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UNION ELECTRIC

April 25, 1994

Document Control Desk
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Mail Stop P1-137
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ULNRC-3008

Gentlemen:

DOCKET 50-483
CALLAWAY PLANT
NUMARC/NESP-007 EAL SUBMITTAL
REQUEST FOR ADDITIONAL INFORMATION

In accordance with our conversation on April 25, 1994 we submit a more conservative setpoint calculation for the **RCS BARRIER** Loss Indicator based on containment activity on GT-RE-59/60. Also enclosed is a copy of our annunciator EALs revised to reduce the number of power supplies failed from thirteen to "Ten or more".

In regards to a potential overlap problem in Group 1 between Alert and Site Emergency classifications, we are currently revising our source terms used for these calculations. We will submit revised setpoints for Site and General Emergency effluent monitors by October 1, 1994. These monitors are not used to classify the emergency unless dose assessment cannot be performed. Further, since these setpoints reduce our current overlap, the level of effectiveness of the RERP is marginally increased.

If you have any questions regarding these responses please call me at (314) 676-8212 or Mr. Mark Hicks at (314) 676-8705.

Very Truly Yours,

Garry L Randolph

for Milton A. Stiller
Manager, Nuclear Safety and
Emergency Preparedness

MAS/MWH:alr
Enclosure

A001

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Group 2 Fission Product Barriers

RCS BARRIER EALs (cont):

3. Containment Radiation Monitoring

The (11 R/hr) reading is a value which indicates the release of reactor coolant to the containment. The reading was calculated assuming the instantaneous release and dispersal of the reactor coolant noble gas and iodine inventory associated with normal operating concentrations (i.e., within T/S) into the containment atmosphere.

Table 15A-1 of the FSAR describes the parameters used in our accident analysis. All values are assumed for 1% failed fuel. Specific isotopes for 1% failed fuel are listed in FSAR Table 11.1-5. Using the listed isotopes for Iodine we calculate the DEI-131 to be 3.28 µci/cc for 1% failed fuel, above our Tech. Spec. limit. Technical Information Document (TID) - 14844 provides factors to calculate DEI-131 when Iodine concentrations are known.

	FSAR 11.1-5 Iodine	DEI-131 Factor per TID-14844	Normalized to DEI-131
I-131	2.25E+0	1.00	2.25E+0
I-132	8.33E-1	.036	3.00E-2
I-133	3.17E+0	.270	8.56E-1
I-134	3.92E-1	.017	6.66E-3
I-135	1.58E+0	.084	1.33E-1
Total	8.23		3.28 µci/cc

These DEI-131 values were ratio'd (divided by 3.28) reducing them to values corresponding to 1 µci/cc DEI-131.

I-131	6.87E-1
I-132	9.16E-3
I-133	2.61E-1
I-134	2.03E-3
I-135	4.05E-2
Total	1.00 µci/gm DEI-131

From Table 11.1-5, the following noble gas concentrations are for 1% failed fuel. Since 1% failed fuel equals 3.28 µci/cc DEI-131, these values were ratio'd (divided by 3.28) and reduced to values corresponding to 1 µci/cc DEI-131.

Group 2 Fission Product Barriers

RCS BARRIER EALs (cont):

Isotope	1% failed fuel µci/cc FSAR 11.1-5		Normalized to 1 µci/cc DEI-131
Kr-83m	1.82E-1	(1.82E-1/3.28)	= 5.56E-2
Kr-85m	9.00E-1	"	= 2.75E-1
Kr-85	6.70E-2	"	= 2.05E-2
Kr-87	5.27E-1	"	= 1.61E-1
Kr-88	1.69E+0	"	= 5.16E-1
Kr-89	4.53E-2	"	= 1.38E-2
Xe-131m	1.59E-1	"	= 4.85E-2
Xe-133m	8.67E-1	"	= 2.65E-1
Xe-133	4.33E+1	"	= 1.32E+1
Xe-135m	1.18E-1	"	= 3.60E-2
Xe-135	2.58E+0	"	= 7.88E-1
Xe-137	8.15E-2	"	= 2.49E-2
Xe-138	3.96E-1	"	= 1.21E-1
Total			1.55E+1

We then take the above Iodines and noble gases in µci/cc and multiply by the total number of cc in the RCS, i.e. 3.46E+8 cc.

Isotope	N.G. conc. = 1µci/ccDEI-131			Total Activity In RCS µci
Kr-83m	5.56E-2	(3.46E+8cc)	=	1.93E+7
Kr-85m	2.75E-1	(3.46E+8cc)	=	9.52E+7
Kr-85	2.05E-2	(3.46E+8cc)	=	7.09E+6
Kr-87	1.61E-1	(3.46E+8cc)	=	5.57E+7
Kr-88	5.16E-1	(3.46E+8cc)	=	1.79E+8
Kr-89	1.38E-2	(3.46E+8cc)	=	4.79E+6
Xe-131m	4.85E-2	(3.46E+8cc)	=	1.68E+7
Xe-133m	2.65E-1	(3.46E+8cc)	=	9.17E+7
Xe-133	1.32E+1	(3.46E+8cc)	=	4.58E+9
Xe-135m	3.60E-2	(3.46E+8cc)	=	1.25E+7
Xe-135	7.88E-1	(3.46E+8cc)	=	2.73E+8
Xe-137	2.49E-2	(3.46E+8cc)	=	8.62E+6
Xe-138	1.21E-1	(3.46E+8cc)	=	4.19E+7
I-131	6.87E-1	(3.46E+8cc)	=	2.38E+8
I-132	9.16E-3	(3.46E+8cc)	=	3.17E+6
I-133	2.61E-1	(3.46E+8cc)	=	9.05E+7
I-134	2.03E-3	(3.46E+8cc)	=	7.05E+5
I-135	4.05E-2	(3.46E+8cc)	=	1.40E+7
Total				5.73E+9

Group 2 Fission Product Barriers

RCS BARRIER EALs (cont):

Taking the Total activity in µci, we disperse each isotope into containment. The volume of our containment is 7.08E+10 cc. This gives us a Total RCS Activity dispersed into Containment in µci/cc.

Kr-83m	2.72E-4
Kr-85m	1.34E-3
Kr-85	1.00E-4
Kr-87	7 87E-4
Kr-88	2.53E-3
Kr-89	6.77E-5
Xe-131m	2.38E-4
Xe-133m	1.30E-3
Xe-133	6.47E-2
Xe-135m	1.76E-4
Xe-135	3.86E-3
Xe-137	1.22E-4
Xe-138	5.92E-4
I-131	3.36E-2
I-132	4.48E-5
I-133	1.28E-3
I-134	9.96E-6
I-135	1.98E-4
Total	8.10E-2

Taking these total activities dispersed into containment and applying the Dose Conversion Factors from FSAR 15A-4 in (R-M3/Ci-sec) gives us a containment dose rate in R/sec. Converting to R/hr we get the contribution of each isotope to the Containment High Range Area radiation monitors, GT-RE-59/60.

Isotope	Total µci/cc	DCF	sec/hr	Dose Rate
Kr-83m	2.72E-4	2.40E-6	3600	2.35E-6
Kr-85m	1.34E-3	3.71E-2	3600	1.80E-1
Kr-85	1.00E-4	5.11E-4	3600	1.84E-4
Kr-87	7.87E-4	1.88E-1	3600	5.33E-1
Kr-88	2.53E-3	4.67E-1	3600	4.25E+0
Kr-89	6.77E-5	5.27E-1	3600	1.28E-1
Xe-131m	2.38E-4	2.91E-3	3600	2.49E-3
Xe-133m	1.30E-3	7.97E-3	3600	3.72E-2
Xe-133	6.47E-2	9.33E-3	3600	2.17E+0
Xe-135m	1.76E-4	9.91E-2	3600	6.29E-2
Xe-135	3.86E-3	5.75E-2	3600	7.98E-1
Xe-137	1.22E-4	4.51E-2	3600	1.98E-2
Xe-138	5.92E-4	2.80E-1	3600	5.96E-1
I-131	3.36E-2	8.72E-2	3600	1.06E+0
I-132	4.48E-5	5.13E-1	3600	8.28E-2
I-133	1.28E-3	1.55E-1	3600	7.14E-1
I-134	9.96E-6	5.32E-1	3600	1.91E-2
I-135	1.98E-4	4.21E-1	3600	3.01E-1
Total				1.09E+1

We will use 11 R/hr for our indicator for the dispersion of RCS into the Containment at an activity of 1 µci/gm DEI-131.

TABLE 15A-1

PARAMETERS USED IN ACCIDENT ANALYSIS

I.	General	
1.	Core power level, Mwt	3636 (102% power)
2.	Number of fuel assemblies in the core	193
3.	Maximum radial peaking factor	1.65
4.	Percentage of failed fuel	1.0
5.	Steam generator tube leak, lb/hr	500
II.	Sources	
1.	Core inventories, Ci	Table 15A-3
2.	Gap inventories, Ci	Table 15A-3
3.	Primary coolant specific activities, µCi/gm	Table 11.1-5*
4.	Primary coolant activity, technical specification limit for iodines - I-131 dose equivalent, µCi/gm	1.0
5.	Secondary coolant activity technical specification limit for iodines - I-131 dose equivalent, µCi/gm	0.1
III.	Activity Release Parameters	
1.	Free volume of containment, ft^3	2.5×10^6
2.	Containment leak rate	
i.	0-24 hours, % per day	0.2
ii.	after 24 hrs, % per day	0.1
IV.	Control Room Dose Analysis (for LOCA)	
1.	Control building	
i.	Mixing volume, cf	150,000
ii.	Filtered intake, cfm	
	Prior to operator action (0-30 minutes)	900
	After operator action (30 minutes - 720 hours)	450
iii.	Unfiltered inleakage, cfm	300
iv.	Filter efficiency (all forms of iodine), %	90
2.	Control room	
i.	Volume, cf	100,000
ii.	Filtered flow from control building, cfm	540

*Except for SGTR events for which Table 11.I-4 is used.

TABLE 11.1-5

REACTOR COOLANT SPECIFIC ACTIVITY ACCIDENT SOURCE TERMS -
ONE PERCENT FUEL DEFECTS

Isotope	
Class 1	µCi/gm
Kr-83m	1.82E-1
Kr-85m	9.00E-1
Kr-85	6.70E-2
Kr-87	5.27E-1
Kr-88	1.69E+0
Kr-89	4.53E-2
Xe-131m	1.59E-1
Xe-133m	8.67E-1
Xe-133	4.33E+1
Xe-135m	1.18E-1
Xe-135	2.58E+0
Xe-137	8.15E-2
Xe-138	3.96E-1
Total noble gases	5.09E+1
Class 2	
Br-83	4.00E-2
Br-84	2.17E-2
Br-85	2.50E-3
I-130	1.75E-2
I-131	2.25E+0
I-132	8.33E-1
I-133	3.17E+0
I-134	3.92E-1
I-135	1.58E+0
Total halogens	8.31E+0
Class 3	
Rb-86	7.08E-4
Rb-88	1.67E+0
Cs-134	2.08E-1
Cs-136	1.08E-1
Cs-137	1.50E-1
Total Cs, Rb	2.14E+0

EMERGENCY ACTION LEVELS

Group 2 FISSION PRODUCT BARRIERS

A. UNUSUAL EVENT	B. ALERT	C. SITE EMERGENCY	D. SITE EMERGENCY	E. GENERAL EMERGENCY
Any **CONTAINMENT BARRIER** Indicator	Any **RCS BARRIER** Indicator **or** Any **FUEL CLAD BARRIER** Indicator	Any **FUEL CLAD BARRIER** Indicator **and** Any **RCS BARRIER** Indicator	A **CTMT BARRIER** Loss Indicator **and** Any **RCS or FUEL CLAD BARRIER** Indicator	A Loss Indicator from any two barriers **and** Any Indicator from the third

CONTAINMENT BARRIER
MODES: 1-4

Loss indicators:

1. Containment Pressure
   a) A rapid unexplained loss of CTMT pressure following an initial increase in pressure.
   or
   b) CTMT pressure or sump level not increasing with a LOCA.
2. Containment Isolation Valve Status
   Incomplete CTMT isolation allowing a direct release to the environment, following a valid CTMT isolation signal (CISA, CISB, CPIS).
3. SG Release with Primary-Secondary Leakage
   a) Pri-to-sec leakage greater than Tech Spec allowable
   and
   b) either of the following:
      1) The leaking SG pressure is decreasing in an uncontrolled manner or completely depressurized.
      2) Manual use of the leaking SG PORV for cool down.

Potential Loss indicators:

4. Critical Safety Function Status
   Meet the entry requirements for FRZ.1, Red Path Summary for CTMT.
5. Containment Pressure
   a) H2 concentration in containment >4%.
   or
   b) Less than 1 full train of Ctmt spray and Ctmt cooling fans, with Ctmt pressure greater than 27 psig.
6. Significant Radioactive Inventory in Ctmt
   GT-RE-59/60 (Channels 591/601) reading >15 E+3 R/hr
7. Core Exit Thermocouples
   a) Core exit TCs >1200°F and restoration procedures not effective in 15 minutes.
   or
   b) Core exit TCs >700°F and RVLIS (pumps off) <40% and restoration procedures not effective in 15 minutes.

RCS BARRIER
MODES: 1-4

Loss indicators:

1. RCS Leak Rate
   Safety Injection initiated with a loss of subcooling (less than instrument error) using Attachment 2 or 3 of Emerg. Procedure E-0.
2. SG Tube Rupture
   a) Any of the following:
      1) GE-RE-92 (Channel 925) >2.0E-5 µCi/cc
      2) BM-RE-25 (Channel 256) >1.0E-4 µCi/cc
      3) SJ-RE-02 (Channel 026) >1.0E-4 µCi/cc
      4) Narrow range level in any SG continues to increase in an uncontrolled manner
   and
   b) either of the following:
      1) The ruptured SG pressure is decreasing in an uncontrolled manner or completely depressurized.
      2) Manual use of the ruptured SG PORV for cool down.
3. Containment Radiation Monitoring
   GT-RE-59/60 (Channels 591/601) reading 11 R/hr.

Potential Loss indicators:

4. Critical Safety Function Status
   Meet the entry requirement for FRH.1, Red Path Heat Sink or FRP.1, Red Path for Integrity.
5. RCS Leak Rate
   RCS leakage >50 gpm.
6. SG Tube Rupture
   a) Any of the following:
      1) GE-RE-92 (Channel 925) >2.0 E-5 µCi/cc
      2) BM-RE-25 (Channel 256) >1.0 E-4 µCi/cc
      3) SJ-RE-02 (Channel 026) >1.0 E-4 µCi/cc
      4) Narrow range level in any SG continues to increase in an uncontrolled manner.
   and
   b) the primary-to-secondary leak rate exceeds 50 gpm.

FUEL CLAD BARRIER
MODES: 1-4

Loss indicators:

1. Critical Safety Function Status
   Meet the entry requirements for FRC.1, Red Path for Core cooling.
2. Primary Coolant Activity Level
   RCS coolant activity >300µCi/cc dose equivalent I-131.
3. Containment Radiation Monitoring
   GT-RE-59/60 (Channels 591/601) reading >3 E+3 R/hr.

Potential Loss indicator:

4. Critical Safety Function Status
   Meet the entry requirements for FRC.2, Orange Path for Core Cooling or FRH.1, Red Path for Heat Sink.
5. Core Exit Thermocouples
   Core exit TCs >700°F.
6. Reactor Vessel Water Level
   a) RVLIS (Pumps Off) less than 40%
   or
   b) RVLIS (Pumps On) less than minimum

RCP's on	Minimum
4	44
3	30
2	20
1	13

EMERGENCY ACTION LEVELS

Group 4 SYSTEM MALFUNCTIONS
Annunciator Events

UNUSUAL EVENT	ALERT	SITE EMERGENCY
A. Unplanned Loss of Most or All Alarms (Annunciators) for Greater Than 15 Minutes. MODES: 1-4	B. Unplanned Loss of Most or All Annunciators With Either a Transient In Progress, or the Plant Computer is Unavailable. MODES: 1-4	C. Inability to Monitor a Significant Transient in Progress. MODES: 1-4
Indicators 1. Either of the following: a. 3 of 4 field power supplies have failed for greater than 15 minutes (loss of all annunciators) and not a result of planned action. b. Ten or more logic power supplies have failed for greater than 15 minutes (loss of all annunciators) and not a result of planned action. or All of the following: c. Any combination of power supplies (including Optical Isolators) have failed for greater than 15 minutes. d. Any failed power supply's minimum compensatory actions, per OTO-RK-00001, cannot be maintained. e. The loss does not result from planned action.	**Indicators** 1. Either of the following: a. 3 of 4 field power supplies have failed for greater than 15 minutes (loss of all annunciators) and not a result of planned action. b. Ten or more logic power supplies have failed for greater than 15 minutes (loss of all annunciators) and not a result of planned action. or All of the following: c. Any combination of power supplies (including Optical Isolators) have failed for greater than 15 minutes. d. Any failed power supply's minimum compensatory actions, per OTO-RK-00001, cannot be maintained. e. The loss does not result from planned action. and 2. Any of the following: a. A change in reactor power greater than ± 10%. b. Safety injection initiation. c. The plant computer is unavailable.	**Indicators** All of the following: 1. a. Either of the following: 1) 3 of 4 field power supplies have failed (loss of all annunciators). 2) Ten or more logic power supplies have failed (loss of all annunciators). or b. Both of the following: 1) Any combination of power supplies (including Optical Isolators) have failed. 2) Any failed power supply's minimum compensatory actions, per OTO-RK-00001, cannot be maintained. and 2. The plant computer is unavailable. and 3. Either of the following: a. A change in reactor power greater than ± 10%. b. Safety injection initiation.