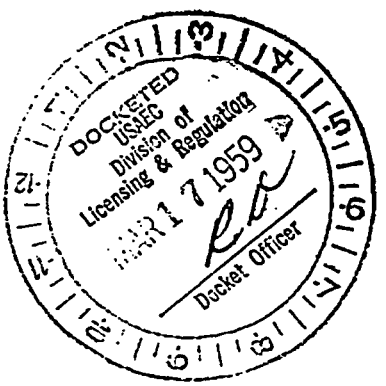
Docket No. 50-39
File Cy.

CURTISS-WRIGHT CORPORATION
RESEARCH DIVISION
QUEHANNA, PENNSYLVANIA
AMHERST 3-4711

March 9, 1959



U. S. Atomic Energy Commission
Division of Licensing & Regulation
1901 Constitution Avenue
Washington 25, D. C.

Attention: Mr. Lyall Johnson, Chief
Licensing Branch
Division of Licensing and Regulation

Gentlemen:

Application is hereby made for a Construction permit to modify our present Utilization Reactor Facility.

At the present time, our Reactor Facility License No. R-36, Amendment No. 2, authorizes us to operate the facility without secondary cooling at power levels up to one megawatt for test runs not to exceed ten (10) hours in duration.

We propose to install additional cooling equipment consisting of a secondary water cooling tower, heat exchanger, and primary and secondary coolant pumps; to redesign and increase the capacity of the Water Purification system; and to make necessary building modifications to contain this additional equipment. Upon effecting such changes, application will be made to the AEC for an amendment to our Reactor Facility License to permit us to increase the power level of the facility from one (1) megawatt to four (4) megawatts thermal, operating under the following conditions:

Flow Rate	1200 GPM
Slow Shutdown-Low Flow	900 GPM
Differential temperature across Core	22.7°F
Alarm temperatures	
Core effluent (annunciation)	115°F

Calculations have indicated that the average maximum fuel element plate temperatures under these conditions will be approximately 165°F. These calculations are based on a core array of 4 x 5, 16 normal fuel elements and 5 control elements without reflector elements.

D-132

(15 Cys. Rec'd)

In conjunction with our application to increase the power level of the facility, a revised edition of the Hazards Evaluation Report will be prepared and submitted. However, for your information, the following is a summary of the major changes to be made in the current Hazards Evaluation Report (CW 400-2, Second Edition dtd. Dec. 1958) so as to incorporate the effect of operating at the indicated increased power level:

I-A-1 Fuel Elements

The present 10 plate element will be substituted by either an 18 or 19 curved plate modified MTR type element. Each plate contains 9 grams of 93% enriched U-235. The overall element dimensions are 3 inch by 3 inch by 35 inches long including nosepiece with a .05 inch thick plate and .12 inch thick coolant passage between plates. Calculations contained therein are based on 19 plate elements.

I-A-6 Cooling System

Coolant water can be pumped through the core at 700 or 1200 GPM through a heat exchanger and returned to pool.

In the secondary system, water can be pumped at 800 or 1600 GPM through a heat exchanger to cooling tower.

At 4 Mw, Reactor can be operated continuously with bulk of pool water at 90°F; temp. rise through core will be approximately 22.7°F.

Low flow and high temperature will be annunciated at the control panel in addition to gauges which will indicate temp. throughout the Primary and Secondary cooling systems.

I-B-3 Water Purification System

A 50 GPM pump in parallel with the present 15 GPM will be installed. Cuno filters have been installed on the inlet to the deionizers. Water can be circulated at 50 GPM through the deionizers from either the pool sump or a pool skimmer, located at the pool water surface.

Therefore, the skimmer serves the purpose of removing foreign particles on the surface of the water in conjunction with purification.

II-G Fuel Management

Increase expected fuel burnup to 20% to minimize frequency of fuel replacement. Associated hazards created by increased fuel burnup are discussed on the following page.

III-A-1 Change in estimated reactivity requirements Table VIII.

TABLE VIII

Estimated Reactivity Requirements

Source	Reactivity Required
Negative temperature coefficient	.001
Poisons (Xe, Sm, etc.)	.048
Experimental requirements	.002
Adequate rate of change of power level	.002
Addition of smallest increment of reactivity available	.003
Xenon override	.010
Total Requirement	.066

IV POSSIBLE CONSEQUENCES OF A RELEASE OF RADIOACTIVE MATERIALS TO THE ATMOSPHERE

As a result of increasing the maximum power from 1 Mw to 4 Mw and extending the maximum burnup from 10% to 20%, the fission product inventory available in the event of an incident is increased. Two general cases of radiation exposure had been considered, namely external radiation from a cloud or from fallout and internal radiation due to inhalation of active materials. In the former case, the gross activity was of concern and in the latter specific isotopes which concentrated in specific tissue were considered.

The gross β-γ activity will be increased by a factor of four by the proposed power and external dose therefore is increased by the same factor. When specific isotopes are considered, the power level determines the available activity in the case of short-lived isotopes, but the burnup determines the available activity for long-lived isotopes. Thus, the activity of Ba-140 / La-140 is increased about four-fold; while the activity of Sr-90 / Y-90 is increased by about two-fold in the case of continuous operation until burnup.

The doses at various points from the reactor under the conditions considered in CWR-400-2 are increased by a factor of 2.5 for internal radiation, and by a factor of 4 for external radiation. The maximum doses considered in CWR-400-2 were not serious even without consideration of many modifying factors which greatly reduce the dose. The proposed operating conditions would still not represent a serious situation.

In the worst case, the maximum dose under inversion conditions at the main area on-site is about 51 rep. This applies only if there is no cloud rise or depletion of the cloud, and a person remains on the cloud axis unsheltered. There would be about 2 hours' warning to permit evacuation if necessary.

Appendix IV - A shut down check-out procedure will be added.

The new 4 Mw Hazards Evaluation Report is now in the process of preparation and should be completed by about May 1, 1959.

Very truly yours,

CURTISS-WRIGHT CORPORATION
RESEARCH DIVISION

Wm. T. LAKE
Controller

State of New Jersey :
: ss.
County of Bergen :

Wm. T. Lake , being duly sworn according to law, deposes and says that he is the Controller of the Curtiss-Wright Corporation mentioned in the foregoing application, that he has read the said application and knows the contents thereof and that the same is true to his own knowledge except as to matters therein stated on information and belief and as to those matters he believes it to be true.

Wm. T. LAKE
Controller

Sworn to and subscribed
before me this 16th day
of March, 1959.

Notary Public
NOTARY PUBLIC OF NEW JERSEY
MY COMMISSION EXPIRES JULY 16, 1961

I, Roger W. Mullin, Jr. , certify that I am the Secretary of the Corporation named, as applicant herein, that Wm. T. Lake , who signed this application, was then Controller of said Corporation; that said application was duly signed for and in behalf of said Corporation by authority of its governing body, and is within the scope of its corporate powers.

Secretary