FPL Energy
Seabrook Station

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JAN 13 2005

Docket No. 50-443
SBK-L-04155

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555-0001

Seabrook Station
Facility Operating License NPF-86
Response to Request for Additional Information Regarding
License Amendment Request 03-02
Implementation of Alternate Source Term

References:

1. FPL Energy Seabrook, LLC letter NYN-03061, LAR 03-02, "Implementation of Alternate Source Term," dated October 6, 2003.
2. FPL Energy Seabrook, LLC letter NYN-04039, Seabrook Station Response to Request For Additional Information Regarding License Amendment Request 03-02, dated May 5, 2004.
3. FPL Energy Seabrook, LLC letter NYN-04046, Seabrook Station Response to Request For Additional Information Regarding License Amendment Request 03-02, dated May 24, 2004.
4. NRC letter to Seabrook Station, "Seabrook Station Unit No. 1 Request For Additional Information (TA No. MC1097), dated December 1, 2004.

By letter dated October 6, 2003 (Reference 1), FPL Energy Seabrook, LLC (FPL Energy Seabrook) requested an amendment to facility operating license NPF-86 and the Technical Specifications for Seabrook Station. This license amendment request (LAR 03-02) is an application for implementation of an Alternate Source Term.

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By letters dated May 5, 2004 and May 24, 2004 (References 2 and 3, respectively), FPL Energy Seabrook responded to previous NRC requests for additional information regarding LAR 03-02. Enclosure 1 to this letter contains FPL Energy Seabrook's response to the request for additional information contained in the NRC letter dated December 1, 2004 (Reference 4). Enclosure 2 to this letter contains a revised Technical Specification markup and retype of the affected page. The revised Technical Specification page have been reviewed by the Station Operation Review Committee and the Company Nuclear Review Board.

Should you have any questions concerning this LAR, please contact Mr. James M Peschel, Regulatory Programs Manager, at (603) 773-7194.

Very truly yours,

FPL Energy Seabrook, LLC

Mark E. Warner
Site Vice President

Enclosure

cc: S. J. Collins, NRC Region I Administrator
V. Nerses, NRC Project Manager, Project Directorate I-2
G. T. Dentel, NRC Resident Inspector

Mr. Bruce Cheney, Director
New Hampshire Bureau of Emergency Management
State Office Park South
107 Pleasant Street
Concord, NH 03301-3809

Oath and Affirmation

I, Mark E. Warner, Site Vice President of FPL Energy Seabrook, LLC hereby affirm that the information and statements contained within this response to request for additional information regarding License Amendment Request 03-02 are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

Sworn and Subscribed
Before me this

13 day of January, 2005

Notary Public

Mark E. Warner
Site Vice President

MICHAEL D. O'KEEFE
MY COMMISSION EXPIRES FEB. 5, 2008
NOTARY PUBLIC
NEW HAMPSHIRE

Enclosure 1 to Letter SBK-L-04155

Response to NRC Requests for Additional Information (RAIs) Regarding Seabrook Station LAR 03-02 Implementation of Alternate Source Term

RAI #1:

Table 11.1-1 of the Seabrook Updated Final Safety Analysis Report (UFSAR) was utilized to obtain a distribution of the ^{131}I - ^{135}I isotope in primary coolant. This distribution was based upon 1% fuel defects. The licensee utilized this distribution and the inhalation thyroid dose conversion factors from Federal Guidance Report No. (FGR) 11 to calculate the activity level of isotopes ^{131}I - ^{135}I at an overall primary coolant activity level of 1 µCi/g of dose equivalent ^{131}I. The licensee utilized this activity level to calculate the dose consequences of Main Steam Line Break (MSLB) and Steam Generator Tube Rupture (SGTR) accidents at 1 µCi/g and at 60 µCi/g dose equivalent ^{131}I. Total Effective Dose Equivalent (TEDE) doses were calculated using EDE dose conversion factors from FGR 11. The results met the acceptance criteria of Regulatory Guide 1.183. As long as actual reactor coolant activity levels remain below 1 µCi/g and 60 µCi/g, when calculated using the inhalation thyroid conversion factors of FGR 11, acceptable doses would result if a MSLB or STGR accident occurred and similar conditions existed as were identified in the submittal. The staff considers that use of the thyroid dose conversion factors appear acceptable but the licensee's proposed definition of dose equivalent ^{131}I should be changed. The licensee should consider whether they agree to the following definition change (note the words in bold):

DOSE EQUIVALENT 1-131 shall be that concentration of 1-131 (micro curie per gram) which alone would produce the same ~~thyroid~~ **TEDE** dose as the quantity and isotopic mixture of 1-131, 1-132, 1-133, 1-134, and 1-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed **under Inhalation** in Federal Guidance Report No. 11 (FGR 11), "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion."

FPLE Response to RAI 1:

FPL Energy Seabrook agrees with the changes identified by the NRC. A revised marked up and retyped Technical Specification page is included with this letter. FPL Energy Seabrook understands, based on discussions with NRC staff, that this definition continues to use the thyroid Committed Dose Equivalent values listed in Table 2.1 of Federal Guidance Report No. 11 (FGR 11), "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion." The changes to the Technical Specification definition do not alter the original conclusion of the significant hazards determination in that the proposed changes to the Technical Specification do not represent a significant hazards consideration.

RAI #2:

The staff considers that the licensee has not provided adequate justification for their assumption that only 1.15% of the ECCS leakage is available for flashing. The licensee has provided an analysis with 10% presumed to flash that the staff finds as acceptable. Since there is a lack of adequate justification for the 1.15% the licensee should withdraw their 1.15% flashing analysis, and instead, the analysis based upon 10% flashing should be utilized for this licensing action.

FPL Energy Seabrook Response to RAI 2:

FPL Energy Seabrook letter NYN-04046 dated May 24, 2004 submitted its response to previous NRC requests for additional information (RAIs) including RAIs 6D1 and 6D2. The 10% flashing factor for Emergency Core Cooling System (ECCS) leakage included in the response to RAIs 6D1 and 6D2 will be the flashing factor utilized for the Seabrook Station licensing basis.

RAI #3:

Please provide how the iodine partition coefficients of Table 2.1-4 were obtained?

FPL Energy Seabrook Response to RAI 3:

The addition of higher temperature sump water to the refueling water storage tank (RWST) through backleakage will increase the energy, and thus, the temperature of the refueling water storage tank water. The amount of iodine released from the refueling water storage tank is dependent upon the concentration of iodine (I_2) in the gas phase above the liquid. This concentration is determined by the partition coefficient, which is a function of the refueling water storage tank temperature and based on Equation 15 of Section 3.3 of NUREG /CR-5950 (Iodine Evolution and pH Control).

In calculating the time dependent refueling water storage tank temperature, it was assumed that the leaked sump water is instantaneously transferred to the refueling water storage tank, and the new refueling water storage tank temperatures were found. The leakage does not occur until the earliest start of recirculation, which is given as 26 minutes (0.4333 hour).

The refueling water storage tank initial temperature is 98°F and is assumed to be at an atmospheric pressure of 14.7 psia (the refueling water storage tank vent to the atmosphere is open).

Pressure	=	14.7 psia,
Temperature	=	98°F
RWST water v_f	=	0.0161227 ft^3/lbm
RWST water h_f	=	66.0392 BTU/lbm

The minimum initial refueling water storage tank volume is 47,000 gallons. Therefore, the initial refueling water storage tank mass is:

(47,000 gal)(0.13368 ft^3/gal)(1/0.0161227 ft^3/lbm) = 389,697 lbm

The maximum sump temperature profile is given by Figure 6.2-3 of the UFSAR. This figure gives the time dependent sump water temperature for minimum safety injection flow. This temperature response bounds that for maximum safety injection flow. UFSAR Figure 6.2-3 provides the following time-dependent sump temperatures:

Table 1
Time-Dependent Containment Sump Temperature

Time (hr)	Temperature (°F)	Specific Volume (ft^3/lbm)	Enthalpy (BTU/lbm)
0.4333	255	0.01704694	223.669
1	238	0.01691045	206.423
2	225	0.01681199	193.277
3.5	212	0.01671859	180.165
5	200	0.01663663	168.093
8	189	0.01656528	157.045
11	182	0.01652178	150.022
22	172	0.01646219	139.998
24	161	0.0164002	128.983
100	125	0.01622453	92.9926
200	113	0.01617588	81.0107
300	109	0.01616084	77.0178
400	104	0.01614291	72.0273
500	104	0.01614291	72.0273
600	104	0.01614291	72.0273
700	104	0.01614291	72.0273
720	104	0.01614291	72.0273

The temperature dependent iodine (I_2) partition coefficient is given by Equation 15 of NUREG/CR-5950:

$$\mathbf{Log_{10}\,PC(I_2)} = 6.29 - 0.0149T$$

where T is in degrees Kelvin

$$\mathbf{PC(I_2)} = 10^{6.29 - 0.0149T}$$

Using the information given, the time dependent refueling water storage tank temperature and iodine partition coefficient can be calculated. This calculation is presented in Table 2. The calculations performed by this spreadsheet are:

RWST backleakage rate = 0.9595 gpm

Leak Vol = Leakage rate x Time period x 0.13368 ft^3/gal x 60 (min/hr)
where: time period = current time – previous time

Leak Sp Vol = Leakage specific volume

Leak Mass = (Leak Vol) / (Average Leak Sp Vol over time period)

Leak H = Leakage enthalpy

Total Mass = Leak Mass + Total Mass from previous time step

New H = New RWST enthalpy =

$$\frac{[(\text{Leak Mass x Average Leak H}) + (\text{Total Mass x New H both from previous time step})]}{(\text{Total Mass from current time step})}$$

Temp = RWST temperature based on 14.7 psia and RWST enthalpy

Partition Coefficient = $10^{6.29 - 0.0149\,T}$
where T is in degrees Kelvin

Table 2
Time-Dependent RWST Temperature and Iodine Partition Coefficient

Leakage (gpm)	0.9595		Initial RWST Mass (lbm)	389697.00		Initial H (BTU/lbm)	66.0392		
Time (hr)	**Leak Vol (ft^3)**	**Leak Sp. Vol (ft^3/lbm)**	**Leak Mass (lbm)**	**Leak H (BTU/lbm)**	**Total Mass (lbm)**	**New H (BTU/lbm)**	**Temp (°F)**	**Temp (°K)**	**Partition Coefficient**
0.433333	0.00	0.0170469	0.00	223.669	389697.00	66.039	98.000	309.667	47.42
1	4.36	0.0169105	256.85	206.423	389953.85	66.137	98.107	309.726	47.32
2	7.70	0.016812	456.43	193.277	390410.28	66.294	98.264	309.813	47.18
3.5	11.54	0.0167186	688.56	180.165	391098.84	66.506	98.477	309.932	46.99
5	11.54	0.0166366	692.18	168.093	391791.03	66.696	98.667	310.037	46.82
6	7.70	0.0166366	462.59	168.093	392253.62	66.815	98.786	310.103	46.72
7	7.70	0.0166366	462.59	168.093	392716.21	66.935	98.907	310.171	46.61
8	7.70	0.0165653	463.59	157.045	393179.79	67.047	99.019	310.233	46.51
9	7.70	0.0165653	464.58	157.045	393644.38	67.154	99.126	310.292	46.41
11	15.39	0.0165218	930.39	150.022	394574.77	67.357	99.329	310.405	46.23
15	30.78	0.0165218	1863.23	150.022	396437.99	67.746	99.719	310.622	45.89
22	53.87	0.0164622	3266.54	139.998	399704.53	68.377	100.351	310.973	45.34
24	15.39	0.0164002	936.75	128.983	400641.28	68.532	100.507	311.059	45.21
100	584.89	0.0162245	35855.79	92.993	436497.07	72.019	104.000	313.000	42.30
200	769.60	0.0161759	47505.31	81.011	484002.38	73.490	105.474	313.819	41.12
300	769.60	0.0161608	47598.88	77.018	531601.26	73.985	105.970	314.094	40.74
400	769.60	0.0161429	47647.46	72.027	579248.72	74.029	106.014	314.119	40.70
500	769.60	0.0161429	47673.92	72.027	626922.63	73.877	105.862	314.034	40.82
600	769.60	0.0161429	47673.92	72.027	674596.55	73.746	105.730	313.961	40.92
700	769.60	0.0161429	47673.92	72.027	722270.47	73.632	105.616	313.898	41.01
720	153.92	0.0161429	9534.78	72.027	731805.25	73.612	105.596	313.887	41.03
Total	5537.75		342108.25						

RAI #4:

The licensee assumed that the rupture of a letdown line does not result in a reactor trip. Is this an appropriate assumption since an iodine spike has occurred and primary coolant activity is at 1 μCi/g of dose equivalent ^{131}I? Would it be reasonable to assume that the reactor will be shutdown in order to control primary side activity levels of dose equivalent ^{131}I rather than remain operating? Under such a condition, the release would occur over a duration substantially less than 30 days. Therefore, if you consider the NRC staff's assumption reasonable, does the rupture of the letdown line require re-analysis? (Note that Items 5 and 6 below also address the analysis of the letdown line rupture.)

FPL Energy Seabrook Response to RAI 4:

A reactor trip is not assumed to occur in the rupture of a letdown line since analyzing the event with no reactor trip maximizes the release. Thus, the event with no reactor trip is more limiting and bounds a letdown line rupture with a reactor trip event. This assumption is consistent with the Seabrook Station current licensing basis and UFSAR Section 15.6. The rupture of the letdown line event does not require re-analysis.

RAI #5:

The licensee assumed that no loss of offsite power with the rupture of the letdown line. What is the basis for not assuming a loss of offsite power for this accident when all the other accidents have assumed a loss of offsite power?

FPL Energy Seabrook Response to RAI 5:

A loss of offsite power is not assumed to occur since a loss of offsite power would result in a reactor trip. As stated in FPL Energy Seabrook's response to RAI 4, a reactor trip is not assumed to occur in the rupture of a letdown line event since analyzing the event with no reactor trip maximizes the release. Thus, the event with no reactor trip is more limiting and bounds a letdown line rupture with a reactor trip event. This assumption is consistent with the Seabrook Station current licensing basis and UFSAR Section 15.6.

RAI #6:

The licensee assumed that a letdown line rupture resulted in a release from the secondary side via the condenser. The licensee indicated that this assumption was consistent with the pre-trip treatment of a secondary side release for a SGTR, A review if the SGTR analysis in the UFSAR did not address releases from this accident occurring from the condenser. The FPLES analysis used a decontamination factor of 100 for radionuclide and particulate for the release from the condenser. If the release path were the condenser, it would seem that the partition factor for iodine should be as noted in Section 2.2-7 of NUREG-0133. This value is 0.15. On the other hand, if a loss of offsite power is assumed, the partition factor should be consistent with the treatment of the secondary side releases from the Main Steam Safety Valves and Automatic Dump Valves of the intact steam generators during a SGTR or a MSLB accident. Based upon the above and the response to Item 5, it would appear that the letdown line analysis would need to be revised.

FPL Energy Seabrook Response to RAI 6:

License Amendment Request (LAR) 03-02, Licensing Technical Report (page 42 of 94), Item 9, "Regulatory Position 5.5.4 of Appendix E" states that an iodine decontamination factor of 99% will be assigned for the releases from the condenser. The 99% iodine decontamination factor occurs entirely in the steam generator. There is no decontamination assumed to occur in the condensers. Therefore, there is no difference in the iodine decontamination factor for a release from the steam generators or a release from the condensers. The letdown line rupture event does not require re-analysis.

RAI #7:

The acceptance criterion used by the licensee for consequences of the release of the contents of the offgas system is inconsistent with BTP 11-5 of SRP 11.3 that clearly indicates that the criteria associated with the contents of a waste gas processing system is limited to Part 20. This BTP was issued July 1981. On the other hand, Section 5.6.1 of NUREG-0133, issued October 1978, specifically calls out the limit for a PWR with charcoal as being a small fraction of Part 100 provided that the gross radioactivity measured prior to entering the adsorption system is limited by a release rate alarm setpoint with indication in the main control room. This monitor provides reasonable assurance that the potential consequence of an accident does not result in a total body dose, which exceeds a small fraction of Part 100. Does Seabrook have such a release rate alarm setpoint? What is the criterion in the Seabrook Radiological Effluent Technical Specifications for a release from this pathway?

FPL Energy Seabrook Response to RAI 7:

Yes, Seabrook Station has a release rate monitor that provides indication to the Control Room.

There are three monitors associated with the carbon delay beds: 1) a monitor upstream of the carbon delay beds that provides indication and alarm, 2) a monitor that indicates the degradation of the absorption properties of the carbon delay beds that provides indication and alarm, and 3) a monitor downstream of the carbon delay beds that provides indication, alarm and isolation. The downstream monitor also has the capability of maintaining a running inventory of the total activity vented to the atmosphere.

The criterion for a release from this pathway is based on 10 CFR Part 20. As stated in the Seabrook Station Offsite Dose Calculation Manual (ODCM), the alarm/trip setpoints for the radioactive gaseous effluent instrumentation are calculated to ensure that the alarm and trip will occur prior to exceeding the limits of 10 CFR Part 20.

RAI #8:

The analysis of the liquid waste system failure may not be necessary. Refer to the Seabrook Operating License SER and also to Section 4.4 of NUREG-0133. The latter specifies the manner of treatment of tanks outside containment which contain radioactive liquid and are not surrounded by liners, dykes or walls capable of holding the tank contents and do not have tank overflow and drains connected to the liquid radwaste system. Indoor tanks are excluded in the analysis unless (based upon the design basis fission product release leakage from the fuel results in concentration in the tank that would exceed the limits of 10 CFR Part 20, Appendix B, Table 2, Column 2) the leaked fluid is capable of affecting the nearest existing or known future water supply ion an unrestricted area. The licensee should indicate how the liquid waste system failure at SS is not excluded from analysis by NUREG-0133.

FPL Energy Seabrook Response to RAI 8:

The response to this question is based on clarification from the NRC reviewer received during a conference call on 12/22/04.

Seabrook Station UFSAR Section 15.7.2, "Radioactive Liquid Waste System (RLWS) Leak or Failure (Release to Atmosphere)," evaluates the radiological consequence of a release to the atmosphere of radioactive fission gases from an unexpected and uncontrolled release of radioactive liquids contained in waste systems. This event analyzes atmospheric releases from the rupture of either the boron waste storage tank or a letdown degasifier. The Radioactive Liquid Waste System Failure was reanalyzed using Alternate Source Term Methodology to remain consistent with the UFSAR Chapter 15 events.

Regulatory Guide 1.183 "Alternative Radiological Source Terms For Evaluating Design Basis Accidents At Nuclear Power Reactors," does not provide any requirement or dose limits for a RLWS failure; therefore, the acceptance criteria were set by the current Seabrook Licensing basis. Section 15.7.2.4 of the current Seabrook UFSAR concludes only that the consequences are within a "small fraction" of the values specified in 10CFR Part 100. Therefore, the off-site dose acceptance criteria were established as 10% of the 10 CFR 50.67 limits.

Upon further review, FPL Energy Seabrook concurs with the NRC's assessment that 10 CFR Part 20 limits are more appropriate for a RLWS event. Therefore, the acceptance criteria for the radioactive liquid waste system failure is changed to 100 mrem TEDE. Actual analysis for this event indicates dose will be below this limit.

Enclosure 2 to Letter SBK-L-04155

Marked Up and Retyped Pages to Support the Response to NRC Requests for Additional Information #1 Regarding Seabrook Station LAR 03-02 Implementation of Alternate Source Term

DOSE EQUIVALENT I-131 TEDE

1.12 DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microCurie/gram) which alone would produce the same ~~thyroid~~ dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed ~~in NRC Regulatory Guide 1.109, Revision 1, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I."~~ under inhalation in Federal Guidance Report No. 11 (FGR 11), "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," 1989.

$\bar{E}$ - AVERAGE DISINTEGRATION ENERGY

1.13 $\bar{E}$ shall be the average (weighted in proportion to the concentration of each radionuclide in the sample) of the sum of the average beta and gamma energies per disintegration (MeV/d) for the radionuclides in the sample with half-lives greater than 10 minutes.

ENGINEERED SAFETY FEATURES (ESF) RESPONSE TIME

1.14 The ESF RESPONSE TIME shall be that time interval from when the monitored parameter exceeds its actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function (i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.). Times shall include diesel generator starting and sequence loading delays where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured. In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.

FREQUENCY NOTATION

1.15 The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 1.1.

GASEOUS RADWASTE TREATMENT SYSTEM

1.16 A GASEOUS RADWASTE TREATMENT SYSTEM shall be any system designed and installed to reduce radioactive gaseous effluents by collecting Reactor Coolant System offgases from the Reactor Coolant System and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

IDENTIFIED LEAKAGE

1.17 IDENTIFIED LEAKAGE shall be:

a. Leakage (except CONTROLLED LEAKAGE) into closed systems, such as pump seal or valve packing leaks that are captured and conducted to a sump or collecting tank, or

DOSE EQUIVALENT I-131

1.12 DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microCurie/gram) which alone would produce the same TEDE dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134, and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed under inhalation in Federal Guidance Report No. 11 (FGR 11), "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion and Ingestion," 1989.

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