GE Nuclear Energy

General Electric Company
175 Curtner Avenue, San Jose, CA 95125

February 24, 1994 Docket No. 52-001

Chet Poslusny, Senior Project Manager
Standardization Project Directorate
Associate Directorate for Advanced Reactors
and License Renewal
Office of the Nuclear Reactor Regulation

Subject: Submittal Supporting Accelerated ABWR Schedule -
Simultaneous Withdrawal of a Control Rod and FMCRD

Dear Chet:

Enclosed is the revised write-up on the consequences of simultaneous withdrawal of a control rod and its FMCRD you requested.

Please provide a copy of this transmittal to Dave Diec amd George Thomas.

Sincerely,

Jack Fox

Jack Fox
Advanced Reactor Programs

cc:

	Alan Beard	(GE)
	Norman Fletcher	(DOE)
	Maryann Herzog	(GE)
	Joe Quirk	(GE)
	Craig Sawyer	(GE)

280035

D50 1/1

CONSEQUENCE OF SIMULTANEOUS WITHDRAWAL OF CONTROL ROD AND FMCRD

In the unlikely event that a control rod and its FMCRD are removed simultaneously, sufficient makeup capability is available to maintain RPV and Spent Fuel pool water levels, while emergency action is taken to plug the opening at the bottom of the vessel.

During drive removal operations, personnel under the RPV will be required to monitor water leakage out of the CRD housing. Abnormal or excessive leakage after only partial FMCRD removal will indicate the absence of a full metal-to-metal seal between the control rod and the control rod guide tube prior to full removal. The FMCRD can then be reinstalled to stop the leakage and allow corrective action. However, if the control rod and FMCRD are removed simultaneously, the personnel under the RPV would use a walkie-talkie to immediately notify the Main Control room personnel of the high leakage out of the CRD housing.

In addition, as water flows out of the RPV into the lower drywell it would be collected in the lower drywell sump. In the Main Control room there are high and low level alarms for the drywell sump. The FMCRD orifice is 60 mm in diameter, producing an expected flow rate from the opening of 174 cubic meters/hr. Due to the high flow rate exiting the RPV it would only take one to two minutes to reach high level in the sump and activate the alarm.

Therefore, within two minutes the Main Control room personnel will be aware of the leakage from the bottom of the RPV. At that time the plant personnel would start to take action to close off the tunnel entrances and plug the opening at the bottom of the vessel.

The supply of pool makeup water is automatically started upon receipt of a Spent fuel pool low water level signal, in addition an alarm is activated in the Main control room. The systems described on the next page are capable of automatically providing sufficient makeup water to the Spent Fuel Pool and the RPV.

The lower drywell volume up to the equipment platform is 106 cubic meters. At a flow rate of 174 cubic meters/hr it would take 36 minutes for the water level to reach the tunnel entrances and begin flowing into the access tunnels. Assuming it takes less than 6 minutes (per the above paragraphs it should take less than two minutes) for the Main control room personnel to determine that the equipment hatch and personnel access door must be closed. It is expected that the plant personnel can close the personnel door and the equipment hatch within the approximately 30 minutes remaining before the water level would reach the tunnel entrances and begin flowing into the access tunnels. The equipment hatch would be closed by first securing a sufficient number of bolts so that the door could not be pried loose, leakage around the hatch as the remaining bolts are being attached can easily be maintained by sump pumps in the secondary containment.

It would take approximately 10 hours to fill the lower drywell up to the openings that connect the lower drywell to the upper drywell inside the connecting vents. During this time, plant personnel on the refueling floor can replace the control rod and stop the leakage from the bottom of the RPV.

MAKEUP WATER CAPABILITIES:

During the first 21 days of a refueling outage, the Spent Fuel Pool storage pool gate is removed and the spent fuel storage pool, the reactor well and the Dryer/Seperator pool are all interconnected. Spent Fuel Pool low water level activates alarms locally and in the Main Control Room. At an expected flow rate of 174 cubic meters/hr the spent fuel pool water level would drop approximately 0.3 M/hr before the pool low water level alarm goes off in the Main Control room. It is expected that the low water level alarm would go off approximately one hour after water begins flowing from the bottom of the RPV.

After activation of the Spent fuel pool low water level alarm, the Makeup Water Condensate (MUWC) system automatically transfers water to the Fuel Pool Cooling and Cleanup (FPCCU) system. This water is then pumped by the FPCCU pumps at a rate of 250 cubic meters/hr to the Spent Fuel Storage pool.

The Suppression Pool Cleanup (SPCU) system provides backup makeup water if MUWC system is not available. The SPCU systenm is capable of pumping 250 cubic meters/hr to the Drywell/Separator pool.

Additional backup water can be provided by RHR AC independent water addition (ACIWA): water from fire protection system is injected into RPV, at flow rates of at least 144 cubic meters/hr.