Serial No. 16-055D
Docket No. 72-16

ATTACHMENT 2

Dominion Engineering Technical Evaluation, ETE-NAF-2016-0111, Rev. 0, "TN-32 Cask Decay Heats for AREVA-TN's High Burnup Cask Thermal Analysis."

(Signatories of this document have been redacted.)

North Anna Power Station ISFSI

Virginia Electric and Power Company

Dominion®

Engineering Technical Evaluation Cover Sheet and Body

1. Stations:	2. Doc Type:	3. Sub Type:	4. Document Number:	5. Rev.:	6. Add:	7. Decomm?
☐MP ☒NA ☐SU	ETE	000	ETE-NAF-2016-0111	0	N/A	☐Yes ☒No

8. Title:
TN-32 Cask Decay Heats for AREVA-TN's High Burnup Cask Thermal Analysis

9. ETE Level:	10. Unit(s):	11. Quality Classification:	12. FSRC Approval:	13. Risk Assessment:
☒Level 1 ☐Level 2	☐Unit 1 ☐Unit 2 ☐Unit 3 ☒ISFSI	☐SR ☒NS ☐NSQ	☐Yes ☒No	☐Low ☐Medium ☐High ☒ N/A

14. *Preparation, Review, and Approval Signatures (add or delete rows as needed)*

Prepared by/Affiliation: (Print) [redacted]	Signature: [redacted]	Date: 8-17-16
Reviewed by/Affiliation: (Print) ☒IND ☐PEER [redacted]	Signature: [redacted]	Date: 8-17-16
Program/Other Reviewer/Affiliation: (Print) ☐IND ☐PEER ☐SME N/A	Signature:	Date:
Supervisor Approval/Affiliation: (Print) [redacted]	[redacted]	Date: 8/17/16
Design Control Engineer (DCE) Review/Site: (Print) N/A	Signature:	Date:

FSRC Approval/Site: (Print)	Signature:	MTG No:	Date:
N/A			

Standard Attachments	Attachment	# of pages	Reviewed/No Impact	Not Req.
15. Design Effects and Considerations (DNES-AA-GN-1003)			☐	☒
16. Document Impact Summary (DRUL) (DNES-AA-GN-1002)				☒

17. Considerations and Conditions for Document Updates (check ☒N/A if no document updates are noted on the DRUL)
☐ All Document updates noted on the DRUL can be initiated immediately
☐ Document updates noted on DRUL are delayed until the following documents/actions are completed (e.g., WO, CR, etc.)
(See DRUL Remarks section)

10CFR50.59 Attachments	Attachment	# of pages	Not Req.
18. 10CFR50.59/72.48 applicability review forms (CM AA-400)			☒
19. 10CFR50.59/72.48 screen form (CM-AA-400)			☒
20. 10CFR50.59/72.48 evaluation form (CM-AA-400)			☒

21. *Additional Attachments*

Attachment	# of pages	Description
1	1	11715-FY-9L SH-001, "Site Plan ISFSI Pad #1 Cask Configuration & Identification Numbers"
2	58	Existing North Anna ISFSI Pad 1 TN-32 Cask Certifications

22. *Distribution*

Primary Recipient(s): [redacted]
(Enter Name/Dept. or Location for EACH Primary Recipient in this block.)

Copy To?	Other Recipient/Department or Location	Copy To?	Other Recipient/Department Location
☒	[redacted]	☐	System Engineer
☒	[redacted]	☒	Nuclear Document Management
☒	[redacted]	☒	[redacted]
☐	Site DCE	☐	
☐	Affected Organization	☐	
☐	Program Owners	☐	

Source Document

Email from AREVA-TN requesting the decay heat of the TN-32B cask and the decay heats of the nine casks on the North end of the ISFSI Pad 1, nearest the TN-32B HBU cask location as of 7/1/2017.

Record of Revision

Original Issue

Purpose

The purpose of this ETE is to provide the decay heats of the TN-32B HBU cask and the nine casks nearest its eventual storage location as design input to the AREVA-TN Thermal Analysis to support a response to the NRC RAI concerning neutron shield resin temperature.

This ETE provides design input data for the AREVA-TN thermal analysis for the TN-32B HBU cask. (*ETE Level 1 item 2.3.j).*

Design Inputs and Assumptions

1. The existing TN-32 cask payloads have been provided in Attachments 3.

2. Fuel data was provided in References 3 and 4.

3. The use of the NUHOMS HD Technical Specification decay heat algorithm is acceptable for use in this evaluation. The decay heat was derived from Origen runs and the license it is used for is irrelevant so long as the fuel type is consistent.

Discussion

The nine TN-32 casks that are the closest to the TN-32B HBU cask are identified in Reference 1 (Attachment 1) as TN-32.45, TN-32.49, TN-32.43, TN-32.38, TN-32.36, TN-32.37, TN-32.29, TN-32.20, and TN-32.23. The TN-32B HBU cask will be placed on pad location 1-28, which is located on the north west corner of pad 1. The nine casks closest to the TN-32B HBU cask are being evaluated due to the request from AREVA-TN.

The decay heats of the TN-32 casks are calculated as a sum of individual fuel assembly decay heats using the Decay Heat Algorithm provided in Table 4B of NUHOMS HD Technical Specifications under CoC 1030. An adjustment of -0.05 wt% of U235 enrichment and +2.5% burnup have been included in the final decay heat values to account for uncertainties. The decay heat has been calculated as of 7/1/2017.

The following tables provide the required fuel data information needed for the calculation of decay heats for the TN-32B HBU cask and the first nine TN-32 casks closest to the TN-32B HBU cask. The cask number is listed at the top of each table along with the cask location on the pad, which is designated by parenthesis ( ) .

TN-32B HBU Cask (1-28)

ID	Enrichment (wt% U235)	Final Burn (MWD/ MTU)	Last Irradiation Date	Adjusted Enrichment (wt% U235)	Adjusted Burn up (MWD/MTU)	Cooling Time (Years)	Decay Heat (Watts)
6T0	4.25	54223	10/2/2005	4.2	55579	11.75	1013
3K7	4.55	53414	3/8/2009	4.5	54749	8.31	1167
3T6	4.25	54298	10/2/2005	4.2	55655	11.75	1015
6F2	4.25	51904	5/2/2004	4.2	53202	13.16	909
3F6	4.25	52138	5/2/2004	4.2	53441	13.16	914
30A	4.55	52020	9/12/2010	4.5	53321	6.80	1276
22B	4.55	51155	3/11/2012	4.5	52434	5.31	1503
20B	4.55	50477	3/11/2012	4.5	51739	5.31	1477
5K6	4.55	53268	3/8/2009	4.5	54600	8.31	1163
5D5	4.2	55496	3/12/2000	4.15	56883	17.30	903
5D9	4.2	54579	3/12/2000	4.15	55943	17.30	882
28B	4.55	50966	3/11/2012	4.5	52240	5.31	1496
F40	3.59	50646	4/19/1987	3.54	51912	30.20	696
57A	4.55	52154	9/12/2010	4.5	53458	6.80	1281
30B	4.55	50623	3/11/2012	4.5	51889	5.31	1482
3K4	4.55	51841	3/8/2009	4.5	53137	8.31	1120
5K7	4.55	53335	3/8/2009	4.5	54668	8.31	1165
50B	4.55	50870	3/11/2012	4.5	52142	5.31	1492
3U9	4.45	53074	3/18/2007	4.4	54401	10.29	1037
0A4	4	50047	9/9/1994	3.95	51298	22.81	725
15B	4.55	50972	3/11/2012	4.5	52246	5.31	1496
6K4	4.55	51868	3/8/2009	4.5	53165	8.31	1121
3T2	4.25	55087	10/2/2005	4.2	56464	11.75	1036
3U4	4.45	52850	3/18/2007	4.4	54171	10.29	1031
56B	4.55	50952	3/11/2012	4.5	52226	5.31	1495
54B	4.55	51340	3/11/2012	4.5	52624	5.31	1511
6V0	4.4	53506	3/8/2009	4.35	54844	8.31	1178
3U6	4.45	52968	3/18/2007	4.4	54292	10.29	1035
4V4	4.4	51183	9/14/2008	4.35	52463	8.79	1073
5K1	4.55	53012	3/8/2009	4.5	54337	8.31	1155
5T9	4.25	54890	10/2/2005	4.2	56262	11.75	1031
4F1	4.25	52285	5/2/2004	4.2	53592	13.16	918
						Total (kW)	**36.799**

TN-32.23 (1-18)

ID	Enrichment (wt% U235)	Final Burn (MWD/ MTU)	Last Irradiation Date	Adjusted Enrichment (wt% U235)	Adjusted Burn up (MWD/MTU)	Cooling Time (Years)	Decay Heat (Watts)
L45	2.11	16,614	3/7/80	2.06	17029	37.32	180
L53	2.11	16,332	3/7/80	2.06	16740	37.32	177
D33	3.21	27,112	5/17/82	3.16	27790	35.12	312
P04	3.10	23,570	4/2/83	3.05	24159	34.25	269
D10	3.21	36,417	5/12/84	3.16	37327	33.14	447
D22	3.21	36,446	5/12/84	3.16	37357	33.14	448
D45	3.21	36,820	5/12/84	3.16	37741	33.14	453
F19	3.59	12,544	5/12/84	3.54	12858	33.14	163
D42	3.21	36,301	11/4/85	3.16	37209	31.66	450
E06	3.40	34,800	11/4/85	3.35	35670	31.66	425
E12	3.40	34,771	11/4/85	3.35	35640	31.66	425
E17	3.40	36,701	11/4/85	3.35	37619	31.66	454
E22	3.40	36,688	11/4/85	3.35	37605	31.66	454
E24	3.40	34,587	11/4/85	3.35	35452	31.66	422
E25	3.40	36,682	11/4/85	3.35	37599	31.66	454
E26	3.40	36,605	11/4/85	3.35	37520	31.66	453
E29	3.40	36,544	11/4/85	3.35	37458	31.66	452
E30	3.40	36,645	11/4/85	3.35	37561	31.66	453
E31	3.40	34,533	11/4/85	3.35	35396	31.66	421
E33	3.40	36,611	11/4/85	3.35	37526	31.66	453
E43	3.40	36,659	11/4/85	3.35	37575	31.66	453
E56	3.40	34,115	11/4/85	3.35	34968	31.66	415
E59	3.40	36,167	11/4/85	3.35	37071	31.66	446
S07	3.59	28,081	2/20/86	3.54	28783	31.36	333
S44	3.59	28,568	2/20/86	3.54	29282	31.36	339
G16	3.60	36,423	4/19/87	3.55	37334	30.20	453
S62	3.59	34,004	2/25/89	3.54	34854	28.34	423
D44	3.21	28,059	1/12/91	3.16	28760	26.47	346
D52	3.21	28,008	1/12/91	3.16	28708	26.47	346
S02	3.59	38,767	2/26/92	3.54	39736	25.34	511
S41	3.59	38,517	2/26/92	3.54	39480	25.34	507
S56	3.59	39,105	2/26/92	3.54	40083	25.34	517
						Total (kW)	**12.855**

TN-32.20 (1-20)

ID	Enrichment (wt% U235)	Final Burn (MWD/ MTU)	Last Irradiation Date	Adjusted Enrichment (wt% U235)	Adjusted Burn up (MWD/MTU)	Cooling Time (Years)	Decay Heat (Watts)
L28	2.11	15,246	3/7/80	2.06	15627	37.32	165
L29	2.11	16,214	3/7/80	2.06	16619	37.32	176
L35	2.11	13,730	3/7/80	2.06	14073	37.32	149
L38	2.11	15,960	3/7/80	2.06	16359	37.32	173
L40	2.11	16,968	3/7/80	2.06	17392	37.32	184
L41	2.11	15,997	3/7/80	2.06	16397	37.32	173
L42	2.11	16,202	3/7/80	2.06	16607	37.32	176
L44	2.11	16,868	3/7/80	2.06	17290	37.32	183
N17	2.60	23,086	4/2/83	2.55	23663	34.25	262
N20	2.60	23,202	4/2/83	2.55	23782	34.25	264
N28	2.60	23,535	4/2/83	2.55	24123	34.25	268
N45	2.60	23,309	4/2/83	2.55	23892	34.25	265
E01	3.40	29,018	5/12/84	3.35	29743	33.14	340
E05	3.40	29,854	5/12/84	3.35	30600	33.14	352
E09	3.40	25,139	5/12/84	3.35	25767	33.14	291
E34	3.40	28,308	5/12/84	3.35	29016	33.14	331
E46	3.40	32,929	5/12/84	3.35	33752	33.14	394
E47	3.40	32,817	5/12/84	3.35	33637	33.14	392
E57	3.40	25,722	5/12/84	3.35	26365	33.14	298
E62	3.40	29,415	5/12/84	3.35	30150	33.14	346
P19	3.10	35,713	8/2/84	3.05	36606	32.91	438
P33	3.10	38,490	8/2/84	3.05	39452	32.91	482
P40	3.10	38,830	8/2/84	3.05	39801	32.91	487
P50	3.10	37,892	8/2/84	3.05	38839	32.91	472
P51	3.10	34,526	8/2/84	3.05	35389	32.91	420
H27	3.60	38,507	2/25/89	3.55	39470	28.34	493
H28	3.60	39,951	2/25/89	3.55	40950	28.34	516
S09	3.59	36,582	1/12/91	3.54	37497	26.47	470
S13	3.59	36,139	1/12/91	3.54	37042	26.47	463
S22	3.59	36,487	1/12/91	3.54	37399	26.47	469
S43	3.59	35,477	1/12/91	3.54	36364	26.47	453
S51	3.59	35,525	1/12/91	3.54	36413	26.47	454
						Total (kW)	**10.803**

TN-32.29 (1-21)

ID	Enrichment (wt% U235)	Final Burn (MWD/ MTU)	Last Irradiation Date	Adjusted Enrichment (wt% U235)	Adjusted Burn up (MWD/MTU)	Cooling Time (Years)	Decay Heat (Watts)
B01	2.60	28,628	12/28/80	2.55	29344	36.51	331
B02	2.60	26,960	12/28/80	2.55	27634	36.51	308
B03	2.60	27,194	12/28/80	2.55	27874	36.51	312
B04	2.60	28,662	12/28/80	2.55	29379	36.51	331
B05	2.60	28,428	12/28/80	2.55	29139	36.51	328
B06	2.60	29,067	12/28/80	2.55	29794	36.51	337
B07	2.60	26,852	12/28/80	2.55	27523	36.51	307
B08	2.60	28,145	12/28/80	2.55	28849	36.51	324
B09	2.60	29,077	12/28/80	2.55	29804	36.51	337
B10	2.60	28,371	12/28/80	2.55	29080	36.51	327
B11	2.60	28,340	12/28/80	2.55	29049	36.51	327
B14	2.60	29,016	12/28/80	2.55	29741	36.51	336
B15	2.60	27,012	12/28/80	2.55	27687	36.51	309
B16	2.60	28,678	12/28/80	2.55	29395	36.51	332
B17	2.60	27,034	12/28/80	2.55	27710	36.51	309
B19	2.60	26,715	12/28/80	2.55	27383	36.51	305
B20	2.60	26,774	12/28/80	2.55	27443	36.51	306
B21	2.60	28,924	12/28/80	2.55	29647	36.51	335
B22	2.60	28,767	12/28/80	2.55	29486	36.51	333
B23	2.60	28,833	12/28/80	2.55	29554	36.51	334
B25	2.60	26,947	12/28/80	2.55	27621	36.51	308
B26	2.60	28,147	12/28/80	2.55	28851	36.51	324
B27	2.60	28,172	12/28/80	2.55	28876	36.51	325
B28	2.60	27,060	12/28/80	2.55	27737	36.51	310
B29	2.60	26,923	12/28/80	2.55	27596	36.51	308
B34	2.60	28,783	12/28/80	2.55	29503	36.51	333
B37	2.60	27,168	12/28/80	2.55	27847	36.51	311
B38	2.60	27,308	12/28/80	2.55	27991	36.51	313
B44	2.60	27,870	12/28/80	2.55	28567	36.51	321
D03	3.21	25,392	5/17/82	3.16	26027	35.12	290
D27	3.21	25,424	5/17/82	3.16	26060	35.12	290
D28	3.21	22,735	5/17/82	3.16	23303	35.12	258
						Total (kW)	**10.161**

TN-32.37 (1-22)

ID	Enrichment (wt% U235)	Final Burn (MWD/ MTU)	Last Irradiation Date	Adjusted Enrichment (wt% U235)	Adjusted Burn up (MWD/MTU)	Cooling Time (Years)	Decay Heat (Watts)
K01	3.80	42,629	9/7/93	3.75	43695	23.81	583
K03	3.80	42,512	9/7/93	3.75	43575	23.81	581
K04	3.80	42,018	9/7/93	3.75	43068	23.81	572
K06	3.80	42,023	9/7/93	3.75	43074	23.81	572
K07	3.80	41,828	9/7/93	3.75	42874	23.81	569
K09	3.80	42,076	9/7/93	3.75	43128	23.81	573
K10	3.80	41,829	9/7/93	3.75	42875	23.81	569
K12	3.80	41,856	9/7/93	3.75	42902	23.81	570
3A5	4.20	44,635	9/9/94	4.15	45751	22.81	619
3A8	4.20	44,736	9/9/94	4.15	45854	22.81	621
4A7	4.20	44,930	9/9/94	4.15	46053	22.81	624
K13	3.80	43,223	9/9/94	3.75	44304	22.81	601
K16	3.80	42,109	9/9/94	3.75	43162	22.81	581
K19	3.80	42,703	9/9/94	3.75	43771	22.81	591
K22	3.80	42,927	9/9/94	3.75	44000	22.81	595
K25	3.80	43,432	9/9/94	3.75	44518	22.81	605
K31	3.80	43,270	9/9/94	3.75	44352	22.81	602
K33	3.80	42,607	9/9/94	3.75	43672	22.81	590
K35	3.80	42,761	9/9/94	3.75	43830	22.81	592
1L1	4.02	44,233	3/25/95	3.97	45339	22.27	619
1L5	4.02	41,307	3/25/95	3.97	42340	22.27	567
2L2	4.02	42,029	3/25/95	3.97	43080	22.27	580
2L6	4.02	44,034	3/25/95	3.97	45135	22.27	615
3L1	4.02	43,816	3/25/95	3.97	44911	22.27	611
3L5	4.02	43,154	3/25/95	3.97	44233	22.27	600
3L6	4.02	41,066	3/25/95	3.97	42093	22.27	563
3L9	4.02	40,693	3/25/95	3.97	41710	22.27	557
K56	4.00	43,753	2/11/96	3.95	44847	21.39	618
K58	4.00	44,563	2/11/96	3.95	45677	21.39	633
K59	4.00	44,490	2/11/96	3.95	45602	21.39	631
K60	4.00	44,004	2/11/96	3.95	45104	21.39	622
K64	4.00	44,870	2/11/96	3.95	45992	21.39	638
						Total (kW)	**19.065**

TN-32.36 (1-23)

ID	Enrichment (wt% U235)	Final Burn (MWD/ MTU)	Last Irradiation Date	Adjusted Enrichment (wt% U235)	Adjusted Burn up (MWD/MTU)	Cooling Time (Years)	Decay Heat (Watts)
X01	3.80	44,565	2/26/92	3.75	45679	25.34	608
Y38	4.21	44,686	9/7/93	4.16	45803	23.81	612
Y44	4.21	37,214	9/7/93	4.16	38144	23.81	489
Y50	4.21	43,954	9/7/93	4.16	45053	23.81	599
Y59	4.21	44,015	9/7/93	4.16	45115	23.81	601
Y60	4.21	37,345	9/7/93	4.16	38279	23.81	491
Y61	4.21	44,270	9/7/93	4.16	45377	23.81	605
Y63	4.21	43,903	9/7/93	4.16	45001	23.81	599
J01	3.79	44,392	3/25/95	3.74	45502	22.27	626
J04	3.79	44,796	3/25/95	3.74	45916	22.27	634
J10	3.79	44,763	3/25/95	3.74	45882	22.27	633
J12	3.79	43,948	3/25/95	3.74	45047	22.27	618
J36	3.79	43,706	3/25/95	3.74	44799	22.27	614
K66	3.80	41,028	3/25/95	3.75	42054	22.27	566
K70	3.80	42,103	3/25/95	3.75	43156	22.27	585
K71	3.80	41,933	3/25/95	3.75	42981	22.27	582
K76	3.80	41,734	3/25/95	3.75	42777	22.27	578
W01	3.80	44,293	3/25/95	3.75	45400	22.27	624
W06	3.80	44,053	3/25/95	3.75	45154	22.27	620
W07	3.80	44,183	3/25/95	3.75	45288	22.27	622
W15	3.80	42,844	3/25/95	3.75	43915	22.27	598
W25	3.80	43,686	3/25/95	3.75	44778	22.27	613
W26	3.80	43,621	3/25/95	3.75	44712	22.27	612
W27	3.80	43,149	3/25/95	3.75	44228	22.27	603
0A3	4.00	44,551	2/11/96	3.95	45665	21.39	632
0A6	4.00	44,600	2/11/96	3.95	45715	21.39	633
1A1	4.00	44,448	2/11/96	3.95	45559	21.39	631
1A2	4.00	44,501	2/11/96	3.95	45614	21.39	632
1A3	4.00	44,216	2/11/96	3.95	45321	21.39	626
1A6	4.00	43,618	2/11/96	3.95	44708	21.39	615
1A8	4.00	43,721	2/11/96	3.95	44814	21.39	617
2A7	4.00	44,510	2/11/96	3.95	45623	21.39	632
						Total (kW)	**19.351**

TN-32.38 (1-24)

ID	Enrichment (wt% U235)	Final Burn (MWD/ MTU)	Last Irradiation Date	Adjusted Enrichment (wt% U235)	Adjusted Burn up (MWD/MTU)	Cooling Time (Years)	Decay Heat (Watts)
X21	4.00	44,169	9/7/93	3.95	45273	23.81	607
X23	4.00	43,786	9/7/93	3.95	44881	23.81	600
X25	4.00	44,749	9/7/93	3.95	45868	23.81	617
X26	4.00	43,578	9/7/93	3.95	44667	23.81	596
X27	4.00	43,481	9/7/93	3.95	44568	23.81	595
X31	4.00	44,135	9/7/93	3.95	45238	23.81	606
X34	4.00	43,902	9/7/93	3.95	45000	23.81	602
X37	4.00	43,873	9/7/93	3.95	44970	23.81	602
X38	4.00	44,276	9/7/93	3.95	45383	23.81	609
X39	4.00	44,666	9/7/93	3.95	45783	23.81	616
X46	4.00	42,829	9/7/93	3.95	43900	23.81	583
X47	4.00	44,419	9/7/93	3.95	45529	23.81	611
X48	4.00	44,887	9/7/93	3.95	46009	23.81	620
X52	4.00	43,627	9/7/93	3.95	44718	23.81	597
Y02	3.99	43,112	9/7/93	3.94	44190	23.81	588
Y07	3.99	43,303	9/7/93	3.94	44386	23.81	592
Y08	3.99	43,858	9/7/93	3.94	44954	23.81	601
Y10	3.99	42,917	9/7/93	3.94	43990	23.81	585
Y11	3.99	43,160	9/7/93	3.94	44239	23.81	589
Y12	3.99	42,542	9/7/93	3.94	43606	23.81	578
Y13	3.99	44,441	9/7/93	3.94	45552	23.81	612
Y18	3.99	43,960	9/7/93	3.94	45059	23.81	603
Y25	3.99	43,091	9/7/93	3.94	44168	23.81	588
Y26	3.99	44,171	9/7/93	3.94	45275	23.81	607
3B1	4.21	44,105	2/11/96	4.16	45208	21.39	621
3B2	4.21	44,474	2/11/96	4.16	45586	21.39	627
3B7	4.21	43,967	2/11/96	4.16	45066	21.39	618
4B4	4.21	43,953	2/11/96	4.16	45052	21.39	618
5B0	4.21	44,515	2/11/96	4.16	45628	21.39	628
5B5	4.21	44,733	2/11/96	4.16	45851	21.39	632
5B8	4.21	44,064	2/11/96	4.16	45166	21.39	620
5B9	4.21	44,894	2/11/96	4.16	46016	21.39	635
						Total (kW)	**19.403**

TN-32.43 (1-25)

ID	Enrichment (wt% U235)	Final Burn (MWD/ MTU)	Last Irradiation Date	Adjusted Enrichment (wt% U235)	Adjusted Burn up (MWD/MTU)	Cooling Time (Years)	Decay Heat (Watts)
W41	4.00	43,367	8/21/90	3.95	44451	26.86	574
W42	4.00	43,418	8/21/90	3.95	44503	26.86	575
W45	4.00	44,009	8/21/90	3.95	45109	26.86	585
W46	4.00	44,411	8/21/90	3.95	45521	26.86	592
W47	4.00	44,269	8/21/90	3.95	45376	26.86	590
W48	4.00	43,249	8/21/90	3.95	44330	26.86	572
W49	4.00	44,372	8/21/90	3.95	45481	26.86	591
W52	4.00	43,367	8/21/90	3.95	44451	26.86	574
W53	4.00	44,057	8/21/90	3.95	45158	26.86	586
W54	4.00	44,585	8/21/90	3.95	45700	26.86	595
W55	4.00	42,460	8/21/90	3.95	43522	26.86	559
W56	4.00	42,432	8/21/90	3.95	43493	26.86	558
W57	4.00	42,784	8/21/90	3.95	43854	26.86	564
W58	4.00	44,435	8/21/90	3.95	45546	26.86	593
W59	4.00	43,983	8/21/90	3.95	45083	26.86	585
W60	4.00	44,605	8/21/90	3.95	45720	26.86	596
W61	4.00	43,689	8/21/90	3.95	44781	26.86	580
W63	4.00	43,469	8/21/90	3.95	44556	26.86	576
W23	3.80	41,572	2/26/92	3.75	42611	25.34	555
X02	3.80	44,174	2/26/92	3.75	45278	25.34	601
X03	3.80	44,523	2/26/92	3.75	45636	25.34	607
X06	3.80	43,377	2/26/92	3.75	44461	25.34	587
X07	3.80	44,102	2/26/92	3.75	45205	25.34	599
X08	3.80	44,624	2/26/92	3.75	45740	25.34	609
X11	3.80	44,143	2/26/92	3.75	45247	25.34	600
X13	3.80	43,945	2/26/92	3.75	45044	25.34	597
X41	4.00	42,611	2/26/92	3.95	43676	25.34	570
X42	4.00	42,845	2/26/92	3.95	43916	25.34	574
X43	4.00	42,206	2/26/92	3.95	43261	25.34	563
X45	4.00	42,630	2/26/92	3.95	43696	25.34	570
X50	4.00	43,261	2/26/92	3.95	44343	25.34	581
X51	4.00	42,764	2/26/92	3.95	43833	25.34	573
						Total (kW)	**18.630**

TN-32.49 (1-26)

ID	Enrichment (wt% U235)	Final Burn (MWD/ MTU)	Last Irradiation Date	Adjusted Enrichment (wt% U235)	Adjusted Burn up (MWD/MTU)	Cooling Time (Years)	Decay Heat (Watts)
J49	3.99	43,778	1/12/91	3.94	44872	26.47	584
J50	3.99	43,831	1/12/91	3.94	44927	26.47	585
J53	3.99	43,734	1/12/91	3.94	44827	26.47	583
J54	3.99	44,041	1/12/91	3.94	45142	26.47	588
J55	3.99	37,205	1/12/91	3.94	38135	26.47	477
J56	3.99	43,796	1/12/91	3.94	44891	26.47	584
J57	3.99	43,933	1/12/91	3.94	45031	26.47	586
0C1	4.01	44,374	5/11/97	3.96	45483	20.14	640
0C3	4.01	43,777	5/11/97	3.96	44871	20.14	629
0C6	4.01	44,760	5/11/97	3.96	45879	20.14	648
0C8	4.01	43,848	5/11/97	3.96	44944	20.14	631
1C1	4.01	43,910	5/11/97	3.96	45008	20.14	632
1C4	4.01	44,214	5/11/97	3.96	45319	20.14	637
1C5	4.01	44,303	5/11/97	3.96	45411	20.14	639
1C7	4.01	44,571	5/11/97	3.96	45685	20.14	644
2C0	4.01	43,234	5/11/97	3.96	44315	20.14	619
2C1	4.01	44,144	5/11/97	3.96	45248	20.14	636
2C7	4.01	43,783	5/11/97	3.96	44878	20.14	629
2C8	4.01	44,216	5/11/97	3.96	45321	20.14	637
3A6	4.20	43,787	5/11/97	4.15	44882	20.14	626
4N7	4.21	44,591	4/5/98	4.16	45706	19.24	650
4N8	4.21	44,277	4/5/98	4.16	45384	19.24	644
4N9	4.21	44,288	4/5/98	4.16	45395	19.24	644
5N2	4.21	43,557	4/5/98	4.16	44646	19.24	630
5N5	4.21	41,443	4/5/98	4.16	42479	19.24	592
5N7	4.21	41,096	4/5/98	4.16	42123	19.24	586
5N9	4.21	44,422	4/5/98	4.16	45533	19.24	646
1D5	4.00	42,912	9/13/98	3.95	43985	18.80	627
1D8	4.00	42,353	9/13/98	3.95	43412	18.80	616
1D9	4.00	43,493	9/13/98	3.95	44580	18.80	638
2D0	4.00	42,772	9/13/98	3.95	43841	18.80	624
J24	3.79	41,341	9/13/98	3.74	42375	18.80	601
						Total (kW)	**19.732**

TN-32.45 (1-27)

ID	Enrichment (wt% U235)	Final Burn (MWD/ MTU)	Last Irradiation Date	Adjusted Enrichment (wt% U235)	Adjusted Burn up (MWD/MTU)	Cooling Time (Years)	Decay Heat (Watts)
W03	3.80	43,671	8/21/90	3.75	44763	26.86	583
W08	3.80	43,517	8/21/90	3.75	44605	26.86	580
W10	3.80	44,520	8/21/90	3.75	45633	26.86	598
W12	3.80	44,205	8/21/90	3.75	45310	26.86	592
W20	3.80	44,359	8/21/90	3.75	45468	26.86	595
W24	3.80	44,317	8/21/90	3.75	45425	26.86	594
W28	3.80	43,606	8/21/90	3.75	44696	26.86	582
W29	4.00	43,464	8/21/90	3.95	44551	26.86	576
W30	4.00	43,214	8/21/90	3.95	44294	26.86	572
W32	4.00	43,721	8/21/90	3.95	44814	26.86	580
W33	4.00	42,200	8/21/90	3.95	43255	26.86	555
W35	4.00	43,141	8/21/90	3.95	44220	26.86	570
W36	4.00	43,770	8/21/90	3.95	44864	26.86	581
W37	4.00	43,170	8/21/90	3.95	44249	26.86	571
W39	4.00	44,450	8/21/90	3.95	45561	26.86	593
W40	4.00	43,419	8/21/90	3.95	44504	26.86	575
W11	3.80	41,437	2/26/92	3.75	42473	25.34	553
W16	3.80	42,338	2/26/92	3.75	43396	25.34	568
W18	3.80	41,282	2/26/92	3.75	42314	25.34	550
0B1	4.00	39,639	5/11/97	3.95	40630	20.14	555
0B4	4.00	38,773	5/11/97	3.95	39742	20.14	540
0B9	4.00	39,908	5/11/97	3.95	40906	20.14	560
1B7	4.00	39,960	5/11/97	3.95	40959	20.14	561
2B8	4.21	44,647	5/11/97	4.16	45763	20.14	642
4A2	4.20	44,269	5/11/97	4.15	45376	20.14	635
4A5	4.20	43,033	5/11/97	4.15	44109	20.14	612
4A9	4.20	43,308	5/11/97	4.15	44391	20.14	617
4B3	4.21	44,223	5/11/97	4.16	45329	20.14	634
5A2	4.20	43,285	5/11/97	4.15	44367	20.14	617
5A3	4.20	43,856	5/11/97	4.15	44952	20.14	627
5A9	4.20	44,370	5/11/97	4.15	45479	20.14	637
6A7	4.20	43,686	5/11/97	4.15	44778	20.14	624
						Total (kW)	**18.829**

Conclusions

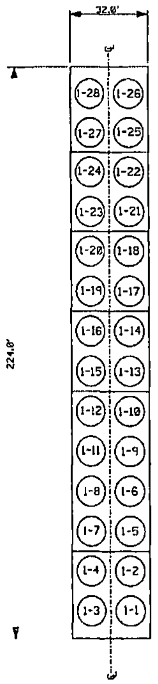
The TN-32HBU cask and TN-32 cask decay heats are as follows as of 7/1/17.

Pad Location	*(1-28)*	*(1-26)*
Cask ID	TN-32B HBU	TN-32.49
Decay Heat	36.799 kW	19.732 kW
	(1-27)	*(1-25)*
	TN-32.45	TN-32.43
	18.829 kW	18.630 kW
	(1-24)	*(1-22)*
	TN-32.38	TN-32.37
	19.403 kW	19.065 kW
	(1-23)	*(1-21)*
	TN-32.36	TN-32.29
	19.351 kW	10.161 kW
	(1-20)	*(1-18)*
	TN-32.20	TN-32.23
	10.803 kW	12.855 kW

References

1. 11715-FY-9L SH-001, "Site Plan ISFSI Pad #1 Cask Configuration & Identification Numbers"
2. U.S. Nuclear Regulatory Commission 10 CFR 72 Certificate of Compliance for Spent Fuel Storage Casks, No. 1030, Amendment 1, Including Attachment 1, Technical Specifications.
3. CALC PM-1737, Rev. 0, Fuel Management Scheme 2015 and FUTIL 2015 Inputs and Assumptions, 7/9/2015
4. ETE-NAF-2015-0068, Rev. 0, Fuel Management Scheme 2015, 7/21/2015
5. ETE-NAF-2015-0057, Rev. 0, Basis for Burn-up Uncertainty used in the Nuclear Spent Fuel Certification Process, 4/28/2015

** DO NOT USE FOR WORK IN PLANT. DATA LOSS POSSIBLE AT THIS SCALE & DPI. **



PLAN - PAD #1

LOCATION	CASK	DATE LAST LOADED	MARK NUMBER
1-1	TN-32.52	SEPTEMBER 18, 2006	0-FH-CASK-1-1-ACCUMU
1-2	TN-32.47	APRIL 4, 2005	0-FH-CASK-1-2-ACCUMU
1-3	TN-32.53	JANUARY 25, 2007	0-FH-CASK-1-3-ACCUMU
1-4	TN-32.48	JUNE 5, 2006	0-FH-CASK-1-4-ACCUMU
1-5	TN-32.41	DECEMBER 8, 2003	0-FH-CASK-1-5-ACCUMU
1-6	TN-32.30	AUGUST 20, 2002	0-FH-CASK-1-6-ACCUMU
1-7	TN-32.42	FEBRUARY 2, 2004	0-FH-CASK-1-7-ACCUMU
1-8	TN-32.32	NOVEMBER 5, 2002	0-FH-CASK-1-8-ACCUMU
1-9	TN-32.26	JANUARY 28, 2002	0-FH-CASK-1-9-ACCUMU
1-10	TN-32.19	AUGUST 22, 2000	0-FH-CASK-1-10-ACCUMU
1-11	TN-32.24	AUGUST 13, 2001	0-FH-CASK-1-11-ACCUMU
1-12	TN-32.21	JANUARY 16, 2001	0-FH-CASK-1-12-ACCUMU
1-13	TN-32.10	AUGUST 24, 1998	0-FH-CASK-1-13-ACCUMU
1-14	TN-32.13	JULY 19, 1999	0-FH-CASK-1-14-ACCUMU
1-15	TN-32.06	JULY 13, 1998	0-FH-CASK-1-15-ACCUMU
1-16	TN-32.12	JUNE 8, 1999	0-FH-CASK-1-16-ACCUMU
1-17	TN-32.16	JUNE 19, 2000	0-FH-CASK-1-17-ACCUMU
1-18	TN-32.23	JULY 30, 2001	0-FH-CASK-1-18-ACCUMU
1-19	TN-32.14	DECEMBER 14, 1999	0-FH-CASK-1-19-ACCUMU
1-20	TN-32.20	SEPTEMBER 18, 2000	0-FH-CASK-1-20-ACCUMU
1-21	TN-32.29	FEBRUARY 18, 2002	0-FH-CASK-1-21-ACCUMU
1-22	TN-32.37	AUGUST 18, 2003	0-FH-CASK-1-22-ACCUMU
1-23	TN-32.36	JULY 21, 2003	0-FH-CASK-1-23-ACCUMU
1-24	TN-32.38	SEPTEMBER 8, 2003	0-FH-CASK-1-24-ACCUMU
1-25	TN-32.43	MARCH 8, 2004	0-FH-CASK-1-25-ACCUMU
1-26	TN-32.49	AUGUST 21, 2006	0-FH-CASK-1-26-ACCUMU
1-27	TN-32.45	JUNE 21, 2004	0-FH-CASK-1-27-ACCUMU
1-28	(EMPTY)		

Dominion

NUCLEAR ENGINEERING
RICHMOND, VIRGINIA

SITE PLAN ISFSI PAD #1
CASK CONFIGURATION & IDENTIFICATION NUMBERS
INDEPENDENT SPENT FUEL STORAGE
NORTH ANNA POWER STATION

DRAWING NO. 11715-FY-9L REV 0

SCALE: [illegible] UNLESS OTHERWISE NOTED SH 1 OF 1

PRIOR TO USING FOR DESIGN WORK CHECK DMIS FOR WORK PENDING

Dominion

Memorandum

August 30, 2000

To: Mr. A. G. Neufer
Department: North Anna Operations Support
Location: North Anna Power Station

From: Mr. E. J. Turko
Department: Nuclear Analysis and Fuel
Location: Innsbrook Technical Center 3/SW

TN-32 Cask Number 20
ISFSI Fuel/Insert Certification and Cask Loading Map

Attached are the ISFSI Fuel/Insert Certification, Rev. 0 and the Cask Loading Map, Rev. 0 for TN-32 storage cask number 20. The ISFSI Fuel/Insert Certification certifies that the fuel assemblies and insert components scheduled to be stored in TN-32.20 meet North Anna ISFSI Technical Specification limits and the TN-32 TSAR limit for fuel rod internal pressure.

The following fuel assemblies require special handling considerations due to the conditions described when loaded into this cask. The Cask Loading Map also notes the following conditions with the exception of the rotation of assembly L35.

E01	Debris on top of rods, face 3; no envelope violation
E05	Debris on top of bottom nozzle, faces 2 and 3; no envelope violation
E09	Debris on top of rods; no envelope violation
E34	Debris on top of bottom nozzle, face 4; no envelope violation
E57	Debris on top of rods, faces 1 and 3; no envelope violation
E62	Debris on top of rods, face 2; no envelope violation
L28	Debris on top of grid 8, face 3; no envelope violation
L35	180° out of orientation

Operations which may cause movement of the debris in assemblies E01, E05, E09, E34, E57, E62, and L28 should be avoided. Fuel assembly L35 must be rotated 180° prior to loading in the cask.

Based on an actual cask weight of approximately 183,550 pounds and a combined fuel and insert component weight of approximately 48,319 pounds, the total weight of TN-32.20 when placed at the ISFSI will be approximately 231,869 pounds.

E. J. Turko

Attachments: ISFSI Fuel Certification, Rev. 0, TN-32, No. 20
Cask Loading Map, Rev. 0, TN-32, No. 20

Dominion

Memorandum

Memorandum: E.J. Turko to A. G. Neufer, August 30, 2000
TN-32.20 Fuel Certification and Loading Map

cc: Mr. G. B. Crisman – North Anna Operations Support
Mr. B. H. Wakeman – IN/3SW
Mr. T. A. Brookmire – IN/3SW
Mr. C. B. LaRoe – IN/3SW
Mr. J. D. Nichols – IN/3SW
Mr. R. T. Robins – IN/3SW
FPA File 5.8
Records Management, NP-2884 – IN/GW
North Anna Records (ISFSI)

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 20
PAGE 1 OF 2

Technical Specifications Limits

Initial Fuel Enrichment	≤ 3.85 wt % U235
Fuel Burnup	≤ 40,000 MWD/MTU
Decay Heat/Fuel Assembly & Insert Component	≤ 847 Watts
Time Since Discharge for Fuel	≥ 2,555 Days
Gamma Source/Cask	≤ 2.31E+17 Photons/Sec
Neutron Source/Cask	≤ 4.83E+09 Neutrons/Sec
Fuel Assembly Design	W 17x17 Std or Vantage 5H
Fuel Assembly and Insert Component Weight	≤ 1,533 Pounds
Time Since Discharge for BPRA	See TS Figure 2-5.1
Time Since Discharge for TPD	See TS Figure 2-5.2

Other Parameters

Fuel Rod Internal Pressure After 2,555 Days	≤ 126.3 Bar

Fuel Assembly ID	Initial Fuel Enrichment (wt % U235)	Fuel Burnup (MWD/MTU)	F/A and Insert Decay Heat On 7/1/00 (Watts)	Days From Fuel Discharge To 7/1/00	Fuel Rod Pressure (Bar)	Gamma Source On 7/1/00 (P/Sec)	Neutron Source On 7/1/00 (N/Sec)
E01	3.40	29,018	527	5,894	73.1	2.12E+15	6.33E+07
E05	3.40	29,854	527	5,894	73.1	2.12E+15	6.33E+07
E09	3.40	25,139	527	5,894	73.1	2.12E+15	6.33E+07
E34	3.40	28,308	527	5,894	73.1	2.12E+15	6.33E+07
E46	3.40	32,929	527	5,894	73.1	2.12E+15	6.33E+07
E47	3.40	32,817	527	5,894	73.1	2.12E+15	6.33E+07
E57	3.40	25,722	527	5,894	73.1	2.12E+15	6.33E+07
E62	3.40	29,415	527	5,894	73.1	2.12E+15	6.33E+07
H27	3.60	38,507	756	4,144	59.2	3.20E+15	1.66E+08
H28	3.60	39,951	756	4,144	59.2	3.20E+15	1.66E+08
L28	2.11	15,246	269	6,691	82.4	1.04E+15	9.41E+06
L29	2.11	16,214	269	6,691	82.4	1.04E+15	9.41E+06
L35	2.11	13,730	269	6,691	82.4	1.04E+15	9.41E+06
L38	2.11	15,960	269	6,691	82.4	1.04E+15	9.41E+06
L40	2.11	16,968	269	6,691	82.4	1.04E+15	9.41E+06
L41	2.11	15,997	269	6,691	82.4	1.04E+15	9.41E+06
L42	2.11	16,202	269	6,691	82.4	1.04E+15	9.41E+06
L44	2.11	16,868	269	6,691	82.4	1.04E+15	9.41E+06
N17	2.60	23,086	401	6,300	88.8	1.59E+15	3.60E+07
N20	2.60	23,202	401	6,300	88.8	1.59E+15	3.60E+07
N28	2.60	23,535	401	6,300	88.8	1.59E+15	3.60E+07
N45	2.60	23,309	401	6,300	88.8	1.59E+15	3.60E+07
P19	3.10	35,713	582	5,812	94.8	2.29E+15	1.09E+08
P33	3.10	38,490	638	5,812	94.8	2.48E+15	1.52E+08
P40	3.10	38,830	638	5,812	94.8	2.48E+15	1.52E+08
P50	3.10	37,892	638	5,812	94.8	2.48E+15	1.52E+08
P51	3.10	34,526	582	5,812	94.8	2.29E+15	1.09E+08
S09	3.59	36,582	673	3,458	82.7	2.81E+15	1.10E+08
S13	3.59	36,139	673	3,458	82.7	2.81E+15	1.10E+08
S22	3.59	36,487	673	3,458	82.7	2.81E+15	1.10E+08
S43	3.59	35,477	652	3,458	80.6	2.70E+15	1.02E+08
S51	3.59	35,525	652	3,458	80.6	2.70E+15	1.02E+08
Totals:			15,885			5.39E+16	2.26E+09

Decay Heat column includes 33 watts for each F/A's insert.

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 20
PAGE 2 OF 2

Fuel Assembly ID	Insert Component ID	Fuel Assembly Design	F/A And Insert Weight (Pounds)	Insert Component Burnup (MWD/MTU)	Required Cooling Time (Days)	Actual Cooling Time to 7/1/00 (Days)
E01	BP583	W 17x17 Std	1,533	21,925	365	657
E05	BP604	W 17x17 Std	1,533	23,528	365	657
E09	8P54	W 17x17 Std	1,492	0	N/A	N/A
E34	BP597	W 17x17 Std	1,492	18,384	365	657
E46	VR20P31	W 17x17 Std	1,511	16,442	365	6,620
E47	8P58	W 17x17 Std	1,492	0	N/A	N/A
E57	BP532	W 17x17 Std	1,482	19,743	365	818
E62	BP632	W 17x17 Std	1,492	18,448	365	657
H27	BP576	W 17x17 Std	1,533	23,006	365	657
H28	BP515	W 17x17 Std	1,533	24,871	365	818
L28	16P60	W 17x17 Std	1,505	18,038	365	5,353
L29	VG16P23	W 17x17 Std	1,505	15,287	365	6,691
L35	VR20P39	W 17x17 Std	1,511	16,741	365	6,620
L38	VG20P6	W 17x17 Std	1,511	16,962	365	6,691
L40	VG16P45	W 17x17 Std	1,505	15,524	365	6,691
L41	VR20P17	W 17x17 Std	1,511	16,872	365	6,620
L42	VG20P2	W 17x17 Std	1,511	17,351	365	6,691
L44	VR20P18	W 17x17 Std	1,511	16,532	365	6,620
N17	20P70	W 17x17 Std	1,511	17,317	365	5,894
N20	20P68	W 17x17 Std	1,511	15,899	365	5,894
N28	8P55	W 17x17 Std	1,492	0	N/A	N/A
N45	BP380	W 17x17 Std	1,533	23,349	365	1,392
P19	VR20P5	W 17x17 Std	1,511	18,720	365	7,585
P33	20P128	W 17x17 Std	1,511	17,297	365	5,353
P40	20P166	W 17x17 Std	1,511	19,651	365	4,822
P50	BP540	W 17x17 Std	1,533	25,665	365	818
P51	16P91	W 17x17 Std	1,505	20,101	365	5,245
S09	BP004	W 17x17 Std	1,482	18,896	365	3,048
S13	BP581	W 17x17 Std	1,533	22,898	365	657
S22	BP008	W 17x17 Std	1,482	19,156	365	3,048
S43	BP063	W 17x17 Std	1,523	23,588	365	3,048
S51	BP136	W 17x17 Std	1,523	24,316	365	2,489

This is to certify that the North Anna Power Station fuel assemblies and insert components listed for the TN-32 storage cask number 20 do not exceed Technical Specifications and other limits.

Prepared — Date 8-30-2000

Reviewed — Date 8/30/00

Reviewed — Date 8/30/00

Reviewed — Date 8/30/00

Approved — Date 8/30/00

NORTH ANNA ISFSI CASK LOADING MAP, REVISION 0
TN-32, NUMBER 20

Cell No.
F/A ID
Insert ID
Comment

WEST

	1 E01 BP583 Debris, top of rods, Face 3, No EV	2 L28 16P60 Debris, top of Grid 8, Face 3, No EV	3 L29 VG16P23	4 E05 BP604 Debris, top of B/N, Faces 2 and 3, No EV	
5 E62 BP632 Debris, top of rods, Face 2, No EV	6 S43 BP063	7 P40 20P166	8 H27 BP576	9 P19 VR20P5	10 E09 8P54 Debris, top of rods, No EV
11 L44 VR20P18	12 S09 BP004	13 N17 20P70	14 N20 20P68	15 S13 BP581	16 L35 VR20P39
17 L42 VG20P2	18 S22 BP008	19 N28 8P55	20 N45 BP380	21 P33 20P128	22 L38 VG20P6
23 E57 BP532 Debris, top of rods, Faces 1 and 3, No EV	24 P51 16P91	25 H28 BP515	26 P50 BP540	27 S51 BP136	28 E34 BP597 Debris, on top of B/N, Face 4, No EV
	29 E47 8P58	30 L41 VR20P17	31 L40 VG16P45	32 E46 VR20P31	

EAST

Prepared	Date	Loaded	Date
Reviewed	Date	Checked	Date
Reviewed	Date	Checked	Date
Approved	Date		

REFERENCES
Dry Storage Cask: TN-32.20

Initial Enrichment
Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1A, May 1999

Fuel Assembly Burnup
Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1A, May 1999

Burnable Poison Rod Assembly Burnup
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1214, Revision 0, October 1999

Fuel Assembly Decay Heat at 1/01/2000
Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1A, May 1999

Burnable Poison Rod Assembly Decay Heat
Technical Report NE-1162, Revision 1

Days Since Discharge to 7/01/2000 for Fuel Assemblies
Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1A, May 1999

Days Since Discharge to 7/01/2000 for BPRA
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1214, Revision 0, October 1999

Fuel Rod Pressure
Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1A, May 1999
Limit: Calculation PA-0138, Revision 0, July 1997

Gamma and Neutron Emission Rates at 1/01/2000
Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1A, May 1999

Fuel Assembly and Insert Component Weight
Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 1

Dominion

Memorandum

July 23, 2001

To: Mr. Bobby D. Speckine
Department: North Anna Operations Support
Location: North Anna Power Station

From: Mr. T. A. Brookmire
Department: Nuclear Analysis and Fuel
Location: Innsbrook Technical Center 3/SW

TN-32 Cask Number 23
ISFSI Fuel/Insert Certification and Cask Loading Map

Attached are the ISFSI Fuel/Insert Certification, Rev. 0 and the Cask Loading Map, Rev. 0 for TN-32 storage cask number 23. The ISFSI Fuel/Insert Certification certifies that the fuel assemblies and insert components scheduled to be stored in TN-32.23 meet North Anna ISFSI Technical Specification limits and the TN-32 TSAR limit for fuel rod internal pressure.

The following fuel assemblies require special handling considerations due to the conditions described when loaded into this cask. The Cask Loading Map also notes the following conditions.

D33	Debris on top of grid 8; no envelope violation
D22	Debris on top of grid 8; no envelope violation
E26	Grid damage, grid 6, face 3; slight envelope violation

Avoid operations which may cause movement of the debris in assemblies D33 and D22. Interactions with face 3 of assembly E26 which contains a torn grid should be minimized.

All thirty-two assemblies in this cask may be susceptible to thimble tube sleeve bulge joint failures as noted on the attached loading map. These fuel assemblies were inspected for indications ofintergranular stress corrosion cracking on the thimble sleeves and are cleared for one time handling using the normal fuel handling tool for three months from their inspection date. If the fuel assemblies are handled within this three-month period they should be visually inspected again prior to additional handling. After a three-month period from their last inspection, another inspection is required before further handling.

Based on an actual cask weight of approximately 184,450 pounds and a combined fuel and insert component weight of approximately 48,285 pounds, the total weight of TN-32.24 when placed at the ISFSI will be approximately 232,735 pounds.

T. A. Brookmire

Attachments: ISFSI Fuel Certification, Rev. 0, TN-32, No. 23
Cask Loading Map, Rev. 0, TN-32, No. 23

Dominion

Memorandum

Memorandum: T. A. Brookmire to Bobby D. Speckine, July 23, 2001
TN-32.23 Fuel Certification and Loading Map

cc: Mr. G. B. Crisman – North Anna Operations Support
Mr. B. H. Wakeman – IN/3SW
Mr. T. A. Brookmire – IN/3SW
Mr. C. B. LaRoe – IN/3SW
Mr. A. H. Nicholson – IN/3SW
Mr. J. D. Nichols – IN/3SW
Mr. R. T. Robins – IN/3SW
FPA File 5.4.4
Records Management, NP-2884 – IN/GW
North Anna Records (ISFSI)

REVISION 0
TN-32, NUMBER 23
PAGE 1 OF 2

Technical Specifications Limits

Initial Fuel Enrichment	≤ 3.85 wt % U235
Fuel Burnup	≤ 40,000 MWD/MTU
Decay Heat/Fuel Assembly & Insert Component	≤ 847 Watts
Time Since Discharge for Fuel	≥ 2,555 Days
Gamma Source/Cask	≤ 2.31E+17 Photons/Sec
Neutron Source/Cask	≤ 4.83E+09 Neutrons/Sec
Fuel Assembly Design	W 17x17 Std or Vantage 5H
Fuel Assembly and Insert Component Weight	≤ 1,533 Pounds
Time Since Discharge for BPRA	See TS Figure 2-5.1
Time Since Discharge for TPD	See TS Figure 2-5.2

Other Parameters

Fuel Rod Internal Pressure After 2,555 Days	≤ 126.3 Bar

Fuel Assembly ID	Initial Fuel Enrichment (wt % U235)	Fuel Burnup (MWD/MTU)	F/A and Insert Decay Heat On 4/1/01 (Watts)	Days From Fuel Discharge To 4/1/01	Fuel Rod Pressure (Bar)	Gamma Source On 4/1/01 (P/Sec)	Neutron Source On 4/1/01 (N/Sec)
D33	3.21	27,112	408	6,894	72.2	1.62E+15	2.72E+07
D10	3.21	36,417	586	6,168	76.9	2.27E+15	1.10E+08
D22	3.21	36,446	586	6,168	76.9	2.27E+15	1.10E+08
D45	3.21	36,820	586	6,168	76.9	2.27E+15	1.10E+08
D42	3.21	36,301	598	5,627	76.8	2.32E+15	1.14E+08
D44	3.21	28,059	491	3,732	79.1	1.97E+15	4.63E+07
D52	3.21	28,008	491	3,732	79.1	1.97E+15	4.63E+07
E06	3.40	34,800	593	5,627	80.4	2.34E+15	1.01E+08
E12	3.40	34,771	593	5,627	80.4	2.34E+15	1.01E+08
E17	3.40	36,701	593	5,627	80.4	2.34E+15	1.01E+08
E22	3.40	36,688	593	5,627	80.4	2.34E+15	1.01E+08
E24	3.40	34,587	593	5,627	80.4	2.34E+15	1.01E+08
E25	3.40	36,682	593	5,627	80.4	2.34E+15	1.01E+08
E26	3.40	36,605	593	5,627	80.4	2.34E+15	1.01E+08
E29	3.40	36,544	593	5,627	80.4	2.34E+15	1.01E+08
E30	3.40	36,645	593	5,627	80.4	2.34E+15	1.01E+08
E31	3.40	34,533	593	5,627	80.4	2.34E+15	1.01E+08
E33	3.40	36,611	593	5,627	80.4	2.34E+15	1.01E+08
E43	3.40	36,659	593	5,627	80.4	2.34E+15	1.01E+08
E56	3.40	34,115	593	5,627	80.4	2.34E+15	1.01E+08
E59	3.40	36,167	593	5,627	80.4	2.34E+15	1.01E+08
F19	3.59	12,544	212	6,168	66.3	8.46E+14	1.45E+06
G16	3.60	36,423	645	5,096	75.2	2.65E+15	1.11E+08
L45	2.11	16,614	264	6,965	82.4	1.02E+15	9.22E+06
L53	2.11	16,332	264	6,965	82.4	1.02E+15	9.22E+06
P04	3.10	23,570	360	6,574	88.0	1.44E+15	1.67E+07
S07	3.59	28,081	614	5,519	74.3	2.48E+15	9.87E+07
S44	3.59	28,568	614	5,519	74.3	2.48E+15	9.87E+07
S02	3.59	38,767	714	3,322	82.7	2.89E+15	1.45E+08
S41	3.59	38,517	714	3,322	82.7	2.89E+15	1.45E+08
S56	3.59	39,105	714	3,322	82.7	2.89E+15	1.45E+08
S62	3.59	34,004	798	4,418	76.2	3.24E+15	2.15E+08
Totals			17,961			7.130E+16	2.973E+09

Decay Heat column includes 33 watts for each F/A's insert.

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TN-32, NUMBER 23
PAGE 2 OF 2

Fuel Assembly ID	Insert Component ID	Fuel Assembly Design	F/A And Insert Weight (Pounds)	Insert Component Burnup (MWD/MTU)	Required Cooling Time (Days)	Actual Cooling Time to 4/1/01 (Days)
D33	BP715	W 17x17 Std	1,511	24,975	365	385
D10	16P227	W 17x17 Std	1,511	25,569	365	3,732
D22	20P133	W 17x17 Std	1,511	17,003	365	5,627
D45	BP118	W 17x17 Std	1,503	21,040	365	3,009
D44	BP125	W 17x17 Std	1,533	24,404	365	2,763
D42	BP488	W 17x17 Std	1,513	20,947	365	1,421
D52	BP259	W 17x17 Std	1,482	26,332	365	2,199
E06	16P77	W 17x17 Std	1,513	14,754	365	5,627
E12	16P65	W 17x17 Std	1,533	17,593	365	5,627
E17	16P56	W 17x17 Std	1,482	18,009	365	5,627
E22	16P67	W 17x17 Std	1,513	17,838	365	5,627
E24	16P55	W 17x17 Std	1,505	18,010	365	5,627
E25	16P53	W 17x17 Std	1,505	15,737	365	5,627
E26	16P51	W 17x17 Std	1,505	15,641	365	5,627
E29	16P59	W 17x17 Std	1,505	18,116	365	5,627
E30	16P75	W 17x17 Std	1,505	15,957	365	5,627
E31	16P49	W 17x17 Std	1,492	15,695	365	5,627
E33	20P145	W 17x17 Std	1,498	17,218	365	5,627
E43	16P58	W 17x17 Std	1,505	17,728	365	5,627
E56	8P52	W 17x17 Std	1,498	N/A	N/A	N/A
E59	16P63	W 17x17 Std	1,505	17,913	365	5,627
F19	16P120	W 17x17 Std	1,533	22,767	365	4,969
G16	16P111	W 17x17 Std	1,498	21,949	365	4,969
L45	VG16P12	W 17x17 Std	1,511	15,140	365	6,965
L53	VG16P9	W 17x17 Std	1,513	17,411	365	6,965
P04	16P216	W 17x17 Std	1,505	23,731	365	3,876
S07	16P103	W 17x17 Std	1,505	19,240	365	5,519
S44	16P81	W 17x17 Std	1,505	19,169	365	5,519
S02	BP414	W 17x17 Std	1,533	23,628	365	1,666
S41	BP439	W 17x17 Std	1,505	18,949	365	1,666
S56	BP054	W 17x17 Std	1,533	24,134	365	3,322
S62	BP115	W 17x17 Std	1,505	24,179	365	3,009

This is to certify that the North Anna Power Station fuel assemblies and insert components listed for the TN-32 storage cask number 23 do not exceed Technical Specifications and other limits.

Randall T. Breus 7-19-01
Prepared Date

Thomas S. Pinch 7/20/01
Reviewed Date

B.H. Nash 7/20/01
Reviewed Date

James D. Nichols 7/23/01
Reviewed Date

Tom A. Brookmire 7/23/01
Approved Date

TN-32, NUMBER 23

Cell No.
F/A ID
Insert ID
Comments

WEST

	1 ✓ E29 16P59 BJFS	2 ✓ E30 16P75 BJFS	3 ✓ E31 16P49 BJFS	4 ✓ E33 20P145 BJFS	
5 ✓ S44 16P81 BJFS	6 ✓ E26 16P51 Grid Damage, F/3, G/6, EV BJFS	7 ✓ G16 16P111 BJFS	8 ✓ D42 BP488 BJFS	9 ✓ D45 BP118 BJFS	10 ✓ D44 BP125 BJFS
11 ✓ L45 VG16P12 BJFS	12 ✓ E25 16P53 BJFS	13 ✓ S62 BP115 BJFS	14 ✓ S02 BP414 BJFS	15 ✓ E06 16P77 BJFS	16 L53 VG16P9 BJFS
17 ✓ P04 16P216 BJFS	18 ✓ E24 16P55 BJFS	19 ✓ S41 BP439 BJFS	20 ✓ S56 BP054 BJFS	21 ✓ E12 16P65 BJFS	22 ✓ F19 16P120 BJFS
23 ✓ D33 BP715 Debris top G/8, NoEV BJFS	24 ✓ E22 16P67 BJFS	25 ✓ D10 16P227 BJFS	26 ✓ D22 20P133 Debris top G/8, NoEV BJFS	27 ✓ E17 16P56 BJFS	28 ✓ D52 BP259 BJFS
	29 ✓ E43 16P58 BJFS	30 ✓ E56 8P52 BJFS	31 ✓ E59 16P63 BJFS	32 ✓ S07 16P103 BJFS	

EAST

B/N - Bottom Nozzle
EV - Envelope Violation
F/ - Face
G/ - Grid
RC - Rod Clips
BJFS - Bulge Joint Failure Susceptible

Randy T. Robins Prepared	7-19-01 Date	Loaded	Date
B.W. Trahan Reviewed	7/20/01 Date	Checked	Date
Jack D. Nichols Reviewed	7/23/01 Date	Checked	Date
Tom A. Brockmann Approved	7/23/01 Date		

REFERENCES
Dry Storage Cask: TN-32.23

Initial Enrichment

Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1, Addendum A, May 1999
Calculation PA-0154, Revision 1, Addendum B, November 2000
Calculation PA-0154, Revision 1, Addendum C, July 2001

Fuel Assembly Burnup

Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1, Addendum A, May 1999
Calculation PA-0154, Revision 1, Addendum B, November 2000
Calculation PA-0154, Revision 1, Addendum C, July 2001

Burnable Poison Rod Assembly Burnup

Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1275, Revision 0, May 2001

Fuel Assembly Decay Heat at 4/01/2001

Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1, Addendum A, May 1999
Calculation PA-0154, Revision 1, Addendum B, November 2000
Calculation PA-0154, Revision 1, Addendum C, July 2001

Burnable Poison Rod Assembly Decay Heat

Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 1

Days Since Discharge to 4/01/2001 for Fuel Assemblies

Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1, Addendum A, May 1999
Calculation PA-0154, Revision 1, Addendum B, November 2000
Calculation PA-0154, Revision 1, Addendum C, July 2001

Days Since Discharge to 4/01/2001 for BPRA

Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1275, Revision 0, May 2001

Fuel Rod Pressure

Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1, Addendum A, May 1999
Calculation PA-0154, Revision 1, Addendum B, November 2000
Calculation PA-0154, Revision 1, Addendum C, July 2001
Limit: Calculation PA-0138, Revision 0, July 1997

Gamma and Neutron Emission Rates at 4/01/2001

Calculation PA-0154, Revision 1, July 1998
Calculation PA-0154, Revision 1, Addendum A, May 1999
Calculation PA-0154, Revision 1, Addendum B, November 2000
Calculation PA-0154, Revision 1, Addendum C, July 2001

Fuel Assembly and Insert Component Weight

Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 1

Dominion

Memorandum

February 4, 2002

To: Mr. Bobby D. Speckine
Department: North Anna Operations Support
Location: North Anna Power Station

From: Mr. T. A. Brookmire
Department: Nuclear Analysis and Fuel
Location: Innsbrook,Technical Center 3/SW

TN-32 Cask Number 29
ISFSI Fuel/Insert Certification and Cask Loading Map

Attached are the ISFSI Fuel/Insert Certification, Rev. 0 and the Cask Loading Map, Rev. 0 for TN-32 storage cask number 29. The ISFSI Fuel/Insert Certification certifies that the fuel assemblies and insert components scheduled to be stored in TN-32.29 meet North Anna ISFSI Technical Specification limits and the TN-32 TSAR limit for fuel rod internal pressure.

The following fuel assemblies require special handling considerations due to the conditions described when loaded into this cask. The Cask Loading Map also notes the following conditions.

B19	Grid damage, grid 7, face 4, rod 1; no envelope violation
B28	Debris, grid 8, face 3, rods 2 & 3; no envelope violation
B38	Debris, grid 1, face 1, bottom nozzle; no envelope violation
D28	Debris, face 2, top of rods; no envelope violation

Avoid movements of fuel assemblies B28, B38 and D28 may cause this debris to move or become a handling problem. Minimize interaction of face 4 of fuel assembly B19 during movement.

All of fuel assemblies in this cask may be susceptible to thimble tube sleeve bulge joint failures as noted on the attached loading map. These fuel assemblies were inspected for indications of intergranular stress corrosion cracking on the thimble sleeves and are cleared for one time handling using the normal fuel handling tool for three months from their inspection date. If the fuel assemblies are handled within this three-month period they should be visually inspected again prior to additional handling. After a three-month period from their last inspection, another inspection is required before further handling.

Based on an actual cask weight of approximately 184,450 pounds and a combined fuel and insert component weight of approximately 48,297 pounds, the total weight of TN-32.29 when placed at the ISFSI will be approximately 232,747 pounds.

T. A. Brookmire

Dominion

Memorandum

Attachments: ISFSI Fuel Certification, Rev. 0, TN-32, No. 29
Cask Loading Map, Rev. 0, TN-32, No. 29

cc: Mr. G. B. Crisman – North Anna Operations Support
Mr. B. H. Wakeman – IN/3SW
Mr. C. B. LaRoe – IN/3SW
Mr. A. H. Nicholson – IN/3SW
Mr. J. D. Nichols – IN/3SW
Mr. R. T. Robins – IN/3SW
FPA File 5.4.4
Records Management, NP-2884-6 – IN/GW
North Anna Records (ISFSI)

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 29
PAGE 1 OF 2

Technical Specifications Limits

Initial Fuel Enrichment	≤ 3.85 wt % U235
Fuel Burnup	≤ 40,000 MWD/MTU
Decay Heat/Fuel Assembly & Insert Component	≤ 847 Watts
Time Since Discharge for Fuel	≥ 2,555 Days
Gamma Source/Cask	≤ 2.31E+17 Photons/Sec
Neutron Source/Cask	≤ 4.83E+09 Neutrons/Sec
Fuel Assembly Design	W 17x17 Std or Vantage 5H
Fuel Assembly and Insert Component Weight	≤ 1,533 Pounds
Time Since Discharge for BPRA	See TS Figure 2-5.1
Time Since Discharge for TPD	See TS Figure 2-5.2

Other Parameters

Fuel Rod Internal Pressure After 2,555 Days	≤ 126.3 Bar

Fuel Assembly ID	Initial Fuel Enrichment (wt % U235)	Fuel Burnup (MWD/MTU)	F/A and Insert Decay Heat On 01/01/02 (Watts)	Days From Fuel Discharge to 01/01/02	Fuel Rod Pressure (Bar)	Gamma Source On 01/01/02 (P/Sec)	Neutron Source On 01/01/02 (N/Sec)
B01	2.60	28,628	428	7,674	101.2	1.60E+15	5.50E+07
B02	2.60	26,960	428	7,674	101.2	1.60E+15	5.50E+07
B03	2.60	27,194	428	7,674	101.2	1.60E+15	5.50E+07
B04	2.60	28,662	428	7,674	101.2	1.60E+15	5.50E+07
B05	2.60	28,428	428	7,674	101.2	1.60E+15	5.50E+07
B06	2.60	29,067	428	7,674	101.2	1.60E+15	5.50E+07
B07	2.60	26,852	428	7,674	101.2	1.60E+15	5.50E+07
B08	2.60	28,145	428	7,674	101.2	1.60E+15	5.50E+07
B09	2.60	29,077	428	7,674	101.2	1.60E+15	5.50E+07
B10	2.60	28,371	428	7,674	101.2	1.60E+15	5.50E+07
B11	2.60	28,340	428	7,674	101.2	1.60E+15	5.50E+07
B14	2.60	29,016	428	7,674	101.2	1.60E+15	5.50E+07
B15	2.60	27,012	428	7,674	101.2	1.60E+15	5.50E+07
B16	2.60	28,678	428	7,674	101.2	1.60E+15	5.50E+07
B17	2.60	27,034	428	7,674	101.2	1.60E+15	5.50E+07
B19	2.60	26,715	428	7,674	101.2	1.60E+15	5.50E+07
B20	2.60	26,774	428	7,674	101.2	1.60E+15	5.50E+07
B21	2.60	28,924	428	7,674	101.2	1.60E+15	5.50E+07
B22	2.60	28,767	428	7,674	101.2	1.60E+15	5.50E+07
B23	2.60	28,833	428	7,674	101.2	1.60E+15	5.50E+07
B25	2.60	26,947	428	7,674	101.2	1.60E+15	5.50E+07
B26	2.60	28,147	428	7,674	101.2	1.60E+15	5.50E+07
B27	2.60	28,172	428	7,674	101.2	1.60E+15	5.50E+07
B28	2.60	27,060	428	7,674	101.2	1.60E+15	5.50E+07
B29	2.60	26,923	428	7,674	101.2	1.60E+15	5.50E+07
B34	2.60	28,783	428	7,674	101.2	1.60E+15	5.50E+07
B37	2.60	27,168	428	7,674	101.2	1.60E+15	5.50E+07
B38	2.60	27,308	428	7,674	101.2	1.60E+15	5.50E+07
B44	2.60	27,870	428	7,674	101.2	1.60E+15	5.50E+07
D03	3.21	25,392	403	7,169	72.2	1.58E+15	2.65E+07
D27	3.21	25,424	403	7,169	72.2	1.58E+15	2.65E+07
D28	3.21	22,735	403	7,169	72.2	1.58E+15	2.65E+07
Totals			422			1.6E+15	1.6E+10

Decay Heat column includes 33 watts for each fuel assembly insert.

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 29
PAGE 2 OF 2

Fuel Assembly ID	Insert Component ID	Fuel Assembly Design	F/A and Insert Component Weight (Lbs.)	Insert Component Burnup (MWD/MTU)	Required Cooling Time (Days)	Actual Cooling Time to 01/01/02 (Days)
B01	VG16P18	17x17 Std	1,505	17,035	365	7,240
B02	20P90	17x17 Std	1,511	18,490	365	6,361
B03	VG16P40	17x17 Std	1,505	17,017	365	7,240
B04	VR20P44	17x17 Std	1,511	16,497	365	7,169
B05	20P113	17x17 Std	1,511	18,222	365	6,361
B06	VR16P2	17x17 Std	1,505	19,052	365	8,134
B07	16P52	17x17 Std	1,505	16,199	365	5,902
B08	VG16P24	17x17 Std	1,505	14,182	365	7,240
B09	BP460	17x17 Std	1,523	20,859	365	1,696
B10	VG16P22	17x17 Std	1,505	17,097	365	7,240
B11	BP725	17x17 Std	1,533	25,743	365	660
B14	VG16P15	17x17 Std	1,505	17,098	365	7,240
B15	VR20P10	17x17 Std	1,511	15,924	365	7,169
B16	VR20P27	17x17 Std	1,511	16,485	365	7,169
B17	BP002	17x17 Std	1,482	19,160	365	3,597
B19	BP753	17x17 Std	1,533	24,757	365	660
B20	VG20P8	17x17 Std	1,511	16,757	365	7,240
B21	BP108	17x17 Std	1,523	25,818	365	3,284
B22	BP650	17x17 Std	1,533	25,805	365	842
B23	1BP01	17x17 Std	1,511	19,545	365	5,794
B25	VG16P38	17x17 Std	1,505	14,183	365	7,240
B26	VG16P17	17x17 Std	1,505	16,896	365	7,240
B27	20P155	17x17 Std	1,511	19,989	365	5,794
B28	16P73	17x17 Std	1,505	16,226	365	5,902
B29	VR20P38	17x17 Std	1,511	15,868	365	7,169
B34	BP736	17x17 Std	1,482	20,427	365	660
B37	BP091	17x17 Std	1,513	25,149	365	3,284
B38	VG16P31	17x17 Std	1,505	14,035	365	7,240
B44	VG16P7	17x17 Std	1,505	16,876	365	7,240
D03	16P54	17x17 Std	1,505	14,752	365	5,902
D27	20P137	17x17 Std	1,511	17,349	365	5,902
D28	20P136	17x17 Std	1,511	17,441	365	5,902

This is to certify that the North Anna Power Station fuel assemblies and insert components listed for the TN-32 storage cask number 29 do not exceed Technical Specifications and other limits

BZ Brake 01/31/02
Prepared Date

W. D. McPeek 1/31/02
Reviewed Date

Randy T. Robuck 1-31-02
Reviewed Date

[signature] 1/31/02
Reviewed Date

Tom A Brookmire 2-1-02
Approved Date

NORTH ANNA ISFSI CASK LOADING MAP, REVISION 0
TN-32, NUMBER 29

Cell No.
F/A ID
Insert ID
Comment

WEST

	1 B01 VG16P18 BJFS	2 B02 20P90 BJFS	3 B03 VG16P40 BJFS	4 B04 VR20P44 BJFS	
5 B05 20P113 BJFS	6 B06 VR16P2 BJFS	7 B07 16P52 BJFS	8 B08 VG16P24 BJFS	9 B09 BP460 BJFS	10 B10 VG16P22 BJFS
11 B11 BP725 BJFS	12 B14 VG16P15 BJFS	13 B15 VR20P10 BJFS	14 B16 VR20P27 BJFS	15 B17 BP002 BJFS	16 B19 BP753 Grid Damage/No EV BJFS
17 B20 VG20P8 BJFS	18 B21 BP108 BJFS	19 B22 BP650 BJFS	20 B23 1BP01 BJFS	21 B25 VG16P38 BJFS	22 B26 VG16P17 BJFS
23 B27 20P155 BJFS	24 B28 16P73 Debris/No EV BJFS	25 B29 VR20P38 BJFS	26 B34 BP736 BJFS	27 B37 BP091 BJFS	28 B38 VG16P31 Debris/No EV BJFS
	29 B44 VG16P7 BJFS	30 D03 16P54 BJFS	31 D27 20P137 BJFS	32 D28 20P136 Debris/No EV BJFS	EV - Envelope Violation BJFS - Bulge Joint Failure Susceptible

EAST

BJ Mah — Prepared — 01/31/02 — Date — _____ — Loaded — _____ — Date

Randy J. Robins — Reviewed — JDM 1/31/02 — 1-31-02 — Date — _____ — Checked — _____ — Date

Tony A Brockman — Approved — 2-1-02 — Date

REFERENCES
NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
TN-32, NUMBER 29

Fuel Assembly Initial Enrichment

Calculation PA-0154, Revision 1A, May 1999
Calculation PA-0154, Revision 1D, January 2002

Fuel Assembly Burnup

Calculation PA-0154, Revision 1A, May 1999
Calculation PA-0154, Revision 1D, January 2002

Burnable Poison Rod Assembly Burnup

Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1275, Revision 0, May 2001

Fuel Assembly Decay Heat at 01/01/02

Calculation PA-0154, Revision 1A, May 1999
Calculation PA-0154, Revision 1D, January 2002

Burnable Poison Rod Assembly Decay Heat

Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 1

Fuel Assembly Days Since Discharge to 01/01/02

Calculation PA-0154, Revision 1A, May 1999
Calculation PA-0154, Revision 1D, January 2002

Burnable Poison Rod Assembly Days Since Discharge to 01/01/02

Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1275, Revision 0, May 2001

Fuel Rod Pressure

Calculation PA-0154, Revision 1A, May 1999
Calculation PA-0154, Revision 1D, January 2002
Limit: Calculation PA-0138, Revision 0, July 1997

Gamma and Neutron Emission Rates at 01/01/02

Calculation PA-0154, Revision 1A, May 1999
Calculation PA-0154, Revision 1D, January 2002

Fuel Assembly and Insert Component Weight

Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 1

Dominion

Memorandum

July 17, 2003

To: Mr. Bobby D. Speckine
Department: North Anna Operations Support
Location: North Anna Power Station

From: Ms. J. S. Butler
Department: Nuclear Analysis and Fuel
Location: Innsbrook Technical Center 3/SW

TN-32 Cask Number 36
ISFSI Fuel/Insert Certification and Cask Loading Map

Attached are the ISFSI Fuel/Insert Certification, Rev. 0 and the Cask Loading Map, Rev. 0 for TN-32 storage cask number 36. The ISFSI Fuel/Insert Certification certifies that the fuel assemblies and insert components scheduled to be stored in TN-32.36 meet North Anna ISFSI Technical Specification limits and the TN-32 TSAR limit for fuel rod internal pressure.

The following fuel assemblies require special handling considerations due to the conditions described when loaded into this cask. The Cask Loading Map also notes the following conditions.

J04 Debris, top of bottom nozzle, face 4; no envelope violation
J12 Debris, top of bottom nozzle; no envelope violation

Avoid movements of fuel assembly J12 that may cause this debris to move or become a handling problem. Minimize interaction of face 4 of fuel assembly J04 during movement. All other fuel assemblies to be loaded into storage cask TN-32.36 have been inspected and verified to possess no conditions which will limit the loading of these assemblies into the cask. Additionally, none of the fuel assemblies to be stored in this cask are susceptible to thimble tube sleeve bulge failures.

Based on an actual cask weight of approximately 184,800 pounds and a combined fuel and insert component weight of approximately 48,636 pounds, the total weight of TN-32.36 when placed at the ISFSI will be approximately 233,436 pounds.

Based on a memorandum from Mr. C. A. Ford to Mr. T. A. Brookmire dated November 16, 2001 entitled "ESCORP02 Error in Calculated Fuel Rod Pressures – Preliminary Evaluation," an administrative fuel rod pressure limit of 771 psia was imposed on fuel assemblies identified on ISFSI Fuel Certification, Rev 0, TN-32.36.

If you have any questions, please contact me.

Jennifer S. Butler

Jennifer S. Butler

Attachments: ISFSI Fuel Certification, Rev. 0, TN-32, No. 36

Dominion

Memorandum

cc: Mr. K. L. Basehore – IN/3SW
Mr. T. A. Brookmire – IN/3SW
Mr. B. H. Wakeman – IN/3SW
Mr. R. T. Robins – IN/3SW
Mr. A. H. Nicholson – IN/3SW
Mr. J. D. Nichols – IN/3SW

FPA File 5.4.4
Records Management, NP-2884-6 – IN/GW
North Anna Records (ISFSI)

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 36
PAGE 1 OF 4

Technical Specifications Limits

Initial Fuel Enrichment	≤ 4.30 wt % U235
Fuel Burnup	≤ 45,000 MWD/MTU
Decay Heat/Fuel Assembly & Insert Component	≤ 1020 Watts
Time Since Discharge for Fuel	See TS Figure 2.1-1
Fuel Assembly Design	W 17x17 Std or Vantage 5H
Fuel Assembly and Insert Component Weight	≤ 1,533 Pounds
Time Since Discharge for BPRA	See TS Figure 2.1-2
Time Since Discharge for TPD	See TS Figure 2.1-3
Fuel Assembly Initial Uranium Content	≤ 467.1 kgU/assembly

Other Parameters

Fuel Rod Internal Pressure	≤ 857psia @ 298 K
Gamma Source/Cask	≤ 1.699E+17 Photons/Sec
Neutron Source/Cask	≤ 1.049E+10 Neutrons/Sec

Fuel Assembly ID	Initial Fuel Enrichment (wt % U235)	Fuel Burnup (MWD/MTU)	F/A and Insert Decay Heat On 7/01/03 (Watts)	Days From Fuel Discharge To 7/01/03	Fuel Rod Pressure (psia)	Gamma Source On 7/01/03 (P/Sec)	Neutron Source On 7/01/03 (N/Sec)
J01	3.79	44,392	914	3,020	426.3	3.81E+15	2.56E+08
J04	3.79	44,796	914	3,020	426.3	3.81E+15	2.56E+08
J10	3.79	44,763	914	3,020	426.3	3.81E+15	2.56E+08
J12	3.79	43,948	914	3,020	426.3	3.81E+15	2.56E+08
J36	3.79	43,706	914	3,020	426.3	3.81E+15	2.56E+08
K66	3.80	41,028	856	3,020	417.6	3.69E+15	1.98E+08
K70	3.80	42,103	856	3,020	417.6	3.69E+15	1.98E+08
K71	3.80	41,933	856	3,020	417.6	3.69E+15	1.98E+08
K76	3.80	41,734	856	3,020	417.6	3.69E+15	1.98E+08
0A3	4.00	44,551	964	2,697	444.7	4.29E+15	2.36E+08
0A6	4.00	44,600	964	2,697	444.7	4.29E+15	2.36E+08
1A1	4.00	44,448	964	2,697	444.7	4.29E+15	2.36E+08
1A2	4.00	44,501	964	2,697	444.7	4.29E+15	2.36E+08
1A3	4.00	44,216	964	2,697	444.7	4.29E+15	2.36E+08
1A6	4.00	43,618	964	2,697	444.7	4.29E+15	2.36E+08
1A8	4.00	43,721	964	2,697	444.7	4.29E+15	2.36E+08
2A7	4.00	44,510	964	2,697	444.7	4.29E+15	2.36E+08
X01	3.80	44,565	855	4,143	409.0	3.55E+15	2.35E+08
W01	3.80	44,293	862	3,020	448.0	3.54E+15	2.31E+08
W06	3.80	44,053	862	3,020	448.0	3.54E+15	2.31E+08
W07	3.80	44,183	862	3,020	448.0	3.54E+15	2.31E+08
W15	3.80	42,844	862	3,020	448.0	3.54E+15	2.31E+08
W25	3.80	43,686	862	3,020	448.0	3.54E+15	2.31E+08
W26	3.80	43,621	862	3,020	448.0	3.54E+15	2.31E+08
W27	3.80	43,149	862	3,020	448.0	3.54E+15	2.31E+08
Y38	4.21	44,686	895	3,584	404.2	3.89E+15	2.02E+08
Y44	4.21	37,214	730	3,584	387.4	3.24E+15	9.62E+07
Y50	4.21	43,954	895	3,584	404.2	3.89E+15	2.02E+08
Y59	4.21	44,015	895	3,584	404.2	3.89E+15	2.02E+08
Y60	4.21	37,345	730	3,584	387.4	3.24E+15	9.62E+07
Y61	4.21	44,270	895	3,584	404.2	3.89E+15	2.02E+08
Y63	4.21	43,903	895	3,584	404.2	3.89E+15	2.02E+08
Totals			28,530			1.224E+17	7.01E+09

Decay Heat column includes 33 watts for each F/A's insert.

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 36
PAGE 2 OF 4

Fuel Assembly ID	Insert Component ID	Fuel Assembly Design	F/A and Insert Weight (Pounds)	Insert Component Burnup (MWD/MTU)	Required Cooling Time (Days)	Actual Cooling Time to 07/01/03 (Days)
J01	20P45	W 17X17 Std	1,511	15,614	365	6,989
J04	BP357	W 17X17 Std	1,523	23,640	365	2,697
J10	BP334	W 17X17 Std	1,482	19,080	365	2,697
J12	BP309	W 17X17 Std	1,533	24,166	365	2,697
J36	BP429	W 17X17 Std	1,533	23,321	365	2,487
K66	BP281	W 17X17 Std	1,523	23,764	365	3,020
K70	BP254	W 17X17 Std	1,533	25,646	365	3,020
K71	BP264	W 17X17 Std	1,533	24,846	365	3,020
K76	BP282	W 17X17 Std	1,523	23,142	365	3,020
0A3	BP348	W 17X17 V5H	1,531	24,744	365	2,697
0A6	BP546	W 17X17 V5H	1,521	23,616	365	1,913
1A1	BP390	W 17X17 V5H	1,531	23,060	365	2,487
1A2	BP391	W 17X17 V5H	1,531	23,106	365	2,487
1A3	BP339	W 17X17 V5H	1,480	19,157	365	2,697
1A6	BP413	W 17X17 V5H	1,531	24,217	365	2,487
1A8	BP415	W 17X17 V5H	1,531	24,207	365	2,487
2A7	BP341	W 17X17 V5H	1,531	25,201	365	2,697
X01	BP138	W 17X17 Std	1,523	24,695	365	3,584
W01	BP303	W 17X17 Std	1,492	20,686	365	3,020
W06	BP293	W 17X17 Std	1,533	24,990	365	3,020
W07	BP299	W 17X17 Std	1,492	20,856	365	3,020
W15	BP274	W 17X17 Std	1,533	24,896	365	3,020
W25	BP302	W 17X17 Std	1,492	21,441	365	3,020
W26	BP263	W 17X17 Std	1,533	24,853	365	3,020
W27	BP284	W 17X17 Std	1,523	23,324	365	3,020
Y38	BP132	W 17X17 V5H	1,521	24,624	365	1,521
Y44	BP061	W 17X17 V5H	1,521	23,152	365	1,521
Y50	BP150	W 17X17 V5H	1,531	25,504	365	1,531
Y59	BP405	W 17X17 V5H	1,480	18,471	365	1,480
Y60	BP384	W 17X17 V5H	1,531	23,174	365	1,531
Y61	BP416	W 17X17 V5H	1,531	24,098	365	1,531
Y63	BP131	W 17X17 V5H	1,521	23,529	365	1,521

This is to certify that the North Anna Power Station fuel assemblies and insert components listed for the TN-32 storage cask number 36 do not exceed Technical Specifications and other limits

Jennifer S. Butler 7/16/03
Prepared Date

D. D. McPhee 7/16/03
Reviewed Date

Randy J Robins 7-16-03
Reviewed Date

[signature] 7/17/03
Reviewed Date

Tom A Brockman 7-17-03
Approved Date

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
CASK LOADING MAP, REVISION 0
TN-32, NUMBER 36
PAGE 3 OF 4

Cell No.
F/A ID
Insert ID
Comment

WEST

	1 X01 BP138	2 Y60 BP384	3 Y44 BP061	4 K76 BP282	
5 W15 BP274	6 J10 BP334	7 Y38 BP132	8 Y50 BP150	9 J36 BP429	10 K71 BP264
11 W25 BP302	12 1A8 BP415	13 1A6 BP413	14 1A3 BP339	15 1A2 BP391	16 K70 BP254
17 W26 BP263	18 1A1 BP390	19 0A6 BP546	20 0A3 BP348	21 2A7 BP341	22 K66 BP281
23 W27 BP284	24 J01 20P45	25 Y61 BP416	26 Y59 BP405	27 Y63 BP131	28 J12 BP309 Debris B/N NO EV
	29 W06 BP293	30 W01 BP303	31 W07 BP299	32 J04 BP357 Debris B/N Face 4/NO EV	

EAST

B/N - Bottom Nozzle
F/ - Face
G/ - Grid
EV - Envelope Violation
RC - Rod Clips
BJFS - Bulge Joint Failure Susceptible

Prepared	7-17-03 Date	Loaded	Date
Reviewed	7/17/03 Date	Checked	Date
Reviewed	7/17/03 Date	Checked	Date
Approved	7-17-03 Date		

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 36
PAGE 4 OF 4

References

Fuel Assembly Initial Enrichment
Calculation PA-0203, Revision 0, March 2003

Fuel Assembly Burnup
Calculation PA-0203, Revision 0, March 2003

Burnable Poison Rod Assembly Burnup
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1275, Revision 0, May 2001

Fuel Assembly Decay Heat at 07/01/03
Calculation PA-0203, Revision 0, March 2003

Burnable Poison Rod Assembly Decay Heat
Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 2

Fuel Assembly Days Since Discharge to 07/01/03
Calculation PA-0203, Revision 0, March 2003

Burnable Poison Rod Assembly Days Since Discharge to 07/01/03
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1275, Revision 0, May 2001

Fuel Rod Pressure
Calculation PA-0203, Revision 0, March 2003
Calculation PA-0203, Revision 0, Addenum A, July 2003
Criteria: Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 2

Gamma and Neutron Emission Rates at 07/01/03
Calculation PA-0203, Revision 0, March 2003

Fuel Assembly and Insert Component Weight
Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 2

Dominion

Memorandum

August 12, 2003

To: Mr. Bobby D. Speckine
Department: North Anna Operations Support
Location: North Anna Power Station

From: Ms. Jennifer S. Butler
Department: Nuclear Analysis and Fuel
Location: Innsbrook Technical Center 3/SW

TN-32 Cask Number 37
ISFSI Fuel/Insert Certification and Cask Loading Map

Attached are the ISFSI Fuel/Insert Certification, Rev. 0 and the Cask Loading Map, Rev. 0 for TN-32 storage cask number 37. The ISFSI Fuel/Insert Certification certifies that the fuel assemblies and insert components scheduled to be stored in TN-32.37 meet North Anna ISFSI Technical Specification limits and the TN-32 TSAR limit for fuel rod internal pressure.

The following fuel assemblies require special handling considerations due to the conditions described when loaded into this cask. The Cask Loading Map also notes the following conditions:

K19 Debris, sticking through bottom nozzle

Avoid movements of fuel assembly K19 that may cause this debris to move or become a handling problem. All other fuel assemblies to be loaded into storage cask TN-32.37 have been inspected and verified to possess no conditions which will limit the loading of these assemblies into the cask. Additionally, none of the fuel assemblies to be stored in this cask are susceptible to thimble tube sleeve bulge joint failures.

Assemblies K06, K56, K58, K59, K60, and K64 have rod clips attached.

Based on an actual cask weight of approximately 184,400 pounds and a combined fuel and insert component weight of approximately 48,616 pounds, the total weight of TN-32.37 when placed at the ISFSI will be approximately 233,016 pounds.

Based on a memorandum from Mr. C. A. Ford to Mr. T. A. Brookmire dated November 16, 2001 entitled "ESCORP02 Error in Calculated Fuel Rod Pressures – Preliminary Evaluation," an administrative fuel rod pressure limit of 771 psia was imposed on fuel assemblies identified on ISFSI Fuel Certification, Rev 0, TN-32.37.

If you have any questions, please contact me.

Jennifer S. Butler

Jennifer S. Butler

Attachments: ISFSI Fuel Certification, Rev. 0, TN-32, No. 37

cc: Mr. T. A. Brookmire – IN/3SW
Mr. B. H. Wakeman – IN/3SW
Mr. R. T. Robins – IN/3SW
Mr. A. H. Nicholson – IN/3SW
Mr. J. D. Nichols – IN/3SW
FPA File 5.4.4 – IN/3SW
Records Management, NP-2884-6 – IN/GW

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 37
PAGE 1 OF 4

Technical Specifications Limits

Initial Fuel Enrichment	≤ 4.30 wt % U235
Fuel Burnup	≤ 45,000 MWD/MTU
Decay Heat/Fuel Assembly & Insert Component	≤ 1020 Watts
Time Since Discharge for Fuel	See TS Figure 2.1-1
Fuel Assembly Design	W 17x17 Std or Vantage 5H
Fuel Assembly and Insert Component Weight	≤ 1,533 Pounds
Time Since Discharge for BPRA	See TS Figure 2.1-2
Time Since Discharge for TPD	See TS Figure 2.1-3
Fuel Assembly Initial Uranium Content	≤ 467.1 kgU/assembly

Other Parameters

Fuel Rod Internal Pressure	≤ 857psia @ 298 K
Gamma Source/Cask	≤ 1.699E+17 Photons/Sec
Neutron Source/Cask	≤ 1.049E+10 Neutrons/Sec

Fuel Assembly ID	Initial Fuel Enrichment (wt % U235)	Fuel Burnup (MWD/MTU)	F/A and Insert Decay Heat On 7/01/03 (Watts)	Days From Fuel Discharge To 7/01/03	Fuel Rod Pressure (psia)	Gamma Source On 7/01/03 (P/Sec)	Neutron Source On 7/01/03 (N/Sec)
K01	3.80	42,629	825	3,584	444.6	3.47E+15	1.98E+08
K03	3.80	42,512	825	3,584	444.6	3.47E+15	1.98E+08
K04	3.80	42,018	825	3,584	444.6	3.47E+15	1.98E+08
K06	3.80	42,023	825	3,584	444.6	3.47E+15	1.98E+08
K07	3.80	41,828	825	3,584	444.6	3.47E+15	1.98E+08
K09	3.80	42,076	825	3,584	444.6	3.47E+15	1.98E+08
K10	3.80	41,829	825	3,584	444.6	3.47E+15	1.98E+08
K12	3.80	41,856	825	3,584	444.6	3.47E+15	1.98E+08
K13	3.80	43,223	870	3,217	455.1	3.70E+15	2.20E+08
K16	3.80	42,109	870	3,217	455.1	3.70E+15	2.20E+08
K19	3.80	42,703	870	3,217	455.1	3.70E+15	2.20E+08
K22	3.80	42,927	870	3,217	455.1	3.70E+15	2.20E+08
K25	3.80	43,432	870	3,217	455.1	3.70E+15	2.20E+08
K31	3.80	43,270	870	3,217	455.1	3.70E+15	2.20E+08
K33	3.80	42,607	870	3,217	455.1	3.70E+15	2.20E+08
K35	3.80	42,761	870	3,217	455.1	3.70E+15	2.20E+08
K56	4.00	43,753	950	2,697	416.3	4.13E+15	2.37E+08
K58	4.00	44,563	950	2,697	416.3	4.13E+15	2.37E+08
K59	4.00	44,490	950	2,697	416.3	4.13E+15	2.37E+08
K60	4.00	44,004	950	2,697	416.3	4.13E+15	2.37E+08
K64	4.00	44,870	950	2,697	416.3	4.13E+15	2.37E+08
3A5	4.20	44,635	948	3,217	464.2	4.22E+15	2.15E+08
3A8	4.20	44,736	948	3,217	464.2	4.22E+15	2.15E+08
4A7	4.20	44,930	948	3,217	464.2	4.22E+15	2.15E+08
1L1	4.02	44,233	967	3,020	414.2	4.38E+15	2.24E+08
1L5	4.02	41,307	967	3,020	414.2	4.38E+15	2.24E+08
2L2	4.02	42,029	967	3,020	414.2	4.38E+15	2.24E+08
2L6	4.02	44,034	967	3,020	414.2	4.38E+15	2.24E+08
3L1	4.02	43,816	967	3,020	414.2	4.38E+15	2.24E+08
3L5	4.02	43,154	967	3,020	414.2	4.38E+15	2.24E+08
3L6	4.02	41,066	967	3,020	414.2	4.38E+15	2.24E+08
3L9	4.02	40,693	967	3,020	414.2	4.38E+15	2.24E+08
Totals			28,890			1.26E+17	7.69E+09

Decay Heat column includes 33 watts for each F/A's insert.

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
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Fuel Assembly ID	Insert Component ID	Fuel Assembly Design	F/A and Insert Weight (Pounds)	Insert Component Burnup (MWD/MTU)	Required Cooling Time (Days)	Actual Cooling Time to 07/01/03 (Days)
K01	BP606	W 17X17 Std	1,533	23,913	365	1,752
K03	BP505	W 17X17 Std	1,492	17,664	365	2,242
K04	BP151	W 17X17 Std	1,533	24,664	365	3,584
K06	BP469	W 17X17 Std	1,482	17,008	365	2,242
K07	BP875	W 17X17 Std	1,523	24,162	365	660
K09	BP139	W 17X17 Std	1,523	24,586	365	3,584
K10	BP370	W 17X17 Std	1,492	20,313	365	2,697
K12	BP448	W 17X17 Std	1,533	21,255	365	2,242
K13	BP773	W 17X17 Std	1,533	25,811	365	842
K16	BP288	W 17X17 Std	1,523	23,030	365	3,020
K19	BP081	W 17X17 Std	1,513	25,784	365	3,830
K22	BP262	W 17X17 Std	1,533	24,637	365	3,020
K25	BP234	W 17X17 Std	1,523	26,015	365	3,217
K31	BP267	W 17X17 Std	1,533	24,996	365	3,020
K33	BP218	W 17X17 Std	1,523	25,039	365	3,217
K35	BP222	W 17X17 Std	1,523	26,786	365	3,217
K56	16P108	W 17X17 Std	1,505	21,484	365	2,137
K58	BP455	W 17X17 Std	1,533	21,146	365	2,242
K59	16P78	W 17X17 Std	1,505	14,843	365	6,448
K60	20P64	W 17X17 Std	1,511	15,892	365	6,989
K64	20P142	W 17X17 Std	1,511	18,911	365	6,340
3A5	BP816	W 17X17 V5H	1,531	25,589	365	842
3A8	BP417	W 17X17 V5H	1,521	22,276	365	2,487
4A7	BP465	W 17X17 V5H	1,531	21,361	365	2,242
1L1	BP453	W 17X17 V5H	1,531	21,145	365	2,242
1L5	BP430	W 17X17 V5H	1,531	23,343	365	2,487
2L2	BP480	W 17X17 V5H	1,531	21,954	365	2,242
2L6	BP350	W 17X17 V5H	1,521	23,304	365	2,697
3L1	BP564	W 17X17 V5H	1,490	20,049	365	1,913
3L5	BP321	W 17X17 V5H	1,521	23,635	365	2,697
3L6	BP070	W 17X17 V5H	1,511	27,730	365	3,830
3L9	BP418	W 17X17 V5H	1,521	22,461	365	2,487

This is to certify that the North Anna Power Station fuel assemblies and insert components listed for the TN-32 storage cask number 37 do not exceed Technical Specifications and other limits

Jennifer S Butler 8/4/03
Prepared Date

[signature] 8/5/03
Reviewed Date

[signature] 8/7/03
Reviewed Date

[signature] 8-7-03
Reviewed Date

[signature] 8/12/03
Approved Date

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
CASK LOADING MAP, REVISION 0
TN-32, NUMBER 37
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Cell No.
F/A ID
Insert ID
Comment

WEST

	1 K01 BP606	2 K03 BP505	3 K04 BP151	4 K06 BP469 RC	
5 K25 BP234	6 K31 BP267	7 2L6 BP350	8 3L1 BP564	9 K33 BP218	10 K07 BP875
11 K22 BP262	12 2L2 BP480	13 K64 20P142 RC	14 K60 20P64 RC	15 3L5 BP321	16 K09 BP139
17 K19 BP081 Debris B/N	18 1L5 BP430	19 K58 BP455 RC	20 K59 16P78 RC	21 3L6 BP070	22 K10 BP370
23 K16 BP288	24 1L1 BP453	25 K56 16P108 RC	26 3L9 BP418	27 K35 BP222	28 K12 BP448
	29 K13 BP773	30 4A7 BP465	31 3A8 BP417	32 3A5 BP816	

EAST

B/N - Bottom Nozzle
F/ - Face
G/ - Grid
EV - Envelope Violation
RC - Rod Clips
BJFS - Bulge Joint Failure Susceptible

Jennifer S Butler Prepared	8/8/03 Date	Loaded	Date
David J Bovis Reviewed	8-8-03 Date	Checked	Date
Doug Nichols Reviewed	8/8/03 Date	Checked	Date
Tom Brookman Approved	8/12/03 Date		

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
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References

Fuel Assembly Initial Enrichment
Calculation PA-0203, Revision 0, March 2003

Fuel Assembly Burnup
Calculation PA-0203, Revision 0, March 2003

Burnable Poison Rod Assembly Burnup
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1313, Revision 0, February 2002

Fuel Assembly Decay Heat at 07/01/03
Calculation PA-0203, Revision 0, March 2003

Burnable Poison Rod Assembly Decay Heat
Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 2

Fuel Assembly Days Since Discharge to 07/01/03
Calculation PA-0203, Revision 0, March 2003

Burnable Poison Rod Assembly Days Since Discharge to 07/01/03
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1313, Revision 0, February 2002

Fuel Rod Pressure
Calculation PA-0203, Revision 0, March 2003
Criteria: Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 2

Gamma and Neutron Emission Rates at 07/01/03
Calculation PA-0203, Revision 0, March 2003

Fuel Assembly and Insert Component Weight
Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 2

Dominion

Memorandum

September 4, 2003

To: Mr. Bobby D. Speckine
Department: North Anna Operations Support
Location: North Anna Power Station

From: Ms. Jennifer S. Butler
Department: Nuclear Analysis and Fuel
Location: Innsbrook Technical Center 3/SW

TN-32 Cask Number 38
ISFSI Fuel/Insert Certification and Cask Loading Map

Attached are the ISFSI Fuel/Insert Certification, Rev. 0 and the Cask Loading Map, Rev. 0 for TN-32 storage cask number 38. The ISFSI Fuel/Insert Certification certifies that the fuel assemblies and insert components scheduled to be stored in TN-32.38 meet North Anna ISFSI Technical Specification limits and the TN-32 TSAR limit for fuel rod internal pressure.

The fuel assemblies to be loaded into storage cask TN-32.38 have been inspected and verified to possess no conditions which will limit the loading of these assemblies into the cask. Additionally, none of the fuel assemblies to be stored in this cask are susceptible to thimble tube sleeve bulge failures.

Based on an actual cask weight of approximately 184,550 pounds and a combined fuel and insert component weight of approximately 48,490 pounds, the total weight of TN-32.38 when placed at the ISFSI will be approximately 233,040 pounds.

Based on a memorandum from Mr. C. A. Ford to Mr. T. A. Brookmire dated November 16, 2001 entitled "ESCORP02 Error in Calculated Fuel Rod Pressures – Preliminary Evaluation," an administrative fuel rod pressure limit of 771 psia was imposed on fuel assemblies identified on ISFSI Fuel Certification, Rev 0, TN-32.38.

If you have any questions, please contact me.

Jennifer S. Butler

Jennifer S. Butler

Attachments: ISFSI Fuel Certification, Rev. 0, TN-32, No. 38

cc: Mr. T. A. Brookmire – IN/3SW
Mr. B. H. Wakeman – IN/3SW
Mr. R. T. Robins – IN/3SW
Mr. A. H. Nicholson – IN/3SW
Mr. J. D. Nichols – IN/3SW
FPA File 5.4.4 – IN/3SW
Records Management, NP-2884-6 – IN/GW

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 38
PAGE 1 OF 5

Technical Specifications Limits

Initial Fuel Enrichment	≤ 4.30 wt % U235
Fuel Burnup	≤ 45,000 MWD/MTU
Decay Heat/Fuel Assembly & Insert Component	≤ 1020 Watts
Time Since Discharge for Fuel	See TS Figure 2.1-1
Fuel Assembly Design	W 17x17 Std or Vantage 5H
Fuel Assembly Initial Uranium Content	≤ 467.1 kgU/assembly

Fuel Assembly ID	Insert Component ID	Initial Fuel Enrichment (wt % U235)	Fuel Burnup (MWD/MTU)	F/A and Insert Decay Heat On 7/01/03 (Watts)	Required Days From Fuel Discharge	Actual Days From Fuel Discharge To 7/01/03	Fuel Assembly Design	Uranium Content (kgU/assembly)
3B1	BP561	4.21	44,105	1,011	2,557	2,697	W 17X17 V5H	463.641
3B2	BP780	4.21	44,474	1,011	2,557	2,697	W 17X17 V5H	462.958
3B7	BP007	4.21	43,967	1,011	2,557	2,697	W 17X17 V5H	464.896
4B4	BP078	4.21	43,953	1,011	2,557	2,697	W 17X17 V5H	463.024
5B0	BP124	4.21	44,515	1,011	2,557	2,697	W 17X17 V5H	463.715
5B5	BP645	4.21	44,733	1,011	2,557	2,697	W 17X17 V5H	463.139
5B8	BP112	4.21	44,064	1,011	2,557	2,697	W 17X17 V5H	463.098
5B9	BP128	4.21	44,894	1,011	2,557	2,697	W 17X17 V5H	463.328
X21	BP206	4.00	44,169	855	2,557	3,584	W 17X17 Std	463.694
X23	BP246	4.00	43,786	855	2,557	3,584	W 17X17 Std	462.747
X25	BP245	4.00	44,749	855	2,557	3,584	W 17X17 Std	462.719
X26	BP485	4.00	43,578	855	2,557	3,584	W 17X17 Std	465.512
X27	BP171	4.00	43,481	855	2,557	3,584	W 17X17 Std	463.928
X31	BP457	4.00	44,135	855	2,557	3,584	W 17X17 Std	465.114
X34	BP144	4.00	43,902	855	2,557	3,584	W 17X17 Std	465.550
X37	BP450	4.00	43,873	855	2,557	3,584	W 17X17 Std	465.362
X38	BP471	4.00	44,276	855	2,557	3,584	W 17X17 Std	465.296
X39	BP317	4.00	44,666	855	2,557	3,584	W 17X17 Std	465.332
X46	BP454	4.00	42,829	855	2,557	3,584	W 17X17 Std	463.471
X47	BP134	4.00	44,419	855	2,557	3,584	W 17X17 Std	464.876
X48	BP353	4.00	44,887	855	2,557	3,584	W 17X17 Std	463.928
X52	BP240	4.00	43,627	855	2,557	3,584	W 17X17 Std	462.972
Y02	BP387	3.99	43,112	866	2,557	3,584	W 17X17 V5H	463.872
Y07	BP295	3.99	43,303	866	2,557	3,584	W 17X17 V5H	463.935
Y08	BP492	3.99	43,858	866	2,557	3,584	W 17X17 V5H	462.150
Y10	BP294	3.99	42,917	866	2,557	3,584	W 17X17 V5H	463.130
Y11	BP275	3.99	43,160	866	2,557	3,584	W 17X17 V5H	464.030
Y12	BP215	3.99	42,542	866	2,557	3,584	W 17X17 V5H	462.307
Y13	BP044	3.99	44,441	866	2,557	3,584	W 17X17 V5H	463.816
Y18	BP252	3.99	43,960	866	2,557	3,584	W 17X17 V5H	464.680
Y25	BP205	3.99	43,091	866	2,557	3,584	W 17X17 V5H	462.549
Y26	BP237	3.99	44,171	866	2,557	3,584	W 17X17 V5H	463.295

Decay Heat column includes 4 watts for each F/A's insert.

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
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Other Parameters

Fuel Rod Internal Pressure	≤ 857psia @ 298 K
Gamma Source/Cask	≤ 1.699E+17 Photons/Sec
Neutron Source/Cask	≤ 1.049E+10 Neutrons/Sec

Fuel Assembly ID	Insert Component ID	Fuel Rod Pressure (psia)	Gamma Source On 7/01/03 (P/Sec)	Neutron Source On 7/01/03 (N/Sec)
3B1	BP561	403.0	4.84E+15	2.26E+08
3B2	BP780	403.0	4.84E+15	2.26E+08
3B7	BP007	403.0	4.84E+15	2.26E+08
4B4	BP078	403.0	4.84E+15	2.26E+08
5B0	BP124	403.0	4.84E+15	2.26E+08
5B5	BP645	403.0	4.84E+15	2.26E+08
5B8	BP112	403.0	4.84E+15	2.26E+08
5B9	BP128	403.0	4.84E+15	2.26E+08
X21	BP206	447.1	3.72E+15	2.28E+08
X23	BP246	447.1	3.72E+15	2.28E+08
X25	BP245	447.1	3.72E+15	2.28E+08
X26	BP485	447.1	3.72E+15	2.28E+08
X27	BP171	447.1	3.72E+15	2.28E+08
X31	BP457	447.1	3.72E+15	2.28E+08
X34	BP144	447.1	3.72E+15	2.28E+08
X37	BP450	447.1	3.72E+15	2.28E+08
X38	BP471	447.1	3.72E+15	2.28E+08
X39	BP317	447.1	3.72E+15	2.28E+08
X46	BP454	447.1	3.72E+15	2.28E+08
X47	BP134	447.1	3.72E+15	2.28E+08
X48	BP353	447.1	3.72E+15	2.28E+08
X52	BP240	447.1	3.72E+15	2.28E+08
Y02	BP387	398.8	3.86E+15	2.20E+08
Y07	BP295	398.8	3.86E+15	2.20E+08
Y08	BP492	398.8	3.86E+15	2.20E+08
Y10	BP294	398.8	3.86E+15	2.20E+08
Y11	BP275	398.8	3.86E+15	2.20E+08
Y12	BP215	398.8	3.86E+15	2.20E+08
Y13	BP044	398.8	3.86E+15	2.20E+08
Y18	BP252	398.8	3.86E+15	2.20E+08
Y25	BP205	398.8	3.86E+15	2.20E+08
Y26	BP237	398.8	3.86E+15	2.20E+08

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 38
PAGE 3 OF 5

Technical Specifications Limits

Time Since Discharge for BPRA	See TS Figure 2.1-2
Time Since Discharge for TPD	See TS Figure 2.1-3
Fuel Assembly and Insert Component Weight	≤ 1,533 Pounds

Fuel Assembly ID	Insert Component ID	F/A and Insert Weights (Pounds)	Insert Component Burnup (MWD/MTU)	Required Cooling Time (Days)	Actual Cooling Time to 07/01/03 (Days)
3B1	BP561	1,490	20,038	365	1,913
3B2	BP780	1,531	24,877	365	842
3B7	BP007	1,480	19,249	365	4,143
4B4	BP078	1,511	26,462	365	3,830
5B0	BP124	1,480	21,228	365	3,830
5B5	BP645	1,531	25,171	365	1,388
5B8	BP112	1,531	23,972	365	3,830
5B9	BP128	1,521	24,613	365	3,584
X21	BP206	1,523	25,612	365	3,217
X23	BP246	1,482	21,991	365	3,020
X25	BP245	1,482	21,930	365	3,020
X26	BP485	1,523	20,302	365	2,242
X27	BP171	1,513	22,474	365	3,584
X31	BP457	1,523	20,792	365	2,242
X34	BP144	1,533	25,090	365	3,584
X37	BP450	1,533	20,863	365	2,242
X38	BP471	1,482	17,348	365	2,242
X39	BP317	1,533	24,138	365	2,697
X46	BP454	1,533	21,099	365	2,242
X47	BP134	1,523	23,855	365	3,584
X48	BP353	1,523	22,723	365	2,697
X52	BP240	1,492	21,056	365	3,217
Y02	BP387	1,531	23,198	365	2,487
Y07	BP295	1,531	24,568	365	3,020
Y08	BP492	1,521	20,765	365	2,242
Y10	BP294	1,531	25,588	365	3,020
Y11	BP275	1,531	25,552	365	3,020
Y12	BP215	1,521	25,937	365	3,217
Y13	BP044	1,511	23,735	365	4,143
Y18	BP252	1,531	25,822	365	3,020
Y25	BP205	1,521	25,338	365	3,217
Y26	BP237	1,490	20,996	365	3,217

This is to certify that the North Anna Power Station fuel assemblies and insert components listed for the TN-32 storage cask number 38 do not exceed Technical Specifications and other limits.

Jennifer S Butler	9/2/03	[signature]	9/3/03
Prepared	Date	Reviewed	Date
[signature]	9/3/03	[signature]	9/3/03
Reviewed	Date	Reviewed	Date
[signature]	9/4/03		
Approved	Date		

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
CASK LOADING MAP, REVISION 0
TN-32, NUMBER 38
PAGE 4 OF 5

Cell No.
F/A ID
Insert ID
Comment

WEST

	1 Y02 BP387	2 Y07 BP295	3 Y08 BP492	4 Y10 BP294	
5 X31 BP457	6 X34 BP144	7 5B8 BP112	8 5B9 BP128	9 X37 BP450	10 Y11 BP275
11 X27 BP171	12 X47 BP134	13 5B5 BP645	14 5B0 BP124	15 X48 BP353	16 Y12 BP215
17 X26 BP485	18 X46 BP454	19 3B7 BP007	20 4B4 BP078	21 X52 BP240	22 Y13 BP044
23 X25 BP245	24 X39 BP317	25 3B2 BP780	26 3B1 BP561	27 X38 BP471	28 Y18 BP252
	29 X23 BP246	30 X21 BP206	31 Y26 BP237	32 Y25 BP205	

EAST

B/N - Bottom Nozzle
F/ - Face
G/ - Grid
EV - Envelope Violation
RC - Rod Clips
BJFS - Bulge Joint Failure Susceptible

Jennifer S. Butler Prepared	9/2/03 Date	Loaded	Date
BH Nah Reviewed	9/3/03 Date	Checked	Date
Jeff D. McPeb Reviewed	9/3/03 Date	Checked	Date
Tom A Bucknum Approved	9-4-03 Date		

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 38
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References

Fuel Assembly Initial Enrichment
Calculation PA-0203, Revision 0, March 2003

Fuel Assembly Burnup
Calculation PA-0203, Revision 0, March 2003

Burnable Poison Rod Assembly Burnup
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1275, Revision 0, May 2001

Fuel Assembly Decay Heat at 07/01/03
Calculation PA-0203, Revision 0, March 2003

Burnable Poison Rod Assembly Decay Heat
Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 2
Calculation PA-0187, Revision 0, January 2002

Fuel Assembly Days Since Discharge to 07/01/03
Calculation PA-0203, Revision 0, March 2003

Burnable Poison Rod Assembly Days Since Discharge to 07/01/03
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1275, Revision 0, May 2001

Fuel Rod Pressure
Calculation PA-0203, Revision 0, March 2003
Criteria: Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 2

Gamma and Neutron Emission Rates at 07/01/03
Calculation PA-0203, Revision 0, March 2003

Fuel Assembly and Insert Component Weight
Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 2

Uranium Content
Technical Report NE-853, Revision 3, August 1994

Dominion

Memorandum

March 4, 2004

To: Mr. Bobby D. Speckine
Department: North Anna Operations Support
Location: North Anna Power Station

From: Ms. Jennifer S. Butler
Department: Nuclear Analysis and Fuel
Location: Innsbrook Technical Center 3/SW

TN-32 Cask Number 43
ISFSI Fuel/Insert Certification and Cask Loading Map

Attached are the ISFSI Fuel/Insert Certification, Rev. 0 and the Cask Loading Map, Rev. 0 for TN-32 storage cask number 43. The ISFSI Fuel/Insert Certification certifies that the fuel assemblies and insert components scheduled to be stored in TN-32.43 meet North Anna ISFSI Technical Specification limits and the TN-32 TSAR limit for fuel rod internal pressure.

All fuel assemblies to be loaded into storage cask TN-32.43 have been inspected and verified to possess no conditions which will limit the loading of these assemblies into the cask. Additionally, none of the fuel assemblies to be stored in this cask are susceptible to thimble tube sleeve bulge joint failures.

Based on an actual cask weight of approximately 184,500 pounds and a combined fuel and insert component weight of approximately 48,311 pounds, the total weight of TN-32.43 when placed at the ISFSI will be approximately 232,811 pounds.

If you have any questions, please contact me.

Jennifer S. Butler

Jennifer S. Butler

Attachments: ISFSI Fuel Certification, Rev. 0, TN-32, No. 43

cc: Mr. T. A. Brookmire – IN/3SW
Ms. J. S. Butler – IN/3SW
Mr. B. H. Wakeman – IN/3SW
Mr. A. H. Nicholson – IN/3SW
Mr. J. D. Nichols – IN/3SW
FPA File 5.4.4 – IN/3SW
Records Management, NP-2884-6 – IN/GW

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 43
PAGE 1 OF 6

Technical Specifications Limits

Initial Fuel Enrichment	≤ 4.30 wt % U235
Fuel Burnup	≤ 45,000 MWD/MTU
Decay Heat/Fuel Assembly & Insert Component	≤ 1020 Watts
Time Since Discharge for Fuel	See TS Figure 2.1-1
Fuel Assembly Design	W 17x17 Std or Vantage 5H
Fuel Assembly Initial Uranium Content	≤467.1 kgU/assembly

Fuel Assembly ID	Insert Component ID	Initial Fuel Enrichment (wt % U235)	Fuel Burnup (MWD/MTU)	F/A and Insert Decay Heat On 1/01/04 (Watts)	Required Days From Fuel Discharge	Actual Days From Fuel Discharge To 1/01/04	Fuel Assembly Design	Uranium Content (kgU/assembly)
W23	BP434	3.80	41,572	765	2,555	4,327	W 17X17 Std	464.313
W41	16P138	4.00	43,367	797	2,555	4,881	W 17X17 Std	463.659
W42	12P166	4.00	43,418	797	2,555	4,881	W 17X17 Std	464.440
W45	16P149	4.00	44,009	797	2,555	4,881	W 17X17 Std	462.532
W46	12P141	4.00	44,411	797	2,555	4,881	W 17X17 Std	463.032
W47	VG16P4	4.00	44,269	797	2,555	4,881	W 17X17 Std	464.074
W48	BP037	4.00	43,249	797	2,555	4,881	W 17X17 Std	465.193
W49	12P165	4.00	44,372	797	2,555	4,881	W 17X17 Std	462.993
W52	16P117	4.00	43,367	797	2,555	4,881	W 17X17 Std	464.188
W53	BP011	4.00	44,057	797	2,555	4,881	W 17X17 Std	462.374
W54	12P164	4.00	44,585	797	2,555	4,881	W 17X17 Std	463.046
W55	BP784	4.00	42,460	797	2,555	4,881	W 17X17 Std	465.588
W56	BP863	4.00	42,432	797	2,555	4,881	W 17X17 Std	465.608
W57	12P156	4.00	42,784	797	2,555	4,881	W 17X17 Std	463.867
W58	16P115	4.00	44,435	797	2,555	4,881	W 17X17 Std	462.875
W59	16P125	4.00	43,983	797	2,555	4,881	W 17X17 Std	463.144
W60	16P231	4.00	44,605	797	2,555	4,881	W 17X17 Std	465.343
W61	16P116	4.00	43,689	797	2,555	4,881	W 17X17 Std	465.692
W63	16P135	4.00	43,469	797	2,555	4,881	W 17X17 Std	463.650
X02	BP344	3.80	44,174	841	2,555	4,327	W 17X17 Std	462.881
X03	BP093	3.80	44,523	841	2,555	4,327	W 17X17 Std	463.183
X06	BP406	3.80	43,377	841	2,555	4,327	W 17X17 Std	463.825
X07	BP031	3.80	44,102	841	2,555	4,327	W 17X17 Std	462.731
X08	BP327	3.80	44,624	841	2,555	4,327	W 17X17 Std	462.604
X11	BP068	3.80	44,143	841	2,555	4,327	W 17X17 Std	463.331
X13	BP174	3.80	43,945	841	2,555	4,327	W 17X17 Std	463.459
X41	BP050	4.01	42,611	835	2,555	4,327	W 17X17 Std	463.554
X42	BP424	4.01	42,845	835	2,555	4,327	W 17X17 Std	465.219
X43	BP058	4.01	42,206	835	2,555	4,327	W 17X17 Std	464.939
X45	BP219	4.01	42,630	835	2,555	4,327	W 17X17 Std	465.345
X50	BP048	4.01	43,261	835	2,555	4,327	W 17X17 Std	463.345
X51	BP066	4.01	42,764	835	2,555	4,327	W 17X17 Std	463.460
Totals				26,008				

Decay Heat column includes 33 watts for each F/A's insert.

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 43
PAGE 2 OF 6

Other Parameters

Fuel Rod Internal Pressure	≤ 857psia @ 298 K
Gamma Source/Cask	≤ 1.699E+17 Photons/Sec
Neutron Source/Cask	≤ 1.049E+10 Neutrons/Sec

Fuel Assembly ID	Insert Component ID	Fuel Rod Pressure (psia)	Gamma Source On 1/01/04 (P/Sec)	Neutron Source On 1/01/04 (N/Sec)
W23	BP434	413.7	3.10E+15	1.78E+08
W41	16P138	383.9	3.22E+15	1.96E+08
W42	12P166	383.9	3.22E+15	1.96E+08
W45	16P149	383.9	3.22E+15	1.96E+08
W46	12P141	383.9	3.22E+15	1.96E+08
W47	VG16P4	383.9	3.22E+15	1.96E+08
W48	BP037	383.9	3.22E+15	1.96E+08
W49	12P165	383.9	3.22E+15	1.96E+08
W52	16P117	383.9	3.22E+15	1.96E+08
W53	BP011	383.9	3.22E+15	1.96E+08
W54	12P164	383.9	3.22E+15	1.96E+08
W55	BP784	383.9	3.22E+15	1.96E+08
W56	BP863	383.9	3.22E+15	1.96E+08
W57	12P156	383.9	3.22E+15	1.96E+08
W58	16P115	383.9	3.22E+15	1.96E+08
W59	16P125	383.9	3.22E+15	1.96E+08
W60	16P231	383.9	3.22E+15	1.96E+08
W61	16P116	383.9	3.22E+15	1.96E+08
W63	16P135	383.9	3.22E+15	1.96E+08
X02	BP344	409.0	3.45E+15	2.31E+08
X03	BP093	409.0	3.45E+15	2.31E+08
X06	BP406	409.0	3.45E+15	2.31E+08
X07	BP031	409.0	3.45E+15	2.31E+08
X08	BP327	409.0	3.45E+15	2.31E+08
X11	BP068	409.0	3.45E+15	2.31E+08
X13	BP174	409.0	3.45E+15	2.31E+08
X41	BP050	384.2	3.46E+15	2.07E+08
X42	BP424	384.2	3.46E+15	2.07E+08
X43	BP058	384.2	3.46E+15	2.07E+08
X45	BP219	384.2	3.46E+15	2.07E+08
X50	BP048	384.2	3.46E+15	2.07E+08
X51	BP066	384.2	3.46E+15	2.07E+08
			1.060E+17	6.57E+09

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 43
PAGE 3 OF 6

Technical Specifications Limits

Time Since Discharge for BPRA	See TS Figure 2.1-2
Time Since Discharge for TPD	See TS Figure 2.1-3
Fuel Assembly and Insert Component Weight	≤ 1,533 Pounds

Fuel Assembly ID	Insert Component ID	F/A and Insert Weights (Pounds)	Insert Component Burnup (MWD/MTU)	Required Cooling Time (Days)	Actual Cooling Time to 01/01/04 (Days)
W23	BP434	1,492	19,370	365	2,671
W41	16P138	1,505	22,814	365	5,974
W42	12P166	1,498	23,848	365	4,737
W45	16P149	1,505	21,799	365	5,974
W46	12P141	1,498	24,465	365	4,737
W47	VG16P4	1,505	16,793	365	7,970
W48	BP037	1,513	23,715	365	4,327
W49	12P165	1,498	24,091	365	4,737
W52	16P117	1,505	21,139	365	5,974
W53	BP011	1,492	19,804	365	4,327
W54	12P164	1,498	25,035	365	4,737
W55	BP784	1,533	26,295	365	1,026
W56	BP863	1,492	19,805	365	844
W57	12P156	1,498	25,416	365	4,737
W58	16P115	1,505	22,745	365	5,974
W59	16P125	1,505	22,741	365	5,974
W60	16P231	1,505	25,833	365	4,737
W61	16P116	1,505	22,793	365	5,974
W63	16P135	1,505	22,877	365	5,974
X02	BP344	1,533	25,119	365	2,881
X03	BP093	1,523	26,718	365	4,014
X06	BP406	1,482	18,785	365	2,671
X07	BP031	1,513	25,122	365	4,327
X08	BP327	1,533	24,746	365	2,881
X11	BP068	1,523	26,388	365	4,014
X13	BP174	1,513	22,835	365	3,768
X41	BP050	1,523	24,751	365	4,327
X42	BP424	1,523	22,485	365	2,671
X43	BP058	1,523	24,376	365	4,327
X45	BP219	1,523	24,871	365	3,401
X50	BP048	1,523	24,282	365	4,327
X51	BP066	1,523	27,522	365	4,014

This is to certify that the North Anna Power Station fuel assemblies and insert components listed for the TN-32 storage cask number 43 do not exceed Technical Specifications and other limits.

Jennifer S Butler 3/1/04
Prepared Date

J. S. Nichols 3/1/04
Reviewed Date

3/1/04
Reviewed Date

3/1/04
Reviewed Date

Norman P. Waghope 3/4/04
Approved for Date
T. A. Brookmire

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
CASK LOADING MAP, REVISION 0
TN-32, NUMBER 43
PAGE 4 OF 6

Cell No.
F/A ID
Insert ID
Comment

WEST

	1 W23 BP434	2 W41 16P138	3 W42 12P166	4 W45 16P149	
5 W59 16P125	6 W60 16P231	7 X07 BP031	8 X08 BP327	9 W61 16P116	10 W46 12P141
11 W58 16P115	12 X06 BP406	13 X50 BP048	14 X51 BP066	15 X11 BP068	16 W47 VG16P4
17 W57 12P156	18 X03 BP093	19 X45 BP219	20 X43 BP058	21 X42 BP424	22 W48 BP037
23 W56 BP863	24 X02 BP344	25 X41 BP050	26 X13 BP174	27 W63 16P135	28 W49 12P165
	29 W55 BP784	30 W54 12P164	31 W53 BP011	32 W52 16P117	

EAST

B/N - Bottom Nozzle
F/ - Face
G/ - Grid
EV - Envelope Violation
RC - Rod Clips
BJFS - Bulge Joint Failure Susceptible

Jennifer S Butler Prepared	3/1/04 Date	_____ Loaded	_____ Date
B/ Mahe Reviewed	3/1/04 Date	_____ Checked	_____ Date
H.D. Nichols Reviewed	3/1/04 Date	_____ Checked	_____ Date
Norman P. Wolfhope Approved for T. A. Brookmire	3/4/04 Date		

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 43
PAGE 5 OF 6

References

Fuel Assembly Initial Enrichment
Calculation PA-0203, Revision 0, March 2003
Calculation PA-0213, Revision 0, January 2004

Fuel Assembly Burnup
Calculation PA-0203, Revision 0, March 2003
Calculation PA-0213, Revision 0, January 2004

Burnable Poison Rod Assembly Burnup
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1275, Revision 0, May 2001

Fuel Assembly Decay Heat at 01/01/04
Calculation PA-0203, Revision 0, March 2003
Calculation PA-0213, Revision 0, January 2004

Burnable Poison Rod Assembly Decay Heat
Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 4
Calculation PA-0187, Revision 0, January 2002

Fuel Assembly Days Since Discharge to 01/01/04
Calculation PA-0203, Revision 0, March 2003
Calculation PA-0213, Revision 0, January 2004

Burnable Poison Rod Assembly Days Since Discharge to 07/01/03
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1275, Revision 0, May 2001

Fuel Rod Pressure
Calculation PA-0203, Revision 0, March 2003
Calculation PA-0213, Revision 0, January 2004
Criteria: Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 4

Gamma and Neutron Emission Rates at 01/01/04
Calculation PA-0203, Revision 0, March 2003
Calculation PA-0213, Revision 0, January 2004

Fuel Assembly and Insert Component Weight
Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 4

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 43
PAGE 6 OF 6

Uranium Content

DOE/NRC Form 741, YLM-XJW, Transaction Number 000097, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000096, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000095, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000101, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000102, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000103, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000104, Correction 0

Dominion

Memorandum

June 15, 2004

To: Mr. Bobby D. Speckine
Department: North Anna Operations Support
Location: North Anna Power Station

From: Ms. Jennifer S. Butler
Department: Nuclear Analysis and Fuel
Location: Innsbrook Technical Center 3/SW

TN-32 Cask Number 45
ISFSI Fuel/Insert Certification and Cask Loading Map

Attached are the ISFSI Fuel/Insert Certification, Rev. 0 and the Cask Loading Map, Rev. 0 for TN-32 storage cask number 45. The ISFSI Fuel/Insert Certification certifies that the fuel assemblies and insert components scheduled to be stored in TN-32.45 meet North Anna ISFSI Technical Specification limits and the TN-32 TSAR limit for fuel rod internal pressure.

All fuel assemblies to be loaded into storage cask TN-32.45 have been inspected and verified to possess no conditions which will limit the loading of these assemblies into the cask. Additionally, none of the fuel assemblies to be stored in this cask are susceptible to thimble tube sleeve bulge joint failures.

Based on an actual cask weight of approximately 184,550 pounds and a combined fuel and insert component weight of approximately 48,455 pounds, the total weight of TN-32.45 when placed at the ISFSI will be approximately 233,005 pounds.

If you have any questions, please contact me.

Jennifer S. Butler

Jennifer S. Butler

Attachments: ISFSI Fuel Certification, Rev. 0, TN-32, No. 45

cc: Mr. T. A. Brookmire – IN/3SW
Mr. B. H. Wakeman – IN/3SW
Mr. R. T. Robins – IN/3SW
Mr. A. H. Nicholson – IN/3SW
Mr. J. D. Nichols – IN/3SW
FPA File 5.4.4 – IN/3SW
Records Management, NP-2884-6 – IN/GW

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 45
PAGE 1 OF 6

Technical Specifications Limits

Initial Fuel Enrichment	≤ 4.30 wt % U235
Fuel Burnup	≤ 45,000 MWD/MTU
Decay Heat/Fuel Assembly & Insert Component	≤ 1020 Watts
Time Since Discharge for Fuel	See TS Figure 2.1-1
Fuel Assembly Design	W 17x17 Std or Vantage 5H
Fuel Assembly Initial Uranium Content	≤ 467.1 kgU/assembly

Fuel Assembly ID	Insert Component ID	Initial Fuel Enrichment (wt % U235)	Fuel Burnup (MWD/MTU)	F/A and Insert Decay Heat On 1/01/04 (Watts)	Required Days From Fuel Discharge	Actual Days From Fuel Discharge To 1/01/04	Fuel Assembly Design	Uranium Content (kgU/assembly)
4A2*	BP652	4.20	44,269	915	2,555	2,578	W 17x17 V5H	463.420
4A5*	BP720	4.20	43,033	915	2,555	2,578	W 17x17 V5H	464.679
4A9*	BP732	4.20	43,308	915	2,555	2,578	W 17x17 V5H	463.723
5A2*	BP754	4.20	43,285	915	2,555	2,578	W 17x17 V5H	463.592
5A3*	BP654	4.20	43,856	915	2,555	2,578	W 17x17 V5H	462.482
5A9*	BP657	4.20	44,370	915	2,555	2,578	W 17x17 V5H	464.064
6A7*	BP706	4.20	43,686	915	2,555	2,578	W 17x17 V5H	462.401
0B1*	BP749	4.00	39,639	836	2,555	2,578	W 17x17 V5H	464.133
0B4*	BP751	4.00	38,773	836	2,555	2,578	W 17x17 V5H	464.380
0B9*	BP752	4.00	39,908	836	2,555	2,578	W 17x17 V5H	464.364
1B7*	BP573	4.00	39,960	836	2,555	2,578	W 17x17 V5H	462.430
2B8*	BP164	4.21	44,647	974	2,555	2,578	W 17x17 V5H	463.566
4B3*	BP699	4.21	44,223	974	2,555	2,578	W 17x17 V5H	464.293
W03	12P162	3.80	43,671	771	2,555	4,881	W 17x17 Std	465.468
W08	12P139	3.80	43,517	771	2,555	4,881	W 17x17 Std	465.810
W10	16P159	3.80	44,520	771	2,555	4,881	W 17x17 Std	465.779
W12	12P135	3.80	44,205	771	2,555	4,881	W 17x17 Std	465.923
W20	BP700	3.80	44,359	771	2,555	4,881	W 17x17 Std	465.038
W24	16P64	3.80	44,317	771	2,555	4,881	W 17x17 Std	464.711
W28	12P163	3.80	43,606	771	2,555	4,881	W 17x17 Std	465.584
W11	BP423	3.80	41,437	736	2,555	4,327	W 17x17 Std	465.987
W16	BP790	3.80	42,338	736	2,555	4,327	W 17x17 Std	464.717
W18	BP052	3.80	41,282	736	2,555	4,327	W 17x17 Std	463.900
W29	16P226	4.00	43,464	768	2,555	4,881	W 17x17 Std	465.247
W30	16P84	4.00	43,214	768	2,555	4,881	W 17x17 Std	465.205
W32	16P112	4.00	43,721	768	2,555	4,881	W 17x17 Std	463.792
W33	12P137	4.00	42,200	768	2,555	4,881	W 17x17 Std	464.858
W35	BP102	4.00	43,141	768	2,555	4,881	W 17x17 Std	464.534
W36	16P121	4.00	43,770	768	2,555	4,881	W 17x17 Std	465.896
W37	BP250	4.00	43,170	768	2,555	4,881	W 17x17 Std	464.948
W39	BP698	4.00	44,450	768	2,555	4,881	W 17x17 Std	465.889
W40	BP798	4.00	43,419	768	2,555	4,881	W 17x17 Std	463.395
Totals				26,214				

Decay Heat column includes 4 watts for each F/A's insert.

* The F/A and Insert Decay Heat and Actual Days from Fuel Discharge were calculated on 6/1/04 instead of 1/1/04.

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 45
PAGE 2 OF 6

Other Parameters

Fuel Rod Internal Pressure	≤ 857psia @ 298 K
Gamma Source/Cask	≤ 1.699E+17 Photons/Sec
Neutron Source/Cask	≤ 1.049E+10 Neutrons/Sec

Fuel Assembly ID	Insert Component ID	Fuel Rod Pressure (psia)	Gamma Source On 1/01/04 (P/Sec)	Neutron Source On 1/01/04 (N/Sec)
4A2*	BP652	401.7	4.18E+15	2.07E+08
4A5*	BP720	401.7	4.18E+15	2.07E+08
4A9*	BP732	401.7	4.18E+15	2.07E+08
5A2*	BP754	401.7	4.18E+15	2.07E+08
5A3*	BP654	401.7	4.18E+15	2.07E+08
5A9*	BP657	401.7	4.18E+15	2.07E+08
6A7*	BP706	401.7	4.18E+15	2.07E+08
0B1*	BP749	402.6	3.97E+15	1.49E+08
0B4*	BP751	402.6	3.97E+15	1.49E+08
0B9*	BP752	402.6	3.97E+15	1.49E+08
1B7*	BP573	402.6	3.97E+15	1.49E+08
2B8*	BP164	406.2	4.60E+15	2.17E+08
4B3*	BP699	406.2	4.60E+15	2.17E+08
W03	12P162	379.5	3.20E+15	2.15E+08
W08	12P139	379.5	3.20E+15	2.15E+08
W10	16P159	379.5	3.20E+15	2.15E+08
W12	12P135	379.5	3.20E+15	2.15E+08
W20	BP700	379.5	3.20E+15	2.15E+08
W24	16P64	379.5	3.20E+15	2.15E+08
W28	12P163	379.5	3.20E+15	2.15E+08
W11	BP423	413.7	3.10E+15	1.78E+08
W16	BP790	413.7	3.10E+15	1.78E+08
W18	BP052	413.7	3.10E+15	1.78E+08
W29	16P226	383.9	3.22E+15	1.96E+08
W30	16P84	383.9	3.22E+15	1.96E+08
W32	16P112	383.9	3.22E+15	1.96E+08
W33	12P137	383.9	3.22E+15	1.96E+08
W35	BP102	383.9	3.22E+15	1.96E+08
W36	16P121	383.9	3.22E+15	1.96E+08
W37	BP250	383.9	3.22E+15	1.96E+08
W39	BP698	383.9	3.22E+15	1.96E+08
W40	BP798	383.9	3.22E+15	1.96E+08
			1.150E+17	6.28E+09

* The gamma and neutron source were calculated on 6/1/04 instead of 1/1/04.

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
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Technical Specifications Limits

Time Since Discharge for BPRA	See TS Figure 2.1-2
Time Since Discharge for TPD	See TS Figure 2.1-3
Fuel Assembly and Insert Component Weight	≤ 1,533 Pounds

Fuel Assembly ID	Insert Component ID	F/A and Insert Weights (Pounds)	Insert Component Burnup (MWD/MTU)	Required Cooling Time (Days)	Actual Cooling Time to 01/01/04 (Days)
4A2	BP652	1,531	25,696	365	1,572
4A5	BP720	1,531	26,972	365	1,390
4A9	BP732	1,531	25,422	365	1,390
5A2	BP754	1,531	25,475	365	1,390
5A3	BP654	1,531	25,488	365	1,572
5A9	BP657	1,531	25,713	365	1,572
6A7	BP706	1,531	26,826	365	1,390
0B1	BP749	1,531	24,622	365	1,390
0B4	BP751	1,531	25,111	365	1,390
0B9	BP752	1,531	25,254	365	1,390
1B7	BP573	1,521	20,970	365	1,936
2B8	BP164	1,480	19,618	365	3,768
4B3	BP699	1,501	23,285	365	1,390
W03	12P162	1,498	24,490	365	4,737
W08	12P139	1,498	24,473	365	4,737
W10	16P159	1,505	21,229	365	5,423
W12	12P135	1,498	24,120	365	4,737
W20	BP700	1,503	23,119	365	1,390
W24	16P64	1,505	16,170	365	6,632
W28	12P163	1,498	24,948	365	4,737
W11	BP423	1,523	21,843	365	2,671
W16	BP790	1,482	20,029	365	1,026
W18	BP052	1,523	24,229	365	4,327
W29	16P226	1,505	24,083	365	4,881
W30	16P84	1,505	19,298	365	6,524
W32	16P112	1,505	21,957	365	5,974
W33	12P137	1,498	25,403	365	4,737
W35	BP102	1,523	26,307	365	4,014
W36	16P121	1,505	22,793	365	5,974
W37	BP250	1,533	25,212	365	3,204
W39	BP698	1,503	23,352	365	1,390
W40	BP798	1,533	26,999	365	1,026

This is to certify that the North Anna Power Station fuel assemblies and insert components listed for the TN-32 storage cask number 45 do not exceed Technical Specifications and other limits.

Jennifer S Butler 6/9/04
Prepared Date

J. D. Nichols 6/9/04
Reviewed Date

Randy J. Robins 6-9-04
Reviewed Date

6/11/04
Reviewed Date

Tom A Brookman 6-14-04
Approved Date

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
CASK LOADING MAP, REVISION 0
TN-32, NUMBER 45
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Cell No. F/A ID Insert ID Comment

WEST

	1 W11 BP423	2 W24 16P64	3 W32 16P112	4 W08 12P139	
5 W20 BP700	6 W37 BP250	7 4A2 BP652	8 4A5 BP720	9 0B4 BP751	10 W16 BP790
11 W36 16P121	12 5A9 BP657	13 6A7 BP706	14 1B7 BP573	15 W39 BP698	16 W28 12P163
17 W30 16P84	18 5A3 BP654	19 4B3 BP699	20 2B8 BP164	21 4A9 BP732	22 W33 12P137
23 W03 12P162	24 0B1 BP749	25 W40 BP798	26 5A2 BP754	27 0B9 BP752	28 W10 16P159
	29 W12 12P135	30 W35 BP102	31 W29 16P226	32 W18 BP052	

EAST

B/N - Bottom Nozzle
F/ - Face
G/ - Grid
EV - Envelope Violation
RC - Rod Clips
BJFS - Bulge Joint Failure Susceptible

Jennifer S Butler Prepared	6/9/04 Date	Loaded	Date
Randy T. Fobian Reviewed	6-9-04 Date	Checked	Date
J. D. Nichols Reviewed	6/9/04 Date	Checked	Date
Tom A Bookman Approved	6-11-04 Date		

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 45
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References

Fuel Assembly Initial Enrichment
Calculation PA-0213, Revision 0, January 2004

Fuel Assembly Burnup
Calculation PA-0213, Revision 0, January 2004

Burnable Poison Rod Assembly Burnup
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1379, Revision 0, July 2003
Technical Report NE-1100, Revision 0, November 1996
Technical Report NE-1272, Revision 0, May 2001
Technical Report NE-876, Revision 0, May 1992

Fuel Assembly Decay Heat
Calculation PA-0213, Revision 0, January 2004

Burnable Poison Rod Assembly Decay Heat
Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 4
Calculation PA-0187, Revision 0, January 2002

Fuel Assembly Days Since Discharge
Calculation PA-0213, Revision 0, January 2004

Burnable Poison Rod Assembly Days Since Discharge
Technical Report NE-853, Revision 3, August 1994
Technical Report NE-1379, Revision 0, July 2003
Technical Report NE-1100, Revision 0, November 1996
Technical Report NE-1272, Revision 0, May 2001
Technical Report NE-876, Revision 0, May 1992

Fuel Rod Pressure
Calculation PA-0213, Revision 0, January 2004
Criteria: Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 4

Gamma and Neutron Emission Rates
Calculation PA-0213, Revision 0, January 2004

Fuel Assembly and Insert Component Weight
Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 4

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
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Uranium Content

DOE/NRC Form 741, YLM-XJW, Transaction Number 000120, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000121, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000125, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000132, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000133, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000134, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000135, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000094, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000093, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000099, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000098, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000097, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000096, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000095, Correction 0

Dominion

Memorandum

August 16, 2006

To: Mr. Bobby D. Speckine
Department: North Anna Operations Support
Location: North Anna Power Station

From: Mr. J. D. Nichols
Department: Nuclear Analysis and Fuel
Location: Innsbrook Technical Center 3/SW

TN-32 Cask Number 49
ISFSI Fuel/Insert Certification and Cask Loading Map

Attached are the ISFSI Fuel/Insert Certification, Rev. 0 and the Cask Loading Map, Rev. 0 for TN-32 storage cask number 49. The ISFSI Fuel/Insert Certification certifies that the fuel assemblies and insert components scheduled to be stored in TN-32.49 meet North Anna ISFSI Technical Specification limits and the TN-32 TSAR limit for fuel rod internal pressure.

All fuel assemblies to be loaded into storage cask TN-32.49 have been inspected and verified to possess no conditions which will limit the loading of these assemblies into the cask. Fuel assembly J57 has slight envelope violation on face 1, grid 7. Minimize interaction with face 1 during movement. Fuel assembly 2D0 has a raised spring clamp gap on faces 3 & 4. Be aware of this condition during handling.
None of the fuel assemblies to be stored in this cask are susceptible to thimble tube sleeve bulge joint failures.

In a recently issued Interim Staff Guidance (ISG-22), the NRC has expressed a concern that exposure of fuel pellets to an oxidizing atmosphere such as air may lead to swelling of the pellet and possible rupture of the fuel cladding. To prevent the possibility of this occurring, the NRC proposes the following solutions.

1. Demonstrate that active fuel region is not exposed to air during blowdown, or
2. If active fuel region is exposed to air:
   a) Demonstrate that fuel has no hairline cracks or pinholes using reactor records, or
   b) Perform analysis showing that the temperature and duration of fuel exposure to air does not exceed threshold for significant oxidation.

Nuclear Analysis and Fuel has examined the coolant activity and fuel examination records for the discharge cycles of the fuel assemblies being loaded in TN-32.49. These records show that the assemblies being loaded into this cask are free from fuel defects that would allow the fuel pellets to come into contact with an oxidizing atmosphere and undergo the changes described in ISG-22.

Dominion

Memorandum

Based on an actual cask weight of approximately 184,300* pounds and a combined fuel and insert component weight of approximately 48,428 pounds, the total weight of TN-32.49 when placed at the ISFSI will be approximately 232,728 pounds. This meets the requirement of the North Anna ISFSI Safety Analysis Report, Section 4.2.1.4 for a minimum cask weight of 230,000 pounds.

If you have any questions, please contact me.

J.D. Nichols

Attachments: ISFSI Fuel Certification, Rev. 0, TN-32, No. 49

cc: Mr. T. A. Brookmire – IN/3SW
Mr. A. L. Black – IN/3SW
Mr. A. H. Nicholson – IN/3SW
Mr. B. H. Wakeman – IN/3SW
Mr. R. T. Robins - IN/3SW
FPA File 5.4.4 – IN/3SW
Records Management, NP-2884-6 – IN/GW

*Based on TN32.49 Final Document Package

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 49
PAGE 1 OF 6

Technical Specifications Limits

Initial Fuel Enrichment	≤ 4.30 wt % U235
Fuel Burnup	≤ 45,000 MWD/MTU
Decay Heat/Fuel Assembly & Insert Component	≤ 1020 Watts
Time Since Discharge for Fuel	See TS Figure 2.1-1
Fuel Assembly Design	W 17x17 Std or Vantage 5H
Fuel Assembly Initial Uranium Content	≤ 467.1 kgU/assembly

Fuel Assembly ID	Insert Component ID	Initial Fuel Enrichment (wt % U235)	Fuel Burnup (MWD/MTU)	F/A and Insert Decay Heat On 1/01/06 (Watts)	Required Days From Fuel Discharge	Actual Days From Fuel Discharge To 1/01/06	Fuel Assembly Design	Uranium Content (kgU/assembly)
J24	BP565	3.79	41,341	872	2,555	2,667	W 17X17 STD	464.406
J49	BP026	3.98	43,778	734	2,555	5,468	W 17X17 STD	463.024
J50	BP016	3.98	43,831	734	2,555	5,468	W 17X17 STD	463.572
J53	BP135	3.98	43,734	734	2,555	5,468	W 17X17 STD	464.169
J54	BP326	3.98	44,041	734	2,555	5,468	W 17X17 STD	463.031
J55	BP098	4.01	37,205	734	2,555	5,468	W 17X17 STD	464.285
J56	BP018	4.00	43,796	734	2,555	5,468	W 17X17 STD	464.562
J57	BP110	4.00	43,933	734	2,555	5,468	W 17X17 STD	466.158
3A6	BP160	4.19	43,787	845	2,555	3,157	W 17X17 V5H	463.300
0C1	BP507	3.99	44,374	939	2,555	3,157	W 17X17 V5H	463.186
0C3	BP501	3.99	43,777	939	2,555	3,157	W 17X17 V5H	462.490
0C6	BP556	4.00	44,760	939	2,555	3,157	W 17X17 V5H	462.051
0C8	BP476	4.00	43,848	939	2,555	3,157	W 17X17 V5H	462.164
1C1	BP447	4.02	43,910	939	2,555	3,157	W 17X17 V5H	463.998
1C4	BP791	4.01	44,214	939	2,555	3,157	W 17X17 V5H	463.020
1C5	BP487	4.02	44,303	939	2,555	3,157	W 17X17 V5H	464.031
1C7	BP495	4.00	44,571	939	2,555	3,157	W 17X17 V5H	462.506
2C0	BP703	4.02	43,234	939	2,555	3,157	W 17X17 V5H	464.482
2C1	BP466	4.01	44,144	939	2,555	3,157	W 17X17 V5H	463.030
2C7	BP899	4.03	43,783	939	2,555	3,157	W 17X17 V5H	464.962
2C8	BP504	4.01	44,216	939	2,555	3,157	W 17X17 V5H	463.347
1D5	BP630	4.00	42,912	999	2,555	2,667	W 17X17 V5H	461.837
1D8	BP578	4.01	42,353	999	2,555	2,667	W 17X17 V5H	463.205
1D9	BP672	4.00	43,493	999	2,555	2,667	W 17X17 V5H	462.978
2D0	BP1090	4.02	42,772	999	2,555	2,667	W 17X17 V5H	462.741
4N7	BP1007	4.21	44,591	975	2,555	2,828	W 17X17 V5H	462.819
4N8	BP750	4.21	44,277	975	2,555	2,828	W 17X17 V5H	462.587
4N9	BP1085	4.21	44,288	975	2,555	2,828	W 17X17 V5H	462.944
5N2	BP585	4.21	43,557	975	2,555	2,828	W 17X17 V5H	463.624
5N5	BP512	4.21	41,443	975	2,555	2,828	W 17X17 V5H	462.747
5N7	BP511	4.20	41,096	975	2,555	2,828	W 17X17 V5H	464.068
5N9	BP608	4.21	44,422	975	2,555	2,828	W 17X17 V5H	462.761
Totals				28,944				

Decay Heat column includes 4 watts for each F/A's insert.

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
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Other Parameters

Fuel Rod Internal Pressure	≤ 857psia @ 298 K
Gamma Source/Cask	≤ 1.699E+17 Photons/Sec
Neutron Source/Cask	≤ 1.049E+10 Neutrons/Sec

Fuel Assembly ID	Insert Component ID	Fuel Rod Pressure (psia)	Gamma Source On 1/01/06 (P/Sec)	Neutron Source On 1/01/06 (N/Sec)
J24	BP565	383.7	3.94E+15	1.98E+08
J49	BP026	385.3	3.01E+15	1.83E+08
J50	BP016	385.3	3.01E+15	1.83E+08
J53	BP135	385.3	3.01E+15	1.83E+08
J54	BP326	385.3	3.01E+15	1.83E+08
J55	BP098	385.3	3.01E+15	1.83E+08
J56	BP018	385.3	3.01E+15	1.83E+08
J57	BP110	385.3	3.01E+15	1.83E+08
3A6	BP160	401.7	3.71E+15	1.95E+08
0C1	BP507	373.2	4.32E+15	2.41E+08
0C3	BP501	373.2	4.32E+15	2.41E+08
0C6	BP556	373.2	4.32E+15	2.41E+08
0C8	BP476	373.2	4.32E+15	2.41E+08
1C1	BP447	373.2	4.32E+15	2.41E+08
1C4	BP791	373.2	4.32E+15	2.41E+08
1C5	BP487	373.2	4.32E+15	2.41E+08
1C7	BP495	373.2	4.32E+15	2.41E+08
2C0	BP703	373.2	4.32E+15	2.41E+08
2C1	BP466	373.2	4.32E+15	2.41E+08
2C7	BP899	373.2	4.32E+15	2.41E+08
2C8	BP504	373.2	4.32E+15	2.41E+08
1D5	BP630	372.0	4.82E+15	2.26E+08
1D8	BP578	372.0	4.82E+15	2.26E+08
1D9	BP672	372.0	4.82E+15	2.26E+08
2D0	BP1090	372.0	4.82E+15	2.26E+08
4N7	BP1007	373.6	4.63E+15	2.16E+08
4N8	BP750	373.6	4.63E+15	2.16E+08
4N9	BP1085	373.6	4.63E+15	2.16E+08
5N2	BP585	373.6	4.63E+15	2.16E+08
5N5	BP512	373.6	4.63E+15	2.16E+08
5N7	BP511	373.6	4.63E+15	2.16E+08
5N9	BP608	373.6	4.63E+15	2.16E+08
			1.323E+17	6.98E+09

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
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Technical Specifications Limits

Time Since Discharge for BPRA	See TS Figure 2.1-2
Time Since Discharge for TPD	See TS Figure 2.1-3
Fuel Assembly and Insert Component Weight	≤ 1,533 Pounds

Fuel Assembly ID	Insert Component ID	F/A and Insert Weights (Pounds)	Insert Component Burnup (MWD/MTU)	Required Cooling Time (Days)	Actual Cooling Time to 01/01/06 (Days)
J24	BP565	1,483	18,918	365	2,667
J49	BP026	1,513	24,539	365	5,058
J50	BP016	1,493	20,199	365	5,058
J53	BP135	1,523	24,648	365	4,499
J54	BP326	1,533	24,973	365	3,612
J55	BP098	1,523	26,437	365	4,745
J56	BP018	1,503	21,631	365	5,058
J57	BP110	1,533	24,661	365	4,745
3A6	BP160	1,531	25,396	365	4,499
0C1	BP507	1,491	17,479	365	3,157
0C3	BP501	1,491	17,494	365	3,157
0C6	BP556	1,531	24,375	365	2,828
0C8	BP476	1,481	16,840	365	3,157
1C1	BP447	1,531	21,301	365	3,157
1C4	BP791	1,481	19,971	365	1,757
1C5	BP487	1,521	20,459	365	3,157
1C7	BP495	1,521	20,655	365	3,157
2C0	BP703	1,531	26,484	365	2,121
2C1	BP466	1,531	21,364	365	3,157
2C7	BP899	1,531	23,545	365	1,211
2C8	BP504	1,491	17,810	365	3,157
1D5	BP630	1,491	18,739	365	2,667
1D8	BP578	1,531	22,949	365	2,667
1D9	BP672	1,531	26,032	365	2,303
2D0	BP1090	1,531	25,691	365	476
4N7	BP1007	1,531	25,209	365	1,043
4N8	BP750	1,531	24,842	365	2,121
4N9	BP1085	1,491	19,344	365	609
5N2	BP585	1,531	22,138	365	2,667
5N5	BP512	1,481	22,341	365	2,828
5N7	BP511	1,481	22,270	365	2,828
5N9	BP608	1,531	23,819	365	2,667

This is to certify that the North Anna Power Station fuel assemblies and insert components listed for the TN-32 storage cask number 49 do not exceed Technical Specifications and other limits.

Prepared 8/7/06 Date

Reviewed 8/7/06 Date

Reviewed 8-7-06 Date

Reviewed 8/9/06 Date

Approved 8/16/06 Date

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
CASK LOADING MAP, REVISION 0
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Cell No.
F/A ID
Insert ID
Comment

WEST

	1 J24 BP565	2 0C3 BP501	3 1C1 BP447	4 J53 BP135	
5 J54 BP326	6 1C7 BP495	7 5N9 BP608	8 5N7 BP511	9 5N5 BP512	10 J56 BP018
11 0C1 BP507	12 2C0 BP703	13 1D5 BP630	14 1D8 BP578	15 5N2 BP585	16 1C4 BP791
17 3A6 BP160	18 2C1 BP466	19 1D9 BP672	20 2D0 BP1090 TN clamp gap	21 4N9 BP1085	22 1C5 BP487
23 J55 BP098	24 2C7 BP899	25 2C8 BP504	26 4N7 BP1007	27 4N8 BP750	28 J57 BP110 EV
	29 J49 BP026	30 0C6 BP556	31 0C8 BP476	32 J50 BP016	

EAST

B/N - Bottom Nozzle
F/ - Face
G/ - Grid
EV - Envelope Violation
RC - Rod Clips
BJFS - Bulge Joint Failure Susceptible

Prepared	Date	Loaded	Date
Reviewed	Date	Checked	Date
Reviewed	Date	Checked	Date
Approved	Date		

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
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References

Fuel Assembly Burnup

Calculation PA-0213, Revision 0, January 2004
Calculation PA-0217, Revision 0, October 2004

Burnable Poison Rod Assembly Burnup

Technical Report NE-1458, Revision 0, January, 2006
Calculation PM-1094, Revision 0, January 2006

Fuel Assembly Decay Heat

Calculation PA-0213, Revision 0, January 2004
Calculation PA-0217, Revision 0, October 2004

Burnable Poison Rod Assembly Decay Heat

Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 5
Calculation PA-0187, Revision 0, January 2002

Fuel Assembly Days Since Discharge

Calculation PA-0213, Revision 0, January 2004
Calculation PA-0217, Revision 0, October 2004

Burnable Poison Rod Assembly Days Since Discharge

Technical Report NE-1458, Revision 0, January, 2006

Fuel Rod Pressure

Calculation PA-0213, Revision 0, January 2004
Calculation PA-0217, Revision 0, October 2004
Criteria: Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 5

Gamma and Neutron Emission Rates

Calculation PA-0213, Revision 0, January 2004
Calculation PA-0217, Revision 0, October 2004

Fuel Assembly and Insert Component Weight

Fuel Performance Analysis Manual, Part VI, Chapter C, Revision 5

NORTH ANNA ISFSI FUEL ASSEMBLY/INSERT COMPONENT CERTIFICATION
REVISION 0
TN-32, NUMBER 49
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Uranium Content & Fuel Assembly Initial Enrichment

DOE/NRC Form 741, YLM-XJW, Transaction Number 000090, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000091, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000087, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000089, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000088, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000122, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000147, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000144, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000145, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000146, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000157, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000158, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000156, Correction 1
DOE/NRC Form 741, YLM-XJW, Transaction Number 000150, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000152, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000151, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000155, Correction 0
DOE/NRC Form 741, YLM-XJW, Transaction Number 000154, Correction 0

Fuel Integrity

1. Technical Report NE-838, Revision 0,
"North Anna 1 Cycle 8", Core Performance Report,May 1991.

2. Technical Report NE-1160, Revision 0; "Fuel Performance Evaluation of N2C12 and Cycle 12 to Cycle 13 Refueling Outage Activities", June 1998.

3. Technical Report NE-1138, Revision 0, Fuel Performance Evaluation of N1C12 and Cycle 12 to Cycle 13 Refueling Outage Activities, August 1997.

4. Technical Report NE-1186, Revision 0, "Fuel Performance Evaluation of North Anna 1 Cycle 13 and Cycle 13 to Cycle 14 Refueling Outage Activities", September 1999.