in and drop-out voltages will be verified by test for each size motor starter used on the safety-related 480V buses.

The transformer tap settings used to achieve the auxiliary bus voltages listed above for low voltage conditions will result in high voltage, no load values of 4370V on the 4160V buses and 504V on the 480V buses. These bus voltages are both less than the maximum voltage allowed by the equipment ratings.

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AUXILIARY BUS VOLTAGE ANALYSIS - VERIFICATION TESTS

In order to provide confidence in the auxiliary distribution system voltage drop calculations, voltage, current, and watt readings will be taken on the auxiliary system. The readings will be taken when the auxiliary system is heavily loaded and is being supplied by offsite power. The major items of interest are the transformer regulation values and the power factor of the loads. The actual results of the test will then be compared to the calculated results for verification.

A second test which will be performed is intended to demonstrate that the motor starters at Point Beach are capable of pulling in and holding at a voltage lower than the calculated, sustained low voltage of 108V. The minimum pull-in and maximum drop-out voltages for each size motor starter used on the safety-related motor control center will be determined.

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