EPRI-NP--552

DE83 901934

Core Design and Operating Data for Quad Cities 1 Cycle 3

NP-552
Research Project 497-1

Interim Report, March 1983

Prepared by

GENERAL ELECTRIC COMPANY
Nuclear Energy Systems Division
175 Curtner Avenue
San Jose, California 95125

Principal Investigator
N. H. Larsen

Prepared for

Electric Power Research Institute
3412 Hillview Avenue
Palo Alto, California 94304

EPRI Project Manager
B. A. Zolotar

Materials and Corrosion Program
Nuclear Power Division

ORDERING INFORMATION

Requests for copies of this report should be directed to Research Reports Center (RRC), Box 50490, Palo Alto, CA 94303, (415) 965-4081. There is no charge for reports requested by EPRI member utilities and affiliates, U.S. utility associations, U.S. government agencies (federal, state, and local), media, and foreign organizations with which EPRI has an information exchange agreement. On request, RRC will send a catalog of EPRI reports.

NOTICE

Prepared by
General Electric Company
San Jose, California

EPRI PERSPECTIVE

PROJECT DESCRIPTION

During the early 1970s, reprocessing of spent fuel to recover plutonium for use in mixed-oxide fuel was an option, and EPRI sponsored several projects to improve understanding of fuel performance and neutronics. The General Electric Company Quad Cities project is the last to be completed, and the fuel has achieved the longest time in reactor and the highest burnup (energy extraction). Additional mixed-oxide projects have not been undertaken because of the low probability that plutonium recycle will occur in the United States in the next decade.

PROJECT OBJECTIVE

This project is intended to generate data that verify (1) fuel performance characteristics (e.g., Zircaloy corrosion and fuel fission gas release), (2) BWR safety limits, and (3) isotope production and decay. These data would provide support for the use of recycle plutonium in water reactors.

PROJECT RESULTS

This report for RP497-1 provides detailed information on the fuel design; core characteristics; and third-cycle loading pattern, thermal-hydraulic history, power history, and control rod configuration. EPRI Topical Report NP-240 provided similar information for Cycles 1 and 2. Subsequent reports provide similar information on later cycles, fuel performance (e.g., fission gas release), and neutronics (e.g., isotopic analysis). This information is of interest to engineers involved in the design, analysis, or evaluation of core and fuel performance.

David Franklin, Program Manager
Nuclear Power Division

ABSTRACT

This report contains the design and operating data needed to define the fuel characteristics and reactor operation characteristics for Cycle 3 of the Quad Cities 1 reactor. The purpose is to provide reference quality data for use in the qualification of reactor core analysis methods and to provide the basis for the assessment of the irradiation environment of the plutonium recycle assemblies present.

The design data include fuel assembly description, core component arrangements, and core loading patterns. Hydraulic characteristics of the assemblies and the inlet orifices are also provided. Operating data are compiled for steady-state points during Cycle 3. Each state point includes core average exposure, thermal power, pressure, flux, inlet subcooling, control configuration, and axial in-core detector readings.

This report should be used with EPRI Topical Report NP-240 for a complete description of the first three cycles of operation. Certain data presented in this report update and clarify Cycle 1 and Cycle 2 information.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

LIST OF DATA SETS

1. INTRODUCTION

Under RP497-1 General Electric Company agreed to provide the design and operating data needed to define the fuel characteristics and reactor operating characteristics for Cycles 1, 2, and 3 of the Quad Cities 1 reactor. The compilation of these data for Cycles 1 and 2 has been completed and reported in EPRI NP-240 (Reference 1). This topical report furnishes the additional data for Cycle 3. Additional data are also included which update and clarify Cycles 1 and 2 information.

The fuel and core design data were extracted from appropriate reports and drawings and, in general, all of the data requested is provided. Almost all of the operating data provided was obtained directly from process computer output edits. Although some of the data requested was not available, the data provided in this report and Reference 1 together provide a relatively complete definition of the operation of the reactor through Cycles 1, 2, and 3.

2. DISCUSSION

2.1 CORE AND FUEL DESIGN DATA FOR QUAD CITIES 1 CYCLE 3

2.1.1 Fuel Assembly Descriptions

At the end of Cycle 2, 156 assemblies were discharged and replaced with 104 assemblies identical to the 8x8 reload 1 (except 12 had finger spring seals on the lower tie plate); and 52 assemblies of the same geometry as the 8x8 reload 1 (except with a 2.62 wt % average enrichment). The design data for the 2.62 wt % bundle is included as Figure 2-1.

A fuel assembly lattice drawing, including detailed dimensions for all of the 8x8 reload 1 and reload 2 assemblies is included as Figure 2-2.

Table 2-1 summarizes, for all reload fuel, the rod arrays, fuel rod pitch, rod-to-channel spacing, gap thicknesses, control augmentation characteristics, U weights, channel characteristics, and water to UO_2 volume ratios.

Table 2-2 provides core loading, assembly pitch, fuel pin pitch, spacer data, average fuel compositions, and fuel weights for all of the fuel assemblies during Cycles 1, 2, and 3.

Table 2-3 includes pellet and stack densities, Gd_2O_3 and UO_2 pellet length, pellet outside diameter (o.d.), cladding o.d., cladding thickness, and gas plenum length for the new 8x8 fuel type inserted in Cycle 3.

Table 2-4 includes spacer weights, end plug weights, upper and lower tie plate weights, fission gas plenum material weights, the alloy compositions recommended for nuclear analyses, and spacer placement identification for all assembly types. Fission gas plenum weights reported in Reference 1 have been corrected.

Figures 2-3 and 2-4 are assembly detail drawings for the new 8x8 2.50% enriched fuel containing finger springs, and the new 2.62% enriched fuel.

Figure 2-5 shows a drawing of the spacer capture rod for the initial 7x7 fuel. The purpose of this rod is to provide a locking tab which "captures" the fuel rod spacers to hold them in their designed axial position. This is accomplished by an end plug connector that contains a fork design which catches a tab on the spacer. The fuel rod is thus segmented into eight segments for the seven spacers. Fission gas may travel from segment to segment by means of a hole in the center of the connector plugs. For the 8x8 assemblies, the water rod is also the spacer capture rod. In this case, the capture mechanism is simply welded to the tube, which is the same as the cladding for the fuel rods. Holes are provided at the bottom and top of the water rod to provide water flow and little or no boiling inside the tube.

2.1.2 Core Descriptions

Table 2-5 identifies the total number of fuel assemblies, number of fuel assembly types, heat transfer surface area, total weight of U in the core, etc., for Cycles 1, 2, and 3.

Table 2-6 presents the bundle type and identification core loading array for Cycle 3.

Figure 2-6 shows the core orificing zones and nuclear instrument locations for Cycles 1, 2, and 3.

2.1.3 Thermal Hydraulics

The hydraulic characteristics of 7x7 and 8x8 fuel assemblies are presented in Figures 2-7 to 2-10 as functions of active coolant flow, active coolant power and subcooling. These data may be applied over a pressure range of 1035 ± 100 psia. Bundle pressure drop is somewhat insensitive to axial power distribution. The data are based on a distribution peaked at the middle with a peak-to-average value of 1.5. With a bundle flow of 130×10^5 lb/hr, bottom-peaked axial

(3/8 point of active fuel length) will yield a pressure drop about 0.66 psi larger. A top-peaked axial yields essentially the same pressure drop as the middle peaked axial.

The pressure drop characteristics of the central and peripheral region orifices are presented as functions of active coolant flow on Figures 2-11 through 2-14. These Figures should replace those in Reference 1, and are valid for Cycles 1, 2, and 3.

The total core bypass flow rates for Cycles 1, 2, and 3 are presented in Figures 2-15, 2-16, and 2-17, respectively.

2.1.4 Instrumentation Data

The TIP data are the full power adjusted, commonly normalized TIP readings at 6-in. intervals up the length of the assembly. They were obtained directly from the process computer, and no adjustments, other than the full power and common position normalization, have been applied. The experimentally determined common position normalization is applied to normalize the data from the different TIP machines so that they produce the same readings when operated in the common position. Figure 2-6 shows the core location and coordinate identification of the TIP strings. The position of the TIP is in the water gap outside the fuel channels in the LPRM instrument assembly as described in Reference 1. A complete description of the TIP along with the other in-core neutron monitoring systems can be found in Reference 2.

The TIP measures the axial neutron flux distribution in the water gap by use of a 1-in. long U-235 fission chamber attached to a cable and motor which allows the chamber to be positioned at any point along the axial length of up to 10 core positions for each TIP machine. There are five TIP machines in the Quad Cities-1 reactor. The TIP values reported in the data sets for 6-in. intervals represent the weighted average value of seven measurements made at 1-in. intervals (five interior measurements which are given twice the weighting as the two end points). A total of 143 measurements is made for each core position resulting in 24 values of 6 in. each.

2.2 OPERATING DATA FOR QUAD CITIES 1 CYCLE 3

2.2.1 Rod Withdrawal Sequences

Figures 2-18 to 2-21 present the rod withdrawal sequences for Quad Cities 1 Cycle 3.

2.2.2 Benchmark Operating Data for Cycles 2 and 3

Due to hardware problems during the last 1-1/2 months of Cycle 2 operation, one of the five TIP machines in the core failed to operate. Thus, the last two TIP data sets dated December 19, 1975 and December 31, 1975 were incomplete and were not included in Reference 1. The locations missing were 16-41, 24-41, 08-49, 40-49, 24-57, 32-57, and 40-57. These locations are shown in Figure 2-6.

For General Electric evaluations, the missing TIP data were created by applying the known asymmetries from the November 13, 1975 (data set 27) complete TIP data set to the symmetric location readings for both the incomplete sets. The complete TIP sets are documented here as data sets 28 and 29.

Data sets 30 to 37 contain the reactor data for eight selected operating states during Cycle 3. Each data set except no. 31 and 32 contains the following data: date, core average exposure, core thermal power, dome pressure, core flow, inlet subcooling, control configuration, and complete axial TIP distribution data for all 41 LPRM string locations. The TIP data read from the bottom to the top of core; i.e., the first entry is for the bottom 6-in. node. Exposure can be accumulated by using the calculated core power distribution for each of the data sets provided to advance to the next operating state. When a control rod sequence change is encountered between data sets, the exposure may be advanced to the sequence exchange date, and the data set after the exchange used to advance the exposure to the date of the data set immediately following the exchange date. Experience has shown that taking exposure steps finer than 700 MWd/t does not significantly add to the tracking accuracy (see Table 2-7).

All of these data were taken during steady-state operation. The reactor had been operating for at least 48 hours with essentially constant power, flow, and rod pattern before the data were accumulated.

Core thermal power, inlet subcooling, and recirculation flow rate are important to the reactor data evaluation. The values for these items were taken directly from process computer PI output. The PI output does not contain the detailed data used to calculate the output values and the detailed data are normally not available from the plant data (i.e., special edits must be requested or special readings taken). Therefore, the detailed data cannot be provided. However, the method used by the process computer to compute the values is given here.

2.2.2.1 Core Thermal Power

The core thermal power is obtained from the process computer which writes an energy balance on a system composed of the reactor vessel, recirculation loop piping, and cleanup demineralizer piping. Flows entering the system are the reactor feedwater flow, which is assumed to enter in two branches, and the control rod drive system flow. The only flow assumed to be leaving the system is the primary steam flow. Nonflow power inputs are the fission power (core thermal power) and recirculation pumping power; nonflow power losses are the radiative power loss and the net power transferred across the boundary of the cleanup demineralizer loop. Analytically, the energy balance is:

$$\text{Core Power, MWt} = \frac{W_{fw}\,(h_s - h_{fw}) + W_{cr}\,(h_s - h_{cr})}{C_1} + Q_{cu} + Q_r - Q_p$$

where:

W_{fw} = feedwater flow rate entering reactor at top of downcomer, Mlb/hr

h_s = enthalpy of steam leaving the reactor vessel, Btu/lb

h_{fw} = feedwater enthalpy, Btu/lb

W_{cr} = control rod drive system flow, Mlb/hr

h_{cr} = enthalpy of control rod drive system flow, Btu/lb

Q_p = power added to downcomer fluid by recirculation pumps, MW

Q_r = radiative power loss, MW

Q_{cu} = power removed from downcomer fluid by cleanup demineralizer system, MW

C_1 = conversion constant = 3.413 MBtu/MWh

2.2.2.2 Core Inlet Subcooling

The core inlet subcooling is obtained from the process computer by writing an energy balance on the core downcomer (the volume between the core shroud and the vessel wall, and including the external recirculation and cleanup loops) yielding:

$$W_T\,h_o = W_{r\ell}\,h_f + W_{rs}\,h_g + W_{fw}\,h_{fw} + W_{cr}\,h_{cr} + (Q_p - Q_{cu})\,C_1$$

where:

W_T = flow rate entering core inlet plenum, Mlb/hr

h_o = core inlet enthalpy (enthalpy of W_T), Btu/lb

$W_{r\ell}$ = flow rate of saturated liquid entering downcomer, Mlb/hr

h_f = saturated liquid enthalpy, Btu/lb

W_{rs} = flow rate of saturated steam entering downcomer (i.e., "carryunder"), Mlb/hr

h_g = saturated steam enthalpy, Btu/lb

and other terms are defined as above.

The total flow entering the inlet plenum is:

$$W_T = W_{r\ell} + W_{rs} + W_{fw} + W_{cr}$$

2.2.2.3 *Recirculation Flow*

The recirculation flow is monitored by the process computer by direct measurement of differential pressure across the jet pump diffusers. The flow rate of each jet pump is proportional to the square root of the pressure differential and the total flow rate is the sum of the 20 individual jet pump flow rates.

2.3 OPERATING DATA SUMMARY

Figures 2-22 to 2-34 present operating data summaries for each month during Cycle 3. The data presented include daily values of power level, flow, subcooling, and rod notch inventory (rod notches inserted). The rod notch inventory is the sum of the number of rod notches inserted for all the control blades.

Table 2-1
RELOAD FUEL DESCRIPTION

	UO_2 7x7	UO_2, 8x8 RELOAD 1 & 2	UO_2, 8x8 RELOAD 2
Fuel Assembly			
Number of Fuel Assemblies per Batch	0 to 60	0 to 140*	0 to 52
Fuel Rod Array	7x7	8x8	8x8
Fuel Rod Pitch, in.	0.738	0.640	0.640
Peripheral-Rod-to-Channel Spacing, in.	0.1435	0.1525	0.1525
1/2 Width of Wide Water Gap, in.	0.375	0.375	0.375
1/2 Width of Narrow Water Gap, in.	0.188	0.188	0.188
Cladding Length, in.	156	156	156
Bundle Average Enrichment (wt % U-235 in total U)	2.30	2.50	2.62
Control Augmentation			
Type	Fuel Rods Containing Gd_2O_3		
Number	3	4	4
Control Length, in.	144	144	144
Control Material	2.5% Gd_2O_3	1.5% Gd_2O_3	1.5% Gd_2O_3
Locations	In Fuel Lattice		
Weight of U per Fuel Assembly			
lb	412.7	404.6	404.6
kg	187.2	183.5	183.5
Channel			
Outside Dimensions, in.	5.438x5.438	5.438x5.438	5.438x5.438
Thickness, in.	0.080	0.080	0.080
Inside Corner Radius, in.	0.40	0.40	0.40
Material	Zr-4	Zr-4	Zr-4
Water/UO_2 Volume Ratio (cold)	2.43	2.60	2.60

*12 bundles have finger spring seals on lower tie plate.

Table 2-2
FUEL ASSEMBLY DATA

	Initial 7x7					Reload		7x7 MO_2 Special	
	3 Gd		2 Gd		7x7	8x8	8x8	5 Gd	3 Gd
	Dished	Undished	Dished	Undished		Undished		Undished	
Assembly Type	1a	1b	2a	2b	3	4	7	5	6
No. of Assemblies, Initial Core	185	127	276	136	0	0	0	0	0
No. of Assemblies, Cycle 2	164	115	251	130	23	36	0	4	1
No. of Assemblies, Cycle 3	109	98	196	101	23	140*	52	4	1
Geometry	7x7	7x7	7x7	7x7	7x7	8x8	8x8	7x7	7x7
Assembly Pitch, in.	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Fuel Rod Pitch	0.738	0.738	0.738	0.738	0.738	0.640	0.640	0.738	0.738
Fuel Rods per Assembly	49	49	49	49	49	63	63	49	49
Instrument Rods per Assembly	0	0	0	0	0	0	0	0	0
Water Rods per Assembly	0	0	0	0	0	1	1	0	0
Burnable Poison Positions	3	3	2	2	3	4	4	5	3
No. of Spacer Grids	7	7	7	7	7	7	7	7	7
Inconel per Grid, lb	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102
Zr-4 per Grid, lb	0.537	0.537	0.537	0.537	0.537	0.614	0.614	0.537	0.537
Spacer Width, in.	1.625	1.625	1.625	1.625	1.625	1.625	1.625	1.625	1.625
Assembly Average Fuel Composition									
Gd_2O_3, gm	269	269	260	260	324	196	196	645	324
UO_2, kg	218.05	222.97	218.07	222.98	212.36	208.19	208.19	208.67	209.79
PuO_2, gm	0	0	0	0	0	0	0	1454	1124
Total Fuel, kg	218.32	223.24	218.33	223.24	212.69	208.38	208.38	210.76	211.24

*12 of these assemblies contain finger spring seals on lower tie plate.

Table 2-3
ASSEMBLY TYPE 7 DENSITY, LENGTH, etc., DATA

ASSEMBLY TYPE 7

Rod Type	No. of Rods	Pellet Density UO_2 (gm/cc)	Pellet Density $UO_2 + Gd_2O_3$ (gm/cc)	Stack Density (gm/cc)	Gd_2O_3 (gm)	UO_2 (gm)	Stack Length (in.)
1	40	10.42	–	10.32	0	3309	144
2	14	10.42	–	10.32	0	3309	144
3	4	10.42	–	10.32	0	3309	144
4	1	10.42	–	10.32	0	3309	144
5	4	–	10.35	10.25	49	3239	144
6	1	–	–	–	0	0	–

Pellet o.d. = 0.416 in., all rods
Cladding = Zircaloy-2, 0.493-in. o.d. x 0.034-in. wall, all rods

Water rod has holes drilled top and bottom to provide water flow and little or no boiling.

Gd_2O_3 in rod type 5 runs full 144 inches
Gas plenum length = 11.24 inches

Table 2-4
FUEL ASSEMBLY HARDWARE WEIGHTS PER BUNDLE

	7x7 Initial Assemblies		7x7 Reload Assemblies		8x8 Reload Assemblies Without Finger Springs		8x8 Reload Assemblies With Finger Springs	
	Quantity	Pounds	Quantity	Pounds	Quantity	Pounds	Quantity	Pounds
Spacers								
Zircaloy-4	7	3.757	7	3.757	7	4.299	7	4.299
Inconel	112	0.717	112	0.717	112	0.717	112	0.717
End Plugs								
Zircaloy-2	98	3.565	98	3.565	128	4.098	128	4.098
Lower Tie Plate								
Type-304 Stainless Steel	1	9.614	1	9.614	1	10.516	1	10.516
Inconel Springs							4	0.106
Upper Tie Plate Assembly with Hardware								
Type-304 Stainless Steel	1	4.514	1	4.222	1	4.409	1	4.409
Fission Gas Plenum								
Spring, Type-304 Stainless Steel	49	2.386	49	2.386	63	2.432	63	2.432
Getter, Zirconium Alloy	49	0.972	49	0.990	63	1.360	63	1.360

Wt % Alloy Compositios for Nuclear Analyses

Metal	Zircaloy-2	Zircaloy-4	Type-304 Stainless Steel	Inconel-X
Zr	98.30	98.24		
Fe	0.14	0.21	67.34	9.0
Sn	1.40	1.45		
Ni	0.06		9.50	70.0
Cr	0.10	0.10	19.50	16.77
Ti				2.50
Mn			1.50	0.50
C			0.08	0.03
Si			2.00	0.30
S			0.04	
P			0.04	
A1				0.90

Spacer Placement

There are seven spacers in the initial and reload fuel assemblies. Their center positions above the bottom of the active fuel in inches are 18.5, 38.0, 57.5, 77.0, 96.5, 116.0, and 135.5. Each spacer is 1.625 in. long.

Table 2-5
CORE DESCRIPTION

	Cycle 1	Cycle 2	Cycle 3
Total Number of Fuel Assemblies	724	724	724
Number of Fuel Assembly Types	4	8	9
Number of Fuel Assemblies of Each Type	See Table 2-2	See Table 2-2	See Table 2-2
Total Number of Control Elements	177	177	177
Number of Control Element Types	1	1	1
Number of Control Elements of Each Type	177	177	177
Total Number of In-core Flux Monitors	41	41	41
Heat Transfer Surface Area, ft^2	62,747	63,140	64,841
Total Weight of U in Core, short tons	154.7	154.0	152.3
Core			
Core Lattice Pitch, in.	12.0	12.0	12.0
Water/UO_2 Volume Ratio (cold)	2.452	2.458	2.489

Table 2-6
CYCLE 3 BUNDLE TYPES AND IDENTIFICATION

CX 001 to CX 126	7x7	UO_2	2.12 wt %	Undished with Gd_2O_3 in Three Rods
CX 134 to CX 309	7x7	UO_2	2.12 wt %	Dished with Gd_2O_3 in Three Rods
CX 313 to CX 448	7x7	UO_2	2.12 wt %	Undished with Gd_2O_3 in Two Rods
CX 499 to CX 723	7x7	UO_2	2.12 wt %	Dished with Gd_2O_3 in Two Rods
GEB 087 to GEB 156	7x7	UO_2	2.30 wt %	Undished with Gd_2O_3 in Three Rods
GEH 001 to GEH 040	8x8	UO_2	2.50 wt %	Undished with Gd_2O_3 in Four Rods
GEB 158 to GEB 161	7x7	MO_2	2.71 wt %	Undished with Gd_2O_3 in Five Rods
GEB 162	7x7	MO_2	2.51 wt %	Undished with Gd_2O_3 in Three Rods
LJ2530 – LJ2621	8x8	UO_2	2.50 wt %	Undished with Gd_2O_3 in Four Rods
LJ2622 – LJ2673	8x8	UO_2	2.62 wt %	Undished with Gd_2O_3 in Four Rods
LJ0154 LJ1724 LJ0159 LJ1735 LJ0165 LJ1752 LJ1699 LJ1753 LJ1713 LJ1754 LJ1715 LJ1756	8x8	UO_2	2.50 wt %	Undished with Gd_2O_3 in Four Rods and Having Finger Spring Seals

Table 2-6 (Cont.)

BUNDLE IDENTIFICATION

I / J	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1											CX0342	CX0030	CX0507	CX0166	CX0279
2										CX0307	CX0334	CX0134	GEB123	CX0070	CX0103
3							CX0519	CX0326	CX0305	CX0550	LJ2646	CX0468	LJ2670	CX0232	CX0612
4						CX0393	CX0031	CX0363	CX0386	CX0081	CX0567	LJ1724	CX0175	LJ2588	CX0716
5					CX0072	CX0371	CX0059	CX0542	LJ2659	CX0637	LJ2662	CX0139	GEH023	CX0117	GEH016
6				CX0376	CX0012	CX0083	CX0658	LJ2654	CX0167	LJ2534	CX0484	LJ2564	CX0303	LJ2592	CX0602
7			GEB162	CX0422	CX0113	CX0490	LJ2673	CX0184	LJ2629	CX0321	CX0718	CX0343	CX0691	CX0069	GEH027
8			CX0213	CX0690	CX0514	LJ2634	CX0705	LJ1713	CX0471	LJ2574	CX0695	LJ2616	CX0111	LJ2538	CX0619
9			CX0186	CX0053	LJ2633	CX0248	LJ2669	CX0614	CX0286	CX0488	CX0661	CX0336	CX0517	CX0333	GEH002
10		CX0183	CX0253	CX0095	CX0285	LJ2560	CX0137	LJ2568	CX0126	LJ2571	CX0078	LJ2621	CX0364	LJ2554	CX0603
11	CX0021	CX0100	LJ2626	CX0659	LJ2644	CX0148	CX0584	CX0387	CX0546	CX0025	GEH021	CX0382	CX0308	CX0367	GEB119
12	CX0006	CX0438	CX0551	LJ0154	CX0255	LJ2556	CX0353	LJ2575	CX0390	LJ2570	CX0375	LJ2582	CX0016	LJ2576	CX0177
13	CX0674	GEB135	LJ2625	CX0246	GEH031	CX0570	CX0644	CX0395	CX0501	CX0586	CX0629	CX0065	CX0531	CX0086	GEB149
14	CX0208	CX0720	CX0685	LJ2557	CX0461	LJ2589	CX0048	LJ2544	CX0399	LJ2573	CX0013	LJ2615	CX0368	LJ2535	CX0701
15	CX0223	CX0365	CX0579	CX0493	GEH012	CX0499	GEH004	CX0689	GEH024	CX0496	GEB143	CX0260	GEB137	CX0296	GEB161
16	CX0265	CX0033	CX0535	CX0687	GEH033	CX0636	GEH018	CX0723	GEH006	CX0571	GEB132	CX0181	GEB109	CX0152	GEB158
17	CX0485	CX0509	CX0280	LJ2566	CX0654	LJ2590	CX0372	LJ2547	CX0424	LJ2532	CX0068	LJ2562	CX0092	LJ2533	CX0495
18	CX0470	GEB142	LJ2638	CX0633	GEH032	CX0007	CX0539	CX0448	CX0478	CX0618	CX0562	CX0047	CX0510	CX0400	GEB126
19	CX0678	CX0119	CX0712	LJ0165	CX0179	LJ2567	CX0428	LJ2542	CX0341	LJ2546	CX0079	LJ2550	CX0019	LJ2586	CX0256
20	CX0582	CX0182	LJ2639	CX0564	LJ2645	CX0714	CX0620	CX0664	CX0534	CX0447	GEH009	CX0071	CX0710	CX0430	GEB106
21		CX0243	CX0425	CX0402	CX0178	LJ2545	CX0276	LJ2530	CX0443	LJ2541	CX0259	LJ2569	CX0332	LJ2595	CX0711
22			CX0281	CX0524	LJ2642	CX0262	LJ2623	CX0504	CX0634	CX0044	CX0608	CX0406	CX0625	CX0322	GEH007
23			CX0045	CX0417	CX0541	LJ2643	CX0576	LJ0159	CX0085	LJ2558	CX0032	LJ2552	CX0349	LJ2584	CX0703
24			CX0615	CX0120	CX0338	CX0500	LJ2637	CX0547	LJ2641	CX0366	CX0646	CX0150	CX0624	CX0317	GEH022
25				CX0392	CX0407	CX0039	CX0650	LJ2650	CX0237	LJ2553	CX0188	LJ2587	CX0191	LJ2611	CX0611
26					CX0060	CX0313	CX0439	CX0677	LJ2660	CX0205	LJ2651	CX0522	GEH040	CX0089	GEH034
27						CX0094	CX0385	CX0052	CX0011	CX0110	CX0508	LJ1754	CX0680	LJ2609	CX0463
28							CX0657	CX0394	CX0097	CX0003	LJ2652	CX0466	LJ2648	CX0273	CX0692
29										CX0180	CX0378	CX0289	GEB114	CX0421	CX0200
30											CX0481	CX0316	CX0486	CX0219	CX0268

Table 2-6 (Cont.)

BUNDLE IDENTIFICATION

I / J	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	CX0138	CX0252	CX0569	CX0196	CX0492										
2	CX0099	CX0577	CX0668	CX0304	CX0347	CX0295									
3	CX0561	CX0536	LJ2647	CX0641	LJ2661	CX0457	CX0239	CX0437	CX0545						
4	CX0675	LJ2598	CX0452	LJ1756	CX0709	CX0087	CX0351	CX0118	CX0010	CX0350					
5	GEH011	CX0096	GEH035	CX0617	LJ2636	CX0235	LJ2649	CX0676	CX0337	CX0066	CX0215				
6	CX0190	LJ2603	CX0124	LJ2572	CX0309	LJ2540	CX0210	LJ2653	CX0706	CX0038	CX0051	CX0217			
7	GEH019	CX0431	CX0528	CX0236	CX0699	CX0698	LJ2624	CX0621	LJ2635	CX0580	CX0185	CX0441	CX0529		
8	CX0671	LJ2578	CX0369	LJ2548	CX0708	LJ2605	CX0473	LJ1715	CX0475	LJ2668	CX0697	CX0432	CX0141		
9	GEH003	CX0054	CX0652	CX0037	CX0662	CX0283	CX0656	CX0631	LJ2627	CX0194	LJ2671	CX0101	CX0446		
10	CX0554	LJ2583	CX0319	LJ2561	CX0408	LJ2608	CX0413	LJ2620	CX0339	LJ2601	CX0221	CX0327	CX0123	CX0352	
11	GEB129	CX0001	CX0266	CX0107	GEH014	CX0158	CX0483	CX0315	CX0616	CX0275	LJ2658	CX0572	LJ2667	CX0082	CX0348
12	CX0263	LJ2602	CX0088	LJ2607	CX0506	LJ2543	CX0419	LJ2614	CX0056	LJ2619	CX0270	LJ1735	CX0518	CX0009	CX0024
13	GEB144	CX0080	CX0523	CX0427	CX0667	CX0525	CX0645	CX0344	CX0566	CX0467	GEH036	CX0230	LJ2631	GEB120	CX0238
14	CX0520	LJ2593	CX0005	LJ2531	CX0396	LJ2613	CX0067	LJ2599	CX0357	LJ2618	CX0026	LJ2537	CX0526	CX0036	CX0288
15	GEB159	CX0206	GEB113	CX0487	GEB110	CX0719	GEH005	CX0302	GEH008	CX0494	GEH017	CX0638	CX0622	CX0023	CX0585
16	GEB160	CX0171	GEB105	CX0464	GEB118	CX0593	GEH013	CX0143	GEH026	CX0665	GEH010	CX0557	CX0640	CX0383	CX0233
17	CX0145	LJ2581	CX0064	LJ2549	CX0388	LJ2596	CX0374	LJ2577	CX0102	LJ2617	CX0469	LJ2594	CX0173	CX0346	CX0298
18	GEB117	CX0015	CX0174	CX0323	CX0146	CX0681	CX0552	CX0328	CX0604	CX0450	GEH025	CX0163	LJ2665	GEB087	CX0140
19	CX0277	LJ2610	CX0418	LJ2606	CX0061	LJ2565	CX0091	LJ2579	CX0423	LJ2536	CX0197	LJ1699	CX0707	CX0465	CX0491
20	GEB130	CX0324	CX0696	CX0340	GEH030	CX0170	CX0597	CX0379	CX0607	CX0456	LJ2664	CX0673	LJ2666	CX0220	CX0632
21	CX0558	LJ2591	CX0426	LJ2559	CX0440	LJ2555	CX0004	LJ2580	CX0436	LJ2539	CX0257	CX0106	CX0156	CX0435	
22	GEH015	CX0125	CX0683	CX0058	CX0599	CX0300	CX0713	CX0476	LJ2628	CX0555	LJ2663	CX0717	CX0041		
23	CX0642	LJ2612	CX0112	LJ2563	CX0653	LJ2604	CX0513	LJ1752	CX0216	LJ2630	CX0503	CX0515	CX0135		
24	GEH028	CX0122	CX0449	CX0278	CX0559	CX0462	LJ2640	CX0222	LJ2632	CX0643	CX0115	CX0380	CX0682		
25	CX0628	LJ2597	CX0022	LJ2551	CX0227	LJ2585	CX0655	LJ2657	CX0626	CX0105	CX0077	CX0361			
26	GEH029	CX0578	GEH001	CX0241	LJ2672	CX0269	LJ2655	CX0598	CX0420	CX0104	CX0063				
27	CX0610	LJ2600	CX0543	LJ1753	CX0553	CX0002	CX0702	CX0043	CX0433	CX0416					
28	CX0648	CX0198	LJ2622	CX0497	LJ2656	CX0381	CX0203	CX0320	CX0688						
29	CX0335	CX0109	GEB156	CX0162	CX0014	CX0042									
30	CX0172	CX0609	CX0258	CX0329	CX0356										

Table 2-7
BURN STEP INFORMATION

EXPOSURE INTERVAL (mwd/t)	CONTROL ROD SEQUENCE	REACTOR DATA FROM DATA SET NUMBER
	Cycle 2	
11973 to 12348	All Rods Out	28
12348 to 12466	All Rods Out	29
	Cycle 3	
9350 to 9774	A	30
9774 to 10122	A	30
10122 to 10350	B	31
10350 to 10713	B	32
10713 to 11175	B	33
11175 to 11405	B	33
11405 to 11895	A	34
11895 to 12263	A	35
12263 to 12775	A	36
12775 to 12940	A	36
12940 to 13200	A	37
13200 to 13431	A	37

2.62 wt% U-235 BUNDLE AVERAGE

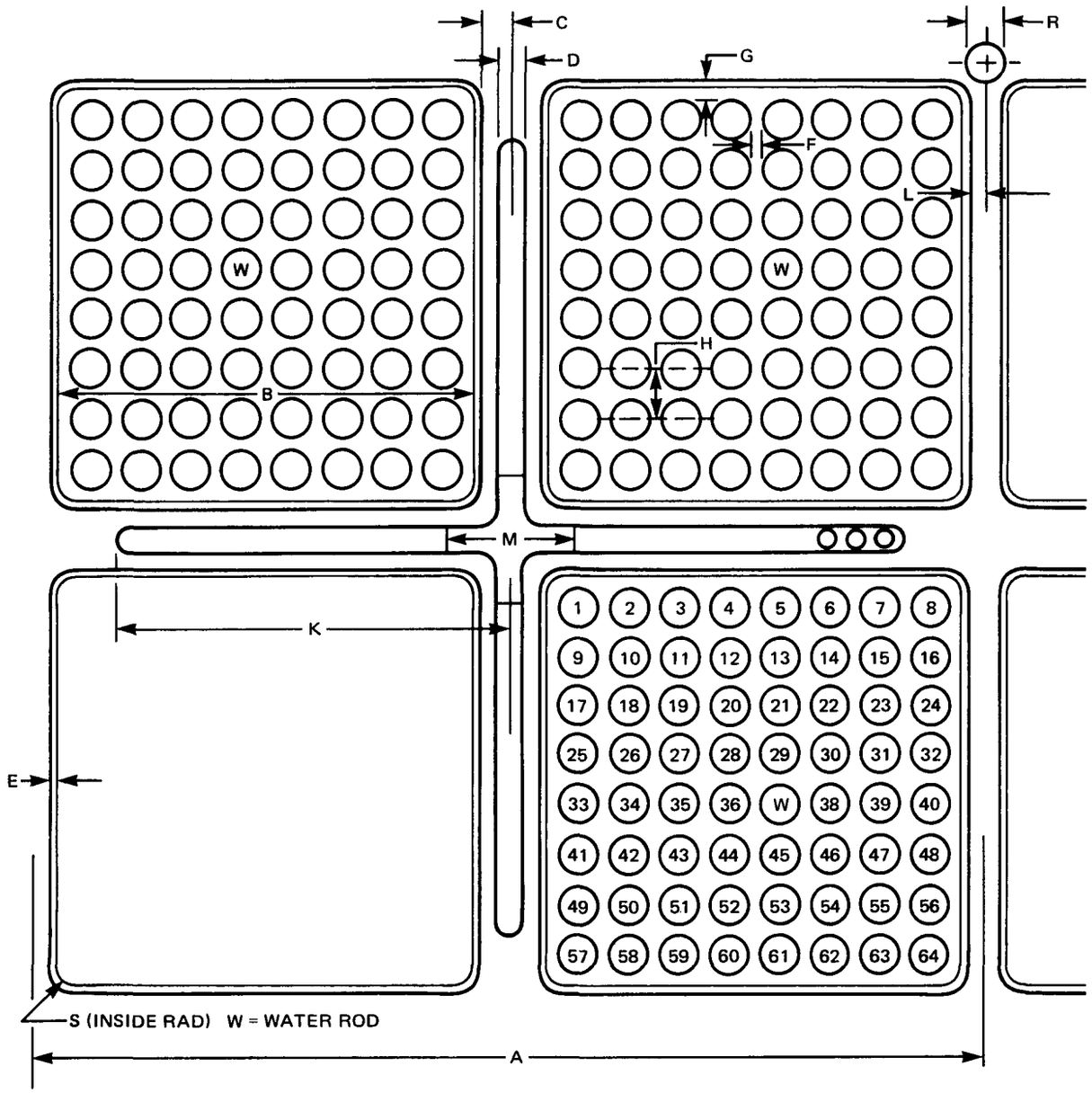
WIDE-WIDE CORNER

4	3	T 2	2	2	T 2	2	3
3	2	1	1	1	1	1	2
T 2	1	G 5	1	1	1	G 5	T 1
2	1	1	1	1	1	1	1
2	1	1	1	WS	1	1	1
T 2	1	1	1	1	1	1	T 1
2	1	G 5	1	1	1	G 5	1
3	2	T 1	1	1	T 1	1	2

ROD TYPE	ENRICHMENT wt% U-235	Gd_2O_3 wt%	NUMBER OF RODS
1	2.87	0	40
2	2.14	0	14
3	1.87	0	4
4	1.45	0	1
5	2.87	1.5	4
WS	–	0	1

WS – SPACER CAPTURE WATER ROD
T – TIE RODS
G – FULL LENGTH GADOLINIUM RODS

Figure 2-1. Bundle Design for 8 x 8 UO_2 Reload-2.



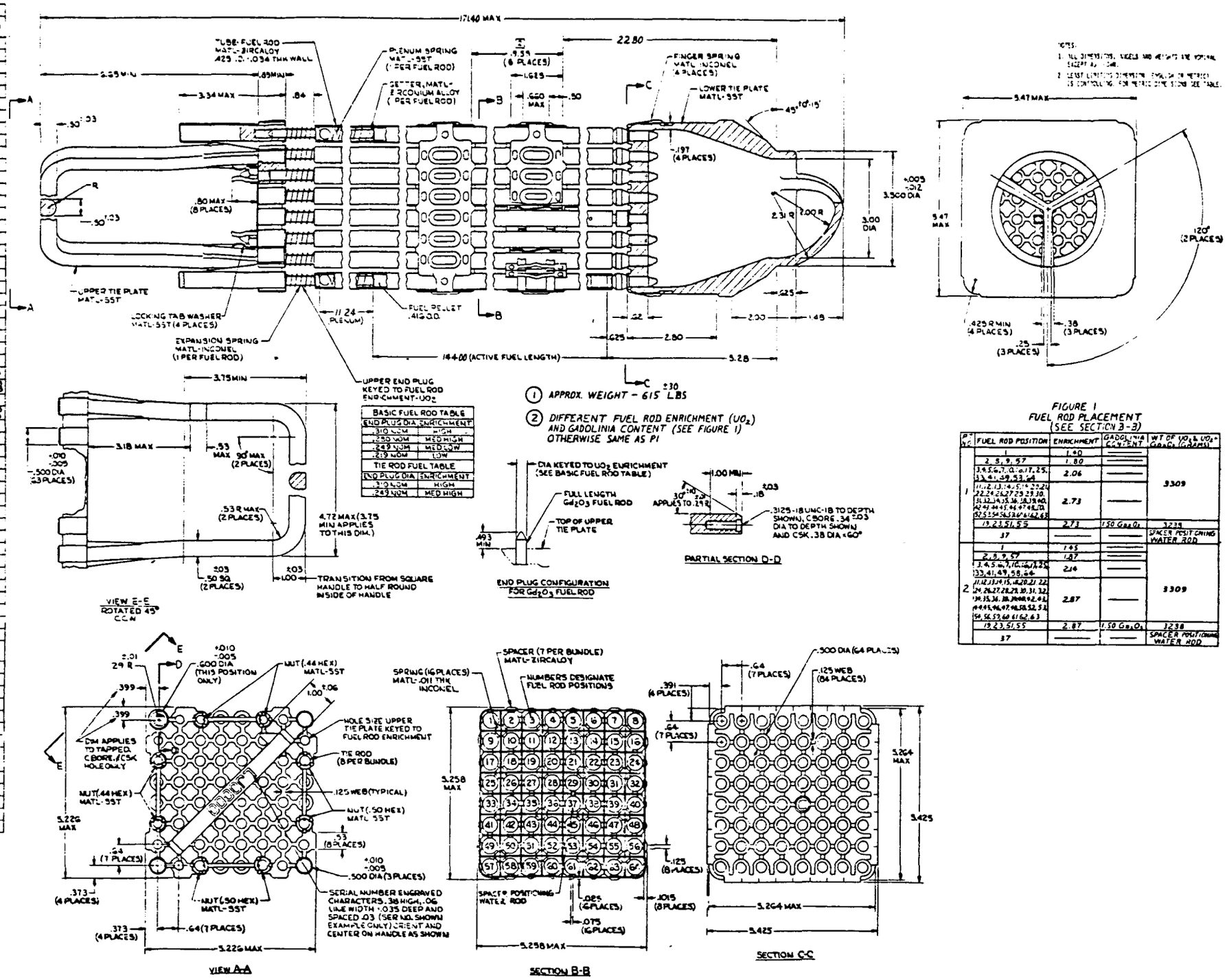
DIM IDENTIFICATION	A	B	C	D	E	F	G	H	I	J
DIM INCHES	12.0	5.278	0.375		0.080	0.147	0.1525	0.640		

DIM IDENTIFICATION	K	L	M					R	S	
DIM INCHES		0.187							0.400	

Figure 2-2. 8 x 8 Reload Fuel Assembly Lattice.

METRIC CONVERSION TABLE		
	NC-65	WILL METRIC
	.01	0.25
	.034	0.86
	.039	0.99
	.04	1.0
	.079	1.91
	.083	2.0
	.073	1.875
	.29	7.8
	.3[illegible]	[illegible]
	.37	9.30
	.23	5.96
	.249	6.32
	.25	6.3
	.233	7.11
	.2[illegible]	7.[illegible]
	.3[illegible]	7.87
	.3[illegible]	8.[illegible]
	.373	9.47
	.33	9.7
	.331	9.93
	.3[illegible]	10.13
	.[illegible]	10.97
	.423	0.79
	.[illegible]	11.2
	.493	2.53
	.50	3.7
	.500	12.70
	.500 +.03 -.03	12.7 +0.8 -0.8
	.500 +.009 -.004	12.70 +0.23 -0.13
	.53	13.4
	.600 +.03 -.03	15.24 +0.25 -0.13
	.62	15.7
	.625	15.88
	.64	16.26
	.660	16.76
	.80	20.3
	.83	21.3
	.85	21.5
	1.00	23.4
	1.00 +.03 -.06	25.4 +0.8 -1.5
	1.00 +.06 -.06	25.4 +1.5 -1.5
	1.49	37.6
	1.625	41.28
	2.00	50.8
	2.31	58.7
	2.80	[illegible]
	3.00	76.2
	3.18	80.7
	3.34	84.8
	3.500 +.005 -.012	88.90 +0.12 -0.30
	3.75	95.3
	4.72	119.9
	5.226	132.74
	5.258	133.55
	5.264	133.71
	5.28	134.1
	5.425	137.8
	5.47	138.9
	6.63	168.0
	11.24	285.5
	19.55	496.6
	22.80	579.1
	144.00	3657.6
	171.40	6353.5

RELATED WEIGHTS	
POUNDS	KILOGRAMS
615 ±10	279 ±5



BASIC FUEL ROD TABLE	
END PLUG DIA	ENRICHMENT
.310 NOM	HIGH
.280 NOM	MED HIGH
.249 NOM	MED LOW
.219 NOM	LOW
TIE ROD FUEL TABLE	
END PLUG DIA	ENRICHMENT
.310 NOM	HIGH
.249 NOM	MED HIGH

1. APPROX. WEIGHT - 615 LBS
2. DIFFERENT FUEL ROD ENRICHMENT (UO_2) AND GADOLINIA CONTENT (SEE FIGURE 1) OTHERWISE SAME AS P1

NOTES:
1. ALL DIMENSIONS, LOADS AND WEIGHTS ARE NOMINAL EXCEPT AS NOTED.
2. LEAST LIMITING DIMENSION, TOLERANCE OR METRIC IS CONTROLLING FOR METRIC CONVERSION SEE TABLE.

FIGURE 1
FUEL ROD PLACEMENT
(SEE SECTION 3-3)

PIN NO.	FUEL ROD POSITION	ENRICHMENT	GADOLINIA CONTENT	WT OF UO_2 & UO_2+ GRADE (GRAMS)
1	1	1.40	—	3309
	2,5,9,57	1.80	—	
	3,6,8,[illegible],49,53,64	2.06	—	
	[illegible]	2.73	—	
	19,23,51,55	2.73	1.50 Gd_2O_3	3239
	37	—	—	SPACER POSITIONING WATER ROD
2	1	1.65	—	3309
	2,5,9,57	1.87	—	
	3,4,5,6,7,10,[illegible]	2.16	—	
	[illegible]	2.87	—	
	19,23,51,55	2.87	1.50 Gd_2O_3	3238
	37	—	—	SPACER POSITIONING WATER ROD

Figure 2-3. Fuel Assembly Drawing for 2.50% Enriched 8 x 8 Reload Fuel with Finger Springs

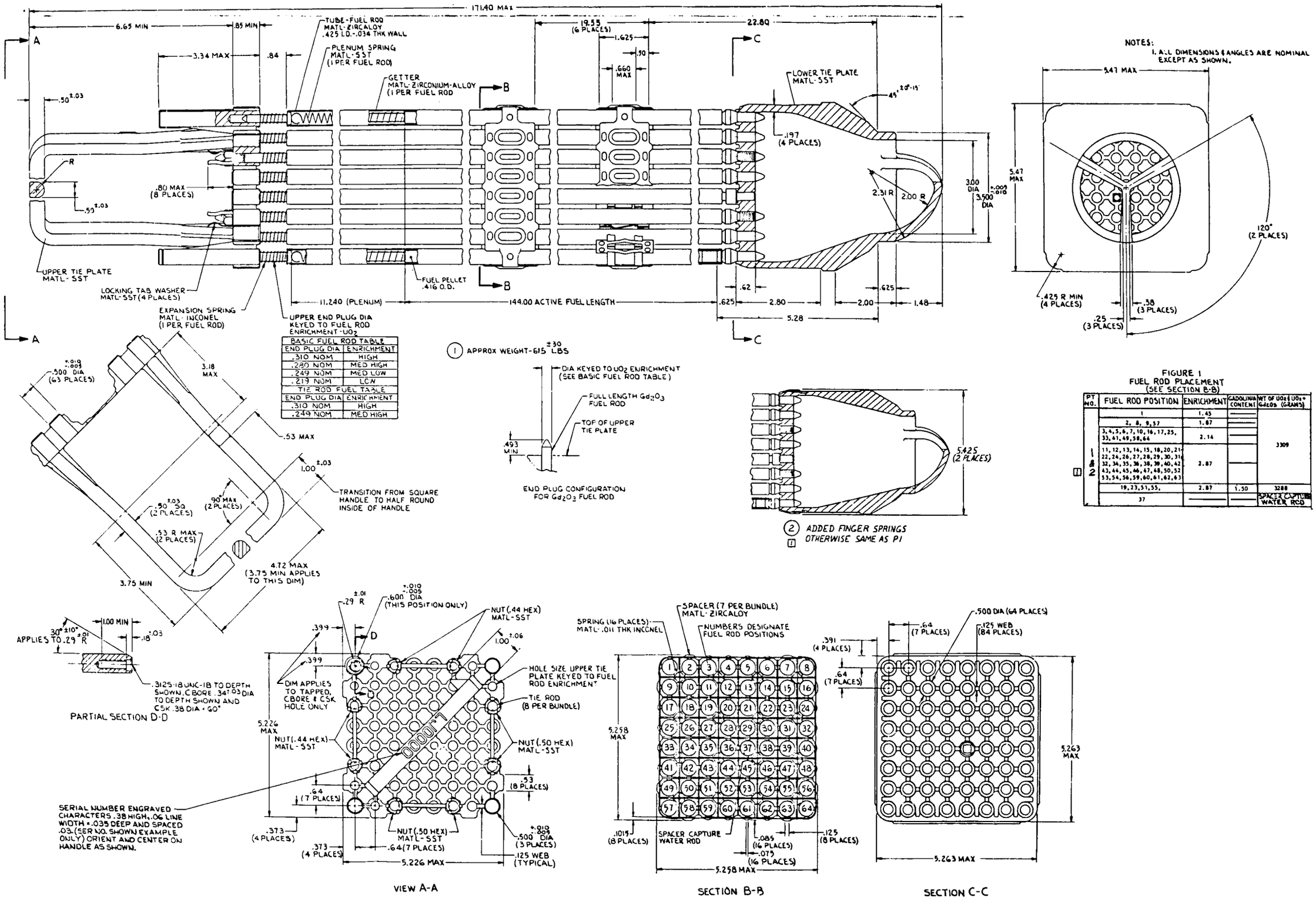
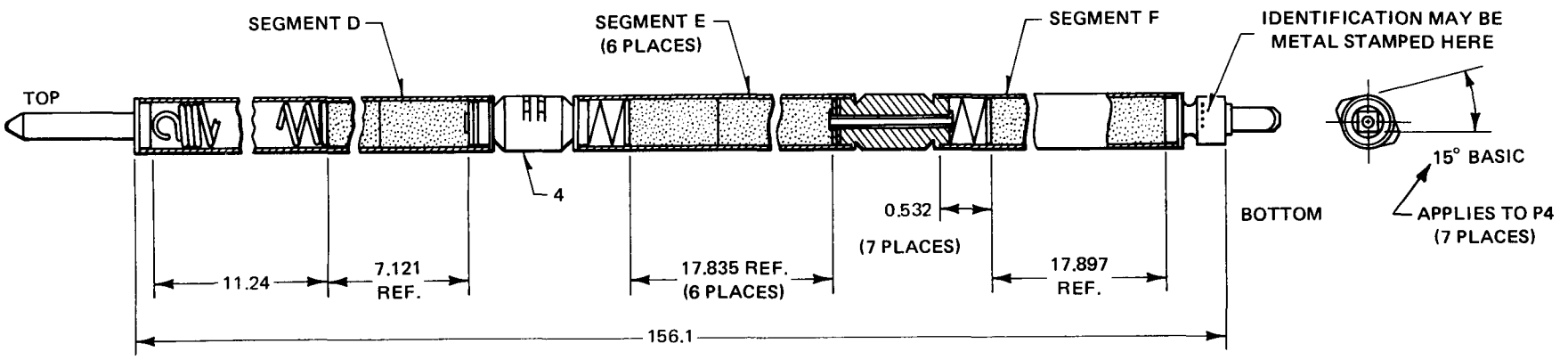


FIGURE 1
FUEL ROD PLACEMENT
(SEE SECTION B-B)

PT NO.	FUEL ROD POSITION	ENRICHMENT	GADOLINIA CONTENT	WT OF UO_2 & UO_2+ Gd_2O_3 (GRAMS)
1 & 2 [1]	1	1.45	—	3309
	2, 8, 9, 57	1.87	—	
	3, 4, 5, 6, 7, 10, 16, 17, 25, 33, 41, 49, 58, 64	2.14	—	
	11, 12, 13, 14, 15, 18, 20, 21, 22, 24, 26, 27, 28, 29, 30, 31, 32, 34, 35, 36, 38, 39, 40, 42, 43, 44, 45, 46, 47, 48, 50, 52, 53, 54, 56, 59, 60, 61, 62, 63	2.87	—	
	19, 23, 31, 55,	2.87	1.50	3288
	37	—	—	SPACER CAPTURE WATER ROD

Figure 2-4. Fuel Assembly Drawing for 2.62% Enriched 8 x 8 Reload Fuel



SEGMENT	WEIGHT OF UO_2 (grams)
D	226
E	565.4
F	567.4

Figure 2-5. Spacer Capture Rod for Initial Fuel.

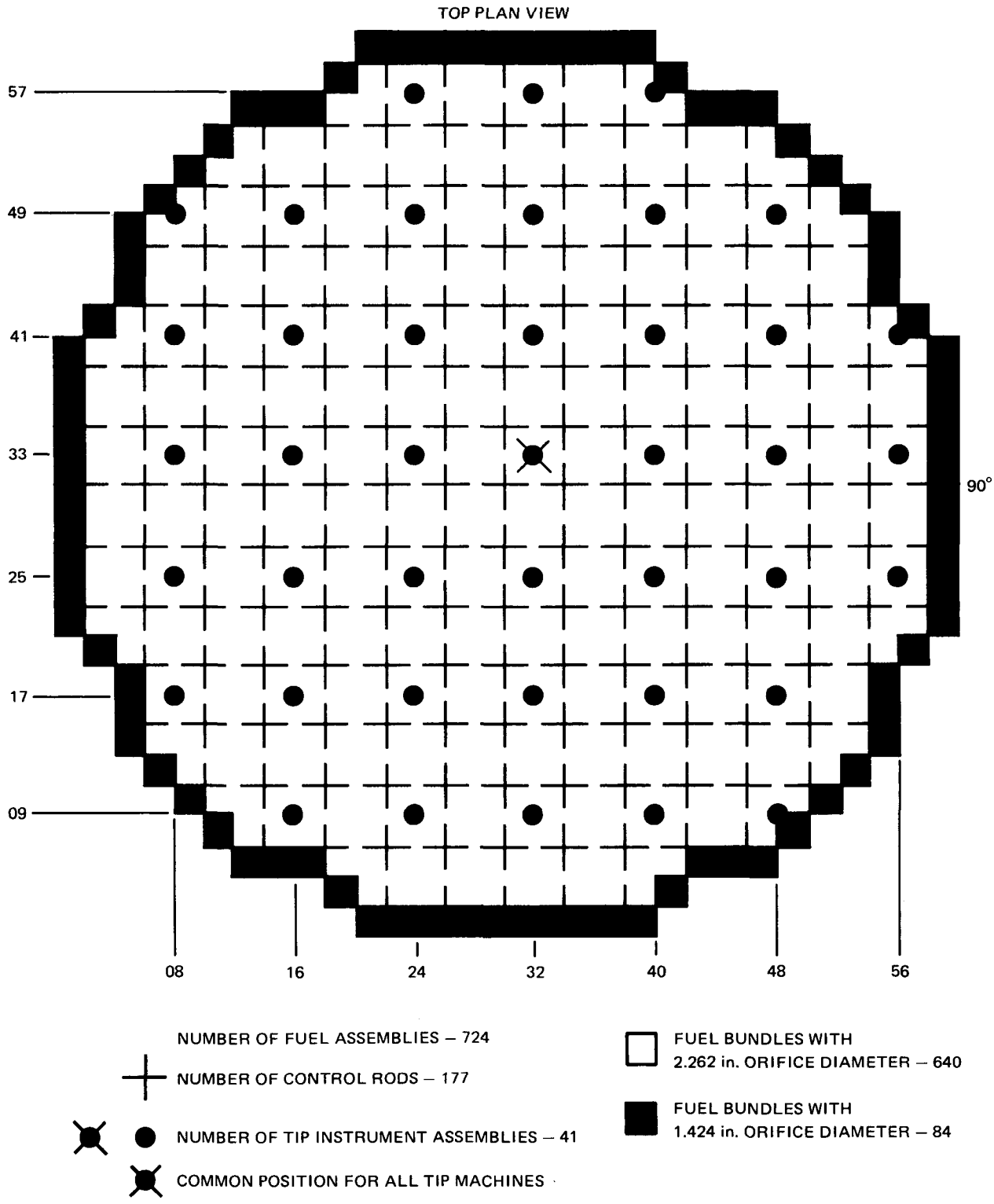


Figure 2-6. Core Orificing and Tip System Arrangement for Cycles 1, 2, and 3.

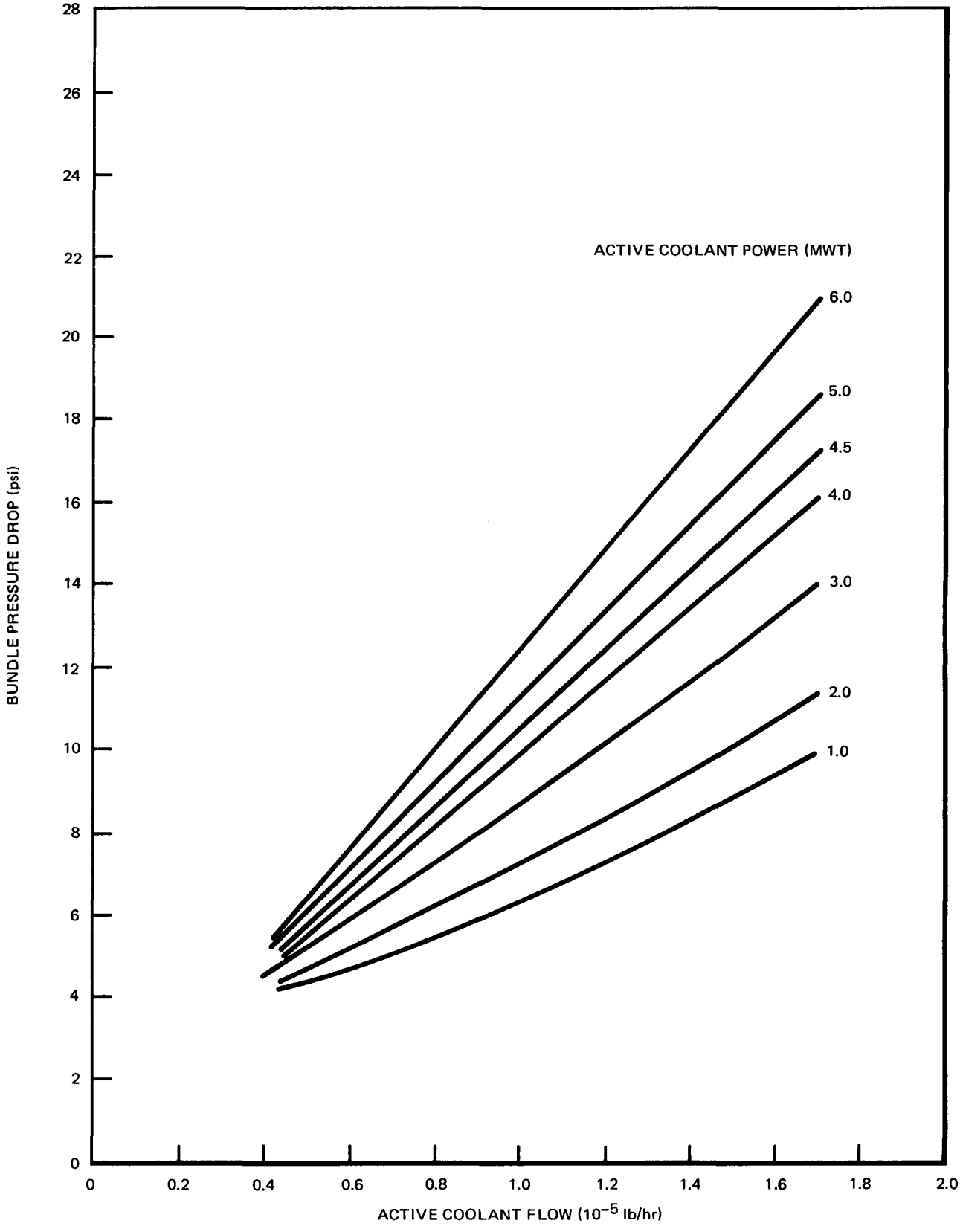


Figure 2-7. Flow Characteristics 7 x 7 Fuel Assemblies, 20 Btu/lb Subcooling.

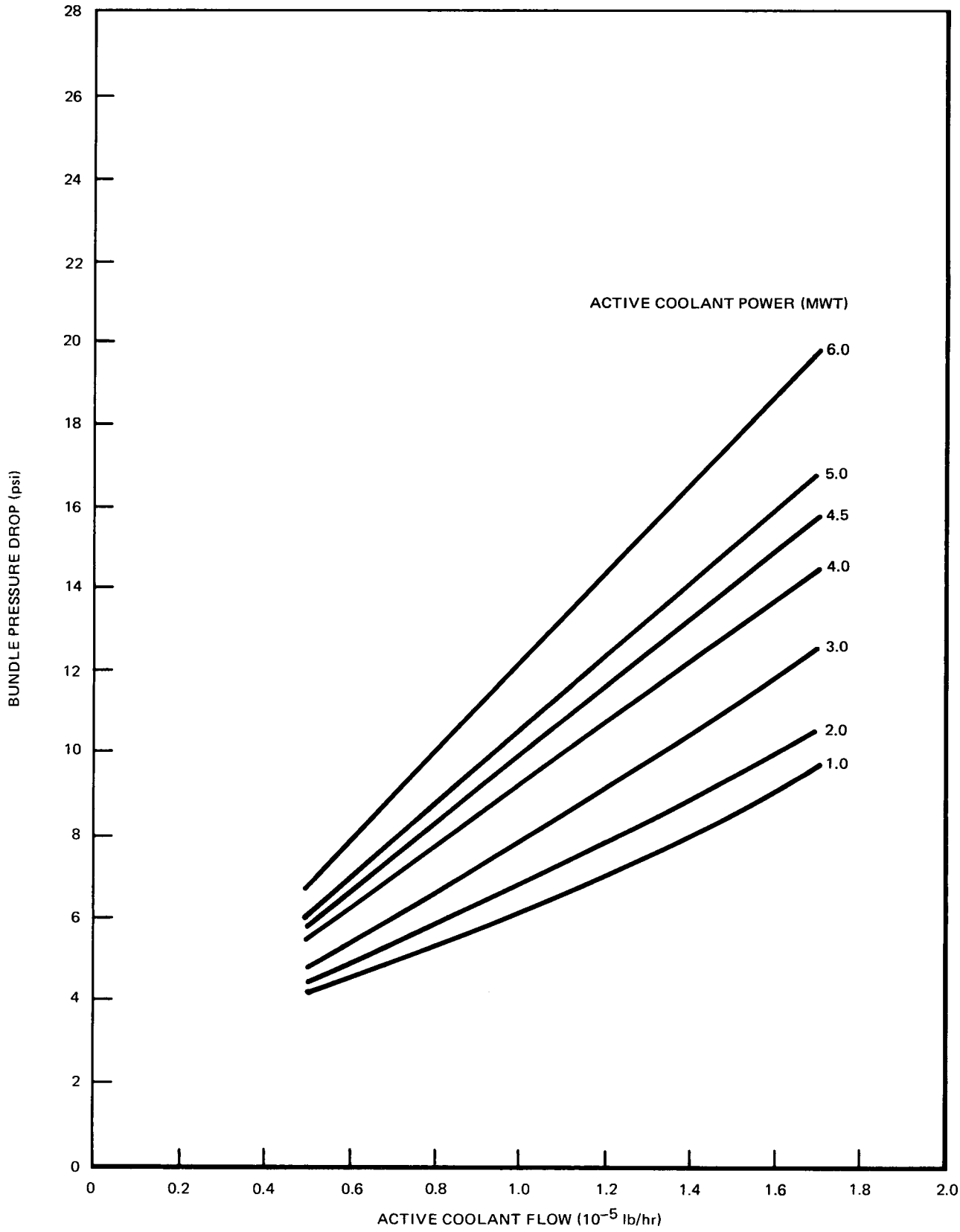


Figure 2-8. Flow Characteristics 7 x 7 Fuel Assemblies, 30 Btu/lb Subcooling.

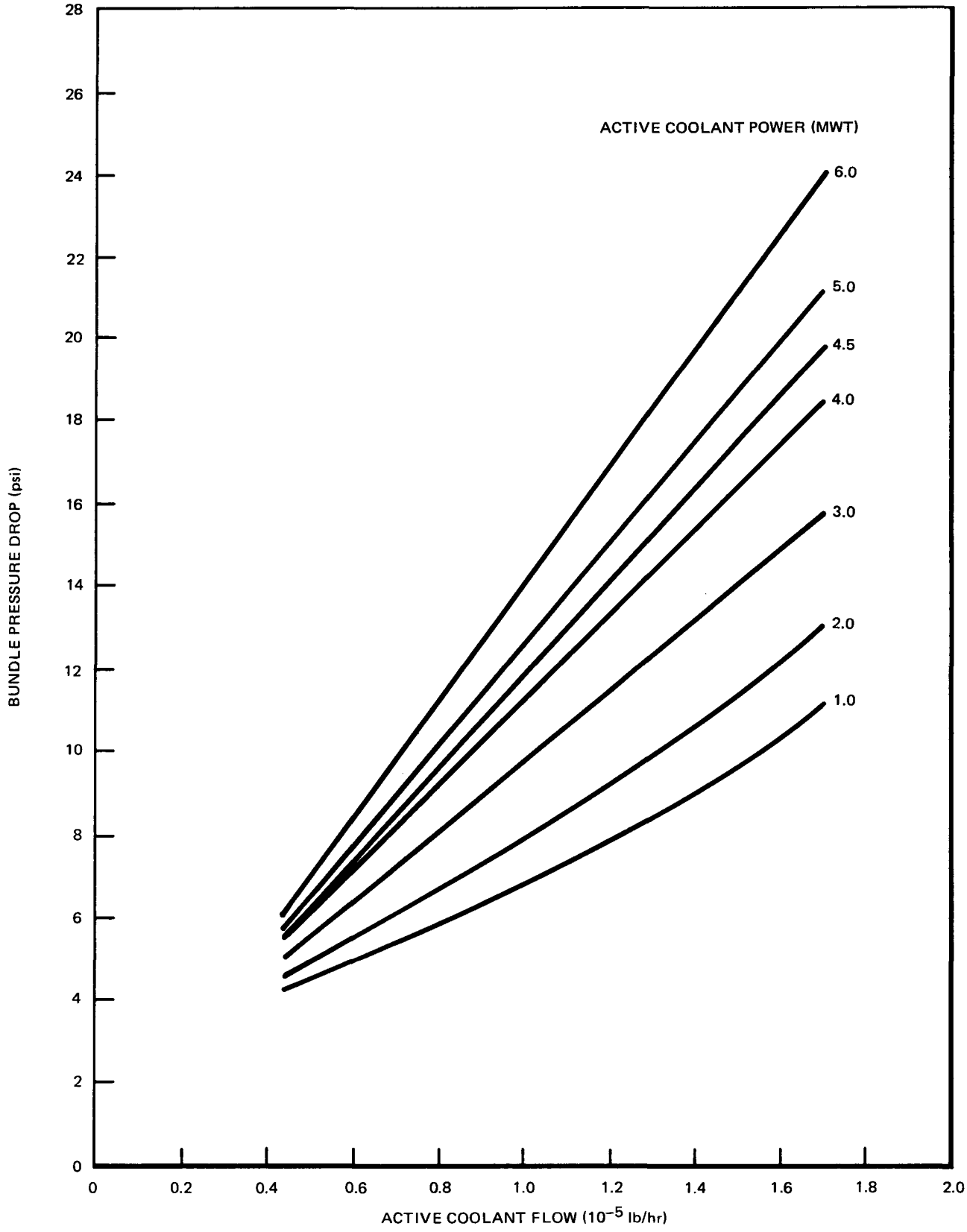


Figure 2-9. Flow Characteristics 8 x 8 Fuel Assemblies, 20 Btu/lb Subcooling.

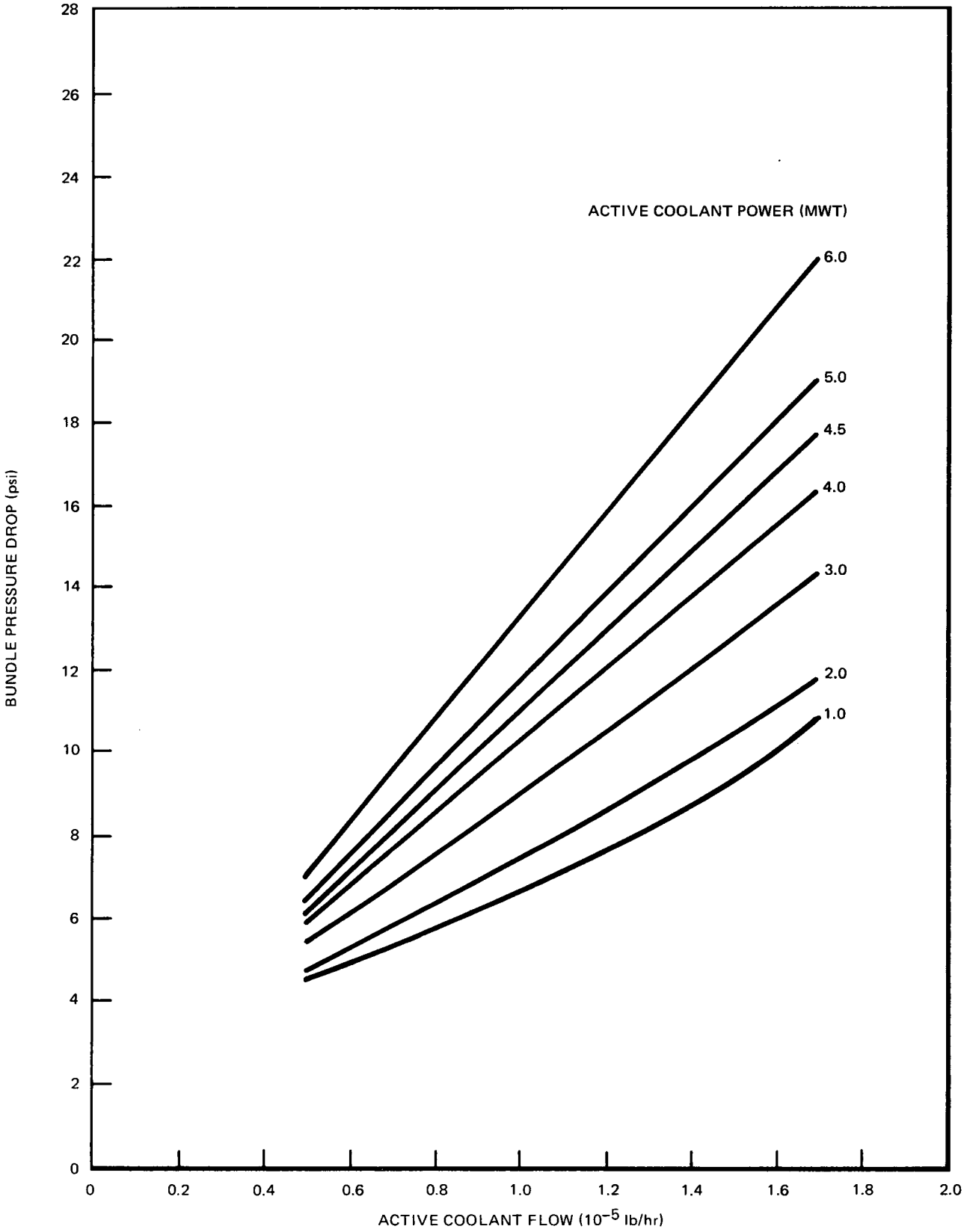


Figure 2-10. Flow Characteristics 8 x 8 Fuel Assemblies, 30 Btu/lb Subcooling.

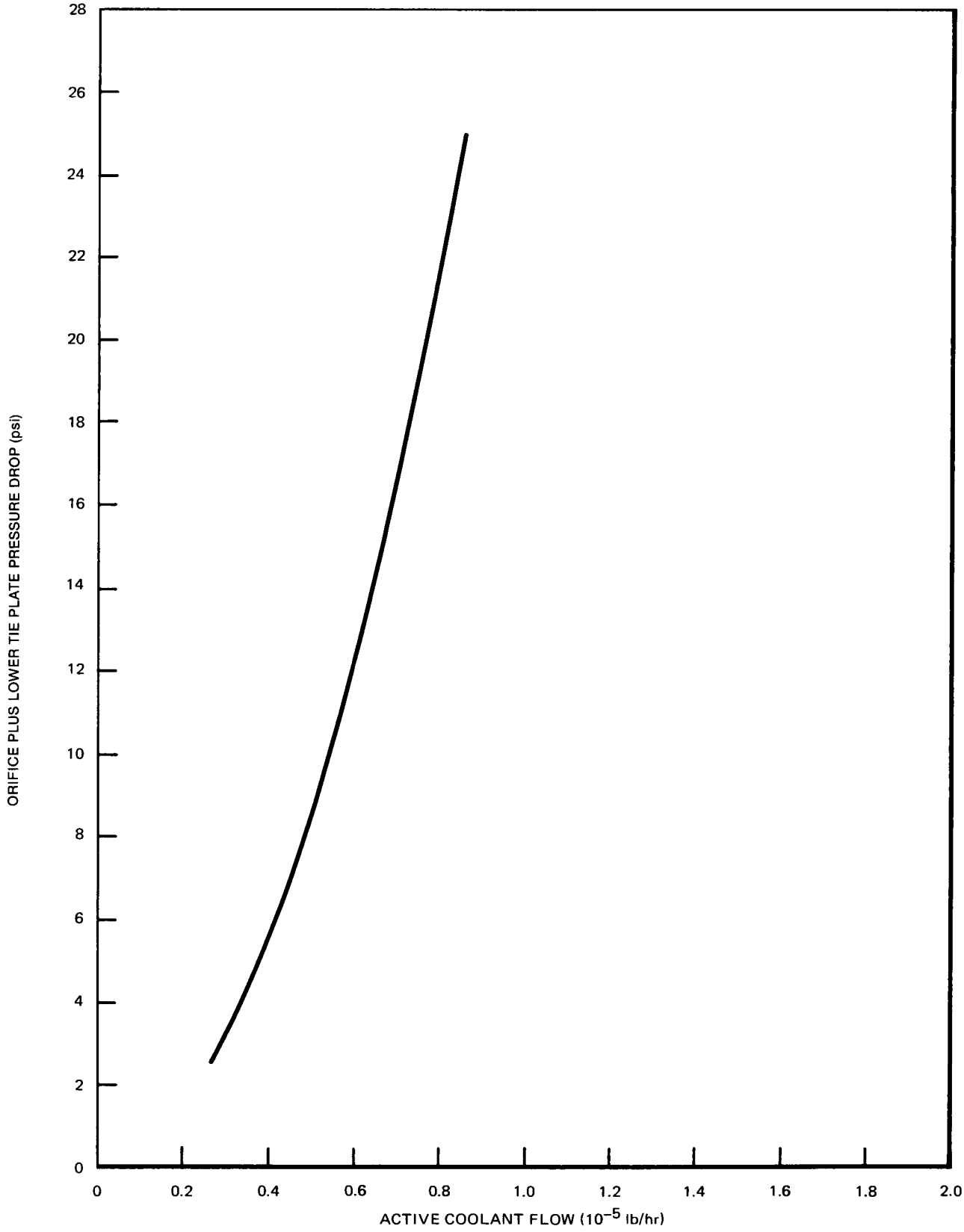


Figure 2-11. 1.424 in. Orifice Diameter, 20 Btu/lb Subcooling.

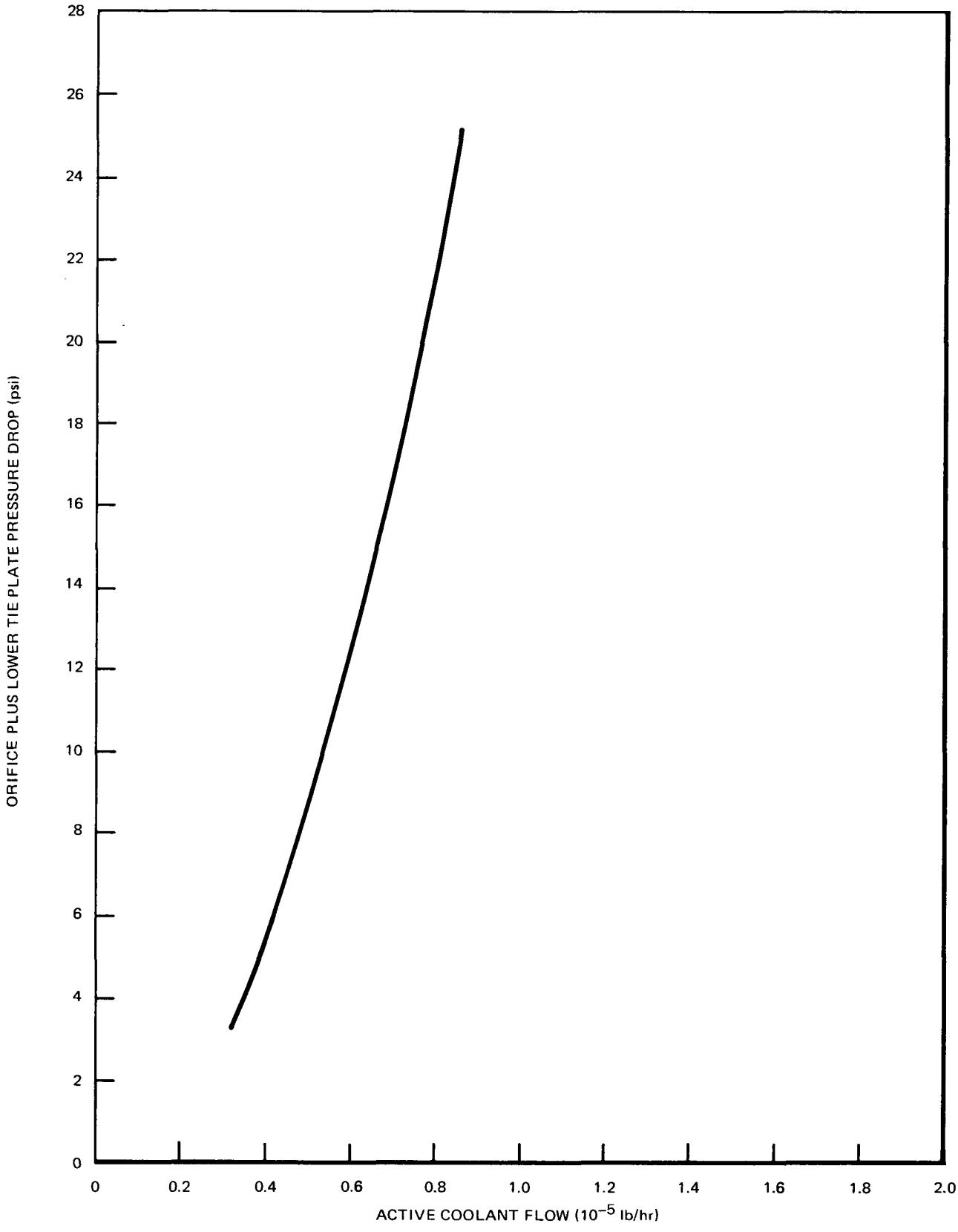


Figure 2-12. 1.424 in. Orifice Diameter, 30 Btu/lb Subcooling.

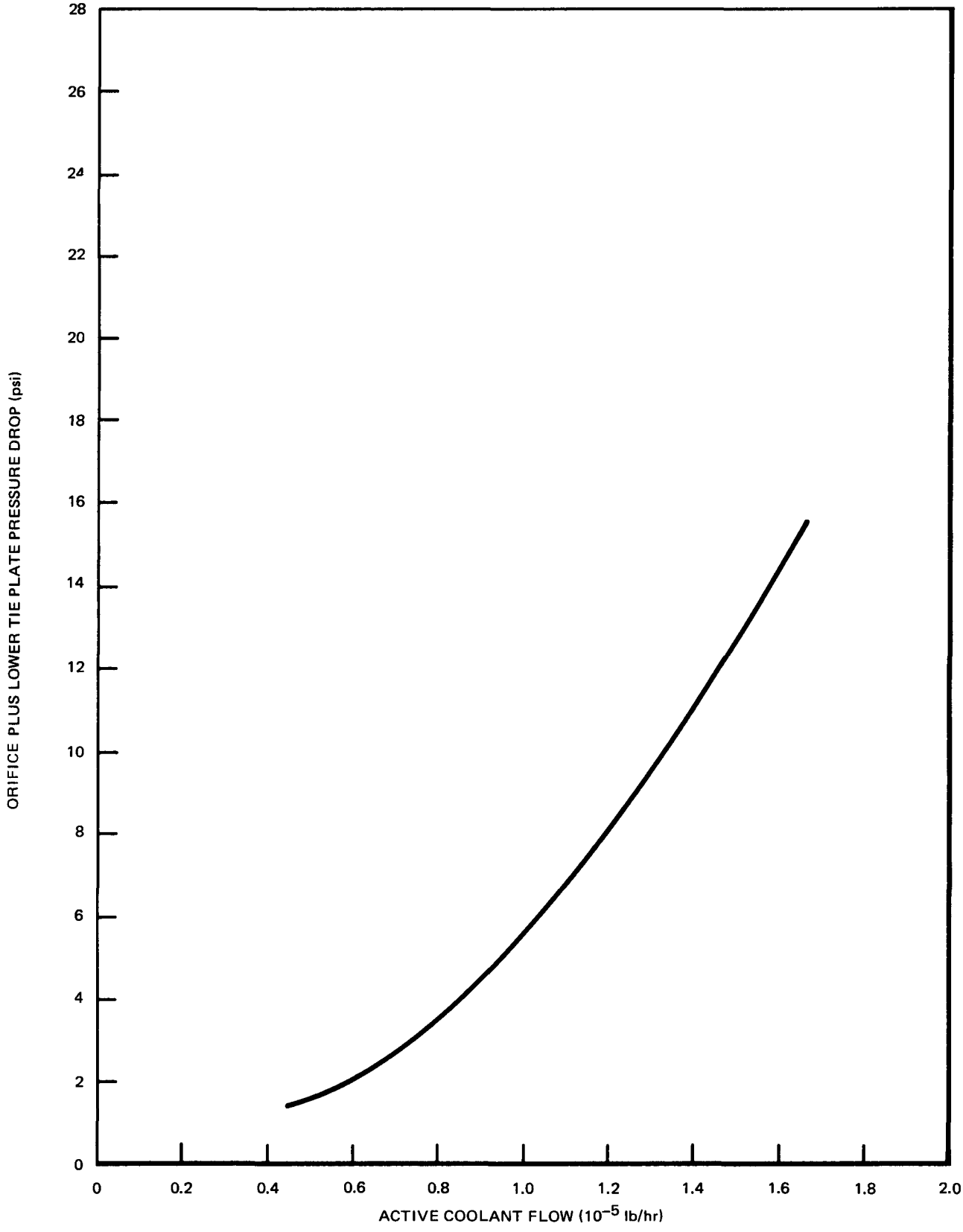


Figure 2-13. 2.262 in. Orifice Diameter, 20 Btu/lb Subcooling.

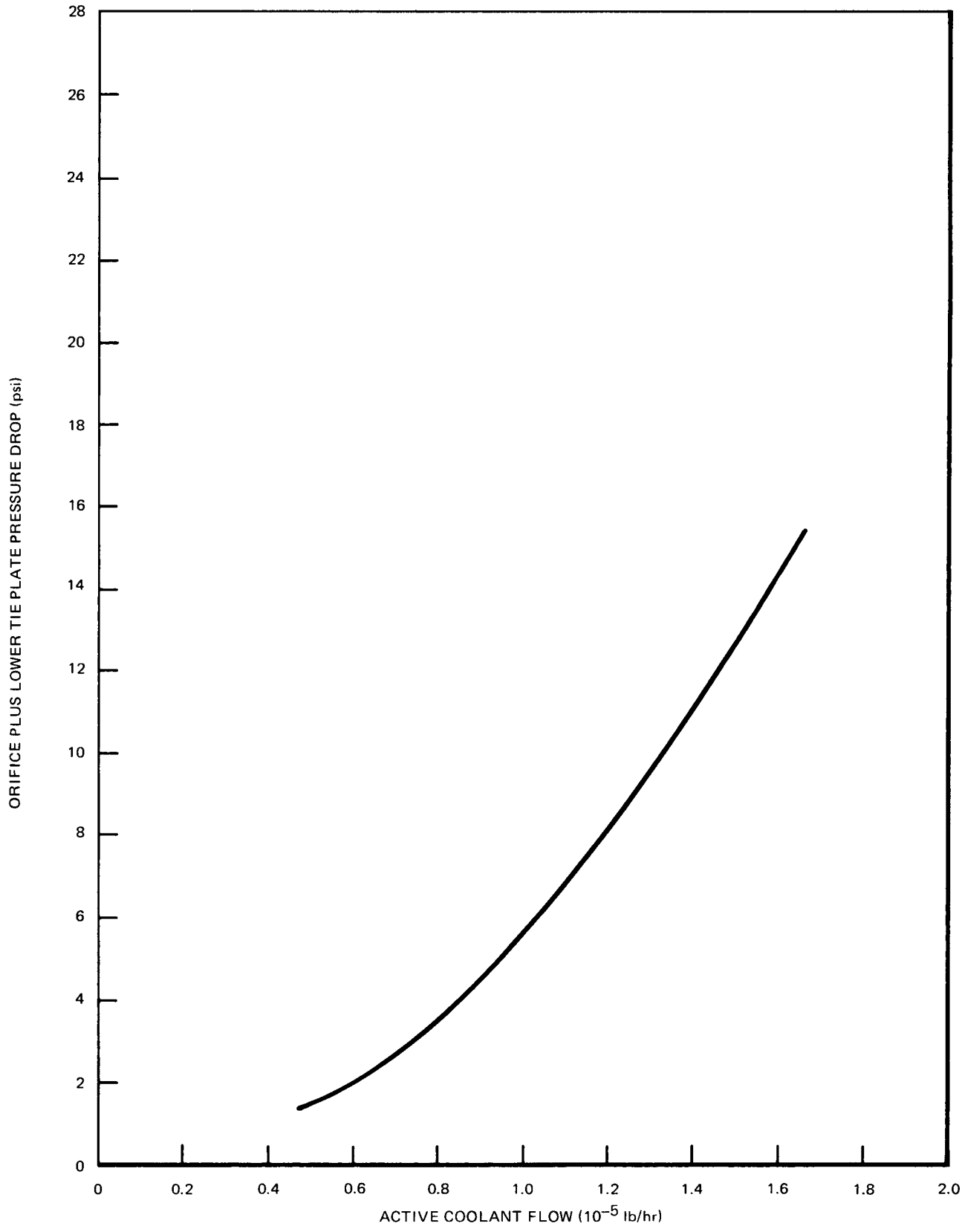


Figure 2-14. 2.262 in. Orifice Diameter, 30 Btu/lb Subcooling.

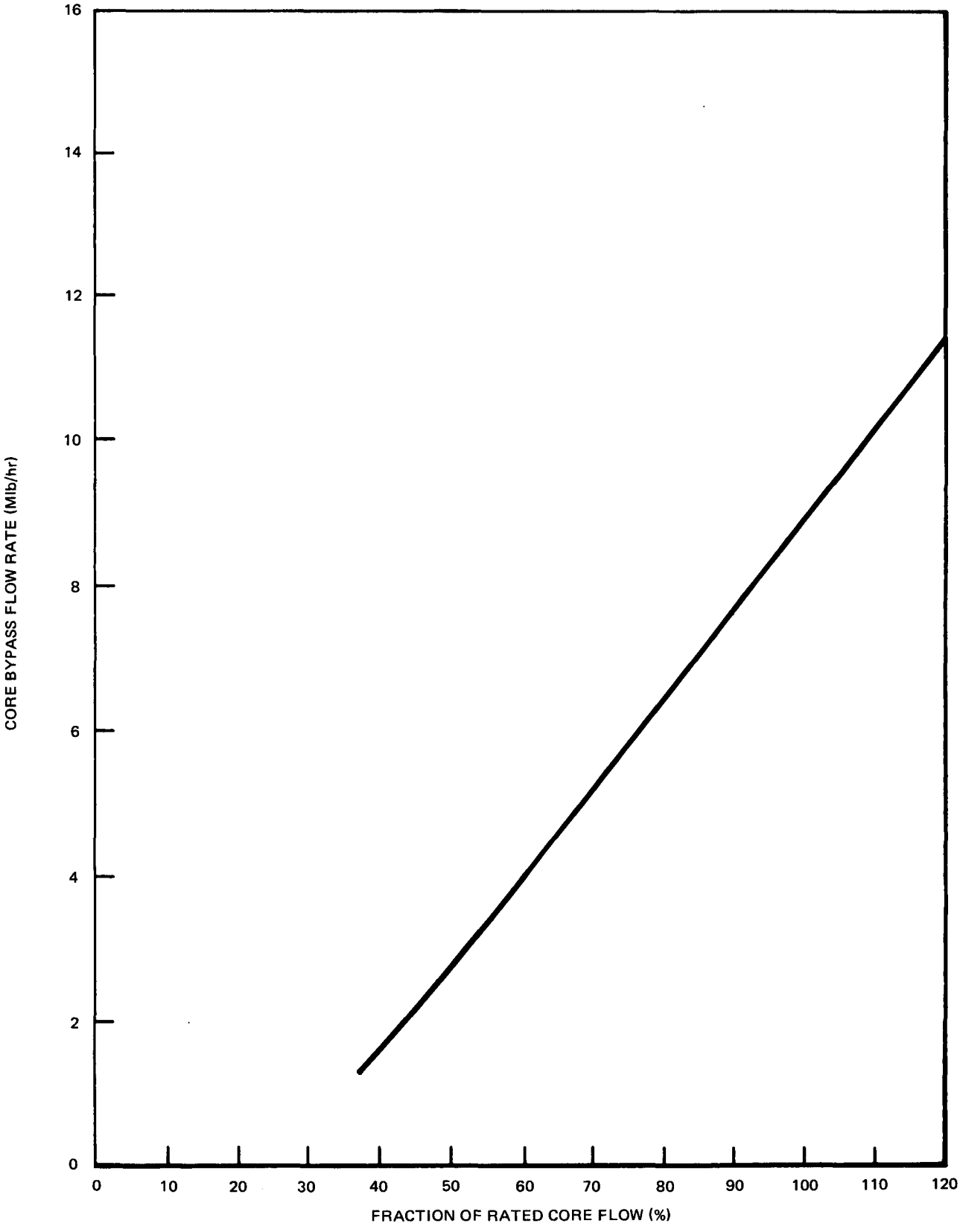


Figure 2-15. Core Bypass Flow for Cycle 1.

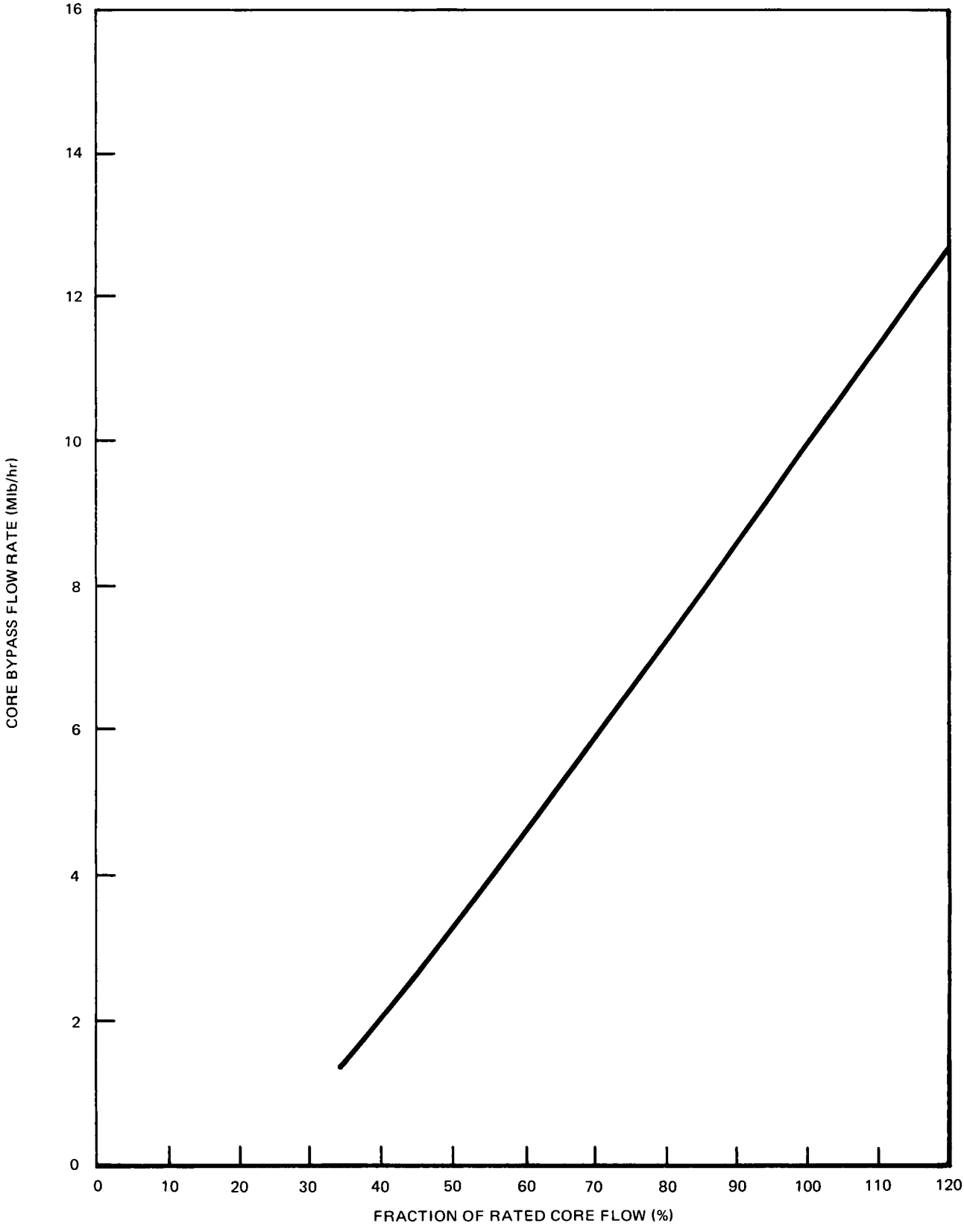


Figure 2-16. Core Bypass Flow for Cycle 2.

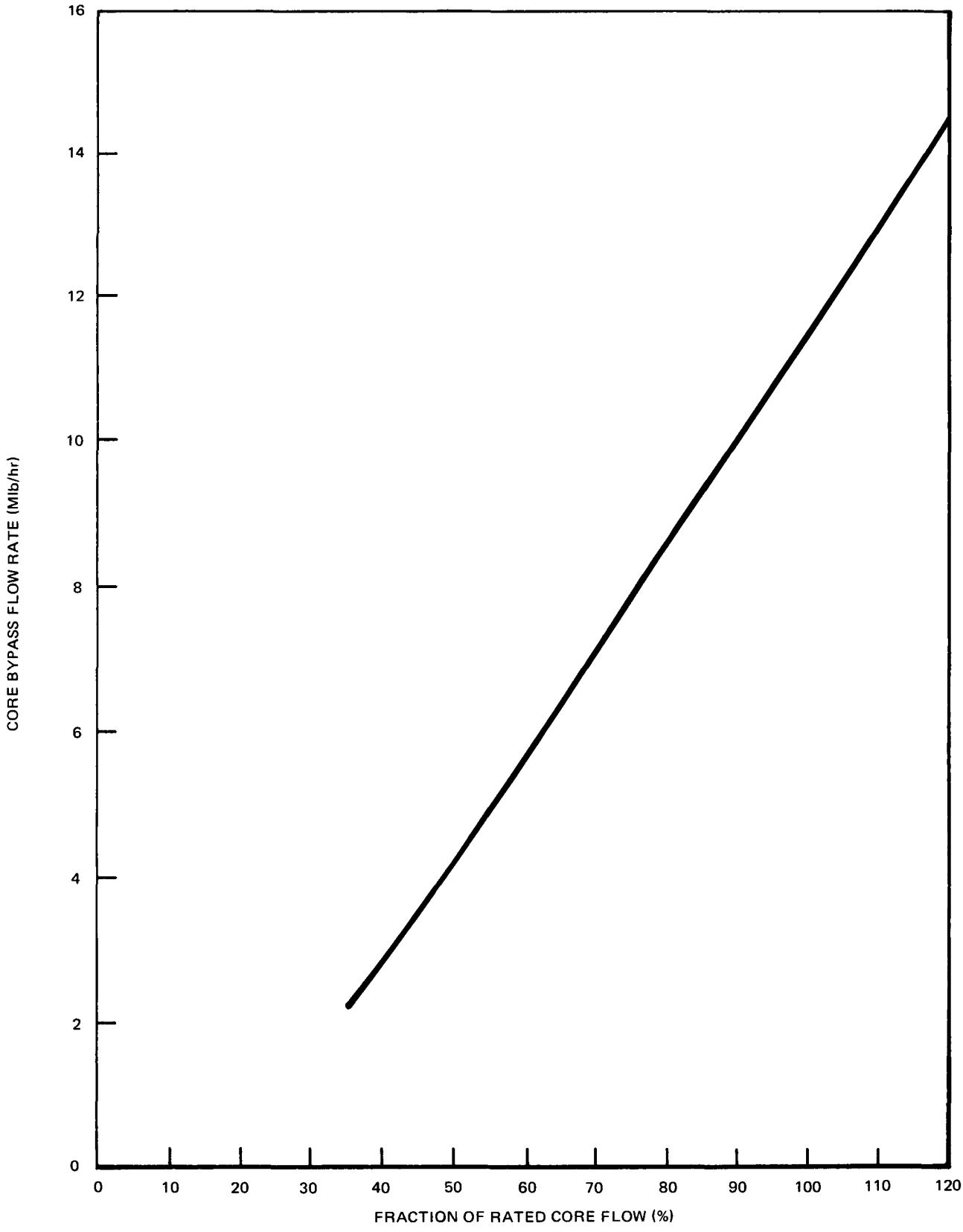


Figure 2-17. Core Bypass Flow for Cycle 3.

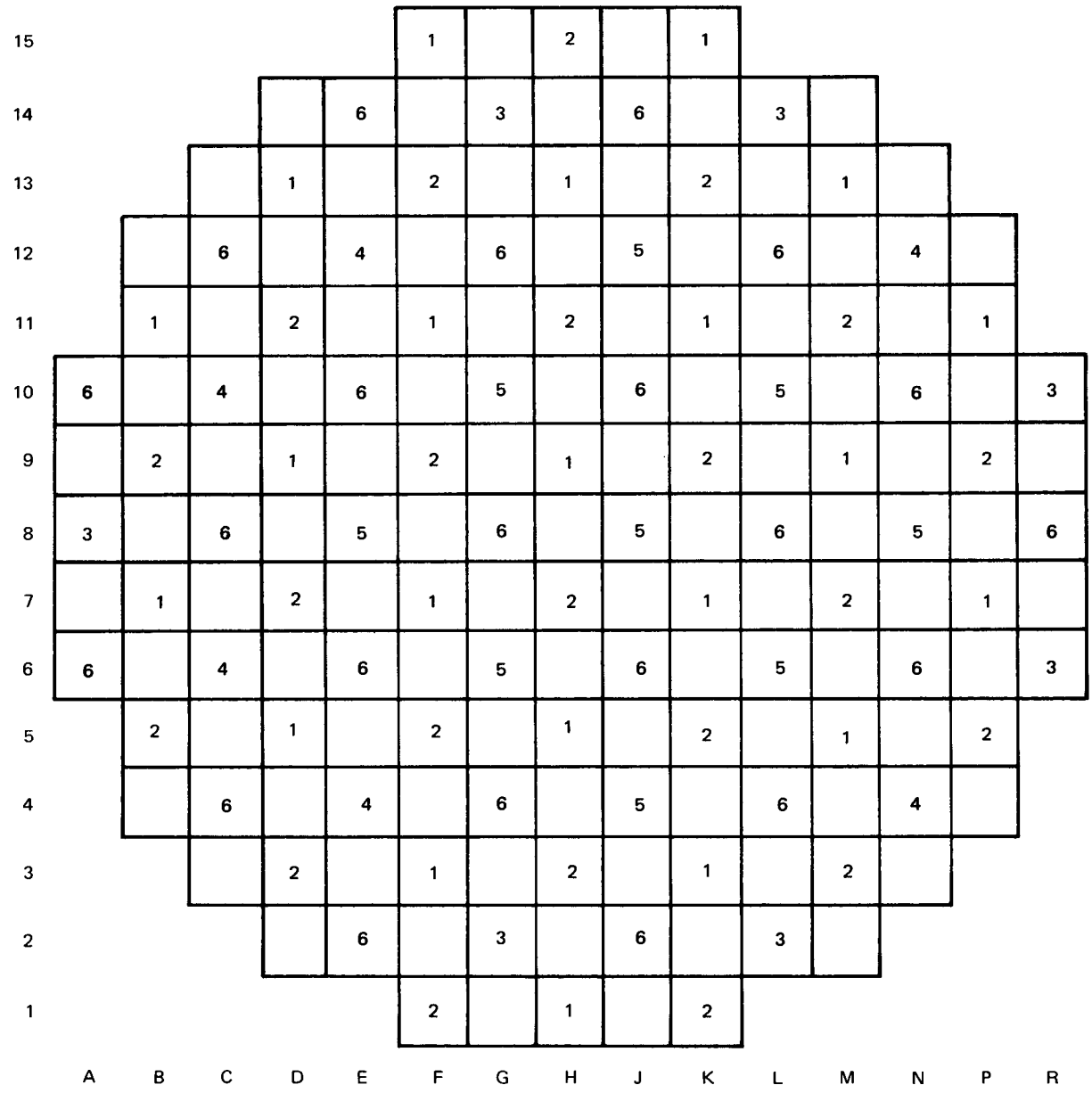
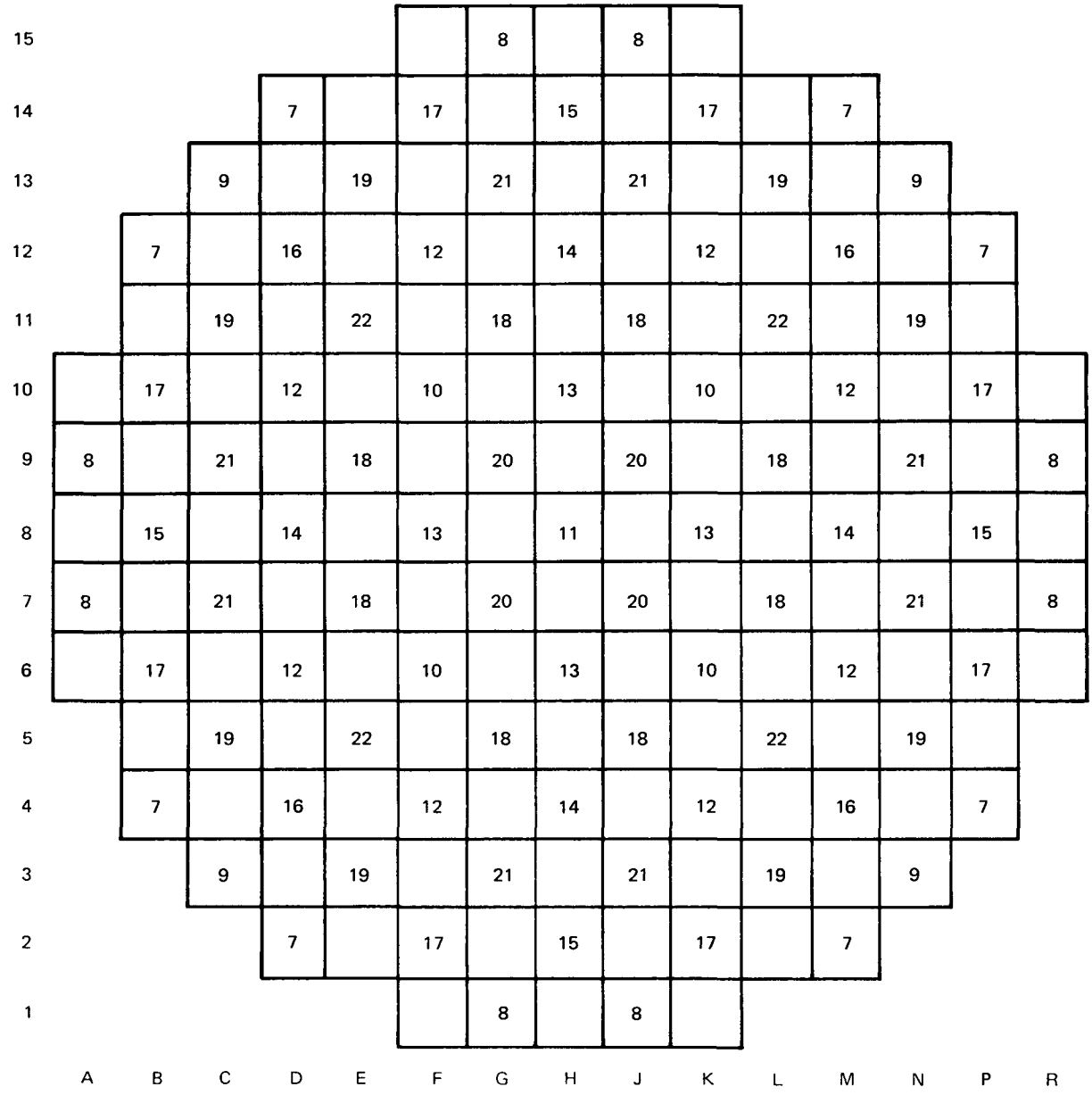


Figure 2-18. Quad Cities 1, Cycle 3, Control Rod A Sequence Groups 1-6.



P RODS – GROUPS 7, 8, AND 9
A-1 SEQUENCE S RODS; A-2 SEQUENCE D RODS – GROUPS 11-17
A-1 SEQUENCE D RODS; A-2 SEQUENCE S RODS – GROUPS 18-22

Figure 2-19. Quad Cities 1, Cycle 3, Control Rod A Sequence Groups 7-22.

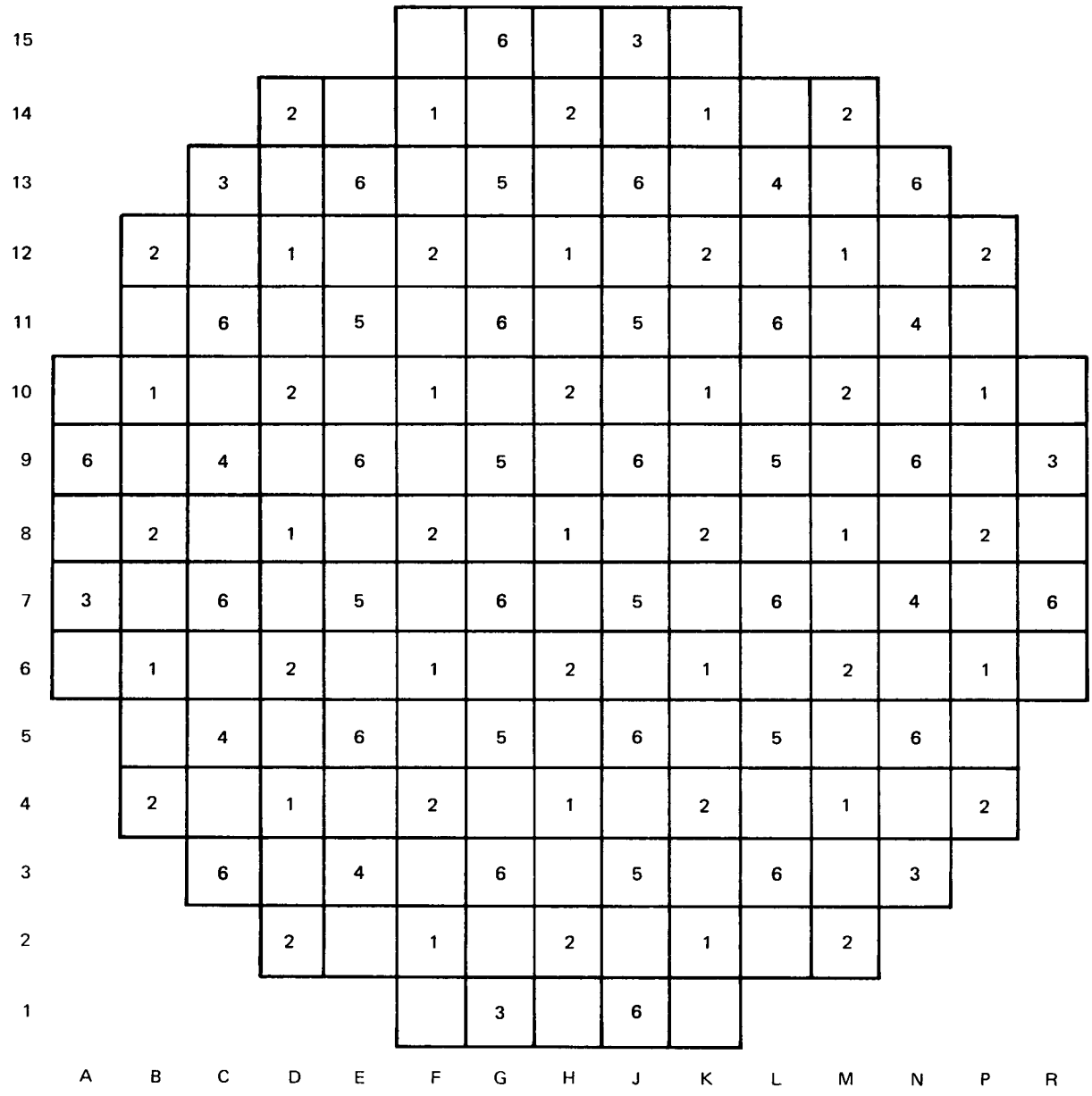
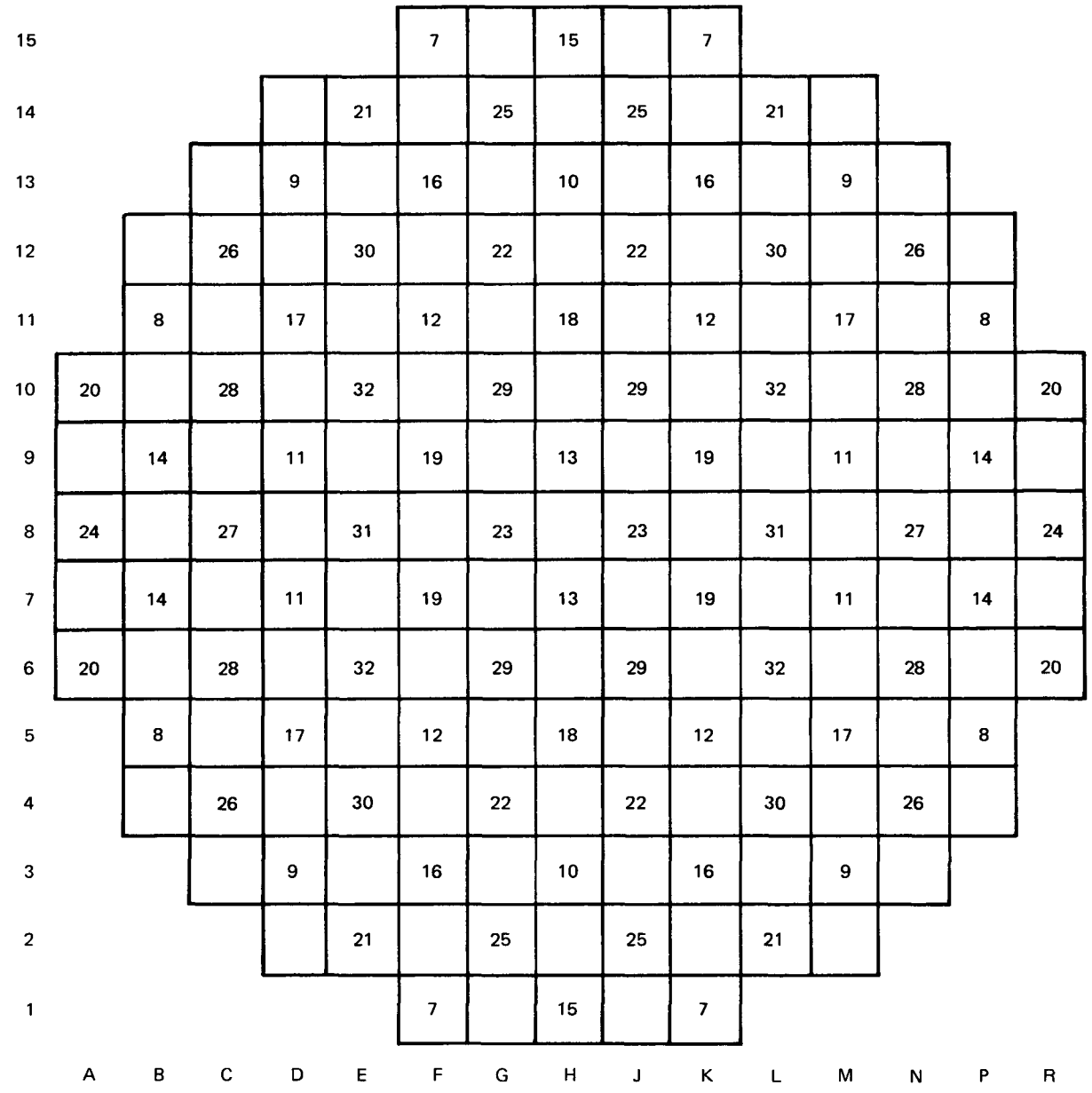


Figure 2-20. Quad Cities 1, Cycle 3, Control Rod B Sequence Groups 1-6.



P RODS – GROUPS 15, 7, 21, 8, 20, 24

B-1 SEQUENCE S RODS; B-2 SEQUENCE D RODS – GROUPS 25, 22, 29, 23, 30, 32 31, 27, 28, 26, 14

B-1 SEQUENCE D RODS; B-2 SEQUENCE S RODS – GROUPS 10, 18, 13, 19, 12, 16 9, 17, 11, 8, 14

Figure 2-21. Quad Cities 1, Cycle 3, Control Rod B Sequence Groups 7-32.

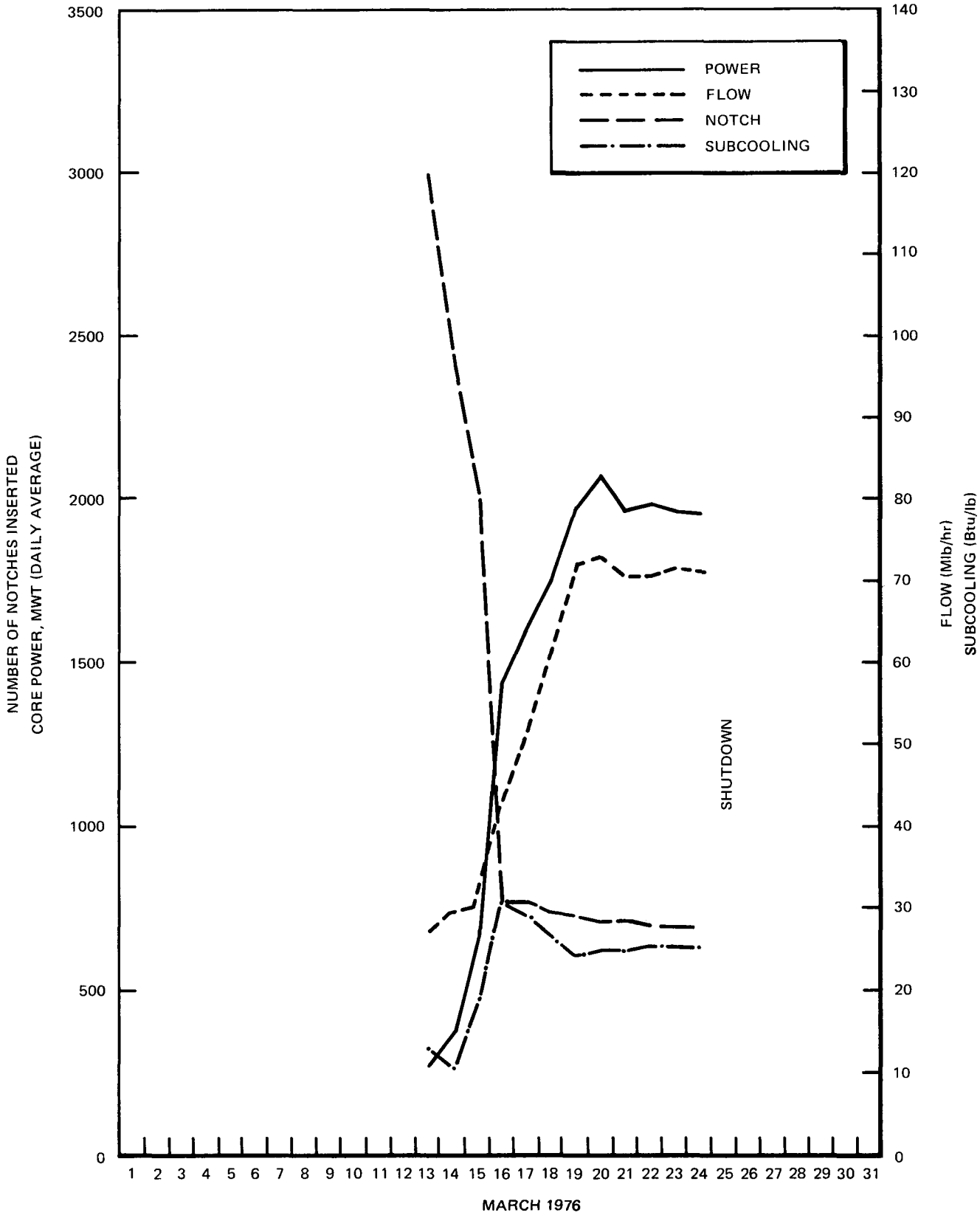


Figure 2-22. Data Summary

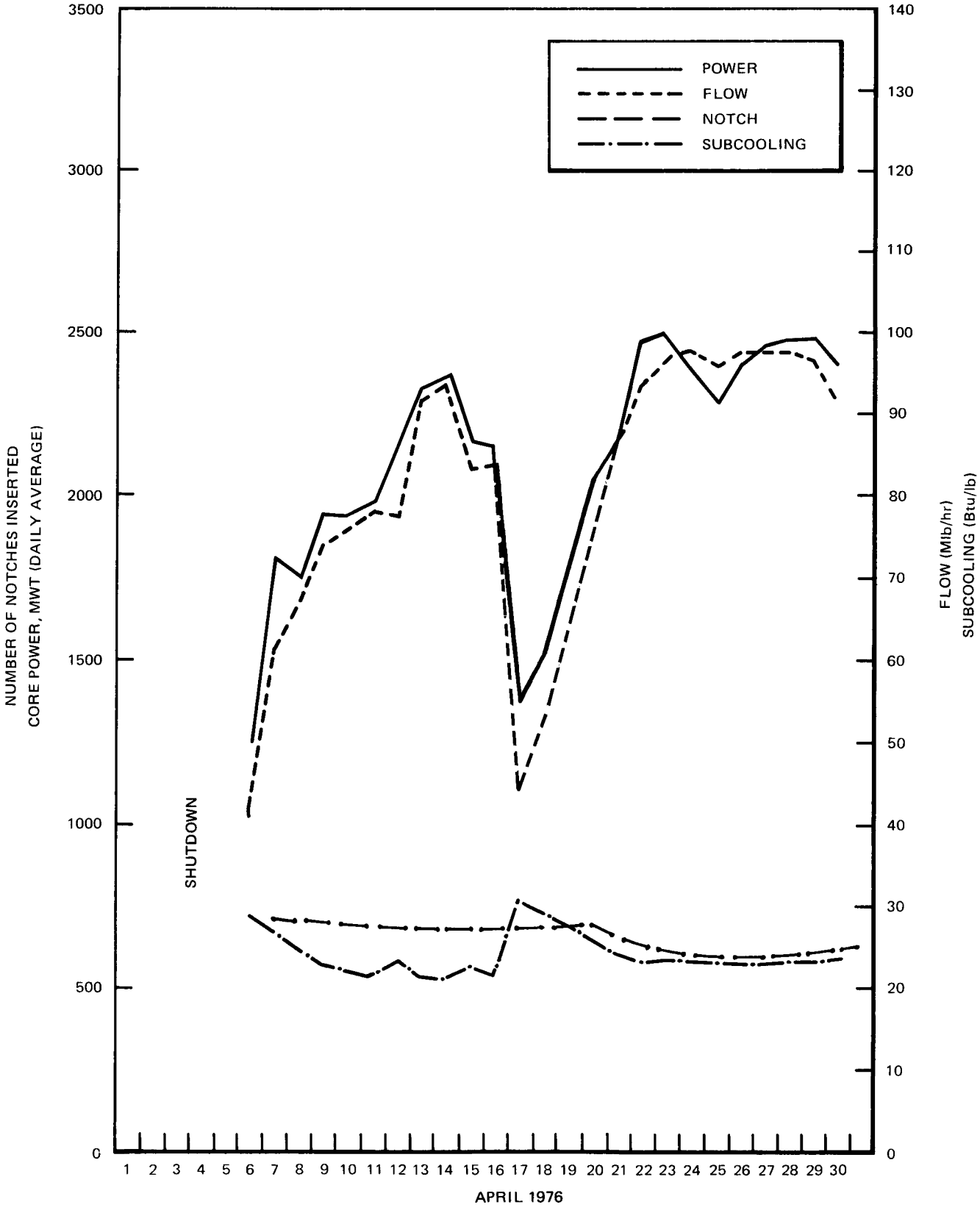


Figure 2-23. Data Summary

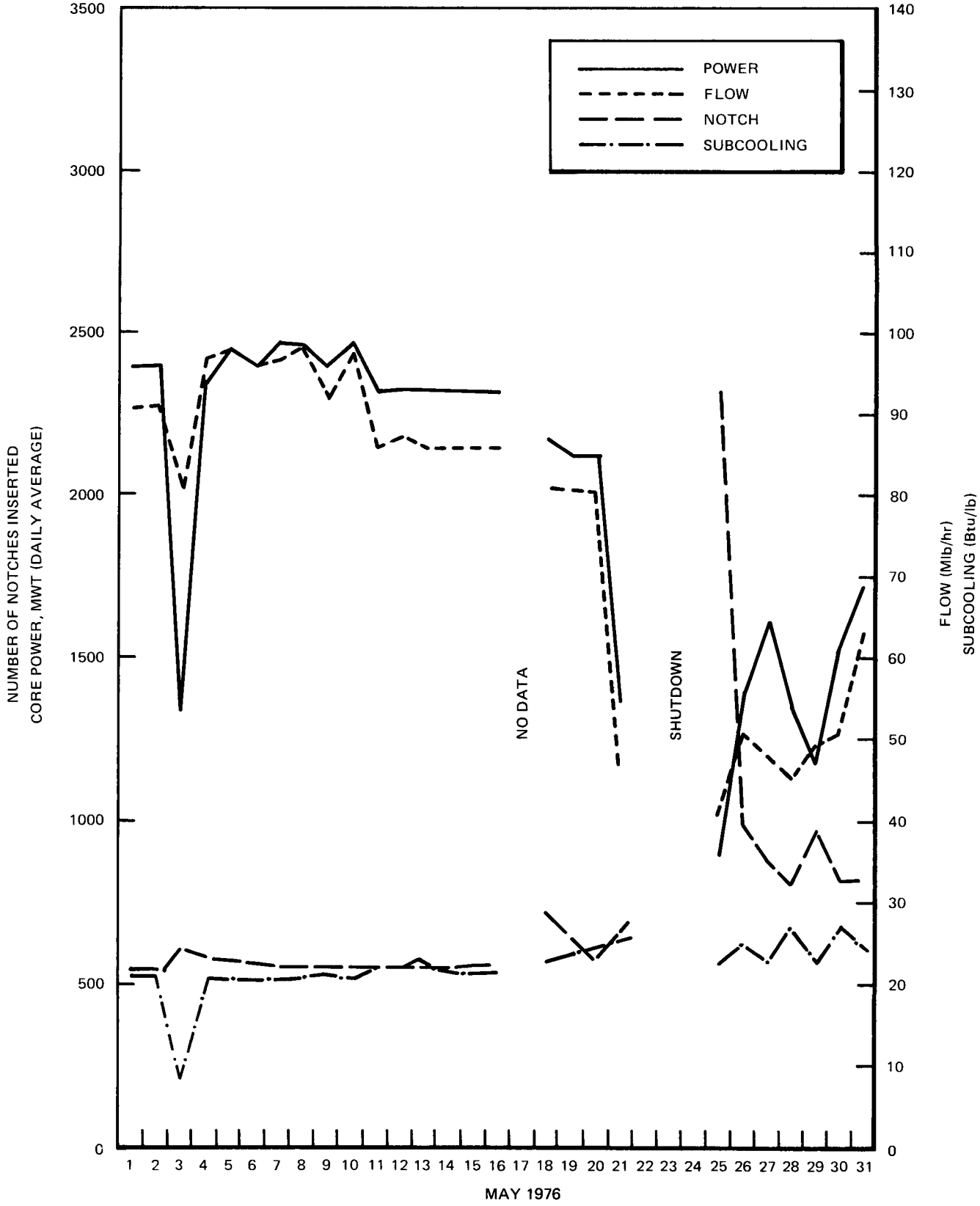


Figure 2-24. Data Summary

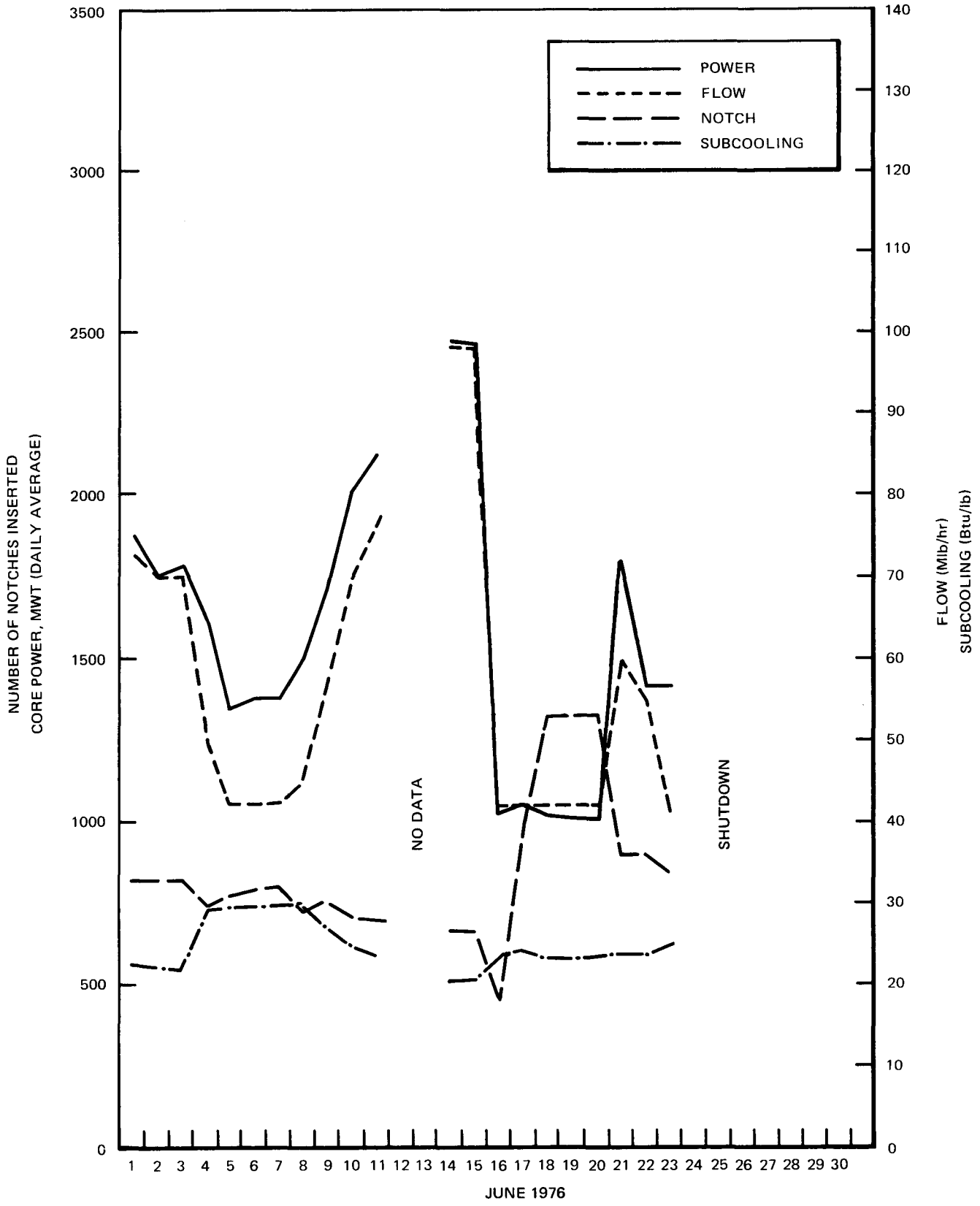


Figure 2-25. Data Summary

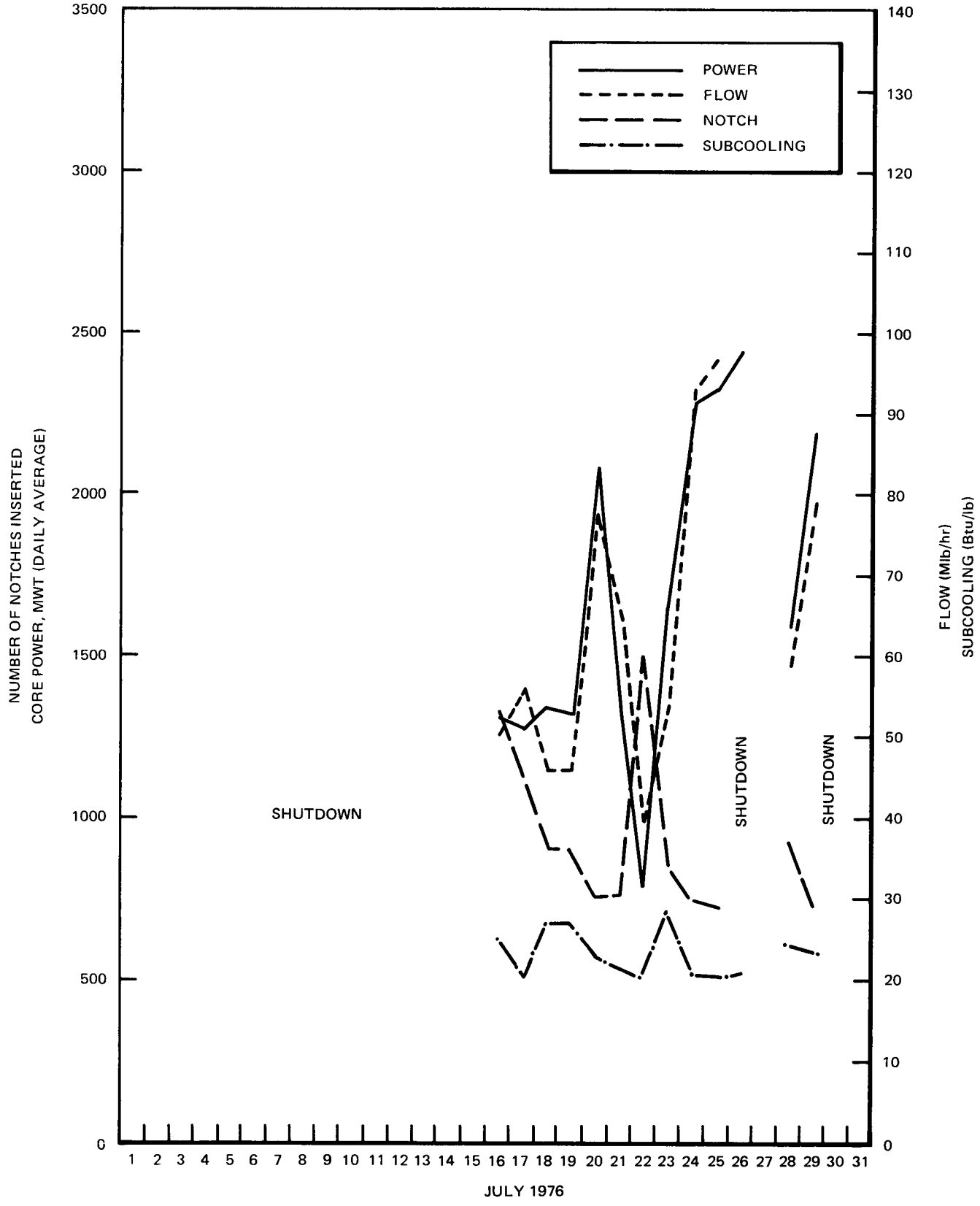


Figure 2-26. Data Summary

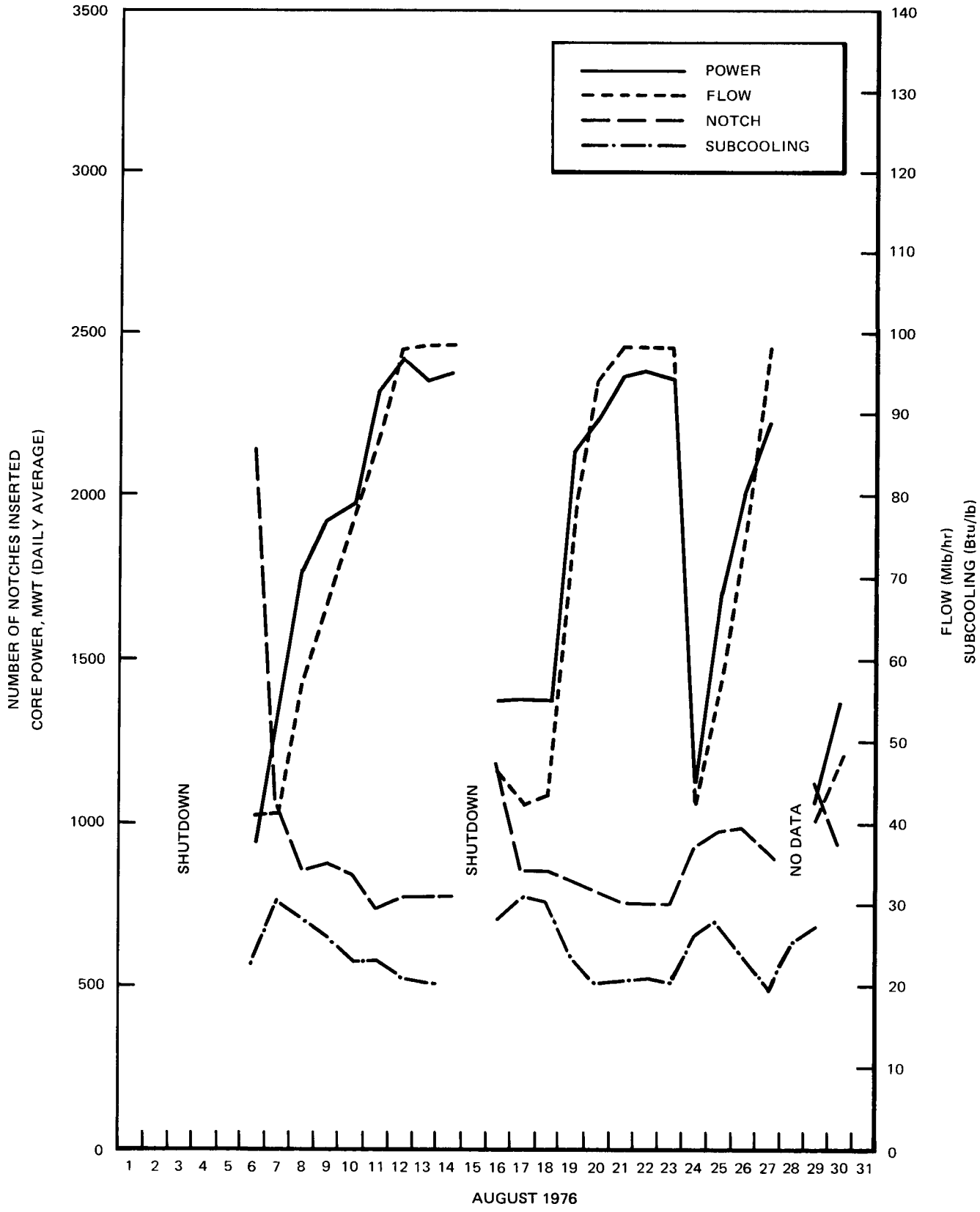


Figure 2-27. Data Summary

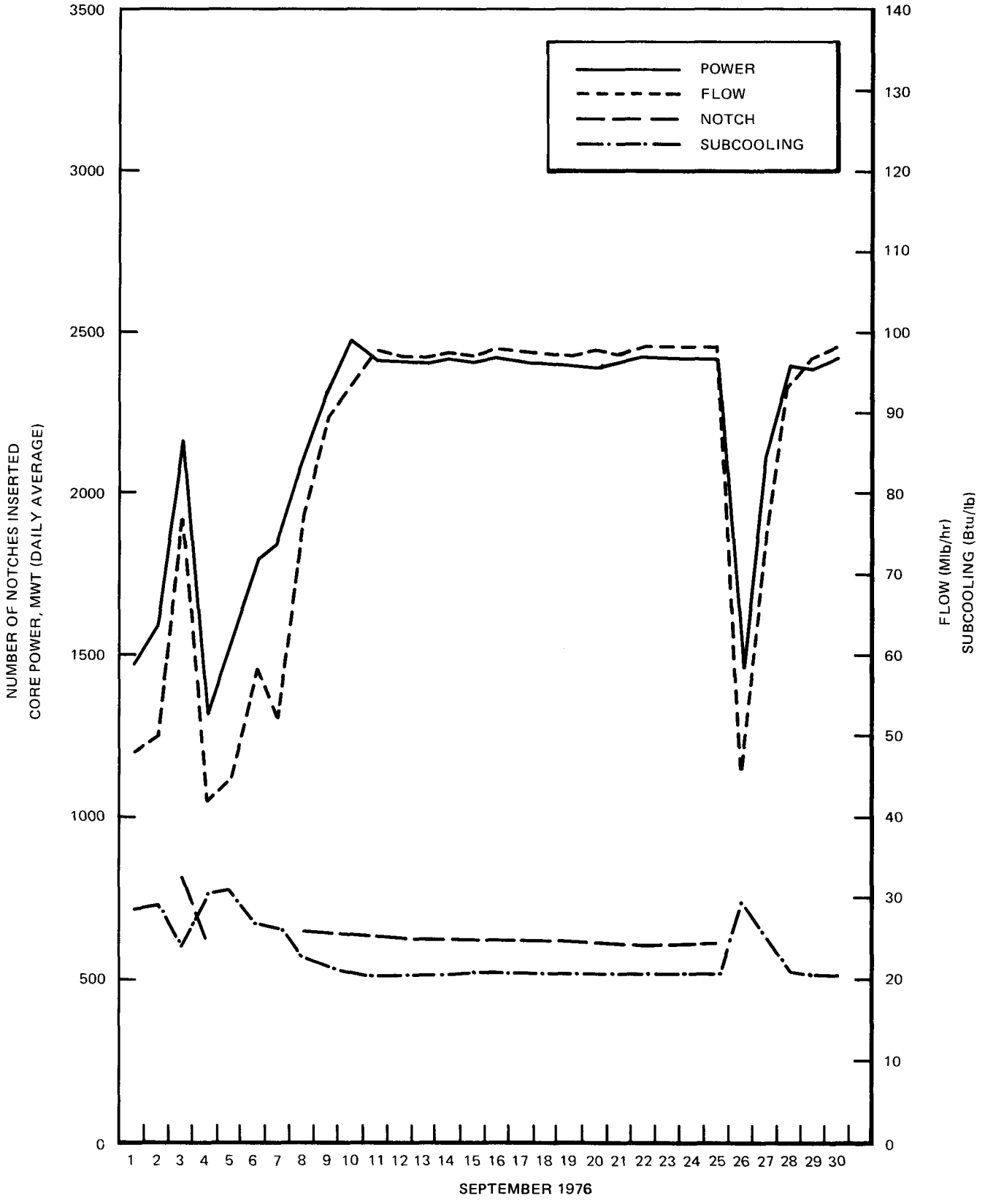


Figure 2-28. Data Summary

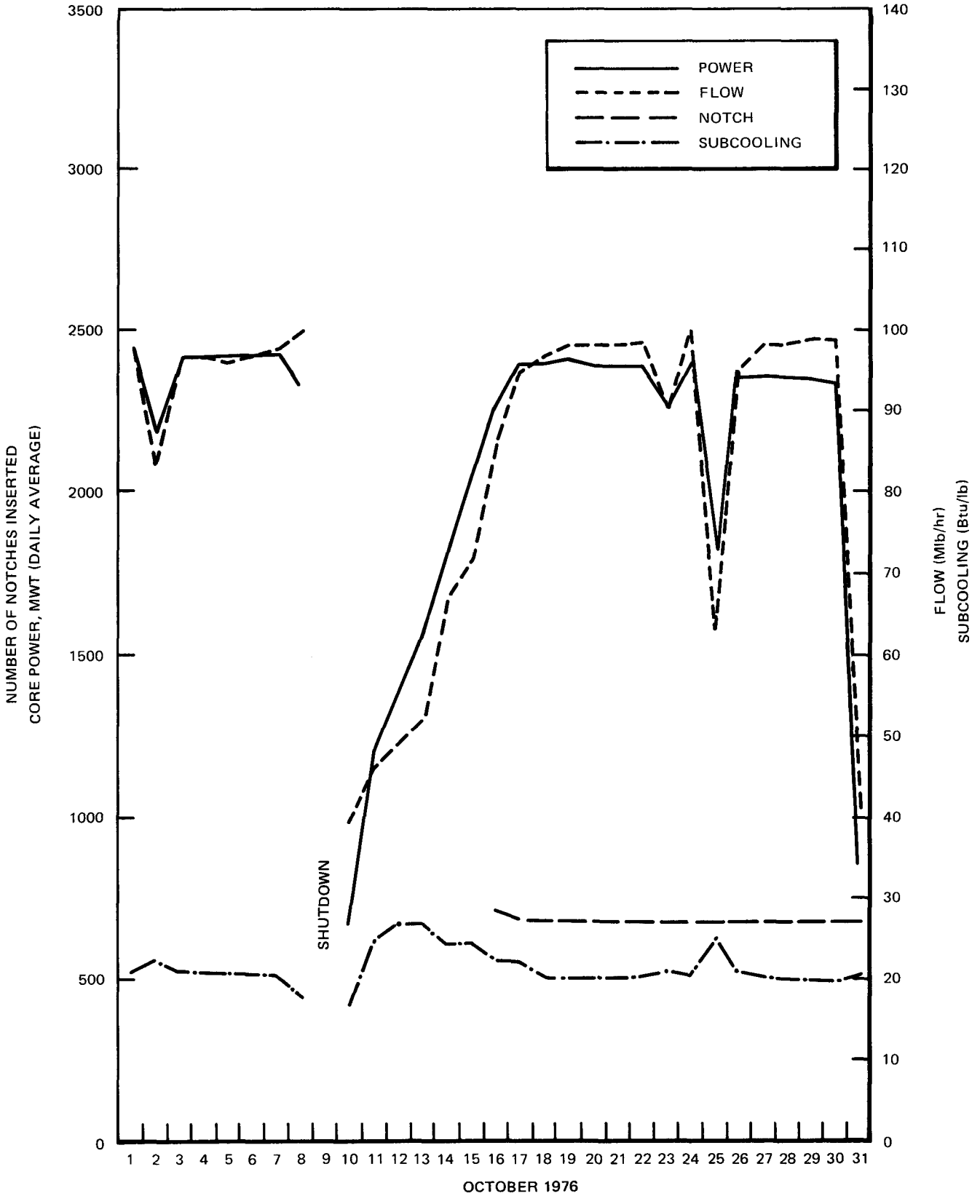


Figure 2-29. Data Summary

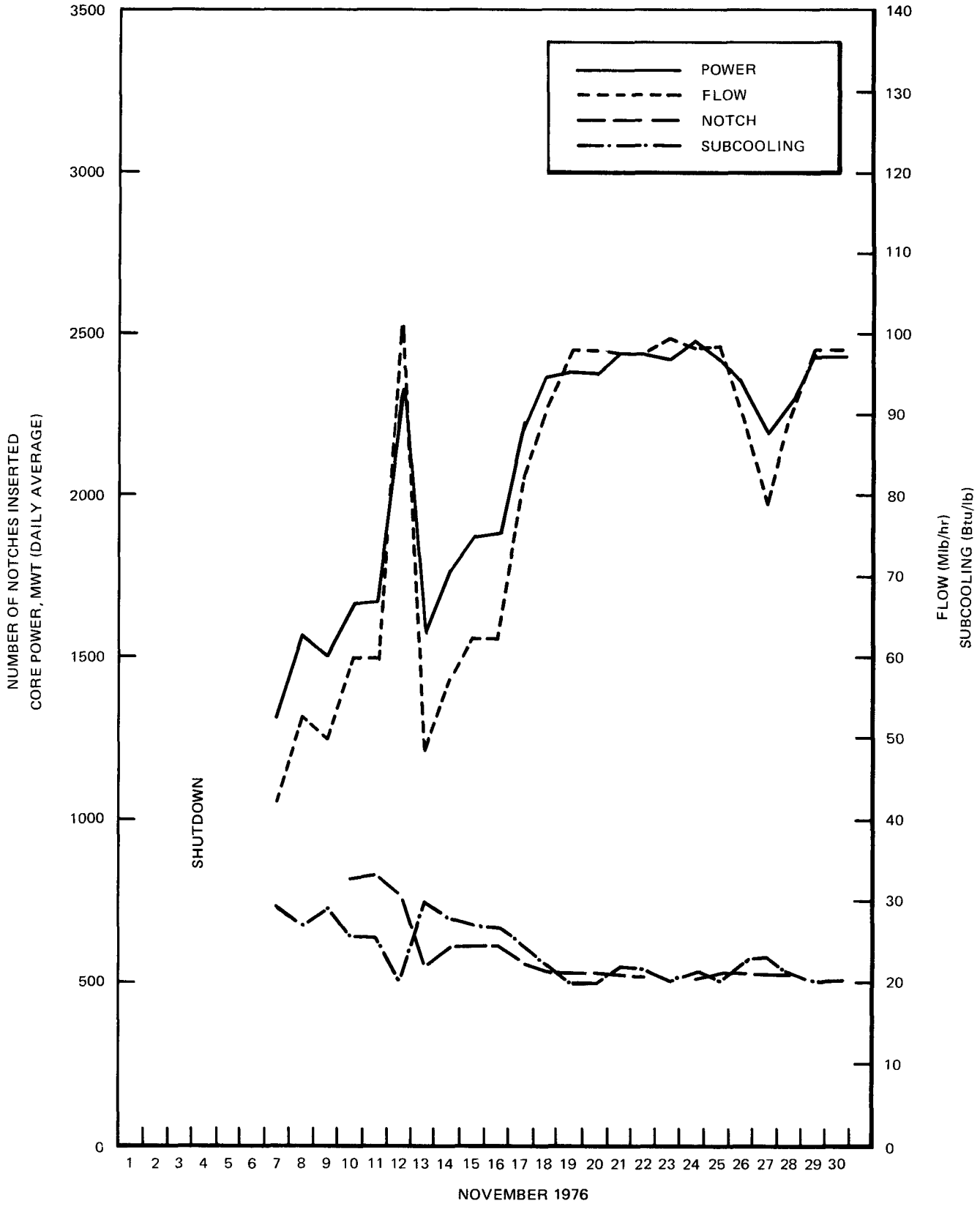


Figure 2-30. Data Summary

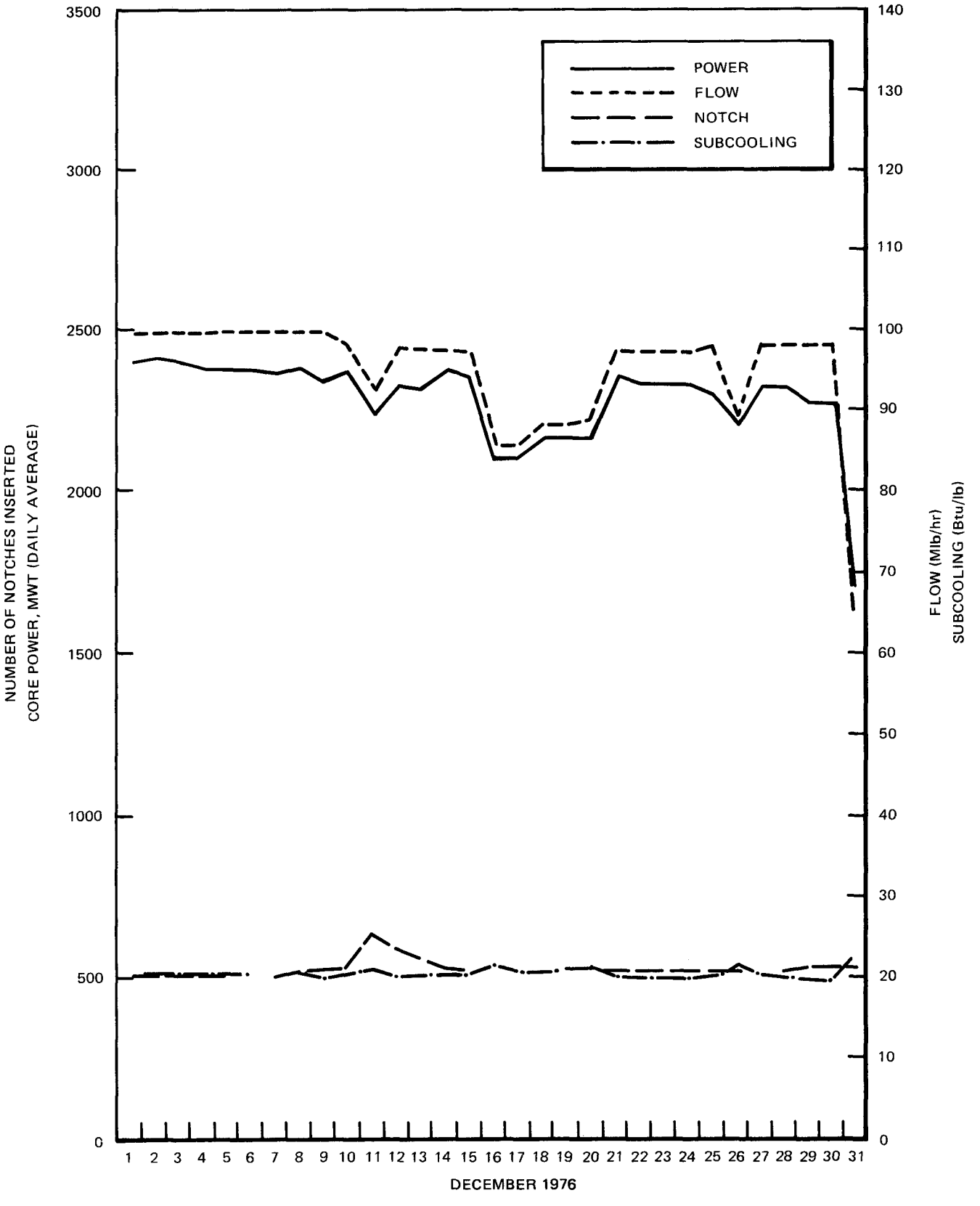


Figure 2-31. Data Summary

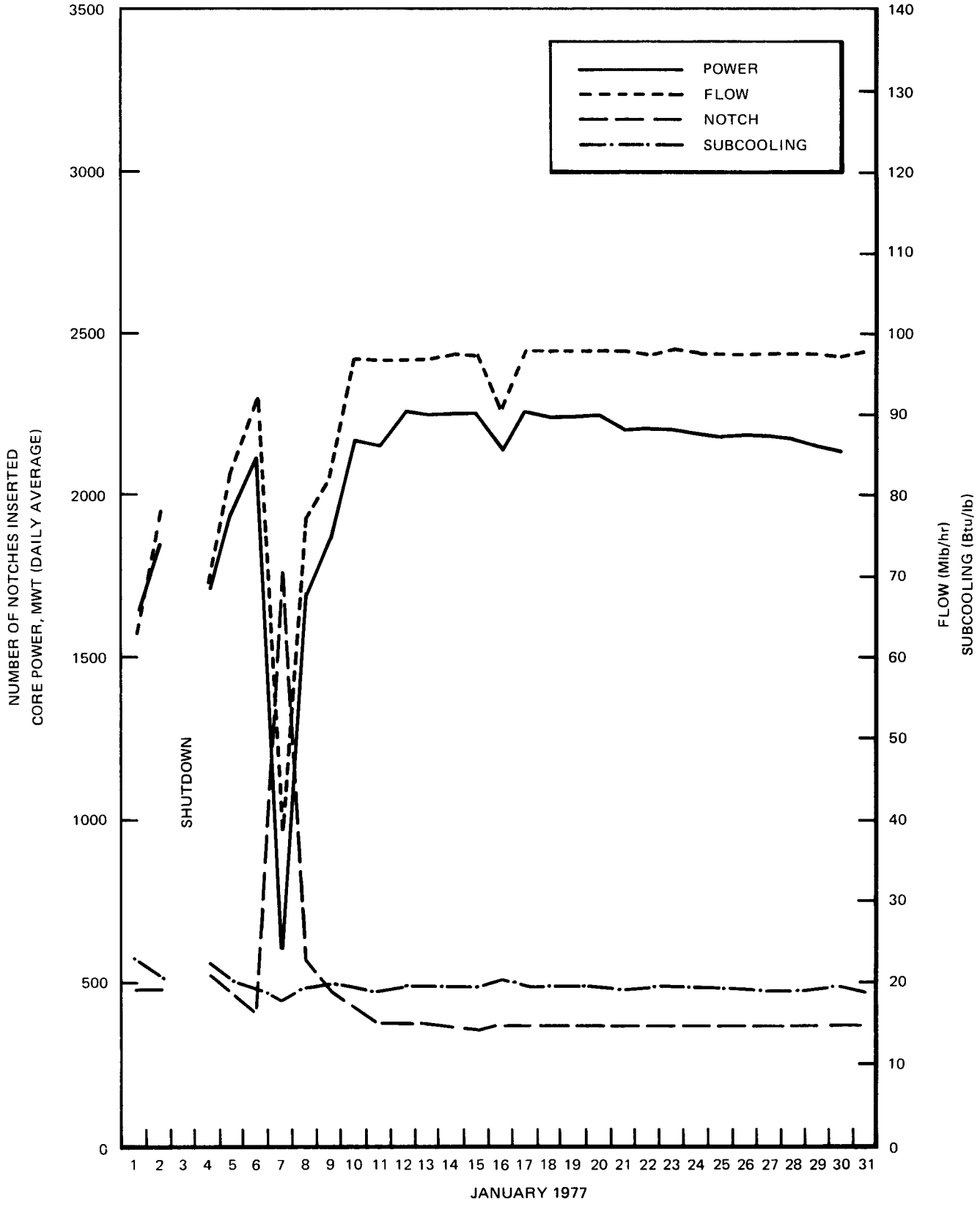


Figure 2-32. Data Summary

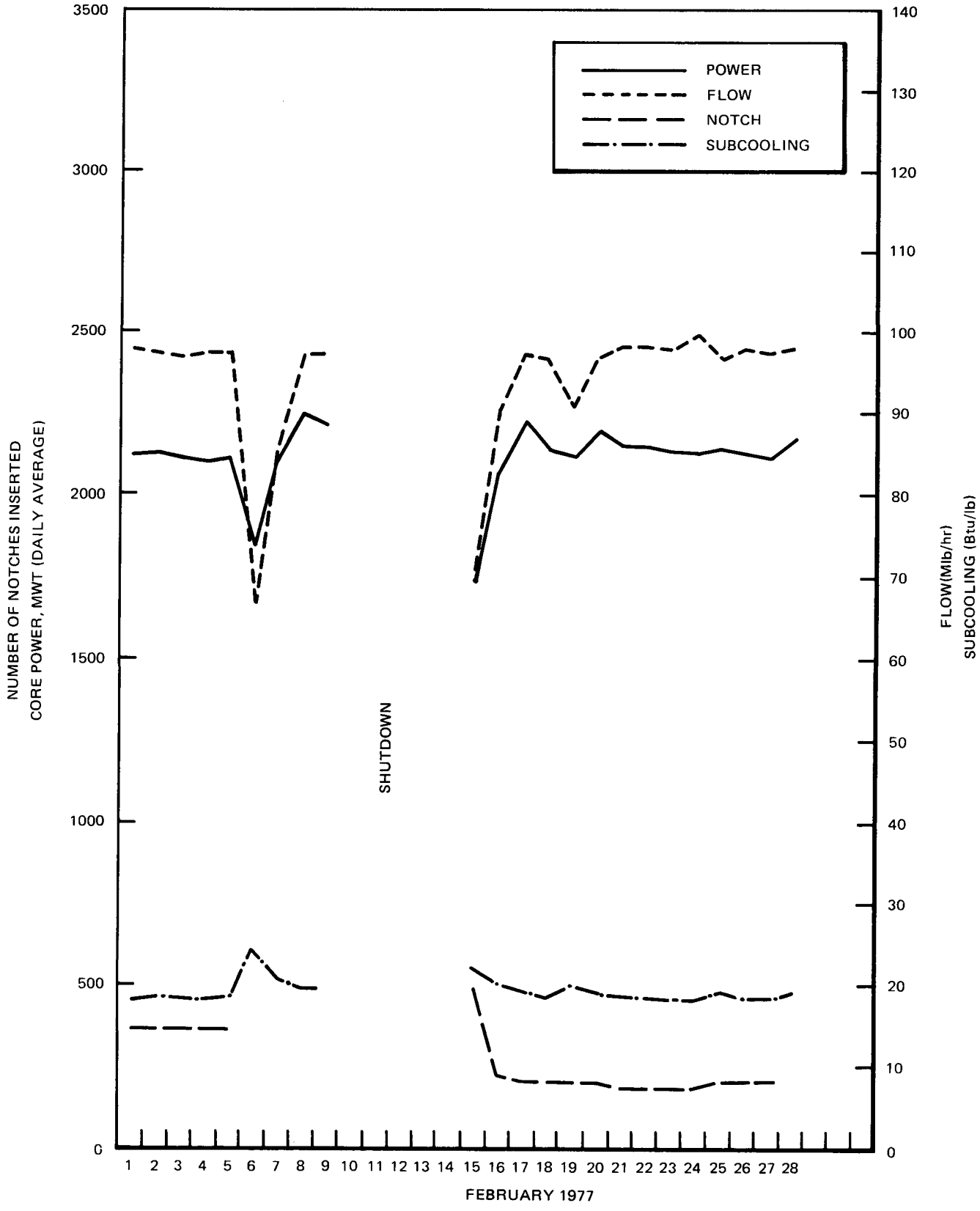


Figure 2-33. Data Summary

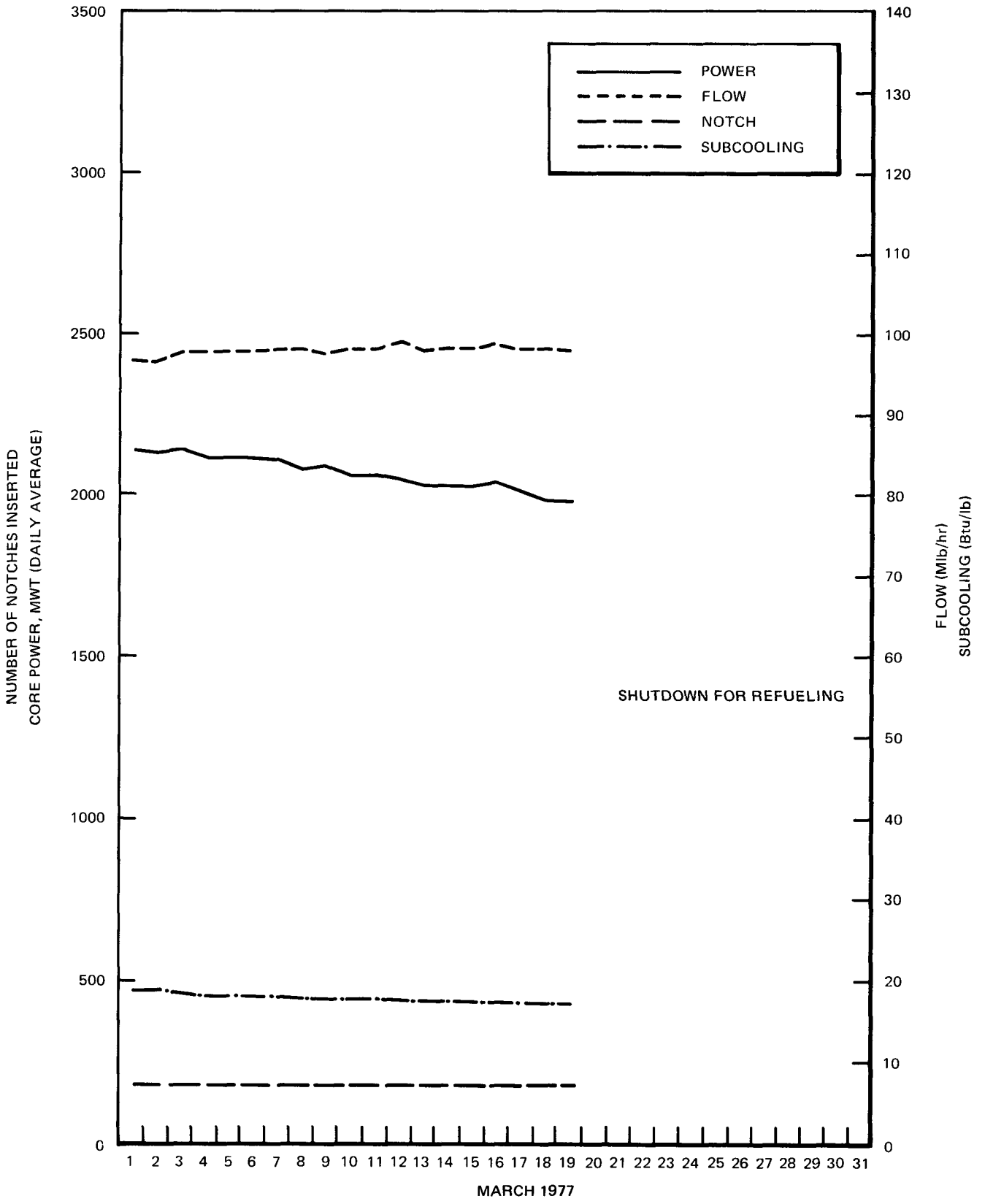


Figure 2-34. Data Summary

3. REFERENCES

1. "Core Design and Operating Data for Cycles 1 and 2 of Quad Cities 1," (EPRI-NP-240), November, 1976.

2. *In-Core Neutron Monitoring System for General Electric Boiling Water Reactors*, revised April, 1969 (APED-5706).

APPENDIX A
DATA SETS

Cycle 2 Data

DATASET 28, December 19, 1975

Reactor Conditions

Core Average Exposure, 12348 MWd/t
Core Thermal Power, 1547 MWt
Dome Pressure, P, 952 psia
Core Flow, 95.7 Mlb/hr
Inlet Subcooling at P, 15.6 Btu/lb

Control Configuration

Legend: 48, Full Out; 0, Full In.

48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48

Axial TIP Distribution, Bottom to Top of Core

See Figure 2-6.

```
1609 37.4 63.3 78.0 77.6 79.6 78.0 75.4 78.0 78.0 81.2 87.7 92.6
     94.2 87.7 97.5 97.5104.0 95.8101.7 97.5 93.6 87.7 71.5 43.9
2409 45.5 78.0 97.1 97.8101.4100.7100.7104.3107.9107.9110.4117.9
    120.2116.3124.1124.1121.8126.7126.4122.8116.3112.1 87.7 62.7
3209 48.7 79.9 91.3 91.0 91.9 90.3 81.2 87.1 90.3 90.0 91.0 94.2
     94.5 90.6103.0 99.1100.7109.8111.1107.9100.7 90.3 78.0 45.5
4009 49.7 79.6 91.0 91.3 96.5 91.9 87.7 91.6 89.7 91.6 95.2 94.2
     97.8 94.2103.6103.3 94.2107.2105.6104.6 94.2 90.3 71.8 40.6
4809 24.8 41.8 54.1 52.5 55.3 55.0 53.1 52.5 54.7 54.4 57.9 64.4
     64.4 64.0 68.5 73.7 74.0 71.4 73.4 71.8 66.0 64.4 54.7 35.4
 817 42.1 67.3 77.6 79.3 84.1 82.2 78.6 80.9 82.8 81.2 87.4 87.7
     88.0 84.1 90.9 90.9 87.4 93.5 95.4 88.0 80.9 74.4 61.5 40.4
1617 62.4101.9119.7122.9128.8119.7115.8122.3119.1113.9118.1129.4
    129.7121.3126.2127.8122.9127.8127.2119.1108.4 97.4 74.4 55.0
2417 52.0 87.7102.3103.0104.6104.0103.0104.0103.6105.3104.0113.4
    112.7102.7113.7112.1115.6115.3122.5110.4105.3 97.8 84.5 55.2
3217 46.5 78.0 96.8 93.6 97.1 97.1 95.5 97.8 99.1100.1102.3104.0
    112.1101.0105.3114.0113.7113.7120.2119.2106.6109.1 88.7 58.5
```

4017 54.1 90.1106.8105.6111.0109.4103.0107.8106.2112.0117.5117.5
122.9122.9125.5129.7138.4131.6134.5140.9119.1114.2 91.7 62.8
4817 46.7 80.4 96.5 96.2103.0 99.8 99.1104.3105.6107.2106.2111.0
115.8114.2124.2119.1119.1125.5123.9114.9109.1 99.8 77.2 57.9
825 49.8 84.1101.6100.3106.1103.5 98.7103.5103.9 97.1 97.7106.8
103.5 99.0110.7100.6106.8106.8109.4102.2 96.1 93.8 74.4 56.0
1625 63.1103.5115.2119.4122.3115.8106.8110.0107.1106.8112.6116.5
113.2110.7115.8116.5111.0121.3121.3111.6106.8 98.7 80.6 62.1
2425 55.2 87.7106.6104.0107.2104.0 97.8100.7100.7 97.1 98.1106.9
100.7 91.9106.2103.6105.6107.2110.4104.9103.0 94.2 81.2 58.5
3225 55.2 87.7105.9102.3102.3 99.1 93.6 93.9 93.9 94.5100.7103.3
100.7 92.6103.0105.3105.9112.7113.4110.1104.3 98.1 84.5 64.3
4025 54.7 83.7101.4 96.5102.3102.3 97.2103.0103.0 96.5109.1109.4
112.6103.0115.8112.3112.6116.2117.1119.1107.8103.0 85.9 54.7
4825 51.5 88.8106.2104.6108.4104.6102.0102.3105.2104.9105.2112.6
114.9110.1121.0116.5118.1118.4125.5117.5103.6101.4 84.0 61.5
5625 28.6 51.5 67.6 67.6 70.8 64.4 61.8 67.3 74.0 76.6 78.8 80.4
80.8 80.8 96.2 96.2100.7 98.5 94.0 94.0 88.5 91.7 80.4 54.7
833 43.7 71.5 82.2 85.7 86.7 84.8 81.5 85.7 86.1 84.1 89.9 93.8
93.2 90.6 93.8100.3 97.1100.3103.5 98.4 94.5 84.8 73.4 55.6
1633 58.2 90.6103.5104.2105.5105.2 97.7102.6102.9100.9103.2110.0
101.9100.3107.4105.5105.8112.9113.6107.4103.5 97.7 77.0 59.9
2433 49.2 80.9 97.1 95.4 98.7 96.4 90.6 97.4 96.1 93.8 96.4 93.8
100.3 95.4103.2101.9100.9105.5106.8103.5100.6 92.2 76.0 59.5
3233 49.4 86.1108.5106.9115.0113.7106.9104.6107.2104.0101.7107.2
104.6 99.1104.3107.2107.2107.2111.1110.8104.0 97.5 84.1 52.0
4033 45.1 76.9 96.5 96.2103.0 99.8 99.8 96.5 98.1 96.5 93.6 96.5
99.1 95.9103.0 99.8101.7104.6109.1104.6 96.9 96.9 78.8 57.9
4833 48.9 83.0102.3 99.8106.5105.9100.1 99.8103.6107.2103.3112.6
112.6114.9114.2112.0115.8115.2126.1122.9105.9 96.2 90.1 82.1
5633 28.2 53.1 69.7 70.4 76.4 75.4 76.4 82.7 83.0 83.3 91.0 92.3
93.3 92.6 99.3 94.6 99.3 97.9 98.9 99.9 91.0 88.0 69.4 59.4
841 42.1 71.5 87.0 85.7 90.6 89.9 86.4 90.6 90.6 91.6100.3106.8
103.5100.0108.4116.2119.7110.0116.5114.5100.3 97.1 74.4 51.8
1641 49.8 90.1107.9106.7111.0109.4108.2113.2112.6113.1114.0115.2
118.0121.7114.2123.2124.6119.8117.0121.2108.4103.9 87.1 60.9
2441 48.1 79.5 98.4 94.6100.3 97.2 92.3100.9 98.9 93.6104.7106.1
113.7100.9114.6111.2111.5115.0114.8121.5108.9106.1 91.1 68.4
3241 41.9 76.9 98.4 96.2106.1104.8104.8105.2107.9113.9108.6111.0
113.0108.4120.5108.8111.9117.2121.1115.1107.6107.6 85.9 56.7
4041 46.5 83.0108.2105.6109.6107.9104.6106.2104.6103.6107.9112.5
115.5106.2112.9109.6114.5114.2111.9109.6100.3 94.6 76.4 51.8
4841 51.1 91.3112.9107.6116.2116.2106.9110.2112.9109.9108.9116.2
119.5109.6115.2113.2111.9115.5113.5109.2102.3 96.6 73.0 45.5
5641 25.2 43.2 53.8 52.1 54.8 55.4 53.5 56.4 57.4 56.8 59.8 66.1
65.7 66.4 66.7 69.7 67.1 73.0 73.0 67.1 66.7 62.1 49.8 36.5
0849 20.8 36.4 49.2 49.9 53.1 53.4 53.6 51.5 55.8 58.2 62.5 72.8
74.7 73.6 76.7 83.3 82.1 77.1 82.2 86.9 72.6 72.1 62.9 45.3
1649 51.5 83.0 99.3102.3 99.6 99.3 92.3 92.0 92.3 89.6102.9103.9
99.3101.9110.9111.9101.6114.5111.6102.6 96.3 91.0 69.7 39.8
2449 49.8 84.7101.3102.3102.6 99.9 99.9102.3102.6 99.3102.3106.2
104.6 99.9111.2105.2101.3117.9112.2107.9102.9 96.3 79.7 46.5
3249 33.2 68.1 89.6 96.3102.9102.3 99.6105.2106.2109.6109.6118.5
118.5117.9122.8120.2123.8125.5129.5122.8112.9112.9 92.0 69.7
4049 45.0 88.6112.9104.4116.2116.2113.3112.2115.2108.8107.8116.2
120.7117.3122.1116.6114.1122.4120.3117.9107.4104.3 81.0 53.2
4849 30.5 61.4 81.0 86.0 93.0 90.0 85.7 83.3 86.3 84.7 83.3 91.3
92.3 89.6 96.3 97.9 96.9 91.6 96.3 97.9 87.0 83.0 71.4 47.1
2457 26.6 50.0 66.9 69.6 75.8 72.1 66.7 65.3 68.1 72.8 71.7 80.4
81.6 75.9 88.5 89.5 93.7 94.6 93.1 91.2 85.0 82.5 76.4 54.2
3257 29.3 54.2 67.6 67.6 71.1 67.1 64.9 68.6 68.1 70.0 73.7 82.2
84.9 86.1 87.4 86.1 96.3 96.9 97.9 99.9 95.6 93.3 71.5 52.3
4057 24.7 45.4 56.0 55.8 56.4 59.3 57.8 60.4 62.0 61.3 64.0 69.4
69.6 75.7 73.4 74.6 74.5 82.5 81.8 77.8 75.4 74.5 58.3 38.3

Cycle 2 Data

DATASET 29, December 31, 1975

Reactor Conditions

Core Average Exposure, 12466 MWd/t
Core Thermal Power, 1487 MWT
Dome Pressure, P, 953 psia
Core Flow, 94.9 Mlb/hr
Inlet Subcooling at P, 15.2 Btu/lb

Control Configuration

Legend: 48, Full Out; 0, Full In.

48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48

Axial TIP Distribution, Bottom to Top of Core

See Figure 2-6.

```
1609 32.4 56.2 70.1 70.1 72.1 75.0 72.1 73.4 74.4 76.0 82.6 81.0
     89.3 89.3 97.2 91.2 98.8 98.5 97.5 96.2 86.6 87.6 72.7 52.9
2409 38.0 67.8 89.3 89.3 98.8 95.9 94.2 98.8101.8102.5109.1113.7
    116.7115.7124.0125.6122.3123.0125.6125.0109.8109.1 97.5 76.0
3209 42.3 70.7 85.3 83.6 86.3 84.0 80.7 83.0 86.0 82.6 84.6 93.9
     95.5 89.9102.5 99.2104.1105.8107.4110.7 95.9 92.6 79.0 59.5
4009 40.3 69.4 85.3 85.3 88.6 86.6 85.3 86.0 87.6 91.2 90.9 94.2
     96.9 95.9102.5 99.2102.5105.8103.8105.1 92.9 86.6 75.0 46.3
4809 22.7 37.4 49.1 50.8 54.8 53.8 50.8 51.8 53.4 54.1 56.8 62.8
     64.1 66.4 68.1 73.5 73.5 75.8 73.5 74.1 67.1 67.4 60.1 36.7
 817 37.4 64.2 75.4 74.8 79.9 78.8 77.1 81.6 83.3 81.6 86.0 87.3
     91.1 85.3 93.5 89.4 92.4 93.5 95.5 85.3 83.3 79.9 64.6 40.8
1617 55.4 95.2112.1114.9119.3120.6115.2120.6118.3115.2120.6131.9
    128.5122.7131.5125.7132.5132.5130.8127.4113.5102.6 84.6 61.2
2417 46.3 76.0 94.9 94.9 99.5 98.5 95.2 97.5102.5100.5 99.2110.7
    112.4105.8110.7112.4115.7112.4114.0120.7104.1105.8 82.6 60.5
3217 36.4 69.1 86.9 86.6 92.6 91.9 89.6 93.2 96.5 98.5 94.2102.8
    104.8104.1108.1109.1109.1108.1117.4119.0107.1111.7 99.8 78.3
```

4017 49.7 82.5103.2100.8106.8101.8106.8106.8110.2110.2115.2116.2
116.9120.2131.9122.5134.6129.5140.2136.6122.5123.5 98.5 68.4
4817 40.1 71.8 90.2 90.8 97.8 99.2 94.2 99.8110.2 97.2108.5113.5
116.5114.9115.9118.9120.2119.9117.5126.2110.5106.8 93.2 60.1
825 45.9 78.2 98.6 98.6106.4103.7 98.6101.3 98.6 97.9 99.2106.7
104.0 99.9109.4108.1108.8112.1111.5108.8 99.6 94.8 78.2 58.8
1625 51.7 91.1111.5112.1116.2115.5108.8110.5110.5106.0109.8112.1
115.2109.1119.3119.6124.4121.7125.1122.3108.8102.0 88.4 64.2
2425 49.6 82.0 96.5 95.9 98.5 98.8 95.5 96.2 95.2 93.2 96.2 98.8
98.8 90.9102.5102.5103.5105.1108.1107.1 99.5 95.5 79.3 54.2
3225 46.3 79.0 95.9 92.6 95.2 92.6 87.6 89.9 90.9 87.6 89.9 95.9
97.5 90.9 99.5 99.8108.4108.4112.1112.4105.5 99.2 82.6 70.7
4025 46.7 78.5 94.5 91.8 97.8 97.2 94.8100.2100.2 98.5106.8112.9
113.5106.5112.9109.2114.2117.5122.5120.2110.2107.8 85.5 50.1
4825 43.4 76.8 93.5 93.5 97.2 95.8 94.2 92.8 93.5 90.8 94.5 95.2
101.8100.8103.5103.5106.8105.8110.2108.2104.5 98.5 76.8 48.4
5625 24.4 45.1 62.4 65.1 66.8 63.1 60.1 65.1 71.8 73.5 77.5 79.5
79.8 86.5 95.2105.8 98.5103.5 97.5 93.5 89.5 93.8 83.1 53.4
833 40.8 68.0 82.9 80.2 84.3 81.9 80.2 85.0 87.7 85.3 88.4 91.8
95.8 91.1101.6101.3 98.2101.3107.4107.1102.3 98.9 79.9 55.1
1633 50.6 83.3 98.6100.3102.0101.6 96.9101.3 98.6102.6102.3108.1
108.8105.4108.1112.1115.5116.9115.5116.2110.5 98.6 85.0 59.5
2433 44.2 74.8 91.4 91.8 95.2 95.2 92.4 93.5 97.2 93.5 98.6100.3
101.3 94.8102.3101.6107.1111.1111.1110.8101.6 98.2 80.2 72.0
3233 41.3 75.4 99.2102.2109.1108.8105.5104.8105.5105.1104.1106.5
108.1 99.2107.4109.1112.4110.7112.7115.4 99.8102.5 89.3 66.1
4033 40.1 70.1 92.5 90.2 99.5 97.2 93.8 95.8 95.8 96.8 99.8100.2
99.5 93.5 98.8104.2105.8103.5110.2113.5 99.8 95.8 85.1 55.1
4833 29.4 60.1 84.5 88.5 94.2 94.2 94.5 96.8103.5104.2106.2114.5
117.2111.5114.5117.5120.9120.2125.9120.2113.2109.2 91.5 69.8
5633 21.8 47.8 65.8 68.6 72.7 73.1 73.8 80.4 82.8 82.8 80.0 93.2
93.5 91.5 93.5 97.0 97.7104.3106.0104.6 93.5 92.5 75.5 50.9
841 36.7 68.6 85.0 84.6 85.3 85.3 84.6 88.4 91.4 91.4 98.2101.6
104.7102.3112.1112.1115.2118.9115.9111.5 98.9102.0 86.3 53.4
1641 45.7 82.5104.2101.8106.8101.8112.1112.1116.8111.3111.7113.9
112.2119.0120.0116.4121.1117.9122.0117.5111.5112.4 93.6 66.4
2441 41.1 74.6 91.7 90.0 95.8 92.3 90.1 98.2 96.2 95.6102.5109.5
114.6104.4111.8108.1113.1116.3120.1122.6111.3111.0 90.6 62.6
3241 37.3 70.1 94.4 90.2102.5102.1 98.5104.4105.4114.2115.8115.2
113.4105.7115.6113.6116.4115.9122.3124.9110.8106.3 92.8 54.0
4041 41.6 76.9102.2101.8106.7105.3103.6100.8103.9107.7110.9110.9
114.3105.7114.3114.3117.1116.7115.4112.6102.9100.1 83.1 65.8
4841 46.8 83.1107.4103.6110.9110.5112.2109.1113.6110.2112.6112.6
119.2112.6118.5118.1117.8115.0123.7117.8102.2 97.0 79.7 43.3
5641 24.2 40.9 51.3 50.9 53.0 52.7 52.0 54.7 57.9 58.2 62.4 64.1
66.2 65.8 70.7 69.3 72.7 73.8 74.1 74.1 70.0 65.5 52.0 31.2
0849 19.1 32.5 44.7 48.3 52.6 52.2 51.3 50.8 54.5 57.9 61.3 71.0
74.4 76.4 76.3 83.1 81.6 81.9 82.3 89.7 73.8 75.5 69.1 47.0
1649 46.8 79.7 93.5 93.5 97.0 93.5 89.0 91.5 93.5 93.5 96.3102.5
100.5101.2101.2116.1109.5114.3110.9103.9103.6 92.1 69.3 34.6
2449 45.0 79.7 97.0 97.0100.8 99.4 97.7 96.3 97.0 94.2 98.0 98.7
105.7104.6107.4107.4110.9109.8114.3112.2108.4102.2 79.7 50.2
3249 30.5 62.4 87.6 91.8 97.7 97.7 98.0100.5107.4108.1110.2118.8
121.6115.7118.8121.9125.4124.7130.6124.7117.4113.3 94.9 72.4
4049 41.2 80.6107.4100.5110.9110.5118.9111.3115.9109.1111.5112.6
120.4120.5125.6121.6120.2121.9131.1127.2107.3104.8 88.5 50.7
4849 25.6 52.3 76.2 82.8 86.6 86.6 87.0 84.9 84.9 84.9 87.3 93.5
96.7 92.8100.1 98.7100.5 97.3100.5 95.3 90.4 86.6 71.0 54.7
2457 22.7 43.8 61.8 67.1 71.5 70.7 64.9 63.2 66.1 69.8 70.5 79.5
80.6 81.3 87.6 98.4 91.6 99.4 96.5 90.7 85.9 84.4 79.0 52.9
3257 22.7 48.8 63.8 65.9 67.6 65.1 62.7 66.7 67.9 70.0 64.8 83.0
85.1 85.1 82.3 88.3 94.8103.3104.9104.6 98.2 98.1 77.8 44.8
4057 23.7 43.0 53.4 54.5 54.6 56.4 56.2 58.5 62.5 62.9 66.8 67.3
70.2 75.0 77.8 74.2 80.7 83.4 83.0 86.0 79.1 78.6 60.8 32.8

Cycle 3 Data

DATASET 30, April 27, 1976

Reactor Conditions

Core Average Exposure, 9774 MWd/t
Core Thermal Power, 2441 MWT
Dome Pressure, P, 998 psia
Core Flow, 96.3 Mlb/hr
Inlet Subcooling at P, 21.0 Btu/lb

Control Configuration

Legend: 48, Full Out; 0, Full In.

48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	42	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	12	48	38	48	24	48	38	48	12	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	38	48	12	48	44	48	12	48	38	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	42	48	24	48	44	48	0	48	44	48	24	48	42	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	38	48	12	48	44	48	12	48	38	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	12	48	38	48	24	48	38	48	12	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	42	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48

Axial TIP Distribution, Bottom to Top of Core

See Figure 2-6

```
1609 39.4 63.2 75.2 83.0 88.6 89.1 92.5 94.7 94.5 91.2 93.3 92.4
     88.2 84.5 87.1 84.4 84.8 83.6 83.8 76.8 71.7 61.5 42.6 24.0
2409 76.6116.7140.3159.0162.9160.8155.4156.9147.8134.8137.9136.5
    128.7127.5127.3123.2120.5119.8114.3102.1 93.3 74.0 53.1 36.6
3209 66.3104.3125.7147.6151.9147.8144.7143.9134.2125.2123.5122.2
    118.9115.3116.0116.3111.1109.8106.6 96.7 91.5 75.4 55.1 38.6
4009 57.9 91.2106.3119.2126.6124.6123.5125.2120.0114.5114.7112.9
    105.7103.8104.1101.2 97.5 98.4 94.7 84.4 79.1 63.5 45.5 26.8
4809 18.3 30.0 35.7 37.5 39.7 41.0 39.0 41.0 42.2 41.7 44.4 44.3
     45.1 46.5 47.5 47.7 48.0 51.8 53.8 51.0 50.8 45.0 33.8 23.6
0817 63.4 75.0 82.6 86.5 85.9 84.5 86.6 83.9 82.0 83.8 82.6 77.8
     78.3 78.2 75.4 75.0 77.5 76.0 69.1 64.8 57.0 41.5 28.6 23.2
1617 52.7 75.6 86.2 95.2102.0103.0103.6104.7102.6 98.9 98.3 95.8
     89.5 89.1 92.0 91.5 91.9 96.4 98.9 92.6 89.8 74.2 52.9 28.8
2417 58.3 87.8102.3113.8126.6131.1134.3131.7120.8114.9120.7114.9
    111.0111.6113.5110.4108.4112.1108.8 98.3 93.1 75.8 57.2 37.4
3217 66.6 99.6115.8127.2131.9131.2125.7124.8117.1111.0119.0124.5
    126.3130.3134.8135.7130.5134.2129.2116.3107.7 87.6 63.2 39.6
```

4017 47.9 77.9 93.9107.5120.2129.4134.0133.9134.8126.2131.5124.6
120.8115.6119.0116.8115.5119.6119.7109.2103.5 87.5 67.5 49.7
4817 39.3 67.6 86.1 97.7108.0111.4113.0121.4114.3109.4110.2105.2
100.5 98.1 98.0 99.3 96.3100.6105.5 99.9 92.8 79.9 59.8 42.2
0825111.4124.4133.0137.1137.9129.5125.5120.5111.9111.8114.0107.7
106.8105.4103.7 98.6 97.7 93.9 83.9 75.9 67.2 47.8 34.3 28.8
1625 66.5 96.3109.6127.1135.9138.9139.0141.0137.1126.4131.5129.4
124.6123.3125.5128.9126.0129.0121.2112.8104.0 86.5 64.4 45.0
2425 59.1 89.7104.4115.4118.5115.4111.4112.9105.1102.2102.7101.5
97.5 98.7 98.1100.6100.0106.0110.6103.4 98.9 82.3 59.4 36.1
3225 97.4122.3137.2141.2133.2125.2125.1120.7109.8112.2111.4106.8
100.9103.3103.4 97.6100.5 99.5 90.5 87.0 78.4 59.5 42.7 34.8
4025 53.5 84.7102.0111.6119.5121.3118.0116.5115.1106.7108.7108.2
104.3103.8103.0104.5101.8107.6114.3107.6106.5 90.9 67.9 48.6
4825 58.3 94.4109.7123.5130.0141.9137.2136.2132.8121.7119.0118.9
115.4113.1116.4112.1102.8104.2102.9 92.5 89.0 74.1 54.3 30.4
5625 52.2 82.7 99.7110.3110.1105.9106.1113.6117.2106.5105.4 96.4
92.7 97.6 95.0 92.6 88.6 82.6 78.6 72.1 70.5 55.1 38.6 21.0
0833 77.7111.3130.7150.7150.5139.8135.6130.5124.2113.2112.1117.0
112.5113.6112.6109.1104.9102.4 99.8 88.9 82.6 67.5 48.2 27.8
1633 72.5105.9121.6135.9138.0136.4129.5138.6127.5127.9132.2140.3
143.8143.6147.0150.1142.0141.9137.2117.7109.9 89.7 69.2 51.3
2433 77.7113.9129.9146.9145.9140.1131.2130.8118.0115.9119.5115.5
110.2110.4110.9112.6105.6108.4107.8 97.8 90.6 76.0 55.1 31.2
3233 56.0 95.3116.2131.3134.7130.5124.8122.8118.9109.7107.4105.7
102.1102.0103.6104.1 98.6 99.5 98.4 88.9 84.6 72.7 53.9 39.5
4033 63.0102.1124.7139.9143.4131.5119.7120.1116.5113.5111.1115.2
109.9108.6110.6111.9109.7113.5108.4 99.5 92.7 77.2 58.0 37.8
4833 56.2 91.8112.9127.5132.8132.3127.1127.3119.5116.3120.7126.3
130.6134.8137.2133.4131.5133.7126.2111.5103.0 88.2 65.5 47.0
5633 33.8 57.3 77.7 94.8104.3109.5110.1110.2111.7106.9107.2106.0
102.0 98.9103.9 99.1 91.8 93.7 91.8 80.5 75.0 62.4 45.4 33.4
0841102.3118.7135.6137.9137.7133.9134.5129.3121.1122.9119.8112.3
109.5109.8107.0103.8101.9101.4 89.9 80.9 67.0 48.9 34.5 31.2
1641 50.7 83.2103.8120.7138.0147.4153.1159.6149.4142.9141.6140.5
137.3132.4132.2133.5126.4132.3130.4117.4111.0 92.1 70.0 50.5
2441 50.1 78.4 94.8105.6111.9110.7112.2111.1106.2101.7100.5101.7
98.8 96.0 94.7 96.8 94.6102.3103.9 99.0 97.3 84.1 64.0 43.8
3241 65.5106.7131.7147.8156.5153.4147.8141.6136.0128.6132.5131.4
132.6129.1131.4130.8124.2130.6124.6111.0103.6 85.0 64.2 38.1
4041 40.1 71.2 87.9 97.7107.8108.8107.4111.4108.1104.3103.1103.8
102.3 98.9101.9101.4 98.0107.4118.1111.1104.6 93.5 70.2 50.9
4841 47.4 78.8 98.5110.3120.0127.6123.7129.2127.2117.7118.3117.6
113.8111.1114.0113.1107.7111.3109.4 98.8 93.0 81.2 57.5 39.9
5641 28.4 45.2 57.6 62.2 65.1 64.1 61.1 63.3 61.5 60.2 61.1 62.8
61.1 59.2 59.0 60.7 58.8 58.7 57.6 51.6 50.2 43.3 32.3 24.0
0849 31.6 39.4 41.9 45.2 45.9 45.8 47.3 47.8 47.1 49.7 49.9 49.4
50.5 50.7 51.8 51.8 54.3 55.7 51.9 51.9 46.9 34.9 24.0 16.5
1649 35.3 64.3 83.9 95.9104.0108.2108.3112.5109.1105.0105.8101.7
98.2 92.9 95.4 96.1 98.5102.9106.8100.4 97.6 84.9 61.3 41.6
2449 47.2 85.1110.1117.2132.8142.6141.8146.0141.3135.3135.5134.2
133.1131.4134.3127.9121.6122.9117.9106.0 98.0 84.7 63.3 48.1
3249 51.3 92.7118.5133.6145.1145.8138.8138.2131.9122.9124.9130.5
133.8134.7139.4134.7126.1123.0124.9111.7103.8 91.0 68.6 52.7
4049 51.5 80.9 99.1111.7120.2124.4128.1126.6122.5115.8115.8112.3
107.0103.0106.0106.9101.7107.1105.5 95.9 90.6 75.2 57.1 37.7
4849 26.9 46.7 60.5 67.3 73.9 77.3 76.9 80.1 81.4 79.7 82.5 82.9
80.8 80.9 81.2 82.9 83.5 88.8 95.8 93.0 87.5 74.1 55.8 42.2
2457 67.9 85.9 95.1100.6103.5100.1100.7 97.7 92.3 91.4 91.5 89.0
83.1 84.3 83.5 78.4 82.5 76.8 68.3 62.1 53.7 38.9 25.8 17.2
3257 39.1 62.0 78.1 92.8 99.9100.2 99.6 97.6 94.1 88.8 91.4 88.5
84.0 79.4 79.4 79.2 74.8 75.9 74.3 65.2 63.1 54.4 42.0 30.8
4057 45.0 57.5 63.5 68.6 71.4 71.7 73.7 71.1 71.6 73.9 72.3 71.0
69.3 69.4 68.9 66.4 67.3 63.3 58.7 53.9 46.5 35.4 21.9 7.3

Cycle 3 Data

DATASET 31, June 14, 1976

Reactor Conditions

Core Average Exposure, 10350 MWd/t
Core Thermal Power, 2472 MWT
Dome Pressure, P, 994 psia
Core Flow, 98.1 Mlb/hr
Inlet Subcooling at P, 20.7 Btu/lb

Control Configuration

Legend: 48, Full Out; 0, Full In.

48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	32	48	32	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	10	48	36	48	36	48	8	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	22	48	34	48	18	48	18	48	34	48	22	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	42	48	0	48	42	48	42	48	0	48	42	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	22	48	34	48	18	48	18	48	34	48	22	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	10	48	36	48	36	48	8	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	32	48	32	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48

Axial TIP Distribution

No TIP Data on this Date

Cycle 3 Data

DATASET 32, August 19, 1976

Reactor Conditions

Core Average Exposure, 10713 MWd/t
Core Thermal Power, 2119 MWT
Dome Pressure, P, 1010 psia
Core Flow, 78.2 Mlb/hr
Inlet Subcooling at P, 23.7 Btu/lb

Control Configuration

Legend: 48, Full Out; 0, Full In.

48	08	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	24	48	24	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	0	48	36	48	36	48	0	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	12	48	30	48	12	48	12	48	30	48	12	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	40	48	0	48	42	48	42	48	0	48	40	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	12	48	30	48	12	48	12	48	30	48	12	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	0	48	36	48	36	48	0	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	24	48	24	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48

Axial TIP Distribution

No TIP Data on This Date

Cycle 3 Data

DATASET 33, September 23, 1976

Reactor Conditions

Core Average Exposure, 11175 MWd/t
Core Thermal Power, 2423 MWT
Dome Pressure, P, 1015 psia
Core Flow, 98.2 Mlb/hr
Inlet Subcooling at P, 20.7 Btu/lb

Control Configuration

Legend: 48, Full Out; 0, Full In.

48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	42	48	42	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	12	48	34	48	34	48	12	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	28	48	38	48	6	48	6	48	38	48	28	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	44	48	10	48	44	48	44	48	10	48	44	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	28	48	38	48	6	48	6	48	38	48	28	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	12	48	34	48	34	48	12	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	42	48	42	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48

Axial TIP Distribution, Bottom to Top of Core

See Figure 2-6.

```
1609 48.8 75.6 89.9 97.7101.2 98.1 95.7 99.6 96.4 89.0 91.4 87.8
     82.5 79.3 80.7 79.1 77.4 80.1 76.5 69.0 65.5 54.3 39.6 24.8
2409 59.9 97.2121.9149.7158.9159.2158.8155.5146.7138.9139.7132.9
   122.3120.9118.1115.3107.6108.4104.7 93.0 84.1 67.6 46.5 25.9
3209 54.7 86.1108.3132.6142.5141.5140.2142.3135.3125.8125.5122.0
   111.0106.4106.0103.2 96.2 98.7 93.7 85.0 78.6 67.1 49.1 32.0
4009 61.9 93.4113.6127.3131.6129.6125.9125.0119.1112.9113.1109.5
   101.8 99.8 97.5 95.0 91.2 91.7 89.4 81.2 75.6 60.3 42.2 23.2
4809 25.3 39.8 46.3 49.5 51.1 50.7 47.4 48.5 47.9 47.0 47.9 48.1
     47.4 46.5 47.7 46.8 46.8 47.5 48.7 45.0 43.6 38.9 31.0 24.0
0817 73.8 86.7 95.9 96.1 92.5 90.3 90.0 87.1 85.8 89.3 90.8 88.9
     84.9 84.8 81.9 75.7 76.5 73.2 64.7 60.4 53.3 39.3 26.9 20.1
1617 66.2 93.7106.5116.2115.2109.5109.7109.9103.0 95.8100.5 96.7
     87.9 88.2 88.4 86.7 86.2 90.8 89.9 84.0 81.7 66.7 48.8 28.3
2417 53.5 79.8 90.4101.4107.1109.2114.2122.8119.1114.5115.5112.5
   102.9100.2101.0 97.2 92.3 92.3 92.6 84.4 81.6 69.4 50.4 26.3
3217 53.7 78.8 91.3102.9110.8116.9123.0134.1133.4128.6130.6128.3
   119.1115.9115.8114.4110.3110.0107.3 97.7 90.9 77.6 54.0 31.5
```

4017 50.2 81.6 96.8108.2113.0117.0115.7119.7116.3110.4112.1114.1
104.3103.4105.5103.3 97.4104.5106.8 98.5 95.7 81.9 62.0 47.5
4817 65.0108.2133.6149.7154.0147.7136.3136.3132.5119.9119.2122.2
112.0106.5108.7106.5 99.0100.2 99.4 87.3 80.4 67.3 51.6 36.6
0825 87.5101.7111.9115.2109.4105.1107.0104.9105.0114.2119.2113.6
111.8111.2110.5 99.5 98.9 93.3 82.2 73.3 63.4 47.5 34.2 30.2
1625 63.8 96.5109.0121.8128.0136.6138.2137.2131.2123.1127.9127.6
122.2117.0117.2116.6111.1112.9108.7101.3 93.6 79.1 57.7 38.1
2425 50.6 76.6 89.8100.2105.8107.0104.8103.4102.1 96.6101.4 97.7
91.5 89.8 90.0 88.2 86.1 87.7 86.0 78.9 79.3 69.2 52.7 34.5
3225 73.6 88.2 95.3101.0101.3101.6105.3100.0 96.0 94.0 93.3 87.1
83.2 83.4 82.0 76.5 77.9 77.3 72.0 72.9 68.7 55.3 40.8 33.7
4025 46.7 76.3 91.7104.4117.3127.8128.3130.3127.0117.8115.5117.8
111.5105.5107.2104.4 97.7101.6100.4 92.2 88.0 76.3 58.7 41.7
4825 54.7 87.2103.4114.6115.4113.9112.7112.9113.3109.9119.3121.6
114.0109.1110.6107.0 97.4 98.6 95.0 84.9 82.2 68.2 51.8 31.4
5625 48.7 76.3 90.6100.2 99.7 95.2 99.6104.2103.7101.3103.3 95.4
94.9 99.8 99.3 95.0 89.0 82.5 78.9 71.7 67.5 54.5 38.1 21.2
0833 75.0108.9127.7141.0142.1133.5123.6122.2115.1112.3112.4110.5
104.0106.4103.8101.4 94.7 95.9 90.0 81.9 78.0 62.9 46.5 31.4
1633 65.8 98.7112.4129.4133.1133.7128.4131.0122.7119.8123.9122.4
118.1117.2113.6111.6106.9111.2110.5104.1102.1 83.8 63.3 40.0
2433 66.7 99.3114.6127.9133.2128.9122.0121.1116.8111.4116.1111.7
103.8102.7100.3100.6 95.4 96.6 93.1 86.5 83.2 70.2 53.0 32.0
3233 49.3 87.2114.1131.0139.3133.6124.6127.2123.6117.0113.5113.1
105.8100.2102.3 98.7 91.9 94.4 93.2 87.1 83.0 74.3 55.8 43.7
4033 52.1 80.8 95.9106.5111.5109.5 99.8108.0103.6 96.7 97.4 95.9
90.4 88.9 89.4 87.6 85.0 87.0 91.1 86.2 87.0 73.7 55.0 33.0
4833 56.0 95.0103.5142.5146.0143.5130.8139.0133.5123.8126.6125.0
121.2116.6117.0117.3109.4110.2107.0 98.3 89.5 79.1 58.5 45.2
5633 43.0 69.1 83.6 91.6 97.3 99.1 95.9 97.0100.0 96.4104.1102.1
99.7 97.4 94.7 91.4 88.0 87.1 85.3 76.8 71.4 60.1 42.9 28.5
0841 82.3 96.5104.5106.1108.4109.4108.6113.0116.2127.7132.8131.8
123.6122.0118.5109.9112.6104.2 92.8 82.9 68.1 48.0 34.4 27.6
1641 57.4 95.1117.2134.3145.9150.2150.9153.6147.9142.7142.2141.6
136.2132.5136.9132.2120.7125.6118.7109.7100.9 87.2 66.7 53.9
2441 44.0 69.0 82.1 93.0 99.8102.9103.1109.7104.3102.3103.3100.3
93.6 89.4 88.9 88.7 83.0 86.0 84.8 78.6 79.4 71.3 56.3 42.1
3241 49.4 76.7 91.8102.3110.6115.6118.5121.2124.6112.5113.5113.8
109.8106.8104.0102.0 97.4 97.7 93.0 86.9 84.2 74.3 56.2 30.4
4041 40.7 71.0 90.4 99.6113.1120.9121.7127.2124.0117.7117.9114.1
115.4107.3105.9106.8101.1104.0103.2 95.5 90.8 80.1 62.3 42.3
4841 53.1 90.5108.0116.5122.4117.7113.2115.4109.4110.1120.8126.1
124.5118.6119.8116.8108.3110.6107.7 95.0 88.7 76.1 55.0 36.6
5641 25.1 42.2 51.3 55.0 57.4 57.4 54.4 57.2 58.6 57.9 63.2 65.2
65.3 63.4 66.7 64.0 60.8 61.6 59.0 52.6 49.0 42.9 31.8 23.7
0849 43.8 54.0 56.2 58.6 58.0 56.9 56.9 55.8 55.5 57.5 56.8 55.3
55.7 54.0 54.7 53.5 52.5 54.2 49.3 47.1 40.9 31.8 21.4 13.4
1649 48.3 85.2110.4126.3128.3127.4118.7117.0112.1105.4102.0 98.9
97.5 94.2 92.8 91.5 90.3 95.3100.3 94.0 89.0 75.1 59.1 49.0
2449 44.3 79.7104.7115.7124.3128.2127.2138.2138.1135.8136.5134.5
127.5117.2117.3114.3105.8107.0105.3 97.4 89.3 78.5 59.4 42.7
3249 44.4 81.3107.2121.5134.5143.5139.8156.7159.7152.3149.2147.1
134.3124.5123.9117.8109.9109.6106.6 96.0 89.3 79.0 62.8 51.1
4049 56.9 90.1108.5119.4124.3120.5114.8114.3109.8100.8 99.0100.4
93.8 91.1 91.9 88.3 87.0 92.5 97.2 91.3 87.8 73.2 54.3 34.2
4849 47.4 84.2106.8118.5122.4120.7114.4113.9107.2103.0101.1105.5
99.5 97.1 98.3 95.8 89.0 92.9 93.1 81.4 79.1 66.8 49.1 34.6
2457 49.9 68.2 85.2 99.2104.0103.6105.6100.0 93.8 95.1 89.9 86.6
82.4 81.0 78.6 74.9 75.9 71.0 63.3 60.3 50.2 36.5 24.5 13.8
3257 31.3 50.3 65.9 79.5 92.0 96.0 94.4 97.7 94.0 86.8 86.5 83.7
79.8 76.7 75.9 73.1 70.3 71.5 68.6 60.5 58.5 51.8 38.4 26.4
4057 42.4 54.8 62.8 70.9 74.7 75.0 76.4 75.2 73.7 75.1 74.5 70.8
66.4 67.5 66.3 62.6 62.4 60.6 55.7 51.4 44.1 33.7 20.6 7.3

Cycle 3 Data

DATASET 34, November 22, 1976

Reactor Conditions

Core Average Exposure, 11895 MWd/t
Core Thermal Power, 2445 MWT
Dome Pressure, P, 1016 psia
Core Flow, 98.4 Mlb/hr
Inlet Subcooling at P, 20.9 Btu/lb

Control Configuration

Legend: 48, Full Out; 0, Full In.

48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	44	48	10	48	10	48	44	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	44	48	28	48	36	48	36	48	28	48	44	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	10	48	36	48	44	48	44	48	36	48	10	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	10	48	36	48	44	48	44	48	36	48	10	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	44	48	28	48	36	48	36	48	28	48	44	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	44	48	10	48	10	48	44	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48

Axial TIP Distribution, Bottom to Top of Core

See Figure 2-6.

1609	38.2	65.3	82.2	94.0	99.9	96.9	95.4	96.3	93.9	88.0	90.7	87.6
	85.5	82.7	81.6	77.7	75.4	77.8	71.9	65.9	61.7	50.4	35.7	20.0
2409	50.4	78.3	91.1	102.1	104.2	103.0	103.2	102.6	98.9	95.5	95.9	96.2
	91.5	91.5	89.4	88.9	86.1	90.3	92.6	89.6	87.6	71.3	50.9	31.1
3209	41.0	63.1	74.3	80.9	84.6	83.1	82.7	85.4	83.9	79.2	81.4	79.4
	73.5	74.8	74.9	75.0	74.9	80.5	84.1	85.4	85.8	74.6	56.1	36.4
4009	46.4	76.0	97.0	108.1	113.6	109.6	110.0	107.6	102.3	99.3	99.4	99.5
	92.1	91.6	90.8	89.6	86.0	88.8	83.7	76.6	71.5	59.4	41.3	21.4
4809	23.2	37.3	44.4	46.4	47.6	47.4	45.8	47.3	45.9	44.7	47.4	48.0
	48.3	46.8	46.7	46.6	44.3	45.9	45.4	42.2	40.8	35.5	27.5	21.2
0817	62.1	79.2	91.1	93.3	90.7	89.8	87.9	84.4	77.9	82.7	80.8	78.2
	73.0	72.8	71.5	67.5	67.7	65.7	57.8	54.0	47.2	34.7	24.0	18.9
1617	67.6	96.4	109.1	117.1	116.4	107.4	105.2	106.0	100.3	98.9	104.7	109.1
	98.4	98.8	97.3	94.7	89.4	89.9	84.7	76.7	71.6	59.3	42.8	24.2
2417	49.2	73.5	83.9	90.6	95.7	100.9	106.9	111.7	109.7	104.6	104.6	104.7
	100.5	99.7	94.4	94.1	92.0	93.2	90.3	83.5	80.1	66.4	48.0	27.6
3217	47.2	71.2	80.7	92.7	100.1	105.7	114.7	119.4	118.1	112.3	117.3	114.5
	110.3	109.8	111.0	108.1	104.8	105.4	105.2	96.4	90.8	76.1	54.6	33.0

4017 49.8 80.5 96.3104.9109.4107.2105.7108.7108.4105.7116.6121.3
119.8116.0118.0115.6108.7110.5105.8 94.0 88.9 74.8 55.6 35.5
4817 57.5 98.5129.2143.2148.3145.0133.4134.3125.6117.3115.5115.7
109.1102.5102.4101.1 94.5 93.9 91.6 80.9 75.1 63.5 46.0 30.6
0825 73.0 82.3 92.0 93.2 90.5 86.4 89.0 85.7 80.8 81.6 80.0 77.1
74.3 74.4 73.2 69.5 71.8 74.3 71.1 71.4 62.0 45.8 33.9 30.0
1625 54.8 80.5 91.5100.7106.0110.4118.5122.0118.5115.2119.9118.3
113.5111.3110.7110.2103.3106.7105.3 94.8 87.3 74.4 54.8 35.0
2425 49.2 77.3 96.2109.6114.2116.1114.9119.5116.2109.7114.7115.0
107.1106.4106.1102.7 96.6 99.4 96.3 85.4 80.3 65.2 49.2 30.7
3225 74.9 95.5109.8116.4119.5116.5121.6117.8113.9112.9112.7106.6
102.0101.2 99.1 92.6 92.9 90.5 82.5 77.2 69.0 53.0 38.9 32.0
4025 42.5 67.5 82.1 92.9 97.5104.9113.9119.6121.6116.4118.5118.8
114.1108.5110.7109.6100.7102.0100.5 89.7 86.0 73.4 55.8 40.0
4825 45.8 72.2 84.1 92.5 96.6 96.7 94.4 96.1 92.6 90.9 89.0 86.0
83.7 82.1 82.1 79.9 75.7 78.9 79.1 77.9 79.1 68.2 51.7 35.1
5625 39.0 62.1 73.1 79.9 81.6 76.4 78.2 83.9 82.9 80.4 77.5 70.8
69.8 72.3 75.5 73.6 70.7 69.3 68.7 63.8 64.2 53.0 37.3 17.9
0833 47.1 64.1 71.3 78.8 81.0 77.8 80.0 76.2 76.0 74.2 76.1 75.2
73.1 71.0 71.3 70.0 71.2 72.3 76.8 75.3 76.1 67.0 49.4 27.5
1633 50.4 72.8 82.6 95.4106.8113.0126.3134.3135.3127.2127.6131.4
121.2119.3117.2116.1111.6115.0109.9 99.1 94.1 78.0 57.9 38.0
2433 61.7 90.2103.3117.4120.4119.3119.7122.2115.8115.8117.2117.7
107.3107.5108.4105.4 98.1 99.7 96.0 85.2 79.6 64.4 47.3 27.6
3233 45.2 81.0104.5120.2127.6128.5119.9126.9121.8116.7117.4118.4
112.6106.9109.9108.0 99.4101.5 98.3 88.8 81.6 72.5 53.3 39.7
4033 44.8 68.7 83.0 91.5 98.9108.0113.5121.3121.0112.7117.9117.7
106.1105.0107.8103.3 99.0 98.7 94.0 86.0 81.6 67.1 49.7 32.6
4833 38.2 63.2 75.4 84.0 90.0 96.7 94.4 99.5 97.7 91.7 98.7 95.2
92.6 89.3 89.0 88.7 87.4 91.6 93.0 88.9 90.0 77.4 61.8 47.8
5633 29.6 47.9 57.6 61.9 64.9 64.5 63.5 67.2 67.2 69.2 71.5 70.9
69.0 67.2 67.2 68.7 67.0 69.6 71.3 69.4 67.5 58.5 44.9 34.1
0841 82.3100.9115.2120.3116.7112.2114.2111.8103.4107.4101.9 98.1
92.7 91.3 93.0 88.6 89.9 87.5 76.5 72.9 61.8 44.0 31.0 25.9
1641 52.3 87.4105.0115.0120.1119.3121.6120.3121.8121.8131.6134.1
129.5126.9129.7126.4118.6120.5114.4101.7 95.5 79.2 59.8 42.2
2441 42.1 65.4 78.4 87.4 93.4 99.6106.8116.1115.8110.7114.9112.5
105.6 98.8101.6100.1 93.3 94.4 92.8 83.6 79.7 67.5 52.9 39.5
3241 46.6 72.0 85.5 97.9106.5117.0129.1137.5135.7131.9134.8131.7
126.0122.8122.4119.9113.5111.4107.8 96.5 89.2 73.3 54.4 30.2
4041 37.2 65.1 81.4 90.1 96.0 96.9 96.8100.8105.6105.7116.0121.2
118.8114.9115.1111.7107.3106.1105.5 96.5 89.8 77.4 59.1 43.8
4841 50.5 89.3110.4122.3127.1125.1116.9114.2111.3102.6104.1106.5
102.8 98.2 99.0 98.1 93.1 95.0 93.7 83.7 79.0 67.9 51.4 36.0
5641 22.7 38.6 47.6 52.1 56.2 54.3 51.5 53.7 51.8 50.3 52.1 51.1
50.9 49.3 49.5 48.8 49.3 51.1 50.7 46.0 44.7 38.7 29.2 21.9
0849 38.0 46.8 51.0 54.3 54.7 52.5 53.5 51.8 51.5 52.9 52.6 50.3
51.2 51.3 48.9 47.2 48.1 47.5 43.8 41.5 36.8 28.7 19.7 15.1
1649 49.6 89.9121.3139.5142.1139.6127.4121.9116.8107.2112.0111.4
105.9102.1101.3 99.7 97.2 96.7 95.3 84.7 76.9 66.4 48.9 36.0
2449 36.9 67.0 85.9 92.8102.3103.8103.2102.7100.1 96.7 99.3100.0
96.8 92.9 92.1 92.4 87.4 90.0 91.3 87.8 86.1 79.0 60.6 43.9
3249 33.9 59.6 77.0 83.8 93.8 95.0 96.5102.7100.6100.2 99.7 99.7
94.3 89.6 90.6 87.3 82.8 88.4 90.4 90.8 91.8 84.8 65.7 50.9
4049 54.3 90.4109.3121.8126.9118.7112.0109.4105.3 98.1101.7101.3
96.9 95.3 94.0 94.4 90.7 94.1 91.5 82.9 79.2 65.6 49.9 29.9
4849 45.7 84.0105.1119.5122.7118.2108.0110.0104.5103.5103.8103.5
98.7 96.8 98.8 93.7 86.7 88.8 86.7 76.5 68.1 60.1 43.4 32.6
2457 50.9 62.0 69.0 74.1 72.1 72.1 72.6 71.6 67.9 69.0 69.0 65.4
62.9 66.1 64.3 62.6 64.5 63.9 59.9 57.8 52.0 38.3 24.8 14.8
3257 31.9 48.8 55.7 58.4 59.9 59.0 58.7 59.6 60.4 58.6 60.4 60.1
60.0 60.5 60.3 59.5 59.3 62.5 63.7 59.2 60.5 54.7 41.0 27.0
4057 35.7 47.3 51.6 56.3 57.4 57.6 58.6 58.9 56.9 60.5 60.7 59.5
59.6 59.5 58.4 56.1 57.4 56.6 52.0 49.2 43.5 32.7 20.0 7.5

Cycle 3 Data

DATASET 35, December 17, 1976

Reactor Conditions

Core Average Exposure, 12263 MWd/t
Core Thermal Power, 2090 MWT
Dome Pressure, P, 998 psia
Core Flow, 83.5 Mlb/hr
Inlet Subcooling at P, 21.7 Btu/lb

Control Configuration

Legend: 48, Full Out; 0, Full In.

48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	44	48	10	48	10	48	44	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	44	48	26	48	36	48	36	48	26	48	44	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	10	48	36	48	44	48	44	48	36	48	10	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	10	48	36	48	44	48	44	48	36	48	10	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	44	48	26	48	36	48	36	48	26	48	44	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	44	48	10	48	10	48	44	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48

Axial TIP Distribution, Bottom to Top of Core

See Figure 2-6.

1609	36.0	59.2	74.1	85.8	91.2	90.3	88.5	90.7	90.6	83.9	90.4	88.8
	84.2	83.6	82.4	81.3	77.3	77.5	74.5	66.7	63.1	51.3	37.1	23.4
2409	46.2	70.7	82.9	92.1	95.5	94.4	95.9	96.7	93.9	92.5	95.0	95.7
	90.7	91.2	92.0	89.1	88.3	95.4	94.6	88.8	85.7	71.9	50.0	29.4
3209	37.8	58.0	66.3	72.3	74.9	75.3	76.7	78.5	78.2	75.2	76.6	76.1
	75.7	75.3	77.1	76.3	76.7	81.9	83.6	86.8	86.2	74.3	52.7	31.4
4009	42.4	68.9	87.8	99.8	103.0	102.3	99.6	99.3	98.5	92.8	95.5	94.8
	92.9	89.5	90.9	90.2	86.8	88.8	84.1	75.3	73.0	60.5	42.7	23.5
4809	21.5	34.4	40.3	43.0	45.4	44.4	43.7	44.7	44.7	45.1	47.0	48.0
	47.3	47.4	47.9	47.7	46.9	47.7	47.5	43.9	42.9	37.6	29.1	21.4
0817	59.9	76.2	86.4	90.8	87.1	85.8	87.5	84.5	79.1	83.0	84.7	80.6
	77.2	76.0	73.5	70.4	71.4	67.6	61.4	57.2	48.8	36.2	25.8	20.6
1617	63.8	90.1	100.2	111.1	110.6	104.3	102.5	99.9	96.5	94.3	99.1	103.3
	100.1	102.1	100.2	101.0	95.8	94.8	90.2	80.8	76.2	62.4	44.7	23.5
2417	45.9	67.7	76.7	83.6	87.1	92.7	97.7	104.0	102.1	95.2	101.3	101.7
	96.9	98.7	97.7	95.6	92.9	95.3	92.0	86.9	83.4	70.4	48.5	26.1
3217	41.9	61.7	73.1	82.0	90.9	98.3	106.3	111.9	111.0	107.1	112.2	109.9
	109.1	109.5	110.2	108.4	108.2	109.1	108.1	99.3	95.6	79.7	57.1	34.4

4017 47.8 75.1 89.1 95.4101.0103.9100.7105.0103.0100.6111.0120.2
117.6118.4121.0119.8114.5114.1113.3101.4 93.2 80.5 58.5 38.5
4817 53.4 95.1117.4131.3135.3136.3127.2128.1122.5114.9115.2116.6
110.5107.1107.0103.1 99.5100.2 96.5 85.6 77.9 66.1 48.2 29.5
0825 68.7 77.9 85.4 91.8 89.8 89.3 88.0 87.3 81.2 83.8 84.8 80.9
78.6 79.2 79.6 75.5 77.3 79.2 76.8 75.2 65.3 47.7 34.7 31.1
1625 51.8 74.2 83.8 94.1 99.7106.1111.2116.6116.5112.6117.6117.2
114.2113.6113.8112.9106.3110.9108.6 98.1 94.9 77.6 57.5 42.0
2425 45.3 71.8 86.1 99.1105.1107.5111.3115.8114.2111.5115.6111.8
105.0108.1108.1106.5102.1102.9 98.5 89.5 84.3 70.6 51.0 27.4
3225 66.2 84.2 94.0103.2106.5107.8113.5115.0110.1109.9107.6103.9
101.4102.0100.0 94.3 95.8 91.9 82.9 79.4 70.2 54.0 40.7 36.5
4025 40.1 64.1 76.7 86.0 93.5101.4107.5118.6119.6115.0119.8121.4
117.7115.3117.6113.0107.7111.6107.5 97.1 93.6 78.8 59.4 39.3
4825 43.2 67.9 78.7 86.7 90.5 91.8 91.6 93.4 94.0 91.6 92.4 89.4
87.1 84.7 85.6 84.1 82.0 85.8 84.0 81.9 84.7 72.7 54.7 33.0
5625 38.0 58.3 68.5 75.7 76.1 73.3 77.9 83.8 82.4 81.1 79.6 74.4
73.3 78.8 79.0 77.9 73.5 73.1 69.8 69.8 66.7 56.4 39.9 22.7
0833 44.3 61.1 67.3 74.5 76.4 78.0 79.0 79.3 78.8 79.0 80.1 79.1
74.8 74.6 74.3 77.4 74.3 76.1 81.0 79.9 81.2 70.1 50.8 30.2
1633 46.8 66.3 76.5 88.7 98.3109.9120.0127.3128.6130.3131.5132.9
120.3124.4126.9122.7114.0121.9115.3104.5 99.9 82.0 64.9 49.5
2433 55.7 80.5 93.4107.7110.2114.1118.9121.3115.4111.8117.1119.0
109.6111.9111.3109.4105.5106.9100.9 90.8 85.8 70.6 51.2 31.6
3233 40.7 72.2 94.5109.0117.0121.7117.6122.9120.8116.2116.9120.6
117.2111.7115.4112.2105.5107.8103.6 93.7 88.8 78.3 58.6 41.6
4033 41.9 63.4 75.2 83.7 94.1100.3111.5122.1119.8116.5118.1117.7
107.5107.6109.2106.0 99.6103.1100.7 89.1 86.1 72.9 55.1 38.9
4833 37.3 59.0 70.3 79.2 84.8 88.4 93.1 97.1101.7 97.0 99.5 97.4
93.1 93.3 90.2 96.2 91.3 96.5 98.7 94.7 96.6 84.6 62.1 46.6
5633 28.3 46.3 55.2 57.1 61.2 62.6 62.5 67.0 69.3 69.3 70.7 71.6
71.2 71.4 73.1 70.9 70.1 74.4 75.5 71.4 68.9 62.5 44.1 28.3
0841 76.4 95.3107.6112.2112.8111.9112.9108.9107.4107.5108.4101.0
99.3 98.5 96.4 91.7 93.0 89.6 79.7 79.7 64.6 46.6 33.3 27.7
1641 48.8 79.6 96.8105.5112.7113.3113.9116.0117.8119.4125.5134.6
131.2136.3138.4131.7125.3126.4121.3108.4102.3 86.4 65.4 49.5
2441 39.1 61.2 72.3 79.8 87.4 93.6101.6109.3110.3107.9112.8114.2
108.7103.0105.3103.3 97.5101.0 97.2 87.3 84.5 72.6 56.2 35.9
3241 43.4 66.9 78.9 88.9100.1110.2122.0133.7132.4132.7133.3132.7
130.7127.9126.9123.3117.0118.9113.0101.0 94.5 78.7 58.1 33.9
4041 35.5 61.3 77.8 85.4 91.8 94.4 93.3100.6100.1100.5108.1116.6
122.0116.8120.0118.6112.0115.1110.2101.1 96.7 82.6 62.7 45.5
4841 49.1 84.9107.0119.4124.9119.6111.1114.0109.9106.5107.9107.4
104.3103.4104.0103.7 98.3101.7 98.9 91.0 85.8 75.6 53.8 35.3
5641 22.8 38.0 47.7 52.2 53.9 53.9 51.2 52.3 52.1 50.5 52.7 53.8
53.5 54.1 54.2 54.4 51.8 53.7 53.6 48.9 46.9 41.9 31.4 22.8
0849 34.7 43.0 46.5 49.6 49.3 48.6 49.7 50.2 50.0 52.6 51.5 51.3
51.9 51.8 51.6 50.6 50.3 48.7 45.0 45.4 39.2 29.7 20.6 14.4
1649 46.5 84.8113.8131.0140.6135.4125.2122.3118.3114.0114.1114.2
110.8102.4107.2107.2100.2106.0101.2 90.1 83.2 69.3 51.1 37.3
2449 35.8 62.5 81.1 86.0 93.2 95.2 94.7100.0 98.6 94.9 95.2100.5
98.9 93.8 99.1 97.9 91.8 93.6 97.4 92.9 93.2 81.9 63.4 47.8
3249 32.0 56.7 71.1 77.6 86.3 91.2 93.0 98.4100.2 97.6100.4 99.5
99.1 93.3 97.0 92.9 90.6 92.5 98.9 97.0 97.6 87.3 69.7 55.9
4049 51.9 85.5104.5118.3121.1117.1111.3109.8103.3 98.8103.5100.3
97.4 98.2 98.8 99.5 94.6 99.9 96.8 86.2 83.9 70.4 51.7 30.2
4849 45.6 80.9 99.8113.2117.8115.5107.9108.3107.9102.8101.2103.6
102.6 98.4102.1 99.1 92.7 94.8 90.2 77.7 71.8 62.3 44.4 27.2
2457 48.4 60.5 66.6 70.4 71.3 71.0 71.6 70.1 68.3 71.8 70.1 68.0
66.7 68.2 69.0 66.1 69.2 67.6 61.2 60.6 53.5 39.9 26.9 17.6
3257 30.2 46.3 53.8 55.6 56.8 56.7 55.2 57.1 57.8 56.9 60.5 59.8
58.7 62.0 61.5 61.7 62.4 65.1 65.0 61.3 61.9 55.3 42.9 32.1
4057 34.4 45.1 49.1 53.7 56.0 56.4 56.8 59.6 59.2 61.6 61.8 61.8
59.9 60.2 59.1 57.1 59.7 58.6 55.0 52.0 46.2 34.6 21.5 7.4

Cycle 3 Data

DATASET 36, January 24, 1977

Reactor Conditions

Core Average Exposure, 12775 MWd/t
Core Thermal Power, 2190 MWT
Dome Pressure, P, 1002 psia
Core Flow, 97.6 Mlb/hr
Inlet Subcooling at P, 19.1 Btu/lb

Control Configuration

Legend: 48, Full Out; 0, Full In.

48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	20	48	20	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	16	48	48	48	48	48	16	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	20	48	48	48	48	48	48	48	48	48	20	48	48
48	48	48	48	48	48	48	32	48	48	48	48	48	48	48
48	48	20	48	48	48	48	48	48	48	48	48	20	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	16	48	48	48	48	48	16	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	20	48	20	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48

Axial TIP Distribution, Bottom to Top of Core

See Figure 2-6.

1609	51.2	76.1	86.0	91.1	91.1	88.0	87.9	86.5	86.9	86.5	87.9	90.3
	87.6	88.5	90.5	92.4	90.5	93.6	91.6	82.8	77.2	64.9	47.1	29.2
2409	53.3	78.2	87.3	95.0	95.5	95.1	96.1	96.2	95.2	93.8	101.2	103.0
	106.6	116.4	128.4	134.6	131.9	134.7	130.2	116.7	109.9	90.9	60.7	33.4
3209	41.0	61.8	70.3	73.9	75.3	74.9	74.9	78.3	77.9	76.2	83.2	85.1
	90.7	100.9	111.1	119.4	122.1	121.7	120.5	109.1	103.5	86.4	62.4	40.1
4009	57.3	85.7	96.3	102.1	102.7	100.3	98.1	98.6	96.3	94.7	101.3	101.8
	101.6	104.6	108.3	109.8	109.3	112.6	108.8	98.8	90.0	73.0	52.4	29.2
4809	24.3	37.6	41.7	42.7	42.1	41.1	39.5	39.9	40.9	40.8	43.5	45.5
	46.6	47.9	49.1	52.0	52.9	54.8	55.3	51.4	49.7	44.3	34.7	25.8
0817	75.7	82.8	89.2	87.1	84.2	84.7	83.5	80.2	78.4	81.3	83.3	80.5
	80.4	85.0	83.5	79.9	82.3	81.6	72.0	70.2	61.9	45.0	31.2	23.6
1617	74.6	100.7	106.9	113.3	108.5	101.2	99.5	96.6	92.1	88.7	91.4	91.6
	87.0	89.0	92.7	98.7	102.8	107.6	108.5	95.6	91.3	75.9	56.3	32.7
2417	73.5	104.9	112.9	115.9	113.6	108.3	102.4	99.3	94.1	90.5	91.8	96.5
	93.4	97.8	105.2	106.1	104.3	109.7	110.4	98.9	94.5	79.8	57.9	31.8
3217	75.1	104.8	116.1	120.4	117.0	111.7	103.9	102.2	100.5	93.9	101.5	104.8
	105.4	109.9	117.0	123.3	119.5	124.9	125.5	114.8	106.9	89.6	65.6	40.0

4017 57.6 88.1100.8104.3104.9 99.6 95.4 95.1 94.4 89.6 94.6 95.1
96.5 99.8106.7114.7116.5126.0128.5117.7110.7 95.6 69.6 45.1
4817 66.1106.6124.7131.3131.0124.9118.2118.1115.3107.7109.9109.0
108.4106.5110.1112.3108.4113.9111.8101.0 96.4 83.9 61.2 42.4
0825 73.3 81.9 90.2 92.0 87.0 85.8 86.5 82.4 84.6 89.4 90.3 91.9
101.5110.3111.8111.9114.5111.7 98.5 94.4 79.0 58.3 41.5 35.1
1625 82.9114.8124.3130.8126.2118.0112.4110.6106.0101.8107.3107.0
108.6113.1117.9121.6119.8127.8126.0114.4107.1 93.6 68.1 46.7
2425 73.3105.0111.5114.4112.5107.6104.6103.4101.1 99.5101.9101.7
99.4102.4104.8105.2104.3107.8107.0 96.4 92.8 77.6 58.3 36.1
3225 94.7107.4110.2108.2105.4 99.9101.4103.1100.8103.4104.8102.6
102.4105.8106.1100.0103.1103.8 93.6 90.5 80.8 63.1 46.2 40.6
4025 66.1102.8116.2118.4117.1110.6102.3105.2100.7 97.4100.5102.5
102.6104.1109.0109.5108.5116.3115.6105.9102.2 89.0 65.7 44.7
4825 53.4 80.4 91.3 95.7 92.9 89.6 87.2 88.0 85.7 85.8 86.6 87.8
90.3 98.9108.2111.2108.6111.2113.0102.3103.4 84.6 63.4 42.2
5625 38.6 59.2 67.3 72.1 72.8 67.3 70.4 78.9 80.5 81.3 83.0 82.1
84.8 94.6100.0100.6101.2 98.7 97.8 87.6 82.8 67.5 47.2 27.3
0833 46.7 63.8 68.3 72.6 74.5 74.1 74.8 75.6 74.5 78.7 83.1 86.9
91.0102.1107.5118.2119.8116.9115.0103.0 98.8 80.9 60.6 38.5
1633 83.2112.9121.2129.9130.3124.5119.2121.0116.7117.7120.8125.5
123.2129.0134.7137.2135.0137.9137.4121.3114.7 94.1 73.7 54.8
2433 81.9106.7111.5115.7111.6104.5108.8108.2107.2108.4111.1117.7
113.3113.0113.9115.8113.4117.4111.2100.4 96.9 79.4 60.1 37.9
3233 49.3 77.7 90.5 93.9 95.2 93.8 94.1102.2110.4111.1118.9122.8
123.8119.2119.0121.1113.3119.6117.2104.9 99.5 88.5 67.3 50.4
4033 74.2108.7116.5121.0118.1104.3 99.9106.7103.6 98.7104.5102.1
101.4103.5106.2108.8104.5108.2108.6 97.4 95.7 80.7 59.4 34.2
4833 47.1 74.3 86.8 91.2 94.6 91.7 90.2 93.5 90.5 90.0 92.9 99.1
99.6109.0127.7134.2132.8135.9133.5117.9113.4 95.4 74.4 57.3
5633 29.3 47.5 54.6 57.2 59.9 59.3 59.9 64.1 67.8 71.0 77.4 78.8
83.6 87.7 95.0101.1 98.5101.3102.0 89.8 86.5 73.7 55.6 43.0
0841 93.2105.7111.8109.1107.0104.1109.1106.7107.1110.2111.5113.5
112.0116.6118.5117.1121.4116.7101.5 95.2 79.5 58.6 40.9 34.9
1641 60.9 95.1111.7113.9114.7112.8108.8109.0109.1104.7108.8110.6
110.4114.8122.2128.0132.0142.5141.6126.7121.1103.9 77.5 55.3
2441 65.3 96.7109.0111.8109.1105.0 99.5100.0 97.3 92.9 96.1 97.6
93.7 94.7 99.0 99.9100.5104.0103.8 95.9 95.5 79.7 62.0 43.9
3241 76.8112.2126.5130.4127.6120.7117.1121.0119.6110.4117.1123.0
117.3120.4122.8125.0123.7123.4120.6109.2102.7 86.6 65.4 38.8
4041 49.9 83.5 99.3102.8104.2 99.5 92.7 94.3 91.7 89.3 90.2 92.4
93.8 93.6 99.4107.1111.5123.0123.4112.2111.6 96.8 76.8 63.2
4841 66.5108.1123.2126.1122.0117.1107.3107.8105.6 99.5104.2106.6
103.3101.8111.2112.4110.2117.2117.4105.6100.9 88.4 66.3 45.3
5641 25.8 41.6 50.0 53.2 52.9 51.6 49.9 52.0 52.1 51.6 54.0 55.4
56.6 61.1 63.9 67.2 65.7 68.5 67.4 59.5 58.1 51.6 38.2 25.5
0849 38.1 45.6 46.4 48.1 47.3 45.6 45.7 46.8 46.0 47.6 49.8 51.1
53.6 53.9 55.1 55.3 57.9 56.9 52.9 51.9 46.1 35.8 25.1 17.0
1649 60.1103.8124.6132.5132.6128.4116.6115.4111.4105.0106.0109.9
111.0107.0112.6115.0117.0119.0116.5108.2100.4 86.7 63.5 39.7
2449 44.8 77.2 93.6 98.8 99.1 99.1 93.3 90.6 92.4 90.2 94.3 96.5
98.5106.6119.8125.6124.7128.5128.3116.3108.4 96.9 74.3 53.7
3249 46.5 75.2 89.6 94.7 96.2 95.5 92.5 94.8 94.1 93.2 95.6 99.4
102.5109.6121.3128.9128.0130.3132.1119.1113.4103.2 78.0 58.3
4049 70.0105.9116.4121.2115.9108.9103.8102.9 99.2 94.9 97.2 97.0
97.8 99.2104.0107.3110.6114.7113.1103.6 99.6 83.8 62.0 37.0
4849 51.3 86.3105.8110.6114.9110.5102.4104.8102.4 99.6101.8101.9
102.9102.3103.5106.3105.7106.8106.6 94.5 88.8 75.6 54.4 32.3
2457 50.0 61.2 65.4 67.4 67.3 64.6 67.6 68.0 69.1 72.9 76.0 76.3
79.4 85.3 88.5 87.5 89.0 87.6 80.3 75.9 64.5 46.6 31.8 21.5
3257 31.3 46.8 52.8 53.9 53.3 52.6 51.8 54.0 55.4 57.2 62.0 65.8
69.6 72.9 78.1 80.9 83.4 86.6 85.8 77.4 73.9 66.6 49.8 34.0
4057 38.2 47.6 49.1 52.7 53.0 51.0 53.6 54.4 55.3 60.7 63.6 65.2
67.2 70.6 72.1 73.0 75.3 73.2 67.0 62.9 54.4 40.9 25.7 10.8

Cycle 3 Data

DATASET 37, March 2, 1977

Reactor Conditions

Core Average Exposure, 13200 MWd/t
Core Thermal Power, 2126 MWT
Dome Pressure, P, 1002 psia
Core Flow, 96.8 Mlb/hr
Inlet Subcooling at P, 18.8 Btu/lb

Control Configuration

Legend: 48, Full Out; 0, Full In.

48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	40	48	40	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	22	48	48	48	48	48	22	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	40	48	48	48	48	48	48	48	48	48	40	48	48
48	48	48	48	48	48	48	32	48	48	48	48	48	48	48
48	48	40	48	48	48	48	48	48	48	48	48	40	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	22	48	48	48	48	48	22	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	40	48	40	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48
48	48	48	48	48	48	48	48	48	48	48	48	48	48	48

Axial TIP Distribution, Bottom to Top of Core

See Figure 2-6.

```
1609 48.4 75.5 84.5 89.1 93.5 92.0 90.5 93.7 95.0 93.2 95.4 96.5
     95.7 94.1 95.1 94.2 93.6 93.7 89.1 81.1 76.1 64.0 46.9 28.0
2409 56.4 86.2100.7117.4129.4133.3136.9140.5137.1130.3138.2136.3
    131.0125.6127.2125.7119.1118.8116.2103.1 97.2 77.9 55.8 31.9
3209 47.8 73.0 86.7102.3114.7121.2121.8125.1124.1116.3121.3115.6
    113.3106.8110.7110.2104.5108.0103.7 93.6 91.4 77.8 56.8 38.6
4009 57.9 86.9 98.4107.8112.1112.5113.7113.7113.0110.4115.1117.2
    112.3111.1110.6108.8105.9108.0105.5 94.2 87.7 71.4 51.5 32.1
4809 23.1 35.5 39.4 40.6 40.9 41.6 39.9 41.2 42.2 43.0 46.7 48.7
     49.3 51.3 52.1 53.4 52.7 54.6 55.0 51.3 50.6 44.0 34.5 25.8
0817 74.6 83.0 90.9 91.9 92.8 91.1 90.8 91.0 86.9 91.0 92.5 89.1
     87.9 88.1 85.9 81.6 84.2 81.1 72.7 69.1 60.7 44.3 31.4 24.0
1617 72.2 97.9105.7111.1110.2107.9107.0105.5102.6 97.5 99.6 99.9
    100.3107.6111.4113.1108.2110.1103.8 93.2 90.4 74.8 55.7 37.9
2417 72.2103.9112.1119.5117.8115.7114.6110.7108.2 97.6107.5105.6
    103.4103.6109.7108.3103.8106.4103.1 95.4 91.8 76.3 56.3 36.8
3217 74.1107.3120.0128.4130.5126.6119.0120.1115.8112.4119.0119.9
    118.9117.4120.1120.2119.1121.7120.0108.6102.1 86.0 63.7 38.6
```

4017 56.3 86.7 99.0106.6106.7105.2103.4104.8102.1101.3107.3112.7
110.6119.4129.1131.9127.1129.8126.5112.3107.6 90.6 69.7 51.6
4817 63.0100.6119.2126.1130.0128.1121.9126.0121.1116.5119.6121.0
117.8115.3118.4118.9113.2114.3109.3100.8 96.0 81.7 59.5 40.5
0825 82.0 94.5108.8122.5127.3126.6125.6124.7119.0122.8119.9114.7
110.8112.9109.3101.1101.3 99.5 87.0 81.6 71.8 52.5 37.9 31.9
1625 83.3116.1128.6134.4137.0133.8131.2131.0124.7124.0126.1123.9
120.1121.3125.9128.2122.2124.6123.2110.0102.3 88.0 65.8 45.9
2425 69.0 98.2107.4110.3110.9107.1105.8107.9106.1105.0108.4111.6
106.0108.6112.4109.3108.8110.9109.2 98.4 94.7 79.5 58.1 31.2
3225 88.3100.0102.8104.8103.3100.8105.0106.8104.0107.0107.7106.1
107.5108.5108.1102.3106.4104.5 93.4 90.8 83.2 64.4 47.4 38.9
4025 62.6 99.0111.7118.0117.0113.1108.2111.9109.4108.4112.3114.3
112.9113.4117.8118.1111.5115.3116.0104.4100.8 87.2 67.9 49.2
4825 53.7 81.7 95.2105.3115.5119.2116.4120.6119.3113.9115.8110.8
108.3107.7107.6105.9 99.4100.4100.3 90.6 88.4 75.9 57.6 31.5
5625 41.7 64.4 75.9 84.3 87.3 85.7 91.7100.6100.1 97.3101.3 96.9
94.7 96.3 97.6 98.1 90.7 86.8 83.4 76.8 75.3 62.4 44.2 23.8
0833 52.3 73.6 83.4100.7114.1118.9127.0126.5119.1116.2120.4120.8
112.2108.3104.9102.4101.9103.0 99.6 88.5 86.1 72.5 52.9 33.1
1633 80.3111.8121.7133.0138.3136.7136.2137.4135.9135.5141.3138.0
133.6134.2136.4134.8126.5130.3128.0114.8107.3 90.1 67.4 44.0
2433 74.3 98.7103.5109.6109.4107.7108.3108.3110.1114.7115.8119.7
115.8116.4119.0118.0117.4116.9111.6102.0 98.4 80.8 60.9 35.6
3233 43.8 70.9 82.0 85.1 88.1 89.2 92.3103.2109.6115.0122.1127.1
125.2122.0124.8123.5116.7119.9117.2107.8102.0 90.6 71.0 59.3
4033 69.3103.4112.3117.5115.2114.6110.9112.4109.3104.7115.0113.6
108.7110.7111.3109.3106.5110.7109.8 96.5 90.6 77.8 59.6 40.3
4833 48.2 77.4 94.4113.1123.6135.3131.3142.4135.0137.6135.9130.8
127.6119.7127.8125.9118.8117.3117.7103.0 97.9 86.1 65.0 45.5
5633 32.8 53.3 63.7 70.5 77.0 81.2 84.7 89.7 94.2 95.0 98.9 99.4
96.4 97.3 95.0 91.9 90.8 89.9 89.7 80.5 75.2 67.2 50.8 39.9
0841 92.8105.1113.2117.1119.3123.7127.1125.2124.6126.6124.1121.1
119.1120.1116.7114.1113.9109.0 98.7 92.5 76.8 54.5 39.3 30.5
1641 59.2 92.3108.6112.8119.8117.2117.0120.2118.5117.0123.3125.5
128.2138.2143.4146.4139.8141.6138.3124.0116.5 98.8 75.7 54.3
2441 60.8 91.2101.6107.9108.6107.5104.8104.5104.8 98.9103.1105.7
102.1102.9105.2109.5105.9108.5103.5 95.2 93.3 81.8 64.6 52.7
3241 71.6107.2119.3125.7126.6123.5123.7127.7126.2118.9125.5127.7
128.9128.7128.3126.3121.1125.7120.6107.3102.7 86.7 66.3 46.7
4041 47.5 79.4 94.9 97.4103.5100.1 96.6 98.7 98.7 97.2100.5101.9
108.9113.3121.2124.9119.8124.7122.5111.3107.1 94.3 73.8 59.3
4841 66.9105.6123.0131.5133.1128.6122.0122.6119.3114.8119.1117.6
118.4112.1117.1117.9113.3113.6111.3 99.9 96.6 83.4 61.4 44.1
5641 26.8 43.9 53.8 57.7 59.2 59.9 58.3 60.2 61.1 60.4 62.9 64.9
63.8 63.7 63.4 63.6 61.8 61.4 62.0 56.8 53.2 47.8 36.1 27.3
0849 36.8 43.9 45.7 46.4 46.9 46.4 47.8 49.1 49.1 50.9 53.1 54.1
54.6 56.4 57.3 56.6 57.2 57.4 53.5 52.8 46.7 35.5 24.5 14.7
1649 57.2 99.1119.0126.6131.1129.0117.4121.2116.9111.2114.5121.1
116.4111.6116.7118.1114.4120.6116.1105.8 97.9 84.8 63.4 43.0
2449 44.5 77.9 97.9105.4121.3126.1125.4127.1127.9121.6122.8126.0
123.7120.8123.5123.6114.1115.3114.5101.9 97.1 85.7 67.3 54.5
3249 43.7 77.3 98.4111.6129.9139.1138.1143.4140.7132.0135.2137.1
130.2123.8127.2121.1113.5115.6113.0104.6 99.7 88.3 69.7 55.6
4049 67.7102.4115.4122.7124.6121.9115.1115.2110.3107.2109.7114.2
110.2110.9114.5109.9110.8113.0112.3 97.5 95.1 79.3 60.9 41.4
4849 48.8 84.4101.1109.6113.0108.5108.1108.7107.6107.7111.1111.1
111.5107.5112.6110.6106.4106.0106.5 95.7 87.0 75.6 55.3 36.5
2457 55.6 68.9 75.9 81.1 83.3 82.8 86.9 85.1 81.2 84.1 85.5 82.9
80.9 82.2 83.5 79.2 81.4 79.1 70.0 68.0 58.9 43.0 28.8 18.7
3257 36.7 55.0 64.2 67.7 70.9 73.1 74.0 76.5 76.3 76.6 80.2 79.3
77.2 77.3 75.7 76.8 74.0 76.7 75.2 67.6 66.7 59.1 45.1 31.4
4057 40.3 50.0 53.7 58.3 60.4 61.0 64.5 64.8 65.4 69.8 69.9 70.1
69.9 72.2 70.0 67.3 70.2 67.1 61.4 58.3 52.2 39.8 24.4 3.7