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**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

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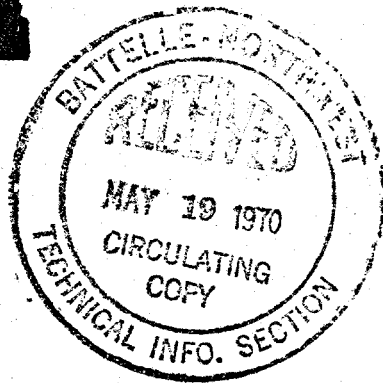
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DOUGLAS UNITED NUCLEAR MONTHLY REPORT

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This document consists
of 46 pages.

May 18, 1970

DOUGLAS UNITED NUCLEAR

MONTHLY REPORT

April 1970

DOUGLAS UNITED NUCLEAR, INC.
Richland, Washington

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By Authority of CG-NMP-1

DS Lewis, 8-25-94

By Terri Mally, 11-22-94

Verified By S. Blusta, 12-20-94

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1-6. W. Devine, Jr.

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Division of ProductionAEC - SAVANNAH RIVER

10. N. Stetson

DU PONT - SAVANNAH RIVER

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SUMMARY

REACTOR PLANT OPERATIONS

Production Statistics

	<u>KE</u>	<u>N</u>
Input Production - Pu (KMWD)	97.1	80.8
Time Operated Efficiency - %	82.9	72.7
Steam Availability to WPPSS - %	-	71.2

K Reactors

KE Reactor operation was uninterrupted except for one scheduled charge-discharge and maintenance outage. Power level was restricted by the 4000 MW administrative limit associated with inlet piping brittle fracture considerations.

Deactivation work at the KW Reactor building is 98 percent complete. 165-KW boiler operation was discontinued when other provisions for KE coolant backup were made.

N Reactor

Equilibrium reactor operation was at 4000 MW, the maximum authorized power level. Following the March charge-discharge, this level enabled the main steam header pressure to be maintained at 127 psig, permitting WPPSS to generate at slightly more than 800 MWe.

There were five outages in April, one as scheduled for refueling and maintenance, and four unscheduled. The latter were necessitated by a fuel failure, a flow monitor sensing line failure, and high primary coolant makeup rates on two occasions.

Steam generator retubing in Cell 1 continued on schedule.

FUEL AND TARGET FABRICATION

Production Statistics (tons)

	<u>For KE</u>	<u>For N</u>
Billets Extruded	-	31.1
Finished Fuel Produced	339.4	12.4

KE Fuel

AlSi canning continued on the basis of day-shift operation, 5 days/week, with four lines for four days, three lines for nine days, and two lines for nine days.

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Due to a shift in production emphasis, coextrusion input was considerably more than forecasted.

TECHNICAL ACTIVITIESK Reactors

Refinements in riser-break calculational methods were completed which largely eliminate the hand calculation and input steps previously required in the development of tube power limits.

Analysis of NpO₂-graphite wafers irradiated to determine the cause of the excessive longitudinal growth observed in previous tests indicates that the growth resulted from a combination of irradiation and fission product damage to the graphite matrix.

Results from ex-reactor flow tests indicate that, from the thermal-hydraulic standpoint, it will be feasible to use the hollow-shell neptunium target concept.

Completed thermal-hydraulic studies of the feasibility of fringe and central zone loading of B and C Reactor type fuels in KE Reactor indicate that three types of charges could be utilized that would be compatible with current tube power limits.

Engineering was completed in support of a project to assure compliance with Federal regulations applicable to smoke emissions from fossil-fueled boilers operated by DUN in the 100-K, 100-N, and 300 Areas. A prototype smoke density monitor performed satisfactorily in tests at 165-KW.

Tests on the replacement charcoal filters being installed in the reactor confinement systems at KE and N show iodine adsorption efficiencies of 99.9+ percent, vs. the 95 percent minimum required by applicable standards.

Engineering work related to KW plant deactivation is essentially completed.

Effective May 1, the C Basin Examination Facility will be placed in standby for emergency use only.

N Reactor

Data from the high U-236 test, as received from BNW and anticipated shortly from ARHCO, are expected to provide U-236 and Np-237 effective cross section information and also plutonium buildup and quality data in support of conversion table normalization objectives.

Reliability analysis of the rupture detection and diversion function indicates there is about a 98 percent chance yearly that some primary loop contamination will result from a minor fretter-type fuel element failure. The probability

of contamination from an end cap or other end-associated failure is about the same, but the degree of contamination probably would be about four times greater.

Further reliability analysis of the flow monitoring system revealed additional failure paths. However, all such paths considered require at least two component failures to adversely affect the primary safety function of the system.

The high pressure injection system design criteria have been completed and are being reviewed. A comparative reliability analysis of the existing system and the proposed modified system has been started.

The limit stop settings of the CV-2 check valves in the safety flow control legs of N Reactor have been readjusted, and a Production Test has been conducted to establish the limit for normal injection makeup rate that would satisfy criteria for independence of the emergency cooling system from the primary cooling system.

Graphite distortion measurements and inspection showed that three of the five ball channels inspected had liner separations large enough to leak balls into the stack. The side-to-side traverse channel in layer 57 has increased from 2 to about 3-1/2 inches in width. Process tubes 1657 and 2556 have maximum subsidences of 0.700 and 1.366 inches, respectively. A neutron flux traverse in the vicinity of ball channel 49 is planned to determine the configuration of balls now in the stack as a possible aid to their removal. The reactivity effect of using Inconel ball channel inserts to minimize ball leakage would be about 0.3 mk for the full reactor.

Design criteria have been developed to cover needed modifications to the heating, ventilating, and air conditioning systems at 105-N and 109-N.

IRRADIATION SERVICES

In the work being performed for Argonne National Laboratory, two capsules, each containing 8 pounds of iodine, were charged into the Snout Facility at KE Reactor. Each of these capsules is expected to yield about 1500 ml of Xe-128.

GENERAL

Extensive emphasis in April was placed on preparation of the FY-1971 and FY-1972 budgets. These budgets were submitted to AEC-RL by established due dates.

The annual review of DUN's Vital Records Listing was completed. Twenty-nine new or revised manuals and procedures were added, and five items were deleted. An updated listing was prepared and forwarded to AEC-RL.

A Company-wide paper cleanout campaign is scheduled for May 1 through June 5. The goal is to reduce office records holdings by 20 percent from the amount shown on the 1969 report.

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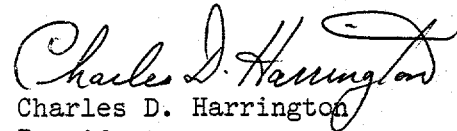
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Work continued on the AEC-wide audit of equipment. DUN and AEC auditors completed scheduled reviews, and the required statistical data were assembled. Reviews of movable equipment for standby facilities are made continually, and excessing and other activities to reduce equipment holdings are being accomplished as fast as available manpower allows.

For the calendar year to date, 58 voluntary layoffs have been granted, twenty employees have terminated for other reasons (i.e., quits, deaths, etc.), and 169 employees have been laid off, bringing total separations to 247. The Company's force at month end was 1,439.

Company efforts on behalf of employees in layoff status have resulted in 49 placements with other employers. Twenty-six of these placements were with other Hanford contractors.

There were no disabling injuries in April, and no radiation exposures exceeded operational control.


Charles D. Harrington
President

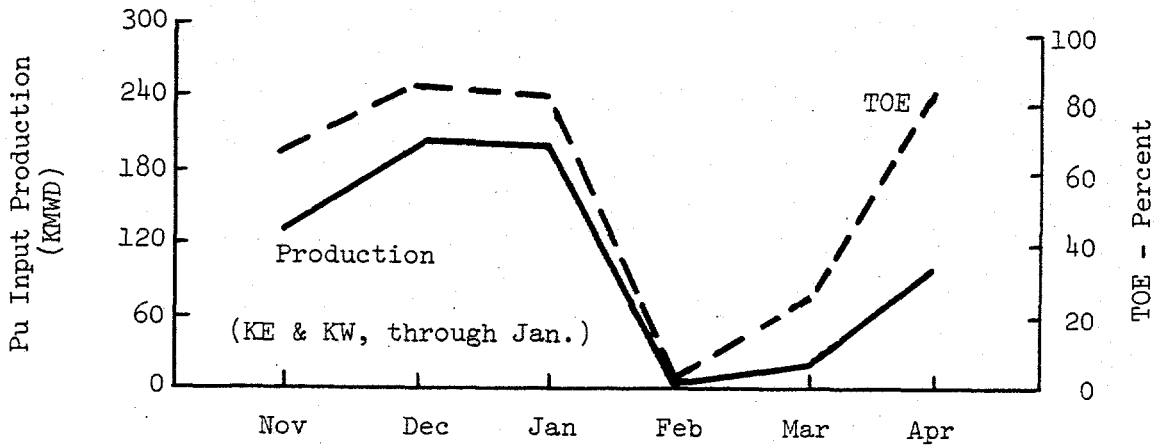
REACTOR PLANT OPERATIONS - KE

PRODUCTION

General

Production (largely weapons grade Pu), power levels, efficiencies and related statistics for the KE Reactor are tabulated below.

K reactor input production and time operated efficiency (TOE) for the past six months are shown on the following chart:



Statistical Summary

Input Production - Pu (KMWD)	97.1
- U-233 (Equiv. MWD)	1,856
Power Level (MW) - Maximum	4,000
- Average	3,903
Time Operated Efficiency - %	82.9
Number of Outages	1
Number of Startup Interruptions	0
Operating Coolant Flow - 1000 gpm	200.2
Fuel Charge (Tons) - 94 Metal	86.7
- Natural U	350.0
Fuel Element Failures	0
Helium Losses - 1000 cu.ft.	119.7

OPERATING EXPERIENCE

Reactor Loading

The front face map showing the loading in KE is reproduced on page B-5. The tonnages listed are approximate; actual fuel charge totals are tabulated above.

Power Level

The power level at KE Reactor was restricted by the 4000 MW administrative limit associated with inlet piping brittle fracture considerations.

Reactor Outages

<u>Date Down</u>	<u>Outage Hours</u>	<u>Remarks</u>
April 4	123.0	Scheduled charge-discharge and miscellaneous maintenance.

EQUIPMENT EXPERIENCE

Vertical & Horizontal Rods

All HCRs are fully serviceable except No. 4, which is in use but has been removed from the scram circuit. The rod binds at 10 and 50 percent insertion and will be replaced with a flat cooled rod.

All VSRs are serviceable with the average hot drop time well within Process Standards.

Resistance Temperature Detectors (RTDs)

Fifty-nine RTDs have failed since the rear face piping was decontaminated in February. It was originally estimated that 200 RTD failures would be experienced as the result of that decontamination. It now appears that the number of failures will be much lower than expected.

Ball 3X Sensing Lines

Design Change 1297, "Ball-3X Sample Line Fitting Revisions", has been completed. It provides an improved riser take-off connection to minimize line plugging due to corrosion. Also, the new fittings are designed to facilitate the removal of corrosion buildup should this occur in the future; the originals made no provision for maintenance without dismantling the line. Tests indicate a marked improvement in flow.

Power Rate Meter

The original "stop gap" power rate-of-rise instrument was replaced at KE Reactor with a newer instrument from the deactivated B Reactor. This change

(authorized by Design Change 1298) provides a more reliable and stable rate monitor, the original instrument having been dependent upon the integrity of each of the sensors whereas the newer instrument can tolerate the loss of any sensor. Also, it has provisions for quickly locating a faulty sensor.

Gas System Control

Planned revisions to the gas makeup instruments and control system have been completed per Design Change 1226. They provide centralized control of the pressure and composition of the reactor gas atmosphere, and are expected to reduce gas losses and minimize air intake.

Deactivation - KW Plant

The No. 2 boiler at 165-KW was shut down on April 10, following the installation of portable back-up diesel pumps at the KE filter plant.

Installation of the permanent piping intertie from the 183-KE sedimentation basins to the filtered water clearwells is approximately 70 percent complete, with completion and testing scheduled for May 15.

Deactivation work at the reactor building is 98 percent complete.

Trench and Crib - K Area

The isolation work on the K trench has been completed. One section of the trench was covered with wire to preclude water fowl access, and a dam between two sections was covered with clay to prevent seepage. Routine patrol has been discontinued at the trench and the propane guns were relocated to the crib site and the 107-KW effluent tanks.

PROCESS ASSISTANCE AND CONTROL

Operational Physics

Flux traverses taken after the outage showed peak-to-average flux ratios of approximately 1.92. These peak-to-average ratios occurred in those portions of the reactor covered by both the tip of an outboard full rod and the rear of an outboard half-rod. This flux peaking can be minimized by the use of full and/or half-splines; it should present no significant operational problems and no nuclear safety problems.

Flattening efficiency has progressively increased since the April 10 startup. The high ECTs have required continual monitoring of those tubes used to calculate ECT to assure that an ECT of 2300 is not exceeded (basis: inlet piping brittle fracture considerations).

Some operational physics parameters of interest are shown in the following table:

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Effective Central Tubes*	2225
Flattening Efficiency** - April	0.718
- 12-Month Average	0.724
Maximum Operating Time Permitting Scram Recovery - Hours***	10

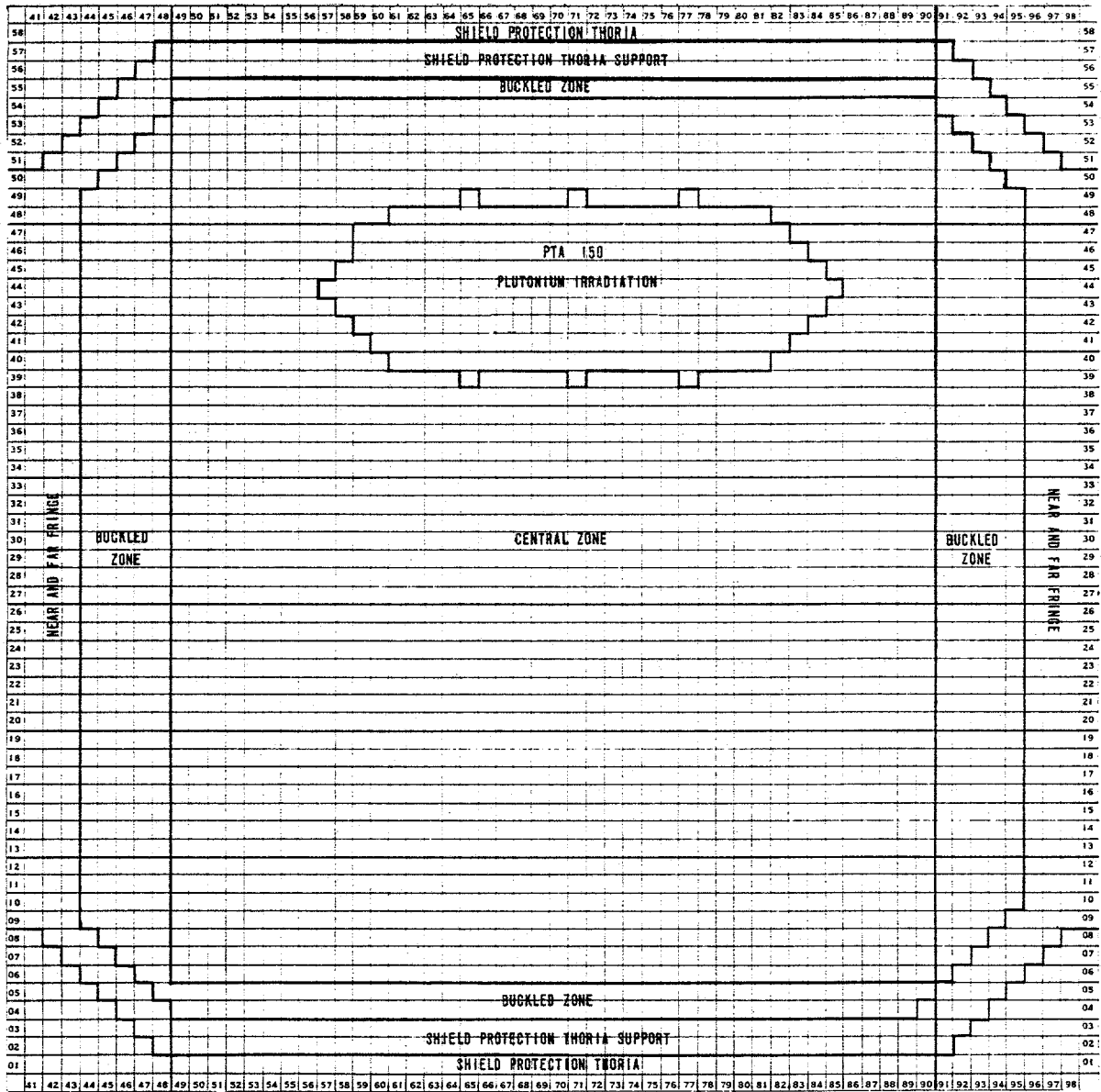
*Reactor power level divided by the average power of the ten most productive tubes which are representative of the reactor loading.

**ECT divided by the number of power generating tubes.

***The maximum operating time subsequent to a cold startup following which a scram recovery could be made using the currently approved startup procedure.

Recertification Lectures

Preparation of lecture material on reactor physics fundamentals was completed, and twice-weekly sessions were presented during the month to operational personnel. Presentation of makeup sessions will complete the current refresher series.



<u>Zone</u>	<u>Tons</u>	<u>Material</u>
Central	219 65	Natural Uranium 94 Metal
Buckled	82	Natural Uranium
Near and Far Fringe	48	Natural Uranium
Shield Protection	23 6	94 Metal (Thoria Support) Thoria

Loading Pattern - KE Reactor

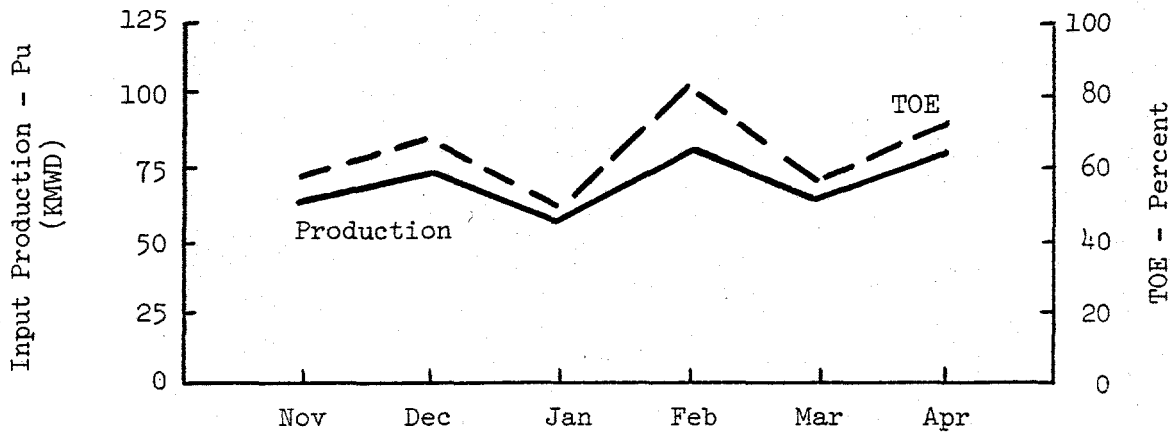
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REACTOR PLANT OPERATIONS - N

PRODUCTION

General

Reactor production (largely fuel grade Pu), power level, and related statistics are tabulated below. Input production and time operated efficiency (TOE) for the past six months are shown on the following chart:



Statistical Summary

Input Production - Pu (KMWD)	80.77
Electrical Generation (KMWH) - WPPSS	395.88
- 184-N	<u>6.54</u>
Total	402.42
Power Level (MW) - Maximum	4,000
- Average	3,709
Time Operated Efficiency - %	72.7
Steam Availability - %	71.2
Number of Shutdowns - Scheduled	1
- Unscheduled	4
Fuel Failures	1

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Fuel Charge (Tons) - 94 Metal	327.19
- 125 Metal	65.28
- Natural U	<u>0.37</u>
Total	392.84
Helium Losses - 1000 cu.ft.	452.51
Fuel Oil Usage - bbl.	19,608

OPERATING EXPERIENCE

Reactor Loading

The reactor loading at month end is shown on page BN-6. One hundred three (103) fuel columns were charge-discharged during the scheduled outage that started on April 26.

Reactor Power Level

The maximum authorized power level of 4000 MW was maintained during equilibrium reactor operation. This level enabled the main steam header pressure to be maintained at 127 psig, thus permitting an electrical generation by WPPSS of slightly more than 800 MWe.

Reactor Outages

A summary of the April outages is tabulated below:

<u>Date Down</u>	<u>Outage Hours</u>	<u>Cause</u>
April 3	31.5	Manual shutdown because of fuel failure in tube 2349.
April 4	7.2	Automatic scram from flow monitor due to failure of sensing line fitting.
April 9	29.8	Manual shutdown due to high primary coolant make-up rate.
April 10	27.9	Manual shutdown due to high primary coolant make-up rate.
April 26	100.0	Scheduled shutdown for charge-discharge and maintenance.

EQUIPMENT EXPERIENCE

Primary Loop

The primary loop leak rate was about 480 gpm at the beginning of the month.

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Leak repairs during the unscheduled outages reduced the rate to about 340 gpm. However, by the April 26 shutdown the leakage had increased to about 500 gpm.

Twenty-eight V-11 valves were repacked in the leak repair effort. In addition, repairs were made on six primary loop valves and three leaks in flow monitor sensing lines.

Replacement of the stainless steel flow monitor sensing lines with Inconel in tube column 64 was completed during the scheduled outage. A 1640 psig leak test was successfully completed on the newly installed lines.

Cell 1 retubing work continued on schedule. The steam generator head of unit 1A was being welded in place at month end.

Boiler Experience

The CE-1 boiler was given an internal inspection by Combustion Engineering on April 1. Firebrick replacement and repair will be needed in the near future.

The FW boiler flamed-out on April 15 while lighting a burner; restart was made within three minutes. This boiler was removed from service on April 21, due to leaking tubes. Tube 14, in row two, was plugged as it had reached the failure point as a result of thinning due to fire-side effects. Leaking plugs in tubes 13 and 14 of row three were replaced. The FW boiler was again removed from service on April 30 due to leaking tubes.

Emergency Raw Water Cooling System

During the April 3 outage, the left-side CV-2 valves were readjusted and retested. These valves are located in the safety flow control piping that connects the primary loop risers with the emergency raw water cooling system piping. They serve a dual purpose by (1) allowing entry of the emergency water supply when appropriate, and (2) limiting backflow to the flush header. Based upon results of the test, the primary loop high pressure injection flow was set at 1600 gpm with the reactor operating at 4000 MW. The normal injection flow rate limit of 1800 gpm is applicable at reactor power levels of 3600 MW or less. (See also pages DN-4, -5, -6.)

The emergency cooling line orifice plate was removed and the pipe inspected for cleanliness. There were no indications of foreign material in the line.

Ball Safety System

During scheduled functional testing of ball safety system hoppers, one hopper failed the test. It was an "unreworked" hopper, the second one to fail since January 1969. As a result of this hopper failure, additional unreworked hoppers that would soon be due for an annual test were tested. These hoppers tested satisfactorily; all were reworked, retested, and returned to service.

Circulating Raw Water System

The class "A" overhaul has been completed on Number 4 CRW pump. The bowl splitter was missing so the pump unit was removed from the pump well. A diver

located the splitter on the floor of the pump bay and it was recovered without difficulty. The pump motor has been returned from the General Electric service shops.

Graphite Stack

Four ball system channels were inspected for damage and graphite separation. The liners in channels 48 and 57 had significant separations; channels 46 and 52 were intact. (See also page DN-2.)

Oil Barge Unloading Line

The oil barge unloading line at the river bank was removed. All oil is being received in tank trucks, and the barge line had potential for oil leakage.

Equipment Modifications

The following equipment modifications were completed:

EMP-220, "Simplification of IWV-253 Valve Control System", provided for removal of excess equipment from the pneumatic control of this valve.

EMP-294, "C-D Elevator Air Samplers", provided for the completion of work on C and D elevator air samplers.

PROCESS ASSISTANCE AND CONTROL

Operational Physics

The equilibrium reactivity status during April was slightly less than predicted from TRUE-K adjusted for residual ball effects. The long-term reactivity trend continued to be downward at the end of the operating run.

Axial flux traverses from TWFM data continued to show the major part of the flux depression vertically near the reactor center due to residual balls in the graphite stack. The full-pile reactivity effect of these balls has been estimated to be 2 milli-k utilizing the TWFM data. The CLUMSY code was used to determine the axial local reactivities based on the flux profile. The code calculates the local reactivities to come up with a just-critical condition. It was therefore necessary only to weigh the local reactivities where the flux was dished to determine the reactivity difference from the unperturbed case. The effective control area side-to-side was determined from the side-to-side calibration curve of No. 55 rod over the distance that the rod worth was nearly constant.

Some operational physics parameters of interest are shown in the following table:

Effective Central Tubes*	810
Flattening Efficiency* - April	0.81
- 12-Month Average	0.80

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Maximum Operating Time Permitting
Scram Recovery - Hours*

24

*For definitions see page B-5.

Production Fuel Performance

The fuel failure on April 3 (serial No. 56) was a Mark IV element which had been charged on March 17. The cause of failure was clad penetration on the inner surface of the outer element at the locking clip. Preliminary evidence indicates the failure mechanism to have been wire fretting.

	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74				
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21						E	E	X	X	X	G	G	G	F	F	F	F	F	F	F	F	F	F	G	G	F	G	G	F	G	X	X	X	E	E	E	21	
20						E	E	X	X	X	G	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	X	X	X	E	E	E	20		
19						E	E	X	X	X	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	X	X	X	E	E	E	19		
18						E	E	94	X	X	G	F	G	G	F	G	G	F	G	F	F	G	G	G	G	G	G	G	F	G	X	X	X	E	E	E	18	
17						E	E	X	X	X	F	F	G	G	01	F	G	F	F	G	F	F	G	F	F	G	01	G	F	G	X	X	X	E	E	E	17	
16						E	E	X	X	X	G	G	N	F	G	G	F	F	F	G	G	F	F	F	F	F	G	F	G	X	X	X	E	E	E	16		
15						E	E	X	X	X	G	G	G	G	F	G	G	G	G	G	F	G	G	G	F	G	G	G	G	X	X	X	E	E	E	15		
14						E	E	94	X	X	G	G	G	G	F	F	F	G	G	G	G	G	F	G	G	01	G	G	01	G	F	G	X	X	X	E	E	14
13						E	E	X	X	X	G	F	G	G	F	F	G	F	G	F	G	F	G	F	F	F	F	F	X	X	X	E	E	E	13			
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11						E	E	X	X	X	G	F	F	F	F	F	F	F	F	F	F	F	G	G	F	G	F	F	G	X	X	X	E	E	E	11		
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09						E	E	X	X	X	G	F	F	G	G	G	F	G	G	G	F	F	F	G	G	G	G	F	G	X	X	X	E	E	E	09		
08						E	E	E	X	X	X	F	F	G	G	G	G	G	G	G	F	G	G	G	G	G	G	F	G	X	X	X	E	E	E	08		
07						E	E	E	X	X	X	X	G	G	G	G	G	F	G	G	G	F	G	G	G	G	G	F	X	94	X	X	E	E	E	07		
06						E	E	E	X	X	X	X	G	G	G	G	G	G	F	G	G	G	G	G	F	F	X	X	X	X	E	E	E	E	E	06		
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	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74				

Fuel Code	No. Tubes	Description	PT-NR No.	No. Tubes	Description
E	224	Mk-IC (94 Metal - Fringe)	94*	8	Mk-IV Demonstration
F	202	Mk-IV (94 Metal - High U-236)	01	6	Mk-I & Mk-IV from
G	331	Mk-IV (94 Metal - Central)			Direct-Cast Billets
N	1	Mk-IB (Natural U)	■	1	Graphite Samples
X	231	Mk-IA & Mk-IV (125 & 94 Metal)			Channel
	989	Total		15	Total PTs
	15	Total PTs			
	1004	Grand Total			

*Includes Mk-IV high U-236 content fuel and 6 tubes with Mk-Mk-IV-AA 125 Metal and Mk-IV 94 Metal.

Loading Pattern - N Reactor

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FUEL AND TARGET FABRICATION - KE REACTOR

PRODUCTION

General

Production of AlSi-bonded fuel for KE Reactor was 100.1 percent of forecast. Canning operations were conducted for four days on four lines, nine days on three lines, and nine days on two lines. Seventy-two percent of the elements produced had self-supports attached.

Acceptable Fuel Elements Produced

Tons	339.4
Yields: Current Month	95.6%
FY to Date	95.7%

Month-End Inventories - Tons

Bare Uranium Cores	599*
Finished Fuel: AlSi-Bonded	1,705*
Hot-Die-Sized	19
Thoria Elements	14

*These totals include 101 tons of bare cores and 110 tons of finished fuel in sizes used in the smaller reactors. In addition, 12 tons of material of this type was in process at month end.

OPERATING EXPERIENCE

Canning efficiency of the AlSi-bonding lines was 98.4 percent. Downtime was assigned 69 percent to equipment malfunctions and 31 percent to operations.

EQUIPMENT EXPERIENCE

Nothing significant to report.

PROCESS ASSISTANCE AND CONTROL

Flow turbulence caused by the current 50-mil stock K5 self-support resulted in several fuel element irradiation failures during the summer of 1969 due to accelerated cladding erosion-corrosion in the support vicinity. Redesign increased the support length by 1/8 inch, reduced the support tab thickness by 20 mils, and streamlined the frontal configuration. Production quantities (200,000 K5E

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and 500,000 K5N) are on order and scheduled for delivery the early part of May.

The new support is scheduled for use on downstream elements to be charged during the June, July, August, and September KE outages. A minimum of 7,500 K5E and 28,000 K5N elements fabricated with the new support design will provide sufficient fuel for the downstream ten positions in K5N columns and fifteen positions in K5E columns.

FUEL AND TARGET FABRICATION - N REACTOR

PRODUCTION

Input Production

Total billets extruded	191
Tons extruded	31.1
Percent of forecast	311.0

Output Production

Total finished fuel assemblies	515
Tons output	12.4
Percent of forecast	103.3

Uranium Utilization - % 83.2

Month-End Inventories - Tons

Bare uranium billets	265
Finished fuel	204

OPERATING EXPERIENCE

Coextrusion input production was considerably higher than forecast (and AlSi production somewhat lower) due to a significant shift in production emphasis. This shift in emphasis was necessary to accommodate a reduced AlSi core supply from NLO, and to provide greater flexibility in responding to potential end-of-year budgetary variables.

EQUIPMENT EXPERIENCE

Nothing significant to report.

PROCESS ASSISTANCE AND CONTROL

Under normal operation, following coextrusion and tube sectioning, the copper-silicon lubricant (which was the extrusion can) adhering to the Zircaloy cladding is removed by pickling in a nitric acid solution. This process has worked well; however, a large quantity of acid is consumed, and undesirable gases are evolved, since each outer coextrusion must be stripped of about 12 pounds of copper-silicon and each inner coextrusion of about 8 pounds.

Recent emphasis on pollution control of both gas and liquid wastes has generated interest in cleaner copper stripping methods. One method that has shown promise

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for copper removal is electrostripping in a sulfuric acid-copper sulfate electrolytic cell. The basic components of the cell are a cathode (usually a copper tube), an anode (the copper-clad fuel piece), the electrolyte (sulfuric acid-copper sulfate bath), and a DC power source. Work reported in the fall of 1969 showed that optimum bath operating conditions were achieved with bath concentrations of 0.21 lb/gal copper sulfate and 0.42 lb/gal sulfuric acid, a pH of about 0.6, an anode-to-cathode spacing of about one inch, and a bath temperature of 68-73 C.

Recent work has been performed using these parameters to copper strip as-sawed 26-inch fuel pieces successfully at current densities ranging from 75 to 180 amps/ft². Work thus far indicates that higher current densities provide faster copper removal from the fuel tube (~1-1/2 hours) with lower current efficiency, whereas lower current densities require longer stripping times (~3-1/2 hours) with higher current efficiencies. A longer electrolytic cell is being fabricated to provide capability for stripping 1- to 2-inch OD copper-clad tubing in lengths up to 20 feet.

TECHNICAL ACTIVITIES - KE REACTORRESEARCH AND DEVELOPMENTBasic ProductionK Limit Calculations

Refinements in riser-break calculational methods, which permit automation of the CLUMSY input data from internal computer code iterations, have been completed and essentially debugged. These refinements largely eliminate the hand calculation and input steps previously required to iterate between thermal hydraulics and kinetics code application in the development of tube power limits.

Water Hammer Study

The K reactor water hammer study which centered around the 24-inch check valve closure has been completed. The results were incorporated into the planning of the KE proof test that was completed in March.

The flow transient analysis of the KE Reactor coolant supply system has been expanded to include the crossheaders and process tubes and the actuation of the 5-inch check valves located in the crossheaders.

Fuel Examination

Examination of 28 columns of PT-181 fuel (11-inch HDS), six columns of fuel from PT-158 (through-reactor decontamination), and crack testing of fuel from PT-093 (depleted-depleted) has been completed. Currently, fuel from PT-011 (HDS and ALSi fuel performance monitoring) is being examined while awaiting shipment of the final four columns of fuel from PT-158.

As previously reported, the C Basin Examination Facility will be placed in standby status effective May 1. Except for emergencies when the KE Technical Viewing Pit cannot be utilized, no further operation of C Basin equipment is planned.

Through-Reactor Decontamination

Preliminary data from the analyses of water samples and downstream spacers to evaluate the through-reactor decontamination test (PTA-158, Supplement B) performed at the KE Reactor in February included the following:

- Samples of effluent water were taken from the header decontaminated through-reactor and compared to normal effluent. The water from the decontaminated header contained As-76 and Mn-56 concentrations considerably below those in normal effluent.
- Fuel elements from tubes fed by the decontaminated header were discharged after one operating period and will be examined.

- Analyses of films from downstream spacer elements after through-reactor decontamination showed that mostly Zn-65 with traces of Sc-46, Co-58, and Co-60 remained on spacers from aluminum process tubes, and that mostly ZrNb-95 with traces of Sc-46 and Zn-56 remained on spacers from Zircaloy process tubes. Dose rates on the spacers were 1-2 mR/hr.
- Gross gamma counting of samples of well water, for evaluation of the suitability of the crib for the disposal of waste decontamination solutions, has not shown any increase in activity.

Rear-Face Dose Rate Study

Measurements of relative radioisotopic activities were obtained on a KE Reactor rear-face nozzle which verified previous assumptions that Sc-46 now is a major contributor to rear-face dose rates. Relative isotopic concentrations were: Sc-46 (62.1%), Zn-65 (20.6%), Cr-51 (11.7%), Fe-59 (1.9%), Co-60 (1.6%), Co-58 (1.5%), and Eu-152 (0.6%). Because of the highly energetic, double gamma emissions from Sc-46, this one isotope contributes about 75 percent of the total dose rate.

Neutron activation analyses of raw Columbia River water during 1969 did not show any increase in parent scandium in the river; therefore, samples were taken in January from the water treatment plant filter effluent to determine if parent scandium was being added with water treatment chemicals. The analyses showed that parent concentrations were no higher than in untreated river water; thus, there is no simple explanation for the apparent increased buildup of Sc-46 in rear-face piping in recent years. Indications are that either Sc-46 is not being removed in the water treatment process as efficiently as was done several years ago, or the deposition characteristics have changed in-reactor. Since there is no current budget support for research into this area, further investigation is not planned this fiscal year.

Product Flexibility

Ten Kilogram PuAl Irradiation (PTA-150)

Four additional columns of thoria and 21 of 94 Metal within the tailored region surrounding the PuAl columns were replaced with natural uranium. Because of the slightly greater local excess in rods than desirable, the intended 5 to 10 percent increase in PuAl column temperatures did not occur. Loading changes during the May outage are intended to reduce the excess reactivity which must be compensated by control rods in that locale.

Pu-238

Neptunium Irradiations

All of the 30 neptunium elements from PTA-163 have been shipped to BNW for dissolution and product recovery. The targets are to be dissolved in three batches, permitting separate chemical analysis to be performed on

each batch. The three batches consist of the 12 NpAl elements irradiated in the core of KW Reactor, the 12 NpGr elements from the core, and the six NpGr elements irradiated in the fringe.

NpO₂-graphite wafers were irradiated under PTA-194 to determine the cause of the excessive longitudinal growth seen in previous tests. Analysis of these wafers shows the apparent cause of growth to be a combination of irradiation and fission product damage to the graphite matrix. Thermally insulating some of the wafers from the cold cladding caused a marked reduction in the amount of growth.

Ex-reactor flow tests were made on prototype hollow shell (I&E) neptunium targets. Results of the tests, which utilized flows up to twice the expected in-core flowrates, indicated no evidence of vibration or chattering. Thus, from the thermal-hydraulic standpoint, it will be feasible to utilize the hollow shell target concept.

Fabrication of NpO₂-Al Target Elements

The fabrication of sufficient NpO₂-Al thin-annulus pellets has been completed, and 15 of the required 20 target elements have been assembled and tested through radiograph. A high reject rate at closure welding resulted in the loss of seven targets, which required decanning and reprocessing. No unusual problems were encountered in fabricating the graphite core targets, and this target design will be shipped in time for reactor charging in early May.

Oralloy Test

A final version of DUN-6757, "Production Test Draft - K Reactor Oralloy Fuel Irradiation", has been completed. This draft document records the preparations made for the production test prior to its cancellation.

Lithium Splines

Spline samples containing dispersions of Li₂CO₃, LiF, and LiAl alloy in aluminum were irradiated in KE Reactor and discharged in January. Visual examination showed the splines containing the Li salts to be blistered extensively, and those containing LiAl alloy dispersions had swelled due to contact with water at the ends of the samples.

Program results to date indicate that Li-bearing splines may not be a feasible method of producing tritium and no further work is planned.

Environmental and Regulatory Technology

Nothing to report.

Waste Management

Nothing to report.

ENGINEERING AND TECHNOLOGY - REACTORUtilization of B and C Reactor Fuel

Thermal-hydraulic studies have been completed to determine the feasibility of fringe and central zone loading of B and C Reactor type fuels in KE Reactor. Results of the studies indicated that three types of charges could be utilized that would be compatible with the tube power limits currently in application; namely:

1. Full-length (35-element) C2N columns charged into central zone aluminum tubes.
2. Mixed C2N - K4N columns charged into central zone aluminum tubes.
3. Mixed O3N - K4N columns (up to twelve O3N elements in upstream position) in the outer three lattice units.

The tube power limits developed for the standard 35-element K4N column may be applied to the columns (1 and 2, above) loaded in the central zone. The third type of charge would be in a region of the reactor in which other factors than tube power limits will determine outlet temperature limits. For practical purposes, operating conditions for the central zone-loaded columns would be identical with those for full-length, 35-element K4N charges. Mixed O3N and K4N charges in the fringe zone may be treated as full-length K4N charges provided that an O3W mixer element separates the two segments.

Smoke Density Monitor Installation

The policy of the Federal Government concerning air pollution has been established by Executive Order 11282, "Prevention, Control, and Abatement of Air Pollution by Federal Activities", and Title 42, Code of Federal Regulations, Part 76, "Prevention, Control, and Abatement of Air Pollution from Federal Government Activities: Performance Standards and Techniques of Measurement". To implement EO 11282 and Title 42, CFR 76, Immediate Action Directive 0510-13 was issued to establish procedures and requirements for the prevention, control, and abatement of air pollution from AEC facilities. Compliance with the regulations is required by June 30, 1972.

The regulations require that smoke emissions from fossil-fired facilities be limited in density, and that the particulate content of such emissions be limited in size and quantity.

Engineering in support of a project to assure compliance with the above requirements has been completed. Prototype equipment designed to continuously monitor smoke density of stack emissions was procured and installed on a boiler in 165-KW Building and tested. The results of the test were satisfactory. Related design criteria have been developed and approved for submittal to AEC-RL.

The equipment proposed for installation would consist of commercially available photoelectric type monitoring equipment with associated amplification,

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indicating, and recording equipment. It would be installed on the three oil-fired boilers in 165-KE, the three oil-fired boilers in 184-N, and on one oil-fired and four coal-fired boilers in 300 Area.

As regards the limitation required by the regulations on particulate size and quantity in stack emissions, it has been concluded that the DUN-operated oil-fired boilers are presently operating in accordance with the regulations. Therefore, it is expected that periodic tests of stack emissions will be adequate to assure continued compliance. Preliminary tests of the coal-fired boilers in the 300 Area, however, indicate that the quantity of particulate matter in the stack emissions from these boilers may at certain loads be unacceptable. Further testing will be performed before corrective action is recommended.

Confinement Charcoal Filter Replacement

Activated charcoal filters are utilized in the reactor confinement systems to trap the halogen fission products that would be released to the reactor building exhaust air system during an accident. The present filters have been in continuous service for approximately six years at KE Reactor and five years at N Reactor. In 1968, inspection and testing revealed that the effectiveness of the charcoal filters at C, KE, and KW Reactors was rapidly deteriorating as a result of (1) severe corrosion of the metal containers, (2) loss of charcoal from the containers due to abrasion of the charcoal particles by the exhaust air passing through the filters, and (3) reduction of the charcoal's adsorption efficiency for iodine. In view of the questionable remaining service life of the existing charcoal filters, replacement charcoal filters were procured and are being installed.

To comply with AEC Nuclear Safety Criteria, Process Standards have established 95 percent iodine removal as a minimum requirement for the confinement system charcoal filter banks. The replacement filters have been tested at the vendor's plant, on receipt at Hanford (a statistical sample), and after installation in the filter cells to assure that the required efficiency is maintained. The filters were tested individually and the units exhibited an iodine adsorption efficiency of greater than 99.99 percent. In-place tests, performed to determine the overall filter bank efficiency to assure proper gasketing in the filter frames, have indicated an in-place efficiency of 99.9 percent for those filter calls equipped with the replacement filters.

Facilities have been provided at both KE and N Reactors to permit in-place testing of the filter banks with radioiodine to assure continued compliance with Nuclear Safety requirements.

KE Emergency Water Backup

The engineering work involved in meeting KE emergency water backup requirements was completed permitting shutdown of the 165-KW boiler facilities. Chiefly the arrangement entailed design changes that provided a gravity intertie between the sedimentation basins and the clearwells to permit utilization of the total in-place water inventory. Further potential backup was provided by arrangements for using the Benton-Midway 115-KV line to secure power in event of an emergency requiring water beyond the "in place" inventory.

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Project Engineering

The status of construction projects relating to K Plant facilities is summarized in Appendix A. As formalized, the impact of the KW shutdown on these projects will be covered by appropriate entries in this Appendix.

ENGINEERING AND TECHNOLOGY - FUELS AND TARGETS

Nothing significant to report.

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TECHNICAL ACTIVITIES - N REACTOR

RESEARCH AND DEVELOPMENT

Basic Production

Accountability Analyses

Data from the N Reactor high U-236 test have been received from BNW, and comparable data are expected shortly from ARHCO. In addition to the U-236 and Np-237 effective cross section data sought by the original test, the batch samples will provide plutonium buildup and quality data in support of conversion table normalization objectives.

Computer Code Development

Consultation with BNW on the DUNCAP 3D code derived from FLARE revealed a programming error in a subprogram whose subsequent correction has resulted in flux distribution and calibration behavior more consistent with expectations.

The document providing instructions for use of the GRAPH code was issued as DUN-6778, "GRAPH, A Data Manipulation and Calcomp-Plotting Program."

Rupture Monitoring and Tube Diversion Systems

The rupture detection and diversion (RD&D) function reliability analysis has been completed. This analysis examined the RD&D function from the aspect of its ability to prevent fission products from entering the main coolant loop after a fuel element failure. The system analyzed consisted of the V-12 valves and control circuitry, the gamma energy monitor, the gross gamma monitor, the human operator, and the fuel element failures.

Results show that there is about a 98 percent chance yearly that some loop contamination will result from a minor fretter-type fuel element failure.

The probability of contamination due to end cap or other end-associated failures is about the same. However, the degree of contamination is likely to be approximately four times greater. The probability of a gross disintegration of a fuel element followed by a non-divert condition is considered to be too small to warrant engineering changes to avoid it.

Some of the most critical parts in the system are V-12 valves and associated control lines, human operation of the selector switch on the divert panel, GM tubes, differential alarm module trip mechanism, and facility power.

Flow Monitoring System

Additional reliability analysis of the flow monitoring system has been performed. Although additional failure paths have been found, all failure paths considered require at least two component failures to adversely affect

the primary safety function of the flow monitor system. Additionally, the components of concern have long mean-time-to-failure demonstrated performances.

Fault trees are being constructed to compare the probability of loss of a flow monitor trip signal path due to capacitor shorts in the shorted diode detector circuitry, and the probability of loss of a flow monitor trip signal path due to shorts in the channel logic diode quads.

High Pressure Injection System

The high pressure injection system design criteria have been completed and modified and are being reviewed. A comparative reliability analysis of the existing system versus the proposed modified system has been started.

Several MIMIC simulations were made to determine the effect of a step increase in primary loop leakage occurring simultaneously with a power bus loss. The curves of Figure 1 (on next page) show the maximum drop in pressurizer level as a function of pre-scrum injection rate and the magnitude of the step increases in leakage. These results are the primary bases for the tradeoff between power level and injection makeup limit, as well as the assumption of a linear relationship between primary loop shrinkage and scrams from different power levels.

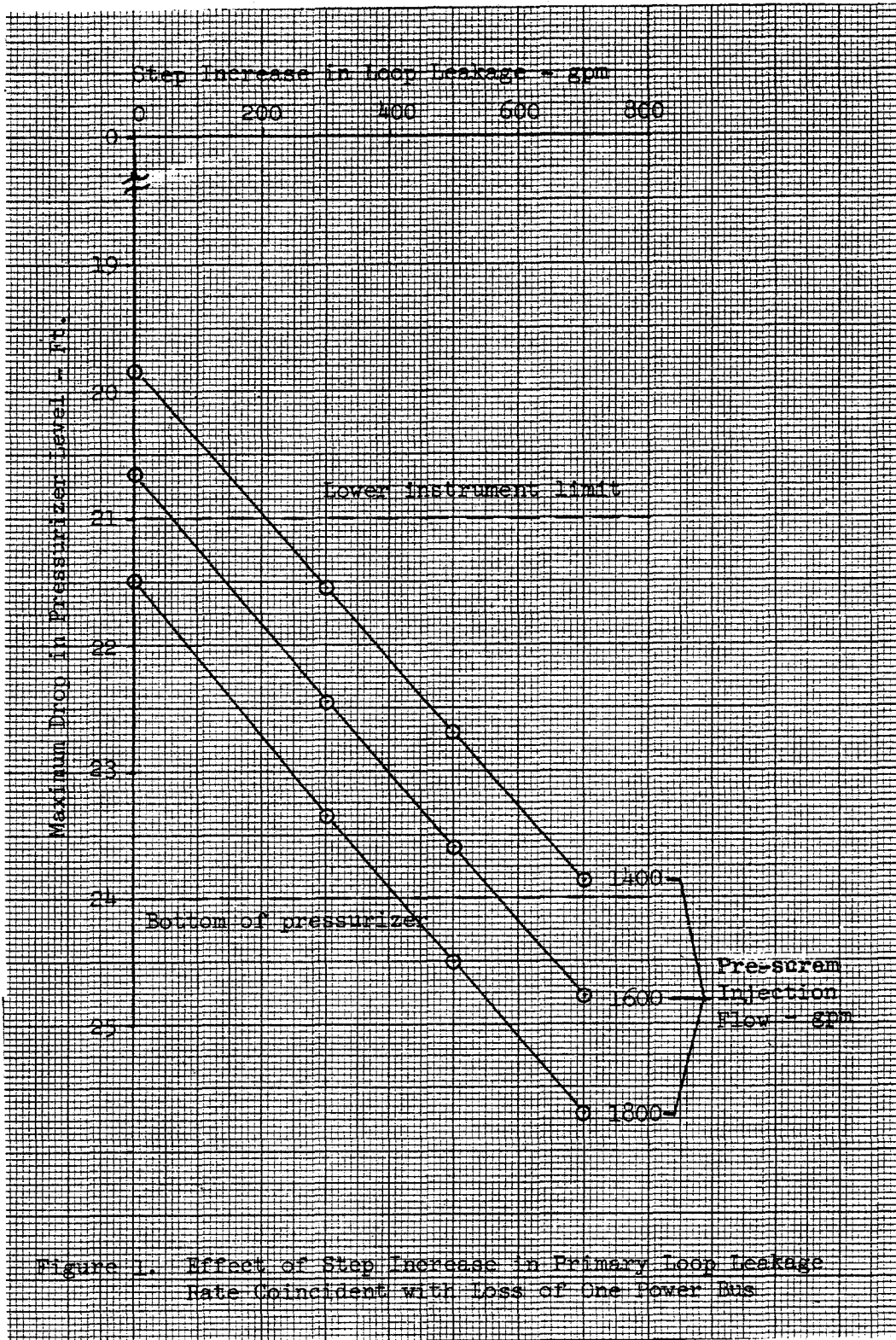
Graphite Distortion

Stack Measurements

Results of the graphite distortion measurements and inspections performed during the March 18-28 outage have been reported in DUN-6875, and included the following:

- Ball channels 47, 51, and 58 have separations between the liner blocks large enough to leak balls; ball channels 14 and 38 do not show any separations. Channels 47 and 51 also exhibit horizontal misalignment greater than 1/2-inch between the second and third liner blocks.
- The side-to-side traverse channel in layer 57 has increased in width from 2 inches to approximately 3-1/2 inches, indicating front-to-rear separation of the stack. This channel contained balls which had apparently leaked from ball channels 47, 48, 49, and 51.
- Process tubes 1657 and 2556 have maximum subsidence of 0.700 and 1.366 inches, respectively.

These data show that the contraction rate at N Reactor is about 50 percent of that of the K Reactors; this was anticipated due to differences in graphite.



Calculated Reactivity Cost of Inconel Inserts for Ball Channels

The reactivity effect of Inconel inserts for the N ball channels, inserted to midway between the first two active columns, has been calculated to be approximately 0.3 mk for the full reactor. The calculation of local strength was made assuming no local flux perturbation, and the relative rod strength versus insertion distance was used to determine the total reactor effect.

Studies Related to Residual 3X Balls

A Production Test for obtaining a neutron flux traverse in the vicinity of ball channel 49 has been drafted. The intent of the test is to determine the configuration of the balls within the stack as a possible aid to their recovery.

Investigation of the possibility of reducing potential for balls leaking into the stack by reducing hopper inventory indicated that this approach is probably not feasible. Mechanisms for ball escape from the channel apparently include ricocheting of falling balls, and this would not be precluded by partial channel filling. Furthermore, current nuclear safety checks on channel operability are based on the hopper being filled to the neck of the fill pipe.

Through-Reactor Decontamination

Examination of the emergency coolant supply line in N Reactor Corridor 5, into which the phosphoric acid is injected for through-reactor decontamination, indicated that barnacle formation was not severe enough to constitute a plugging hazard in the primary piping or fuel elements when the reactor is decontaminated in June. The ECS piping will be given a hot, high velocity flush prior to the decontamination to remove any loose particulate matter.

Product Flexibility

Nothing to report.

Environmental and Regulatory Technology

High Pressure Injection Limits

The DUN Monthly Report for February 1970 discussed investigations of the settings of the limit stops of CV-2 check valves in the safety flow control legs of N Reactor. The limit stop settings of the valves have been readjusted, and Production Test NR-143 has been conducted to establish the limit for normal injection makeup rate that would satisfy criteria for independence of the emergency cooling system from the primary cooling system.

The principal nuclear safety criterion applied is that, in the event of a simultaneous failure of an 8-inch high pressure flush header and A or B electrical bus, the high pressure injection system shall have sufficient

reserve capacity to prevent draining of the pressurizer during the post-scrum transient that would follow the accident. This constraint assures that the postulated accident would not actuate the emergency cooling system which, under such circumstances, would be severely affected.

Compliance with the foregoing criterion requires that the high pressure injection rate under normal operating conditions be limited to an amount such that the difference between the maximum available injection capacity (with two pumps) and the total post-accident leak rate shall be equal to or greater than the flowrate required to offset excessive post-scrum shrinkage of the primary coolant.

Figure 2 (on next page) has been developed to determine the injection makeup limit from cold flow leak rate from a high pressure flush header obtained by reactor test under simulated accident conditions. For a given cold flow leak rate in Figure 2, determined at a 300 psi pressure differential between inlet risers and flush header, the corresponding leak rate predicted to occur under hot accident conditions has been deducted from the maximum pre-scrum injection rate that could be permitted according to the foregoing criterion. Higher injection limits can be permitted for power levels less than 4000 MW because of the smaller post-scrum shrinkage that would take place. The 1800 gpm limit is specified in Process Standards and is based upon considerations other than the flush header rupture (such as failure of certain automatic post-scrum actions).

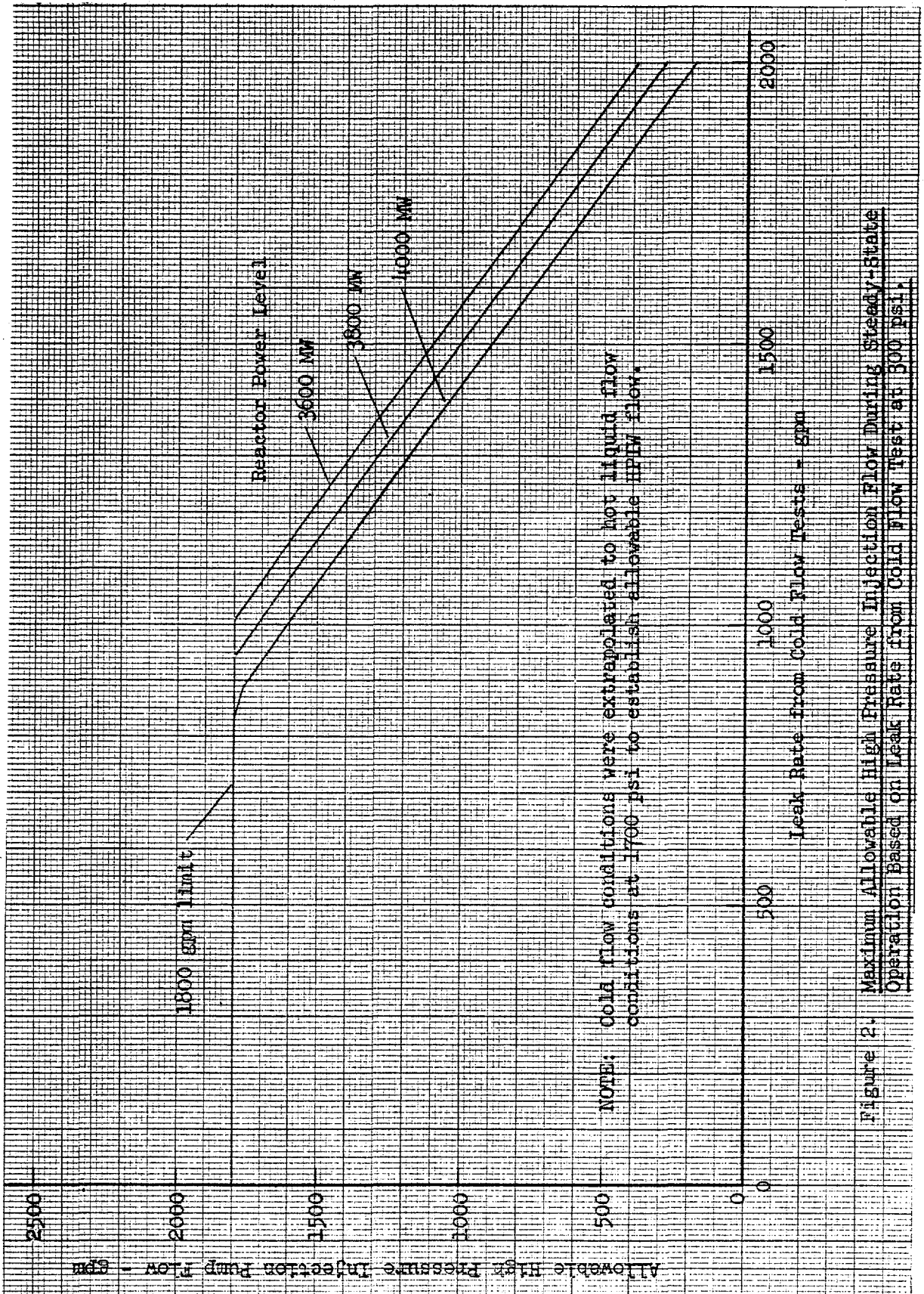
The Production Test yielded a cold flush header leak rate of 1000 gpm; when applied to Figure 2, this rate established a maximum allowable injection makeup rate of 1600 gpm for a 4000 MW reactor power and 1800 gpm for a 3600 MW power level. There have been no serious problems with operating the reactor under these constraints.

Radioactivity Release Data

At the request of AEC-RL, information has been provided on the release of radioactivity from DUN-operated facilities for the years 1967, 1968 and 1969. This transmittal summarized all available data regarding liquid and gaseous release measurements from N Reactor and the fuel fabrication facilities. Corresponding information for the K reactors was transmitted earlier under separate cover.

Confinement System

Fault tree modeling of the base-case N Reactor confinement system is now complete. The fault tree consists of 1796 basic input events and 1531 gates (3327 total events). The model considers the existing confinement system after completion of the Effluent Control Project (GCP-411). The data for the base case have been collected and are presently being prepared for computer simulation. The failure rate data being used consist of on-plant experience, where such exists, and equivalent industrial data if a relevant statistical sample cannot be obtained from plant experience.



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V-4 Valves

Documentation has been completed for a status report on the present condition of the N Reactor V-4 valve seats. The results of the study indicate that no gross failure or rapid deterioration of the valve seats is occurring at the present time. It is intended that the surveillance program on the V-4 valves (namely, the monitoring of coolant temperature upstream and downstream of the valves) will be continued.

Waste Management

Nothing to report.

ENGINEERING AND TECHNOLOGY - N REACTOR

RTD Procurement Requirements

A memorandum has been prepared to interpret technical bases issued earlier in terms of requirements for the all-tube temperature monitor (ATM) as well as the zone temperature monitor. A much slower response would be acceptable with the ATM consistent with the time cycles for readout and printout of the monitoring functions for which it is intended.

Examination of the sources and relative magnitudes of neutron flux impinging on the high-level chambers shows that the majority of the neutrons result from streaming where the source is at the edge of the active zone. This result is encouraging for relating high-level chamber indications more directly with events in the reactor core than would be possible if the entire source were attenuated through the reflector. The calculational indications are supported by instrument observations from rod-swap geometries listed in the final report of PT-NR-85 (RL-GEN-1540A) covering Mark II physics tests.

Other flux distribution studies related to high-level protection are being conducted with the EXTERMINATOR and CLUMSY codes.

Tube Scratching Problem

Installation of the wear machine in the 189-D Building was completed, and testing began on April 16 using unautoclaved wear plates. Autoclaved wear plates (simulated tube surface) will be tested with 1010 steel shoes in an effort to duplicate the in-reactor environment and the generation of metal shavings. The major candidates for shoe materials at this time remain 430 SS, 17-4 PH steel, and chrome-plated 17-4 PH steel. Chrome-plated 1010 steel and Zircaloy-2, however, will be investigated as potential interim solution candidates. Case hardened steel studs will also be tested as a potential spacer support material.

Consideration is being given to identifying and defining the distribution of shavings in the primary loop. The shavings are currently thought to settle out ultimately in dead flow areas, in view of the fact that fretting failures are generally experienced only within 5 to 15 days after a charge-discharge.

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If a potential exists for dislodging these chips as a result of maintenance, flow tests, or some other means (e.g., restoring deactivated cells to service), fretting failures could persist subsequent to elimination of the basic wire generation mechanism. Further consideration will be given to this aspect of the problem.

Circulating Raw Water System (CRWS)

Debris Monitoring

Periodic inspections of the various heat exchangers have indicated that a significant amount of debris may be entering the CRWS through the traveling screens. Since this system supplies backup coolant for several critical reactor systems which contain small flow channels, a Development Test is being prepared to provide for the collection and characterization of this debris.

A-B Electric Bus Hydraulic Interdependence

Engineering effort has continued in order to determine the reasons for CRWS flow instability which could cause the loss of B-bus electrical power because of system upset resulting from the loss of the A-bus powered CRWS pumps. W. G. Love, a General Electric Company consultant, was on plant to review the flow instability problem. Although the cause of and solution to the problem were not determined, Mr. Love made several recommendations for further testing and observation. These included the following items:

1. Install Plexiglas ports in the water box of the turbine generator (TG) condenser to look for air or two-phase flow.
2. Install a Plexiglas section in the air removal piping to observe its function.
3. Install an independent flow device for the TG condenser CRW flow.
4. Perform a test with and without the TG condenser vacuum priming unit in service to determine its effect.
5. Test with air injected into the TG condenser as instability is approached.
6. Test with river pumps far out on their curves (140,000 gpm) in various combinations and observe pump bays for vortexing, etc.

It is planned to install the equipment recommended in items 1 and 3, above, during the extended 1970 summer outage.

Heating and Ventilating System Improvements, 105-N and 109-N

The heating, ventilating, and air conditioning systems in the 105-N and 109-N Buildings have three primary functions:

1. Contamination control by means of zoning and maintaining pressure

differentials between ventilation zones.

2. Filtration of exhaust ventilation streams from critical zones.
3. Control of air temperature and pressure within the ventilation zones.

Ventilation equipment deficiencies, coupled with primary loop leakage in Zone 1 and some component degradation, have resulted in excessive temperatures in some zones. Cracking of concrete has already occurred in Zone 1 of the 105 building and additional cracking and spalling of the confinement barriers can be expected if the high temperatures continue. Malfunctions of electrical equipment located in high temperature areas have occurred. Progressive deterioration of equipment and portions of the building structure are expected to continue if the excessive temperature conditions are not corrected. The humidity conditions in Zone 1 of the 105 building are being considered in the plant maintenance program.

To improve the cooling efficiency and ventilating capacity of the basic heating and ventilating systems, remedial action has been proposed. Design criteria and a project proposal have been approved by the DUN Design Council for transmittal to AEC-RL.

The proposed modifications include the following:

- Increased exhaust ventilation capacity in Zone I, 105 building, and in Zone I of the 109 building.
- Increased water supply to the air washers in Zones I, II, III, and IV of the 105 building and in Zones I, II, and III of the 109 building to provide for higher cooling efficiencies in these zones.
- Replacement and addition of turning vanes in the exhaust ducts to reduce friction losses in the 117 building.
- Replacement of removable concrete floor slabs with steel floor grating in the turbine bays (Zone III of the 109 building) and addition of wall exhaust fans.

Project Engineering

The status of construction projects relating to N Plant facilities is summarized in Appendix A.

ENGINEERING AND TECHNOLOGY - FUELS AND TARGETS

Long Billet Program

The fuels from twenty long outer billets extruded during April are now being processed through the shop. These billets were 23.8 inches in length instead of the standard 19.75 inches. This additional length has increased the number

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of fuels cut from a tube from 10 full-length pieces, plus one 17-inch piece, to 13 full-length pieces. Evaluation of end defects from these extrusions indicates that in some cases a good 12-inch fuel could also have been cut from these extrusions, and in other cases a 15-inch clad variation Class II fuel could have been obtained.

No special problems were noted in extrusion of the long billets, and it appears that a longer than standard billet could be incorporated in the manufacturing process. This would reduce by 18 percent the number of outer extrusions required to produce the same number of fuels now obtained from the standard billet length. Zircaloy-2 cladding components manufactured onsite were successfully used on the long billets.

IRRADIATION SERVICES

ISOTOPE PRODUCTION

Xenon-128 for Argonne National Laboratory

Two capsules, each containing 8 pounds of iodine, were charged into a downstream position of the KE Reactor Snout Facility. This irradiation will yield about 1500 ml of Xe-128 gas from each capsule.

MATERIAL TESTING

Corrosion Product Transport Facilities

The in-reactor test section was installed into the KEX facility and test run No. 4 was begun.

ROUTINE IRRADIATIONS

Twenty activation analysis capsules were irradiated in the KE Quickie Facilities.

Six cooled tensile specimen capsules were charged into the Water-Cooled Magazine Facility. These samples had previously been irradiated in a KW Snout Facility.

Two capsules containing U-235 foils were charged into a bottom Front-to-Rear Test Facility.

Creep rate measurements IV-30 and IV-42 were discharged from KW General Purpose Facilities and buried. Creep rate measurement capsules, IV-38 and IV-40, were discharged and shipped to the customer for examination.

ADMINISTRATION - GENERALFY-1971 and FY-1972 BUDGETS

Primary emphasis in April was placed on preparation of the FY-1971 and FY-1972 budgets. The following budgets were submitted to AEC-RL on established due dates:

Operating Inventories - Requirements and Justification	4/6/70
Summary of Contractors Expenses and Distribution	4/13/70
Summary of 02 Special Nuclear Materials	4/17/70
Production and R&D Cost and Employee Assignment	4/17/70
R&D Costs and Justification (189's)	4/17/70
Capital Plant and Equipment	4/14/70

RECORDS MANAGEMENT

The annual review of DUN's Vital Records Listing was completed. Twenty-nine new or revised manuals and procedures were added, and five items were deleted. An updated listing was prepared and forwarded to AEC-RL.

A Company-wide paper cleanout campaign is scheduled for May 1 through June 5. The goal is to reduce office records holdings by 20 percent from the amount shown on the 1969 report.

PURCHASING ACTIVITIES

Some shipments are being delayed by wildcat strikes in the trucking industry. None are causing serious troubles, but could if they persist. Purchasing is routing shipments by other modes of transportation until conditions improve.

AEC-WIDE AUDIT - EQUIPMENT MANAGEMENT

Work continues on the AEC-wide audit of equipment. DUN and AEC auditors completed scheduled walk-throughs, and the required statistical data were assembled.

In general, justification for equipment held in operating areas was adequate. Reviews of movable equipment for standby facilities are made continually, and excessing and other activities to reduce equipment holdings are being accomplished as fast as available manpower allows.

EMPLOYMENTEmployment Summary

DUN personnel totals and employee allocations as of March 31 and April 30 are shown in Appendix B.

Force Reduction

For the year to date, 58 voluntary layoffs have been granted, twenty employees have terminated for other reasons (i.e., quits, deaths, etc.), and 169 employees have been laid off, bringing total separations to 247.

Company efforts on behalf of employees in layoff status have resulted in 49 placements with other employers. Twenty-six of these placements were with other Hanford contractors.

SAFETY

No personnel radiation exposures exceeded operational control.

Month-end safety statistics were:

Disabling injuries - April	0
- CY to date	1
Days since last disabling injury	77
Man-hours since last disabling injury	620,700

APPENDIX A

PROJECT STATUS SUMMARY - REACTOR FACILITIES

AUTHORIZED PROJECTS

<u>Number & Title</u>	<u>Authorized Funds - \$</u>	<u>Percent Complete</u>		<u>Remarks</u>
		<u>Design</u>	<u>Construction</u>	
<u>Single-Pass Reactors</u>				
DCE-505, Rev. 3, Boiler Control Improvements - 165-KE & KW	410,000	100	100	Project was completed with exceptions April 14.
DAP-516, Storage Building Addition - 105-KE & KW	142,000	100	0	Awaiting AEC-RL decision to proceed with KE portion. Design only released.
DAE-518, Effluent Radioiodine Monitor - KE & KW Reactors	100,000	100	100	Acceptance testing was resumed.
DAP-526, Deactivation of Hanford Production Reactor C	105,000	100	44	DUN has recommended to AEC-RL the elimination of fire protection from the 105-C metal exam facility since it is scheduled for deactivation.
DCP-535, Sodium Sulfite System - 182-K Building	25,300	100	81	No activity.
<u>N Reactor</u>				
GCP-406, Improved Safety Platforms and Accesses - 100-N Area	300,000	100	86	Work is continuing on the Cell 1 snubber platforms and water quality lab escape hatch.

Number & Title	Authorized Funds - \$	Percent Complete		Remarks
		Design	Construction	
GCP-411, Effluent Control Program - 100-N Area	1,830,000	100	69	Section II - Approximately two-thirds of the piping order has been received and accepted.
DCE-519, Replacement of Bridge Crane and Hoist System with New Crane System - 105-N Storage Basin Area	465,000	99	2	Section IV - Held in abeyance pending approval of increased funding requested in Rev. 2 to the project proposal. Section V - Dump tank interior painting and exterior insulating are in progress.
DCP-528, Fire Protection System Improvements - 100-N	40,000	5	0	The construction schedule was approved April 2 by AEC-RL. Minor structural work in progress in 105-N storage basin. Crane vendor is behind in his design schedule. No activity. \$40,000 authorized of \$290,000 requested.

PROJECT PROPOSALS AWAITING AUTHORIZATION

Number & Title	Funds Requested	Date to AEC-RL
GCP-411, Rev. 2, Effluent Control Program - 100-N	\$2,010,000 (new total)	9/24/69
DCP-525, Fire Protection Improvements - KE	225,000	5/2/69
DCP-527, Graphite Cooling & Fog Spray - N	97,000	5/9/69
DCP-528, Rev. 1, Fire Protection System Improvements - 100-N	394,000 (new total)	4/1/70

<u>Number & Title</u>	<u>Funds Requested</u>	<u>Date to AEC-RL</u>
DCP-529, Gravity Drainage System and Disposal Basin - 100-N	\$ 200,000	7/10/69
DAP-530, Upgraded Electrical Services and Lighting - 1100-N and 1101-N Buildings	78,000	10/2/69
DAP-531, Establish 1102-N Office Building - 100-N Area	45,000	8/19/69
DCE-532, Isolation of Process Coolant Risers - K Reactors	270,000*	9/25/69

*Additionally, this project requests the use of \$240,000 of operating funds.

PROJECT PROPOSAL PREPARATION

<u>Number & Title</u>	<u>Design Criteria</u>	<u>Project Proposal</u>
DCP-527, Rev. 1, Graphite Cooling & Fog Spray - N	Completed	In approval status
Export Water System Backup - 182-D (for 200 Areas)	Completed	In approval status
Stack Monitoring Improvements - 100-N Plant	Completed	In preparation
Heat & Ventilation System Improvements - 105-N & 109-N	Completed for Design Council approval	In approval status
High Pressure Injection System Improvements - N Plant	Completed for Design Council approval	In preparation
Upgrade Flux Monitor System - N Reactor	Completed for Design Council approval	In approval status
Smoke Density Monitors for DUN-Operated Facilities	Completed for Design Council approval	In preparation

<u>Number & Title</u>	<u>Design Criteria</u>	<u>Project Proposal</u>
Reactor Instrumentation Critical Power Supplies - N Reactor	Completed for Design Council approval	In preparation

APPENDIX BEMPLOYMENT SUMMARY
(with employee allocations)

	<u>3/31/70</u>	<u>4/30/70</u>
<u>CONTRACT PERSONNEL</u>		
<u>02 Programs</u>		
Douglas United Nuclear	1426	1353
Assisting Other Contractors	<u>15</u>	<u>19</u>
Total - 02	1441	1372
<u>Other Programs Under AEC Contract</u>		
Assisting Other Contractors and WPPSS	35	36
Special Irradiations	4	10
Other Programs - Standards	<u>3</u>	<u>1</u>
Total - Other Programs	42	47
Total Contract Personnel	<u>1483</u>	<u>1419</u>
<u>COMMERCIAL ACTIVITIES PERSONNEL</u>	<u>23</u>	<u>20</u>
TOTAL FORCE	1506	1439