Startup Test Report

Indian Point Nuclear Generating Unit No. 3

Power Authority of the State of New York

Consolidated Edison Company of New York, Inc.

November, 1976

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REVISION 1
INSTRUCTION SHEET

Remove	Insert
Title Page	Title Page
viii	viii
3-1	3-1
3-9	3-9
5-7	5-7
5-10	5-10
	C-7a (Appendix C)

LIST OF TABLES

3.0 PRE-CRITICALITY TESTS

3.1 INITIAL CORE LOADING

Prior to initial core loading, the reactor vessel water boron concentration was established at about 2,070 ppm. Throughout the core loading sequence, periodic measurements of the boron concentration were performed to verify that the boron concentration was greater than the required 2,000 ppm. Core loading was accomplished by adding fuel assemblies to the vessel following the prescribed sequence shown in Figure 3.1. ICRR data obtained from the NIS source range channels and temporary detectors are presented in Figures 3.2 and 3.3. There were no unexpected changes in core reactivity during the loading of the fuel assemblies.

In Table 3.1 the final plant source range detector data and core conditions for the fully loaded core are summarized.

3.2 INCORE THERMOCOUPLE (T/C) AND RTD CALIBRATION

The Incore T/C System consists of 65 thermocouples to measure fuel assembly coolant outlet temperatures at pre-determined locations in the core, as shown in Figure 1.2. The RTD's (Resistance Temperature Detectors) are located in the RCS loops and are designed to provide extreme accuracy in the normal operating temperature band. Each RCS loop contains two manifolds each of which contains two narrow range RTD's, in addition to a wide range RTD installed in both the hot and cold legs.

The test was undertaken to provide a functional checkout and the cross-calibration data for Incore T/C's and RTD's.

Temperature measurements at reference temperatures of approximately 250°F, 350°F, 450°F, 540°F and 547°F were obtained. Both the Prodac output and the Honeywell correction factors showed no larger than 5°F deviations from the true temperature for all T/C's except three (T/C's located at E-4, B-8 and R-5) which were found to be defective. In the case of RTD's a correction factor for all above reference temperatures of no more than 2.2°F for Narrow Range and 4.4°F for Wide Range was found. Three RTD's (#421A, #431A and 431B) were found to be defective and were replaced. A calibration of these replaced RTD showed a correction factor of no more than 1.9°F from the true temperature at 550°F. Results for RTD's and T/C's are shown in Tables 3.2 and 3.3, respectively. 1

Table 3.2

RTD Correction Factor
True Temp = 550°F

RTD Number	Type	CF
410A	NR	+0.7
411A	NR	-2.2
413A	WR	+2.4
410B	NR	+0.7
411B	NR	-0.9
413B	WR	+1.8
420A	NR	0.0
421A	NR	+1.8
423A	WR	+2.7
420B	NR	+0.6
421B	NR	-1.9
423B	WR	+2.4
430A	NR	+0.1
431A	NR	+1.9
433A	WR	+2.4
430B	NR	-0.4
431B	NR	+0.5
433B	WR	+1.6
440A	NR	+0.5
441A	NR	+0.6
443A	WR	+2.8
440B	NR	+0.6
441B	NR	+0.2
443B	WR	+2.8

CF = True Temp - Measured Temperature
NR = Narrow Range
WR = Wide Range

1

E. No manual intervention should be required to bring plant conditions to equilibrium values following the transient

Numerous retests were required after the control systems were adjusted. The steam generator high level trip stepoint was increased from 70% to 75% to help eliminate the occurrence of a high level trip during large load transients.

A review of the test results for the load rejection from 75% power revealed that all the acceptance criteria were met and the test results were approved.

During the performance of a 50% step load reduction from 100% power test no. 31 heater drain pump tripped causing a main boiler feed pump speed runback. This necessitated the operator to take manual control of the main boiler feed pump speed controls. This condition has been reviewed and since the time frame during which this action was performed is consistent with safe and orderly plant operations and was a non-safety related manual operator action, the results of the 50% load reduction test from 100% power were found to be acceptable. 1

Tables C-7 and C-7A (of Appendix C) show the initial, maximum, minimum and final values for the various parameters occuring during the tests.

5.10 UNIT TRIP TESTS

5.10.1 Plant Trip Test From 50% Power INT - TP-9.5

The plant trip test from 50% power was conducted May 15, 1976. The objectives of the test were to verify the ability of the primary and secondary plant to sustain a trip from 50% power and bring the plant to a stable condition following the trip, determine the overall response time of the reactor coolant hot leg resistance temperature detectors, and adjust control system setpoints to improve transient response based on actual plant conditions.

The primary and secondary plant reacted to the plant trip as expected with the pressurizer level reaching a slightly lower level than expected (.4% lower than the expected minimum). The pressurizer level controller was readjusted to help optimize its response in the future.

The reactor coolant hot leg resistance temperature detectors response time was measured to be 8.5 seconds which was less than the maximum allowable limit of 9.8 seconds.

All acceptance criteria of the test was satisfied and the overall performance of the plant was as expected. Table C-8 (of Appendix C) shows the initial, maximim, minimum and final values for the various parameters occurring during the test.

5.12 STEAM GENERATOR MOISTURE CARRYOVER INT-TP-10.2

The purpose of this test is to determine the moisture carryover of the steam generators at 100% and 90% power by adding a radioactive tracer-sodium 24 (Na_{24}) - to the steam generators and comparing the concentrations of Na_{24} in the steam generator blowdown samples, main steam samples and feedwater samples. This method of testing is compatible with the all volatile treatment (AVT) chemistry control incorporated at Indian Point Station Unit No. 3. 1

The results have been reviewed and were found acceptable with the average moisture carryover being calculated to be 0.192% at 99% power and 0.044% at 90% power.

TEST 50% LOAD REDUCTION FROM 100% POWER

TIME AND DATE: 1830 hr. 7/21/76

50% Load Rejection from 100% Power

PLANT PARAMETER	TAG NO.	INITIAL CONDITION	DURING TRANSIENT MINIMUM	DURING TRANSIENT MAXIMUM	FINAL CONDITION
Plant Operating Level (MWe-Gross)	XXXX	960	XXXXX	XXXXX	430
Power - Nuclear (%)	NR-44	100	50	100	50
T_{avg} (Auctioneered) (°F)	TR-412	565	553	577.5	554.5
T_{ref} (°F)	TR-412	565.5	XXXXX	XXXXX	556
ΔT (°F)	TR-411	52.5	26.5	52.5	26.5
ΔT Overpower Setpoint (°F)	TR-411	56	XXXXX	XXXXX	56
ΔT Overtemperature Setpoint (°F)	TR-411	65.5	XXXXX	XXXXX	57
Pressurizer Pressure (psig)	PR-455	2245.5	2103.5	2293.5	2105.5
Pressurizer Level (%)	LR-459	48	34	65	34
Steam Header Pressure (psig)	PI-404	705	705	920	820
Steam Flow - Loop 31 (LB/HR)	FR-417	3.1×10^6	XXXXX	XXXXX	1.4×10^6
Steam Flow - Loop 32 (LB/HR)	FR-427	3.2×10^6	XXXXX	XXXXX	1.4×10^6
Steam Flow - Loop 33 (LB/HR)	FR-437	3.2×10^6	XXXXX	XXXXX	1.4×10^6
Steam Flow - Loop 34 (LB/HR)	FR-447	3.2×10^6	XXXXX	XXXXX	1.4×10^6
Steam Generator Level-Loop 31 (%)	LT-417C	48	37	60	48
Steam Generator Level-Loop 32 (%)	LT-427C	47	37	60	47
Steam Generator Level-Loop 33 (%)	LT-437C	46	36	59	46
Steam Generator Level-Loop 34 (%)	LT-447C	49	35	60	45
Feedwater Temperature-Loop 31 (°F)	Computer	406.2	XXXXX	XXXXX	356.5
Feedwater Temperature-Loop 32 (°F)	Computer	405.2	XXXXX	XXXXX	353.8
Feedwater Temperature-Loop 33 (°F)	Computer	405.5	XXXXX	XXXXX	355.2
Feedwater Temperature-Loop 34 (°F)	Computer	406.2	XXXXX	XXXXX	355.7
Feedwater Flow - Loop 31 (LB/HR)	FR-417	3.1×10^6	XXXXX	XXXXX	1.4×10^6
Feedwater Flow - Loop 32 (LB/HR)	FR-427	3.1×10^6	XXXXX	XXXXX	1.4×10^6
Feedwater Flow - Loop 33 (LB/HR)	FR-437	3.05×10^6	XXXXX	XXXXX	1.4×10^6
Feedwater Flow - Loop 34 (LB/HR)	FR-447	3.1×10^6	XXXXX	XXXXX	1.4×10^6
Feed Pump Disch. Hdr. Press. (psig)	PI-408A	860	860	1120	1050
Feedwater Pump #1 Speed (RPM)	SC-408	4500	3900	4700	3900
Feedwater Pump #2 Speed (RPM)	SC-409	4750	4100	4900	4100
Control Rod Pos.-Bank C (Steps)	Digital Step	228	XXXXX	XXXXX	215
Control Rod Pos.-Bank D (Steps)		212	XXXXX	XXXXX	87
Channel 41 ΔI		-4	XXXXX	XXXXX	-13
Boron Concentration (PPM)	Log Book	950	XXXXX	XXXXX	950

Time to reach equilibrium following load changer: 12 minutes.