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QUARTERLY OPERATING REPORT
Fourth Quarter 1978
DLCS 5000478

Approved by: _____

T. D. Jones
T. D. Jones
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 Department of Energy, Technical Information Center at Oak Ridge, Tennessee, where this information is readily available.

1. SUMMARY OF OPERATIONS

At the beginning of the fourth quarter of 1978, the Shippingport Atomic Power Station was in a hot shutdown condition with the 1A, 1B, 1C and 1D reactor coolant loops and the 1AC and 1BD purification loops in service. The planned Fall shutdown schedule was nearing completion. The main turbine was on turning gear with plant testing and training in progress. The reactor was in a shutdown condition without unlatching the movable fuel. The remainder of the expended PWR Core 2 was in storage under shielding water in the deep pit of the Fuel Handling Building.

The 1A, 1B, 1C and 1D 991 psig self-actuated steam relief valves remained gagged during the quarter to prevent leakage through the valve seats. Gagging of redundant relief valves is permitted by ASME Code and approved operating procedures.

The Fall shutdown, which included training on reactor startups, main unit turbine and generator startups and shutdowns, was completed and the station was started up and placed in service for power operation on October 7.

On October 8, the 1D loop was removed from service, isolated and cooled down to $\approx 250^{\circ}\text{F}$, then placed on the reactor plant cooldown heat exchanger. Removal of the 1D loop from service was necessary to repair the faulty internals in the 1D boiler feedwater control regulating valve. The station was operated at reduced power for 3 loop operation according to approved operating procedures. A station shutdown was performed on October 13 to return the 1D loop to service. The 1D feedwater control regulating valve was repaired, the loop heated up and then returned to service on the same day. A reactor startup was completed and the station placed back in service on October 14. Full power operation with four coolant loops in service was restored on October 14.

Station output was limited to the capability of one boiler feedwater pump operating (55 MWG) between October 17 and October 20 due to abnormal vibration of the 1B boiler feedwater pump. The pump vibration was corrected by realignment and then returned to service. Full power capability was attained again on October 20.

In addition, a station shutdown was performed on December 1 to complete necessary modifications on the Duquesne Light Company network No. 2 138 KV bus. Upon completion of the modifications, the station was returned to service on December 2 and the station output increased to maximum.

1. SUMMARY OF OPERATIONS (Cont'd)

On shift Casualty and Emergency Drills were performed during the quarter by operating personnel.

During the quarter, the station was operated for Duquesne Light Company system grid including base load and swing load operation. Forty-three (43) swing load operations have been performed on the LWBR Core this quarter to meet the LWBR operating plan of fifty (50) during this operating phase. The LWBR Core has generated 8879.48 EFPH from start-up through the end of the quarter. The generator load factor this quarter was 79%.

The Reactor Coolant System average leak rate for this quarter was 9 gallons per hour. The leakage is collected in the Radioactive Waste Processing System and processed as reuse water for the reactor plant water storage tank.

Two environmental studies were continued this quarter. The first involved reduction of main unit condenser chlorination and the second, river intake screen fish impingement sampling. Both studies were calendar year 1978 programs and were completed.

There were no radioactive liquid discharges from the Radioactive Waste Processing System to the river this quarter. The radioactive liquid waste effluent line to the river remained blanked off to prevent inadvertent radioactive liquid waste discharges. A leak check of the vent gas system of the Radioactive Waste Processing System was performed during the quarter and leakage could not be detected.

During the quarter, 7,319 cubic feet of gas was discharged from the Radioactive Waste Processing System containing 0.00045 curies of Xe 133 activity.

During the fourth quarter of 1978, 2,726 cubic feet of radioactive solid waste was shipped out of state for burial. These shipments contained 0.258 curies of radioactivity which does not include irradiated components and irradiated fuel which was shipped offsite (See Maintenance Section).

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Figure 1

2. SUMMARY OF LWBR STATION PERFORMANCE

Electrical output (Gross) to date	.kwhr 660,930,000
EFPH to date	.hr 8879.48
EFPH for the quarterly period	.hr 1850.94
Hours reactor critical to date	.hr 10303.20
Hours reactor critical for the quarterly period	.hr 2108.60
No. 1 main unit service hours (quarterly period).	.hr 2036.10
Net Station Output (quarterly period)	.kwhr 113,856,000
No. of forced outages*	0

* Interruption of electrical output due to protective equipment action and/or operator action.

3. CHEMISTRY

During the fourth quarter of 1978, the Chemistry Section maintained specifications in the various plant systems and fulfilled the station manual requirements.

Reactor Plant

The reactor coolant system was maintained within all chemical specifications without any exceptions during the periods of hot standby and operations. Refer to Tables I and II. The only out-of-specification conditions which existed in the reactor plant auxiliary systems occurred in the coolant charging water system and the canal waters. The out-of-specification conditions which existed in the coolant charging water system were that of high pH and specific conductance values.* The high pH's and specific conductances were attributed to the presence of ammonia which entered the system during an ammonium hydroxide chemical treatment of the primary coolant system. Make-up water added to the Reactor Plant Water Storage Tank enabled the pH and specific conductances to be lowered to within specification. Refer to Table VI. The canal water out-of-specification pH was attributed to the absorption of carbon dioxide from the atmosphere. Continued recirculation of the canal waters through the canal water demineralizers aided in raising the water's pH to within specification. See Table VI.

During this quarter, Test Procedures LWBR-DLCS 58001, Reactor Coolant Fission Product Monitoring During Reactor Startup, and LWBR-DLCS 59201, Periodic Radiochemical Analysis of LWBR Reactor Coolant, were performed. The reactor coolant samples drawn for LWBR-DLCS 58001 and analyzed for Gross Iodine and Iodine-131 showed no abnormal peaking of Iodine activities as the reactor power was increased in accordance with scheduled power range operations, verifying the integrity of the core cladding. The results of LWBR-DLCS 59201, which at the time of this writing were not formalized, will be included in the first QOR of 1979.

* All of the out-of-specification conditions were of short duration and are not expected to have had detrimental effects on plant materials.

3. CHEMISTRY (Cont'd)

Turbine Plant

At the beginning of the fourth quarter of 1978, the station was in hot standby anticipating start-up following the planned fall shutdown period. During the period of hot standby, the 1C and 1D main unit steam generators exceeded the maximum allowed pH specification and all the steam generators reached out-of-specification specific conductivities.* These out-of-specification conditions were attributed to the presence of ammonia formed from the chemical decomposition of hydrazine while "steaming down" the boilers for start-up. Subsequent boiler blowdowns re-established chemistry control by lowering the boiler's conductivities and pH values. Refer to Table IV.

Following start-up, the 1D main unit steam generator had to be isolated and placed in wet layup condition for repairs on a malfunctioning feedwater regulator. While in cold layup, the boiler was out-of-specification because of low pH and low hydrazine concentrations.* These two out-of-specification conditions were corrected by an additional treatment of hydrazine to the affected steam generator. See Table III. During the period of operations, the only out-of-specification condition which occurred in the main unit boilers was that of high specific conductivities.* The high specific conductivities were attributed to low flow through the condensate polishing demineralizer. Again, subsequent boiler blowdowns lowered the conductivities to within specifications. Refer to Table V.

Radioactive Waste Processing

There were no liquid discharges from the Radioactive Waste Processing System during this quarter. However, 7,319 cubic feet of gas was discharged from the Radioactive Waste Processing System containing 0.00045 curies of activity. The radioactivity released from Shippingport is far too small to have any measurable effect on the general background environmental activity outside the plant.

* All of the out-of-specification conditions were of short duration and are not expected to have had detrimental effects on plant materials.

TABLE I
REACTOR COOLANT SYSTEM
WATER CONDITIONS AND CHEMICAL ADJUSTMENTS
HOT STANDBY (> 200°F)

PARAMETERS	SPECIFICATIONS	ANALYTICAL RESULTS		NH ₄ OH (liters)	H ₂ (cu. ft.)	DEGASSI- FICATION (hrs.)
		MIN.	MAX.			
pH @ 25°C	10.10 - 10.30	10.17	10.28			
Specific Conductivity (μmhos/cm)	Consistent with pH	39.5	47.0			
Chloride	0.10 ppm max	----	<0.10			
Total Gas (cc/kg)	125 cc/kg max	26.5	40.0			
Hydrogen (cc/kg)	10 - 60 (cc/kg)	10.3	21.9			
Chemicals Added				0.0	111	0.0

TABLE II
REACTOR COOLANT SYSTEM
WATER CONDITIONS AND CHEMICAL ADJUSTMENTS
OPERATING CONDITIONS

PARAMETERS	SPECIFICATIONS	ANALYTICAL RESULTS		NH ₄ OH (liters)	H ₂ (cu. ft.)	DEGASSI- FICATION (hrs.)
		MIN.	MAX.			
pH @ 25°C	10.10 - 10.30	10.10	10.29			
Specific Conductivity (μmhos/cm)	Consistent with pH	28.5	50.0			
Chloride	0.10 ppm max	----	<0.10			
Total Gas (cc/kg)	125cc/kg max	43.4	107			
Hydrogen (cc/kg)	10 - 60 (cc/kg)	22.7	59.0			
Chemicals Used				174.5	0.0	68.6

TABLE III
Non-Operating Heat Exchangers
Cold Lay-up
Water Chemistry

Water Conditions	Specifications	Non-Operating Heat Exchangers			
		1A	1B	1C	1D
1. Conductivity Max. $\mu\text{mhos/cm}$	30				23
2. pH @ 25°C Min. Max.	9.50 10.50				9.34* 9.80
3. Chloride ppm Max.	0.5				<0.10
4. Hydrazine ppm Min. Max.	50 100				44* 72
5. Chemicals used in pounds:					
N_2H_4					35
$\text{C}_4\text{H}_2\text{NO}$					

*See Turbine Plant Section of QOR.

TABLE IV
NON-OPERATING BOILER CHEMISTRY
HOT STANDBY (> 200°F) WATER CHEMISTRY

PARAMETERS	SPECIFICATIONS	BOILERS			
		1A	1B	1C	1D
pH @ 25°C	Min. 8.50	8.78	8.87	8.82	8.81
	Max. 9.30	9.07	9.19	9.61*	10.24*
Specific Conductivity	Min. ----	5.4	4.9	5.2	5.7
	Max. 10 µmohs/cm	10.9*	10.5*	9.5	65*
Chloride	Min. ----	----	----	----	----
	Max. 0.20 ppm	<0.10	<0.10	<0.10	<0.10
Morpholine	Min. 0.50 ppm	0.55	0.54	0.50	0.60
	Max. 6.00 ppm	4.54	3.90	4.00	4.00
Chemicals used (lbs) C ₄ H ₉ NO		1.75	1.38	1.72	1.91

* See turbine section of QOR

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TABLE V
OPERATING BOILER WATER CHEMISTRY
VOLATILE WATER CHEMISTRY

PARAMETERS	SPECIFICATIONS	BOILERS			
		1A	1B	1C	1D
pH @ 25°C	Min.	8.50	8.50	8.56	8.56
	Max.	9.30	9.15	9.17	9.13
Specific Conductivity	Min.	----	4.2	4.0	4.3
	Max.	10 µmhos/cm	11.5*	11.0*	9.6
Hydrazine	Min.	0.005 ppm	0.014	0.012	0.018
	Max.	0.125 ppm	0.084	0.084	0.088
Chloride	Min.	----	-----	-----	-----
	Max.	0.20 ppm	<0.10	<0.10	<0.10
Morpholine	Min.	0.50 ppm	0.57	0.55	0.72
	Max.	6.0 ppm	3.00	3.50	3.60
Silica	Min.	----	1.16	1.03	1.12
	Max.	25 ppm	1.22	1.20	1.16
Chemicals Used (lbs)					
N ₂ H ₄		20.94	20.94	20.94	20.94
C ₄ H ₉ NO		47.94	47.94	47.94	47.94

* See turbine section of Q.O.R.

TABLE VI
REACTOR PLANT AUXILIARY SYSTEMS

WATER CONDITIONS

SYSTEM	Conductivity $\mu\text{mhos/cm}$	pH at 25° C	CONC. - ppm			Gross Gamma Activity $\mu\text{Ci/ml}$
			CrO_4^{--}	Cl^-	Dis. O_2	
Component Cooling Spec.	N.P.	N.P.	500 - 1000	1 max.	N.P.	N.S.
Observed	N.P.	N.P.	501 - 631	0.85	N.P.	1.58×10^{-7} - 6.60×10^{-7}
Coolant Charging Water Specifications	2.5 max.	6.0 - 8.0	N.P.	0.1 max.	NOTE*	N.P.
Observed	2.4 - 4.3**	6.74 - 8.47**	N.P.	<0.10	3.2 - 6.5	N.P.
Canal Water Specifications	5.0 max.	5.8 - 8.0	N.P.	N.P.	N.P.	NOTE*
Observed	1.3 - 1.5	5.45** - 5.90	N.P.	N.P.	N.P.	<MDA - 2.3×10^{-5}

* There is no specification for operating plant conditions.

** See Reactor Plant Section of QJR

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

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

MDA is $8.39 \times 10^{-8} \mu\text{Ci/ml}$

4. MAINTENANCE

Scheduled preventive, as well as corrective maintenance, was performed on plant equipment during this report period. The scheduled testing and maintenance shutdown which started at the end of the third quarter was completed this quarter.

Significant work items completed or in progress during this period are summarized as follows:

Turbine Plant

Retubing of the condensate cooler was initiated, the high and low frequency alarm contacts of the Main Unit Generator Frequency Recorder were connected to an annunciator in the Main Control Room, Phase I of the Turbine-Generator Rotor Torsional Testing is in progress, installation of a new Conductivity Recorder was completed. The Acid Batch Tank was replaced, an outage was taken on the #2 23 KV transformer to add oil and replace a broken stand-off insulator.

Reactor Plant

Two (2) Core 1 Allis Chalmers Main Coolant Pumps were shipped off-site for burial, the Sand Bed Filter was flushed, installation of the Poly Shredder was completed, removal of the underwater racks in the Fuel Storage Pit was started, and the New Fuel Storage Facility was disassembled.

PWR II - Fuel Shipments

The fifth shipment of the PWR-II spent fuel in the M-160 irradiated fuel shipping container was completed this quarter. The expended fuel assemblies were shipped off-site for disposal. Also, preparations for the sixth shipment were started.

5. TEST PROGRAM

The primary objective of the test program during the quarterly report period was to continue reactivity depletion of the LWBR Core for proof of breeding. The second scheduled testing and maintenance shutdown which began on September 15, was completed early this quarter.

Nineteen tests were performed during the report period. Fifteen tests were completed and four remained in progress at the end of the quarter. Table VII lists these tests and Figure 2 indicates the performance dates. Information pertaining to Chemistry tests may be found in the Chemistry Section of this report.

The required monthly performances of test procedure LWBR-DLCS 55201, Safety Injection System (SIS) Monthly Periodic Pump Tests, were performed during the quarter. The tests continue to verify proper flow rate to the SIS heat exchangers from deepwell pumps, 19-G1-1 and 2, for the October, November and December performances. Testing of the new deepwell pump, 53-G2-4009, showed no further significant decrease in flow rate for the three performances. The pump is performing well within the acceptance criteria of the test procedure. Individual testing of the Boiler Feed Pumps was conducted each month and both pumps continue to operate satisfactorily.

The fourth performance of test procedure LWBR-DLCS 55203, SIS Quarterly Periodic Valve Test, remained in progress at the end of the quarter due to unsuccessful operational checks of feed pump recirculation valves 53-H12-4001 and 53-H13-4001. Operation of these valves is not required for proper operation of the Safety Injection System. The problem has been traced to solenoid valve 53-H12-4001 which was replaced and retested on December 21. The valve still failed to operate satisfactorily requiring a second valve to be ordered from the original manufacturer. When the new valve is installed, the remaining portion of this test will be reperformed. Valves 53-H12-4004 and 4005 were not tested during this performance since their testing has been scheduled during the Spring 1979 Shutdown, in accordance with the test procedure. All other SIS valves identified in the test procedure were cycled satisfactorily and their operating times were within the test procedure acceptance criteria.

Test procedure LWBR-DLCS 58301, DNLM System (Operation During Station Startup) was performed satisfactorily for the fourteenth and fifteenth times during the quarter. The fourteenth performance occurred during the scheduled reactor startup following the Fall 1978 Shutdown. The fifteenth performance was required during reactor startup following a station shutdown to return the 1D Loop to service. (See Summary of Operations.) During both test performances, the delayed neutron activity level in the sample flow from the A and/or B main coolant loops was continuously recorded during startup to verify the integrity of the core cladding.

5. TEST PROGRAM (Cont'd)

The eight performance of test procedure LWBR-DLCS 58401, DNLM System Operational Test, was satisfactorily performed following a return to full power after the planned Fall Shutdown. This test determines the delayed neutron emitter activity in the A and/or B loop sampled flow using scalers connected to the DN loop monitors. The test was satisfactorily completed for both the #1 and #2 monitors, even though problems were encountered with the flow indication for monitor #2*. Input voltages to the recorder were recorded and converted using the appropriate calibration curve for the input flow signal. In addition, a procedure has been written for repair of the #2 monitor recorder. This performance is for the operating period between the Fall 1978 and Spring 1979 Shutdowns.

The third performance of test procedure LWBR-DLCS 60901, Periodic Inter-calibration of Temperature Sensing Elements, was successfully completed prior to reactor startup following the Fall Shutdown. As stated in the previous Quarterly Operating Report, a three point check of the instruments was conducted and it was determined that one of the four redundant loop Tc recorders, the 1D Tc recorder, required maintenance.* The maintenance and the appropriate retesting was successfully completed prior to the end of the shutdown.

The following physics test procedures were satisfactorily performed prior to reactor startup following the Fall Shutdown:

The third performance of test procedure LWBR-DLCS 63201, LWBR Pressure Coefficient of Reactivity.

The second performance of test procedure LWBR-DLCS 63202, Flow Coefficient of Reactivity.

The third performance of test procedure LWBR-DLCS 64401, Core Shutdown Reactivity and Azimuthal Reactivity Symmetry (Hot portion only for this performance).

The first performance of test procedure LWBR-DLCS 66102, Movable Fuel Control System Drive Mechanism and BIF Periodic Test was satisfactorily completed prior to station startup following the Fall Shutdown. This test of the Movable Fuel Control System is an expanded version of the test that was conducted during the Spring 1978 Shutdown.

* This equipment problem did not compromise reactor safety or core protection.

5. TEST PROGRAM (Cont'd)

Two special test procedures were satisfactorily completed during the quarter. Test procedure LWBR-DLCS 77801, Reactor Plant Sound Monitoring During the September 1978 Shutdown, was completed as scheduled during the shutdown. Test procedure LWBR-DLCS 77901, Operational Check of TMI Recorder as Applied to DG #1(2) Output, was conducted in preparation for the performance of test procedure LWBR-DLCS 55205, SIS Automatic Operation Checkout, to be performed in the Spring 1979 Shutdown.

Other testing which remained in progress at the end of the quarter included:

Test procedure LWBR-DLCS 66001, Reactivity Lifetime Test (on-going).

Special test procedure LWBR-DLCS 70801, Transferring Test Tank Water to Canal Pit (on-going).

TABLE VII

TESTS PERFORMED DURING FOURTH QUARTER OF 1978

LWBR-DLCS 5520113-15	SIS Monthly Periodic Pump Tests
LWBR-DLCS 5800112-13	Reactor Coolant Fission Product Monitoring During Reactor Startup
LWBR-DLCS 5830114-15	DN Loop Monitoring System (Operation During Station Startup)
LWBR-DLCS 5840108	DN Loop Monitoring System, Operational Test
LWBR-DLCS 6090103	Periodic Intercalibration of Temperature Sensing Elements
LWBR-DLCS 6320103	LWBR Pressure Coefficient of Reactivity
LWBR-DLCS 6320202	Flow Coefficient of Reactivity
LWBR-DLCS 6440103	Core Shutdown Reactivity and Core Azimuthal Reactivity Symmetry
LWBR-DLCS 6610201	Movable Fuel Control System Drive Mechanism and BIF Periodic Test
LWBR-DLCS 7780101	Reactor Plant Sound Monitoring During the September 1978 Shutdown
LWBR-DLCS 7790101	Operational Check of TMI Recorder as Applied to DG#1(2) Outputs

TESTS REMAINING IN PROGRESS AT END OF REPORT PERIOD

LWBR-DLCS 5520304	SIS Quarterly Periodic Valve Test
LWBR-DLCS 5920102	Periodic Radiochemical Analysis of LWBR Reactor Coolant
LWBR-DLCS 66001	Reactivity Lifetime Test
LWBR-DLCS 7080101	Transferring Test Tank Water to a Canal Pit.

PERFORMANCE DATES OF TESTS PERFORMED DURING FOURTH QUARTER

* Performance incomplete at end of report period

Figure 2

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
DOE	Department of Energy
EFPH	equivalent full power hour
Hc	critical height
LWBR	Light Water Breeder Reactor
magamp	magnetic amplifier
MDA	Minimum Detectable Activity
mR	milliroentgen
mrem	milliroentgen equivalent man
NIS	Nuclear Instrumentation System
NPS	Nuclear Protection System
ORMS	Operational Radiation Monitoring System
PWR	Pressurized Water Reactor
QOR	Quarterly Operating Report
R	roentgen

6. GLOSSARY (Cont'd)

RC	resistance capacitance
RCS	Reactor Coolant System
rem	roentgen equivalent man
RPC	Reactor Plant Container
RWPS	Radioactive Waste Processing 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
μ Ci	microcuries
V/O.	percent by volume
VOS.	Valve Operating System