FPL

Turkey Point Nuclear Power Plant
9760 S.W. 344 St.
Florida City, FL 33035

10 CFR 50.90
L-2007-112
July 17, 2007

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

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
License Amendment Request No. 178
Spent Fuel Pool Boraflex® Remedy – Implementation Schedule, Clarification of Prior Response and Camera-Ready Pages

References: 1) Florida Power and Light Company Letter L-2005-247, dated January 27, 2006, License Amendment Request No. 178, Spent Fuel Pool Boraflex Remedy
2) Florida Power and Light Company Letter L-2007-079, dated April 30, 2007, License Amendment Request No. 178: Spent Fuel Pool Boraflex Remedy, Response to NRC Request for Additional Information

In accordance with the provisions of 10 CFR 50.90, Florida Power and Light Company (FPL) requested in Reference 1 that Appendix A of Facility Operating Licenses DPR-31 and DPR-41 for Turkey Point Units 3 and 4, respectively, be amended to incorporate changes to the Technical Specifications (TS). TS Sections 3/4.9.1-Boron Concentration, 3/4.9.14 – Spent Fuel Storage, and 5.5.1 – Criticality, would be revised to include new spent fuel storage patterns and the use of Metamic™ rack inserts. The referenced license amendment request indicated that an implementation schedule would need to be established at the time of amendment issuance. FPL provided additional information in Reference 2 in response to an NRC staff request. The purpose of this letter is to document FPL's intended implementation schedule, to provide a clarification of information provided in Reference 2, and to provide the revised (camera-ready) TS pages for the license amendment.

As regards the implementation schedule, FPL will complete the implementation of the Boraflex® remedy license amendment for both the Turkey Point Unit 3 and Unit 4 spent fuel pools prior to the end of Unit 4 Cycle 24.

On May 10, 2007, representatives of FPL discussed with the NRC staff a clarification of a statement made in FPL's request for additional information response (Reference 2). On page 7 of the response, FPL provided acceptance criteria for neutron attenuation testing of Metamic™ neutron poison material intended for use in the spent fuel pools (Reference 1). The NRC staff sought clarification of the statement regarding "significant decreases in areal density." The paragraph below addresses the clarification.

During the teleconference, FPL defined "a significant decrease in areal density" as any unexpected decrease in areal density from the as-fabricated condition outside the statistical

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inaccuracies of the testing methodology. If testing identifies a significant decrease in areal density, it would be identified within the Corrective Action Program resulting in specific analyses to determine the cause and to understand the boron depletion mechanism. FPL will establish the as-fabricated condition by using the fabrication features, qualification and acceptance testing values for the boron areal density provided by the manufacturer. The manufacturer provides a guaranteed minimum value or a given value with a confidence range. FPL will review the fabrication qualification and acceptance test data to determine whether the value provided is acceptable for pre-characterization. If this value is determined not to be acceptable, FPL may decide to perform neutron attenuation testing of a coupon prior to installation of the Metamic™ inserts to establish a baseline.

The revised camera-ready TS pages are attached.

The original No Significant Hazards Consideration Determination remains valid considering the information provided herein and no revision of the requested TS changes is involved.

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

Should there be any questions, please contact James Connolly at 305-246-6632.

I declare under penalty of perjury that the foregoing is true and correct.

Very truly yours,

7/17/07
Executed on

William Jefferson, Jr.
Vice President
Turkey Point Nuclear Plant

Attachment: Camera-Ready TS Pages

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant
Florida Department of Health

Attachment

Florida Power & Light Company
License Amendment Request No. 178
Boraflex® Remedy
L-2007-112

Revised Camera-Ready Technical Specification Pages

Index Pages: xiii and xiv
Section 3/4.9 Pages: 3/4 9-1 and 3/4 9-15
Section 5.5 Pages: 5-5 through 5-19

LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

INDEX

DESIGN FEATURES

3/4.9 REFUELING OPERATIONS

3/4.9.1 BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 The boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained uniform and sufficient to ensure that the more restrictive of the following reactivity conditions is met; either:

a. A K_{eff} of 0.95 or less, or

b. A boron concentration of greater than or equal to 1950 ppm.

APPLICABILITY: MODE 6.*

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at greater than or equal to 16 gpm of a solution containing greater than or equal to 3.0 wt% (5245 ppm) boron or its equivalent until K_{eff} is reduced to less than or equal to 0.95 or the boron concentration is restored to greater than or equal to 1950 ppm, whichever is the more restrictive.

SURVEILLANCE REQUIREMENTS

4.9.1.1 The more restrictive of the above two reactivity conditions shall be determined prior to:

a. Removing or unbolting the reactor vessel head, and

b. Withdrawal of any full-length control rod in excess of 3 feet from its fully inserted position within the reactor vessel.

4.9.1.2 The boron concentration of the Reactor Coolant System and the refueling canal shall be determined by chemical analysis at least once per 72 hours.

4.9.1.3 Valves isolating unborated water sources** shall be verified closed and secured in position by mechanical stops or by removal of air or electrical power at least once per 31 days.

* The reactor shall be maintained in MODE 6 whenever fuel is in the reactor vessel with the vessel head closure bolts less than fully tensioned or with the head removed.

** The primary water supply to the boric acid blender may be opened under administrative controls for makeup.

3/4.9.14 SPENT FUEL STORAGE

LIMITING CONDITION FOR OPERATION

3.9.14 The following conditions shall apply to spent fuel storage:

a. The minimum boron concentration in the Spent Fuel Pit shall be 1950 ppm.

b. The combination of initial enrichment, burnup, and cooling time of each fuel assembly stored in the Spent Fuel Pit shall be in accordance with Specification 5.5.1.

APPLICABILITY: At all times when fuel is stored in the Spent Fuel Pit.

ACTION:

a. With boron concentration in the Spent Fuel Pit less than 1950 ppm, suspend movement of spent fuel in the Spent Fuel Pit and initiate action to restore boron concentration to 1950 ppm or greater.

b. With condition b not satisfied, suspend movement of additional fuel assemblies into the Spent Fuel Pit and restore the spent fuel storage configuration to within the specified conditions.

c. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.14.1 The boron concentration of the Spent Fuel Pit shall be verified to be 1950 ppm or greater at least once per month.

4.9.14.2 A representative sample of inservice Metamic inserts shall be visually inspected in accordance with the Metamic Surveillance Program described in UFSAR Section 16.2. The surveillance program ensures that the performance requirements of Metamic are met over the surveillance interval.

5.5 FUEL STORAGE

5.5.1 CRITICALITY

5.5.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. A k_{eff} less than 1.0 when flooded with unborated water, which includes an allowance for biases and uncertainties as described in UFSAR Chapter 9.

b. A k_{eff} less than or equal to 0.95 when flooded with water borated to 650 ppm, which includes an allowance for biases and uncertainties as described in UFSAR Chapter 9.

c. A nominal 10.6 inch center-to-center distance for Region I and 9.0 inch center-to-center distance for Region II for the two region spent fuel pool storage racks. A nominal 10.1 inch center-to-center distance in the east-west direction and a nominal 10.7 inch center-to-center distance in the north-south direction for the Region I cask area storage rack.

d. A maximum enrichment loading for fuel assemblies of 4.5 weight percent of U-235.

e. No restriction on storage of fresh or irradiated fuel assemblies in the cask area storage rack.

f. Fresh or irradiated fuel assemblies not stored in the cask area storage rack shall be stored in accordance with Specification 5.5.1.3 or configurations that have been shown to comply with Specification 5.5.1.1a and 5.5.1.1b using the NRC approved methodology in UFSAR Chapter 9.

5.5.1.2 The racks for new fuel storage are designed to store fuel in a safe subcritical array and shall be maintained with:

a. A nominal 21 inch center-to-center spacing to assure k_{eff} equal to or less than 0.98 for optimum moderation conditions and equal to or less than 0.95 for fully flooded conditions.

b. Fuel assemblies placed in the New Fuel Storage Area shall contain no more than 4.5 weight percent of U-235.

5.5.1.3 Credit for burnup and cooling time is taken in determining acceptable placement locations for spent fuel in the two-region spent fuel racks. Fresh or irradiated fuel assemblies shall be stored in compliance with the following:

a. Any 2x2 array of Region I storage cells containing fuel shall comply with the storage patterns in Figure 5.5-1 and the requirements of Table 5.5-1 and 5.5-2, as applicable. The reactivity rank of fuel assemblies in the 2x2 array (rank determined using Table 5.5-3) shall be equal to or less than that shown for the 2x2 array.

b. Any 2x2 array of Region II storage cells containing fuel shall:

i. Comply with the storage patterns in Figure 5.5-2 and the requirements of Table 5.5-1 and 5.5-2, as applicable. The reactivity rank of fuel assemblies in the 2x2 array (rank determined using Table 5.5-3) shall be equal to or less than that shown for the 2x2 array,

ii. Have the same directional orientation for Metamic inserts in a contiguous group of 2x2 arrays where Metamic inserts are required,

iii. Comply with the requirements of 5.5.1.3.c for cells adjacent to Region I racks, and

iv. Comply with the requirements of 5.5.1.3.d for cells adjacent to the spent fuel pit walls.

c. Any 2x2 array of Region II storage cells that interface with Region I shall comply with the rules of Figure 5.5-3. Arrays II-E and II-F may interface with Region I without special restriction.

d. Any 2x2 array of Region II storage cells may adjoin a row of assemblies with a reactivity rank of II-2 (or lower) that is located in the outer row adjacent to the spent fuel pit wall. The outer row of reactivity rank II-2 (or lower) fuel assemblies need not contain any Metamic inserts or full length RCCAs, as long as the following additional requirements are met:

i. Fuel is loaded to comply with the allowable storage patterns defined in Figure 5.5-4, and

ii. Arrays II-E and II-F are loaded without any additional restriction on that 2x2 array. Arrays II-E and II-F do not have empty cells, Metamic inserts, or RCCAs that restrict the interface with the adjoining reactivity rank II-2 (or lower) fuel assemblies.

DRAINAGE

5.5.2 The spent fuel storage pit is designed and shall be maintained to prevent inadvertent draining of the pool below a level of 6 feet above the fuel assemblies in the storage racks.

CAPACITY

5.5.3 The spent fuel pool storage racks are designed and shall be maintained with a storage capacity limited to no more than 1404 fuel assemblies in two region storage racks, and the cask area storage rack is designed and shall be maintained with a storage capacity limited to no more than 131 fuel assemblies. The total spent fuel pool storage capacity is limited to no more than 1535 fuel assemblies.

Table 5.5-1

Blanketed Fuel - Minimum Required Fuel Assembly Burnup (Bu) as a Function of Enrichment (En) and Cooling Time (Ct)

See note 1 for use of Table 5.5-1

Fuel Category	Blanketed Fuel Storage Curve Coefficients[1]							Blanketed Fuel Minimum Burnup[1] (GWd/MTU) for Initial Enrichment[2]					
	A	B	C	D	E	F	G	Cooling Time[3]	2.5 w%	3.0 w%	3.3 w%	4.0 w%	4.5 w%
I-1[4]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I-2	18.8602	-1.090486	0.266387	-0.00474496	-0.158563	0.00314739	-30.1637	0	10.17	16.60	20.20	27.83	32.62
								2.5	9.87	16.11	19.59	26.96	31.57
								5	9.60	15.67	19.06	26.19	30.62
								10	9.18	14.98	18.20	24.94	29.10
								15	8.92	14.52	17.62	24.08	28.04
								20	8.82	14.30	17.32	23.61	27.45
II-1	16.2639	-0.712257	0.175883	-0.00399237	-0.166686	0.00370969	-19.5118	0	16.70	22.87	26.40	34.15	39.25
								2.5	16.13	22.10	25.52	32.99	37.90
								5	15.62	21.43	24.74	31.96	36.70
								10	14.82	20.34	23.49	30.32	34.78
								15	14.27	19.61	22.65	29.23	33.50
								20	13.99	19.24	22.22	28.67	32.85
II-2	14.4600	-0.372732	0.132275	-0.00617104	-0.187813	0.00526411	-12.8293	0	20.99	27.20	30.83	39.05	44.69
								2.5	20.19	26.18	29.68	37.59	43.02
								5	19.48	25.28	28.67	36.32	41.57
								10	18.32	23.85	27.07	34.35	39.32
								15	17.50	22.89	26.04	33.11	37.94
								20	17.04	22.42	25.56	32.62	37.44
II-3	15.4624	-0.501267	-0.06553	0.00160009	-0.161078	0.00340497	-11.2483	0	24.27	30.63	34.32	42.58	48.18
								2.5	23.17	29.33	32.91	40.90	46.31
								5	22.19	28.18	31.65	39.41	44.65
								10	20.60	26.32	29.63	37.00	41.97
								15	19.53	25.05	28.25	35.36	40.13
								20	18.96	24.38	27.51	34.47	39.14

Table 5.5-1 (continued)

Blanketed Fuel - Minimum Required Fuel Assembly Burnup (Bu) as a Function of Enrichment (En) and Cooling Time (Ct)

See note 1 for use of Table 5.5-1

Fuel Category	Blanketed Fuel Storage Curve Coefficients[1]							Blanketed Fuel Minimum Burnup[1] (GWd/MTU) for Initial Enrichment[2]					
	A	B	C	D	E	F	G	Cooling Time[3]	2.5 w%	3.0 w%	3.3 w%	4.0 w%	4.5 w%
II-4	15.3172	-0.444842	-0.114363	0.00273060	-0.162664	0.00344467	-9.1868	0	26.33	32.76	36.52	44.96	50.73
								2.5	25.09	31.34	34.98	43.16	48.73
								5	24.00	30.08	33.61	41.55	46.96
								10	22.25	28.04	31.41	38.97	44.09
								15	21.06	26.67	29.92	37.20	42.14
								20	20.44	25.94	29.13	36.27	41.10
II-5	15.1701	-0.387768	-0.163521	0.00394514	-0.164014	0.00345174	-7.1273	0	28.37	34.89	38.71	47.35	53.29
								2.5	27.02	33.34	37.05	45.41	51.15
								5	25.82	31.97	35.57	43.69	49.26
								10	23.90	29.77	33.20	40.93	46.22
								15	22.60	28.28	31.59	39.05	44.14
								20	21.93	27.50	30.75	38.06	43.05
II-6	13.4516	-0.078364	-0.266734	0.00288411	-0.147006	0.00446530	-3.3460	0	29.79	36.30	40.19	49.21	55.60
								2.5	28.30	34.64	38.42	47.20	53.42
								5	26.97	33.17	36.87	45.45	51.53
								10	24.86	30.85	34.43	42.73	48.61
								15	23.44	29.35	32.88	41.05	46.85
								20	22.73	28.66	32.20	40.41	46.23
II-7	13.7900	-0.086680	-0.355570	0.00574698	-0.145745	0.00426994	-2.0705	0	31.86	38.52	42.49	51.70	58.23
								2.5	30.17	36.65	40.53	49.50	55.86
								5	28.67	35.02	38.81	47.58	53.80
								10	26.31	32.45	36.11	44.60	50.61
								15	24.76	30.80	34.41	42.76	48.67
								20	24.03	30.09	33.70	42.06	47.99

Table 5.5-1 (continued)

Blanketed Fuel - Minimum Required Fuel Assembly Burnup (Bu) as a Function of Enrichment (En) and Cooling Time (Ct)

See note 1 for use of Table 5.5-1

Fuel Category	Blanketed Fuel Storage Curve Coefficients[1]							Blanketed Fuel Minimum Burnup[1] (GWd/MTU) for Initial Enrichment[2]					
	A	B	C	D	E	F	G	Cooling Time[3]	2.5 w%	3.0 w%	3.3 w%	4.0 w%	4.5 w%
II-8	14.1212	-0.094016	-0.448138	0.00877894	-0.143511	0.00402944	-0.7808	0	33.93	40.74	44.80	54.20	60.86
								2.5	32.04	38.67	42.63	51.80	58.29
								5	30.37	36.86	40.74	49.71	56.06
								10	27.75	34.04	37.79	46.47	52.61
								15	26.07	32.25	35.94	44.47	50.51
								20	25.34	31.51	35.19	43.71	49.75

Notes

1. All relevant uncertainties are explicitly included in the criticality analysis. For instance, no additional allowance for burnup uncertainty is required. For a fuel assembly to meet the requirements of a Fuel Category, the assembly burnup must exceed the "minimum burnup" given in the table for the assembly "cooling time" and "initial enrichment." Alternatively, the specific minimum burnup required for each fuel assembly may be calculated from the following equation: $Bu = A \times En + B \times En^2 + C \times Ct + D \times Ct^2 + E \times Ct \times En + F \times Ct^2 \times En + G$. Only cooling times of 0, 2.5, 5, 10, 15 and 20 years may be used in this equation. Actual cooling time (Ct) is rounded down to the nearest value.

2. Nominal central zone U-235 enrichment: Axial blanket material is not considered when determining enrichment.

3. Cooling time in years.

4. Fresh unburned fuel up to 4.5 w% U-235 enrichment: No burnup is required.

Table 5.5-2

Non-Blanketed Fuel - Minimum Required Fuel Assembly Burnup (Bu) as a Function of Enrichment (En) and Cooling Time (Ct)

See note 1 for use of Table 5.5-2

Fuel Category	Non-Blanketed Fuel Storage Curve Coefficients[1]							Non-Blanketed Fuel Minimum Burnup[1] (GWd/MTU) for Initial Enrichment[2]					
	A	B	C	D	E	F	G	Cooling Time[3]	1.8 w%	2.5 w%	3.0 w%	3.5 w%	4.0 w%
I-1[4]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
I-2	18.1371	-0.944126	0.253120	-0.00553408	-0.151450	0.00334051	-29.3574	0	0.23	10.08	16.56	22.56	28.08
								2.5	0.18	9.79	16.08	21.90	27.25
								5	0.14	9.53	15.66	21.33	26.52
								10	0.08	9.11	14.99	20.40	25.34
								15	0.05	8.84	14.55	19.79	24.56
								20	0.03	8.70	14.33	19.48	24.16
II-1	11.9800	0.158287	0.237665	-0.00688305	-0.192273	0.00492032	-14.2029	0	7.87	16.74	23.16	29.67	36.25
								2.5	7.62	16.16	22.36	28.64	35.00
								5	7.38	15.66	21.66	27.75	33.91
								10	6.99	14.85	20.56	26.35	32.22
								15	6.69	14.31	19.85	25.46	31.16
								20	6.49	14.04	19.53	25.10	30.74
II-2	11.8419	0.287918	0.113820	-0.00527641	-0.175033	0.00507248	-9.9305	0	12.32	21.47	28.19	35.04	42.04
								2.5	11.84	20.71	27.22	33.87	40.67
								5	11.41	20.04	26.38	32.86	39.49
								10	10.69	18.98	25.07	31.30	37.68
								15	10.17	18.28	24.25	30.37	36.63
								20	9.83	17.96	23.94	30.06	36.32
II-3	12.6055	0.361578	-0.075193	0.00118870	-0.152297	0.00386780	-8.6212	0	15.24	25.15	32.45	39.93	47.59
								2.5	14.42	24.08	31.20	38.50	45.98
								5	13.70	23.14	30.11	37.25	44.58
								10	12.56	21.68	28.41	35.32	42.41
								15	11.83	20.76	27.35	34.12	41.07
								20	11.51	20.38	26.92	33.65	40.56

Table 5.5-2 (continued)

Non-Blanketed Fuel - Minimum Required Fuel Assembly Burnup (Bu) as a Function of Enrichment (En) and Cooling Time (Ct)

See note 1 for use of Table 5.5-2

Fuel Category	Non-Blanketed Fuel Storage Curve Coefficients[1]							Non-Blanketed Fuel Minimum Burnup[1] (GWd/MTU) for Initial Enrichment[2]					
	A	B	C	D	E	F	G	Cooling Time[3]	1.8 w%	2.5 w%	3.0 w%	3.5 w%	4.0 w%
II-4	12.6130	0.436168	-0.128105	0.00275389	-0.151579	0.00377707	-7.0392	0	17.08	27.22	34.73	42.45	50.39
								2.5	16.13	26.03	33.36	40.90	48.67
								5	15.31	24.99	32.16	39.56	47.17
								10	14.02	23.37	30.31	37.46	44.83
								15	13.21	22.36	29.15	36.16	43.39
								20	12.88	21.96	28.70	35.67	42.85
II-5	12.6086	0.517311	-0.185177	0.00442008	-0.150482	0.00367344	-5.3438	0	19.03	29.41	37.14	45.12	53.37
								2.5	17.96	28.09	35.64	43.45	51.52
								5	17.02	26.94	34.34	42.00	49.91
								10	15.57	25.16	32.32	39.73	47.41
								15	14.67	24.05	31.06	38.33	45.86
								20	14.32	23.62	30.58	37.80	45.27
II-6	17.1055	-0.116940	0.024104	-0.00410005	-0.262366	0.00761230	-10.7361	0	19.67	31.30	39.53	47.70	55.81
								2.5	18.61	29.81	37.74	45.61	53.42
								5	17.67	28.51	36.18	43.79	51.35
								10	16.15	26.47	33.77	41.01	48.20
								15	15.11	25.18	32.30	39.36	46.36
								20	14.55	24.63	31.76	38.83	45.85
II-7	17.5099	-0.130912	-0.143634	0.00199657	-0.235656	0.00625103	-9.1041	0	21.99	33.85	42.25	50.58	58.84
								2.5	20.65	32.13	40.25	48.31	56.29
								5	19.48	30.63	38.51	46.33	54.08
								10	17.64	28.29	35.82	43.28	50.68
								15	16.45	26.83	34.16	41.42	48.62
								20	15.93	26.25	33.54	40.76	47.92

Table 5.5-2 (continued)

Non-Blanketed Fuel - Minimum Required Fuel Assembly Burnup (Bu) as a Function of Enrichment (En) and Cooling Time (Ct)

See note 1 for use of Table 5.5-2

Fuel Category	Non-Blanketed Fuel Storage Curve Coefficients[1]							Non-Blanketed Fuel Minimum Burnup[1] (GWd/MTU) for Initial Enrichment[2]					
	A	B	C	D	E	F	G	Cooling Time[3]	1.8 w%	2.5 w%	3.0 w%	3.5 w%	4.0 w%
II-8	17.9109	-0.143928	-0.308137	0.00796481	-0.209912	0.00492410	-7.4704	0	24.30	36.41	44.97	53.45	61.87
								2.5	22.69	34.45	42.76	51.01	59.17
								5	21.29	32.75	40.85	48.87	56.82
								10	19.13	30.11	37.86	45.55	53.16
								15	17.80	28.48	36.01	43.48	50.88
								20	17.31	27.86	35.30	42.68	49.98

Notes

1. All relevant uncertainties are explicitly included in the criticality analysis. For instance, no additional allowance for burnup uncertainty is required. For a fuel assembly to meet the requirements of a Fuel Category, the assembly burnup must exceed the "minimum burnup" given in the table for the assembly "cooling time" and "initial enrichment." Alternatively, the specific minimum burnup required for each fuel assembly may be calculated from the following equation: $Bu = A \times En + B \times En^2 + C \times Ct + D \times Ct^2 + E \times Ct \times En + F \times Ct^2 \times En + G$. Only cooling times of 0, 2.5, 5, 10, 15 and 20 years may be used in this equation. Actual cooling time (Ct) is rounded down to the nearest value.

2. Nominal U-235 enrichment.

3. Cooling time in years.

4. Fresh unirradiated fuel up to 4.5 w% U-235 enrichment: No burnup is required.

Table 5.5-3

Fuel Categories Ranked by Reactivity[1]

Fuel Category	
Region I	Region II
I-1	II-1
I-2	II-2
	II-3
	II-4
	II-5
	II-6
	II-7
	II-8

Notes

1. Reactivity Rank: Fuel Category is ranked in decreasing order of reactivity, e.g. II-2 is less reactive than II-1, etc.

FIGURE 5.5-1

ALLOWABLE REGION I STORAGE ARRAYS

DEFINITION[1,4] | **ILLUSTRATION[1,2,3,4]**

Array I-A
Checkerboard pattern of Category I-1 assemblies and empty (water filled) cells.

I-1	E
E	I-1

Array I-B
Category I-2 assembly in every cell.

I-2	I-2
I-2	I-2

Array I-C
Category I-1 assemblies and Category I-2 assemblies: Each Category I-1 assembly shall have a full length RCCA in the assembly. The number of Category I-1 assemblies with RCCAs in the assemblies is unrestricted.

I-1	I-2
I-2	I-2

I-1	I-1
I-2	I-2

I-1	I-1
I-2	I-1

I-1	I-1
I-1	I-1

Notes:

1. Fuel Categories are determined from Tables 5.5-1 and 5.5-2.
2. Shaded cells indicate the fuel assembly contains a full length RCCA.
3. **E** indicates an empty (water filled) cell.
4. Attributes for each 2x2 array are as stated in the definition. Diagram is for illustrative purposes only.

FIGURE 5.5-2

ALLOWABLE REGION II STORAGE ARRAYS

DEFINITION[1,4] / **ILLUSTRATION[1,2,3,4]**

Array II-A
Category II-1 assembly in three of every four cells: One of every four cells is empty (water-filled).

II-1	II-1
II-1	E

Array II-B
Category II-2 assembly in every cell: Two of every four cells contain a Metamic insert (or full length RCCA in the assembly).

II-2	II-2
II-2	II-2

II-2	II-2
II-2	II-2

II-2	II-2
II-2	II-2

Array II-C
Checkerboard pattern of Category II-3 and II-5 assemblies: One of every four cells contains a Metamic insert (or full length RCCA in the assembly). Metamic inserts (or RCCAs) may be in either II-3 or II-5 cells.

II-3	II-5
II-5	II-3

II-5	II-3
II-3	II-5

Array II-D
Category II-4 assembly in every cell: One of every four cells contains a Metamic insert (or full length RCCA in the assembly).

II-4	II-4
II-4	II-4

Array II-E
Checkerboard pattern of Category II-6 and II-8 assemblies.

II-8	II-6
II-6	II-8

Array II-F
Category II-7 assembly in every cell.

II-7	II-7
II-7	II-7

Notes:

1. Fuel Categories are determined from Tables 5.5-1 and 5.5-2.
2. Shaded cells indicate either a Metamic insert in the cell or the fuel assembly contains a full length RCCA.
3. **E** indicates an empty (water filled) cell.
4. Attributes for each 2x2 array are as stated in the definition. Diagram is for illustrative purposes only.

FIGURE 5.5-3

ALLOWABLE INTERFACES BETWEEN REGION II – REGION I ARRAYS

DEFINITION[1,4]

ILLUSTRATION[1,2,3,4,5]

For Array II-A, the empty cell shall be in the row adjacent to the Region I Rack.

Region I Rack

I-2	I-2	I-2	I-2
I-2	I-2	I-2	I-2
II-1	**E**	II-1	**E**
II-1	II-1	II-1	II-1

Array II-A

For Array II-B, the reactivity rank of assemblies adjacent to the Region I rack shall be reduced from a rank of II-2 to a reactivity rank of II-4 or lower. The Array II-B pattern shall have the required Metamic insert (or full length RCCA in the assembly) placed in the row adjacent to the Region I rack.

Region I Rack

I-2	I-2	I-2	I-2
I-2	I-2	I-2	I-2
II-4	II-4	II-4	II-4
II-2	II-2	II-2	II-2

Array II-B

Region I Rack

I-2	I-2	I-2	I-2
I-2	I-2	I-2	I-2
II-4	II-4	II-4	II-4
II-2	II-2	II-2	II-2

Array II-B

Region I Rack

I-2	I-2	I-2	I-2
I-2	I-2	I-2	I-2
II-4	II-4	II-4	II-4
II-2	II-2	II-2	II-2

Array II-B

For Arrays II-C and II-D, the Metamic insert (or full length RCCA in the assembly) shall be placed in the row adjacent to the Region I rack.

Region I Rack

I-2	I-2	I-2	I-2
I-2	I-2	I-2	I-2
II-3	II-5	II-3	II-5
II-5	II-3	II-5	II-3

Array II-C

Region I Rack

I-2	I-2	I-2	I-2
I-2	I-2	I-2	I-2
II-5	II-3	II-5	II-3
II-3	II-5	II-3	II-5

Array II-C

Region I Rack

I-2	I-2	I-2	I-2
I-2	I-2	I-2	I-2
II-4	II-4	II-4	II-4
II-4	II-4	II-4	II-4

Array II-D

Notes:

1. Fuel Categories are determined from Tables 5.5-1 and 5.5-2.
2. Shaded cells indicate either a Metamic insert in the cell or the fuel assembly contains a full length RCCA.
3. **E** indicates an empty (water filled) cell.
4. Attributes for each 2x2 array are as stated in the definition. Diagram is for illustrative purposes only.
5. Region I Array I-2 is depicted as the example; however, any Region I array is equally representative.

FIGURE 5.5-4

ALLOWABLE REGION II STORAGE ADJACENT TO SPENT FUEL PIT WALLS

DEFINITION[1,4] | **ILLUSTRATION[1,2,3,4]**

An assembly of rank II-2 placed in the peripheral row of a Region II storage rack shall not be adjacent to a Region I storage rack.

Spent Fuel Pit Wall

II-2	II-2	II-2	II-3
II-3	II-5	II-3	II-5
II-5	II-3	II-5	II-3

Region 2 (Array II-C)

I-2	I-2	I-2	I-2	I-2	I-2	I-2	I-2
I-2	I-2	I-2	I-2	I-2	I-2	I-2	I-2
I-2	I-2	I-2	I-2	I-2	I-2	I-2	I-2

Region I (Array I-B)

For Array II-A, the empty cell in the 2x2 II-A array shall be adjacent to the peripheral row that contains the category II-2 assembly(s). For Array II-A only, the peripheral row may contain category II-1 assemblies as the outer two rows will comply with Array II-A requirements.

Spent Fuel Pit Wall

II-2	II-2	II-2	II-2
II-1	**E**	II-1	**E**
II-1	II-1	II-1	II-1

Array II-A

II-1	II-1	II-1	II-1
II-1	**E**	II-1	**E**
II-1	II-1	II-1	II-1

Array II-A

For Array II-B, the Metamic insert (or full length RCCA in the assembly) shall be adjacent to the peripheral row that contains the category II-2 assembly(s).

Spent Fuel Pit Wall

II-2	II-2	II-2	II-2
II-2	II-2	II-2	II-2
II-2	II-2	II-2	II-2

Array II-B

II-2	II-2	II-2	II-2
II-2	II-2	II-2	II-2
II-2	II-2	II-2	II-2

Array II-B

II-2	II-2	II-2	II-2
II-2	II-2	II-2	II-2
II-2	II-2	II-2	II-2

Array II-B

For Arrays II-C and II-D, the Metamic insert (or full length RCCA in the assembly) shall be adjacent to the peripheral row that contains the category II-2 assembly(s).

Spent Fuel Pit Wall

II-2	II-2	II-2	II-2
II-5	II-3	II-5	II-3
II-3	II-5	II-3	II-5

Array II-C

II-2	II-2	II-2	II-2
II-5	II-3	II-5	II-3
II-3	II-5	II-3	II-5

Array II-C

II-2	II-2	II-2	II-2
II-4	II-4	II-4	II-4
II-4	II-4	II-4	II-4

Array II-D

Notes:

1. Fuel Categories are determined from Tables 5.5-1 and 5.5-2.
2. Shaded cells indicate either a Metamic insert in the cell or the fuel assembly contains a full length RCCA.
3. **E** indicates an empty (water filled) cell.
4. Attributes for each 2x2 array are as stated in the definition. Diagram is for illustrative purposes only.

5.6 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.6.1 The components identified in Table 5.6-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.6-1.

TABLE 5.6-1

COMPONENT CYCLIC OR TRANSIENT LIMITS

COMPONENT	CYCLIC OR TRANSIENT LIMIT	DESIGN CYCLE OR TRANSIENT
Reactor Coolant System	200 heatup cycles at ≤ 100°F/h and 200 cooldown cycles at ≤ 100°F/h.	Heatup cycle - T_{avg} from ≤ 200°F to ≥ 550°F. Cooldown cycle - T_{avg} from ≥ 550°F to ≤ 200°F.
	200 pressurizer cooldown cycles at ≤ 200°F/h.	Pressurizer cooldown cycle temperatures from ≥ 650°F to ≤ 200°F.
	80 loss of load cycles, without immediate Turbine or Reactor trip.	≥ 15% of RATED THERMAL POWER to 0% of RATED THERMAL POWER.
	40 cycles of loss-of-offsite A.C. electrical power.	Loss-of-offsite A.C. electrical ESF Electrical System.
	80 cycles of loss of flow in one reactor coolant loop.	Loss of only one reactor coolant pump.
	400 Reactor trip cycles.	100% to 0% of RATED THERMAL POWER.
	150 leak tests.	Pressurized to ≥ 2435 psig.
	5 hydrostatic pressure tests.	Pressurized to ≥ 3100 psig.
Secondary Coolant System	6 loss of secondary pressure	Loss of Secondary pressure
	50 leak tests	Pressurized to ≥ 1085 psig
	35 hydrostatic pressure tests.	Pressurized to ≥ 1356 psig.