GE Nuclear Energy

General Electric Company
175 Curtner Avenue, San Jose CA 95125

April 30, 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 - **DFSER Open Item 3.11.3-1**

Dear Chet:

Enclosed is a SSAR markup and replacements for Tables 3I.3-9 through 3I.3-13 and Tables 3I.3-19 through 3I.3-22 addressing DFSER Open Item 3.11.3-1.

Please provide a copy of this transmittal to Roger Pedersen.

Sincerely,

Jack Fox

Jack Fox
Advanced Reactor Programs

cc: Hal Careway (GE)
Norman Fletcher (DOE)

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3I.3 ENVIRONMENTAL CONDITIONS PARAMETERS

3I.3.1 Plant Normal Operating Conditions

3I.3.1.1 Pressure, Temperature and Relative Humidity

Tables 3I.3-1 through 3I.3-5 define the thermodynamic environment conditions (pressure, temperature, and relative humidity) for areas inside and outside primary containment vessel during plant normal operating conditions including anticipated test and abnormal occurences. The areas outside the primary containment vessel include: (1) reactor building (secondary containment, and clean zones), (2) control building, and (3) turbine building. The drywell cooling system controls the thermal environment within the drywell, thoroughly mixes the inerting gas, and condenses steam from leaks of the primary coolant to support the leak detection and isolation system.

3I.3.1.2 Radiation

Tables 3I.3-9 through 3I.3-13 define the radiation environment conditions for areas inside and outside the primary containment vessel during plant normal operating conditions including anticipated test and abnormal occurences. The areas outside the primary containment vessel include: (1) reactor building (secondary containment and clean zones), (2) control building, and (3) turbine building.

The dose values denote the integrated (over 60 years.) radiation field to which equipment may be exposed.

INSERT A →

3I.3.2 Plant Accident Conditions

3I.3.2.1 Pressure, Temperature, and Relative Humidity

Tables 3I.3-14 through 3I.3-18 define the thermal environment conditions for areas inside and outside primary containment vessel during plant accident conditions including post accident periods. The areas outside the primary containment vessel include: (1) reactor building (secondary containment, and clean zones), and (2) control building. These environmental conditions are due to a postulated reactor coolant (steam or water) pressure boundary pipe rupture. This postulated accident condition is expected to result in the most severe thermal environment conditions

3I.3.2.2 Radiation

Tables 3I.3-19 through 3I.3-22 define the radiation environment conditions inside and outside the primary containment vessel during plant accident conditions including post accident periods. The areas outside the primary containment vessel include: (1) reactor building (secondary containment), and (2) control building. The dose values denote the integrated dose for 6 months to which equipment may be exposed.

← INSERT B

3I.3.2.3 Water Quality and Submergence

Reactor water quality characteristics for the DBA LOCA are as follows:

(1) pH = 5.3 to 8.9

(2) conductivity $\leq$ 2.0 μ S/cm

(3) $\leq$ 8 ppm O_2, $\leq$ 1 ppm CO_2

(4) $\leq$ 1 ppm dissolved salts available to deposit as dry salts upon evaporation from hot surfaces.

(5) $\leq$ 150 ppb undissolved solids

(6) $\leq$ 60 ppb dissolved H_2 arising from $\leq$ 4.0% volume of H_2O in containment atmosphere.

A 1600 micron particle (maximum diameter) sized containment spray with a flow density of (approximately) 1.0 liter/sec per square meter may be initiated at ten minutes following a Loss-Of-Coolant-Accident (LOCA) signal and continuing for up to 100 days, for areas inside primary containment vessel (drywell and wetwell). The plant design includes provisions for drainage to prevent immersion of essential equipment for 100 days of spray operation.

Water quality characteristics for normal operations are listed in Table 5.2-5 for reactor water and Subsection 5.2.3.2.2, Reference 10a, for ECCS water systems.

Equipment will be qualified for submergence or will not be submerged except where submergence is mitigated by safety functions performed by barrier separated redundant equipment.

← INSERT C

INSERT A

The COL applicant should review and revise the radiation environment conditions given in Tables 3I.3-9 through 3I.3-13 based upon as designed and as procured equipment. (See Subsection 3I.3.3.1 for COL licensing information.)

INSERT B

The COL applicant should review and revise the radiation environment conditions given in Tables 3I.3-19 through 3I.3-22 based upon as designed and as procured equipment. (See Subsection 3I.3.3.1 for COL licensing information.)

INSERT C

3I.3.3 COL License Information

3I.3.3.1 Radiation Environment Conditions

The COL applicant should review and revise the radiation environment conditions given in Tables 3I.3-9 through 3I.3-13 and Tables 3I.3-19 through 3I.3-22 based upon as designed and as procured equipment. (See Subsections 32I.3.1.2 and 3I.3.2.2)

Table 3I.3-9

Radiation Environment Conditions Inside Primary Containment
Plant Normal Operating Conditions

Ref Loc	Zone	Operating Dose Rate			Integrated Dose		
		Gamma R/hr	Beta R/hr	Neutron n/cm^2-sec	Gamma R	Beta R	Neutron n/cm^2
b-1	Upper Drywell	20	neg	$6x10^4$	$1x10^7$	neg	$1x10^{14}$
b-2	Lower Drywell (upper area)	20 (see note 4	neg	$2x10^4$	$1x10^7$	neg	$4x10^{13}$
b-3	Lower Drywell (lower area)	15	neg	$1x10^4$	$8x10^6$	neg	$2x10^{13}$
b-5	Wetwell Area	<1	neg	$2x10^2$	$5x10^5$	neg	$4x10^{11}$

Notes:

1. Integration time based upon 1.5 year cycles at 18 months operations at 95% availability over 60 years.
2. Operating dose rate at 100% rated power and 30cm away from the radiation source.
3. Beta dose rates negligible (neg), primarily due to Ar-41and typically only in area between vessel and shield wall.
4. Gamma dose rate directly under vessel. Dose rate will increase to 9,000 R/hr inside shield directy opposite core mid-plane.

Table 3I.3-10

Radiation Environment Conditions Inside Reactor Building (Secondary Containment)
Plant Normal Operating Conditions

Plant Zone	Figure	Operating Dose Rate		Integrated Dose	
		Gamma R/hr	Beta R/hr	Gamma R	Beta R
General Floor Area		$5x10^{-3}$	neg	$3x10^{3}$	neg
RHR Room	1.2-4	$2x10^{-2}$	neg	$1x10^{4}$	neg
RCIC Room	1.2-4	$5x10^{-3}$/2.0 (see note 4)	neg	$3x10^{3}$	neg
HPCF Room	1.2-4	$5x10^{-3}$	neg	$3x10^{3}$	neg
SGTS Room	1.2-10	$5x10^{-3}$	neg	$3x10^{3}$	neg
CUW Room					
Heat Exchanger	1.2-4	20	neg	$1x10^{7}$	neg
Pump Room	1.2-4	0.6	neg	$3x10^{5}$	neg
Filter Demin/tank room	1.2-6	200	neg	$1x10^{8}$	neg
MS Tunnel	1.2-8	4.0	neg	$3x10^{3}$	neg
Divisional Valve Room	1.2-8	$5x10^{-2}$	neg	$3x10^{4}$	neg
Instrument Rack Room	1.2-6	$<1x10^{-3}$	neg	$5x10^{2}$	neg

Notes:

1. Integration time based upon 1.5 year cycles at 18 months operations at 95% availability over 60 years.
2. Operating dose rate at 100% rated power and 30cm away from the radiation source.
3. Beta dose rates negligible (neg), generally less than 0.1mRem/hr.
4. During system check out dose rate will increase to larger number.

Table 3I.3-11

Radiation Environment Inside Reactor Building Outside Secondary Containment
Plant Normal Operating Conditions

Plant Zone	Figure	Operating Dose Rate		Integrated Dose	
		Gamma	Beta	Gamma	Beta
		R/hr	R/hr	R	R
Clean Zones	6.2-26	$6x10^{-4}$	neg	300	neg
Monitor Room	1.2-8	$5x10^{-3}$	neg	$3x10^{3}$	neg

Notes:

1. Integration time based upon 1.5 year cycles at 18 months operations at 95% availability over 60 years.
2. Operating dose rate at 100% rated power and 30cm away from the radiation source.
3. Beta dose rates negligible (neg), generally less than 0.1mRem/hr.

Table 3I.3-12

Radiation Environment Inside Control Building
Plant Normal Operating Conditions

Plant Zone	Figure	Operating Dose Rate		Integrated Dose	
		Gamma R/hr	Beta R/hr	Gamma R	Beta R
Main Control Room, battery and HVAC Rooms	1.2-15	$6x0^{-4}$	neg	320	neg
RCW pump and Heat Exchanger Room	1.2-15	$5x10^{-3}$	neg	270	neg

Notes:

1. Integration time based upon 60 years.
2. Operating dose rate at 100% rated power and 30cm away from the radiation source.
3. Beta dose rates negligible (neg), generally less than 0.1mRem/hr.

Table 31.3-13

Radiation Environment Inside Turbine Building
Plant Normal Operating Conditions

Plant Zone	Figure	Operating Dose Rate		Integrated Dose	
		Gamma R/hr	Beta R/hr	Gamma R	Beta R
Main Steam Stop Valve Area	1.2-25	10	neg	$5x10^6$	neg

Notes:

1. Integration time based upon 1.5 year cycles at 18 months operations at 95% availability over 60 years.
2. Operating dose rate at 100% rated power and 30cm away from the radiation source.
3. Beta dose rates negligible (neg), generally less than 0.1mRem/hr.

Table 3I.3-19

Radiation Environment Conditions Inside Primary Containment
Design Basis Accident Conditions

Plant Zone	Accident	Figure	Dose Rate		Integrated Dose	
			Gamma R/hr	Beta R/hr	Gamma R	Beta R
Drywell	15.6.5	1.2-3	$2x10^7$	$2x10^8$	$2x10^8$	$9x10^8$
Wetwell	15.6.5	1.2-3	$2x10^7$	$3x10^8$	$2x10^8$	$2x10^9$

Notes:

Integrated dose is summed over a six month period for Accident Case 15.6.5.

Table 3I.3-20

Radiation Environment Conditions Inside Reactor Building
Design Basis Accident Conditions (Secondary Containment)

Plant Zone	Accident	Figure	Dose Rate		Integrated Dose	
			Gamma R/hr	Beta R/hr	Gamma R	Beta R
General Floor Area	15.6.5	1.2-4	$5x10^{0}$	$5x10^{1}$	$6x10^{2}$	$2x10^{4}$
RHR Room	15.6.5	1.2-4	$7x10^{4}$	$6x10^{6}$	$3x10^{7}$	$5x10^{9}$
HPCF Room	15.6.5	1.2-4	$5x10^{4}$	$3x10^{6}$	$2x10^{7}$	$3x10^{9}$
SGTS Room	15.6.5	1.2-10	$6x10^{4}$	$5x10^{-2}$	$5x10^{7}$	$2x10^{1}$
RCIC Room	15.6.2	1.2-4	$5x10^{0}$	$5x10^{-2}$	$7x10^{1}$	$2x10^{1}$
MS Tunnel	15.6.4	1.2-8	$6.2x10^{1}$	$1.1x10^{5}$	$8.0x10^{1}$	$3.8x10^{4}$
Divisional Valve Room	15.6.5	1.2-5	$9x10^{4}$	$3x10^{6}$	$4x10^{7}$	$8x10^{9}$
Instrument Rack Room	15.6.5	1.2-6	$5x10^{0}$	$8x10^{1}$	$2x10^{2}$	$2x10^{4}$

Notes:

Integrated dose is summed over a six month period for Accident Case 15.6.5, 6 hours for 15.6.2, and 2 hours for 15.6.4.

Table 3I.3-21

Radiation Environment Conditions Inside Reactor Building
Design Basis Accident Conditions (Outside Secondary Containment)

Plant Zone	Accident	Figure	Dose Rate		Integrated Dose	
			Gamma	Beta	Gamma	Beta
			R/hr	R/hr	R	R
Clean Zones	15.6.5	6.2-26	$4x10^{-3}$	$5x10^{-2}$	$6x10^{-1}$	$2x10^{1}$
Monitor Room	15.6.5	1.2-9	$4x10^{-3}$	$5x10^{-2}$	$6x10^{-1}$	$2x10^{1}$

Notes:

Integrated dose is summed over a six month period for Accident Case 15.6.5.

Table 31.3-22

Radiation Environment Conditions Inside Control Building
Design Basis Accident Conditions

Plant Zone	Accident	Figure	Dose Rate		Integrated Dose	
			Gamma R/hr	Beta R/hr	Gamma R	Beta R
Main Control Room, battery room, computer room.	15.6.5	1.2-15	$3x10^{-2}$	$4x10^{-1}$	$4x10^{0}$	$7x10^{1}$
HVAC Room	15.6.5	1.2-15	$6x10^{-1}$	$5x10^{-2}$	$5x10^{2}$	$2x10^{1}$

Notes:

Integrated dose is summed over a six month period for Accident Case 15.6.5.