



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

April 22, 1993

Docket No. STN 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 Review Schedule - DFSE Open
Item 16-3

Dear Chet:

Enclosed is the justification of three independent ECCS subsystems which addresses DFSE Open Item 16-3.

Please provide copies of this transmittal to Tim Polich.

Sincerely,

Jack Fox
Advanced Reactor Programs

cc: Alan Beard
Norman Fletcher (DOE)
Cal Tang (GE)

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See attached distribution
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ABWR CDF SENSITIVITY TO ESF DIVISIONS OUT OF SERVICE

Attached are results of studies which evaluated the impact on the estimated core damage frequency (CDF) for the GE Advanced Boiling Water Reactor (ABWR) of removing Engineered Safety Feature (ESF) divisions from service during full power. Analyses were performed by modifying and reevaluating the ABWR Level 1 PRA fault and event tree models documented in the SSAR. Results are based on and reflect the impact of complete removal of each division of engineered safety equipment from service, including all power, instrumentation, and service water.

The tabulation which follows summarizes the impact on calculated CDF for the complete removal of a division from service for 30 days per year. Additionally, the tabulation shows the effect on calculated CDF for removing a complete division from service for the entire year. The base line CDF in the PRA is $1.56\text{E-}07$ per year which assumes ECCS trains (RCIC, HPCFB & C, RHR A,B&C) are out of service (OOS) 2% per year (i.e., 1 week) but not concurrently. The effect of out of service times other than 30 days can be obtained by linear interpolation between the ABWR base case value and that for each configuration of interest taken completely out of service.

Although the percentage impact on CDF is significant, the estimated absolute value is still extremely low. The bounding case, i.e., Division I taken completely out of service, yields an estimated CDF of only $2.09\text{E-}06$ per year. This is a factor of five lower than the NRC safety goal.

Division I out of service prevents the initiation of RCIC and RHRA. It has the greatest impact on the CDF since RCIC is essential for core cooling success in the event of station blackout. Next in importance is Division II which initiates HPCFB and RHRB. The HPCFB incorporates a hard wired manual initiation feature diverse from the multiplexing network. This increases the safety importance of Division II. The least impact is seen when Division III is removed from service, preventing the initiation of HPCFC and RHRC.

| CASE | DIVISION OOS 30 DAYS PER YEAR | | DIV. COMPLETELY REMOVED FROM SERVICE | |
|-----------------------------|-------------------------------|------------|--------------------------------------|------------|
| | CDF PER YEAR | % INCREASE | CDF PER YEAR | % INCREASE |
| ABWR BASE CASE FROM SSAR | $1.56\text{E-}07$ | N/A | N/A | N/A |
| DIVISION I OUT OF SERVICE | $3.15\text{E-}07$ | 102 | $2.09\text{E-}06$ | 1240 |
| DIVISION II OUT OF SERVICE | $2.41\text{E-}07$ | 54 | $1.19\text{E-}06$ | 660 |
| DIVISION III OUT OF SERVICE | $1.92\text{E-}07$ | 23 | $5.94\text{E-}07$ | 280 |