QUARTERLY OPERATING REPORT
First Quarter 1976
DLCS 5000176

Approved by:

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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 had been built and operated solely to produce 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 information on recent technical progress related to the nuclear portion of the Shippingport Atomic Power Station is therefore referred to the United States Energy Research and Development Administration, Division of Technical Information Extension at Oak Ridge, Tennessee, where this information is readily available.

1. SUMMARY OF OPERATIONS

During the first quarter of 1976, the Shippingport Atomic Power Station remained shutdown for PWR/LWBR (Pressurized Water Reactor/Light Water Breeder Reactor) core conversion. The PWR Core has been removed from the reactor vessel and remained in storage in the deep pit of the Fuel Handling Canal. At the beginning of the first quarter, the 1B and 1C reactor coolant loops were isolated from the reactor vessel, filled and on head tank pressure. The 1A and 1D reactor coolant loops remained isolated from the reactor with a nitrogen purge established. The pressurizer was open to the reactor vessel, vented to the blow-off tank and both reactor vessel and pressurizer were drained.

On January 21, the reactor vessel and pressurizer were filled and placed on head tank pressure. The 1B and 1C reactor coolant loops were opened to the reactor on January 22. The 1A reactor coolant loop was filled on February 16, and on February 23 it was opened to the reactor vessel. On February 27, the 1D reactor coolant loop was filled, and on March 7 it was opened to the reactor vessel. Both loops were hydrostatically tested on the primary and secondary before returning to service. The 1D reactor coolant loop was reisolated on March 27 for completion of insulation during plant heatup for pre-core installation preconditioning.

Following the identification of thrust bearing failure with the 1C main coolant pump, the 1C reactor coolant loop was isolated and drained on March 25. After removal of the 1C main coolant pump from the 1C reactor coolant loop, a refurbished Core 1 reactor coolant pump will be placed in the 1C reactor coolant loop.

During the first quarter, training involving the formation and collapse of the pressurizer steam bubble, solid plant heatup and cooldown with a bubble in the pressurizer was performed.

The 1B and 1C secondary loops were filled and recirculating on the reactor plant cooldown and temperature control heat exchanger while work continued on the 1A and 1D secondary loop steam generators at the beginning of the first quarter. The 1A secondary loop was filled on February 10, and the 1C secondary loop was filled on February 25. The 1A steam generator was placed in a partial drain condition on February 26 due to residual activity in existing piping following heat exchanger replacement, and 1B steam generator was placed in a partial drain condition on March 29 in preparation for pre-core installation preconditioning.

Work on reinstalling the turbine generator continued throughout the first quarter and is nearing completion. An oil flush of the turbine oil system was begun on February 11 and continued throughout the first quarter. Heatup for pre-core installation preconditioning was started on March 28 with the 1A and 1B loops in service and continued for the rest of the quarter.

During the first quarter of 1976, 3000 cubic feet of radioactive solid waste was shipped off-site for burial. These shipments contained about 0.17 curie of radioactivity.

2. CHEMISTRY

During the first quarter of 1976, the Chemistry section maintained specifications in the various plant systems and fulfilled station manual requirements.

Reactor Plant

The 1A and 1D reactor coolant loops were filled during this quarter and the AC and BD purification demineralizers were placed in service. The 1B and 1C reactor coolant loops were filled during the fourth quarter of 1975. The 1C reactor coolant loop was later drained and the AC purification loop isolated during this quarter in preparation for removal and replacement of the 1C main coolant pump. The only out-of-specification reactor coolant chemistry condition during this quarter was that of low pH caused by carbonate in the coolant. The low pH levels in the coolant were raised to within specifications by placing the purification demineralizers in service, which removed the carbonate. See Tables I and II. Out-of-specification conditions in the Reactor Plant Auxiliary Systems were low pH in the canal waters, high dissolved oxygen levels and high pH and conductivity in the coolant charging water, and low chromate concentration in the component cooling water. The low pH levels in the canal waters were a result of insufficient recirculation. Recirculation through the canal water demineralizers raised the pH to within specifications. The high dissolved oxygen levels in the coolant charging water were attributed to the loss of the steam blanket on the Primary Water Storage Tank during service boiler outages. The high pH and high conductivity values in the coolant charging water were attributed to the presence of ammonia. Heating of the Primary Water Storage Tank reduced the high oxygen levels and the high pH and conductivity values to within specifications. The low chromate concentration in the component cooling water was due to dilution by addition of make-up water. Chemical treatment with chromate raised the chromate concentration to within specifications. See Table III. Preparations for pre-core installation preconditioning of the reactor coolant system commenced near the end of this quarter.

Turbine Plant

The station has been shutdown for the entire quarter. Installation of the 1A and 1D heat exchangers concluded during this quarter. The 1A and 1D heat exchangers were then placed in cold wet lay-up along with the 1B and 1C heat exchangers. The 1C and 1D heat exchangers remained in cold wet lay-up for the remainder of the quarter. Preparations for preconditioning of the heat exchangers commenced at the end of this quarter. The 1A and 1B heat exchangers were placed in hot standby at the end of this quarter.

Turbine Plant (continued)

The only out-of-specification chemistry conditions in the heat exchangers under cold wet lay-up were that of low pH and low hydrazine concentration in the 1D heat exchanger and high and low hydrazine concentration in the 1A heat exchanger.

The low pH and low hydrazine concentration in the 1D heat exchanger were a result of sampling after insufficient recirculation time after the initial chemical treatment necessary during filling of the heat exchanger. Later sampling after additional recirculation showed all chemical conditions to be within specifications:

The low hydrazine concentration in the 1A heat exchanger resulted from addition of more makeup water to the heat exchanger than anticipated. Chemical treatment with hydrazine raised the hydrazine concentration to within specifications. The high hydrazine concentration in the 1A heat exchanger resulted from addition of less makeup water to the heat exchanger than anticipated. A bleed and feed of the 1A heat exchanger reduced the hydrazine concentration to within specifications. See Table IV.

The only out-of-specification chemistry conditions experienced in the 1A and 1B heat exchangers while in hot standby were that of high pH and high conductivity values. These conditions were expected and resulted from the reduction of hydrazine to ammonia as the heat exchangers were "steaming off". No corrective action was required for these conditions as the pH and conductivity will fall within specifications as the "steaming off" continues. See Table V.

Radioactive Waste Disposal System

The total radioactivity, exclusive of tritium, discharged from Shippingport during the quarter was 0.000057 curie, which is only 0.004% of the allowable limit. The quantity of 0.005 curie of tritium was an insignificant 0.0005% of the allowable limit. These radioactivity releases from Shippingport are far too small to have any measurable effect on the general background environmental activity outside the plant.

TABLE I
Reactor Coolant System
Water Conditions and Chemical Adjustments
Cold Lay-up (<200°F)

Chemical Conditions	Specifications	Analytical Results		N ₂ H ₄ (lbs)	NH ₄ OH (liters)
		Min.	Max.		
Oxygen - ppm max.	0.14	0.005	0.075		
Conductivity umhos/cm		5.9	6.0		
pH	10.1 - 10.3	9.42**	10.25		
Chloride ppm. max.	0.10	<0.05	0.10		
Total Gas-cc/kg max.	25*	15	16		
Chemicals Added				2.01	12.72*

** See Reactor Plant Section of QOR.

* Degassification to 25 cc/kg maximum must be accomplished prior to reducing reactor coolant pressure below the minimum required for reactor coolant pump operation.

TABLE II
Reactor Coolant System
Water Conditions and Chemical Adjustments
Hot Standby (>200°F)

Chemical Conditions	Specifications	Analytical Results		N ₂ H ₄ (lbs)	NH ₄ OH (liters)
		Min.	Max.		
Oxygen - ppm max.	0.14		0.07		
Conductivity umhos/cm		37	39.5		
pH	10.1 - 10.3	10.17	10.18		
Chloride ppm. max.	0.10		<0.10		
Total Gas-cc/kg-max	125		16		
Chemicals Added				--	--

TABLE III

Reactor Plant Auxiliary Systems
Water Conditions

System	Conductivity $\mu\text{mhos/cm}$	pH at 25°C	Conc. - ppm			Gross Gamma * Activity - dpm/ml
			CrO_4^{--}	Cl^-	Dis. O_2	
Component Cooling Specifications	N.S.	8.30 - 10.50	500-1000	1 ppm max.	N.S.	N.S.
Observed	1120 - 1600	8.30 - 9.12	445***-692	<0.05-0.40	N.P.	1.7 - 2.7
Coolant Charging Water Specifications	2.50 max.	6.00 - 8.00	N.S.	0.1 ppm max.	Note ***	N.S.
Observed	0.78 - 5.00***	7.01 - 9.44***	N.P.	<0.05	0.005-1.56**	N.P.
Canal Water Specifications	5.00 max.	6.00 - 8.00	N.S.	N.S.	N.S.	N.S.
Observed	0.70 - 1.5	5.81***-6.62	N.P.	N.P.	N.P.	0.46 - 240

* Multiply tabular value by 4.50×10^{-7} to obtain $\mu\text{Ci/ml}$; MDA = 0.41 dpm/ml.

** Should be <0.14 ppm for reactor plant cold shutdown. See Reactor Plant Section of QOR.

*** See Reactor Plant Section of QOR.

N.S.: No limit needed, therefore, no limit has been specified.

N.P.: Analysis is not necessary and not performed.

TABLE IV

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Non-Operating Heat Exchangers
Cold Layup
Water Chemistry

Water Conditions	Specifi- cations	Non-Operating Heat Exchangers			
		1A	1B	1C	1D
1. Conductivity Max. $\mu\text{mhos/cm}$	30	23	24	24	23
2. pH@25°C Min.	9.50	9.57	9.54	9.51	9.09*
Max.	10.50	9.90	9.93	9.94	9.94
3. Chloride ppm Max.	0.50	0.15	0.10	0.10	0.12
4. Hydrazine ppm Max.	50	37*	51	50	8*
Min.	100	166*	97	97	100
5. Chemicals Used in pounds:					
N ₂ H ₄		72.05	41.21	41.21	48
C ₄ H ₂ N ₀		--	--	--	--

* See Turbine Plant Section of QOR.

TABLE V

Non-Operating Heat Exchangers
Hot Standby
Water Chemistry

Water Conditions	Specifi- cations	Non-Operating Heat Exchangers			
		1A	1B		
1. Conductivity Max. $\mu\text{mhos/cm}$	10	29*	13*		
2. pH@25°C Min.	8.00	9.32	9.50		
Max.	9.30	9.89	9.63*		
3. Chloride ppm Max.	0.50	<0.1	<0.1		
4. Chemical Used in pounds:					
N ₂ H ₄		--	--		
C ₄ H ₂ N ₀		--	--		

* See Turbine Plant Section of QOR.

3. MAINTENANCE

Repairs of major components, as well as routine maintenance on equipment, instruments, controls and preventive maintenance were performed during this report period. Major work items completed or in progress during this period are summarized as follows:

Main Unit Turbine

Reassembly of the main unit turbine is nearing completion in its operating location on the turbine deck. The turbine-generator oil system is being flushed to remove pieces of metal and other impurities which resulted from the turbine failure of 1974 and subsequent maintenance operations.

Main Unit Generator

The generator rotor is in its operating position and has already been coupled to the turbine rotor. The exciter is also in its operating position.

Feedwater Stopcheck Valves

Installation of the refurbished 1A and 1D loop feedwater stopcheck valves is complete.

Pressurized Water Reactor Components

The pressurized water reactor core barrel and fuel assemblies remain in the station fuel handling canal. Welding of the pressurized water reactor vessel head shipping container has been completed. This head, along with the old 1A and 1D loop heat exchangers now await shipment for disposal.

Preconditioning

The preconditioning test head has been secured to the reactor vessel by stretching the test head studs. Reactor plant preconditioning was then able to begin toward the end of this period.

Light Water Breeder Reactor Core Barrel

Assemble of the upper and lower core barrel continues.

"1A" and "1D" Loop Steam Generators

Installation of the spare 1A and 1D loop heat exchangers was completed during this period.

Station Clean-up

General station clean-up continues.

"1C" Loop Main Coolant Pump

It has been found necessary to remove the Core II 1C loop main coolant pump. It will be replaced with a Core I main coolant pump. This project has been started.

Plant Modifications and Improvements

Construction began on a diesel generator system and on an auxiliary control room.

Refueling

Reflector assemblies are being received for the Light Water Breeder Reactor Core.

4. TEST PROGRAM

During the first quarter the following test procedures were performed or were in progress to support plant recovery and preconditioning:

1. LWBR-DLCS 53001 - Piping Movement During Reactor Plant Warm-up
2. LWBR-DLCS 53301 - Flywheel Generator Operational Test
3. LWBR-DLCS 53302 - Flywheel Generator/Pump Flow Coastdown Test
4. LWBR-DLCS 57101 - Pressurizer and Pressure Relief System Checkout
5. LWBR-DLCS 59101 - Preconditioning of the Reactor Coolant System
6. LWBR-DLCS 60201 - Movable Fuel Control System Precritical Test
7. LWBR-DLCS 60301 - Initial Checkout of LWBR Nuclear Protection System Modification
8. LWBR-DLCS 61001 - Periodic Calibration of Pressure Instrumentation
9. LWBR-DLCS 61201 - Periodic Calibration of Pressurizer Level Instrumentation
10. LWBR-DLCS 61401 - Calibration of Reactor Plant Differential Pressure Instrumentation
11. LWBR-DLCS 62301 - Main Coolant Pump Vibration
12. LWBR-DLCS 70501 - Flushing of Turbine Plant System
13. LWBR-DLCS 70601 - Reprocessing Test Tank Water Via a Temporary Pipe Installation
14. LWBR-DLCS 70701 - Flushing of 1A and 1D Heat Exchanger Vents
15. LWBR-DLCS 70801 - Transferring Test Tank Water to a Canal Pit
16. LWBR-DLCS 71001 - Isolated Loop Fill Procedure
17. LWBR-DLCS 71101 - Fill an Isolated Boiler(s) from a Partial or Full Drain Condition

18. LWBR-DLCS 71501 - Reactor Coolant Pump Circuitry Test
19. LWBR-DLCS 71601 - Reactor Coolant Pump Static Circuitry Test
20. LWBR-DLCS 71603 - Main Control Console, Auxiliary Control Panel, Main Instrument Panel, Pre-activation Control Circuit Check-out
21. LWBR-DLCS 71604 - Tie Breaker Static Circuitry Test
22. LWBR-DLCS 71701 - Hydrostatic Test of an Isolated Reactor Coolant Loop and Its Associated Purification Loop and Relief Valve Testing
23. LWBR-DLCS 71702 - Hydrostatic Test of 1A and 1D Vent Line Flanged Connection Piping
24. LWBR-DLCS 71801 - Hydrostatic Test of an Isolated Boiler
25. LWBR-DLCS 71803 - Hydrostatic Test of 1A and 1C Feedwater Stop Check Valves
26. LWBR-DLCS 72201 - Running a Reactor Coolant Pump in an Isolated Loop
27. LWBR-DLCS 72401 - Reactor Vessel and Pressurizer Fill
28. LWBR-DLCS 72501 - Heat Up for Pre-Core Preconditioning Hot Operations
29. LWBR-DLCS 72502 - Pre-Core Preconditioning Hot Operations
30. LWBR-DLCS 72510 - Operation of the RWDS Gaseous Waste System Using a Temporary Configuration During Pre-Core Preconditioning
31. LWBR-DLCS 73201 - Hydrostatic Test of Pressurizer Piping
32. LWBR-DLCS 73202 - Hydrostatic Test of Cooling Water Piping
33. LWBR-DLCS 73203 - Hydrostatic Test of the 1B Steam Generator Level Indication Lines
34. LWBR-DLCS 73204 - Hydrostatic Test of the Steam Header Pressure Switches
35. LWBR-DLCS 73207 - Hydrostatic Test of RWDS Vent Gas Compressor

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36. LWBR-DLCS 73209 - RWD Spray Recycle Tank Level Indication Fill Valve Hydrostatic Test
37. LWBR-DLCS 73211 - RWP Decay Gas Filter Isolation Bypass Valve Hydrotest
38. LWBR-DLCS 73213 - Hydrostatic Test of 1B Flow D/P Cell Piping Welds
39. LWBR-DLCS 73401 - 1A Boiler Feedwater Breaker Static Circuitry Test
40. LWBR-DLCS 73402 - 1A Boiler Feedpump Starting Test
41. LWBR-DLCS 73403 - Operation Test of 1A Boiler Feedpump (BFP)
42. LWBR-DLCS 73404 - 1B Boiler Feedwater Pump Static Circuitry Test
43. LWBR-DLCS 73502 - Hydrostatic Test of Reactor Coolant Sampling System Piping
44. LWBR-DLCS 73801 - Checkout of Nuclear Protection System Pump Power Circuitry
45. LWBR-DLCS 73901 - Flywheel Generator Control Circuitry Test

6. GLOSSARY

AIX	after ion exchanger (outlet)
a/o	atomic percent
BAPL	Bettis Atomic Power Laboratory
BIX	before ion exchanger (inlet)
CIC	compensated ionization chamber
DAS	Data Acquisition System
DE	demineralizer effluent
DF	decontamination factor
EFPH	equivalent full power hour
ERDA	Energy Research and Development Administration
Hc	critical height
HDS	Heat Dissipation System
magamp	magnetic amplifier
MDA	Minimum Detectable Activity
MELBA	Multipurpose Extended Life Blanket Assembly
mR	milliroentgen
mrem	milliroentgen equivalent man
NPS	Nuclear Protection System
ORMS	Operational Radiation Monitoring System
PWR	Pressurized Water Reactor
QOR	Quarterly Operating Report

Glossary

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R	roentgen
RC	resistance capacitance
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 inlet coolant temperature
Th	reactor outlet coolant temperature
Ts	time of sample isolation
μCi	microcuries
v/o	percent by volume
VOS	Valve Operating System

ABSTRACT

During the First Quarter 1976 report period, Shippingport was shutdown for preconditioning preparation and plant modification required for the Light Water Breeder Reactor Program. The Station efforts were directed toward plant maintenance and the preparations for the preconditioning of the new steam generator primary coolant surfaces. The report presents a summary of events which occurred in operations, chemistry, maintenance and testing.