

# SAXTON NUCLEAR EXPERIMENTAL CORPORATION

## Operations Report for December 1969

### 1. GENERAL

At the beginning of this report period the reactor was in a hot shutdown condition. On December 1, the automatic transfer of the SNEC alternate power supply was functionally tested under load conditions by de-energizing the 13.8 KV bus 1B.

On Dec 10, SNEC received AEC authorization for power operation to 28 MWt with Core 1-1.

### 2. REACTOR OPERATIONS

On December 11, the reactor was taken critical and the power increased to 7 MWt. The reactor was shutdown due to lack of indication on nuclear instrumentation power range channel B. The cables and watertight can were replaced on power range channel B. The intermediate range channels A and B and power range C detectors were repositioned to optimize the sensitivity.

On December 12, the reactor was again taken critical and the power increased to 12 MWt for low power physics measurements. On December 15, reactor power was increased to 18 MWt over a six hour period. On December 16, the reactor power was reduced to 10 MWt as part of the low power physics procedure. The reactor was shutdown on December 17 due to leakage from the primary system. The containment vessel was inspected and power range channel B was again repositioned to increase sensitivity and power range C detector was replaced. Primary system leakage was stopped by tightening the vent and drain valves on the primary loop. The reactor was taken critical and on December 18, reactor power was increased to 18 MWt. Power operating physics measurements were made during the remainder of the month.

The secondary system chemistry was troubled with high chlorides. The No. 2 condenser tubes were checked for leakage by splitting the condenser and approximately fifty tubes were plugged. At the end of this period the North side of the condenser was still out of service due to excessive tube leakage.

### 3. EXPERIMENTAL PROGRAM

At power physics parameters for Core III were measured during the month. Preliminary results are as follows:

Temperature Coefficient:  $-1.2 \times 10^{-4} \Delta k/k/^\circ F$  at 744 ppm Boron  
 $-1.79 \times 10^{-4} \Delta k/k/^\circ F$  at 540 ppm Boron

Pressure Coefficient:  $+1.4 \times 10^{-6} \Delta k/k/psi$  at  $485^\circ F$

Power Coefficient:  $-3.1 \times 10^{-4} \Delta k/k/MWt$  at 22 MWt  
 $-5.3 \times 10^{-4} \Delta k/k/MWt$  at 10 MWt

SNEC Operations Report for  
December 1969 . . . . #2

Xenon Worth: .017  $\Delta k/k$  0 to 11 MWt  
.007  $\Delta k/k$  7 to 19 MWt  
Boron Worth:  $1 \times 10^{-4}$   $\Delta k/k/ppm$  at 600 ppm Boron  
Rod 2 Worth: .031  $\Delta k/k$

The above parameters are subject to refinement during operation of Core III. The peak linear power densities measured were as follows:

Loose Lattice Fuel - 18.35 kw/ft  
Load Follow Fuel - 16.41 kw/ft

#### 4. OPERATIONAL TESTS

The SNEC fire and evacuation alarms were tested satisfactorily on December 5, 12, 19 and 26.

The monthly test of the safety injection and recirculation system was conducted on December 16.

The monthly test of the radiation monitoring system was conducted on December 6.

The annual reactor plant alternate power supply automatic transfer test was conducted on December 1.

The monthly calibration of the steam generator blowdown monitor was conducted on December 16.

#### 5. MAINTENANCE

The principal items of mechanical maintenance during the month included replacing a rupture disc on the containment vessel discharge tank; installing a new section of pipe in the steam heating condensate line in the RWDF; replacing a rubber diaphragm on the RWDF number two gas compressor regulating valve; repairing the float valve on the RWDF number one gas compressor separator; installing new pre-filters on the RWDF air handler; fabricating a portable lead shield for the Co-60 source; replacing the check valve on the control and auxiliary building sump pump discharge line; installing a new diaphragm in the neutralized waste tank drain valve; checking the number two condenser tubes and plugging approximately 50 tubes; stroking the letdown stop valve, HIC-23V; flushing the boiler feed pump power water coolers and replacing the gaskets; and draining four drums of evaporator bottoms for processing.

The major items of electrical and instrument maintenance included a functional test of the alternate power supply under load conditions; replacing vacuum tubes in the chemical laboratory pH meter; replacing vacuum tubes in the count room alpha scaler; replacing the meter relay on the number six control rod position indicator circuit; installing new detector cables and a watertight can in power range channel B; installing a new UIC detector in power range channel C; replacing a defective wire in the number two generator OCB closing circuit; installing new heating tapes and insulation on the safety injection system d/p cell instrument lines; overhauling the current to air converter and pneumatic drive on the pressurizer group three heater control auto transformer; installing a new motor in the RWDF evaporator room air mixing fan; installing new gears in the southeast anemometer station recorder; installing vanes in the RWDF alpha monitor pump; overhauling the charging pump pneumatic speed control units; replacing the waxoid switch in the RWDF evaporator steam control circuit; replacing the temperature compensator in the water treatment condensate conductivity sample cell; replacing vacuum tubes in the charging room monitor, RIA-2; and replacing the pressure switch on the site particulate monitor, RIC-8.

## 6. CHEMISTRY

The primary system was in a hot shutdown at the beginning of the month. On December 8, the lithium concentration was increased to 0.54 ppm in preparation for power operation. Hydrogen overpressure was added to the purification purge tank on December 11.

On December 25, the primary coolant activity took a step increase and continued to increase slowly during the remainder of the month. Seven hydrogen analyses were made during the month.

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

<u>Main Coolant System</u>	<u>Minimum</u>	<u>Maximum</u>
pH at 25°C	6.08	6.80
Conductivity, umhos	10.20	22.4
Boron, ppm	632	766
Chlorides, ppm	<0.005	<0.005
Oxygen, ppm	<0.005	<0.005
Hydrogen, cc/kg H <sub>2</sub> O at STP	9	24
Gross Beta-Gamma (15 Min. Degassed) uc/cc	$4.54 \times 10^{-2}$	$6.61 \times 10^{-2}$
Tritium, uc/cc	$1.22 \times 10^{-3}$	$6.41 \times 10^{-2}$
I-131, uc/cc	$7.43 \times 10^{-1}$	$9.97 \times 10^{-1}$
I-133, uc/cc	1.15	1.41
Lithium, ppm	0.46	0.54
Total Primary Coolant Activity, uc/cc	-	8.15

Except for brief periods, the steam generator chloride concentrations were maintained below 0.3 ppm. The activity in the steam generator was less than  $1 \times 10^{-8}$  uc/cc during the month.

A summary of the analysis on the component cooling water is as follows:

<u>pH</u>	<u>Conductivity</u>	<u>CrO<sub>4</sub>-ppm</u>	<u>Activity, uc/cc</u>
9.01	774	310	$3.26 \times 10^{-5}$

## 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:

<u>Location</u>	<u>Radiation Reading</u>
<u>C&amp;A Building</u>	
Waste Drum (baling machine)	0.8 mrem/hr beta-gamma
Charging Pump (contact with chamber)	20 mrem/hr beta-gamma
Sample Room (door of sample panel)	18.0 mrem/hr beta-gamma
Chemical Lab Hot Sink (1" from drain)	4.5 mrem/hr beta-gamma
<u>RWDF</u>	
Evaporator (under bottom)	45 mrem/hr beta-gamma
Evaporator (contact outside upper level)	10 mrem/hr beta-gamma
Drum Storage Area (at HRA fence)	0.75 mrem/hr beta-gamma
<u>C.V.</u>	
Primary Compartment (general upper level)	75 mrem/hr beta-gamma
Primary Compartment (contact M.C. pump volute)	375 mrem/hr beta-gamma
Primary Compartment (S.G. bottom)	175 mrem/hr beta-gamma
Primary Compartment (Pressurizer bottom)	110 mrem/hr beta-gamma
Primary Compartment (general lower level)	85 mrem/hr beta-gamma
Primary Compartment (Regen. HX)	310 mrem/hr beta-gamma
Primary Compartment (Non-Regen. HX)	35 mrem/hr beta-gamma
Auxiliary Equipment Compartment (S.C.H.X.)	11 mrem/hr beta-gamma
Auxiliary Equipment Compartment (D.T. top)	8 mrem/hr beta-gamma
Auxiliary Equipment Compartment (D.T. bottom)	43 mrem/hr beta-gamma
Auxiliary Equipment Compartment (general lower level)	2.5 mrem/hr beta-gamma
Reactor Deck (water level at grating)	40 mrem/hr beta-gamma
Reactor Deck (instrument ports)	260 mrem/hr beta-gamma
Reactor Deck (waist level)	50 mrem/hr beta-gamma
Reactor Deck (storage well railing)	45 mrem/hr beta-gamma

SNEC Operations Report for  
December 1969 . . . . #5

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:

<u>Location</u>	<u>Contamination Reading</u>
<u>C&amp;A Building</u>	
Charging Pump Chamber	272000 d/m/smear beta-gamma
Charging Pump Chamber	<10 d/m/smear alpha
Charging Room Floor	450 d/m/smear beta-gamma
Sample Room Sink	185000 d/m/smear beta-gamma
Sample Room Sink	<10 d/m/smear alpha
Sample Room Floor	9450 d/m/smear beta-gamma
Chemical Lab Hot Sink	324000 d/m/smear beta-gamma
Chemical Lab Hot Sink	<10 d/m/smear alpha
<u>RWDF</u>	
Pump Room Floor	375 d/m/smear beta-gamma
Shipping Room Floor	<100 d/m/smear beta-gamma
<u>C.V.</u>	
Operating Deck	4750 d/m/smear beta-gamma
Operating Deck	<10 d/m/smear alpha
Primary Compartment (grating)	62500 d/m/smear beta-gamma
Primary Compartment (grating)	<10 d/m/smear alpha

Liquid and gaseous effluents from the SNEC site for the month of December, 1969, were as follows:

<u>Effluent Type</u>	<u>(Curie) Activity This Month</u>	<u>(Curie) Activity Year to Date</u>	<u>(Curie) Activity Last Twelve Months</u>
Liquid	0.000467	0.010135	0.010135
Tritium	0.037083	0.937433	0.937433
Air, Xe	0.745670	1.244125	1.244125
Air, I-131	0.000021	0.000021	0.000021
Air, M.F.P.	0.007456	0.012441	0.012441

SNEC Operations Report for  
December 1969 . . . . #6

No 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 November 1969 were a maximum of 1300 mrem with an average of 153.6 mrem.

Radiation exposure for all visiting personnel as measured by film badges for the month of November 1969 were a maximum of 15 mrem with an average of 9.1 mrem.

The average radiation exposure for all personnel as measured by film badges for the month of November 1969 was 134.0 mrem.



SAXTON NUCLEAR EXPERIMENTAL CORPORATION

OPERATING STATISTICS

MONTH DECEMBER YEAR 1969

<u>NUCLEAR</u>	<u>UNIT</u>	<u>MCNTH</u>	<u>YEAR</u>	<u>TO DATE</u>
TIMES CRITICAL	NO.	3	364	1,187
HOURS CRITICAL	HRS.	453.26	671.51	23,620.00
TIMES SCRAMMED (MANUAL)	NO.	2	118	567
* TIMES SCRAMMED (INADVERTANT)	NO.	0	4	46
THERMAL POWER GENERATION	MWH	7,379.88	7,379.88	436,457.41
AVERAGE BURNUP	MWD/MTF	437.70	437.70	10,396.90
Pu Loose Lattice Region	MWD/MTF	1,394.80	1,394.80	18,343.80
U Load Follow Region	MWD/MTF	833.93	833.93	833.93
U Peripheral Region	MWD/MTF	180.07	180.07	9,561.20

CONTROL ROD POSITIONS AT END OF MONTH AT EQUILIBRIUM POWER OF 18.5 MWt  
 MAIN COOLANT BORON 730 PPM

RODS OUT - INCHES

NO. 1 <u>40</u>	NO. 2 <u>13</u>	NO. 3 <u>40</u>
NO. 4 <u>40</u>	NO. 5 <u>40</u>	NO. 6 <u>40</u>

ELECTRICAL

GROSS GENERATION	MWH	1,006	1,006	74,535.3
STATION SERVICE	MWH	350.93	2,127.20	17,300.60
STATION SERVICE	%	34.88	11.45	23.21
AVG. PLANT EFFICIENCY - MWH(e)/MWH(t)	%	13.63	13.63	17.08
AVG. GENERATION RUNNING ( <u>451.05</u> HRS)	KW	2,230.35	2,230.35	3,500.93
PLANT LOAD FACTOR - (AVG. GEN. FOR MONTH/MAX. LOAD)	%	45.67	3.88	17.49

AUXILIARY STEAM SUPPLY - NUCLEAR

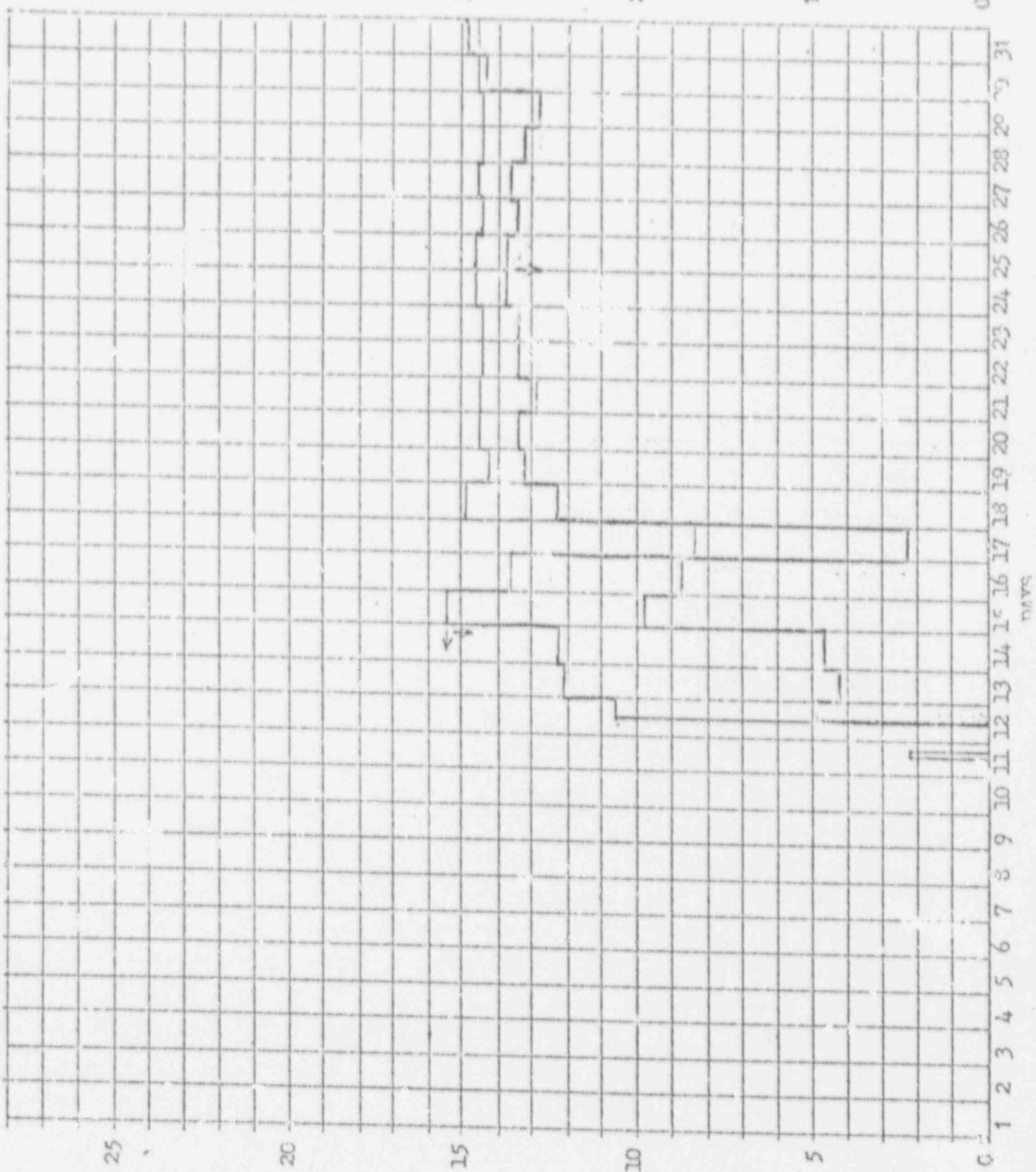
STEAM SUPPLIED BY REACTOR	HRS.	433.3	433.3	19,693.04
RWDF EVAPORATOR OPERATION	HRS.	186.95	2,179.63	9,594.49

\* REMARKS: Correct the November 1969 Operating Statistics report as indicated below:  
Change "Average Burnup" under the "To Date" column to read 9,959.2.  
Delete the first sentence under "Remarks" and insert "The Core III BOL Burnup is listed  
opposite "Average Burnup" under the "To Date" column."

# SAXTON NUCLEAR EXPERIMENTAL CORPORATION

DAILY AVERAGE POWER LEVEL FOR DECEMBER, 1969

--- INTERMITTENT OPERATION      --- CONTINUOUS OPERATION



— AVERAGE REACTOR POWER, MI (UPPER CURVE)

— AVERAGE ELECTRICAL POWER (GROSS) - MI (LOWER CURVE)