DOCKET NO. 50-22
Formal Filing

Westinghouse

ELECTRIC CORPORATION

TESTING REACTOR
July 18, 1960

P.O. BOX 1075
PITTSBURGH 30 PA.

Mr. H. L. Price, Director
Division of Licensing and Regulation
U. S. Atomic Energy Commission
Washington 25, D. C.

Dear Mr. Price:

Subject: License No. TR-2
Docket 50-22

During a meeting with members of your staff on July 12, 1960 certain information was requested to supplement that furnished you with our letter of July 11, 1960.

In paragraph 3, page 3, of our letter we proposed to limit heat flux by limiting the amount of local boiling in the core. A satifactory alternate method of heat flux control is the establishment of minimum primary coolant flow conditions as a function of power level. The following table gives suitable operating conditions which will be observed during the escalation program and early 60 MW operation of the WTR.

Power Level as a Function of
Minimum Core Flow
and Inlet Temperature

Thermal Power	Inlet Temperature °F	Minimum Core Flow GPM	(Approximate Total Coolant Flow GPM)
60	140	11 200	16 800
60	115	9 260	13 900
50	140	8 200	12 300
50	115	7 530	11 300
40	140	6 530	9 800
40	115	5 930	8 900

In between conditions are to be obtained by linear interpolation.

These values were derived on the basis presented in Section X of Report WTR-49. A 10% hot channel factor has been added to cover small defects in fuel elements. The resulting values represent an operational safety factor in burnout heat flux greater than 2.3 under all operating conditions.

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Attached are forty (40) copies of WTR Operating Procedures P-107 which detail action to be taken by the reactor operating staff in the event of sudden reactivity changes or fission product release to the primary coolant.

As requested, we have conducted a thorough review of both the construction drawings and the installed equipment of the primary loop, the vapor container, and the ventilation system in an effort to determine if there were any possible paths of leakage in the containment system. No other possible direct leakage from the containment system other than the known venting system of the primary coolant head and surge tanks was discovered. We have recently applied to the Isotopes Branch of the Division of Licensing and Regulation for a broad Byproduct Materials License. In the course of preparing information required for this license, we are conducting a thorough examination and analysis of any possible abnormal radioactive discharge from secondary radiation sources, such as laboratories and hot cells. The results of this study will be presented to the Isotopes Branch.

We have found the incident of the fuel element failure, although regrettable, to have been a valuable experience from the standpoint of operating standards and procedures, the handling of emergency conditions, and the development of techniques. The following requirements have been particularly emphasized:

a. The need for extreme care in specifying, handling, and inspecting fuel. No step in the process can be taken for granted. In addition to the inspection program outlined in our July 11, 1960 letter, we have set up local inspection facilities immediately adjacent to the main fuel storage rack for rechecking key mechanical dimensions of fuel elements after receipt from the supplier.

b. The training process for reactor operators and supervisors must be a continuing program. We have emphasized and will continue to emphasize to the reactor operators that a sudden change in negative reactivity can be as symptomatically significant as a positive change in reactivity We will, as in the past, continually stress safety at our operations staff meetings and make every effort to keep our operators constantly on the alert for unusual operating symptoms.

As a result of the incident, a number of minor changes have been made or are underway in the plant system. Among the modifications are:

a. Relocation of the fission product monitor to obtain a greater speed of response.

b. Addition of more drainage points in the primary loop to permit easier removal of radioactive particles at pipe bends and other inconvenient locations.

c. Addition of lead shielding on the bottom head of the reactor vessel and rabbit tubes to reduce the radiation level in the sub-pile room.

d. Addition of a spray-wash-down system to confine contamination to the pressure vessel when head is being removed.

e. Addition of new waterproof lines for primary loop temperature instrumentation to permit operation should pipe tunnels become flooded.

f. Addition of a canal filter and vacuuming system to clean up radioactive particles on the floor of the canal.

A number of new techniques for handling radiation and decontamination problems are now available. Methods have been developed for clearing the reactor vessel of radioactive particles, decontaminating the vessel head, removing the shroud tubes when they are contaminated, cleaning the primary piping system, decontaminating the heat exchangers and cleaning the surge tank. Improved methods of waste disposal and water handling have been developed. Canal machinery and underwater handling processes have been improved. Health Physics instrumentation has been strengthened, and the procedures and clothing for working under radioactive conditions have all been proven or modified by experience. Our immediate permanent personnel level has been increased from 110 to 135 of which 8 have been additions to the Health Physics Department.

In summary, our personnel has been subjected to a rigorous experience in the handling and control of high-level radiation problems. This experience has resulted in increased strength in all areas of operation which will be a major factor in the future successful operation of the WTR.

Sincerely yours,

E. T. Morris
General Manager

WTR TECHNICAL OPERATIONS OPERATING PROCEDURES AND STANDARDS	NO. P-107
SUBJECT: ABNORMAL OPERATION PROCEDURES	PAGE 4 OF 7

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July 6., 1960	Original	S.P. NO.: REV. NO.: DATED:

UNEXPLAINED REACTIVITY LOSS

In the event of anv unexplained reactivity loss, as evidenced by:

1. A negative period less than 100 seconds,
2. A power level drop of 2 MW or greater,
3. Continuous control rod motion when on AUTOMATIC control,

the reactor will be removed from AUTO control, and no attempt will be made to restore reactivity or power level by pulling rods until the phenomenon can be explained.

In the event of a major reactivity loss, as evidenced by:

1. Period meter offscale (negative),
2. A power level drop of 10 MW or greater,

the reactor will be scrammed immediately and no attempt to restore power will be made until the phenomenon can be explained.

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WTR-FORM 34

DATE:	REVISION NO.	SUPERSEDES
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FISSION PRODUCT RELEASE INTO PRIMARY COOLANT

Fission product release because of a defective fuel element or experiment will be indicated by high level on the Fission Product Monitor and/or the Head Tank Vent Monitor. In the event of an alarm from either of these channels, the following procedure will be initiated.

1. Cutback reactor power level manually to 20 MW.
2. Verify alarm.
   a. If alarm is from Fission Product Monitor, check against Head Tank Vent Monitor.
   b. If alarm is from Head Tank Vent Monitor, close valve with manual control. If level drops, alarm should be presumed to be genuine.
3. Scram reactor immediately and carry out Plant Shutdown Procedure P-105, but keep PC Ion Exchanger in service. Return water from Surge Tank to Head Tank as necessary to balance Ion Exchanger flow.
4. Obtain complete radiation survey of WTR site and water samples from accessible points in Shutdown Coolant System. Further steps will be determined by the results of this sampling.

ADDITIONAL STEPS FOR LARGE SCALE RELEASE

If a large scale release occurs, such as might be caused by a fuel element meltdown, the fission product concentration in the head tank will raise radiation levels throughout the plant to the point where most of the radiation monitor channels will alarm. If it becomes apparent that this has happened, the reactor will be scrammed and the procedure below will be initiated.

1. The Shift Supervisor, or his delegate in the Control Room, will order evacuation of the plant with exception of Control Room staff and assume the duties of Emergency Coordinator, as specified in the WTR Emergency Procedure Manual.
2. Make certain that automatic closure of Head Tank Vent Valve and shutdown of Surge Tank Blower have taken place.
3. Close Main Flow Control Valve.
4. Open Shutdown Stop Valve (stopping PC pumps).
5. Close Main Stop Valve.

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6. Start Shutdown Coolant Pump.

7. At this point the Control Room will be evacuated if necessary, due to high radiation level or airborne contamination. Otherwise, continue steps below. If evacuation is necessary, they will be carried out as soon as control room can be re-entered.

8. Initiate periodic radiation surveys and PC water analysis. Pump water from surge tank to head tank as needed to balance flow through PC Ion Exchanger.

9. The next step will be to allow off-gassing of head tank.

   a. Open Head Tank Vent Valve. If Head Tank Vent Monitor approaches level required for automatic closure, it will be closed immediately. Repeat at 15 minute intervals until it is possible to leave valve open.

   b. Start surge tank blower. If Head Tank Vent Monitor approaches level required for automatic shutdown, stop blower immediately. Repeat at intervals of 15 minutes until blower can be left in operation.

   c. Start up PC System and operate at 4,000 gpm. If Head Tank Vent monitor approaches the control point, the vent valve will be closed, the PC system shutdown, and the entire process repeated in 30 minutes. During this period the Secondary Cooling System will be operated to keep primary coolant as close to normal operating temperature as possible.

10. The PC system will be operated in this manner for at least four hours, and longer if it appears to be still effective. At the end of this period periodic overflowing of the surge tank will be allowed, to produce a gradual drop in head tank level.

11. When sufficient water has been drained from the PC system to make further operation impossible, it will be shut down and Shutdown Coolant Flow re-established.

12. When the reactor core has decayed to the point at which convection cooling and reduced water level will provide adequate heat removal, the snake pit valves will be opened and the vessel and associated piping drained down to the level of the outlet line. While this is being done, the LP thimble instrumentation should be monitored to detect any undesirable temperature increase.

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13. At this point it may be desirable to refill the vessel and drain it again. This will be determined after a review of the results of water sampling.
14. Refill PC System to minimum operating level and restart, operating at 4,000 gpm.

Steps subsequent to this will be determined by a review of the results of water sampling.