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BVY 02-98

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

Subject: **Vermont Yankee Nuclear Power Station**
License No. DPR-28 (Docket No. 50-271)
Vermont Yankee Cycle 23 Startup Test Report

The purpose of this letter is to submit the Vermont Yankee (VY) Cycle 23 Startup Test Report in accordance with section 6.7.A.1 of the VY Technical Requirements Manual.

We trust that the information provided is adequate; however, should you have questions or require additional information, please contact Mr. Jeffrey Meyer at (802) 258-4105.

Sincerely,

for

Gautam Sen
Manager, Licensing

Attachment

cc: USNRC Region 1 Administrator
USNRC Resident Inspector – VYNPS
USNRC Project Manager – VYNPS
Vermont Department of Public Service

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SUMMARY OF VERMONT YANKEE COMMITMENTS

BVY NO.: 02-98

The following table identifies commitments made in this document by Vermont Yankee. Any other actions discussed in the submittal represent intended or planned actions by Vermont Yankee. They are described to the NRC for the NRC's information and are not regulatory commitments. Please notify the Licensing Manager of any questions regarding this document or any associated commitments.

COMMITMENT	COMMITTED DATE OR "OUTAGE"
None	N/A

VYAPF 0058.04
AP 0058 Original

STARTUP TEST REPORT - VERMONT YANKEE CYCLE 23

In accordance with Vermont Yankee Technical Requirements Manual Section 6.7, this Startup Test Report is being submitted as a result of loading a new fuel bundle type, GE-14 (10x10 fuel bundle array). Since Cycle 20, Vermont Yankee has been loading the following fuel bundle designs, GE9B (8x8 fuel bundle design) and GE13 (9x9 fuel bundle design)

In accordance with USFAR Section 13.5.5, the following information is being provided in this Startup Test Report .

Overview:

Vermont Yankee Cycle 23 initial startup commenced on October 25, 2002 following a 21-day outage for refueling and maintenance activities. Steady state, full power conditions were reached on November 1, 2002.

The core loading for Cycle 23 consists of:

Quantity	Fuel Type	Description	Cycle loaded
24	GE-9B	GE9B-P8DWB335-10GZ-80M-150-T	18
72	GE-13	GE13-P9HTB380-12GZ-100T-146-T	20
40	GE-13	GE13-P9HTB379-13GZ-100T-146-T	20
88	GE-13	GE13-P9DTB386-11G4.0 / 1G3.0-100T-146-T-2425	22
16	GE-13	GE13-P9DTB225-NOG-100T-146-T-2570	22B (mid-cycle outage)
92	GE-14	GE14-P10DNAB394-7G5.0/6G4.0-100T-150-T-2538	23
16	GE-14	GE14-P10DNAB394-8G5.0/6G4.0-100T-150-T-2589	23
20	GE-14	GE14-P10DNAB394-12G5.0-100T-150-T-2590	23

During Cycle 23, Vermont Yankee replaced 152 GE9B and GE13 fuel bundles with 128 GE14 fuel bundles and 24 GE9B previously discharged GE9B fuel bundles. All fuel bundles loaded in Cycle 21 were discharged as a result of the fuel failures experienced during Cycle 22.

Core Verification:

An as-loaded Cycle 23 core map is included as Figure 1. Details of the Cycle 23 core loading are contained in the Global Nuclear Fuels (GNF) document 0000-0007-9764-CMR, " Cycle Management Report for Vermont Yankee Nuclear Power Station, Cycle 23", October 2002.

Vermont Yankee personnel verified the final as-loaded core loading on October 15, 2002 in accordance with Vermont Yankee procedure OP-1411 "Core Verification." The following criteria was checked and verified:

1. Proper bundle seating,
2. Proper bundle orientation,
3. Channel fastener integrity and upper tie plate cleanliness, and
4. Proper core loading (checking the serial number of each bundle against the final approved core-loading map). This verification was performed independently by two separate teams.

Process Computer Data Checks:

Process computer data evaluation checks were completed on October 21, 2002 in accordance with OP- 5401 "Data Shuffling and Data Checks for Process Computer at BOC." These checks included various manual and computer checks of the new data constants.

Control Rod Drive System Testing:

Control rod coupling and withdrawal speed verification was completed October 21, 2002 satisfactorily for all 89 control rods per OP-4111 "Control Rod Drive System Surveillance."

Single rod scram timing of all 89 control rods was completed on October 23, 2002 during the Reactor Hydrostatic Test in accordance with Vermont Yankee Technical Specification Section 4.3.C.1. All insertion times were within the limits defined in the Vermont Yankee Technical Specifications Section 3.3.C.1. In accordance with Vermont Yankee Technical Specification Section 4.3.C.2, the results of the testing are included in Table 1.

Shutdown Margin Testing:

The cold shutdown margin calculation was performed on October 25, 2002 using data collected during the in-sequence critical and information provided in GNF document 0000-0007-9764-CMR, " Cycle Management Report for Vermont Yankee Nuclear Power Station, Cycle 23", October 2002. In accordance with Vermont Yankee Technical Specifications (3.3.A.1), the minimum shutdown margin required is 0.38% $\Delta k/k$. The actual demonstrated shutdown margin was 1.148% $\Delta k/k$, as determined in accordance with OP-4430 "Reactivity Anomalies / Shutdown Margin Check."

In-Sequence Critical Eigenvalue:

The in-sequence critical test was performed on October 25, 2002 as part of the reactor startup. Control rod sequence 23-A-2 (1) was used to perform the in-sequence critical test. Criticality was achieved on the 1st rod in group 6 (22-27) at notch position 10. The moderator temperature was 143 °F. The actual cold critical rod pattern and the predicted critical rod configuration agreed within +/- 1% ΔK per OP-4430, "Reactivity Anomalies / Shutdown Margin Check."

LPRM Operability Check:

No LPRM's were replaced during the refueling outage. LPRM connection verification was performed satisfactorily in accordance with OP-4406, "LPRM Calibration and Functional Check". LPRM hi and low trip alarm set points were verified before startup.

The local power range monitors were manually calibrated twice (October 29, 2002 @~80% CTP and November 6, 2002 @~100% CTP) in accordance with OP 2425, "Core Power Distribution Calculation Utilizing The TIP System." The TIPs and LPRMs were both functionally tested and found to operate satisfactorily.

APRM Calibration:

In accordance with Vermont Yankee Technical Specification Section 2.1.A, APRM gain adjustments were performed as required in accordance with OP 4400 "Calibration of the Average Power Range Monitoring System to Core Thermal Power." In addition, APRM gain adjustments were performed throughout the reactor startup.

Core Performance Evaluations:

In accordance with Vermont Yankee Technical Specification Section 3.11, the core maximum fraction of limiting critical power ratio (MFLCPR), core maximum fraction of limiting power density (CMFLPD), maximum average planar linear heat generation rate ratio to its limit (MAPRAT) were all checked within 12 hours of reaching 25% CTP.

All checks of core thermal limits were within the limits specified in the Vermont Yankee Technical Specifications.

At approximately 50, 75 and 100 percent power levels, the process computer heat balance was compared with an off-line computer calculation. In accordance with OP 2409 "Operating Data Collection and Evaluation" and OP 2410 "Reactor Core Thermal Power Evaluation," the values of core thermal power from each method were found to be in excellent agreement (within 5 Megawatts thermal).

Core flow calibration was completed on November 14, 2002 in accordance with OP 2429 "Recirculation Flow System Baseline Data Collection and Instrument Calibration" and OP 2440 "Reactor Core Flow Determination" to ensure that the core flow calculation by the process computer is accurate over the entire operating range.

Process Computer Power Distribution:

The plant process computer power distribution was updated twice (October 29, 2002 @~80% CTP and November 6, 2002 @~100% CTP) using the traversing in-core probe (TIP) system during the ascent to full power.

The process computer power distribution update performed after reaching steady state conditions was used as a basis for comparison with an off line calculation performed using GENIE (Panacea off-line model) and SIMULATE-3.

The axial power distribution is documented in Table 2 and the relative radial power distribution is documented in Table 3. The results are within 2%, which is acceptable.

TIP Reproducibility and TIP Symmetry:

TIP system reproducibility was checked in conjunction with the power distribution update. The TIP system traces were reproducible to within 2.3%.

With the introduction of GE14, TIP axial alignment (space dips) was not performed.

The total TIP uncertainty was calculated from the November 6, 2002 TIP set in accordance with OP 4455, "TIP Uncertainty." The resulting total TIP uncertainty for this case was 1.107%, which is below the 8.7% acceptance criteria.

TABLE 1

CONTROL ROD SCRAM TESTING RESULTS
VERMONT YANKEE BEGINNING OF CYCLE 23

Scram Number: 206
Single Rod Scram testing performed on October 23, 2002
Reactor Pressure: 1017 Psia
Reactor Power: 0%

Full Core Average - Number Of Rods Averaged: 89

Dropout Position	Avg. Scram Time	Admin. Limit	Pass/Fail
46	0.289	0.347	PASS

Dropout From Notch Position	Average Scram Insertion Time	Tech. Spec. Criteria 3.3.C.1.1	Pass /Fail	Tech. Spec Criteria 3.3.C.1.2	Pass/Fail
46	0.289	0.358	PASS	0.358	PASS
36	0.794	0.912	PASS	1.096	PASS
26	1.317	1.468	PASS	1.860	PASS
6	2.405	2.686	PASS	3.419	PASS

Slowest 2X2 Average Summary for Each % Insertion *

Dropout Position	2 X 2 Average *	Admin. Limit	Pass/Fail
46	0.296	0.368	PASS

Notch and Array Number	2 X 2 Average* Insertion time	Tech. Spec. Criteria 3.3.C.1.1	Pass /Fail	Tech. Spec. Criteria 3.3.C.1.2	Pass/ Fail
46 16	0.296	0.379	PASS	0.379	PASS
36 15	0.810	0.967	PASS	1.164	PASS
26 14	1.344	1.556	PASS	1.971	PASS
6 14	2.448	2.848	PASS	3.624	PASS

* The 2X2 Averages consist of the slowest arithmetic average of the three fastest rods in a 2X2 array.

Slowest Single Rod

Dropout Position	Rod Id.	Scram Time	Tech. Spec. Criteria 3.3.C.2.	Pass/ Fail
6	2227	2.604	7.000	PASS

TABLE 2

CORE AVERAGE AXIAL POWER DISTRIBUTION
COMPARISON BETWEEN PROCESS COMPUTER (3D MONICORE) AND SIMULATE-3
VERMONT YANKEE BEGINNING OF CYCLE 23

Node	3D	Simulate
25	0.064	0.100
24	0.233	0.240
23	0.466	0.460
22	0.591	0.590
21	0.691	0.680
20	0.758	0.750
19	0.824	0.830
18	0.915	0.920
17	0.962	0.960
16	1.015	1.020
15	1.081	1.090
14	1.188	1.190
13	1.228	1.240
12	1.280	1.290
11	1.318	1.320
10	1.347	1.360
9	1.389	1.410
8	1.414	1.420
7	1.389	1.390
6	1.408	1.390
5	1.426	1.380
4	1.384	1.300
3	1.252	1.170
2	0.942	0.900
1	0.438	0.240

TABLE 3

RELATIVE RADIAL POWER DISTRIBUTION
COMPARISON BETWEEN PROCESS COMPUTER (3D MONICORE) AND SIMULATE-3
VERMONT YANKEE BEGINNING OF CYCLE 23

Location	3D	Simulate
23-22	0.879	0.888
19-24	1.374	1.340
15-14	1.296	1.275
17-32	1.345	1.338
29-36	1.303	1.289
39-12	0.275	0.31

FIGURE 1
VERMONT YANKEE CYCLE 23 CORE MAP

North

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	35	37	39	41	43
44									YJA102	YJM511	[illegible]	[illegible]	YJM540	YJA104								
42								YJA058	[illegible]	YJZ308	YJZ278	YJZ290	YJZ282	[illegible]	YJA044							
40					YJA075	[illegible]	[illegible]	[illegible]	JLE721	YJZ356	JLC505	JLC506	YJZ329	JLE722	[illegible]	[illegible]	[illegible]	YJA110				
38				YJM531	YJM522	YJZ270	YJZ349	JLE737	YJZ294	JLC509	[illegible]	[illegible]	JLC510	YJZ301	JLE738	YJZ274	YJZ326	YJM520	YJM506			
36			YJA076	YJM521	JLC513	YJZ276	JLE741	YJZ322	JLC517	YJZ334	JLC521	JLC522	YJZ320	JLC518	YJZ287	JLE742	YJZ275	JLC514	YJM529	YJA049		
34			[illegible]	YJZ269	YJZ311	JLC525	[illegible]	JLC529	[illegible]	JLC533	[illegible]	[illegible]	JLC534	[illegible]	JLC530	[illegible]	JLC526	YJZ312	YJZ328	[illegible]		
32			[illegible]	YJZ351	JLE745	[illegible]	JLE749	YJZ321	JLC537	YJZ336	JLE725	JLE726	YJZ300	JLC538	YJZ288	JLE750	[illegible]	JLE746	YJZ350	[illegible]		
30		YJA057	[illegible]	JLE753	YJZ307	JLC541	YJZ337	JLC545	YJM534	JLC549	JLE306	JLE308	JLC550	YJM536	JLC546	YJZ316	JLC542	YJZ286	JLE754	[illegible]	YJA100	
28	YJA092	[illegible]	JLE729	YJZ341	JLC553	[illegible]	JLC557	YJM503	JLC561	YJM525	JLC565	JLC566	YJM527	JLC562	YJM504	JLC558	[illegible]	JLC554	YJZ318	JLE730	[illegible]	YJA089
26	YJM539	YJZ281	YJZ333	JLC569	YJZ299	JLC573	YJZ297	JLC577	YJM528	JLC581	JLE298	JLE297	JLC582	YJM526	JLC578	YJZ344	JLC574	YJZ340	JLC570	YJZ330	YJZ284	YJM509
24	[illegible]	YJZ280	JLC585	[illegible]	JLC589	[illegible]	JLE733	JLE305	JLC593	JLE310	YJM507	YJM523	JLE312	JLC594	JLE307	JLE734	[illegible]	JLC590	[illegible]	JLC586	YJZ277	[illegible]
22	[illegible]	YJZ279	JLC587	[illegible]	JLC591	[illegible]	JLE735	JLE302	JLC595	JLE299	YJM524	YJM508	JLE311	JLC596	JLE301	JLE736	[illegible]	JLC592	[illegible]	JLC588	YJZ289	[illegible]
20	YJM537	YJZ319	YJZ346	JLC571	YJZ347	JLC575	YJZ298	JLC579	YJM515	JLC583	JLE300	JLE309	JLC584	YJM513	JLC580	YJZ345	JLC576	YJZ293	JLC572	YJZ354	YJZ315	YJM538
18	YJA103	[illegible]	JLE731	YJZ304	JLC555	[illegible]	JLC559	YJM502	JLC563	YJM516	JLC567	JLC568	YJM514	JLC564	YJM501	JLC560	[illegible]	JLC556	YJZ314	JLE732	[illegible]	YJA090
16		YJA087	[illegible]	JLE755	YJZ343	JLC543	YJZ313	JLC547	YJM533	JLC551	JLE304	JLE303	JLC552	YJM535	JLC548	YJZ339	JLC544	YJZ335	JLE756	[illegible]	YJA085	
14			[illegible]	YJZ352	JLE747	[illegible]	JLE751	YJZ303	JLC539	YJZ342	JLE727	JLE728	YJZ331	JLC540	YJZ302	JLE752	[illegible]	JLE748	YJZ324	[illegible]		
12			[illegible]	YJZ327	YJZ310	JLC527	[illegible]	JLC531	[illegible]	JLC535	[illegible]	[illegible]	JLC536	[illegible]	JLC532	[illegible]	JLC528	YJZ309	YJZ271	[illegible]		
10			YJA073	YJM518	JLC515	YJZ355	JLE743	YJZ285	JLC519	YJZ338	JLC523	JLC524	YJZ317	JLC520	YJZ306	JLE744	YJZ353	JLC516	YJM532	YJA097		
8				YJM505	YJM530	YJZ272	YJZ273	JLE739	YJZ305	JLC511	[illegible]	[illegible]	JLC512	YJZ296	JLE740	YJZ323	YJZ325	YJM517	YJM519			
6					YJA043	[illegible]	[illegible]	[illegible]	JLE723	YJZ348	JLC507	JLC508	YJZ332	JLE724	[illegible]	[illegible]	[illegible]	YJA050				
4								YJA052	[illegible]	YJZ283	YJZ292	YJZ291	YJZ295	[illegible]	YJA074							
2									YJA101	YJM510	[illegible]	[illegible]	YJM512	YJA091								

YJM ***	—	Cycle 20
[illegible]	—	Cycle 20
YJZ ***	—	Cycle 22
JLE ***	—	Cycle 22B
JLC ***	—	Cycle 23 (7G5 0/6G4 0) - 92 bundles
JLE ***	—	Cycle 23 (8G5 0/6G4 0) - 16 bundles
JLE ***	—	Cycle 23 (12G5 0) - 20 bundles
YJA ***	—	Cycle 23 Re-Inserts (Cycle 18 Reload Bundles)

Prepared By *Original Signed* / Sept 23, 2002
Chip Dean

Verified By *Original Signed* / Sept 30, 2002
Dorry Crager