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General Offices: 212 West Michigan Avenue, Jackson, Michigan 49201 • Area Code 517 788-0550

March 27, 1972

Dr. Peter A. Morris, Director
Division of Reactor Licensing
United States Atomic Energy Commission
Washington, DC 20545

Re: Docket No 50-155
License No DPR-6

Dear Dr. Morris: Att: Mr. D. J. Skovholt

We are currently in the second week of a five-week refueling outage for the Big Rock Point Plant. The fuel sipping results have indicated the need to reuse two Reload EG fuel bundles (EG-55 and -70) that were classified to be failed during the 1970 refueling outage. Following the 1970 refueling outage, the failed rods in each fuel bundle (two per bundle) were removed and nuclear and thermal hydraulic analyses were performed to determine their suitability for reinsertion in the reactor.

Both EG-55 and EG-70 were in the reactor one cycle. Their exposures in MWd/$_t$ at the end of that cycle were 4441 and 3850, respectively. Visual examination of the failed fuel rods indicated that the failures were most likely due to hydriding of the cladding.

The repairs to EG-55 included the removal of the two failed fuel rods, A-4 and H-5, and the replacement of the two EEI mixed oxide rods with two fresh 2.5 w/o U-235 rods. One of the two vacancies in the fuel bundle is in a tie rod location. Engineering analysis performed on this bundle indicates the mechanical integrity is not affected by this vacancy. The lifting strength supplied by the seven existing tie rods is more than adequate for any normal anticipated lift requirement on the bundles.

The two rods removed from EG-70 were B-7 and H-5.

The reactivity of the repaired fuel bundles was calculated, assuming a bundle average exposure of 4,500 MWd/t, and is compared with a nonrepaired Reload EG bundle at the same exposure.

Bundle	K_∞
Reload EG	1.1352
E-55	1.1488
E-70	1.1466

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Nuclear calculations were performed on these two bundles and compared to peaking calculations on a Reload EG bundle at 5,000 MWd/t. The ratio of the rod power in a repaired bundle to the rod power in a nonrepaired bundle, assuming the same power is being produced in each bundle, is presented in Figures 1 and 2 (attached). Under the assumed conditions, the maximum increase in individual rod power is 19.4%. Because of the increase in rod power of some rods, assuming equivalent bundle powers, we are planning to insert these two bundles in core locations where their bundle power will not exceed the core average bundle power. The steady state and overpower condition heat flux limits specified by Section 5.2.1 of the Technical Specifications will, of course, be observed.

Because the two fuel bundles have a slightly different configuration with two rods removed as compared with a normal fuel bundle, they were analyzed for possible adverse thermal hydraulic effects. This was done with a three-dimensional subchannel analysis in order to investigate the effect on flow and CHFR (critical heat flux ratio) of removing the two rods. The results from the three-dimensional analyses using the multirod best-fit CHF correlation were compared with the results from normal one-dimensional analysis using the Hench-Levy CHF correlation. This comparison shows that the one-dimensional calculation is conservative and that the additional flow areas created by removing the fuel rods present no flow problem. Therefore, it has been concluded that normal one-dimensional calculations for CHFR can be applied to these two fuel bundles.

Based on the analyses presented above, we have concluded that these two fuel bundles are suitable for reuse in the Big Rock Point Plant reactor. We have further concluded that the operating limits contained in the Technical Specifications are conservative. In our opinion, the removal of two fuel rods from each of these two fuel bundles does not constitute a sufficient change in this fuel to require a change in the Technical Specifications.

During the 1971 refueling outage, nine (9) EG bundles were classified as failed. Following the 1971 refueling outage, detailed nuclear calculations were performed to establish possible rod trades that would not affect fuel bundle nuclear characteristics.

During January 1972, three good fuel bundles were formed by trading rods based on the nuclear calculations. Two more good fuel bundles were formed by trading rods that fell slightly outside of the criteria established by the aforementioned calculations. Further nuclear calculations were performed on these two fuel bundles. These calculations showed that the maximum change in local peaking factors was 0.6%. The resultant peaking factor for rods that increased in power was still less than the maximum rod peaking factor in the fuel bundles. Based on these calculations,

we have concluded that these five reconstituted EG fuel bundles are equivalent to the original EG fuel bundles. We plan to reinsert these fuel bundles in the Big Rock Point reactor during the present refueling outage.

Yours very truly,

Ralph B. Sewell

RBS/map

Ralph B. Sewell
Nuclear Licensing Administrator

CC: Boyce H. Grier,
USAEC

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3-27-72

EG-55

Relative Power Generation per Rod

	A	B	C	D	E	F	G	H	I
1	Co	1.026	1.012	1.002	0.995	1.002	1.017	1.027	Co
2	1.065	1.035	1.009	0.990	0.892	0.993	1.012	1.016	1.036
3	1.194	1.084	1.022	0.994	0.986	1.001	1.025	1.045	1.048
4		1.132	1.030	1.000	0.999	1.002	1.079	1.134	1.082
5	1.151	0.966	1.012	0.998	1.002	1.033	1.145		1.125
6	1.058	1.022	0.999	0.991	0.996	1.018	1.076	1.131	1.080
7	1.031	1.011	0.994	0.984	0.981	0.997	1.018	1.034	1.039
8	1.023	0.999	0.998	0.984	0.890	0.988	1.001	1.011	1.024
9	Co	1.016	1.008	0.996	0.992	0.999	1.007	1.015	Co

$$\text{Relative Rod Power} = \frac{\text{New Local Peaking Factor}}{\text{Old Local Peaking Factor}} \times \frac{77}{75}$$

(Assumes Equal Bundle Powers)

Figure 1

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EG-70

Relative Power Generation per Rod

	A	B	C	D	E	F	G	H	I
1	Co	0.989	0.987	0.987	0.987	0.992	0.996	0.998	Co
2	0.989	0.984	0.984	0.983	0.943	0.991	1.000	1.019	1.008
3	0.992	0.987	0.988	0.989	0.992	1.005	1.025	1.034	1.029
4	0.998	0.993	0.995	0.995	1.002	1.027	1.085	1.135	1.073
5	1.016	0.972	1.013	1.005	1.011	1.040	1.156		1.120
6	1.058	1.103	1.063	1.021	1.010	1.029	1.087	1.135	1.073
7	1.100		1.108	1.027	1.004	1.010	1.027	1.035	1.030
8	1.053	1.111	1.053	1.013	0.953	0.996	1.002	1.006	1.011
9	Co	1.025	1.018	1.007	0.997	0.997	1.000	1.001	Co

$$\text{Relative Rod Power} = \frac{\text{New Local Peaking Factor}}{\text{Old Local Peaking Factor}} \times \frac{77}{75}$$

(Assumes Equal Bundle Powers)

Figure 2

FROM:
Consumers Power Company
Jackson, Michigan 49201
Ralph B Sewell

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Dr. Peter A. Morris

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DESCRIPTION: (Must Be Unclassified)
Ltr furnishing info regarding the reuse of two Reload EG fuel bundles (EG-55 & EG-70) during refueling outage at Big Rock Point w/attached Figures 1 & 2...

ENCLOSURES:

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