UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

MAR 2 1973

Files (Docket No. 50-155)
THRU: D. L. Ziemann, Chief, ORB #2, L
D.L. Ziemann

AUXILIARY NEUTRON SOURCES FOR BIG ROCK POINT CORE (CONSUMERS POWER COMPANY)

By letter dated February 2, 1973, Consumers Power Company requested approval of changes to the Technical Specifications of Facility Operating License No. DPR-6 to permit insertion of two additional auxiliary neutron sources designed to be compatible with the new 11 x 11 rod array fuel bundles that will be used to reload the core in 1974 and thereafter.

The new auxiliary sources consist of a homogeneous, 50-50 mixture of antimony-beryllium encapsulated in a 0.3/4 inch OD steel tube that fits inside a zircaloy fuel tube identical to those used for fuel rods and cobalt targets in the 11 x 11 rod bundle. The source occupies the middle 44.26 inches of the 70.110-inch source tube, held there by steel tube spacers at each end.

The two new auxiliary sources will eventually replace the two original auxiliary neutron sources which were inserted into the Big Rock Point core[1,2] during the 1971 refueling outage. The original auxiliary neutron sources experienced damage to the secondary encapsulation that was detected and repaired during the 1972 refueling outage[3]. The changeover from 9 x 9 to 11 x 11 reload G fuel bundles beginning with the 1974 refueling outage necessitates the eventual removal of the original auxiliary neutron sources before all of the 9 x 9 fuel bundles will be removed (by 1977) because the original sources will not fit into the smaller tubes of the reload G fuel bundles. The new auxiliary neutron sources will be positioned in one of the four cobalt target positions in the two lead reload G fuel bundles to be inserted into the Big Rock Point core during the March 1973 refueling outage so that the neutron source activity can build up to a useful level before it is necessary to remove the two old auxiliary neutron sources.

We have reviewed the information provided by the CPCo letter dated February 2, 1973, and the attached fuel bundle power profiles that were provided during a February 7, 1973 telecon in response to our request.

The new auxiliary neutron sources do not differ significantly from the original neutron sources, and the conclusions in our previous evaluation remain unchanged. However, until the neutron source activity builds up to a useful level (a year but no more than 3 years), the original auxiliary neutron sources will remain in the core positions close to the startup detectors. We have concluded, based on the attached power profiles, that no new restrictions on the two lead reload G fuel bundles are required due to the substitution of an auxiliary neutron source in place of one of the four cobalt targets in the corner positions since, according to the attached comparison of Table 1 and Table 2, the inner rod power remains unchanged and the outer peak power rods change less than 1%. Table 3 for the upper and lower void in the auxiliary neutron source shows that the outer rod power generation is increased noticeably; but since the peak heat flux does not occur in this axial region, the critical heat flux ratios are not significantly changed.

Based on the above considerations, we have concluded that operation of the Big Rock Point reactor with the two new auxiliary neutron sources inserted in its core in the manner described does not decrease the critical heat flux ratios significantly, change the LBA peak clad temperature, increase the probability or change the consequences of the design basis accident, nor does it present significant hazards considerations not described or implicit in the Safety Analysis Report. There is reasonable assurance that the health and safety of the public will not be affected by the change.

James J. Shea
Operating Reactors Branch #2
Directorate of Licensing

Enclosures:
1. Tables 1 - 3
2. References

cc w/enclosures:
RTedesco, L:CS (2)
DJSkovholt, L:OR
TJCarter, L:OR
RO (3)
DLZiemann, L:ORB #2
JJShea, L:ORB #2
RMDiggs, L:ORB #2
MJinks, DRA (2)
AEC PDR
~~Local PDR~~

TABLE 1

Cobalt Targets in 4 Corner Positions

Co 0	1.067	0.975	1.167	1.111	1.094	1.111	1.167	0.975	1.067	0
	1.153	1.003	1.179	1.093	1.066	1.093	1.179	1.003	1.153	1.067
		1.086	0.921	0.812	0.464 Gd	0.812	0.921	1.086	1.003	0.975
			1.146	0.946	0.862	0.946	1.146	1.093	1.179	1.167
				0.798	0.784	0.798	0.946	0.812	1.093	1.111
					hollow 0	0.784	0.862	0.464 Gd	1.066	1.094
						0.798	0.946	0.812	1.093	1.111
							1.146	0.921	1.179	1.167
								1.086	1.003	0.975
									1.153	1.067
										0

TABLE 2

Antimony-Beryllium - 45-Inch Length Centered

Source 0	1.105	0.992	1.177	1.115	1.094	1.110	1.164	0.972	1.064	0
	1.183	1.019	1.189	1.097	1.066	1.092	1.176	1.000	1.149	1.064
		1.098	0.927	0.814	0.464 Gd	0.811	0.919	1.083	1.000	0.972
			1.151	0.947	0.862	1.944	1.143	1.090	1.175	1.163
				0.798	0.783	0.796	0.943	0.809	1.089	1.107
					Hollow 0	0.782	0.859	0.462 Gd	1.062	1.090
						0.795	0.943	0.809	1.089	1.107
							1.142	0.918	1.175	1.163
								1.082	0.999	0.971
									1.149	1.063
										0

TABLE 3

Upper or Lower 12.5 Inches Source Extension - SS304

Source										
0	1.128	1.004	1.185	1.119	1.096	1.109	1.163	0.971	1.062	0
	1.205	1.031	1.197	1.100	1.068	1.091	1.175	0.999	1.147	1.061
		1.108	0.932	0.816	0.464	0.810	0.917	1.081	0.998	0.969
			1.156	0.949	0.862	0.943	1.141	1.087	1.172	1.160
				0.798	0.782	0.795	0.941	0.807	1.086	1.104
					0	0.780	0.857	0.461	1.059	1.087
						0.793	0.940	0.807	1.086	1.103
							1.138	0.915	1.171	1.159
								1.078	0.996	0.968
									1.145	1.059
										0

REFERENCES

1. Proposed change to insert two auxiliary neutron sources in removable fuel rod positions in two Big Rock Point core fuel bundles - CPCo letter dated January 18, 1971.

2. Change No. 23 - Approval to insert two auxiliary neutron sources in the Big Rock Point core. Letter from DL to CPCo dated February 22, 1971.

3. Repairs to Outer Zircaloy Encapsulation of Auxiliary Neutron Sources Installed in Big Rock Point reactor in February 1971 - CPCo letter dated April 19, 1972.