Attachment 1

Neutronics Licensing Report

NUCLEAR FUEL SERVICES DEPARTMENT
NUCLEAR DESIGN INFORMATION TRANSMITTAL

☒ SAFETY RELATED ☐ NON-SAFETY RELATED ☐ REGULATORY RELATED	Originating Organization ☒ Nuclear Fuel Services ☐ Other (specify) ______	NDIT No. 9700227 Rev. No. 1 Page 1 of 17

Station Dresden Unit 2 Cycle 16 Generic ______

To: Angela Burkhart

Subject Dresden Unit 2 Cycle 16 Neutronics Licensing Report (NLR)

Jill T. Fisher Preparer	Jill T Fisher Preparer's Signature	3/30/98 Date
John K. Wheeler Reviewer	John K Wheeler Reviewer's Signature	3/30/98 Date
Adelmo S. Pallotta NFS Supervisor	[signature] NFS Supervisor's Signature	3/30/98 Date

Status of Information: ☒ Verified ☐ Unverified ☐ Engineering Judgement

Method and Schedule of Verification for Unverified NDITs: ______

Description of Information: Results and basis of neutronics licensing calculations for Dresden Unit 2 Cycle 16.
Revision 0 – Original Issue.
Revision 1 – Update misoriented bundle delta-CPR results based on an analysis using additive constants from NFS NDIT 9800051 SEQ 00. Value in Revision 0 does not bound the results of the analysis using the additive constants from the indicated NDIT. All other delta-CPRs reported in Revision 0, and maintained in Revision 1, bound the results of analyses using additive constants from NFS NDIT 9800051 SEQ 00. ATRIUM-9B additive constants were revised in NFS NDIT 9800051 SEQ 00 to account for the ANFB correlation being non-conservative for upskew power shapes for ATRIUM-9B fuel.

Purpose of Information: Provide Dresden Station and NFS BSS group with neutronics licensing results.

Source of Information NFS Calculation Notes BNDD:97-078, BNDD:98-002, and BNDD:98-026.

Supplemental Distribution: B. Franzen (Dresden), Dresden Central File, D2C16 Letterbook, DG Central File

Licensing Basis

This document, in conjunction with Reference 20 and the D2C16 plant transient analysis and reload analysis documents, provides the licensing basis for Dresden Unit 2 Reload 15, Cycle 16. The calculations that support this report are given in References 1 through 9 and 21.

Table of Contents

JJ 3/21/98
JKW 3/30/98

I. Nuclear Design

I.1 New Reload Fuel Assembly Nuclear Design

I.1.1 Assembly Average Enrichment

Assembly Name	Batch Identifier	Enrichment (w/o U-235)
SPC ATRIUM-9B 3.30 9Gd3.0/11Gd6.0/9Gd6.0	DRB-8H	3.30
SPC ATRIUM-9B 3.48 9Gd3.0/11Gd5.0/9Gd5.0	DRB-8L	3.48

I.1.2 Axial Enrichment and Burnable Poison Distribution

Assembly Name	Batch Identifier	Figure
SPC ATRIUM-9B 3.30 9Gd3.0/11Gd6.0/9Gd6.0	DRB-8H	1
SPC ATRIUM-9B 3.48 9Gd3.0/11Gd5.0/9Gd5.0	DRB-8L	1

I.1.3 Radial Enrichment and Burnable Poison Distribution

Lattice Name	Batch Found In	Figure
SPC ATRIUM-9B 3.43 9Gd3.0	DRB-8L and DRB-8H	2
SPC ATRIUM-9B 3.43 11Gd6.0	DRB-8H	3
SPC ATRIUM-9B 3.43 11Gd5.0	DRB-8L	4
SPC ATRIUM-9B 3.82 9Gd6.0	DRB-8H	5
SPC ATRIUM-9B 3.82 9Gd5.0	DRB-8L	6
SPC ATRIUM-9B 4.24 9Gd5.0	DRB-8L	7

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TKW 3/30/98

I.2 Core Nuclear Design

I.2.1 Core Configuration and Licensing Exposure Limits

Assembly Name	Cycle Loaded	Number in Core
SPC 9x9-2 3.13 8Gd3.0/8Gd4.0	12	8
SPC 9x9-2 2.95 8Gd4.0	13	52
SPC 9x9-2 2.95 7Gd3.0	13	56
SPC 9x9-2B 3.13 7Gd3.5	14	80
SPC 9x9-2B 3.13 8Gd4.0	14	128
SPC 9x9-2B 3.13 7Gd3.5/8Gd5.0	15	120
SPC 9x9-2B 3.13 8Gd5.0	15	104
SPC ATRIUM-9B 3.48 8Gd4.0/9Gd5.0	15	8
SPC ATRIUM-9B 3.30 9Gd3.0/11Gd6.0/9Gd6.0	16	40
SPC ATRIUM-9B 3.48 9Gd3.0/11Gd5.0/9Gd5.0	16	128

	Core Average Exposure	Cycle Incremental Exposure
Exposure at EOC 15		
Nominal EOC 15 (MWD/MTU)	23875.4	9600.0
Short EOC 15 (MWD/MTU)	23375.4	9100.0

Cycle 16 neutronics analyses are valid for EOC 15 exposures greater than 9100.0 MWD/MT. The exposure window that validates the pressurization transients can be found in the D2C16 reload analysis document.

	Core Average Exposure
Exposure at BOC 16	
With Nominal EOC 15 (MWD/MTU)	15731.1
With Short EOC 15 (MWD/MTU)	15306.9

The Cycle 16 incremental exposure to LFPC is 1266.5 GWD (10,400 MWD/MT) based on a nominal EOC 15.

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I.2.2 Core Reactivity Characteristics

All values reported below are with zero xenon and are for 68°F moderator temperature. The MICROBURN-B cold BOC K-effective bias is 1.0080 (Reference 1). The shutdown margin calculations are based on the short cycle 15 exposure given in Section I.2.1.

BOC Cold K-Effective, All Rods Out	1.10035
BOC Cold K-Effective All Rods In	0.96180
BOC Cold K-Effective, Strongest Rod Out	0.99471
BOC Shutdown Margin, % ΔK	1.32
Minimum Shutdown Margin, % ΔK	1.27
Cycle Exposure of Minimum Shutdown Margin, MWD/MT	1,000
Reactivity Defect (R-value) Total, % ΔK	0.07
Boron Slumping, % ΔK	0.02
SDM Decrease from BOC, % ΔK	0.05
Standby Liquid Control System Shutdown Margin, Cold Condition, 600 ppm, % ΔK	5.14

II. Control Rod Withdrawal Error

Analysis was performed at 100% power, 100% flow, unblocked conditions only.

The value reported below bounds all fuel types found in the core.

Distance Withdrawn (ft)	ΔCPR
12	0.31

The design complies with the SPC 1% plastic strain criteria via conformance to the transient LHGR limits.

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III. Fuel Loading Error

The fuel loading error, including fuel mislocation and misorientation, is classified as an accident. By demonstrating that the fuel loading error meets the more stringent Anticipated Operational Occurrence (AOO) requirements, the offsite dose requirement is assured to be met. Because the events listed below result in a ΔCPR value that is less than that of the limiting transient, the AOO requirements and hence the off-site dose requirements are met for the fuel loading error.

The values reported below bound all fuel types found in the core.

Event	ΔCPR
Mislocated Bundle	0.34
Misoriented Bundle	0.35

For the fuel loading error, the design complies with the SPC 1% plastic strain criteria via conformance to the transient LHGR limits.

IV. Control Rod Drop Accident

This analysis was performed using a rod sequence that bounds the Dresden-supplied rod sequence (to be used in D2C16) as described by Reference 10. A rod sequence that bounds the rod sequence in Reference 10 with the rod pull order modified, group 4 rods pulled before group 3 rods, was also analyzed..

Note that the 0.32%Δk adder mentioned below is included in this analysis to account for possible rod mispositioning errors. The results from two cases are provided. The first column corresponds to the maximum enthalpy addition determined in the analyses. The second column coresponds to the maximum number of failed rods (rods greater than 170 cal/gm) determined in the analyses.

Dropped Control Rod Worth without 0.32 %Δk adder, %Δk	1.10	1.10
Dropped Control Rod Worth with 0.32 %Δk adder, %Δk	1.42	1.42
Doppler Coefficient, 1/k Δk/dT	-10.6E-06 $(°F)^{-1}$	-10.6E-06 $(°F)^{-1}$
Effective Delayed Neutron Fraction used	0.0053	0.0053
Four-Bundle Local Peaking Factor	1.233	1.221
Maximum Deposited Fuel Rod Enthalpy with 0.32 %Δk adder, (cal/gm)	207	205
Number of Rods Greater than 170 cal/gm with 0.32%Δk adder	377	385

Note that the limit on maximum deposited fuel rod enthalpy is 280 cal/gm and the limit on the number of rods greater that 170 cal/gm (failed rods) is 850 (Reference 11).

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V. Loss of Feedwater Heating

The loss of feedwater heating event is analyzed at 100% rated power for 87% and 100% rated flow with an assumed inlet temperature decrease of 200°F.

Event	ΔCPR
Loss of Feedwater Heating	0.31

The design complies with the SPC 1% plastic strain criteria via conformance to the transient LHGR limits.

VI. Maximum Exposure Limit Compliance

Note that the exposures listed below are based on the nominal Cycle 15 exposure, 9600 MWD/MT, and an end-of-cycle 16 core average exposure of 26630.9 MWD/MT (incremental exposure of 1327.4 GWD). See References 12-14 for fuel assembly exposure limits.

Projected Peak Assembly Exposure (GWD/MTU) (Assembly A2F010 @ 9-40 - 9x9-2 Fuel)	38.07
SPC 9x9-2 Assembly Exposure Limit (GWD/MTU)	40.00
Projected Peak Pellet Exposure (GWD/MTU) (Assembly A2F031 @ 21-10-7 - 9x9-2 Fuel)	53.21
SPC 9x9-2 Pellet Exposure Limit (GWD/MTU)	55.00

The above data is for 9x9-2 fuel. The ATRIUM-9B fuel will not be near its exposure limits at the end of cycle 16. The projected peak exposures for ATRIUM-9B fuel are listed below.

Projected ATRIUM-9B Peak Assembly Exposure (GWD/MT) (Assembly A2G231 @ 49-16)	24.19
SPC ATRIUM-9B Assembly Exposure Limit (GWD/MT)	48.00
Projected ATRIUM-9B Peak Pellet Exposure (GWD/MT) (Assembly A2G231 @ 49-16-6)	33.95
SPC ATRIUM-9B Pellet Exposure Limit (GWD/MT)	60.00

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JKW 3/30/98

VII. Spent Fuel Pool and New Fuel Vault Criticality Compliance

For the D2C16 reload, there are two new SPC ATRIUM-9B assembly types consisting of 6 unique lattices, as identified in Section I.1. As described in the Reference 15 transmittal, the two fresh assembly types comply with the spent fuel pool and new fuel vault criticality limits.

VII.1 New Fuel Vault Criticality Compliance

The two new assemblies comply with the fresh fuel vault criticality limits of enrichment less than 5.00 wt% U-235 (lattice average) and gadolinia content greater than 6 rods at 2.0 wt% Gd_2O_3. Reference 16 details the analysis showing that the above enrichment/Gd limits ensure compliance with the Reference 17 UFSAR section.

VII.2 Spent Fuel Pool Criticality Compliance

The two new assemblies comply with the spent fuel pool criticality limits of enrichment less than 4.30 wt% U-235 (lattice average) and gadolinia content greater than 6 rods at 2.0 wt% Gd_2O_3. Reference 18 details the analysis showing that the above enrichment/Gd limits ensure compliance with the Reference 19 Technical Specifications section.

VIII. References

1. NFS Calcnote BNDD:97-059, "D2C16 Final Licensing Loading Plan," Revision 0, 8/4/97.

2. NFS Calcnote BNDD:97-064, "D2C16 Licensing Base Deck," Revision 0, 9/12/97.

3. NFS Calcnote BNDD:97-066, "D2C16 Mislocation Licensing Analysis," Revision 0, 11/6/97.

4. NFS Calcnote BNDD:97-072, "D2C16 Loss of Feedwater Heating Licensing Analysis," Revision 0, 9/24/97.

5. NFS Calcnote BNDD:97-071, "D2C16 Rod Withdrawal Error Licensing Analysis," Revision 0, 10/28/97.

6. NFS Calcnote BNDD:97-077, "Dresden 2 Cycle 16 Standby Liquid Control System Worth Calculations," Revision 0, 10/23/97.

7. NFS Calcnote BNDD:97-073, "D2C16 Misorientation Licensing Analysis," Revision 0, 1/28/98.

8. NFS Calcnote BNDD:97-063, "D2C16 Control Rod Drop Accident Licensing Analysis," Revision 0, 11/24/97.

9. NFS Calcnote BNDD:97-086, "D2C16 Control Rod Drop Accident Licensing Analysis Supplement," Revision 0, 11/24/97.

PJJ 3/27/98
JLW 3/30/98

10. Dresden Station NDIT Number SEC-DR-97-350 Revision 0. "Dresden Station startup sequence steps for groups 1 thru 8.," 11/3/97.

11. "Dresden Updated Final Safety Analysis Report," Section 15.4.10, Revision Approved by On Site Review Number 97-189 and DFL Number 97054.

12. XN-NF-85-67(P)(A), "Generic Mechanical Design for Exxon Nuclear Jet Pump BWR Reload Fuel,"Revision 1, September 1986.

13. XN-NF-82-06(P)(A), Supplement 1, Revision 2, "Qualification of Exxon Nuclear Fuel for Extended Burnup, Supplement 1 Extended Burnup Qualification of ENC 9x9 BWR Fuel," May 1988.

14. EMF-97-085(P), "Fuel Design Report for Dresden 2 Cycle 16 ATRIUM-9B Fuel Assemblies," Revision 0, November 1997.

15. NFS NDIT Number 970202 Revision 0, "Dresden Unit 2 Cycle 16 New Fuel Storage," 10/28/97.

16. EMF-96-148(P) Revision 1/NFS NDIT Number 960127 Revision 0, "Criticality Safety Analysis for ATRIUM-9B Fuel, Dresden and Quad Cities New Fuel Storage Vault," September 1996.

17. "Dresden Updated Final Safety Analysis Report," Section 9.1.1.3, Revision 2, 6/30/97.

18. EMF-94-098(P) Revision 1/NFS NDIT Number 960095 Revision 1, "Criticality Safety Analysis for ATRIUM-9B Fuel, Dresden Units 2 and 3 Spent Fuel Storage Pool," January 1996.

19. "Dresden Units 2 and 3 Technical Specifications," Section 5.6.A, Amendment Nos. 150 and 145.

20. Commonwealth Edison Topical Report NFSR-0091, "Benchmark of CASMO/MICROBURN BWR Nuclear Design Methods," Revision 0, Supplements 1 and 2, December 1991, March 1992, and May 1992, respectively; SER letter dated March 22, 1993.

21. NFS Calcnote BNDD:98-025, "D2C16 Limiting Licensing Cases Run Using Updated Additive Constants," Revision 0, 3/26/98.

MJS 3/30/98

JKW 3/30/98

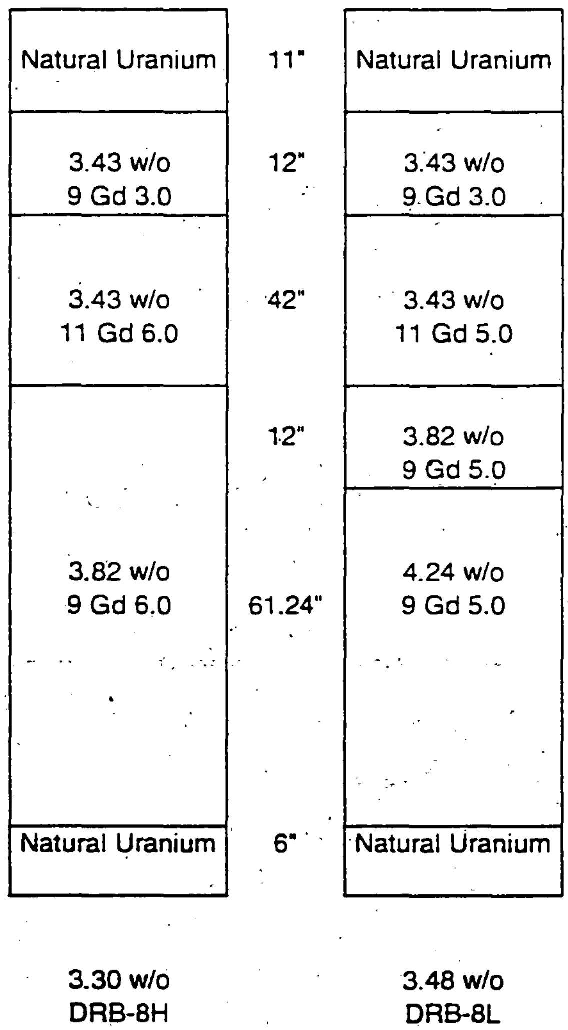

Figure 1
D2C16 ATRIUM-9B Assembly Axial Designs

1 1.90	2 2.25	3 2.60	4 3.00	5 3.25	5 3.25	5 3.25	4 3.00	2 2.25
2 2.25	4 3.00	G1 3.25	7 3.80	7 3.80	G1 3.25	7 3.80	G1 3.25	5 3.25
3 2.60	G1 3.25	7 3.80	6 3.55	6 3.55	7 3.80	7 3.80	7 3.80	6 3.55
4 3.00	7 3.80	6 3.55	Internal Water Channel	Internal Water Channel	Internal Water Channel	7 3.80	G1 3.25	7 3.80
5 3.25	7 3.80	6 3.55	Internal Water Channel	Internal Water Channel	Internal Water Channel	7 3.80	7 3.80	7 3.80
5 3.25	G1 3.25	7 3.80	Internal Water Channel	Internal Water Channel	Internal Water Channel	7 3.80	7 3.80	7 3.80
5 3.25	7 3.80	7 3.80	7 3.80	7 3.80	7 3.80	6 3.55	7 3.80	7 3.80
4 3.00	G1 3.25	7 3.80	G1 3.25	7 3.80	7 3.80	7 3.80	G1 3.25	7 3.80
2 2.25	5 3.25	6 3.55	7 3.80	7 3.80	7 3.80	7 3.80	7 3.80	4 3.00

1	Rods (1)	1.90 w/o U-235
2	Rods (4)	2.25 w/o U-235
3	Rods (2)	2.60 w/o U-235
4	Rods (6)	3.00 w/o U-235
5	Rods (8)	3.25 w/o U-235
6	Rods (7)	3.55 w/o U-235
7	Rods (35)	3.80 w/o U-235
G1	Rods (9)	3.25 w/o U-235+3.0 w/o Gd_2O_3

Figure 2
SPC ATRIUM-9B 3.43 9Gd3.0 (DRB-8L and DRB-8H)
Enrichment Distribution

[illegible] 3/27/98
[illegible] 3/30/98

1 1.90	2 2.25	3 2.60	4 3.00	5 3.25	5 3.25	5 3.25	4 3.00	2 2.25
2 2.25	4 3.00	G1 3.25	7 3.80	7 3.80	G1 3.25	7 3.80	G1 3.25	5 3.25
3 2.60	G1 3.25	7 3.80	6 3.55	G1 3.25	7 3.80	7 3.80	7 3.80	6 3.55
4 3.00	7 3.80	6 3.55				7 3.80	G1 3.25	7 3.80
5 3.25	7 3.80	G1 3.25		Internal Water Channel		7 3.80	7 3.80	7 3.80
5 3.25	G1 3.25	7 3.80				7 3.80	7 3.80	7 3.80
5 3.25	7 3.80	7 3.80	7 3.80	7 3.80	7 3.80	6 3.55	7 3.80	7 3.80
4 3.00	G1 3.25	7 3.80	G1 3.25	7 3.80	7 3.80	7 3.80	G1 3.25	7 3.80
2 2.25	5 3.25	6 3.55	7 3.80	7 3.80	7 3.80	7 3.80	7 3.80	4 3.00

1	Rods (1)	1.90 w/o U-235
2	Rods (4)	2.25 w/o U-235
3	Rods (2)	2.60 w/o U-235
4	Rods (6)	3.00 w/o U-235
5	Rods (8)	3.25 w/o U-235
6	Rods (5)	3.55 w/o U-235
7	Rods (35)	3.80 w/o U-235
G1	Rods (11)	3.25 w/o U-235+6.0 w/o Gd2O3

Figure 3
SPC ATRIUM-9B 3.43 11Gd6.0 (DRB-8H)
Enrichment Distribution

JB 3/27/98
JKW 3/30/98

1 1.90	2 2.25	3 2.60	4 3.00	5 3.25	5 3.25	5 3.25	4 3.00	2 2.25
2 2.25	4 3.00	G1 3.25	7 3.80	7 3.80	G1 3.25	7 3.80	G1 3.25	5 3.25
3 2.60	G1 3.25	7 3.80	6 3.55	G1 3.25	7 3.80	7 3.80	7 3.80	6 3.55
4 3.00	7 3.80	6 3.55				7 3.80	G1 3.25	7 3.80
5 3.25	7 3.80	G1 3.25		Internal Water Channel		7 3.80	7 3.80	7 3.80
5 3.25	G1 3.25	7 3.80				7 3.80	7 3.80	7 3.80
5 3.25	7 3.80	7 3.80	7 3.80	7 3.80	7 3.80	6 3.55	7 3.80	7 3.80
4 3.00	G1 3.25	7 3.80	G1 3.25	7 3.80	7 3.80	7 3.80	G1 3.25	7 3.80
2 2.25	5 3.25	6 3.55	7 3.80	7 3.80	7 3.80	7 3.80	7 3.80	4 3.00

1	Rods (1)	1.90 w/o U-235
2	Rods (4)	2.25 w/o U-235
3	Rods (2)	2.60 w/o U-235
4	Rods (6)	3.00 w/o U-235
5	Rods (8)	3.25 w/o U-235
6	Rods (5)	3.55 w/o U-235
7	Rods (35)	3.80 w/o U-235
G1	Rods (11)	3.25 w/o U-235+5.0 w/o Gd2O3

Figure 4
SPC ATRIUM-9B 3.43 11Gd5.0 (DRB-8L)
Enrichment Distribution

JJJ 3/27/98
TLW 3/30/98

1 1.90	2 2.60	3 3.00	4 3.25	5 3.55	5 3.55	5 3.55	4 3.25	2 2.60
2 2.60	4 3.25	G1 3.55	7 4.15	7 4.15	G1 3.55	8 4.40	G1 3.55	5 3.55
3 3.00	G1 3.55	7 4.15	6 3.80	6 3.80	7 4.15	8 4.40	8 4.40	6 3.80
4 3.25	7 4.15	6 3.80				8 4.40	G1 3.55	8 4.40
5 3.55	7 4.15	6 3.80		Internal Water Channel		7 4.15	8 4.40	8 4.40
5 3.55	G1 3.55	7 4.15				8 4.40	7 4.15	8 4.40
5 3.55	8 4.40	8 4.40	8 4.40	7 4.15	8 4.40	6 3.80	7 4.15	8 4.40
4 3.25	G1 3.55	8 4.40	G1 3.55	8 4.40	7 4.15	7 4.15	G1 3.55	7 4.15
2 2.60	5 3.55	6 3.80	8 4.40	8 4.40	8 4.40	8 4.40	7 4.15	4 3.25

1	Rods (1)	1.90 w/o U-235
2	Rods (4)	2.60 w/o U-235
3	Rods (2)	3.00 w/o U-235
4	Rods (6)	3.25 w/o U-235
5	Rods (8)	3.55 w/o U-235
6	Rods (7)	3.80 w/o U-235
7	Rods (15)	4.15 w/o U-235
8	Rods (20)	4.40 w/o U-235
G1	Rods (9)	3.55 w/o U-235+6.0 w/o Gd2O3

Figure 5
SPC ATRIUM-9B 3.82 9Gd6.0 (DRB-8H)
Enrichment Distribution

3/27/98

1 1.90	2 2.60	3 3.00	4 3.25	5 3.55	5 3.55	5 3.55	4 3.25	2 2.60
2 2.60	4 3.25	G1 3.55	7 4.15	7 4.15	G1 3.55	8 4.40	G1 3.55	5 3.55
3 3.00	G1 3.55	7 4.15	6 3.80	6 3.80	7 4.15	8 4.40	8 4.40	6 3.80
4 3.25	7 4.15	6 3.80				8 4.40	G1 3.55	8 4.40
5 3.55	7 4.15	6 3.80		Internal Water Channel		7 4.15	8 4.40	8 4.40
5 3.55	G1 3.55	7 4.15				8 4.40	7 4.15	8 4.40
5 3.55	8 4.40	8 4.40	8 4.40	7 4.15	8 4.40	6 3.80	7 4.15	8 4.40
4 3.25	G1 3.55	8 4.40	G1 3.55	8 4.40	7 4.15	7 4.15	G1 3.55	7 4.15
2 2.60	5 3.55	6 3.80	8 4.40	8 4.40	8 4.40	8 4.40	7 4.15	4 3.25

1	Rods (1)	1.90 w/o U-235
2	Rods (4)	2.60 w/o U-235
3	Rods (2)	3.00 w/o U-235
4	Rods (6)	3.25 w/o U-235
5	Rods (8)	3.55 w/o U-235
6	Rods (7)	3.80 w/o U-235
7	Rods (15)	4.15 w/o U-235
8	Rods (20)	4.40 w/o U-235
G1	Rods (9)	3.55 w/o U-235+5.0 w/o Gd2O3

Figure 6
SPC ATRIUM-9B 3.82 9Gd5.0 (DRB-8L)
Enrichment Distribution

3/27/98

1 2.25	2 3.00	3 3.25	4 3.55	5 3.80	5 3.80	5 3.80	4 3.55	2 3.00
2 3.00	4 3.55	G1 4.15	7 4.70	7 4.70	G1 4.15	7 4.70	G1 4.15	5 3.80
3 3.25	G1 4.15	7 4.70	6 4.40	6 4.40	7 4.70	7 4.70	7 4.70	6 4.40
4 3.55	7 4.70	6 4.40				7 4.70	G1 4.15	7 4.70
5 3.80	7 4.70	6 4.40	Internal	Water	Channel	7 4.70	7 4.70	7 4.70
5 3.80	G1 4.15	7 4.70				7 4.70	7 4.70	7 4.70
5 3.80	7 4.70	7 4.70	7 4.70	7 4.70	7 4.70	6 4.40	7 4.70	7 4.70
4 3.55	G1 4.15	7 4.70	G1 4.15	7 4.70	7 4.70	7 4.70	G1 4.15	7 4.70
2 3.00	5 3.80	6 4.40	7 4.70	7 4.70	7 4.70	7 4.70	7 4.70	4 3.55

1	Rods (1)	2.25 w/o U-235
2	Rods (4)	3.00 w/o U-235
3	Rods (2)	3.25 w/o U-235
4	Rods (6)	3.55 w/o U-235
5	Rods (8)	3.80 w/o U-235
6	Rods (7)	4.40 w/o U-235
7	Rods (35)	4.70 w/o U-235
G1	Rods (9)	4.15 w/o U-235+5.0 w/o Gd2O3

Figure 7
SPC ATRIUM-9B 4.24 9Gd5.0 (DRB-8L)
Enrichment Distribution

3/27/98

ATTACHMENT A - NEUTRONIC LICENSING PROCEDURE REFERENCES

1. NFS-ND-900, "Nuclear Design Procedures," Revision 4, 8/20/96, Appendix A, "Performing Nuclear Design Routine Controlled Analysis using SPC Methods," Section 5.9, "Design Shutdown Margin (SDM) Calculations," Revision 2, 2/19/97.

2. NFS-ND-900, "Nuclear Design Procedures," Revision 4, 8/20/96, Appendix A, "Performing Nuclear Design Routine Controlled Analysis using SPC Methods," Section 8.2, "Bundle Misorientation Analysis," Revision 0, 8/9/93.

3. NFS-ND-900, "Nuclear Design Procedures," Revision 4, 8/20/96, Appendix A, "Performing Nuclear Design Routine Controlled Analysis using SPC Methods," Section 8.3, "Fuel Assembly Mislocation Calculations," Revision 0, 8/10/93.

4. NFS-ND-900, "Nuclear Design Procedures," Revision 4, 8/20/96, Appendix A, "Performing Nuclear Design Routine Controlled Analysis using SPC Methods," Section 8.4, "Rod Withdrawal Error (RWE) Calculations," Revision 0, 9/21/93.

5. NFS-ND-900, "Nuclear Design Procedures," Revision 4, 8/20/96, Appendix A, "Performing Nuclear Design Routine Controlled Analysis using SPC Methods," Section 8.5 "Control Rod Drop Accident (CRDA) Analysis," Revision 1, 3/20/97.

6. NFS-ND-900, "Nuclear Design Procedures," Revision 4, 8/20/96, Appendix A, "Performing Nuclear Design Routine Controlled Analysis using SPC Methods," Section 8.7, "Standby Liquid Control System Worth Calculations," Revision 1, 8/21/97.

7. NFS-ND-900, "Nuclear Design Procedures," Revision 4, 8/20/96, Appendix A, "Performing Nuclear Design Routine Controlled Analysis using SPC Methods," Section 8.8, "Loss of Feedwater Heating Transient Analysis," Revision 3, 8/5/97.

8. NFS-ND-900, "Nuclear Design Procedures," Revision 4, 8/20/96, Appendix A, "Performing Nuclear Design Routine Controlled Analysis using SPC Methods," Section 8.6, "Reload Licensing Report (RLR)," Revision 0, 11/2/93.

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