DUQUESNE LIGHT COMPANY

SHIPPINGPORT ATOMIC POWER STATION

TEST RESULTS

DLCS 2340105
T-641306

RADIATION LEVELS IN THE VICINITY OF THE PURIFICATION DEMINERALIZERS

5532 EFPH

CORE I SEED 1

Section 1 of 1 Section

First Issue, October 10, 1960

DISCLAIMER

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CORE I SEED 1

Purpose

To measure the extent of activity build-up inside the 1AC and 1BD purification demineralizer concrete enclosures.

Conclusions

A maximum radiation level of 1100 mr/hr was detected inside the 1AC demineralizer enclosure at a point 10.0 feet from the top of the enclosure. The maximum radiation level inside the 1BD enclosure was 700 mr/hr located at a point 9.5 feet below the top of the enclosure.

An analysis of data from the five performances of this test indicates that the extent of the activity build-up as well as the level of activity of the demineralizers is definitely increasing. It further appears that this activity is due mainly to long-lived nuclides.

However, since it is not known either to what extent or level the resin activity can be allowed to build up to before its usefulness is ended no definite conclusion as to resin life can or should be made from these results.

Description of Test Equipment and Test Procedure

Portable Jordan survey meters with long extension cords were employed to determine the radiation levels inside the concrete shields surrounding the 1AC and 1BD purification demineralizers. Radiation level readings were obtained at six inch intervals from six feet to twenty feet below the top of the concrete shield. From these readings the hot spot was determined in each enclosure and this location was monitored every odd hour thereafter for a period of fifteen hours. Additional readings were obtained thirty hours after the initial survey.

Results

DLCS 2340105 (T-641306), Radiation Levels In The Vicinity Of The Purification Demineralizers, was performed on September 6 and 7, 1959.

New resin was charged into each demineralizer on September 11, 1957. Since that time, the 1AC demineralizer has been in service for approximately 12213 hours* while the 1BD demineralizer has been in service for approximately 9035 hours*.

* Determined from station operating logs.

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The total gross generated power since the beginning of station operation was 371,658,900 kilowatt hours. The power history for four days prior to this test is tabulated in Table I.

During this performance a maximum radiation level of 1100 mr/hr for the 1AC demineralizer was located at a distance of 10 feet down from the top of the concrete enclosure. A maximum radiation level of 700 mr/hr for the 1BD demineralizer was located at a distance of 9 to 9 1/2 feet down from the top of the concrete enclosure.

The activity levels at specific locations for each demineralizer are listed in Table II. The "hot spot" was monitored at specified times and the data are listed in Table III. The data of Tables II and III along with the data obtained during the four previous performances of this test are plotted on Figures 1 through 4.

The curves on Figures 1 and 2 indicate that during the first performance (September 17, 1958) a band of high radiation approximately 1 foot wide was measured near the center portion of 1AC demineralizer vessel. The second performance (November 3, 1958) indicated the band of high activity had increased its width to 1.5 feet and remained near the center of the demineralizer. The third performance (March 11, 1959) located a narrow band of high activity at the upper portion of the demineralizer. The fourth performance (May 21, 1959) showed a band of high activity approximately 1.5 feet wide measured near the same position as in the first and second performances of this test. The fifth performance showed a narrow band of high activity in approximately the same position as the third performance. Generally, the activity extent and level increased with each performance (particularly in the case of the 1BD demineralizer) and the "hot spot" moved upward slightly in the demineralizers.

The slopes of the curves on Figures 3 and 4 (which are an indication of decay of activity present) vary somewhat but in general would seem to indicate little or no decay of activity level which would in turn indicate that most of the activity present is due to long-lived nuclides. The portable radiation meters used during these surveys probably contribute considerably to the inconsistency of some of the plotted data.

The portable Jordan survey meters Nos. 668 and 726 were calibrated September 5, 1959 using a Co^{60} source. This calibration data are tabulated in Table IV.

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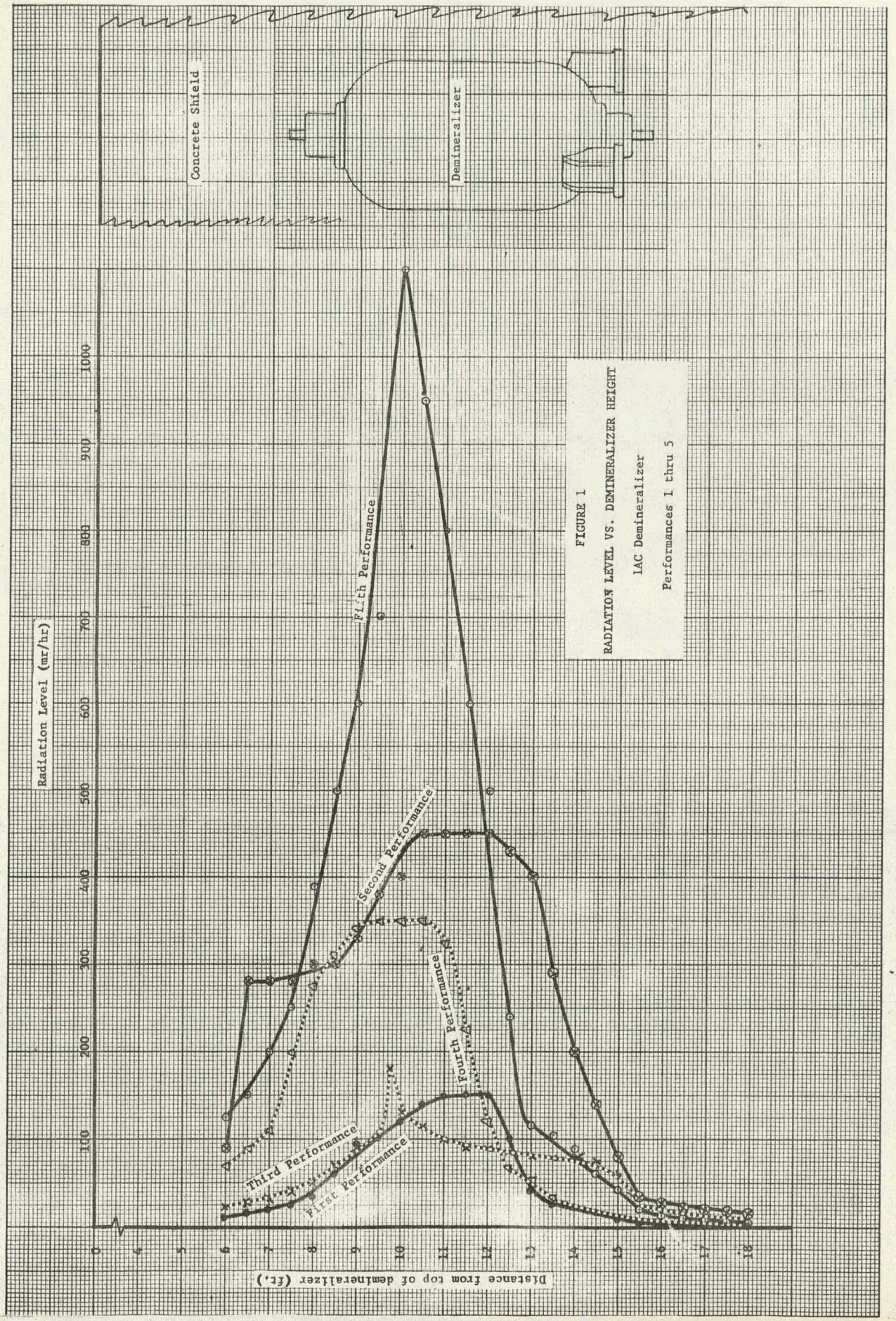

FIGURE 1
RADIATION LEVEL VS. DEMINERALIZER HEIGHT
1AC Demineralizer
Performances 1 thru 5

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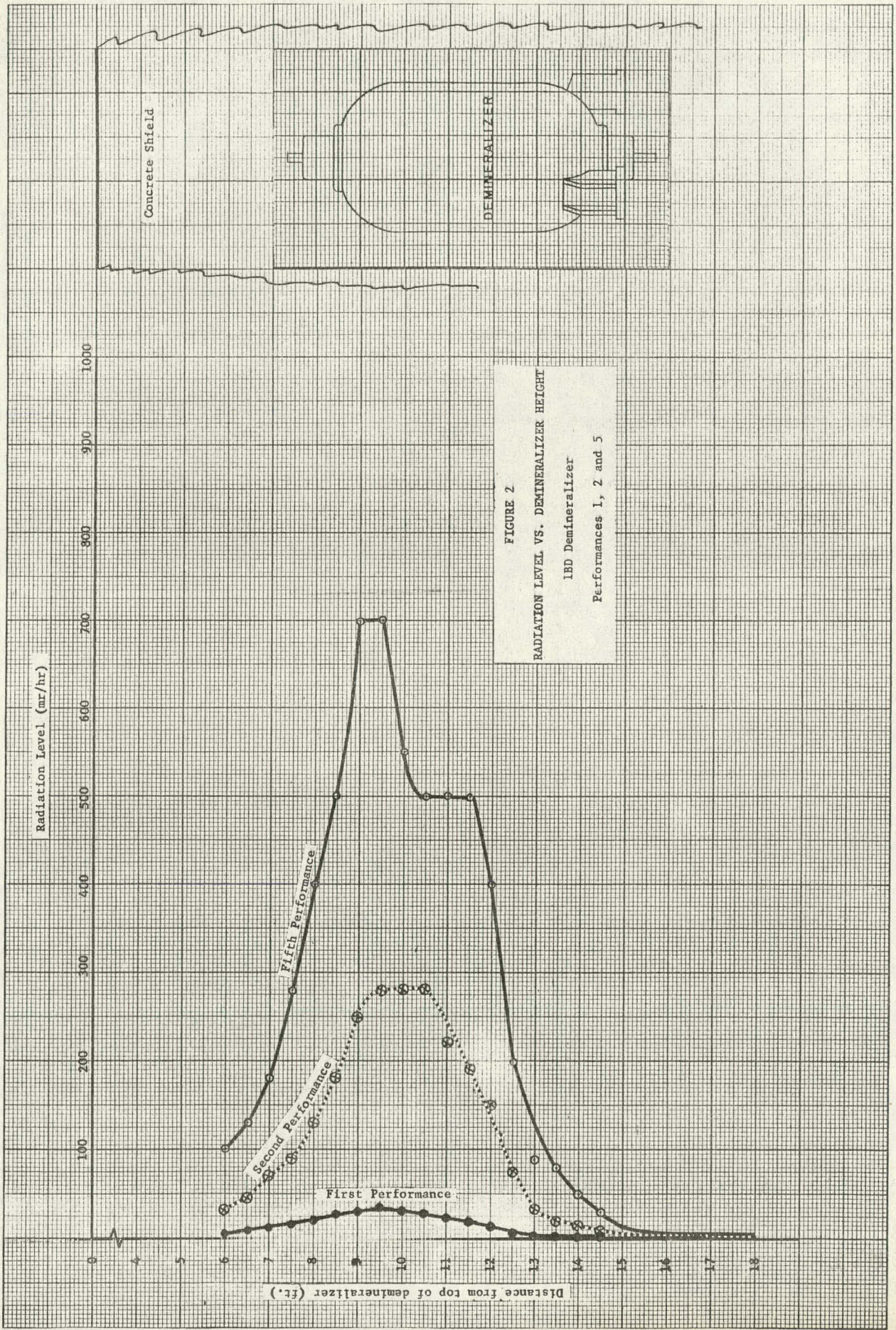

FIGURE 2
RADIATION LEVEL VS. DEMINERALIZER HEIGHT
1BD Demineralizer
Performances 1, 2 and 5

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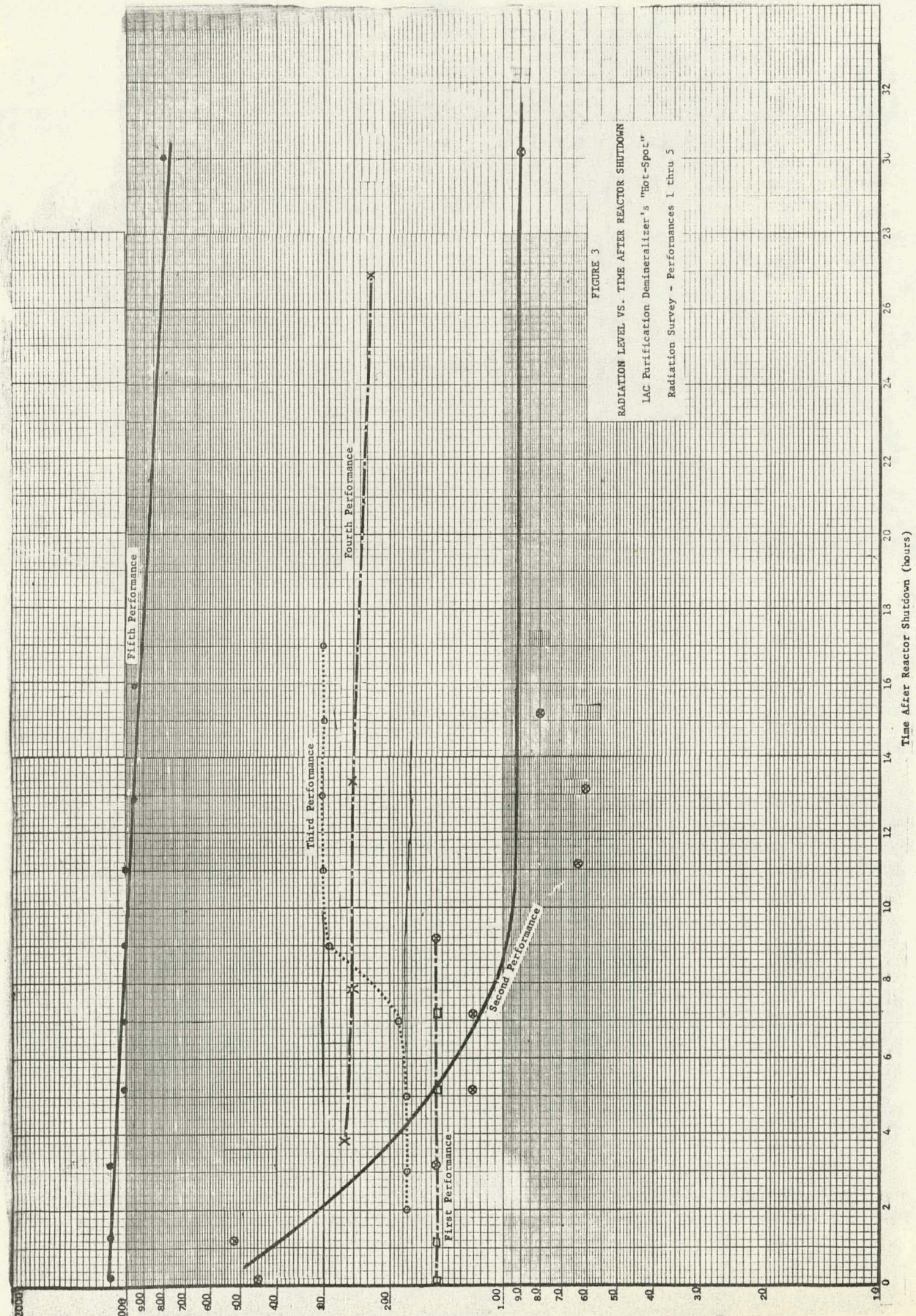

FIGURE 3

RADIATION LEVEL VS. TIME AFTER REACTOR SHUTDOWN

IAC Purification Demineralizer's "Hot-Spot"

Radiation Survey - Performances 1 thru 5

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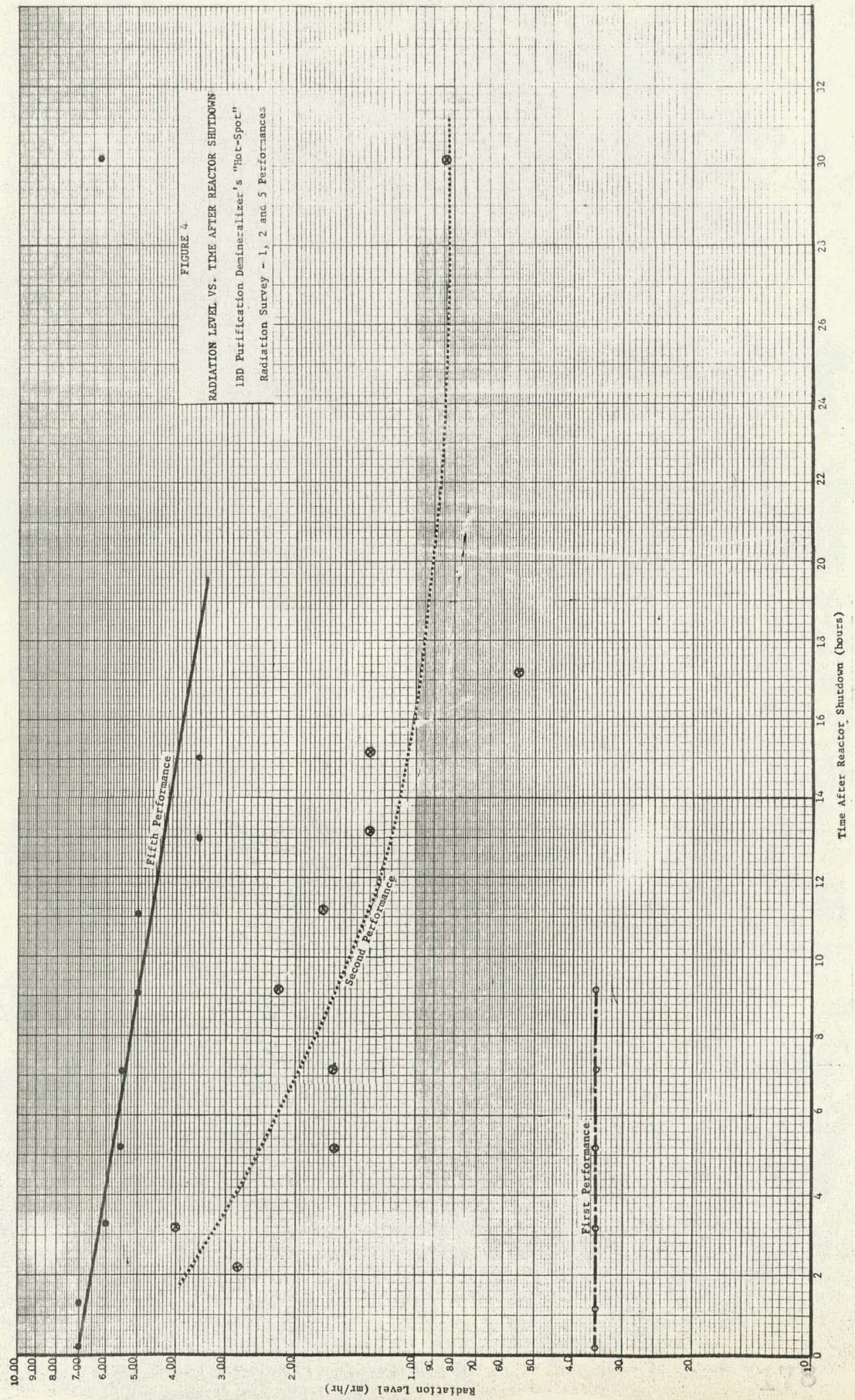

TABLE I

POWER HISTORY

Date Time	9/2/59	Plant Power (gross) MW 9/3/59	9/4/59	9/5/59	9/6/59
0100	66.0	66.0	66.0	66.0	66.0
0200	66.5	66.0	66.0	66.0	66.5
0300	66.0	66.0	66.0	66.5	66.0
0400	66.0	66.0	66.0	66.0	66.5
0500	66.0	66.5	66.0	66.0	65.0
0600	66.0	66.0	66.0	66.0	*
0700	66.0	66.0	66.0	66.0	
0800	66.0	66.0	66.0	66.0	
0900	65.5	66.5	66.0	66.0	
1000	65.5	66.0	66.0	66.0	
1100	66.0	66.0	66.0	66.0	
1200	66.0	66.0	66.0	66.0	
1300	66.0	66.0	66.0	66.5	
1400	66.0	66.0	66.0	65.3	
1500	66.0	66.0	66.0	65.5	
1600	66.0	66.0	66.5	66.0	
1700	66.0	66.0	66.0	66.0	
1800	66.0	66.0	66.0	66.0	
1900	66.0	66.0	66.0	66.5	
2000	66.0	66.0	66.0	66.5	
2100	66.0	66.0	66.0	66.0	
2200	65.5	66.5	66.0	66.0	
2300	66.0	66.0	66.0	67.0	
2400	66.5	66.0	66.0	67.0	

* Reactor shutdown at 0559, 9/6/59

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TABLE II

DEMINERALIZER ACTIVITY

Distance From Top of Encl. FT	1AC DEMINERALIZER		1BD DEMINERALIZER	
	TIME	ACTIVITY MR/HR	TIME	ACTIVITY MR/HR
6	0610	125	0610	100
6.5	0611	150	0610	130
7	0611	200	0610	180
7.5	0611	250	0611	280
8	0612	390	0611	400
8.5	0613	500	0611	500
9	0613	600	0611	700
9.5	0613	700	0611	700
10	0613	1100	0611	550
10.5	0613	950	0612	500
11	0613	800	0612	500
11.5	0614	600	0612	500
12	0614	500	0612	400
12.5	0614	240	0612	200
13	0614	115	0613	90
13.5	0614	105	0613	80
14	0614	90	0613	50
14.5	0615	60	0613	30
15	0615	43	0613	12
15.5	0615	20	0613	8
16	0615	13	0614	5
16.5	0616	11	0614	5
17	0616	8	0614	3.5
17.5	0616	6.5	0614	3.5
18	0617	5	0614	3.5
18.5	0617	5.5	0614	3
19	0617	5.5	0615	3
19.5	0617	5	0615	3
20	0618	5.25	0615	3

1AC Demineralizer was surveyed with Jordan No. 726
1BD Demineralizer was surveyed with Jordan No. 668

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TABLE III

"HOT SPOT" SURVEY

	1AC DEMINERALIZER		1BD DEMINERALIZER	
DATE	TIME	ACTIVITY MR/HR	TIME	ACTIVITY MR/HR
9/6/59	0613	1100	0611	700
	0715	1100	0715	700
	0910	1100	0915	600
	1110	1000	1112	550
	1300	1000	1305	550
	1500	1000	1503	500
	1700	1000	1703	500
	1853	950	1857	350
	2055	950	2100	350
9/7/59	1205	800	1210	625

The 1AC Demineralizer was surveyed 10 feet down from top of enclosure.

The 1BD Demineralizer was surveyed 9.5 feet down from top of enclosure.

TABLE IV

SURVEY METER CALIBRATION DATA

SURVEY METER - JORDAN NO. 668			
DATE	SOURCE	CALCULATED MR/HR	MEASURED MR/HR
9-5-59	Co^{60}	5.0	5.0
	38MC	100	90
		250	250
		500	500
		1000	1000

SURVEY METER - JORDAN NO. 726			
DATE	SOURCE	CALCULATED MR/HR	MEASURED MR/HR
9-5-59	Co^{60}	5.0	5.0
	38MC	100	105
		250	240
		500	500
		1000	900

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Results Prepared By W. Michael Sanetti Jr.

Results Reviewed By John Shumko Jr.

Approved (Duquesne Light Company) Charles James Date 10-10-60