SAXTON NUCLEAR EXPERIMENTAL CORPORATION

Operations Report for February 1968

1. REACTOR OPERATIONS

At the beginning of this report period the reactor was being operated at a power level of 23.5 MWt in continuation of the test program to develop information concerning the utilization of plutonium enriched fuel, the creep rate of Zircaloy-4 cladding, the mechanical performance of borosilicate (Pyrex) glass, and the effect of coolant pH on fuel temperature.

On the morning of February 5th a scheduled reactor scram from a power level of 23.5 MWt was performed. This shutdown was conducted as part of the experimental program to determine the effects of coolant pH on fuel temperature. Recovery from the shutdown was made without any unforeseen delays. The reactor was returned to a power level of 23.5 MWt in approximately 4 hours.

Operation at a power level of 23.5 MWt was continued until the morning of February 12th when the reactor was again manually scrammed from full power for the experimental program. Following the shutdown the reactor was used for reactor start-up training.

On February 13, 14, 15 and 16 the reactor facility was made available for reactor operator examinations. Six Rochester Gas and Electric Company employees, one Metropolitan Edison Company employee, and two Saxton Nuclear Experimental Corporation employees completed Atomic Energy Commission administered written and oral examinations for reactor operator licenses. On February 16th, six Nordostschweitzerische Kraftwerke A.G. employees completed Westinghouse administered examinations to complete their training at Saxton.

In the evening of February 16th, the reactor was made critical and operated at essentially zero power to determine the all-rods-out boron concentration. Following this, main coolant system cooldown was initiated to commence a scheduled plant outage for the purpose of preparing the reactor plant for the escalated power program.

2. GENERAL

During the period February 18 through the remainder of the month the main coolant system was maintained in a cold depressurized condition for maintenance and fuel handling. Subassembly #503-4-25 was removed from core position N-3 and placed in storage. The pH test subassembly #503-4-28 was transferred from core position N-1 to core position N-3. The plutonium 3x3 subassembly #503-4-26 was removed from storage and inserted in core position N-1.

On February 26th the irradiated fuel shipping cask was moved into the containment vessel and placed in the storage well for loading.

3. EXPERIMENTAL PROGRAM

The coolant pH versus fuel temperature experiment was continued during this report period. The pH test subassembly #503-4-28 was located in the center of the core for this series of tests. Data was obtained and analyzed for both high and low pH conditions. The results indicate that there was no significant fuel temperature change during or after a pH increase or decrease.

On February 7th several conditions pertinent to the power escalation program were simulated. Main coolant average temperature was decreased to 490°F while the main coolant pump was being supplied with 63 cycles/sec. power from the variable frequency M-G set. These conditions produced a main coolant flow of 3.08×10^6 lbs/hr and a secondary steam pressure of 430 psig.

On February 16th an all-rods-out, zero power, Xenon free, boron concentration was determined. The boron concentration at a main coolant temperature of 512°F was 971 ppm.

Nine Zircaloy-4 clad test fuel rods were visually examined and measured with the profilometer.

Subassembly #503-4-25 was removed from core position N-3 and placed in storage. The pH test subassembly #503-4-28 was removed from core position N-1, examined with the underwater periscope and inserted in core position N-3.

The plutonium test subassembly #503-4-26 was removed from storage and inserted in core position N-1. The four removable rods in this subassembly are Zircaloy-4 (H-33) clad rods KJ, PM and JO and Zircaloy-4 (H-32) clad rod CK. These rods have approximately 400 EFPH of previous exposure.

The core subassembly status for the next period of operation is as follows:

Core Position	Subassembly
N-1	No. 503-4-26 (Plutonium-Removable Rods KJ, PM, JO and CK)
N-2	No. 3 Reactivity (Flux) Oscillator
N-3	No. 503-4-28 (pH Test)
N-4	Stainless Steel Plug
N-5	No. 503-4-29 (Burnable Poison Test - Removable Rods #783 and #784)

The burnable poison test subassembly #503-4-29 has approximately 1275 EFPH of exposure to date.

The total effective full power hours (EFPH) of operation for Core II is now 7475 and estimates of the fuel burn-up as of February 29, 1968 are: Core II average 8725 MWD/MTM; plutonium region average 14,377 MWD/MTM; peak plutonium rod 18,150 MWD/MTM; peak plutonium pellet 24,225 MWD/MTM.

4. OPERATIONAL TESTS

A normal test of the safety injection system was conducted on February 8th.

On February 16th the rad[illegible] monitoring system circuits were tested.

5. MAINTENANCE

The principal items of mechanical maintenance for the month included repairing the concentrated acid line to the dilute acid tank in the water treatment plant; installing new discs on two valves on RWDF gas decay tank No. 1; checking the steam heating coils in the RWDF monitor tanks and discharge tanks and replacing unions on the heating coils in the discharge tanks; processing four drums of evaporator bottoms; painting the component cooling system piping; replacing the cable on the refueling crane; repairing a ruptured steam heating coil in the switchgear room air handler; patching the storage well protective coating; replacing the pins in the containment vessel rotary crane universal joint; removing, testing and reinstalling one steam generator safety valve; replacing a valve in the auxiliary steam condensate line; fabricating a lifting frame for dissassembling charging pump No. 1; installing new brake linings on the containment vessel rotary crane brake; replacing the bearings and carbon vanes in the air pump for site particulate monitor, RIC-8; replacing the carbon vanes in the air pumps for the charging room and the sample room monitors; repairing the fittings on the sample bomb and the sample panel; replacing the locks on twelve personnel lockers; fabricating and installing a storage shelf in the control room for a high range portable radiation monitor; preparing the reactor vessel head for test fuel changes; handling fuel subassemblies and removable single fuel rods in the storage well; and placing the spent fuel cask in the storage well for loading.

The major items of electrical and instrument maintenance included cleaning contacts in the high voltage power supply for the chemistry laboratory spectrophotometer; removing and cleaning the high level alarm probes in the monitor tanks; calibrating the pressure gauges in No. 2 RWDF gas compressor discharge line and seal water line; checking the setpoints on all station service electrical trips; replacing a mylar cover on the portable alpha probe scintillation crystal; calibrating charging pump No. 2 discharge pressure gauge; cleaning contacts in the fire and evacuation alarm relays and replacing four tubes in the evacuation alarm circuit; repairing a motor operated steam heating valve for the inlet air handler in the control and auxiliary building; checking and servicing the station batteries; installing a new flasher in the RWDF control room alarm panel; installing a new limit switch on the fuel handling crane; decontaminating the G-M tubes in the stack radiation monitor RIC-3, and adjusting the high voltage; replacing a conductivity cell on the sampling

panel for the make-up water treatment plant; replacing the compensated ion chamber in nuclear instrumentation intermediate range channel A; meggering nuclear instrumentation power range channel A detector and cables; calibrating and installing a high range G-M tube in the containment vessel primary compartment to monitor radiation levels; removing the main coolant pump power leads in preparation for disassembly of the pump; checking and replacing tubes in the count room unshielded G-M scaler, the alpha scaler and the liquid scintillation system; replacing a capacitor in the turbine room paging phone; and replacing two vacuum tubes in nuclear instrumentation intermediate range channel A log microammeter.

6. CHEMISTRY

Main coolant system chemistry was maintained for power operating conditions from the beginning of the month to February 19th. During this period the lithium concentration was varied from 0.01 ppm to 1.73 ppm for pH versus fuel temperature tests. On February 16th the boron concentration was increased to 971 ppm for an all-rods-out boron determination. Cooldown of the main coolant system was initiated in the evening of February 16th. The hydrogen concentration was reduced to less than 5 cc/kg H_2O in preparation for opening the main coolant system. The boron concentration for the month varied from a low of 437 ppm during power operation to a high of 1787 ppm after the system was opened to the storage well on February 26th.

A summary of the analyses performed on samples taken from the main coolant system during the month is contained in the following table:

Main Coolant System	Minimum	Maximum
pH at 25°C	5.18	7.09
Conductivity, umhos	2.03	18.0
Boron, ppm	437	1787 *
Chlorides, ppm	< 0.005	< 0.005
Hydrogen, cc/kg H_2O at STP	< 5 *	39
Crud, ppb	26	53
Oxygen, ppm	< 0.005	0.005
Gross Beta-Gamma (15 Min. Degassed) uc/cc	1.10×10^{-2}	7.60×10^{-1}
Tritium, uc/cc	9.09×10^{-2}	1.16×10^{-1}

* Cold Shutdown Conditions

Except for short periods on February 5th, February 9th, and February 10th the chlorides in the steam generator were maintained less than 0.3 ppm. On the above days the condensate return from the reactor plant heating system became contaminated via defective heating coils in the RWDF discharge tanks. The average activity of the steam generator blowdown continued to be less than 1×10^{-8} uc/cc.

During the month 196 grams of potassium dishromate and 40 grams of potassium hydroxide were added to the component cooling water to maintain pH and chromate requirements.

7. RADIATION AND WASTE DISPOSAL

Radiation surveying consisted of routine plant surveys, C.V. during shutdown and materials shipments. The following maximum radiation readings were taken:

Location	Radiation Reading
C&A Building	
Waste Drum (baling machine)	2.5 mrem/hr beta-gamma
Charging Pump (contact with cnamber)	20 mrem/hr beta-gamma
Sample Room (door of sample panel)	1.0 mrem/hr beta-gamma
Chemical Lab Hot Sink (1" from drain)	20 mrem/hr beta-gamma
R&DF	
Evaporator (under bottom)	25 mrem/hr beta-gamma
Evaporator (contact outside upper level)	22 mrem/hr beta-gamma
C.V.	
Primary Compartment (general upper level)	100 mrem/hr beta-gamma
Primary Compartment (contact M.C. pump volute)	500 mrem/hr beta-gamma
Primary Compartment (S.G. bottom)	350 mrem/hr beta-gamma
Primary Compartment (pressurizer bottom)	110 mrem/hr beta-gamma
Primary Compartment (general lower level)	50 mrem/hr beta-gamma
Primary Compartment (Regen. H.X.)	300 mrem/hr beta-gamma
Primary Compartment (Non-Regen. H.X.)	35 mrem/hr beta-gamma
Auxiliary Equipment Compartment (S.C.H.X.)	10 mrem/hr beta-gamma
Auxiliary Equipment Compartment (D.T. top)	8 mrem/hr beta-gamma
Auxiliary Equipment Compartment (D.T. bottom)	60 mrem/hr beta-gamma
Auxiliary Equip. Compartment (general lower level)	6 mrem/hr beta-gamma
Reactor Deck (water level at grating)	25 mrem/hr beta-gamma
Reactor Deck (instrument ports)	400 mrem/hr beta-gamma
Reactor Deck (waist level)	20 mrem/hr beta-gamma
Reactor Deck (storage well railing)	20 mrem/hr beta-gamma

Contamination surveying consisted of routine plant site surveys, surveys of materials shipped, tools, equipment and C.V. during shutdown. The clean areas were within the "Clean Area" limits. The controlled area was generally within the "Clean Area" limits. The controlled area was cleaned frequently to keep and/or to return it to the "Clean Area" limits. The exclusion areas were cleaned periodically to minimize the amount of smearable contamination. The following contamination levels were observed:

Location	Contamination Reading
C&A Building	
Charging Pump Chamber	25155 d/m/smear beta-gamma
Charging Pump Chamber	< 10 d/m/smear alpha
Charging Room Floor	734 d/m/smear beta-gamma
Sample Room Sink	55838 d/m/smear beta-gamma
Sample Room Sink	< 10 d/m/smear alpha
Sample Room Floor	647 d/m/smear beta-gamma
Chemical Lab Hot Sink	203560 d/m/smear beta-gamma
Chemical Lab Hot Sink	< 10 d/m/smear alpha
R.D.F.	
Pump Room Floor	609 d/m/smear beta-gamma
Shipping Room Floor	255 d/m/smear beta-gamma
C.V.	
Operating Deck	628 d/m/smear beta-gamma
Operating Deck	< 10 d/m/smear alpha
Reactor Deck (head)	24581 d/m/smear beta-gamma
Reactor Deck (head)	< 10 d/m/smear alpha
Reactor Deck (grating)	36521 d/m/smear beta-gamma
Reactor Deck (grating)	< 10 d/m/smear alpha
Primary Compartment (grating)	17800 d/m/smear beta-gamma
Primary Compartment (grating)	< 10 d/m/smear alpha
Miscellaneous	
Shipping Cask (arrival)	5758 d/m/smear beta-gamma
	< 10 d/m/smear alpha

Liquid and gaseous effluents from the SNEC site for the month of February 1968 were as follows:

Effluent Type	(Curie) Activity This Month	(Curie) Activity Year to Date	(Curie) Activity Last Twelve Months
Liquid	0.000044	0.000721	0.010582
Tritium	0.000015	1.415033	4.177190
Air, Xe	2.012625	2.175365	13.044099
Air, I-131	0.000105	0.000173	0.001833
Air, M.F.P.	0.020126	0.021753	0.130440

Five (5) barrels of waste were drummed for temporary storage. No drums were shipped from the site.

Radiation exposure for all SNEC personnel as measured by film badges for the month of January 1968 were a maximum of 105 mrem with an average of 23.6 mrem.

Radiation exposure for all visiting personnel as measured by film badges for the month of January 1968 were a maximum of 0 mrem with an average of 0 mrem.

The average radiation exposure for all personnel as measured by film badges for the month of January was 18.15 mrem.

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OPERATING STATISTICS

MONTH February YEAR 1968

NUCLEAR	UNIT	MONTH	YEAR	TO DATE
TIMES CRITICAL	NO.	12	83	625
HOURS CRITICAL	HRS.	276.86	344.26	20,917.26
TIMES SCRAMMED (MANUAL)	NO.	6	32	359
* TIMES SCRAMMED (INADVERTANT)	NO.	0	1	34
THERMAL POWER GENERATION	MWH	6,372.37	6,654.69	384,624.62
AVERAGE BURNUP	MWD/MTU	520.16	543.20	14,377.43

CONTROL ROD POSITIONS AT END OF MONTH AT EQUILIBRIUM POWER OF 0 MWt

MAIN COOLANT BORON 1787 PPM

RODS OUT - INCHES

NO. 1 0 NO. 2 0 NO. 3 0

NO. 4 0 NO. 5 0 NO. 6 0

ELECTRICAL	UNIT	MONTH	YEAR	TO DATE
GROSS GENERATION	MWH	1,146.00	1,189.00	64,465.50
STATION SERVICE	MWH	185.04	775.13	12,991.03
STATION SERVICE	%	16.14	65.19	20.15
AVG. PLANT EFFICIENCY - MWH(e)/MWH(t)	%	17.98	17.87	16.76
AVG. GENERATION RUNNING (271.18 HRS)	KW	4,225.98	4,173.68	3,380.70
PLANT LOAD FACTOR - (AVG. GEN. FOR MONTH/MAX. LOAD)	%	38.38	19.25	27.54

AUXILIARY STEAM SUPPLY - NUCLEAR				
STEAM SUPPLIED BY REACTOR	HRS.	272.80	289.57	17,440.66
RWDF EVAPORATOR OPERATION	HRS.	0	0	0

* REMARKS: _____

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DAILY AVERAGE POWER LEVELS FOR FEBRUARY 1968