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Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, DC 20555

DOCKET 50-155 - LICENSE DPR-6 -
BIG ROCK POINT PLANT - SEP TOPIC
VIII-2, ONSITE EMERGENCY POWER
SYSTEMS - DIESEL GENERATOR

The enclosure to this letter provides Consumers Power Company evaluation of the NRC's June 22, 1982 SER (and its contractors TER) concerning SEP Topic VIII-2, "Onsite Emergency Power Systems - Diesel Generator", for the Big Rock Point Plant. As noted in the evaluation, Big Rock Point's EDG conforms to current NRC licensing criteria.

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Attachment - 5 pages

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CONSUMERS POWER COMPANY
BIG ROCK POINT PLANT

SEP TOPIC VIII-2
ONSITE EMERGENCY POWER SYSTEMS - DIESEL GENERATOR

Consumers Power Company Response
to EG&G and NRC Review of Emergency
Diesel Generator Output Frequency

July 1982

CONSUMERS POWER COMPANY RESPONSE
TO EG&G AND NRC REVIEW OF
EMERGENCY DIESEL GENERATOR OUTPUT FREQUENCY

I. ABSTRACT

This enclosure serves to provide Consumers Power Company response to conclusions reached by EG&G (as documented in Reference #1) and by the NRC (as documented in Reference #2) concerning the Emergency Diesel Generator (EDG) output frequency transient during initial load assumption at Big Rock Point Plant. As concluded by EG&G, the minimum value of EDG output frequency which occurs during the frequency transient when the Electric Fire Pump (EFP) is started is less than the minimum allowable by current licensing criteria. Based on the EG&G conclusion, the NRC states that the EDG low output frequency must be justified by test or analysis or the EDG speed control must be improved. It is the opinion of the Consumers Power Company that the EDG minimum output frequency during the loading transient is acceptable according to current licensing criteria and according to sound engineering judgement.

II. DISCUSSION

A. EG&G AND NRC CONCLUSIONS

As part of the report listed as Reference #1, EG&G states the following in Section 3.1 regarding the EDG output frequency during initial load assumption:

- "A corresponding frequency transient with a maximum frequency of 62.2 Hz and a minimum frequency of 54.5 Hz occurs over a two-second interval."
- ". . . the frequency decrease encountered when starting the electric fire pump is less than the 95% of nominal frequency required by Paragraph C.4 of NRC Regulatory Guide 1.9 and is, therefore, not in compliance with current licensing criteria."
- "NRC Regulatory Guide 1.9, Paragraph C.4 requires that the frequency and voltage decrease during the diesel-generator loading sequence not exceed 95% and 75% of nominal values, respectively; a larger decrease may be justified for a diesel-generator that carries only one large connected load. Since the Big Rock Point diesel-generator carries more than one load, the frequency drop to 54.5 Hz is not in compliance with current licensing criteria."

In Section 4.0 of the report, EG&G summarizes:

"The diesel-generator loading meets the current licensing criteria except that a frequency decrease to 91% of nominal frequency occurs

when starting the electric fire pump. The maximum allowable decrease, as defined in Paragraph C.4 of RG 1.9, is 95%."

Based on the EG&G report, the NRC concludes in Section VI of its Final Safety Evaluation (see Reference #2) that the EDG low output frequency must be justified by test or analysis or the diesel generator speed control improved.

B. CONSUMERS POWER COMPANY RESPONSE TO EG&G AND NRC CONCLUSIONS

Although Consumers Power Company (CP Co) acknowledges that the EDG output frequency does drop below the Regulatory Guide 1.9 recommended minimum value of 95% of nominal frequency, it is the firm opinion of CP Co that the minimum EDG output frequency of 91% of nominal (as reported in Reference #4) is acceptable for two reasons. First, it is the opinion of CP Co that the performance of any of the loads comprising the EDG initial step load group is not degraded below their minimum requirements (which is consistent with IEEE 387-1977; see Reference #3). Second, current licensing criteria allows frequency excursions beyond 95% of nominal frequency in circumstances not unlike those at Big Rock Point. Although each of these reasons was supported and documented in detail in a recent CP Co submittal (see Reference #4) they are briefly described and, in some cases amplified, in the paragraphs that follow.

Regarding the quality of the EDG output frequency during load assumption, Reference #4 shows that the output frequency remains within the Regulatory Guide recommended tolerance of 95% of nominal throughout the entire transient with the exception of only 0.65 seconds. During this 0.65-second period, the frequency drops to a minimum value of 91% and then recovers and rises above the lower 95% recommended limit. As described in detail in Reference #4, it is the opinion of CP Co that this frequency excursion will have an insignificant effect on the individual loads that comprise the EDG initial step load group. The reasons for this opinion (as documented in Reference #4), are listed below.

Component of the EDG
Initial Step Load Group

- | | |
|---|--|
| 1) EFP | 1) The EFP is tested approximately every three days with the EDG supplying a starting frequency similar to that examined in Reference #4. The EFP has never failed to start and reach running speed during such tests. |
| 2) Core Spray Valves
(MO-7070 & MO-7071) | 2) Although an increase in torque is electrically imposed by the EDG output voltage and frequency transient for a very short duration (see |

Attachment 2 of Reference 4 and note that the EDG output frequency is low while the output voltage is high for only approximately one second), this increased electrical torque should have no significant effect on valve operation. The engineering staff at Rotork (the valves' manufacturer) has indicated that the valves' torque switch will not operate to cease the opening stroke. According to Rotork, cessation of valve travel by torque switch can only occur by a restrictive shaft load (ie, valve obstruction, seizure or seating) which causes a linear shaft movement to result in a trip of the torque switch. Simply varying the voltage and frequency of the valves' motor input will not result in torque switch operation.

- 3) Lighting
 - 4) Gland Seal Exhauster
 - 5) I&C Transformer
 - 6) Airlocks
- 3) The lighting may momentarily dim, but should brighten within a couple of seconds.
 - 4) The gland seal exhauster does not automatically restart after power is restored to Bus 2B and, therefore, would not be subject to the frequency transient.
 - 5) Examples of I&C transformer loads are I&C power supplies ES8512A and ES8512B which are rated for operation at 50-400 Hz.
 - 6) By design, the air lock door hydraulic pump motors will not automatically resume operation after power is restored to Bus 2B and, therefore, will not be subjected to the EDG output transient. The air lock control circuits (like the EFP), however, are subjected to such transients approximately every three days. The ability of these circuits to sustain such transients and operate as designed has been proven frequently in the past.

Regarding the acceptability of the EDG output frequency transient according to current licensing criteria, it should be reemphasized that Paragraph C.4 of Regulatory Guide (RG) 1.9 recommends: "The diesel-generator unit design should be such that at no time during the loading sequence should the frequency and voltage decrease to less than 95 percent of nominal and 75 percent of nominal, respectively. (A larger decrease in voltage and frequency may be justified for a diesel-generator unit that carries only one large connected load.)"

Since the RG 1.9 description of under what circumstances a larger decrease in frequency may be justified is quite vague, there is room for quite dissimilar interpretations. As interpreted by EG&G and documented in its interim report (see Reference #1), RG 1.9 allows justification of a frequency decrease below 95% of nominal if the diesel generator carries only one large connected load. The EG&G interim report states: "Since the Big Rock Point diesel-generator carries more than one load, the frequency drop to 54.5 Hz is not in compliance with current licensing criteria". CP Co considers the EG&G interpretation to be incorrect since this interpretation would require that the EDG carry only one load and that this load be a large load in order that justification for a frequency <95% be permitted.

As documented in Reference #4, CP Co assumes a more realistic approach in its interpretation of RG 1.9, Paragraph C.4. Utilizing the NEMA MG-1 definition of "large apparatus" to be 100 hp or greater (see Reference #5), it becomes apparent that only one large load is connected to the EDG during initial load assumption; namely the 100 hp (nameplate rating) EFP. Utilizing full load ratings, the EFP alone constitutes a load equivalent to $108 \text{ kVA} / 250 \text{ kVA} = 43.2\%$ of the EDG full load rating. The balance of the EDG loads that comprise the initial step load group (namely the core spray valves, the lighting, the gland seal exhauster, the I&C transformer and the air locks) represent only $58.1 \text{ kVA} / 250 \text{ kVA} = 23.2\%$ of the EDG full load rating. During starting conditions, the EFP alone comprises between 80% and 90% of the total starting kVA load imposed on the EDG. For these reasons, CP Co feels justified in stating that the Big Rock Point EDG carries only one large connected load.

In an attempt to eliminate the requirement of interpreting RG 1.9, CP Co prefers utilizing one of the basis documents for RG 1.9; namely IEEE 387-1977. Paragraph 5.1.2(5) of the standard (see Reference #3) states that a diesel generator unit shall be capable of "maintaining voltage and frequency at the generator terminals within limits that will not degrade the performance of any of the loads comprising the diesel load below their minimum requirements, including the duration of transients caused by load application or removal". It is the opinion of CP Co that the Big Rock Point EDG provides an output in accordance with this criteria.

CONSUMERS POWER COMPANY RESPONSE
TO EG&G AND NRC REVIEW OF
EMERGENCY DIESEL GENERATOR OUTPUT FREQUENCY

LIST OF REFERENCES

(Sheet 1 of 2)

<u>Reference Number</u>	<u>Reference Description</u>
1.	EG&G Interim Report #EGG-EA-5882, "Systematic Evaluation Program, Topic VIII-2, Diesel Generator, Big Rock Point", dated May 1982.
2.	NRC Final Safety Evaluation as transmitted to CP Co in letter: DMCrutchfield to DJVandeWalle, "SEP Topic VIII-2, Onsite Emergency Power Systems - Diesel Generator, Final Safety Evaluation For Big Rock Point", dated June 22, 1982.
3.	IEEE 387-1977 "IEEE Standard Criteria for Diesel-Generator Units Applied as Standby Power Supplies for Nuclear Power Generating Stations", Para 5.1.2(5) "Quality of Power".
4.	Letter: RAVincent to DMCrutchfield "Big Rock Point Plant - SEP Topic VIII-2, Onsite Emergency Power Systems - Diesel Generator", dated April 21, 1982.
5.	NEMA MG-1 "Motors and Generators", Part 20 "Large Apparatus - Induction Motors", June 1981.