Florida Power & Light Company, 6501 S. Ocean Drive, Jensen Beach, FL 34957

FPL

September 2, 2011

L-2011-360
10 CFR 50.90

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Re: St. Lucie Plant Unit 1
Docket No. 50-335
Renewed Facility Operating License No. DPR-67

Response to NRC Accident Dose Branch Request for Additional Information Regarding Extended Power Uprate License Amendment Request

References:

(1) R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2010-259), "License Amendment Request for Extended Power Uprate," November 22, 2010, Accession No. ML103560419.
(2) Email from T. Orf (NRC) to C. Wasik (FPL), "St. Lucie 1 EPU RAIs (Accident Dose)," June 21, 2011.
(3) R. L. Anderson (FPL) to U.S. Nuclear Regulatory Commission (L-2011-314), "License Amendment Request for Extended Power Uprate," August 12, 2011, Accession No. ML11234A283

By letter L-2010-259 dated November 22, 2010 [Reference 1], Florida Power & Light Company (FPL) requested to amend Renewed Facility Operating License No. DPR-67 and revise the St. Lucie Unit 1 Technical Specifications (TS). The proposed amendment will increase the unit's licensed core thermal power level from 2700 megawatts thermal (MWt) to 3020 MWt and revise the Renewed Facility Operating License and TS to support operation at this increased core thermal power level. This represents an approximate increase of 11.85% and is therefore considered an Extended Power Uprate (EPU).

By email from the NRC Project Manager dated June 21, 2011 [Reference 2], additional information related to accident dose was requested by the NRC staff in the Accident Dose Branch (AADB) to support their review of the EPU LAR. The request for additional information (RAI) identified sixteen questions. The response to this RAI was provided in FPL letter dated August 12, 2011 [Reference 3].

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The Reference 3 submittal included updated site meteorological data and associated revised atmospheric dispersion factors (χ/Q's). The accident dose analysis calculations have been revised to incorporate the data submitted in Reference 3. Attachment 1 to this letter provides the results of the revised accident dose calculations.

As a result of the revised accident dose calculations, FPL is proposing to revise the TS to limit the radioactivity in the gas storage tanks to 165,000 curies noble gases. Attachment 2 contains a revision to the EPU proposed change to TS 3.11.2.6, Radioactive Effluents – Gas Storage Tanks. The EPU LAR originally proposed to limit the radioactivity in the gas storage tanks to 202,500 curies noble gases. Attachment 3 contains the marked-up and clean pages to support the proposed TS revision.

In accordance with 10 CFR 50.91(b)(1), a copy of this letter is being forwarded to the designated State of Florida official.

This submittal does not alter the significant hazards consideration or environmental assessment previously submitted by FPL letter L-2010-259 [Reference 1].

This submittal contains no new commitments and no revisions to existing commitments.

Should you have any questions regarding this submittal, please contact Mr. Christopher Wasik, St. Lucie Extended Power Uprate LAR Project Manager, at 772-467-7138.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed on 02-September-2011

Very truly yours,

Richard L. Anderson
Site Vice President
St. Lucie Plant

Attachments (3)

cc: Mr. William Passetti, Florida Department of Health

Attachment 1

Supplemental Information
Regarding Extended Power Uprate License Amendment Request
Accident Dose Analysis Calculation Results

The following information is provided by Florida Power & Light Company (FPL) in response to the U. S. Nuclear Regulatory Commission's (NRC) Request for Additional Information (RAI). This information was requested to support Extended Power Uprate (EPU) License Amendment Request (LAR) for St. Lucie Nuclear Plant Unit 1 that was submitted to the NRC by FPL via letter (L-2010-259) dated November 22, 2010, Accession Number ML103560419.

In an email dated June 21, 2011 from NRC (Tracy Orf) to FPL (Chris Wasik), Subject: St. Lucie 1 EPU RAIs (Accident Dose), the NRC requested additional information regarding FPL's request to implement the EPU. The RAI consisted of sixteen (16) questions from the NRC's Accident Dose Branch (AADB). By letter dated August 12, 2011, Accession Number ML11234A283, FPL provided responses to the RAI. The transmittal included updated meteorological data and revised atmospheric dispersion factors (χ/Q's).

In addition to the supplemental information discussed below, Tables 2.9.2-21, MSLB Steam Release Rate, and 2.9.2-24 SGTR, Break Flow and Steam Releases, have been revised to correct typographical errors in the EPU LAR.

The following supplemental information is being provided based on the calculation results performed using the revised χ/Q's.

LAR Attachment 5 Section 2.9.2 Radiological Consequences using Alternative Source Term (AST)

The control room unfiltered inleakage is changed from 500 cfm to 460 cfm for all events. This change affects all references to control room unfiltered inleakage of 500 cfm in Section 2.9.2.

Section 2.9.2.2.4 Atmospheric Dispersion Factors (χ/Q's)

The revised meteorological data is based on data collected in years, 1997, 1998, 1999, 2002, and 2003. This data was screened based on discussions with the NRC staff to be acceptable for use in determining χ/Q's.

The references to ARCON96 and PAVAN are deleted.

Section 2.9.2.3.2 Analysis Parameters and Assumptions

Release Inputs

The engineered safeguards feature (ESF) assumption for leakage into the reactor auxiliary building (RAB) is changed to 4750 cc/hr, based on two times the current licensing basis value of 2375 cc/hr.

The time-dependent concentration to the total iodine in the refueling water tank (RWT) was determined from the tank liquid volume and leak rate. This iodine concentration ranged from a minimum value of 0 at the beginning of the event to a maximum value of 4.067E-05 gm-atom/liter at 30 days. Based on a backleakage of sump water, the RWT pH slowly increases from an initial value of 4.5 to a maximum pH of 4.968 at 30 days. The RWT elemental iodine fraction ranged from 0 at the beginning of the event to a maximum of 0.1245.

Loss of Coolant Accident (LOCA) Removal Inputs

Based on the elemental iodine removal rate of 20 hr^{-1}, the DF of 200 is conservatively computed to occur at 2.331 hours.

The particulate iodine removal rate is reduced by a factor of 10 when a DF of 50 is reached. Based on the calculated iodine aerosol removal rate of 6.07 hr^{-1}, the DF of 50 is conservatively computed to occur at 2.334 hours.

The following EPU LAR Attachment 5 Section 2.9.2 tables are being replaced as a result of the revised χ/Q values: (pages 4 through 33 of 39)

- Table 2.9.2-1 – Summary of EPU Radiological Analysis Results
- Table 2.9.2-7 – Onsite Atmospheric Dispersion Factors (χ/Q) for Analysis Events
- Table 2.9.2-8 – Release – Receptor Point Pairs Assumed for Analysis Events
- Table 2.9.2-9 – Offsite Atmospheric Dispersion Factors (χ/Q) for Analysis Events
- Table 2.9.2-10 – Control Room Ventilation System Parameters
- Table 2.9.2-11 – LOCA Direct Shine Dose
- Table 2.9.2-12 – Loss-of-Coolant Accident (LOCA) – Inputs and Assumptions
- Table 2.9.2-13 – LOCA Time Dependent RWT pH
- Table 2.9.2-14 – LOCA Time Dependent RWT Total and Elemental Iodine Concentration
- Table 2.9.2-16 – LOCA Time Dependent RWT Elemental Iodine Fraction
- Table 2.9.2-18 – LOCA Release Rate from Sump to RWT Vapor Space
- Table 2.9.2-19 – Fuel Handling Accident (FHA) – Inputs and Assumptions
- Table 2.9.2-20 – Main Steam Line Break (MSLB) – Inputs and Assumptions
- Table 2.9.2-21 – MSLB Steam Release Rate
- Table 2.9.2-23 – Steam Generator Tube Rupture Accident – Inputs and Assumptions
- Table 2.9.2-24 – SGTR Break Flow and Steam Releases
- Table 2.9.2-28 – Locked Rotor Accident – Inputs and Assumptions
- Table 2.9.2-30 – CEA Ejection Accident – Inputs and Assumptions
- Table 2.9.2-32 – IOMSSV – Inputs and Assumptions

LAR Attachment 5 Section 2.9.3 Radiological Consequences of Gas Decay Tank Ruptures

The control room unfiltered inleakage is changed from 500 cfm to 460 cfm for all events.

2.9.3.2.4 Source Term and Dose Models, Assumptions, and Parameters

The following sentence is added to the third paragraph after the sentence containing the 50 second isolation assumption. "Studies have confirmed that the waste gas decay tank (WGDT) rupture event will generate sufficient count rates for the control room outside air intake radiation monitor based isolation to occur well within this 50 second isolation assumption."

2.9.3.2.6 Results

The Technical Specification limit for WGDT inventory is changed to 165,000 Dose Equivalent Curies Xe-133. This limit will yield an exclusion area boundary dose of 0.099997 rem TEDE.

The following EPU LAR Attachment 5 Section 2.9.3 tables are being replaced as a result of the revised χ/Q values: (pages 34 through 39 of 39)

- Table 2.9.3-3 – RADTRAN-NAI Pathway Description, Tables
    - Pathway 2 – Control Room Unfiltered Inleakage Pathway
    - Pathway 5 – Control Room Exhaust Pathway
- Table 2.9.3-6 – WGDT Failure χ/Q Tables
    - χ/Q Table 1 – EAB
    - χ/Q Table 2 – LPZ
    - χ/Q Table 3 – Control Room HVAC Intake via N or S Fresh Air Intake Summary – Bounding St. Lucie HVAC χ/Q Table
    - χ/Q Table 4 – Control Room Unfiltered Inleakage χ/Q via Louver L-11 or 2L-11
- Table 2.9.3-7 - Dose Consequences for Waste Gas Decay Tank Failure
- Table 2.9.3-8 - WGDT Source Term – Technical Specification DE Xe-133 Curies

Table 2.9.2-1
Summary of EPU Radiological Analysis Results

Case	Allowable Unfiltered Control Room Inleakage (cfm)	EAB Dose[1] (rem TEDE)	LPZ Dose[2] (rem TEDE)	Control Room Dose[2] (rem TEDE)	AOR Control Room Dose[5] (rem TEDE)
LOCA	460	1.14	2.51	4.79	4.69
MSLB – Outside of Containment (1.2% DNB)	460	0.27	0.77	4.63	4.80
MSLB – Outside of Containment (0.29% FCM)	460	0.30	0.81	4.72	4.97
MSLB – Inside of Containment (21% DNB)	460	0.41	0.87	4.67	4.92
MSLB – Inside of Containment (4.5% FCM)	460	0.63	1.21	4.62	4.91
SGTR Pre-accident Iodine Spike	460	0.37	0.37	4.67	3.03
Acceptance Criteria		**≤ 25**[3]	**≤ 25**[3]	**≤ 5**[4]	**≤ 5**[4]
SGTR Concurrent Iodine Spike	460	0.18	0.28	2.24	0.60
Locked Rotor (19% DNB)	460	0.37	0.87	4.38	2.53
IOMSSV [6]	460	0.03	0.03	0.39	0.30
Acceptance Criteria		**≤ 2.5** [3]	**≤ 2.5** [3]	**≤ 5**[4]	**≤ 5**[4]
FHA - Containment	460	0.56	0.58	1.43	1.23
FHA – Fuel Handling Building	460	0.56	0.55	3.47	3.02
CEA Ejection – Containment Release (9.5 % DNB, 0.5 % FCM)	460	0.28	0.55	3.30	2.74
CEA Ejection – Secondary Side Release (9.5 % DNB, 0.5 % FCM)	460	0.29	0.71	3.26	2.60
Acceptance Criteria		**≤ 6.3**[3]	**≤ 6.3**[3]	**≤ 5**[4]	**≤ 5**[4]

(1) Worst 2-hour dose
(2) Integrated 30-day dose
(3) RG 1.183, Table 6
(4) 10CFR50.67
(5) AOR control room dose from CLB AST results
(6) Acceptance criteria from References 1 and 2

Table 2.9.2-7

Onsite Atmospheric Dispersion Factors (*X/Q*) for Analysis Events

This table summarizes the *X/Q* values (sec/m^3) for the control room that apply to the various accident scenarios. For the intakes, values are presented for the unfavorable intake prior to control room isolation, the midpoint between the intakes during isolation, as well as values for the favorable intake following manual restoration of filtered control room make-up flow. These values are not corrected for control room occupancy factors but do include credit for dilution where allowed. Based on the layout of the site, the only cases that credited dilution are the releases from the plant vent stack. However, dilution is not credited during the time period when the control room intakes are isolated for these cases.

A comparison of EPU X/Q values to the pre-EPU X/Q values from Reference 1 is presented in the shaded row below each release-receptor pair (positive values indicate that EPU X/Q values are higher).

* Indicates credit for dilution taken for this case.

The atmospheric dispersion factors corresponding to ADVs were determined to be more limiting than those from the MSSVs for all time periods. Therefore, the more limiting ADV values have been used throughout the analyses for all secondary releases. No distinction is made between automatic steam relief from the MSSVs and controlled releases from the ADVs for radiological purposes.

Table 2.9.2-7
Onsite Atmospheric Dispersion Factors (*X/Q*) for Analysis Events

Release Receptor Pair	Release Point	Receptor Point	0-2 hr X/Q	2-8 hr X/Q	8-24 hr X/Q	1-4 days X/Q	4-30 days X/Q
A*	Stack/Plant Vent	N CR intake	2.39E-03				
			1.70%				
B*	Stack/Plant Vent	S CR intake	6.93E-04	4.88E-04	2.19E-04	1.46E-04	1.28E-04
			3.74%	7.25%	3.79%	15.87%	38.38%
C	Stack/Plant Vent	Midpoint between CR intakes	3.91E-03				
			3.44%				
D	RWT	N CR intake	1.37E-03				
			-0.72%				
E	RWT	S CR intake	1.12E-03	9.10E-04	3.84E-04	2.93E-04	2.37E-04
			1.82%	-2.15%	-3.03%	-0.34%	3.95%

Table 2.9.2-7 (continued)
Onsite Atmospheric Dispersion Factors (*X/Q*) for Analysis Events

Release Receptor Pair	Release Point	Receptor Point	0-2 hr X/Q	2-8 hr X/Q	8-24 hr X/Q	1-4 days X/Q	4-30 days X/Q
F	RWT	Midpoint between CR intakes	1.34E-03				
			0.75%				
G	FHB Closest Point	N CR intake	4.99E-03				
			1.22%				
H	FHB Closest Point	S CR intake	2.01E-03	1.44E-03	6.25E-04	4.34E-04	3.33E-04
			0.50%	2.86%	-1.73%	2.84%	7.77%
I	FHB Closest Point	Midpoint between CR intakes	3.27E-03				
			0.31%				
J	Louver L-7B	N CR intake	4.80E-03				
			-1.03%				
K	Louver L-7A	S CR intake	3.61E-03	2.87E-03	1.20E-03	9.07E-04	7.13E-04
			0.56%	-2.38%	-3.23%	2.60%	3.18%
L	Louver L-7A	Midpoint between CR intakes	5.03E-03				
			-0.20%				
M#	Closest ADV	N CR intake	6.30E-03				
			0.96%				
N#	Closest ADV	S CR intake	1.62E-03	1.32E-03	5.06E-04	3.88E-04	3.30E-04
			0.62%	4.76%	-0.39%	7.78%	21.77%
O#	Closest ADV	Midpoint between CR intakes	2.84E-03				
			0.71%				
P	Closest Main Steam Line Point	N CR intake	5.13E-03				
			0.00%				

Table 2.9.2-7 (continued)
Onsite Atmospheric Dispersion Factors (X/Q) for Analysis Events

Release Receptor Pair	Release Point	Receptor Point	0-2 hr X/Q	2-8 hr X/Q	8-24 hr X/Q	1-4 days X/Q	4-30 days X/Q
Q	Closest Main Steam Line Point	S CR intake	1.49E-03	1.19E-03	4.67E-04	3.57E-04	2.98E-04
			0.00%	4.39%	-1.89%	6.89%	19.68%
R	Closest Main Steam Line Point	Midpoint between CR intakes	2.50E-03				
			0.00%				
S	Closest Feedwater Line Point	N CR intake	7.29E-03				
			-0.14%				
T	Closest Feedwater Line Point	S CR intake	1.76E-03	1.41E-03	5.72E-04	4.29E-04	3.57E-04
			0.57%	4.44%	-0.69%	8.88%	21.43%
U	Closest Feedwater Line Point	Midpoint between CR intakes	3.17E-03				
			0.00%				
V	Containment Maintenance Hatch	N CR intake	1.90E-03				
			1.60%				
W	Containment Maintenance Hatch	S CR intake	8.22E-04	6.57E-04	2.87E-04	1.92E-04	1.74E-04
			1.36%	7.53%	2.87%	11.63%	35.94%
X	Containment Maintenance Hatch	Midpoint between CR intakes	1.21E-03				
			1.68%				
Y	Steam Jet Air Ejector (1)	N CR intake	3.02E-03				
			22.27%				

(1) Based on recent meteorological and plant configuration data, the X/Q for the steam jet air ejector release point was determined to be higher than the X/Q for the condenser release point that was provided in Reference 1.

Table 2.9.2-8
Release-Receptor Point Pairs Assumed for Analysis Events
(Refer to Table 2.9.2-7 for Release/Receptor Pair Locations)

Event	Prior to Control Room Isolation	During Control Room Isolation	After Initiation of Filtered Air Makeup
LOCA:			
- Containment Leakage (SBVS)	A	C	B
- Containment (SBVS Bypass)	S	U	T
- ECCS Leakage	J	L	K
- RWT Backleakage	D	F	E
- Cont. Purge/H_2 Purge	A	C	B
FHA:			
Containment Release	V	X	W
FHB Release	G	I	H
MSLB:			
Outside Containment – Intact SG	M	O	N
Outside Containment – Faulted SG	M	O	N
Inside Containment (SBVS)	A	C	B
Inside Containment (SBVS Bypass)	S	U	T
SGTR	Y (Prior to Reactor Trip) M (After Reactor Trip)	O	N
Locked Rotor	M	O	N
CEA Ejection:			
- Secondary Release	M	O	N
- Inside Containment (SBVS)	A	C	B
- Inside Containment (SBVS Bypass)	S	U	T
IOMSSV	M	O	N

Table 2.9.2-9
Offsite Atmospheric Dispersion Factors (*X/Q*) for Analysis Events

Time Period	EAB *X/Q* (sec/m^3)	LPZ *X/Q* (sec/m^3)
0-2 hours	9.84-05	9.56E-05
0-8 hours	5.53-05	5.34E-05
8-24 hours	4.15-05	3.99E-05
1-4 days	2.22E-05	2.12E-05
4-30 days	9.06E-06	8.55E-06

The above table summarizes the maximum *X/Q* values for the EAB and LPZ. Note that the 0-2 hour EAB *X/Q* value was used for the entire event.

Table 2.9.2-10
Control Room Ventilation System Parameters

Parameter	EPU Value	Pre-EPU Value
Control Room Volume	96,228 ft^3	62,318 ft^3
Normal Operation		
Filtered Makeup Flow Rate	0 cfm	Same
Filtered Recirculation Flow Rate	0 cfm	Same
Unfiltered Makeup Flow Rate	920 cfm	Same
Unfiltered Inleakage	460 cfm	500 cfm
Emergency Operation		
Isolation Mode:		
Filtered Makeup Flow Rate	0 cfm	Same
Filtered Recirculation Flow Rate	1760 cfm*	2000 cfm
Unfiltered Makeup Flow Rate	0 cfm	Same
Unfiltered Inleakage	460 cfm	500 cfm
Filtered Makeup Mode:		
Filtered Makeup Flow Rate	504 cfm*	450 cfm
Filtered Recirculation Flow Rate	1256 cfm*	1550 cfm
Unfiltered Makeup Flow Rate	0 cfm	Same
Unfiltered Inleakage	460 cfm	500 cfm
Filter Efficiencies:		
Particulates	99%	Same
Elemental iodine	95%	Same
Organic iodine	95%	Same

* Control room emergency ventilation flow rates conservatively consider over/under frequency/voltage of the emergency diesel generators, as well as tolerance in the control room ventilation flow rate test acceptance criteria.

Table 2.9.2-11
LOCA Direct Shine Dose

Source	Direct Shine Dose (rem)
Containment	0.027
Filters	0.094
External Cloud	0.078
Total	**0.199 ~ 0.20**

Table 2.9.2-12
Loss-of-Coolant Accident (LOCA) – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
Release Inputs:		
Core Power Level	3030 MWt (~3020 + 0.3%)	2754 MWt (2700 + 2%)
Core Average Fuel Burnup	49,000 MWD/MTU	45,000 MWD/MTU
Fuel Enrichment	1.5 – 5.0 w/o	3.0 – 4.5 w/o
Initial RCS Equilibrium Activity	1.0 μCi/gm DE I-131 and 518.9 μCi/gm DE Xe-133 (Table 2.9.2-2)	1.0 μCi/gm DE I-131 and 100/E-bar gross activity
Core Fission Product Inventory	Table 2.9.2-4	Different based on power, burnup and enrichment
Containment Leakage Rate 0 to 24 hours after 24 hours	 0.5% (by volume)/day 0.25% (by volume)/day	 Same Same
LOCA release phase timing and duration	RG 1.183, Table 4	Same
Core Inventory Release Fractions (gap release and early in-vessel damage phases)	RG 1.183, Sections 3.1 and 3.2	Same
ECCS Systems Leakage Sump Volume (minimum)	 67,394 ft^3	 55,460 ft^3 (difference based on thermodynamic conditions and delivered RWT inventory)
ECCS Leakage to RAB (2 times allowed value)	4750 cc/hr	4510 cc/hr
Flashing Fraction	Calculated – 5.5% Used for dose determination – 10%	Calculated – 7.5% Used for dose determination – 10%
Chemical form of the iodine in the sump water	0% aerosol, 97% elemental iodine, and 3.0% organic iodine	Same
Release ECCS Area Filtration Efficiency	Elemental iodine – 95% Organic iodine – 95% Particulates – 99% (100% of the particulates are retained in the ECCS fluid)	Same Same Same

Table 2.9.2-12 (continued)
Loss-of-Coolant Accident (LOCA) – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
RWT Back-leakage Sump Volume (at time of recirculation)	67,394 ft^3	57,140 ft^3
ECCS Leakage to RWT (2 times allowed value)	2 gpm	Same
Flashing Fraction (elemental iodine assumed to be released into tank space based upon partition factor)	0 % based on temperature of fluid reaching RWT	Same
RWT liquid/vapor Elemental Iodine partition factor	Table 2.9.2-17	Different based on RWT/sump conditions
Elemental Iodine fraction in RWT	Table 2.9.2-16	Different based on RWT/sump conditions
Initial RWT Liquid Inventory (minimum)	44,147 gallons	38,842 gallons
Release from Sump to RWT Vapor Space	Table 2.9.2-18	Different based on RWT/sump conditions
Release from RWT Vapor Space to Environment	1.07 cfm	Not explicitly used as model input; the vent flow concept was incorporated into effective sump to atmosphere iodine flow determination used in pre-EPU model.
Containment or Hydrogen Purge Release	500 cfm for 30 sec (H2 purge)	42,000 cfm for 5 sec (cont purge)
Removal Inputs:		
Containment Particulates/Aerosol Natural Deposition (only credited in unsprayed regions)	0.1/hour	Same
Containment Elemental Iodine Natural/Wall Deposition	2.89/hour	Same
Containment Spray Region Volume	2,155,160 ft^3	Same
Containment Unsprayed Region Volume	350,840 ft^3	Same

Table 2.9.2-12 (continued)
Loss-of-Coolant Accident (LOCA) – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
Flow rate between sprayed and unsprayed containment volumes	23,389 cfm (during spray operation, equal to 4 x unsprayed volume per hour) 11,695 cfm (after sprays are secured, equal to 2 x unsprayed volume per hour)	11,695 cfm
Spray Removal Rates: Elemental Iodine Time to reach DF of 200 Particulate Iodine Time to reach DF of 50	 20/hour 2.331 hours 6.07/hour 2.334 hours	 Same 3.02 hours 6.43/hour 2.60 hours
Spray Initiation Time Spray Termination Time	80.0 seconds 8 hours	64.5 seconds Same
Control Room Ventilation System Time of automatic control room isolation Time of manual control room air intake opening	(See Table 2.9.2-10) 50 seconds 1.5 hrs	 Same Same
Secondary Containment Filter Efficiency	Particulates – 99% Elemental iodine – 95% Organic iodine – 95%	Same Same Same
Secondary Containment Drawdown Time	310 seconds	Same
Secondary Containment Bypass Fraction	9.6%	Same
Containment or Hydrogen Purge Filtration	0 %	Same
Transport Inputs:		
Containment Release Secondary Containment release prior to drawdown	Nearest Containment penetration to CR ventilation intake	Same
Containment Release Secondary Containment release after drawdown	Plant stack	Same

Table 2.9.2-12 (continued)
Loss-of-Coolant Accident (LOCA) – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
Containment Release Secondary Containment Bypass Leakage	Nearest Containment penetration to CR ventilation intake	Same
ECCS Leakage	ECCS exhaust louver	Same
RWT Backleakage	RWT	Same
Containment or Hydrogen Purge	Plant Stack	Same
Personnel Dose Conversion Inputs:		
Atmospheric Dispersion Factors Offsite Onsite	 Table 2.9.2-9 Table 2.9.2-7	 Different based on meteorological data Different based on meteorological data
Breathing Rates	RG 1.183 Sections 4.1.3 and 4.2.6	Same
Control Room Occupancy Factor	RG 1.183 Section 4.2.6	Same

Table 2.9.2-13
LOCA Time Dependent RWT pH

Time (hours)	RWT pH
0.00	4.500
0.40	4.500
0.50	4.500
1.0	4.501
5.0	4.505
10.0	4.511
15.0	4.517
25.0	4.528
50.0	4.555
75.0	4.580
100.0	4.604
125.0	4.626
150.0	4.648
200.0	4.687
250.0	4.724
300.0	4.758
350.0	4.789
400.0	4.818
450.0	4.845
500.0	4.871
550.0	4.895
600.0	4.918
650.0	4.939
700.0	4.960
720.0	4.968

Table 2.9.2-14
LOCA Time Dependent RWT Total and Elemental Iodine Concentration

Time (hours)	RWT Total Iodine Concentration* [I]aq (gm-atom/liter)	RWT Elemental Iodine Concentration $[I_2]$aq (gm-atom/liter)
0.00	0.00E+00	0.000E+00
0.40	0.00E+00	0.000E+00
0.50	1.67E-08	3.142E-12
1.0	1.00E-07	1.122E-10
5.0	7.59E-07	6.173E-09
10.0	1.56E-06	2.487E-08
15.0	2.35E-06	5.339E-08
25.0	3.85E-06	1.320E-07
50.0	7.30E-06	3.960E-07
75.0	1.04E-05	6.904E-07
100.0	1.31E-05	9.771E-07
125.0	1.56E-05	1.241E-06
150.0	1.78E-05	1.477E-06
200.0	2.16E-05	1.865E-06
250.0	2.48E-05	2.151E-06
300.0	2.76E-05	2.355E-06
350.0	3.00E-05	2.493E-06
400.0	3.20E-05	2.582E-06
450.0	3.38E-05	2.631E-06
500.0	3.54E-05	2.651E-06
550.0	3.68E-05	2.648E-06
600.0	3.81E-05	2.627E-06
650.0	3.92E-05	2.594E-06
700.0	4.03E-05	2.551E-06
720.0	4.07E-05	2.532E-06

*Includes radioactive and stable iodine isotopes

Table 2.9.2-16
LOCA Time Dependent RWT Elemental Iodine Fraction

Time (hr)	Elemental Iodine Fraction
0.0	0.000E+00
0.40	0.000E+00
0.50	3.763E-04
1.0	2.242E-03
5.0	1.627E-02
10.0	3.181E-02
15.0	4.551E-02
25.0	6.850E-02
50.0	1.085E-01
75.0	1.333E-01
100.0	1.492E-01
125.0	1.596E-01
150.0	1.663E-01
200.0	1.725E-01
250.0	1.731E-01
300.0	1.707E-01
350.0	1.665E-01
400.0	1.613E-01
450.0	1.557E-01
500.0	1.498E-01
550.0	1.438E-01
600.0	1.379E-01
650.0	1.322E-01
700.0	1.267E-01
720.0	1.245E-01

Table 2.9.2-18
LOCA Release Rate from Sump to RWT Vapor Space

Time (hours)	Adjusted Iodine Release Rate (cfm)
0.0	0.0
0.40	7.973E-07
10.0	8.637E-06
25.0	4.886E-05
75.0	1.545E-04
125.0	2.636E-04
200.0	3.895E-04
300.0	4.995E-04
450.0	5.563E-04
600.0	5.687E-04

Table 2.9.2-19
Fuel Handling Accident (FHA) – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
Core Power Level Before Shutdown	3030 MWt (~3020 + 0.3%)	2754 MWt (2700 + 2%)
Core Average Fuel Burnup	49,000 MWD/MTU	45,000 MWD/MTU
Discharged Fuel Assembly Burnup	45,000 – 62,000 MWD/MTU	Same
Fuel Enrichment	1.5 – 5.0 w/o	3.0 – 4.5 w/o
Maximum Radial Peaking Factor	1.65	1.7
Number of Fuel Assemblies in the Core	217	Same
Number of Fuel Assemblies Damaged	1	Same
Delay Before Spent Fuel Movement	72 hours	Same
FHA Source Term for a Single Assembly	Table 2.9.2-5	Different based on power, burnup and enrichment
High Burnup Fuel Adjustment Factor	2.0	Same
Water Level Above Damaged Fuel Assembly	23 feet minimum	Same
Iodine Decontamination Factors	Elemental iodine – 285 Organic iodine – 1	Same Same
Noble Gas Decontamination Factor	1	Same
Chemical Form of Iodine In Pool	Elemental iodine – 99.85% Organic iodine – 0.15%	Same Same
Chemical Form of Iodine Above Pool	Elemental iodine – 57% Organic iodine – 43%	Same Same
Atmospheric Dispersion Factors Offsite Onsite	 Table 2.9.2-9 Table 2.9.2-7	 Different based on meteorological data Different based on meteorological data
Control Room Ventilation System Time of Control Room Ventilation System Isolation Time of Control Room Filtered Makeup Flow Control Room Unfiltered Inleakage	 50 seconds 1.5 hours 460 cfm	 Same Same 500 cfm
Breathing Rates	RG 1.183 Sections 4.1.3 and 4.2.6	Same
Control Room Occupancy Factor	RG 1.183 Section 4.2.6	Same

Table 2.9.2-20
Main Steam Line Break (MSLB) – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
Core Power Level	3030 MWt (~3020 + 0.3%)	2754 MWt (2700 + 2%)
Core Average Fuel Burnup	49,000 MWD/MTU	45,000 MWD/MTU
Fuel Enrichment	1.5 – 5.0 w/o	3.0 – 4.5 w/o
Maximum Radial Peaking Factor	1.65	1.7
% DNB for MSLB Outside of Containment	1.2%	1.8%
% DNB for MSLB Inside of Containment	21%	29%
% Fuel Centerline Melt for MSLB Outside of Containment	0.29%	0.43%
% Fuel Centerline Melt for MSLB Inside of Containment	4.5%	6.1%
Core Fission Product Inventory	Table 2.9.2-4	Different based on power, burnup and enrichment
Initial RCS Equilibrium Activity	1.0 μCi/gm DE I-131 and 518.9 μCi/gm DE Xe-133 (Table 2.9.2-2)	1.0 μCi/gm DE I-131 and 100/E-bar gross activity
Initial Secondary Side Equilibrium Iodine Activity	0.1 μCi/gm DE I-131 (Table 2.9.2-3)	Same
Release Fraction from DNB Fuel Failures	RG 1.183, Section 3.2	Same
Release Fraction from Centerline Melt Fuel Failures	RG 1.183, Section 3.2, and Section 1 of Appendix H	Same
High Burnup Fuel Adjustment Factor	1.04608	1.03687
Steam Generator Tube Leakage	0.25 gpm per SG (Table 2.9.2-22)	0.25 gpm per SG
Time to Terminate SG Tube Leakage	12.4 hours	12 hours
Steam Release from Intact SGs	Table 2.9.2-21	Different based on different thermodynamic conditions
Intact SG Tube Uncovery Following Reactor Trip Time to tube recovery Flashing Fraction	 1 hour 6%	 1 hour 5%
Steam Generator Secondary Side Partition Coefficient	Unaffected SG - 100 Faulted SG - None	Same

Table 2.9.2-20 (continued)
Main Steam Line Break (MSLB) – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
Time to Reach 212 °F and Terminate Steam Release	12.4 hours	10.32 hours
Containment Volume Containment Leakage Rate 0 to 24 hours after 24 hours	2.506E+06 ft^3 0.5% (by volume)/day 0.25% (by volume)/day	Same Same Same
Secondary Containment Filter Efficiency	Particulates – 99% Elemental iodine – 95% Organic iodine – 95%	Same Same Same
Secondary Containment Drawdown Time	310 seconds	Same
Secondary Containment Bypass Fraction	9.6%	Same
RCS Mass	406,715 lbm Minimum mass used for fuel failure dose contribution to maximize SG tube leakage activity.	411,500 lbm
SG Secondary Side Mass	Minimum – 120,724.1 lbm (per SG) Maximum – 226,800 lbm (per SG) Maximum mass used for faulted SG to maximize secondary side dose contribution. Minimum mass used for intact SG to maximize steam release nuclide concentration.	Minimum – 105,000 lbm (per SG) Maximum – 205,000 lbm (per SG)
Chemical Form of Iodine Released from SGs	Particulates – 0% Elemental iodine – 97% Organic iodine – 3%	Same Same Same
Atmospheric Dispersion Factors Offsite Onsite	 Table 2.9.2-9 Table 2.9.2-7	 Different based on meteorological data Different based on meteorological data
Control Room Ventilation System Time of Control Room Ventilation System Isolation Time of Control Room Filtered Makeup Flow Control Room Unfiltered Inleakage	 50 seconds 1.5 hours 460 cfm	 Same Same 500 cfm
Breathing Rates	RG 1.183 Sections 4.1.3 and 4.2.6	Same

Table 2.9.2-20 (continued)
Main Steam Line Break (MSLB) – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
Control Room Occupancy Factor	RG 1.183 Section 4.2.6	Same
Containment Natural Deposition Coefficients	Aerosols – 0.1 hr^{-1} Elemental Iodine – 2.89 hr^{-1} Organic Iodine – None	Same Same Same

Table 2.9.2-21
MSLB Steam Release Rate

Time (hours)*	Intact SG Steam Release Rate (lbm /min)
0	5225
0.50	2687
0.75	2687
1.39	2687
2.00	2711
4.00	2711
6.00	2711
8.00	2711
10.50	2711
12.40	0.00

* Flow rates are applied until the next time point.

Table 2.9.2-23
Steam Generator Tube Rupture Accident – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
Core Power Level	3030 MWt (~3020 + 0.3%)	2754 MWt (2700 + 2%)
Initial RCS Equilibrium Activity	1.0 μCi/gm DE I-131 and 518.9 μCi/gm DE Xe-133 (Table 2.9.2-2)	1.0 μCi/gm DE I-131 and 100/E-bar gross activity
Initial Secondary Side Equilibrium Iodine Activity	0.1 μCi/gm DE I-131 (Table 2.9.2-3)	0.1 μCi/gm DE I-131
Maximum Pre-Accident Spike Iodine Concentration	60μCi/gm DE I-131	Same
Maximum Equilibrium Iodine Concentration	1.0μCi/gm DE I-131	Same
Iodine Spike Appearance Rate	335 times	Same
Duration of Accident-Initiated Spike	8 hours	Same
Break Flow and Steam Releases	See Table 2.9.2-24	Different based on different thermodynamic conditions and isolation time
Break Flow Flashing Fraction	Prior to Reactor Trip - 17% (Hot Leg) Following Reactor Trip – 6% (Hot Leg)	Prior to Reactor Trip - 17% Following Reactor Trip – 5%
Time to Terminate Break Flow	45 minutes	30 minutes
Steam Generator Tube Leakage Rate	0.25 gpm per SG	Same
Time to Terminate Tube Leakage	12 hours	Same
Time to Re-cover Unaffected SG Tubes	1 hour	Same
Steam Generator Secondary Side Partition Coefficients	Flashed tube flow – none Non-flashed tube flow – 100	Same Same
Time to Reach 212 °F and Terminate Steam Release	12.4 hours	10.32 hours
RCS Mass	Pre-accident Iodine Spike: 406,715 lbm Concurrent Iodine Spike: 474,951 lbm	Pre-accident Iodine spike – 423,700 lbm Concurrent Iodine spike – 452,000 lbm

Table 2.9.2-23 (continued)
Steam Generator Tube Rupture Accident – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
SG Secondary Side Mass	Minimum -120,724 lbm (per SG) Maximum - 226,800 lbm (per SG) Minimum used for primary-to-secondary leakage to maximize secondary nuclide concentration. Maximum used for initial secondary inventory release to maximize secondary side dose contribution.	Minimum – 105,000 lbm (per SG) Maximum – 260,000 lbm (per SG) Minimum used for primary-to-secondary leakage to maximize secondary nuclide concentration. Maximum used for initial secondary inventory release to maximize secondary side dose contribution.
Atmospheric Dispersion Factors		
Offsite	Table 2.9.2-9	Different based on meteorological data
Onsite	Table 2.9.2-7	Different based on meteorological data
Control Room Ventilation System		
Time of Control Room Ventilation System Isolation	522.7 seconds (Hot Leg Break Rx trip + 50 Sec)	409.2 seconds
Time of Control Room Filtered Makeup Flow	1.5 hours	1.5 hours
Control Room Unfiltered Inleakage	460 cfm	500 cfm
Breathing Rates		
Offsite	RG 1.183, Section 4.1.3	Same
Control Room	RG 1.183, Section 4.2.6	Same
Control Room Occupancy Factor	RG 1.183 Section 4.2.6	Same

Table 2.9.2-24
SGTR Break Flow and Steam Releases

Time (hr)*	Event Description	Ruptured SG Break Flow (lbm/min)	Ruptured SG Steam Release (lbm/min)	Unaffected SG Steam Release (lbm/min)
0	Event Initiation	2544.83	111000	110730
0.131	Reactor Trip	1724.28	4920	100
0.75	Ruptured SG Isolated	0.00	130	3760
1.00	Unaffected SG tubes Re-covered	26.00	0	3760
1.50	Manual Realignment of CR Intakes	39.00	0	3760
2.00	X/Q Change	39.00	0	3760
8.00	X/Q Change	39.00	0	2320
12.40	Termination of SG Releases at 212F	0	0	0

*Flow rates are applied until the next time point.

Table 2.9.2-28
Locked Rotor Accident – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
Core Power Level	3030 MWt (~3020+0.3%)	2754 MWt (2700 + 2%)
Core Average Fuel Burnup	49,000 MWD/MTU	45,000 MWD/MTU
Fuel Enrichment	1.5 – 5.0 w/o	3.0 – 4.5w/o
Maximum Radial Peaking Factor	1.65	1.7
Percent of Fuel Rods in DNB	19%	13.7%
High Burnup Fuel Adjustment Factor	1.04608	1.03687
Core Fission Product Inventory	Table 2.9.2-4	Different based on power, burnup and enrichment
Initial RCS Equilibrium Activity	1.0 μCi/gm DE I-131 and 518.9 μCi/gm DE Xe-133 (Table 2.9.2-2)	1.0 μCi/gm DE I-131 and 100/E-bar gross activity
Initial Secondary Side Equilibrium Iodine Activity	0.1 μCi/gm DE I-131 (Table 2.9.2-3)	0.1 μCi/gm DE I-131
Release Fraction from Breached Fuel	RG 1.183, Section 3.2	Same
Steam Generator Tube Leakage	0.5 gpm (Table 2.9.2-31)	0.5 gpm
Time to Terminate SG Tube Leakage	12.4 hours	12 hours
Secondary Side Mass Releases to Environment	Table 2.9.2-29	Different based on different thermodynamic conditions
SG Tube Uncovery Following Reactor Trip Time to tube recovery Flashing Fraction	 1 hour 5 %	 Same Same
Steam Generator Secondary Side Partition Coefficient	Flashed tube flow – none Non-flashed tube flow – 100	Same Same
Time to Reach 212 °F and Terminate Steam Release	12.4 hours	10.32 hours
RCS Mass	Minimum - 406,715 lbm (9060 ft^3 at system conditions of 2250 psia and 578.5°F)	Minimum - 411,500 lbm Minimum mass used for fuel failure dose contribution to maximize SG tube leakage activity.

Table 2.9.2-28 (continued)
Locked Rotor Accident – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
SG Secondary Side Mass	Minimum – 120,724 lbm (per SG) Maximum – 226,800 lbm (per SG) Minimum used for primary-to-secondary leakage to maximize secondary nuclide concentration. Maximum used for initial secondary inventory release to maximize secondary side dose contribution.	Minimum – 105,000 lbm (per SG) Maximum – 205,000 lbm (per SG) Minimum used for primary-to-secondary leakage to maximize secondary nuclide concentration. Maximum used for initial secondary inventory release to maximize secondary side dose contribution.
Atmospheric Dispersion Factors Offsite Onsite	 Table 2.9.2-9 Table 2.9.2-7	 Different based on meteorological data Different based on meteorological data
Control Room Ventilation System Time of Control Room Ventilation System Isolation Time of Control Room Filtered Makeup Flow Control Room Unfiltered Inleakage	 50 seconds 1.5 hours 460 cfm	 Same Same 500 cfm
Breathing Rates Offsite Onsite	 RG 1.183 Section 4.1.3 RG 1.183 Section 4.2.6	 Same Same
Control Room Occupancy Factor	RG 1.183 Section 4.2.6	Same
Control Room Model	96,228 ft^3 volume 504 cfm Makeup Flow	62,318 ft^3 volume 450 cfm Makeup Flow

Table 2.9.2-30
CEA Ejection Accident – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
Core Power Level	3030 MWt (~3020 + 0.3%)	2754 MWt (2700 + 2%)
Core Average Fuel Burnup	49,000 MWD/MTU	45,000 MWD/MTU
Fuel Enrichment	1.5 – 5.0 w/o	3.0 – 4.5 w/o
Maximum Radial Peaking Factor	1.65	1.7
Percent of Fuel Rods in DNB	9.5%	Same
Percent of Fuel Rods with Centerline Melt	0.5%	Same
Core Fission Product Inventory	Table 2.9.2-4	Different based on power, burnup and enrichment
Initial RCS Equilibrium Activity	1.0 μCi/gm DE I-131 and 518.9 μCi/gm DE Xe-133 (Table 2.9.2-2)	1.0 μCi/gm DE I-131 and 100/E-bar gross activity
Initial Secondary Side Equilibrium Iodine Activity	0.1 μCi/gm DE I-131 (Table 2.9.2-3)	0.1 μCi/gm DE I-131
Release Fraction from DNB Fuel Failures	Section 1 of Appendix H to RG 1.183	Same
Release Fraction from Centerline Melt Fuel Failures	Section 1 of Appendix H to RG 1.183	Same
High Burnup Fuel Adjustment Factor	1.04608 10 fuel assemblies	1.03687 8 fuel assemblies
Steam Generator Tube Leakage	0.5 gpm (Table 2.9.2-29)	0.5 gpm
Time to Terminate SG Tube Leakage	12.4 hours	12 hours
Secondary Side Mass Releases to Environment	Table 2.9.2-25a	Different based on different thermodynamic conditions
SG Tube Uncovery Following Reactor Trip Time to tube recovery Flashing Fraction	 1 hour 5 %	 Same Same
Steam Generator Secondary Side Partition Coefficient	Flashed tube flow – none Non-flashed tube flow – 100	Same Same
Time to Reach 212 °F and Terminate Steam Release	12.4 hours	10.32 hours
RCS Mass	Minimum -- 406,715 lbm Minimum mass used for fuel failure dose contribution to maximum SG tube leakage activity.	Minimum – 411,500 lbm Minimum mass used for fuel failure dose contribution to maximum SG tube leakage activity.

Table 2.9.2-30 (continued)
CEA Ejection Accident – Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
SG Secondary Side Mass	Minimum – 120,724 lbm (per SG) Maximum – 226,800 lbm (per SG) Minimum used for primary-to-secondary leakage to maximize secondary nuclide concentration. Maximum used for initial secondary inventory release to maximize secondary side dose contribution.	Minimum – 105,000 lbm (per SG) Maximum – 205,000 lbm (per SG) Minimum used for primary-to-secondary leakage to maximize secondary nuclide concentration. Maximum used for initial secondary inventory release to maximize secondary side dose contribution.
Chemical Form of Iodine Released to Containment	Particulates – 95% Elemental iodine – 4.85% Organic iodine – 0.15%	Same Same Same
Chemical Form of Iodine Released from SGs	Particulates – 0% Elemental iodine – 97% Organic iodine – 3%	Same Same Same
Atmospheric Dispersion Factors Offsite Onsite	 Table 2.9.2-9 Table 2.9.2-7	 Different based on meteorological data Different based on meteorological data
Control Room Ventilation System Time of Control Room Ventilation System Isolation Time of Control Room Filtered Makeup Flow Control Room Unfiltered Inleakage	 50 seconds 1.5 hours 460 cfm	 Same Same 500 cfm
Breathing Rates	RG 1.183 Sections 4.1.3 and 4.2.6	Same
Control Room Occupancy Factor	RG 1.183 Section 4.2.6	Same
Control Room Model	96,228 ft^3 volume 504 cfm Makeup Flow	62,318 ft^3 volume 450 cfm Makeup Flow
Containment Volume Containment Leakage Rate 0 to 24 hours after 24 hours	2.506E+06 ft^3 0.5% (by volume)/day 0.25% (by volume)/day	Same Same Same
Secondary Containment Filter Efficiency	Particulates – 99% Elemental iodine – 95% Organic iodine – 95%	Same Same Same

Table 2.9.2-30 (continued)
CEA Ejection Accident – Inputs and Assumptions

Secondary Containment Drawdown Time	310 seconds	Same
Secondary Containment Bypass Fraction	9.6%	Same
Containment Natural Deposition Coefficients	Aerosols – 0.1 hr^{-1} Elemental Iodine – 2.89 hr^{-1} Organic Iodine – None	Same Same Same

Table 2.9.2-32
IOMSSV Inputs and Assumptions

Input/Assumption	EPU Value	Pre-EPU Value
Core Power Level	3030 MWt (3020 + 0.3%)	2754 MWt (2700 + 2%)
Initial RCS Equilibrium Activity	1.0 μCi/gm DE I-131 and 518.9 μCi/gm DE Xe-133 (Table 2.9.2-2)	1.0 μCi/gm DE I-131 and 100/E-bar gross activity
Initial Secondary Side Equilibrium Iodine Activity	0.1 μCi/gm DE I-131 (Table 2.9.2-3)	0.1 μCi/gm DE I-131
Steam Generator Tube Leakage	0.5 gpm (Table 2.9.2-33)	0.5 gpm
Time to Terminate SG Tube Leakage	12.4 hours	12 hours
Secondary Side Mass Releases to Environment	Entire inventory in 2 hours	Same
Steam Generator Secondary Side Partition Coefficient	None	Same
SG Secondary Side Mass	Maximum - 226,800 lbm per SG Maximum mass used for initial secondary inventory release to maximize secondary side dose contribution.	Maximum - 205,000 lbm per SG Maximum mass used for initial secondary inventory release to maximize secondary side dose contribution.
Atmospheric Dispersion Factors Offsite Onsite	 Table 2.9.2-9 Table 2.9.2-7	 Different based on meteorological data Different based on meteorological data
Control Room Ventilation System Time of Control Room Ventilation System Isolation Time of Control Room Filtered Makeup Flow Control Room Unfiltered Inleakage	 50 seconds 1.5 hours 460 cfm	 Same Same 500 cfm
Breathing Rates: Offsite Onsite	 RG 1.183 Section 4.1.3 RG 1.183 Section 4.2.6	 Same Same
Control Room Occupancy Factor	RG 1.183 Section 4.2.6	Same

Table 2.9.3-3
RADTRAD-NAI Pathway Description Tables

Pathway Description	Pathway Number	Compartment Connections	RADTRAD-NAI Pathway Type
WGDT Leakage	1	1 to 2	Filtered
Control Room Unfiltered Inleakage	2	2 to 3	Filtered
Control Room Filtered Makeup	3	2 to 3	Filtered
Control Room Normal HVAC Intake	4	2 to 3	Filtered
Control Room Exhaust	5	3 to 2	Filtered

Pathway 1 - WGDT Leakage to Environment Pathway

Time (hours)	Flow Rate (cfm)	Filter Efficiency		
		Aerosol	Elemental	Organic
0.0	1e6	0	0	0
720.0	1e6	0	0	0

Pathway 2 - Control Room Unfiltered Inleakage Pathway

Time (hours)	Flow Rate (cfm)	Filter Efficiency		
		Aerosol	Elemental	Organic
0.0	460	0	0	0
720.0	460	0	0	0

Pathway 3 - Control Room Filtered Makeup Pathway

Time (hours)	Flow Rate (cfm)	Filter Efficiency		
		Aerosol	Elemental	Organic
0.0	0.0	0.0	0.0	0.0
0.01389	0.0	0.0	0.0	0.0
1.5	450.0 +12% *	0.0	0.0	0.0
720.0	450.0 +12%	0.0	0.0	0.0

Pathway 4 – Control Room Unfiltered Normal Intake Pathway

Time (hours)	Flow Rate (cfm)	Filter Efficiency		
		Aerosol	Elemental	Organic
0.0	920.0	0.0	0.0	0.0
0.01389	0.0	0.0	0.0	0.0
1.5	0.0	0.0	0.0	0.0
720.0	0.0	0.0	0.0	0.0

* **12% is to account for the potential impact on ventilation flow rates of surveillance test tolerances and over/under frequency of the emergency diesel generators.**

Table 2.9.3-3
RADTRAD-NAI Pathway Description Tables
(continued)

Pathway 5 - Control Room Exhaust Pathway

Time (hours)	Flow Rate (cfm)	Filter Efficiency		
		Aerosol	Elemental	Organic
0.0	1380.0	0.0	0.0	0.0
0.01389	460.0	0.0	0.0	0.0
1.5	964.0	0.0	0.0	0.0
720.0	964.0	0.0	0.0	0.0

Table 2.9.3-6
WGDT Failure X/Q Tables

X/Q Table 1 – EAB

Time (hours)	Unit 1 X/Q (sec/m^3)	Unit 2 X/Q (sec/m^3)	St. Lucie Bounding EAB X/Q (sec/m^3)
0.0	9.84E-05	1.05E-04	1.05E-04
720.0	9.84E-05	1.05E-04	1.05E-04

X/Q Table 2 – LPZ

Time (hours)	Unit 1 X/Q (sec/m^3)	Unit 2 X/Q (sec/m^3)	St. Lucie Bounding LPZ X/Q (sec/m^3)
0.0	9.56E-05	1.01E-04	1.01E-04
2.0	5.34E-05	5.74E-05	5.74E-05
8.0	3.99E-05	4.32E-05	4.32E-05
24.0	2.12E-05	2.33E-05	2.33E-05
96.0	8.55E-06	9.62E-06	9.62E-06
720.0	8.55E-06	9.62E-06	9.62E-06

X/Q Table 3 - Control Room HVAC Intake via N or S Fresh Air Intake
Summary – Bounding St. Lucie HVAC X/Q Table

Time	Stack to HVAC X/Q	L-7A/ 2L-7A to HVAC X/Q	L-7B/ 2L-7B to HVAC X/Q	St. Lucie Bounding HVAC X/Q
(hours)	(sec/m^3)	(sec/m^3)	(sec/m^3)	(sec/m^3)
0	2.390E-03	3.770E-03	3.735E-03	3.770E-03
0.01389	2.390E-03	3.770E-03	3.735E-03	3.770E-03
1.5	6.925E-04	3.770E-03	3.735E-03	3.770E-03
2	4.875E-04	3.195E-03	3.045E-03	3.195E-03
8	2.185E-04	1.390E-03	1.327E-03	1.390E-03
24	1.460E-04	1.101E-03	1.039E-03	1.101E-03
96	1.280E-04	8.870E-04	8.305E-04	8.870E-04
720	1.280E-04	8.870E-04	8.305E-04	8.870E-04

Table 2.9.3-6
WGDT Failure X/Q Tables
(continued)

X/Q Table 4 - Control Room Unfiltered Inleakage X/Q via Louver L-11 or 2L-11

Time (hours)	Unit 1 Stack X/Q (Louver L-11) (sec/m^3)	Unit 2 Stack X/Q (Louver 2L-11) (sec/m^3)	Unit 1 L-7A X/Q (Louver L-11) (sec/m^3)	Unit 1 L-7B X/Q (Louver L-11) (sec/m^3)	Unit 2 L-7A X/Q (Louver 2L-11) (sec/m^3)	Unit 2 L-7B X/Q (Louver 2L-11) (sec/m^3)	St Lucie Bounding Inleakage X/Q (sec/m^3)
0	2.55E-03	2.60E-03	3.56E-03	2.72E-03	3.61E-03	2.90E-03	3.61E-03
2	1.78E-03	1.84E-03	2.83E-03	2.06E-03	2.92E-03	2.17E-03	2.92E-03
8	7.94E-04	8.09E-04	1.17E-03	8.51E-04	1.23E-03	8.98E-04	1.23E-03
24	5.37E-04	5.62E-04	8.92E-04	6.37E-04	9.38E-04	6.83E-04	9.38E-04
96	4.62E-04	4.59E-04	7.14E-04	4.88E-04	7.66E-04	5.17E-04	7.66E-04
720	4.62E-04	4.59E-04	7.14E-04	4.88E-04	7.66E-04	5.17E-04	7.66E-04

Table 2.9.3-7
Dose Consequences for Waste Gas Decay Tank Failure

Dose Contribution	TEDE Dose (rem)		
	EAB 30 Days	LPZ 30 Days	CR 30 Days
WGDT Failure	0.055	0.053	0.269
Acceptance Criteria	0.1*	0.1*	5**
Control Room Unfiltered Inleakage = 460 cfm			

* The 0.1 REM (TEDE) 30 day dose limit is specified in NUREG-0800, BTP-11-3 Rev 3 (March 2007) Position B.1.A for the EAB. The LPZ limit is assumed in this calculation to be the same value.

** The 5.0 REM (TEDE) CR limit is not specified in either the BTP or Reg Guide 1.183 for this event, but is the specified Control Room limit for all other AST events.

Table 2.9.3-8
WGDT Source Term – Technical Specification DE Xe-133 Curies

	DE Xe-133 WGDT Inventory (Ci)	EAB Dose (Limit = 0.1 Rem TEDE)
Design Basis	90,921	0.055
TS	165,000	0.099997

Attachment 2

Technical Specifications Section 3.11.2.6
Radiological Effluents – Gas Storage Tanks
Revision To Proposed Change Submitted By FPL Letter L-2010-259
Regarding Extended Power Uprate License Amendment Request

Description of the Change

EPU LAR Attachment 1, Section 3.1, Renewed Facility Operating License and Technical Specification Changes, Item 28. TS 3/4.11.2.6, RADIOACTIVE EFFLUENTS – GAS STORAGE TANKS, proposed that LIMITING CONDITION FOR OPERATION (LCO) 3.11.2.6 be changed from "less than or equal to 285,000 curies noble gases (considered as Xe-133)." to "less than or equal to 202,500 curies noble gases (considered as Xe-133)."

By email from the NRC Project Manager dated June 21, 2011, additional information related to accident dose was requested by the NRC staff in the Accident Dose Branch (AADB) to support their review of the EPU LAR. The request for additional information (RAI) identified sixteen questions. The response to this RAI was submitted to the NRC by FPL letter L-2011-314, dated August 12, 2011 (Accession No. ML11234A283). The FPL letter contained revised atmospheric dispersion factors (χ/Q's) that were based on updated site meteorological data provided on a compact disc (CD) that was enclosed with the letter.

The revised χ/Q's were inputs to a revision to dose analysis calculations. As a result of the revised calculations, the quantity of radioactivity contained in each gas storage tank is being reduced to less than or equal to 165,000 curies of noble gas.

- LCO 3.11.2.6 is changed from "...less than or equal to 285,000 curies noble gases..." to"...less than or equal to 165,000 curies noble gases..."

  Note that the change described is from the current TS value for curies noble gases, not the EPU LAR proposed value of 202,500 curies noble gases. The marked up TS page in Attachment 3 contains this proposed change and the EPU LAR proposed change that is being revised.

- The remaining changes proposed for TS 3/4.11.2.6 remain valid.

Basis for the change:

The gas storage tank inventory source term required to generate an exclusion area boundary (EAB) dose of 0.1 rem total effective dose equivalent (TEDE) is the basis for a proposed TS limit of 165,000 curies noble gas (considered as Dose Equivalent Xe-133). The limit of 0.1 rem is consistent with Branch Technical Position 11-5, Postulated Radioactive Releases Due to a Waste Gas System Leak or Failure, of Standard Review Plan Chapter 11, Radioactive Waste Management, of NUREG-0800.

FPL letter (L-2011-314) submitted revised atmospheric dispersion factors (χ/Q's) based on updated site meteorological data provided on a compact disc (CD) that was enclosed with the letter. The revised χ/Q's were utilized in accident dose calculation to determine the dose at the EAB. To ensure that the dose at the EAB does not exceed 0.1 rem TEDE, the radioactivity in each of the gas storage tanks has been reduced from the current TS value of "285,000 curies noble gases (considered as Xe-133)" to a limit of "165,000 curies noble gases (considered as Xe-133)." The revised radioactivity limit being proposed in also reduced from the EPU LAR proposed limit of 202,500 curies noble gases (considered as Xe-133).

No Significant Hazards Consideration

This change reduces the quantity of radioactivity in each gas storage tank to ensure that the EAB dose is less than or equal to 0.1 rem TEDE. The change was the result of revised accident dose analysis calculation results which used the χ/Q values that were determined from updated meteorological data. The change is conservative as it is a reduction in the radioactivity in the tanks. As such, the conclusions of EPU LAR Attachment 1 Section 5.2, No Significant Hazards Consideration, Item F. Reactor Coolant System Specific Activity remain valid. Accordingly, the proposed change 1) does not involve a significant increase in the propbability or consequences of an accident previously evaluated, 2) does not create the possibility of a new or different kind of accident from any previously evaluated, and 3) does not result in a significant reduction in a margin of safety.

Environmental Evaluation

This change is a conservative change to reduce the radioactivity in the gas storage tanks. The change is a reduction in the proposed TS radioactivity limit change provided in the EPU LAR. The environmental considerations evaluation contained in the EPU LAR remain valid. Accordingly, the proposed license amendment is eligible for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 50.22(b), no environmental impact statement or environmental assessment is needed in connection with the approval of the proposed license amendment.

ATTACHMENT 3

Supplemental Response to NRC Accident Dose Branch Request for Additional Information Regarding Extended Power Uprate License Amendment Request

Marked Up and Clean Technical Specification Pages

This coversheet plus two pages

RADIOACTIVE EFFLUENTS

GAS STORAGE TANKS

LIMITING CONDITION FOR OPERATION

3.11.2.6 The quantity of radioactivity contained in each gas storage tank shall be limited to less than or equal to ~~285,000~~ curies noble gases (considered as Xe-133).

~~202,500~~
165,000

APPLICABILITY: At all times.

ACTION:

a. With the quantity of radioactive material in any gas storage tank exceeding the above limit, immediately suspend all additions of radioactive material to the tank.

b. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.6 The quantity of radioactive material contained in each gas storage tank shall be determined to be within the above limit at least once per 24 hours when radioactive materials are being added to the tank when reactor coolant system activity exceeds ~~100/$\bar{E}$~~.

518.9 µCi/gram DOSE
EQUIVALENT XE-133

RADIOACTIVE EFFLUENTS

GAS STORAGE TANKS

LIMITING CONDITION FOR OPERATION

3.11.2.6 The quantity of radioactivity contained in each gas storage tank shall be limited to less than or equal to 165,000 curies noble gases (considered as Xe-133).

APPLICABILITY: At all times.

ACTION:

a. With the quantity of radioactive material in any gas storage tank exceeding the above limit, immediately suspend all additions of radioactive material to the tank.

b. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.11.2.6 The quantity of radioactive material contained in each gas storage tank shall be determined to be within the above limit at least once per 24 hours when radioactive materials are being added to the tank when reactor coolant system activity exceeds 518.9 μCi/gram DOSE EQUIVALENT XE-133.