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**DOUGLAS UNITED NUCLEAR
MONTHLY REPORT**

MARCH 1970

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DOUGLAS UNITED NUCLEAR, INC.

RICHLAND, WASHINGTON

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of 42 pages.

April 17, 1970

DOUGLAS UNITED NUCLEAR

MONTHLY REPORT

March 1970

DOUGLAS UNITED NUCLEAR, INC.

Richland, Washington

Work performed under Contract No. AT(45-1)-1857 between the
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SUMMARYREACTOR PLANT OPERATIONSProduction Statistics

	<u>KE</u>	<u>N</u>
Input Production - Pu (KMWD)	23.1	69.0
Time Operated Efficiency - %	22.3	57.6
Steam Availability to WPPSS - %	-	56.5

K Reactors

KE Reactor resumed operation on March 22, concluding the outage initiated February 1 for replacement of wye-joints in the inlet piping, for system proof testing, and for other maintenance. All work was completed satisfactorily.

The deactivation of KW Plant is progressing essentially as scheduled. Boilers in 165-KW are being operated as required for KE coolant backup until alternate provisions can be made.

N Reactor

Operation was at the 4000 MW maximum authorized power level for most of the period preceding the scheduled outage which began March 17. Late in the run, to maintain reactor control with the low excess reactivity available in rods, the main steam header pressure was reduced stepwise from 124 to 104 psig. This lowered WPPSS electrical generation from 803 to 684 MWe.

The scheduled outage was for charge-discharge and maintenance. The one unscheduled outage was required for repair of tube temperature monitor RTDs that failed on refueled tubes during reactor startup.

Steam generator retubing in Cell 1 continued on schedule.

FUEL AND TARGET FABRICATIONProduction Statistics (tons)

	<u>For KE</u>	<u>For N</u>
Billets Extruded	-	9.0
Finished Fuel Produced	248.0	15.0

KE Fuel

Except for two days of 3-line operation, AlSi canning continued on the basis of four lines on the day shift.

N Fuel

Because of extended maintenance on the extrusion press, input production was only 50 percent of that forecasted.

TECHNICAL ACTIVITIES

K Reactors

In the proof testing of KE inlet piping after wye-joint replacement, all four 36" risers and supply lines were pressurized to 900 psi top-of-riser at 43-45 F without detrimental effects on the system components. No leaks attributable to cracks or defects were found. Comparisons of pre- and post-test ultrasonic inspection data indicated no change in the size of small defects found in pre-test examination.

Measurements of downstream spacers before and after the full-crossheader test of through-reactor decontamination at KE indicated gamma+beta decontamination factors of 12 to 30 on spacers from an aluminum tube, and 1.5 to 4 on spacers from a Zircaloy tube. Final gamma dose rates on the spacers ranged from 1.5 to 4 mR/hr. Dose rate measurements at the rear test crossheader indicated the through-reactor approach to be at least as effective as the rear-face-only method.

The electrochemical process for removing hydride case layers from Zircaloy process tubes was tried on 10 tubes in KE Reactor. Five of these tubes also were etched. Tube 2255 (stripped only) and tube 3056 (stripped and etched) were removed for out-of-reactor examination. Tube 2255 exhibited some hydride needles penetrating into the surface even though most of the 4-mil case layer had been removed; tube 3056 was found to be completely free of any residual hydride case layer.

Trial runs of a computer code for evaluating core voiding patterns for calculation of KE Reactor tube power limits indicate that its application will permit elimination of some conservatism in limits that was previously unavoidable with manual evaluation procedures.

Deactivation of the KW boilers will require that alternate steps be taken to meet the "continuity of coolant supply criteria" for KE Reactor. To comply with requirements, means for using sedimentation basin water to insure a 7-day shutdown flow are being considered and alternatives for assuring a continuing post 7-day supply are under study.

Concrete test blocks were removed from the top shield of KW Reactor to determine if any substantial damage has occurred since initial startup in 1955. The blocks display good resiliency with little indication of deterioration.

Due to delay in receipt of 50-mil arch rail self-supports for fuel elements, there is insufficient time to equip enough fuel for full-column summer loading. As a result, fuel elements equipped with the modified supports initially will be charged only in the downstream column positions.

Physics studies completed on two types of thin annulus neptunium target elements, water core and graphite core, indicate that calculated yields and qualities as a function of time were comparable. However, burnout was calculated to be higher with the water core, with resultant lower conversion efficiency.

N Reactor

A comprehensive evaluation of the graphite stack to characterize present and projected distortion patterns was initiated during the March outage. Initial measurements included TV and/or borescopic inspection of five ball channels and test channel 60, vertical height traverses of three process tubes, and inspection of a central side-to-side traverse hole.

Technical bases for assuring adequate geometrical protection against excursions starting at high level have been developed for qualified dependence on the high-level flux monitor system.

Analysis of wind data collected for two years on the Wahluke Slope and northern part of the Hanford reservation indicates that meteorological conditions at the 100-N and 200-W Areas are different, including frequency of northwest winds, direction of highest velocity winds, and channeling of airflows. Preliminary analysis indicates that atmospheric releases at 100-N would cross the Wahluke Slope more than 40 percent of the time.

The investigation of N Reactor tube scratching has shown the probable mechanism to be the cold welding of Zircaloy-2 and zirconium oxide on the 1010 steel support shoes of the fuel. The buildup work-hardens to a hardness exceeding that of the process tube, thus causing the observed tube scratching. The use of a very hard and smooth shoe surface material may eliminate this buildup. Assembly of the wear tester to simulate fuel support and process tube interactions is nearing completion. Fuel support shoes made of five different materials will be tested.

IRRADIATION SERVICES

Separation and recovery of 210 ml of Xe-128 from elemental iodine has been accomplished for development work requested by Argonne National Laboratory. Product yield was within 5 percent of that calculated.

GENERAL

A study of different operating modes was made at the request of AEC-RL. Three different conditions were assumed: (1) K-N Dual Purpose Operation, (2) N Dual Purpose Operation, and (3) N Single Purpose (Power-Only) Operation. The first two conditions were assumed to be under AEC contract, while the third case assumed WPPSS operation. This study was furnished to AEC-RL on March 17.

A review of in-service spare equipment was completed and a report sent to AEC-RL on February 27. One hundred and seventeen pieces of equipment, valued at \$157,000, were identified for excessing. Most of this equipment is from

100 D-DR Area. It will be excessed on the assumption that D and DR Reactors will be reclassified from "standby" to "abandoned-in-place".

An audit program on "Equipment Management" was received on March 5 from the AEC Assistant Controller for Auditing. The work requested under this program is to be completed and a report issued to AEC-RL by May 8. The particular aspects of equipment management which will be covered are: (1) accountability records maintained, and (2) procedures and practices for identifying, justifying retention of, and utilization of idle equipment. An inspection of all standby and abandoned facilities and all storage areas is to be scheduled. Representatives from AEC-RL, AEC-HQ, and DUN will participate.

Through March 31, 173 employees had left DUN rolls as the result of KW Reactor deactivation. Jobs were found for 33 of the 113 who were involuntarily laid off during this period.

The arbitrator sustained the Company's position that previously promoted employees who are returned to the bargaining unit are entitled to seniority as provided by the labor agreement. A dispute now exists as to the appropriate job grades to which such employees may be returned.

A complaint filed with the Washington State Board Against Discrimination alleged that DUN was discriminatory in its method of selecting employees for layoff. Following informal investigation by a Board representative, problems concerning the three individuals named in the complaint were satisfactorily resolved. The case is being held open, however, due to DUN's unwillingness to consent to the Board's position that minority employees should be given immunity from seniority considerations during force reductions.

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

Charles D. Harrington
President

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REACTOR PLANT OPERATIONS - KE

PRODUCTION

General

Production (largely weapons grade Pu), power levels, efficiencies and related statistics for the KE Reactor are tabulated below. The low TOE and production reflect the wye-joint replacements and other work which kept the reactor down until March 22.

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)	23.1
- U-233 (Equiv. MWD)	58
Power Level (MW) - Maximum	3,875
- Average	3,390
Time Operated Efficiency - %	22.3
Number of Outages	1
Number of Startup Interruptions	0
Operating Coolant Flow - 1000 gpm	200.0
Fuel Charge (Tons) - 94 Metal	89.3
- Natural U	346.4
Fuel Element Failures	0
Helium Losses - 1000 cu.ft.	31.0

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OPERATING EXPERIENCE

Reactor Loading

The front face map showing the loading in KE is reproduced on the page following B-4. 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

The reactor continued down until March 22 on a scheduled outage for wye-joint replacement and other maintenance work which began on February 1. The only other outage was:

<u>Date Down</u>	<u>Outage Hours</u>	<u>Remarks</u>
March 25	52.5	Reactor trip due to a flameout of No. 1 boiler.

EQUIPMENT EXPERIENCE

Inlet Piping Revision and Testing

Replacement of four 24"-36" wye-joints in the reactor coolant supply piping at Bldg. 165-KE was completed, and the integrity of the 36" piping was demonstrated with a 900-psig proof test (see also page D-1). The critical check valves in the system were functionally tested and all operated satisfactorily.

Process Tube Replacement

Three Zircaloy tubes were replaced, two in connection with hydride removal studies and one because of a water leak.

Confinement Filters

New-type charcoal filters were installed in A and B cells. In addition, all the absolute filters were replaced with filters from C Reactor. Tests showed the confinement system to have an efficiency rating of greater than 99.9 percent for both charcoal and absolute filters.

Vertical and Horizontal Rods

A broken VSR tip was successfully removed from the bottom exit pipe of channel 49. The channel then was cleared of all foreign material and returned to service.

All VSRs are operable; their average drop time is 1.80 seconds.

Three HCRs were replaced, one with a new flat cooled rod. No. 4 HCR, the only rod presently binding, is scheduled for replacement with a flat cooled rod.

Boiler Experience - 165-KE

The reactor scram on March 25 resulted from a loss of combustion air on No. 1 boiler. Investigation revealed a ruptured diaphragm in the forced draft fan lock-out relay and a leaking soldered joint in the air flow impulse line. Repairs and recalibration were completed, and the boiler was returned to service on March 27 after passing EMS load tests.

Deactivation - KW Reactor

Deactivation work is progressing essentially as scheduled except for the 165-KW Building where deactivation work will be delayed until the boiler is off the line.

PROCESS ASSISTANCE AND CONTROL

Operational Physics

During the wye-joint outage, five thoria columns in the PuAl test block were replaced with natural uranium. This resulted in an average PuAl tube power increase of approximately 15 percent.

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

Effective Central Tubes (ECT)*	2110
Flattening Efficiency** - March	0.70
- 12-Month Average	0.72
Maximum Operating Time Permitting Scram Recovery - Hours***	24

*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 would be made using the currently approved startup procedure.

DECLASSIFIEDGENERALReactor Personnel Training

A Reactor Fundamentals Review Course was started on March 27. It is a general operational physics review that encompasses the use of the 105-D Simulator along with physics lectures and work sheets. Each of the KE Reactor certified personnel will spend one day at 105-D for this program. A similar program will be scheduled later for N Reactor personnel.

Contaminated Ducks

Recently BNW, in its environmental surveillance program, found high concentrations of P-32 in the muscle tissue of ducks sampled from the K and N reactor disposal trenches. A number of actions have been taken (or are planned) to prevent recurrence of this problem. They involve: reducing the amount of trench pondage volume (K only), reducing the flow of effluent water and radio-nuclide release to the trench (K only), chemically treating the water to kill algae and insects, and covering the trenches so the ducks cannot get to the water. Close surveillance of the situation will continue.

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<u>Zone</u>	<u>Tons</u>	<u>Material</u>
Central	214 67	Natural Uranium 94 Metal
Buckled	82	Natural Uranium
Near and Far Fringe	48	Natural Uranium
Shield Protection	23 7	94 Metal (Thoria Support) Thoria

Loading Pattern - KE Reactor

B-A

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REACTOR PLANT OPERATIONS - N

PRODUCTION

General

N 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)	69.02
Electrical Generation (KWH) - WPPSS	313.30
- 184-N	5.34
Total	318.64
Power Level (MW) - Maximum	4,000
- Average	3,862
Time Operated Efficiency - %	57.6
Steam Availability - %	56.5
Number of Shutdowns - Scheduled	1
- Unscheduled	1
Fuel Failures	0

Fuel Charge (Tons) - 94 Metal	326.45
- 125 Metal	65.29
- Natural U	0.36
Total	392.10
 Helium Losses - 1000 cu.ft.	 203.24
 Fuel Oil Usage - bbl.	 10,539

OPERATING EXPERIENCE

Reactor Loading

The reactor loading at month end is shown on the front face map that follows page BN-5. One hundred eighty-two fuel columns were charge-discharged during the scheduled outage. Five of the newly-charged fuel columns were recharged because of observed high pressures during initial charging.

Power Level

Reactor power was limited to 3900 MW from March 1 to March 3, to maintain a small additional margin between tube temperatures and their operating limits and thus to avoid the reactivity transient that would result from a power level cut while operating with less than 1 mK of reactivity in control rods. The maximum authorized level of 4000 MW was achieved on March 3 and was maintained until the scheduled shutdown on March 17.

To increase the reactivity in control rods, the main steam header pressure (MSHP) was lowered on March 10 from 124 to 114 psig. On March 12 the MSHP was further reduced to 104 psig. These lowerings of the MSHP resulted in a reduction of WPPSS electrical generation level to 742 MWe for the first cut and to 684 MWe following the second.

Reactor Outages

The two reactor outages were as follows:

Date Down	Outage Hours	Cause
March 17	308.1	Scheduled shutdown for charge-discharge and maintenance.
March 30	7.1	Manual shutdown to repair process tube RTDs which failed on refueled tubes during startup.

EQUIPMENT EXPERIENCE

Primary Loop

The primary loop leak rate increased from about 400 gpm at the start of the

month to about 500 gpm just prior to the scheduled outage.

During the outage 16 leaking V-11 valves were repacked and six V-12 valves were replaced with rebuilt valves. In replacing the six V-12 valves, two Grayloc hubs were repaired. Non-equilibrium operation of the reactor during the short period following the outage prevented assessment of the effectiveness of the leak repair effort.

Cell 1 retubing work continued on schedule. The primary side of 5B steam generator was opened in an unsuccessful attempt to locate a 12 gpm leak; considerable effort and exposure were expended.

Boiler Experience

The Foster Wheeler boiler was out of service March 18-21 for repair of tube leaks.

This boiler partially flamed-out on March 23 while supplying the 184-N turbine-generator unit with steam during split electrical bus operation. Loss of the B bus ensued. The boiler was relighted and B bus returned to normal.

Emergency Raw Water Cooling System

The CV-2 valves were functionally tested. The backflow rate, as measured, was too high. The swinging disc stop pins were reset to further reduce the backflow; a retest indicated backflow to be satisfactory. Front flow tests were then run and the left side test was satisfactory but the CV-2-11 on the right side failed to open fully. Disassembly of this valve revealed that a small piece of metal had rendered the swinging disc inoperable. Tests after correction were satisfactory. However, the total backflow rate measured on the final test was such that the high pressure injection rate to the primary loop was limited to 1600 gpm during plant operation. Thus limiting injection flow rate assures that adequate injection water is available to the reactor coolant system in case the CV-2 flush headers should break.

The emergency cooling system line and the emergency cooling storage tank were inspected internally to determine if chemical cleaning would be necessary prior to reactor piping decontamination in June. Both the line and the tank walls were found to be in good condition.

During the emergency cooling line flush operation, prior to CV-2 testing, the V-19 valve failed to close. A piece of brass about one inch wide by three inches long was found jammed in the valve port. The valve was reassembled and tested satisfactory. The scrap of brass is believed to be part of a high-lift pump wear ring that failed some time ago.

Horizontal Control Rods

Scram tests of 20 horizontal control rods indicated that all insertion times were within limits necessary for reactor operation. The times for these rods were 1.21 to 1.36 seconds except for one rod timed at 1.52 seconds.

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Flux Monitor System

The subcritical and intermediate systems are operating satisfactorily.

Efforts to replace 3 faulty chambers (one galvanometer and two high-level) during the scheduled outage were unsuccessful. During attempts to replace these chambers, 3 others became inoperative as the result of broken seals. Since one galvanometer and one high-level chamber are in the same location, removal of both chambers is necessary even though only one requires replacement.

Traveling Wire Flux Monitor

Wires were replaced in channels 1, 2, and 3. The wire for No. 9 channel ran off the reel when the limit switch failed to stop the travel. This wire was re-installed in the drive mechanism and the limit switch repaired.

Confinement System

One charcoal-type canister was removed from "D" cell. This canister, which was removed from the interior (not the edge) of the frame, was delivered to the 105-H transfer area for examination. A replacement canister was installed.

The charcoal filters in "B" cell were exchanged with the new type (12 inches thick) stainless screen canisters. There are two frames per cell and 40 canisters in each frame. The frames had previously been modified to accept the new 12-inch canisters. The charcoal had been tested and inspection made after canister filling at the test facility at 190-H. The particulate removal efficiency of "C" cell was tested with dioctyl phthalate on March 24.

New rubber seals were installed on the cell covers.

Electrical Systems

Six new replacement cells were installed in the 105-N-A and 105-N-B batteries. Capacity tests were run on both batteries and they meet standard requirements.

Equipment Modifications

The following equipment modifications were completed:

MDC-N-69-40, "Data Logger Clock Manual Stepping", provided for manual stepping of the data loggers through their logic cycle. This will expedite the location of faults in the system.

MDC-N-70-3, "Charge-Discharge Pressure Recorder", provided a strip chart recorder to document the time and pressure used to discharge the fuel in a process tube. Also, a means for flushing the sensing lines was included to prevent problems encountered with the present recorder.

PROCESS ASSISTANCE AND CONTROL

Operational Physics

The equilibrium reactivity transient during February and March followed closely the nearly steady value predicted by the TRU-K computer program. The nearly constant reactivity status during the last four days prior to the March 17 shutdown, and subsequent to a steady decline, may indicate a slight gain starting from burnout of residual balls in the graphite stack.

Axial flux traverses from TWFM locations 5 and 8 continue to show at least a 20 to 25 percent reduction in the center of the reactor. Traverses were not obtainable in the top center TWFM location No. 2 late in the operating period because of a stuck traverse wire. Indications in mid-February, with all three of the pertinent TWFM locations in service, were that the residual ball effect was causing reductions of about 25, 30, and 35 percent in the peak of the axial flux in the lower central, central, and upper central locations, respectively. A Production Test is being prepared to traverse the reactor vertically to determine more precisely the configuration of the residual balls indicated to be in the vicinity of ball channel 49.

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

Effective Central Tubes*	812
Flattening Efficiency* - March	0.81
- 12-Month Average	0.80
Maximum Operating Time Permitting Scram Recovery - Hours*	24

*For definitions see page B-3.

Production Fuel Performance

Fuel failure No. 55, which occurred in tube 2456 on February 23, has received preliminary examination. The point of water entry was on the inner clad of the outer element near a W-spring support at the head end. Exposure of this Mark IV element, charged during the January 14 outage, was 195 MWD/T column average. Examination by BNW is planned to determine the mechanism involved, suspected to be wire fretting. Failure No. 54 was confirmed by BNW as a wire fretter.

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25	E	E	X	X	X	G	G	G	G	G	G	F	G	F	G	G	G	G	G	G	G	G	G	G	G	G	X	X	X	E	ES	E	25		
24	E	E	X	X	X	G	F	G	01	G	G	F	G	G	F	G	G	G	F	F	F	G	G	G	G	F	G	G	X	X	X	E	E	24	
23	E	E	X	X	X	F	F	F	G	G	G	F	G	F	G	G	94	G	F	G	G	G	G	F	G	G	G	X	X	X	E	E	23		
22	E	E	X	X	X	G	G	G	G	F	F	F	F	G	G	F	F	F	F	G	G	G	G	F	G	F	G	X	X	X	E	ES	E	22	
21	ES	E	X	X	X	G	G	G	F	F	F	G	F	F	F	F	G	F	F	F	F	G	G	G	F	G	G	F	X	X	X	E	E	21	
20	ES	E	X	X	X	G	F	G	G	G	F	F	G	G	F	F	F	F	F	F	G	F	F	F	G	G	F	F	X	X	X	E	ES	20	
19	E	E	X	X	X	F	F	F	F	F	F	G	F	G	F	F	F	F	F	F	G	F	F	G	F	F	G	X	X	X	ES	ES	19		
18	E	E	94	X	X	G	F	G	G	F	G	G	G	F	G	F	G	G	G	G	G	G	G	G	G	F	G	X	X	X	ES	ES	18		
17	ES	ES	X	X	X	F	F	G	G	01	F	G	F	F	G	G	F	F	G	G	F	01	G	F	G	G	G	X	X	X	E	ES	17		
16	ES	E	X	X	X	G	G	N	F	G	G	F	F	F	G	G	F	F	F	F	F	G	F	G	F	G	G	X	X	X	E	ES	16		
15	E	E	X	X	X	G	G	G	G	F	G	G	G	G	G	G	F	G	G	G	F	G	G	F	G	G	G	X	X	X	ES	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	01	G	F	G	G	X	X	X	E	ES	14		
13	E	ES	X	X	X	G	F	G	G	F	F	G	F	G	G	F	G	F	G	F	G	F	G	F	G	F	X	X	X	X	E	ES	13		
12	E	E	X	X	X	G	F	F	F	F	F	G	G	G	G	G	F	94	F	G	F	G	F	G	G	G	X	X	X	X	E	ES	12		
11	E	ES	X	X	X	G	F	F	F	F	G	G	F	F	F	F	G	F	0	0	G	F	F	G	F	F	X	X	X	E	ES	ES	11		
10	E	E	X	X	X	G	F	G	F	F	F	F	F	G	F	F	F	G	G	F	G	F	F	G	F	G	X	X	X	E	ES	E	10		
09	ES	E	X	X	X	X	G	F	F	G	G	G	F	G	G	G	F	F	F	G	G	G	G	F	G	G	X	X	X	X	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	G	F	G	F	X	X	X	F	E	E	08		
07		ES	E	E	X	X	X	X	G	G	G	G	G	G	F	G	G	G	F	G	G	G	G	G	F	X	94	X	X	E	ES	E	07		
06			E	ES	E	X	X	X	X	G	G	G	G	G	G	G	F	G	G	G	G	F	F	X	X	X	X	E	ES	E				06	
05				E	E	E	X	X	X	X	X	X	F	X	X	X	F	X	X	X	X	X	X	X	X	X	X	E	ES	E				05	
04				ES	E	E	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	E	ES	E				04	
03					E	ES	E	E	E	E	E	E	E	E	E	ES	E	E	E	E	E	E	E	E	E	E	ES	ES	E					03	
02						E	E	E	E	E	E	E	E	E	ES	E	ES	ES	ES	ES	ES	ES	E	E	E	E	ES	E						02	
01																																		01	
	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
D	2	Mk-IC (94 Metal - High U-236)	94*	9	Mk-IV Demonstration
E	164	Mk-IC (94 Metal - Fringe)	01	6	Mk-I and Mk-IV from
ES	60	Mk-IC (94 Metal - Fringe)			Direct Cast Billets
F	202	Mk-IV (94 Metal - High U-236)		1	Graphite Samples
G	328	Mk-IV (94 Metal - Central)			Channel
N	1	Mk-IB (Natural U)		16	Total PTs
X	231	Mk-1A (125 - 94 Metal)			
	988	Total			
	16	Total PTs			

1004 Grand Total

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

Loading Pattern - N Reactor

BN-A

FUEL AND TARGET FABRICATION - KE REACTORPRODUCTIONGeneral

Production of AlSi-bonded fuel for KE Reactor was 128.5 percent of forecast. Except for two days of three-line operation, canning continued on the basis of four lines on the day shift, five days per week. Ninety-five percent of the elements produced had self-supports or bumpers attached.

Acceptable Elements Produced

	<u>Tons</u>	<u>Yield - Percent</u>	
		<u>Current Month</u>	<u>FYTD</u>
AlSi-Bonded Fuels	248.0	95.6	95.7

<u>Month-End Inventories</u>	<u>Ton</u>	<u>Tons</u>
Bare Uranium Cores		479*
Finished Fuel: AlSi-Bonded		1,503*
Hot-Die-Sized		19
Thoria Elements		14

*These totals include 113 tons of bare cores and 110 tons of finished fuel of the sizes used in the smaller reactors.

OPERATING EXPERIENCE

Canning efficiency of the AlSi-bonding lines was 98.0 percent. Downtime was assigned equally to equipment malfunctions and operations.

EQUIPMENT EXPERIENCE

Nothing significant to report.

PROCESS ASSISTANCE AND CONTROL

Nothing significant to report.

FUEL AND TARGET FABRICATION - N REACTORPRODUCTIONInput Production

Total billets extruded	42
Tons extruded	9
Percent of forecast	50

Output Production

Total finished fuel assemblies	580
Tons output	15.0
Percent of forecast	93.8

<u>Uranium Utilization - %</u>	85.7
--------------------------------	------

Month-End Inventories - Tons

Bare uranium billets	262
Finished fuel	192

OPERATING EXPERIENCE

Input Production was below forecast because of the extended maintenance outage on the Loewy extrusion press. It was returned to production service on March 20.

EQUIPMENT EXPERIENCE

Extrusion press alignment checks made at various intervals during extrusions following the overhaul indicated very small variations which were well within acceptable limits.

PROCESS ASSISTANCE AND CONTROL

A test quantity of fuel element supports coined from a wire with rectangular cross-section was obtained for testing and evaluation. The component is a tab-less support with the weld projections formed on the underside of the support center. The manufacturing process is much simpler than that currently used to manufacture rigid supports, and less Zircaloy-2 material is wasted; both factors would reduce support cost. Based on the forecast production for the next 18-month period, it is estimated that use of the coined support would reduce rigid support cost by \$20,000-\$30,000.

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TECHNICAL ACTIVITIES - KE REACTOR

RESEARCH AND DEVELOPMENT

Basic Production

Brittle Fracture Program - K Inlet Piping

Proof Testing of KE Piping

The proof test of the 36-inch inlet piping was completed at KE under PTA-202. Each line from the 24-inch check valves in the 165 building to the top of the risers was successfully pressurized to a top-of-riser pressure of 900 psig. The pressurizer schedule for each line included the following:

- 0 to 400 to 600 to 0 psi
- 0 to 750 to 400 (for leak inspection) to 0 psi
- Line flush to lower the water temperature
- 0 to 900 to 400 (for leak inspection) to 0 psi.

Strain gauges were installed on the new 24-36" tee sections, the normal pipe run, the riser, and at a typical riser-to-nozzle connection. Preliminary data from strain readings indicate all strains measured were elastic even at 900 psi. Prior to final pressurization at 900 psi, each line was flushed to reduce the pipe wall temperature as low as possible. Typical pipe wall temperatures at 900 psi were 43-45 F. There were no particular difficulties encountered during the test and the KER pressurizing pumps had adequate capacity to provide 900 psi. All affected piping was inspected at 400 psi following the test and no leakage from cracks or defects was observed. All valves were functionally tested and found to be operable. All defect indications found by ultrasonic inspection prior to the test were reexamined by the same method and were found to be unchanged.

Although the successful performance of the test in itself does not fulfill the requirements for single-riser failure limits, it should allow return to normal inlet pressure.

The proof test also served as the Acceptance Test for the wye-joint replacement work done at the four junctions of 24" and 36" supply piping in Bldg. 165-KE. These joints, which had been judged to be of inadequate design (unreinforced), were replaced during the last outage with fittings of proper design and notch ductile material specifications.

Technical Bases for Tube Power Limits

A computer code to evaluate core voiding patterns for the calculation of K reactor tube power limits has been debugged, and is now ready for use.

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Trial runs with the program indicate that its application will permit elimination of some conservatism in limits that was previously unavoidable with manual evaluation procedures.

Present emphasis is on reevaluating post-accident flow and pressure transients in front crossheaders based on a wave mechanics approach. Upon availability of results early in April, work will start on technical bases for operation of KE Reactor at increased top-of-riser pressures.

K Limits Physics Studies

Calculations for the kinetics-equivalence method of evaluating effective K reactor control strength during scram transient conditions have been completed and will be documented.

Physics Code Developments

Input additions to CLUMSY for facilitating riser failure analyses have been written, and are currently being debugged.

The HAMMER system was successfully converted to CSCX. The drum storage file was replaced by tapes to reduce the substantial monthly charge.

The document on the GRAPH code to facilitate automatic data plotting has advanced to the final draft stage.

Through-Reactor Decontamination

As reported last month, Production Test PTA-158, Supplement B, the through-reactor decontamination with a full crossheader employing preheated decontamination solutions, was successfully completed on February 19. The test proceeded very smoothly and there appear to be no significant operational problems with this process.

In that test, a solution of 6 oz/gal Turco 4528-F (inhibited citric-oxalic acid) preheated to 90 C was injected into the front crossheader and through the process tubes at a flow rate of 1.5 gal/min/tube for 40 minutes. Due to heat loss to the graphite, exit temperature at the rear face was 78 C. Activity measurements on liquid samples periodically removed at the rear face, and on continuous recording radiation detectors installed on rear nozzles and crossheaders, showed that most of the activity was removed the first 10 to 15 minutes and that activity levels slowly decreased with time thereafter.

Radiation measurements of gamma activity on fuel spacers in the downstream end of the process tubes before and after the test gave decontamination factors of 4 to 8 on spacers from an aluminum tube and 1.6 to 5 on spacers from a Zircaloy tube. Corresponding decontamination factors for gamma plus beta activity were 12 to 30 on spacers from an aluminum tube and 1.5 to 3.6 on spacers from Zircaloy tubes. The radiation measurements were hampered because spacers with high initial dose rate readings could not be located on the decontaminated crossheader. Final gamma dose rates on the spacers ranged from 1.5 to 4 mR/hr.

Dose rates at the rear elevator at the test crossheader were compared with dose rates obtained near crossheaders decontaminated by the rear-face-only decontamination method. No differences were noted, indicating the through-reactor method of decontamination is at least as effective as the rear-face-only decontamination.

Flushing the test crossheader with full shutdown front riser pressure (70 psi TORP) for a few minutes following the decontamination completely eliminated any entrapment of activity in the rear nozzles as was found during the previous single-tube, through-reactor tests. Visual examination of fuel elements discharged following the through-reactor test showed complete removal of the corrosion product films and deposits.

To date, there has not been any indication that the through-reactor or rear-face decontamination wastes, or the dehydriding test wastes, are passing from the KE Reactor trench (where the wastes were disposed) to the wells between the trench and the river. The wells and nearby springs will continue to be monitored.

Zircaloy Process Tube Hydriding

Following the removal of hydride case layers from 10 Zircaloy process tubes in KE Reactor using the electrochemical method, as done February 25-27 under PTA-204, tubes 2255 and 3056 were removed for evaluation. Tube 2255 was stripped only, while 3056 was both stripped and etched.

Analysis of tube 2255 showed that some hydride case had been left on the surface even though the bulk had been removed. This remaining case is in the form of needles penetrating into the surface which the stripping operation fails to remove. One facet of this test is to determine if this small quantity of hydride would have ill effects on future tube performance. If all of this remaining case layer did subsequently diffuse into the base metal, it would increase the base metal content about 100 ppm, which is a significant amount.

Tube 3056, which was both stripped and etched, was found to be completely free of any residual case layer. The etching step was designed to remove approximately 2 mils from the surface, and the data indicate that this is enough to eliminate all traces of case layer needles.

K Concrete Shielding Examination

All 29 of KW Reactor top shield concrete test blocks, included in the original design, were removed on March 6 to determine if any substantial damage had occurred since initial startup on January 4, 1955. These 6"x6"x24" blocks were tested for hardness with a "Schmit" hammer. They had good resiliency with little indication of deterioration, and there were no indications of crumbling. Maximum readings were 200-300 mR at the innermost ends of the blocks (which rested on the biological shield plate).

New blocks were installed and the hole was closed on March 12. It was necessary to substitute 3X balls for the three replacement blocks which were

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found to be oversize and would have required considerable machining expense to make them fit.

Modified 50 Mil Arch Rail Self-Support

The initial shipment of the modified 50-mil arch rail self-supports was expected to arrive on site the week of March 9. However, due to a fabrication problem at the vendor's plant, the shipment will not be received until the week of April 6. To prevent recurrence of failures of the type that were experienced during the summer of 1969 with the current model, it is necessary that fuel elements equipped with the modified supports be in-reactor during the coming summer months. There is not enough time before summer to equip sufficient fuel with the modified supports for full fuel column loading. Therefore, fuel elements equipped with the modified supports will initially be charged only in the downstream positions of a fuel column, the point of maximum failure potential.

Product Flexibility

High Enrichment Utilization - Oralloy Test

A first draft of the oralloy-aluminum Production Test authorization document was circulated. However, prior to incorporation of comments into a final draft, instructions were received from AEC-RL to cancel the test and return the unirradiated oralloy. Documentation of the revised Production Test draft will be completed to record preparations made to date.

Pu-238

Physics Studies of Thin-Annulus Neptunium Targets

Burnout, yield, and quality calculations were completed for two types of thin-annulus neptunium target elements, one with a water core and the other with a graphite core. Calculated yields and qualities as a function of time were comparable in the two cases, but burnout was calculated to be higher in the water core, with conversion efficiency thus lower. Results were documented as DUN-6841. Calculation of Pu-236 buildup in thin-annulus elements is currently under way.

Fabrication of NpO₂-Al Target Elements

Process development effort for the fabrication of thin-annulus NpO₂-aluminum core target elements was directed toward determining the composition and density of the core material. The fabrication parameters and approximate core composition had been established previously using UO₂ as a stand-in for NpO₂.

Thin annular pellets of NpO₂-Al at 30 and 40 wt% NpO₂ were fabricated according to the established process and the final dimensions and densities measured. Based on these data, the final desired composition of 33.3 wt% NpO₂ in aluminum was determined.

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The required NpO_2 and aluminum were blended together with 2 wt% Carbowax and pressed at about 20 tsi into pellets 1.515 inches outside diameter, 1.383 inches inside diameter, and about 1.015 inches long. The pressed cylinders were then outgassed and sintered at a temperature of about 620 C for four hours. Calculations made on some finished pellets show the composition and density to be within specifications. Work is continuing and fabrication of the quantities scheduled for irradiation testing is expected to be completed by early April.

Environmental and Regulatory Technology

KW Reactor Deactivation - Effect on KE Reactor

A study was conducted to determine if the deactivation of KW Reactor affected the safety status of KE Reactor. It was determined that, following deactivation of the KW boilers, the "continuity of coolant supply criteria" could not be met without plant modifications.

With both K reactors in operation, the criteria assumed that the BPA-powered primary coolant system would be lost at both reactors, and the steam-powered secondary coolant system would be lost at one reactor. Under these conditions, the reactor which lost both primary and secondary systems would still be assured a continuous coolant supply through the last-ditch diesel system. The diesels draw from the clearwells, and depend upon the operation of electrically-powered river pumps to get a continuous supply to the clearwells. Following shutdown of KW Reactor and deactivation of the KW boilers, there would be no means of providing coolant to the KE clearwells (assuming loss of both primary and secondary systems at KE) unless some alternate power source was made available.

To comply with the requirement for an indefinite supply of water to the diesel system, two alternatives are being investigated. First, techniques are being evaluated to make the water in the sedimentation basins available to the clearwells, assuming loss of both primary and secondary systems. This will provide stored coolant to the diesels for a 7-day shutdown flow. Second, studies are in progress to identify the action which would be taken during this 7-day period to assure that a continuous supply of coolant, for an indefinite period of time, would be available by the end of 7 days.

Project Engineering

The status of construction projects relating to K reactor 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.

Waste Management

Nothing to report.

ENGINEERING AND TECHNOLOGY - FUELS AND TARGETS

Nothing significant to report.

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TECHNICAL ACTIVITY IN REACTOR

RESEARCH AND DEVELOPMENT

Basic Production

Yield and Burnout Sampling (PT-NR-95)

Results have been received from BNW on the three batches of Mark I-C fuel with high initial U-236 content. Translation of the data from the chemical form (g/l) to exposure units and comparison with earlier N conversion data may now proceed. Due to funding limitations, the laboratory analysis of the fission product data desired for meltdown test verification has had to be cancelled. However, the latter information is expected to be available from ARHCO laboratory results, together with independent product yield and quality data.

Bases for ZTM-Upgrade Production Test

Technical bases for assuring adequate geometrical protection against excursions starting at high level have been developed for qualified dependence on the high-level flux monitor system. Conditions related largely to limitations on maximum excess in rods at equilibrium have been defined whereby geometric protection by the high-level flux monitor system can be assured to be equivalent to that normally provided by the Zone Temperature Monitor (ZTM) system. Use of the conditions thus defined could permit debugging work on the ZTM system during operation when certain fault conditions may be more readily checked. The study has been documented as DUN-6816, "Localized Protection with N Reactor High-Level System."

Fuel Development

Unbonded End Closure

Final tolerances and fabrication procedures for the production of unbonded end closure assemblies have been established. Fabrication of about 25 outer and 15 inner extrusions to provide the 12 Mark IV fuel columns for reactor production testing should commence shortly.

End-Spider Supports

The end-spider support Production Test document was completed and is routing for final approval. The goal exposures of test fuels have been modified, and will result in an average plutonium product containing 9 percent Pu-240.

Plant Process Surveillance System

The N Plant surveillance system is a digital computer based system for data acquisition, limit checking, surveillance of all important reactor and

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supporting facility operating parameters, and direct digital control of the N Reactor plant operating power supply systems.

To procure this surveillance system, four steps are required by AEC Manual Chapter 1801 (Procedure for Procuring a Computer System). The first two steps, the feasibility report (DUN-3551) and the system study (DUN-6356, Rev. 1), were completed in June 1968 and November 1969, respectively. The feasibility report was approved by AEC-RL on July 18, 1968. The system study was submitted to AEC-RL on December 18, 1969. The last two steps would be system selection and specification, and the acquisition proposal. No work is currently underway, pending authorization from AEC-RL to proceed.

In the process of defining the system's requirements and cost in the system study, a number of parameters were defined. These included:

- The inputs from the 105, 109, 181-182, and 184 buildings.
- The transducers required for each type of measurement, the transducer cost and the installation cost. It was found that transducer requirements could be filled mostly by off-the-shelf products.
- The physical location of data acquisition equipment in each building as well as optimum placement of cables. Installation cost was also determined.
- The computer requirements and peripheral equipment requirements.
- The equipment needed for information output to the reactor operator and input from the reactor operator to the computer system.
- That analog and digital data from the remote locations (109, 181-182, and 184 Buildings) would be acquired by remote multiplexers and transmitted digitally to the computer in the 105 Building. The inputs from the 105 Building would be connected directly to the computer.

The cost of the surveillance system, including design and installation, was estimated at \$983,700.

Graphite Distortion

Graphite distortion measurements and inspection performed during the March 18-28 outage included the following:

- Inspection of ball channels 14, 38, 47, 51, and 58 to determine if there are separations between the liner blocks.
- Vertical height traverse of process tubes 1657 and 2556.
- Inspection of the stack through the center-center side-to-side

traverse hole. Important information is expected on the presence, location and quantity of retained balls, length of filler blocks, gaps between filler blocks, broken keys, and motion between moderator and shields.

In addition, four more sample blocks were removed from ball channel 60. Inspection of the additional length of channel thus exposed will provide added information about the distortion of this unlined channel.

The data are being analyzed and will be reported in April.

Zircaloy Process Tube Monitoring

The corrosion and hydriding evaluation of process tube 0758 has been completed. The results show that corrosion of the tubing is as expected and should have no effect on tube life expectancy. The maximum corrosion film observed on this tube was 205 mg/dm². This corresponds to an oxide thickness of 0.5 mil and to a metal penetration of ~0.03 mil into the nominal 275-mil tube wall. Tube 0758 exhibited an increased hydrogen content level at the upstream spacer zone relative to its remaining length, as did the two previous tubes examined. The upstream hydrogen absorption appears to be decreasing with exposure from the small sampling obtained to date. Total hydrogen content exceeding 200 ppm would be required to effect a significant change in tube integrity.

A summary of the hydrogen absorptions found in the three process tubes removed from N Reactor and examined is shown in Table 1 on page DN-4.

Additional fatigue and milled-slot burst tests were performed at room temperature with two sections of process tube 0758. In-flux, section E, ~250 inches from the inlet end with a calculated exposure of 1.23×10^{21} n/cm², was fatigue tested to evaluate the effect of irradiation on fracture behavior. The initial flaw was 0.4-inch long milled 85 percent through the tube wall. The section was pressure cycled between 4500 and 300 psig. A detectable leak resulted after 26,500 cycles. The leak was sealed and cycling continued. After an additional 4735 cycles, the crack propagated the full length of the section. The critical crack length, determined visually, was about one inch.

Similar results were obtained previously on a tube section with an exposure of 1.88×10^{21} n/cm², as shown in Table 2 on page DN-4. Irradiation appears to have reduced the critical flaw length by 33 percent. Leak-before-break behavior was obtained in all cases, however, which shows that an in-reactor failure would be detected by excessive leakage long before the flaw grows to a size sufficient to cause catastrophic failure.

The fourth tube to be studied in this program will be discharged in July 1970.

Product Flexibility

Thulium Irradiation Data (PT-NR-89)

The final report on PT-NR-89, "Thulium-170 and -171 Production in N Reactor,"

TABLE 1

Hydrogen Absorption in Process Tubes Removed from N Reactor

Tube Number	1756	2455	0758
Fabricator*	Harvey	Harvey	Chase
Maximum Fluence, n/cm ² , >1 MeV	8 x 10 ²⁰	1.2 x 10 ²¹	1.5 x 10 ²¹
Total Hydrogen, ppm			
In-Flux, maximum	25	18	28
Out-of-Flux, downstream	23	17	41
Out-of-Flux, upstream	58	70	60
Nominal Hydrogen Pickup (upstream)	38	47	21
Rate of Hydrogen Pickup, ppm/day	0.127	0.069	0.026

*Harvey Aluminum Co; Chase Brass and Copper Co.

TABLE 2

Fatigue Crack Propagation Data - Tube 0758

<u>Distance from Inlet Nozzle, in.</u>	<u>Nominal Wall Thickness, in.</u>	<u>Type Defect*</u>	<u>Cyclic Stress Range, psig -</u>	<u>Cycles to Detectable Leak</u>	<u>Additional Cycles to Failure</u>	<u>Critical Crack Length, in.</u>	<u>Fluence, n/cm² x 10²¹ E >1 MeV</u>
24	0	EDM	200-4000	-	16,026	1.5	~0
250	0.041	E.M.	300-4500	26,500	4,735	~1.0	1.23
311	0.041	E.M.	200-4000	26,692**	4,543	~1.0	1.88

*EDM = Electric Discharge Machining; E.M. = End Mill.

**Pin-hole Failure.

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was issued during the month as DUN-6789.

Environmental and Regulatory Technology

Meteorological Studies

Two years of wind data collected by portable stations located on the Wahluke Slope and the northern part of the Hanford reservation have been summarized and subjected to analysis.

The data indicate that the meteorological regions around 100-N Area and the Hanford meteorology tower in 200-W Area are different. These variations are noted in measurements taken 200 feet above ground level at each tower and near the surface. The Hanford tower has a higher frequency of northwest winds than 100-N Area. However, the highest speed winds at the Hanford tower blow predominantly from the southwest, whereas 100-N Area highest winds are generally from the northwest. Additional regional wind shears are indicated by the diurnal wind direction changes and the channeling of airflow in the basin surrounding N Reactor. The data suggest that this basin is a location of the confluence of airstreams from many directions.

The data further show that wind shears and circulations that are pertinent to the transport and diffusion of a pollutant from N Reactor do exist, but are not simply defined by any one sensor or tower near the source. The streamline analysis across Wahluke Slope and the northern portion of Hanford, using station data and balloon flights, supports the data summaries in indicating that the airflow is complex. Preliminary analysis indicates that material released in the atmosphere at 100-N Area would cross the Wahluke Slope more than 40 percent of the time.

Waste Management

Nothing to report.

ENGINEERING AND TECHNOLOGY - REACTOR

Tube Scratching Problem

An interim report (DUN-6700) has been issued on N Reactor tube scratching. Assembly of the wear tester designed to simulate fuel support-tube interactions is complete except for the electric clutch and variable speed transmission. The clutch has been delivered and the transmission is expected to be delivered by mid-April. The clutch will be installed temporarily so that preliminary testing can begin. The absence of the transmission will necessitate testing at constant disc rpm. Preliminary data will be obtained on the effects of sliding velocity and load with this type of testing.

Shoes made of the materials listed below have been or will be fabricated for testing on the wear machine. Data on 1010 steel are included for comparison, and shoes of this material will be used as controls.

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<u>Material</u>	<u>Surface Hardness, DPH</u>	<u>Yield Strength, psi</u>	<u>Reduction of Area, %</u>
1010 steel	100	26,000	50
1010 (chrome coated)	1000	26,000	50
430 stainless steel	160	40,000	60
17-4 PH stainless steel - H-1150 condition	311	125,000	60
17-4 PH stainless steel - H-1150 condition (chrome coated)	1000	125,000	60

The chrome-coated 1010 shoes have been charged-discharged through a mockup tube. The test was inconclusive since the shoes were charged-discharged five to seven times, and the pertinent information (i.e., shoe appearance after one charge-discharge) was not obtained. The chrome-plated shoes displayed much less wear, and appeared to be in better condition than the 1010 steel shoes. The chrome plate had been grooved without being torn off on a number of shoes, indicating that a soft base metal like 1010 steel may not be ideal, even with chrome coating. Microanalysis of the wear area on these shoes indicated that there had been no zirconium pickup.

Subsequent metallography performed at the contact location has shown that the chrome plating cracks when the shoes are fabricated. This may not prove to be a problem since the cracks are just visible at 280X in the center of the shoe where the deformation during fabrication is low. The adherence of the coating seems to be quite good, since flaking is not observed even at the corners of the shoes where the cracking is more extensive, and where the shoe is bent 90 degrees during fabrication.

Three fuel elements in the end-spider flow test have been fitted with chrome-plated 1010 shoes. This test will provide additional wear and corrosion data on chrome-plated shoes. Work on this program continues, including the evaluation of case-hardened spacer support studs.

Surveillance of Weld Flaws in Primary Carbon Steel Piping

Three high stress sections of N Reactor primary piping in steam generator Cell 1 were ultrasonically examined for weld flaws during the outage last month. No flaws were detected.

Circulating Raw Water System

PT-NR-125, Supplement 3, "A-B Electrical Bus Hydraulic Interdependence Test," was conducted on March 17. This test was designed to reproduce and monitor, and attempt to determine the cause of the cycling behavior observed on December 26, 1969, which showed dump condenser 12 to be particularly sensitive to system upsets. The December 26 system cycling was confirmed and duplicated during the test. Analyses of test results have not been completed.

Tube Nozzle Cap Remover-Installer

The program for the design and development of a machine which would permit safe removal and installation of the nozzle caps during the tube charge-discharge operation under conditions of high water flow has been essentially completed. Three identical machines are now on hand and are considered operational. They have been used on-reactor and adequately perform the nozzle cap removal and installation functions.

Since facilities on the rear work platform are different from those on the front, a new concept for supporting the rear face machine was developed. All fabrication work for both front and rear equipment was completed in time for the March outage, when the equipment was used successfully on both the front and rear faces.

Project Engineering

The month-end status of construction projects relating to N Reactor facilities is summarized in Appendix A.

ENGINEERING AND TECHNOLOGY - FUELS AND TARGETS

Billet Reclamation Program

An analysis of reject billets at final inspection at NLO showed that the highest reject categories were internal and external diameter flaws. These flaws (such as small laps, pits, cracks and seams) were cause for rejection because there was no economical method to recover these billets.

Recent work at Hanford on the sleeved billet technique, for converting Mark I billets to Mark IV billet size, indicated that there may be an economical method for reworking a number of surface-defect billets to appropriate sizes that could be salvaged. For example, OD surface reject billets could be machined at NLO to a smaller size (from 6.980" to 6.875") that would remove the flaws. These billets could then be shipped to Hanford for extrusion into sleeve stock material (2.800" OD x 2.510" ID x 20 inches long). Conversely, the ID surface reject billets would be reamed from an ID of 2.510" to 2.800" to remove the existing flaws and shipped to Hanford for subsequent sleeving and coextrusion.

No problems with this procedure are anticipated at Hanford, as the sleeve billet technique has been successfully used to convert approximately 800 Mark I billets (ID = 2.800") to Mark IV size (ID = 2.510").

Fuel Engineering Specifications

The revision of the engineering specifications for N Reactor fuel elements has been prepared with the exception of two items. A decision on whether the thickness of caps for flat brazed closures can be reduced from 0.200 inch to 0.175 or 0.185 inch is required to complete the revision.

DECLASSIFIEDNonmoving Fuel Inventories

Review of nonmoving fuel inventories is continuing to determine the best means of utilization. It appears that several methods will be required, including (1) extension of the planned Class II program, (2) a PT for prototype Mark IV fuel, and possibly (3) one or two material waivers. Completion of the study is targeted for May 15.

IRRADIATION SERVICESPRODUCTION OF Xe-128

Separation and recovery of 210 cc (STP) of Xe-128 from an irradiated target capsule containing 450 grams of elemental iodine has been accomplished for the Xe-128 development work requested by Argonne National Laboratory. Product yield was within 5 percent of that calculated. Analysis of the product revealed CO₂ contamination in excess of the 1 percent maximum specified, and also a small amount of radioactive Xe-129. The latter presents no problem because of its relatively short half-life (8 days). Plans are being made to remove the CO₂ by utilizing the freezing point difference between it and xenon.

ISOTOPE PRODUCTIONCarbon-14

Six columns of Be₃N₂ targets were recharged into KE Reactor process tubes to provide ORNL with C-14. This was material which had previously been under irradiation in C Reactor. An additional two columns were discharged from KW Reactor process tubes and will be recharged into KE after about six months decay.

ROUTINE IRRADIATIONS

A boron carbide capsule was discharged from a KE Reactor general purpose facility. This irradiation is in support of an FFTF control rod material study.

Creep rate measurement capsule IV-41 was discharged from a KW Reactor general purpose facility and buried. The capsule had no further value since it was underexposed. Creep rate measurement capsule IV-36 was discharged and shipped to BNW.

ADMINISTRATION - GENERALFY-1970 BUDGET

A revised FY-1970 budget based on a financial plan of \$40,400,000 was issued March 2. It is expected that additions of \$50,000 for moving special irradiation facilities from KW to KE, and \$25,000 for the Noble Gas Program, will bring the financial plan to \$40,475,000 for which another revised budget is being prepared.

REACTOR OPERATING MODES STUDY

A study of different operating modes was made at the request of AEC-RL. Three different conditions were assumed: (1) K-N Dual Purpose Operation, (2) N Dual Purpose Operation, and (3) N Single Purpose (Power-Only) Operation. The first two conditions were assumed to be under AEC contract, while the third case assumed WPPSS operation. This study was furnished to AEC-RL on March 17.

PROPERTY MANAGEMENT

A review of in-service spare equipment was completed and a report sent to AEC-RL on February 27. One hundred and seventeen pieces of equipment, valued at \$157,000, were identified for excessing. Most of this equipment is from 100-D-DR Area. It will be excessed on the assumption that D and DR Reactors will be reclassified from "standby" to "abandoned-in-place."

AEC-WIDE AUDIT - EQUIPMENT MANAGEMENT

An audit program on "Equipment Management" was received on March 5 from the AEC Assistant Controller for Auditing. The work requested under this program is to be completed and a report issued to AEC-RL by May 8.

The particular aspects of equipment management which will be covered are: (1) accountability records maintained, and (2) procedures and practices for identifying, justifying retention of, and utilization of idle equipment. An inspection of all standby and abandoned facilities and all storage areas is to be scheduled. A determination is to be made as to whether: (1) idle equipment is so identified and adequately tagged, (2) justification for continued retention is adequate, and (3) property is properly classified as to in-service, held for future use, standby, or excess. Representatives from AEC-RL and AEC-HQ Auditing, and DUN Auditing and Property will participate.

COMPUTER ASSISTED AUDITS

The AEC Assistant Controller for Auditing published a "Synopsis of Computer Assisted Audits Performed by AEC and Contractor Audit Staffs." The synopsis provided current information on the extent to which the computer was used in

the performance of audits. It included a total of 52 applications, of which three of the six submitted by Hanford contractors were from Douglas United Nuclear.

EMPLOYMENT

Employment Summary

DUN personnel totals and employee allocations as of February 28 and March 31 are shown in Appendix B.

Force Reductions

Through March 31, 173 employees had left the payroll as the result of the shutdown of KW Reactor. Through extensive placement efforts, jobs were found for 33 of the 113 who were involuntarily laid off during this period.

Equal Employment Opportunity

On March 12, a DUN employee filed a complaint with the Washington State Board Against Discrimination in which it was alleged that the Company is discriminating against its black employees by the manner in which it selected employees for layoff. Two other black employees were named as being subjected to the same discrimination.

Following an informal investigation by a Board representative, the problems concerning the three named individuals were satisfactorily resolved. The case is being held open, however, due to DUN's unwillingness to consent to the Board's position that minority employees should be given immunity from seniority considerations during force reductions.

UNION RELATIONS

A dispute concerning the seniority status of previously promoted employees who are returned to the bargaining unit was heard at arbitration in February. The arbitrator's decision, received on March 9, sustained the Company's position that such employees were entitled to seniority as provided by the labor agreement. A dispute now exists as to the appropriate job grades to which such employees may be returned. It appears that this question may be resolved short of arbitration.

SAFETY

No personnel radiation exposures exceeded operational control.

Month-end safety statistics were:

Disabling injuries - March	0
- CY to date	1

Days since last disabling injury 47

Man-hours since last disabling injury 454,300

Number & Title	Authorized Funds - \$	Percent Complete		Remarks
		Design	Construction	
<u>N Reactor</u>				
GCP-406, Improved Safety Platforms and Accesses - 100-N Area	300,000	100	82	Dump condenser snubber platforms completed March 20.
GCP-411, Effluent Control Program - 100-N Area	1,830,000	100	67	<p>Section I - ATP completed December 11, 1969.</p> <p>Section II - Vulcan pipe being wrapped. One hundred twenty feet were received March 24. Coating and wrapping of an additional 14 pieces of 38-foot pipe is in process.</p> <p>Section IV - Held in abeyance pending approval of increased funding requested in Rev. 2 to the project proposal.</p> <p>Section V - The emergency dump tank has been hydrostatically tested. The retaining wall was poured March 18.</p>
DCE-519, Replacement of Bridge Crane and Hoist System with New Crane System - 105-N Storage Basin Area	465,000	98	0	Preparatory field work started March 2. The construction schedule was submitted for approval March 18. Fifteen preliminary shop drawings were received.
DCP-528, Fire Protection System Improvements - 100-N	40,000	5	0	Field design activities started March 2. Cell design was initiated March 18 with a field trip to check cell dissimilarities. Design halted by AEC-RL direction on March 27 due to funding problems.

PROJECT PROPOSALS AWAITING AUTHORIZATION

<u>Number & Title</u>	<u>Funds Requested</u>	<u>Date to AEC-RL</u>
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, Fire Protection System Improvements - 100-N	290,000	6/4/69
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	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	Completed - in approval status.
DCP-528, Rev. 1, Fire Protection System Improvements - 100-N	Completed	Completed - in approval status.
Export Water System Backup - 182-D (for 200 Areas)	Completed for Design Council approval.	Completed - in approval status.

UNCLASSIFIED

DUN-6596

G-3

UNCLASSIFIED

<u>Number & Title</u>	<u>Design Criteria</u>	<u>Project Proposal</u>
Stack Monitoring Improvements - 100-N Plant	Revision issued to Design Council for approval.	Awaiting approval of revised design criteria.
Heat & Ventilation System Improvements - 105-N and 109-N	Engineering study in progress (draft issued).	In preparation.
High Pressure Injection System Improvements - N Plant*	Preliminary engineering study completed.	In preparation.
Upgrade Flux Monitor System - N Reactor	Engineering study and design criteria preparation in progress.	

*Name change.

APPENDIX BEMPLOYMENT SUMMARY
(with employee allocations)

	<u>2/28/70</u>	<u>3/31/70</u>
<u>CONTRACT PERSONNEL</u>		
<u>02 Programs</u>		
Douglas United Nuclear	1515	1426
Assisting Other Contractors	<u>15</u>	<u>15</u>
Total - 02	1530	1441
<u>Other Programs Under AEC Contract</u>		
Assisting Other Contractors and WPPSS	35	35
Special Irradiations	8	4
Other Programs - Standards	<u>3</u>	<u>3</u>
Total - Other Programs	46	42
Total Contract Personnel	<u>1576</u>	<u>1483</u>
<u>COMMERCIAL ACTIVITIES PERSONNEL</u>		
	<u>19</u>	<u>23</u>
TOTAL FORCE	1595	1506