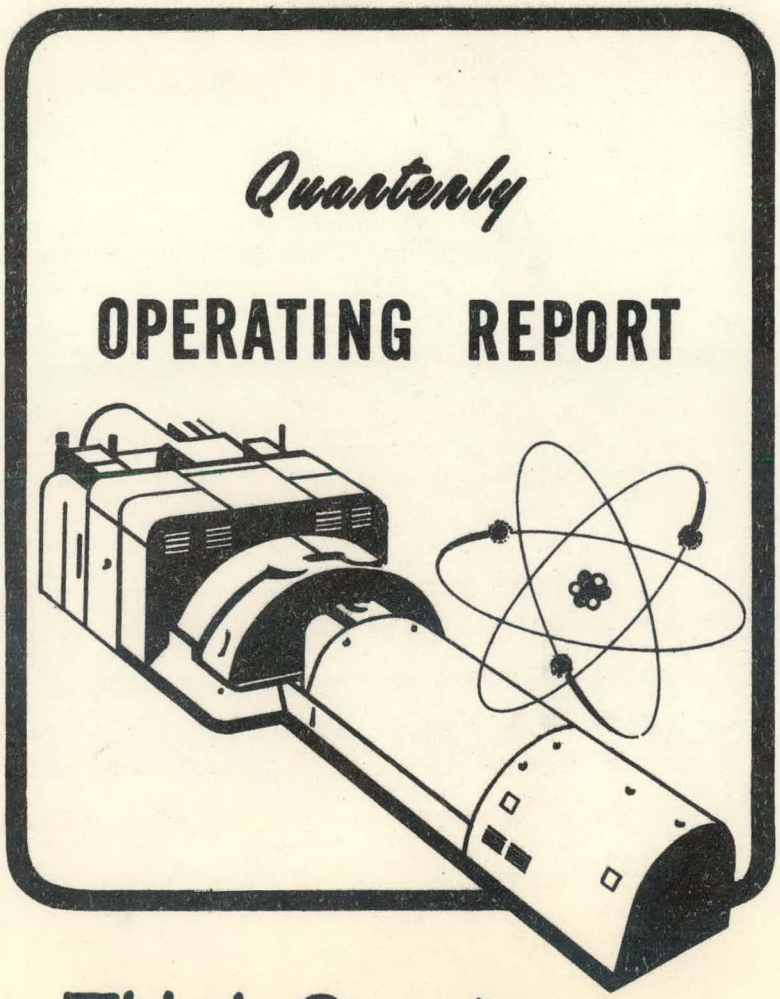
DLCS 5000370

DUQUESNE LIGHT COMPANY

Shippingport Atomic Power Station

Quarterly

OPERATING REPORT



Third Quarter 1970

Contract AT-11-1-292

United States Atomic Energy Commission

DISCLAIMER

Duquesne Light Company
Shippingport Atomic Power Station
Power Stations Department

QUARTERLY OPERATING REPORT
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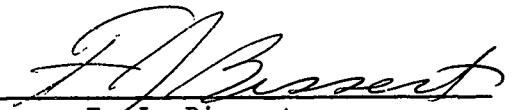
Approved by 
F. J. Bissert
Superintendent

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Preface

This Quarterly Report is prepared and issued by the Duquesne Light Company to disseminate information relative to all significant activities conducted at the Shippingport Atomic Power Station. Consistent with the premise that Shippingport was built to provide information and not power at competitive costs, this report makes no effort to analyze power production costs and makes no deductions regarding costs which might be achieved if Shippingport has been built and operated solely to product power.

In preparation of these reports, it has been presumed that the reader has a working knowledge of nuclear reactors, reactor technology and/or electric utility generating station operations. The reader is reminded, however, that this is an operating report rather than a technical report. Anyone desirous of obtaining advice on recent technical progress related to the nuclear portion of the Shippingport Atomic Power Station is therefore referred to the United States Atomic Energy Commission, Office of Technical Information Extension at Oak Ridge, Tennessee, where this information is readily available.

1. SUMMARY OF OPERATIONS

During the third quarter of 1970, the Shippingport Atomic Power Station was operated as required for DLC system load demand, testing and maintenance. The 1D reactor coolant loop remained isolated and drained until the heat exchanger leak repairs were completed. The 1D Loop was returned to service on July 24, 1970. Nineteen scheduled shutdowns occurred during the quarter, eighteen of which were for training purposes.

On July 2, routine chemical analysis on the 1A boiler water sample contained Florine-18 activity which indicated a primary system leak. Full load was maintained to obtain bi-hourly boiler samples. The leak rate based on F-18 activity was approximately 1/2 gph on July 2 and 11.8 gph at the end of the quarter.

On July 28, the station was operated with 4 loop full flow conditions to establish equilibrium xenon conditions in preparation for the second full power demonstration of PWR Core 2 Seed 2. The load was increased to 150 Mw(ê) on July 31, with 102 Mw on the generator and 48 Mw on the Heat Dissipation System (HDS). The output was maintained at 150 Mw(e) equivalent for 48 hours. The test was completed and the HDS was shutdown at 2:40 AM on August 2.

The 1C reactor coolant loop was removed from service on August 24 for inspection and installation of a flow blocking plate.

Training shutdowns began September 1, with eighteen shutdowns occurring throughout the month. This training is required for Class I operation supervisors and station operators.

On September 29, the Reactor Plant Container Air Treatment System butterfly valves tripped closed when the Operational Radiation Monitoring System (ORMS) monitor malfunctioned. The butterfly valves were reopened and returned to service after the malfunction was corrected.

No shipments of radioactive waste was made from the facility during this report period.

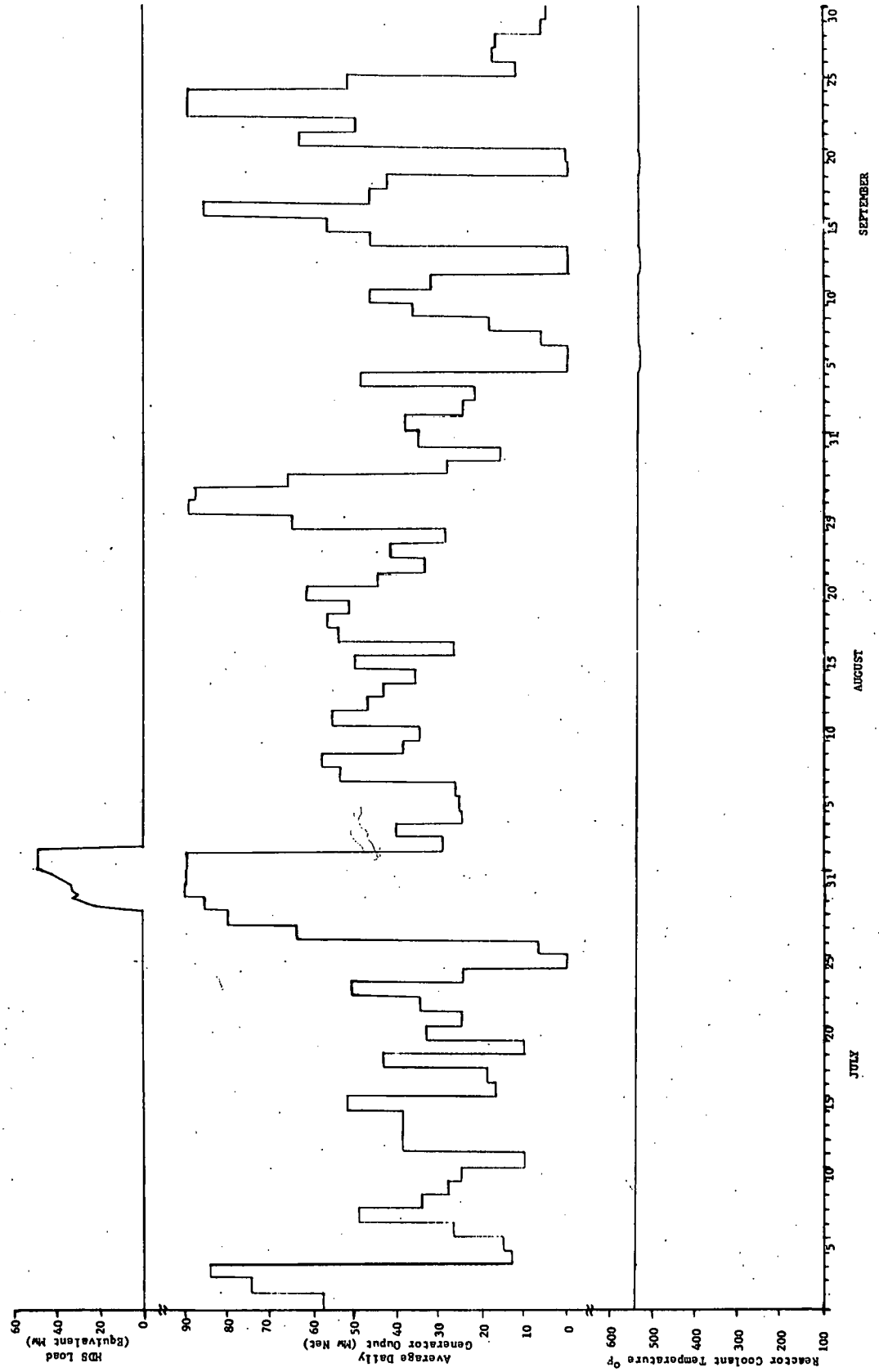


FIGURE 1

Generator Output, HDS Load and Reactor Coolant Temperature During Third Quarter Period 1970

2. SUMMARY OF CORE 2 STATION PERFORMANCE

Electrical output (Gross) to date. . . . . kwhr	2,555,817,700
EFPH to date (Blanket operating time). . . . . hr	17,729.3
EFPH to date (Core 2 Seed 2 operating time). . . . hr	4,077.3
EFPH for the quarterly period. . . . . hr	763.4
Hours reactor critical to date . . . . . hr	38,492.5
Hours reactor critical for the quarterly period. . hr	1,934.5
No. 1 main unit service hours (quarterly period) . hr	1,903.0
Net Station output (quarterly period). . . . . kwhr	87,159,000
No. of forced outages* (quarterly period).	0

* Interruption of electrical output due to protective relay action and/or operator action as required to protect the Station.

3. CHEMISTRY

Reactor Plant

The 1D reactor coolant loop and the BD purification demineralizer were put back into service after being out of service since the beginning of the quarter. The 1C reactor coolant loop and AC purification demineralizer were taken out of service on August 24 and remained out of service through the end of the quarter. The specifications of the reactor coolant loops were maintained in accordance with the station manual (see Table I & II). No out of specifications power or shut down conditions were observed furing the quarter.

The component cooling water system remained inspecifications during the entire quarter except for the pH which temporarily dropped to 8.22 (see Table III) because of a water addition to the system. The primary coolant charging water remained out of specifications because of a hydrazine addition during the previous quarter. There were no out of specification chloride conditions. All canal water specifications were met during this quarter.

The Cs^{138} activities of the reactor coolant remained relatively constant during this quarter. All values are corrected to a standard base of 67% reactor power, four reactor coolant loops, two purification demineralizer loops in service at full flow and 536°F Tavg operation.

Average Cesium - 138 Activity

Month	dpm/ml	uc/ml	No. of Observations
July	470	2.14×10^{-4}	9
August	456	2.07×10^{-4}	5
September	439	2.00×10^{-4}	7

The tritium activity of the reactor coolant was 1.60 uc/1 on August 25, 1970. This number is relatively similar to previously obtained tritium values.

During the third quarter three tests were performed in conjunction with the test program. Samples for Reactor Coolant Fission Product Activity (DLCS 58001), were collected on July 26. The samples were analyzed and the results indicated no failed fuel elements. On July 28 samples were collected for Reactor Coolant Crud Study (Periodic Sampling) (DLCS 59201), and these samples are presently being analyzed. A 1000 hr run sample collection was made on August 26. These samples are also presently being analyzed.

The BD purification demineralizer remained out of service until July 25 when it was put back into service. The Station was then operated with both demineralizers in service until August 24 when the AC purification demineralizer was taken out of service. Gross non-volatile gamma activities ranged from 66.991 x 10^3 cpm/ml to 12.217 x 10^3 cpm/ml at 62% and 15% reactor power respectively. The decontamination factors ranged from 246 to 730 at 15 min. after sampling.

The weekly crud samples had an activity ranging from 3.04 x 10^6 cpm/mg to 3.05 x 10^7 cpm/mg, and a concentration of 2.36 ppb to 7.07 ppb.

Turbine Plant

The 1D coolant loop heat exchanger remained out of service until July 24 when it was placed back into service. The Station was then operated on four coolant loops until August 24 when the 1C coolant loop heat exchanger was taken out of service. The Station operated the remainder of the quarter on the 1A, 1B, 1D coolant loop heat exchangers. There were several hot and cold lay-ups during this period (see Table V). Chemical specifications were maintained for the heat exchangers during operation except for one instance when the 1B and 1C heat exchangers were out of specifications for approximately 8 hours because of a boiler blow down. There were, however, several out of specification conditions during the lay-ups because of insufficient treatment during the weekend training shutdowns.

On July 2 a primary to secondary leak was discovered in the 1A coolant loop heat exchanger. The 1A coolant loop heat exchanger is being sampled daily while in operation to determine the activity and leak rate. On July 2 the F^{18} activity was 17.4 cpm/ml with a leak rate of 0.47 gal/hr, and at the end of the quarter on September 30 the F^{18} activity was 83 dpm/ml (at 13% reactor power) with a leak rate of 11.8 gal/hr.

Radioactive Waste Disposal System

The radioactive waste disposal ion exchangers were used to process liquid waste from five (5) surge tanks. Radioactive liquid waste from the chemical waste tanks was processed through the evaporator. The effluents of these two processing systems were combined at the test tanks. Two (2) of these test tanks were returned to the surge tank for reprocessing, and 36 test tanks were discharged to the Ohio River. The X^{133} activity of the vent gas system ranged from 1.69 dmp/cc to (7.69 uc/cc to 9.78 cc/cc).

TABLE I

Reactor Coolant System

Water Conditions and Chemical Adjustments

Operating Conditions

Chemical Condition	Specifications	Analytical Results Min.	Max.	NH_4OH Additions Liters	Degassification Hours
1. pH @ 25° C	10.20 ± 0.10	10.10 - 10.30			
2. Specific Conductivity umhos	- - - -	34	56	202.1	141.45
3. Ammonia - ppm	- - - -	16	32		
4. Total Gas - cc/kg	125 Maximum	52	108		
5. Hydrogen - cc/kg	10 - 60	22	59		

TABLE II

Reactor Coolant System

Water Conditions and Chemical Adjustments

Non-Operating Conditions

$> 200^{o}F$

Chemical Condition	Specifications	Analytical Results Min.	Max.	NH_4OH Additions Liters	Degassification Hours
1. pH @ 25° C	10.20 ± 0.10	10.15	10.30		
2. Specific Conductivity umhos	- - - -	38	53	12.6	6
3. Total Gas - cc/kg	125 Maximum	46	83		
4. Hydrogen - cc/kg	10 - 60	21	44		
5. Oxygen - ppm	< 0.14	< 0.05			
6. Chloride - ppm	< 0.10		< 0.05		

TABLE III

Reactor Plant Auxiliary Systems

Water Conditions

System	Specific Conductivity umhos	pH at 25° C	Concentration - ppm			Gross Gamma* Activity-dpm/ml
			C_5 O_4	Cl	Dis. O_2	
Component Cooling						
Specifications	none	8.30-10.50	500-1000	1 ppm max.	none	none
Observed	1145-1400	8.22- 9.10	484-604	<0.05-0.85	-	Bkgd.
Coolant Charging Water						
Specifications	2.50 max.	6.00- 8.00	none	0.1 ppm max.	none**	none
Observed	7.50-20.0	6.43- 8.40	-	<0.05	0.64-7.60	-
Canal Water						
Specifications	5.00 max.	6.00- 8.00	none	none	none	none***
Observed	1.00-1.20	6.40- 6.50	-	-	-	Bkgd.

* Multiply tabular value by 4.55×10^{-7} to obtain uc/ml

** Should be <0.14 ppm for reactor plant cold shutdown

*** Normally near background

TABLE IV

Non-Operating Heat Exchangers

Water Chemistry

Water Conditions	Specifications	Non-Operating Heat Exchangers 1A	1B	1C	1D*
1. Dis. Salts - ppm	Min. ---	75	60	80	78
	Max. 1000	133	206	158	128
2. Phosphate - ppm (Hot Lay-up)	Min. 5	42	42	42	-
	Max. 100	44	44	44	-
(Cold Lay-up)	Min. ---	-	-	15	-
	Max. ---	-	-	38	-
3. Chloride - ppm	Min. ---	0.23	0.25	0.35	0.24
	Max. 0.50	0.45	0.45	0.45	0.45
4. pH @ 25°C	Min. 10.00	9.70	9.60	9.80	9.75
	Max. 11.00	10.20	10.20	10.00	10.16
5. Hydrazine - ppm (Hot Lay-up)	Min. Residual	Res.	Res.	Res.	-
	Max. ---	Res.	Res.	0.046	-
(Cold Lay-up)	Min. 50	-	-	40	-
	Max. 100	-	-	100	-
6. Chemicals Used (Pounds)					
Na_3PO_4		0	0	8	0
Na_2HPO_4		0	0	4	0
N_2H4		1	1	21	0

1. A, B, C Boilers hot lay up 7/25-7/26
2. A, B, D Boilers hot lay up 9/4-9/7, 9/12-9/13, 9/19-9/20
3. C Boiler - hot lay up 8/24
4. C Boiler cold lay up 8/25-9/30
5. D Boiler in service 7/27

* No phosphate determination made during hot lay-ups under footnote 2.

TABLE V

Operating Heat Exchanger Chemistry

Water Chemistry

Water Conditions	Specifications	Operating Heat Exchangers			
		1A	1B	1C	1D
1. Dis. Salts - ppm	Min. --- Max. 1000	40 172	30 220	39 164	44 210
2. Phosphate - ppm	Min. 5 Max. 100	22 100	20 100	22 82	26 100
3. Chloride - ppm	Min. 0 Max. 0.5	0.20 0.50	0.16 0.45	0.25 0.45	0.10 0.45
4. Hydrazine - ppm	(residual)	0.019 0.070	0.018 0.083	0.018 0.069	0.014 0.077
5. Silica - ppm	Min. 0 Max. 25	2.10 5.70	2.10 5.60	2.80 5.70	2.20 5.70
6. pH at 25° C	Min. 9.50 Max. 11.00	9.50 10.41	9.30 10.40	9.40 10.45	9.64 10.60
7. Chemicals Used, lbs. Na_3PO_4 Na_2HPO_4 NaH_2PO_4		16 9	15 8	7 3	8 5

4. MAINTENANCE

Routine repairs of major components, instruments, controls and preventive maintenance were performed during the quarterly report period. Major components which were repaired or replaced during the report period are summarized as follows:

"1-D" Heat Exchanger

Repair of the 1-D reactor coolant loop heat exchanger, which had been undertaken during the last quarter of 1969, was completed during the present quarter. All tubes in the boiler were flushed, equipment removed, manways installed and then the heat exchanger was hydrostatically tested. The "D" loop was placed back into service on July 24, 1970.

1-D Reactor Coolant Pump

Prior to the "D" loop being placed in service, maintenance operations were performed on the 1-D Reactor Coolant Pump. The pump stator cap was repaired, reinstalled and welded immediately prior to the 1-D coolant loop being returned to service.

1-C Heat Exchanger

The "C" loop was removed from service at the end of the report period for installation of a flow blocker plate in the outlet plenum. This plate will restrict flow in a small area of the tubesheet where previous tube deterioration has occurred. The contractor is currently conducting a planned tube inspection prior to installation of the flow blocker plate.

1-C Reactor Coolant Pump

During this quarter the 1C Reactor Coolant Pump radial bearing was inspected. After the inspection the rotor lifting and turning fixture was reinstalled to allow manual rotation of the pump during the outage of the 1-C coolant loop.

No. 1 V.O.S. Air Compressor

The third stage cylinder assembly of the No. 1 Valve Operating System Air Compressor was overhauled and assembled. In addition the relief valves were checked and set and new temperature gauges were installed and calibrated. The compressor was then placed back into service.

125 Ton Crane

The 125 Ton Overhead Crane located in the Fuel Handling Building was upgraded by replacing all cast iron drums with cast steel. This was performed on the trolley drive, bridge drive, auxiliary hoist and main hoist. When the quarter ended the crane was not completely assembled and not been returned to service.

5. TEST PROGRAM

The primary objective of the test program during the quarterly report period was to continue reactivity depletion of Core 2 Seed 2 in order to determine irradiation and reactivity lifetime properties and core power distribution as a function of lifetime. Routine tests were also performed to check the operation of the FEDAL System, to obtain radiation surveys of the purification demineralizers, and to calibrate temperature sensing elements.

A variety of special tests were also performed during the report period. A test was performed to obtain temperatures of the 1D Heat Exchanger shell and vibrational characteristics of the heat exchanger. Tests were performed to develop head capacity curves for the boiler feedwater pumps and the RPC Gravity Drainage System Pumps. In order to determine the level of the spent resin in the RWD Storage Tanks a special test was also performed.

Fourteen tests were performed during the report period. Twelve tests were completed and two tests remained in progress at the end of the report period. Table VI lists these tests and Figure 2 displays the performance dates. Information pertaining to chemistry tests may be found in the Chemistry section of this report.

The Boiler Feedwater Pumps Test (DLCS 70001) was performed on July 9 and July 10. Heat capacity curves were obtained for the two Boiler Feedwater Pumps. The results of the test did not indicate any reduction in the capacity of either pump.

Radiation surveys of the demineralizers were taken on July 12, July 22 and September 18 in accordance with DLCS 58501 and on August 5 and September 18 in accordance with DLCS 58502.

The special instrumentation of the D Heat Exchanger Test DLCS 57801 first performed on July 14 with later performances occuring periodically whenever plant conditions were in accordance with the procedure until the last set of data was taken on September 11.

The Periodic Intercalibration of Temperature Sensing Elements Test (DLCS 60901) was performed on July 25 and July 26. The Norwood Th and Tc indicators for D Loop were given both an initial and final adjustment.

The RWD Resin Storage Tanks (Resin Level Determination) Test DLCS 59801 was performed on August 10, 1970. The 1A Resin Storage Tank was found to be approximately 25% full and the 1B - 50% full.

The FEDAL System (operating during station start up) Test (DLCS 58301) was performed first on July 26 and 12 times between September 2 and September 18. The last two performances constituted the 100 and 101 performance of the test and in order to comply with the existing seven digit numbering system the test procedure will be given a new number (DLCS 58302). Consequently the final two performances are listed as DLCS 5830201, and 02. Seed Assembly E-10 (Port 9) was monitored during the start-up in all of the performances. The tests yielded normal results indicating no cladding failures in this assembly.

The FEDAL System Checkout Test (DLCS 58201) was performed on August 20, 21 and 26 followed by The FEDAL System Operational Test (DLCS 58401) on August 27. One channel in each monitor was found to be inoperable. During the performance of the Operational Test it was discovered that Monitor 1 was reading approximately four times the activity of Monitor 2. The difference in activity is unresolved as of now and an investigation is currently underway to gain insight into the nature of this occurrence.

On September 1 the RPC Gravity Drainage System Pumps Test (DLCS 70002) was performed.

The Governor Control Test (DLCS 69901) was performed on September 11. A plot of load limit oil pressure versus gross generator output was obtained.

TABLE VII

Test Performed During Third Quarter 1970

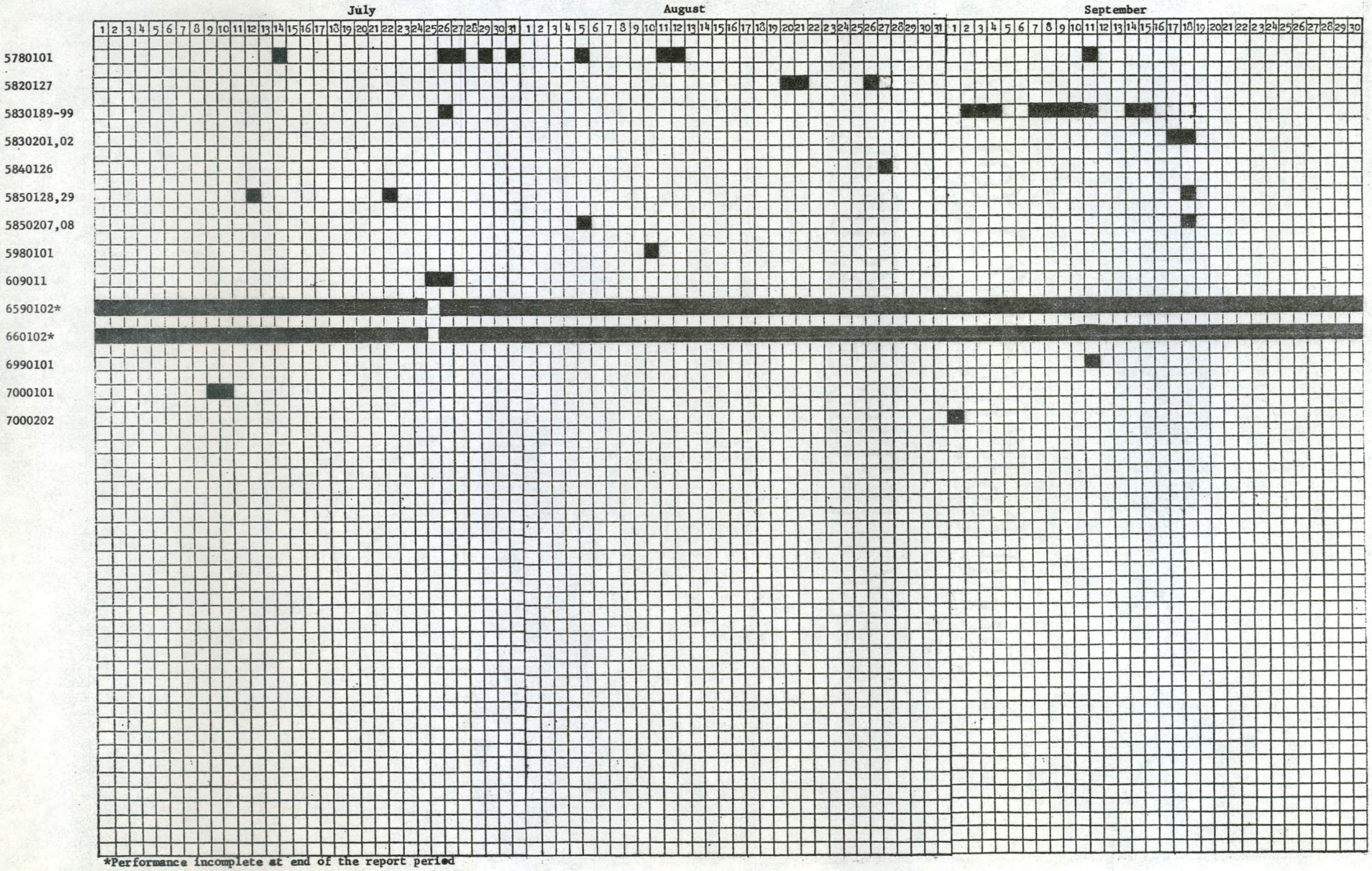
DLCS 5780101	Special Instrumentation of the D Heat Exchanger Test
DLCS 5820127	FEDAL System (Checkout Test)
DLCS 5830189-99	FEDAL System (Operation During Station Start Up)
DLCS 5830103,02	Same as 58301
DLCS 5840126	FEDAL System Operational Test
DLCS 5850128,29	External Radiation Levels of Reactor Coolant Systm Piping and Components and Purification System Demineralizers and Heat Exchangers
DLCS 5850207,08	Radiation Survey of the Demineralizers
DLCS 5980101	RWD Resin Storage Tanks (Resin Level Determination)
DLCS 6090111	Periodic Intercalibration of Temperature Sensing Elements
DLCS 6990101	Governor Control Test
DLCS 7000101	Boiler Feedwater Pumps
DLCS 7000201	RPC Gravity Drainage System Pumps

Tests Remaining in Progress At End of Report Period

DLCS 6590102	Reactor Pressure Drop and Coolant Flow Characteristics
DLCS 6600102	Reactivity Lifetime Test

FIGURE 2

PERFORMANCE DATES
OF
TESTS PERFORMED DURING THIRD QUARTER OF 1970



*Performance incomplete at end of the report period

6. GLOSSARY

AEC . . . . . United States Atomic Energy Commission

AIX . . . . . after ion exchanger (outlet)

a/o . . . . . atomic percent

BAPL . . . . . Bettis Atomic Power Laboratory

BIX . . . . . before ion exchanger (inlet)

bkgd . . . . . background

CIC . . . . . compensated ionization chamber

DAS . . . . . Data Acquisition System

DE . . . . . demineralizer effluent

DF . . . . . decontamination factor

EFPH . . . . . equivalent full power hour

FEDAL . . . . . Failed Element Detection and Location System

FMI . . . . . flow measurement instrumentation

Hc . . . . . critical height

HDS . . . . . Heat Dissipation System

magamp . . . . . magnetic amplifier

MELBA . . . . . Multipurpose Extended Life Blanket Assembly

mr . . . . . milliroentgen

mrem . . . . . milliroentgen equilvalent man

NPS . . . . . Nuclear Protection System

ORMS . . . . . Operational Radiation Monitoring System

PWR . . . . . Pressurized Water Reactor

R . . . . . roentgen

RC . . . . . resistance capacitance

uc . . . . . microcuries

RCS. . . . . Reactor Coolant System

rem. . . . . roentgen equivalent man

RPC. . . . . Reactor Plant Container

RWDS . . . . . Radioactive Waste Disposal System

STP. . . . . standard temperature and pressure

su . . . . . smear unit (100 sq. cm.)

Tavg . . . . . average reactor coolant temperature

Tc . . . . . reactor coolant inlet temperature

Th . . . . . reactor coolant outlet temperature

Ts . . . . . time of sample isolation

v/o. . . . . percent by volume

VOS. . . . . Valve Operating System