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IRRADIATION PROCESSING DEPARTMENT MONTHLY REPORT

FEBRUARY 1964

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HANFORD ATOMIC PRODUCTS OPERATION

GENERAL ELECTRIC

RICHLAND, WASHINGTON

MASTER

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IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
FEBURARY, 1964

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SUMMARY

MANUFACTURING

Reactor input plutonium production for February was 402.1 KMWDs: 297.4 at the six smaller reactors and 104.8 at the two K Reactors. Tritium input production was 6338 equivalent MWDs.

Power levels at the smaller reactors (other than C) were restricted during the first half of the month in compliance with an AEC directive limiting levels to previously attained maximums. On February 18 the AEC relaxed power level limits at the five smaller reactors to the former AEC administrative maximum of 2090 MW. Effective February 24, the bulk outlet water temperature limit of 93.5 C was relaxed at the B, D, DR and F Reactors to a limit of 95 C. By month's end, power levels at these four reactors were restricted by this outlet water temperature limit and at H Reactor by the administrative limit. The following record high power levels were achieved: 2075 MW at B, 2040 at D, 2015 at DR, 2000 at F and 2090 at H.

Power levels at the C Reactor and at the K Reactors were restricted by the AEC administrative limits of 2310 MW and 4400 MW, respectively.

Over-all time operated efficiency was 75.0% (75.4% forecast): 85.9% at the smaller reactors and 42.3% at the K Reactors. Low efficiency at the K Reactors resulted from scheduled tube replacement outages at both reactors.

Six failed I&E fuel elements were removed from the reactors: five of enriched uranium and one of natural uranium. Two of the enriched failures were at H, two at F and one at C Reactor. The natural metal failure was at D. All six of the failed elements were "side hot spot" failures and all six were stuck in process tubes. Six process tube leaks, at the rear Van Stone flanges, were corrected.

PRODUCTION FUELS

A total of 658 tons of natural and enriched uranium fuel elements was produced during February, 105% of forecast.

Canning line operation continued through the month at the rate of ten lines per day. Vacation relief personnel were used to operate the ninth line and seven operators on a temporary transfer from N Reactor Fuels Operation operated the tenth line.

Canning line operating efficiency was 98% for February.

Bare core inventory at month's end was 1050 tons, a 1.6 months' supply.

Finished fuel inventory was 1480 tons, a 2.5 months' supply, including 62 tons of dingot fuel elements.

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The manufacturing yields of regular and self-supported fuels remained at high levels during the month. A record high yield was established on the eight-inch, self-supported fuel.

Work in process at month's end was within the normal expected range. About five thousand self-supported fuel elements were backlogged ahead of the ultrasonic welders and 1200 watermixer elements were waiting spool attachment.

During a weekend, caustic in a sleeve machine boiled over splashing onto the floor and the control panel. The caustic tank had been filled about six hours earlier and was being brought up to temperature when this incident occurred. Poor circulation together with localized heating of the caustic near the steam coils was determined to have caused the violent boiling action. The water inlet pipe now has been extended to the bottom of the tank to improve circulation and minimize the possibility of poor mixing in the future. An over-temperature control near the steam coils is being installed to prevent excessive localized heating in the event of a failure of the circulating system.

The keys in the basket tilt arm on the quench machines have always been troublesome to keep in place. The problem has been worse in recent months because of more frequent basket changes for the K Reactor self-support models. The keys are now being welded into place. This improvement will eliminate some of the quench machine downtime.

Two incidents of greater-than-normal downtime occurred on the lathes during the month. The first involved the cam switch which operates the load and backup cylinders. The faulty switch was replaced with a new switch from spare parts but the problem still existed. The trouble was finally traced back to the new switch which turned out to be faulty. A second new switch corrected the problem after losing 170 minutes of lathe time. The second incident was due to the unload safety photocell and loader alignment. Two hours downtime was experienced. Backlog built up during each of these incidents was worked back into the stream before the end of the following shift.

For the first time in several months, contaminated helium gas gave welding problems on two different occasions. There were four bottles involved and all have been returned to the vendor.

Weld overhang caused by the arc striking at the edge of the cap appears to have been eliminated. A flat area was ground on the switch cam allowing the arc to strike on the inside of the cap, away from the braze layer.

The diameter of the nylon tips for the double spindle welder mandrels and the automatic mandrel was increased in size by five mills and is now the same size as the plug gage. This action, taken when it was found that male end overhang rejects could be forced past the mandrels, will spot the overhang occurrence and will allow immediate corrective action.

During the month, nine lots of material (approximately eighteen thousand pieces) that had been in storage more than 90 days were re-inspected on a sample basis, in accordance with Quality Control Standard F-701.0, and released for shipment.

A complete autoclave failure (the first in 14 months) occurred on February 5, 1964. This has tentatively been determined to be the direct result of a pin-hole in the weld bead connecting with a void in the braze layer.

Producer-site specifications for beta heat treating natural and enriched uranium core blanks were revised to provide a standard 20-second transfer time from the salt bath to quench for both materials. This revision permits National Lead to heat treat enriched uranium in the same furnace as used for natural uranium, thus eliminating the enriched uranium grain size variation that resulted from the poor condition of a furnace formerly used to heat treat enriched material.

Pre-irradiation measurements of ten-inch enriched fuel elements and six-inch controls prepared for a preliminary in-reactor test to compare dimensional stability were completed. Pilot scale evaluation of at least 2,500 small-reactor ten-inch enriched fuel elements and 1,000 K Reactor ten-inch enriched fuel elements is planned.

A third production test consisting of five columns of natural self-supported hot die sized fuel elements, and five columns of alternated hot die sized and AlSi control pieces have been pre-measured for charging into C Reactor during the next outage. Fuel support height was reduced five mils on the test pieces to allow for diameter growth similar to that experienced in earlier tests.

National Lead has experienced difficulty in controlling the carbon content and grain size of the 28 tons of depleted uranium on order. Recycle of low carbon ingots, reject cores, and bar ends will be permitted to produce the 15 tons of K Reactor (KID) cores on order. Approximately one hundred O3D cores were received in February for canning studies, and the balance will be shipped the first week of March. Delivery of the KID cores has been promised by the end of March.

RESEARCH AND ENGINEERING

Data obtained in heat transfer experiments show that flow instability occurs with less coolant flow reduction in smooth-bore process tubes with self-supported fuel than in ribbed process tubes with smooth fuel. Panellit low trip pressure limits for self-supported fuel charges in K and C Reactors have been set higher to achieve the same level of protection as normally provided a fuel charge in a ribbed process tube.

The first phase of a six-ton demonstration irradiation of thorium was loaded in F Reactor on January 14 for a goal exposure of 78 operating days.

Preliminary results from gram samples of thorium encased in graphite instead of aluminum and irradiated for 15 days bear out the hypothesis that significant U-232 contamination in the earlier tests came from the absorption of high energy gamma rays from the aluminum.

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A successful demonstration of automatic flux distribution control was completed at D Reactor; two 3-hour runs and one 22-hour run indicated excellent over-all control consistency (with power level held in general to $\pm 0.25\%$ around the mean) with the input signals derived from representative tube outlet temperatures.

FACILITIES ENGINEERING

Reactor Plant Deactivation Operation was established February 1, 1964. A nucleus organization was appointed, offices established, and engineering studies were initiated during the month.

There are 2,351 zirconium tubes now installed in the 105-KE Reactor, and 2,358 in 105-KW.

Four hundred prototype magnesium magazines for K self-supported fuel elements have been received. The first ten were cycled through the fuel charging operation 10-12 times each at the 105-KE Reactor. There were no indications of damage to either fuel or the magazines.

The two prototype self-supported fuel element charging machines designed and fabricated by the Union Machine Works, Incorporated, were utilized to charge tubes at the KE Reactor. The machines functioned satisfactorily during the displacement discharging operation on goal-exposed fuel. Abnormally high forces continue to be encountered on columns irradiated beyond goal.

Planning is well along for the planned installation of VSR liner sleeves in a second channel at 105-C Reactor. Tests of simulated channel configurations (VSR channel No. 41) have been completed with an acceptable average graphite removal rate.

A contract for design and fabrication of a 105-K Reactor VSR thermal and biological shield opening enlargement machine is being negotiated.

Conceptual and preliminary engineering work on the initial study of the conversion of a small reactor for power production is nearing completion with capital cost estimate preparation and economic evaluation in progress. In this portion of the study program, net electrical outputs ranging from 500 to 950 MWe were obtained. Study results will be published in a report on April 1, 1964.

A preliminary report (HW-80893) covering the investigative work performed to date on the K Reactor RTD corrosion problem was issued. Fabrication of an out-of-pile recirculating test loop has been completed with the exception of installation of the heat exchanger. Installation of test samples intended to provide a means to measure galvanic characteristics of the various stem materials in a simulated reactor environment will be initiated upon completion of loop fabrication.

The prototype intermediate range neutron monitor installed on F Reactor recorded a scram shutdown with satisfactory results. Test data show that this system meets all basic requirements.

RESPONSIBILITY

The Reactor Plant Deactivation Operation was established February 1, 1964 with the Manager - Reactor Plant Deactivation, responsible to the Manager - Facilities Engineering. The new component is responsible for planning and directing reactor plant shutdown and for transfer of the deactivated facilities to the AEC.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
General	7	2	9
Research and Engineering	88	55	143
Manufacturing	387	1321	1708
Production Fuels	98	400	498
Facilities Engineering	88	33	121
Financial	<u>18</u>	<u>13</u>	<u>31</u>
TOTAL	686	1824	2510

W. W. McIntosh, Manager - H Reactor, Manufacturing, was appointed Manager - Reactor Plant Deactivation, Facilities Engineering.

Effective February 15, H. C. Copeland, E. J. O'Black and N. H. Skarshaug were transferred from Manufacturing to Reactor Plant Deactivation, Facilities Engineering, as Senior Engineers - Instrument, Electrical and Mechanical, respectively.

Effective February 1, R. Neidner, Senior Engineer, Research and Engineering, transferred to Hanford Laboratories.

Effective February 10, E. Hilgeman from Production Fuels was appointed Manager - Maintenance, H Reactor, Manufacturing.

Effective February 12, M. P. Johnson, Manager - Power, F Reactor, Manufacturing, transferred to the Mississippi Test Support Operation. E. R. Keplinger was appointed Acting Manager - Power at F.

Effective February 14, D. F. Watson, Engineer, Facilities Engineering, transferred to the Mississippi Test Support Operation.

Effective February 25, C. N. Gross was appointed Acting Manager - B-C Reactor, Manufacturing, to serve while W. J. Ferguson completes his duties as a member of HAPO's negotiating committee. With this change, R. E. Dunn resumed duties as Manager - C Processing, B-C Reactor, Manufacturing.

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SAFETY, SECURITY AND RADIATION EXPERIENCE

There were 105 medical treatment injuries, six security violations, two disabling injuries and no radiation incidents exceeding operational control limits. One disabling injury occurred when a Utility Operator at D Reactor fell from a ladder fracturing the third lumbar vertebra. The other occurred when a B-C Maintenance Supervisor fell on the discharge work platform at B Reactor and sustained a bone fracture of his right arm.

INVENTIONS

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report. Such persons further advise that, for the period therein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

OC Schroeder

Acting General Manager

OC Schroeder:DLD:bm

MANUFACTURING

PRODUCTION & GENERAL

Reactor Production

Reactor input plutonium production for February was 402.1 KMWDs: 297.4 at the six smaller reactors and 104.7 at the two K Reactors. Tritium input production in the H Reactor E-N load was 4,875 equivalent MWDs; incidental production in fringe poison at other reactors yielded an additional 1,463 equivalent MWDs.

Power levels at the smaller reactors (other than C) were restricted during the first half of the month in compliance with an AEC directive limiting levels to previously attained maximums. On February 18 the AEC relaxed power level limits at the five smaller reactors to the former AEC administrative maximum of 2090 MW. Effective February 24, the bulk outlet water temperature limit of 93.5 C was relaxed at the B, D, DR and F Reactors to a limit of 95 C. By month's end, power levels at these four reactors were restricted by this outlet water temperature limit and at H Reactor by the administrative limit. The following record high power levels were achieved: 2075 MW at B, 2040 at D, 2015 at DR, 2000 at F and 2090 at H.

Power levels at the C Reactor and at the K Reactors were restricted by the AEC administrative limits of 2310 MW and 4400 MW, respectively.

Over-all time operated efficiency was 75.0%: 85.9% at the smaller reactors and 42.3% at the K Reactors. This TOE at the K Reactors resulted from scheduled tube replacement outages at both.

Fuel Exposure

There were no discharge goal exposure changes during February. The average exposures (MWD/T) of irradiated fuel discharged were:

	<u>Smaller Reactors</u>	<u>KE & KW Reactors</u>
Natural Uranium	648	776
Enriched Uranium	852	768

Reactor Personnel Certification

Five reactor supervisors and five reactor specialists completed certification requirements. Four engineers and one supplemental crew supervisor completed a special reactor studies program. All group testing of supervisors and specialists is complete.

REACTOR AND POWER STATISTICS - FEBRUARY, 1964

REACTOR DATA	B	C	D	DR	F	H	KE	KW	TOTAL
INPUT PRODUCTION - PU - KMWD	44.8	52.1	50.6	48.6	47.8	53.5	51.9	52.8	402.1
" - TRITIUM - EQUIV. KMWD	311	59	224	469	363	4875	37	0	6338
POWER LEVEL - MW (MAX.)	2075	2310	2040	2015	2000	2090	4400	4400	21330
" - MW (AVG.)	1895	2262	1999	1928	1900	1967	4102	4396	20449
TIME OPER. EFFICIENCY - %	81.5	79.5	87.3	86.9	86.7	93.8	43.1	41.5	75.0
OUTAGES - ALL CAUSES	2	2	1	2	3	2	2	1	15
OUTAGE TIME ALLOCATION - %:									
CHARGE - DISCHARGE	6.4	8.9	5.9	4.6	1.6	0	9.8	0	4.6
FAILED FUEL REMOVAL	0	1.3	2.2	0.7	1.9	6.2	0	0	1.6
WATER LEAKS	2.9	2.2	0	2.7	4.0	0	0	0	1.5
TUBE REPLACEMENT	3.2	1.5	1.0	0.9	0	0	36.9	55.3	12.3
OTHER MAINTENANCE	5.6	1.7	2.6	4.2	5.4	0	4.0	0.9	3.1
PRODUCTION TESTS	0	4.0	0.2	0	0.4	0	2.9	0.2	1.0
PROJECT WORK	0	0	0	0	0	0	0	0	0
OTHER	0.4	0.9	0.8	0	0	0	3.3	2.1	0.9
TOTAL	18.5	20.5	12.7	13.1	13.3	6.2	56.9	58.5	25.0
WATER LEAKS - TUBE	0	0	0	0	0	0	0	0	0
" - VAN STONE	1	0	0	1	4	0	0	0	6
NEW TUBES INSTALLED	1	3	1	1	4	0	628	0	638
FUEL CHARGE - TONS NAT. U.	193.6	184.1	196.2	179.7	189.2	3.1	414.9	403.2	1764.0
" - TONS ENR. U.	28.9	38.6	26.4	39.5	32.1	198.3	45.0	48.9	457.7
FUEL ELEMENT FAILURES	0	1	1	0	2	2	0	0	6
HELIUM CONSUMED - M CU FT.	243.1	372.9	296.3	182.9	212.5	161.3	182.6	124.0	1775.7
POWER DATA									
RIVER WATER PUMPED - M GALS.	8986.8		7690.9		3468.4	4346.1	4065.7	6635.8	35193.7
WATER EXPORTED - M GALS.	588.4		0		0	0	0	0	588.4
WATER TREATED - M GALS.	3287.4	5109.2	4389.7	3160.8	3434.2	4343.1	4046.8	6635.8	34407.0
WATER TO REACTOR - M GALS.	3581.1	4050.7	3477.9	3642.0	3254.1	4078.1	2949.1	5861.4	30894.4
" - GPM (NORM)	89500	97000	88800	87700	88000	91900	206500	207500	
" - PH	6.70	6.60	6.61	6.63	6.64	6.62	6.63	6.85	
" - DICHROMATE (PPM)	1.49	1.39	1.44	1.45	1.38	1.40	1.28	1.57	
STEAM GENERATED - M LBS.	71482		83767		43771	45269	20266	22322	
LBS. STEAM / LB. OF COAL	9.22		9.19		9.16	9.07			9.17
" / GAL. OF OIL							99.7	114.5	106.9
ELECTRICITY GENERATED - MWH							1237.6	1433.6	2671.2

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REACTOR OPERATIONS

Reactor & Power Statistics

These are tabulated on page B-2.

B-C Plant

Power level at B Reactor was restricted during most of the month to the previous high of 1940 MW in compliance with the administrative limit recently imposed by the AEC. During the last few days of the month, with this limit relaxed, a record high power level of 2075 MW was reached during operation at the 95 C bulk outlet water temperature limit. At C Reactor, on 9-pump operation during the first week of the month, power level was restricted by the 95 C bulk outlet temperature limit. With 10-pump operation, started on February 7, C Reactor's power level was restricted by the AEC administrative limit of 2310 MW.

B Reactor had one scheduled outage (93.7 hours) for charge-discharge, and was down on a second occasion for 35.1 hours because of severe water leakage from a front nozzle cap. During the scheduled outage, in addition to charge-discharge, 503 process tubes were gaged for wall thickness, all front face nozzle lug rings were inspected, and five discharge chute mattress plates were replaced. During the second outage at B, the reactor was checked for water leaks, one process tube was replaced because of a leaking rear Van Stone flange, and three leaks were corrected by tightening the rear nozzles.

Two outages occurred at C Reactor: one to remove a failed I&E enriched uranium fuel element (45.0 hours) and a scheduled outage (97.9 hours) for charge-discharge. During the failed fuel element outage, the initial fuel element in the C-1 test loop was discharged and another element charged. During this same outage, some charge-discharge was performed and hardness tests were made on two horizontal control rods. Principal work accomplished during the scheduled outage (other than charge-discharge) was as follows: wall thickness measurements were made on 75 process tubes; two process tubes were removed and replaced in compliance with PT IP-560; an air channel was retubed; a universal flexible vertical safety rod was installed; and the control panel of the gas system was modified (DC 721).

A ground fault on the No. 3 line at Priest Rapids Dam caused two minor surges in the BPA electrical power supply on February 10; equipment in B-C Plant was not affected.

On February 20, the B-C Power Operation accepted responsibility for station maintenance and transmission of data from a Columbia River stage recorder located at the Allard Pump House above Coyote Rapids.

D-DR Plant

Average daily production for February was a new record for D Reactor. Also, new power level records of 2040 MW and 2015 MW were achieved at D and DR Reactors, respectively, following removal of the AEC administrative restriction

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to previously established maximums. At month's end, power levels at both reactors were restricted by the bulk outlet water temperature limit of 95 C.

The one outage at D Reactor (88.4 hours) was caused by the failure of an I&E natural uranium fuel element. The element was stuck, and required downstream rib removal before it could be discharged. Other work accomplished during this outage included charge-discharge, process tube wall thickness measurements (100 tubes), conversion of one poison column control facility tube to a regular process tube, and repositioning of the back snap rings on 26 front nozzles.

DR Reactor experienced two outages in addition to the January fuel element failure outage which continued 53.2 hours into February. One outage (36.3 hours) was for correction of a water leak caused by failure of a process tube rear Van Stone flange. The other was a 1.8-hour outage to repair a water leak at an inlet nozzle adapter. Outage work accomplished during February included charge-discharge, process tube wall thickness measurements (190 tubes), inspection of all front nozzle snap rings (with repositioning as necessary), helium testing to locate the leaking process tube, installation of larger venturis (DC 801) and front-adjust Panellit gages serving two process tube rows, and installation of two new flexible vertical safety rods.

On February 7, 10, 11, and 16, electrical power surges occurred on the BPA system. The only effects noted were fluctuations in water pressure of approximately 12 psi on two of these occasions. The D Reactor rear face fog spray system was activated once by a faulty soldered connection in the instrumentation system.

At DR Reactor, the results of hot and cold vertical safety rod drop time tests made in connection with the outage begun in January, have permitted less restrictive speed-of-control limits. Benefits are primarily in the realization of a more rapid rise to equilibrium power level following shut-down periods.

A preliminary test was conducted at the DR Filter Plant to determine the feasibility of using a less expensive by-product bauxite available from a domestic source. Although this test, which involved only 5,000 pounds of material, was successful, further testing in carload quantities will be necessary for conclusive evidence. The incentive is a reduction in bauxite costs of approximately 50 per cent.

Modification work in connection with the interim program for standardization of emergency audible alarms (DC 795) was completed at D Reactor.

F Plant

F Reactor established a new power level record of 2000 MW and a new average daily production record following removal of the AEC administrative limit which had restricted power level to the previously attained maximum.

Three outages were experienced: The first two (36.5 hours and 55.9 hours) were caused by failures of I&E enriched uranium fuel elements, and the third (0.2 hours) was caused by a Panellit trip which occurred during normal start-up.

Work completed during the first outage included removal of the failed fuel element using hydraulic force, minor charge-discharge, repainting of the rear neoprene seal, and reaming of 14 rear crossheader Parker fittings. Work completed during the second outage included removal of the failed fuel element using hydraulic force, installation of 138 front-adjust Panellit gages, minor charge-discharge, and replacement of four process tubes which had sheared rear Van Stone flanges.

Production Test IP-635-S, "Testing of Corrosion Inhibitors in Reactor Coolant Backup Systems", provides for evaluation of sodium dichromate as a corrosion inhibitor in one of the elevated water storage tanks. The goal concentration of 100 ppm dichromate was achieved February 10.

Momentary fluctuations of the BPA system voltage occurred on February 7 and 10. A brief 5 psi decrease in top-of-riser process water pressure was recorded. No other effects were noted.

The 450 HP motor on No. 14 pump in the River Pump House was removed from service February 18 and shipped offsite for examination to determine reasons for overheating during operation. The motor was returned on February 27 and will be placed into operation early next month.

H Plant

A continuous operational period of 31.4 days at H Reactor was concluded on February 22 by a fuel element failure. The AEC administrative limit on maximum power level at H was changed on February 18 from 1955 MW (the previous maximum) and 95 C bulk outlet water temperature to 2090 MW and 93.5 C bulk outlet temperature. Power level was maintained at the higher limit for the remainder of the month.

Both of H Reactor's two outages (30.1 and 12.8 hours) were caused by the failure of I&E enriched uranium fuel elements. Both elements were stuck in their process tubes. To facilitate removal of the charge which was contained in a spline tube, the front perforated aluminum spacers were removed. During this operation, the irradiated fuel element in the first position was inadvertently pulled out of the front nozzle into the charge platform pit. This element was picked up remotely and placed in the shielded spline pit, thereby permitting routine stuck charge removal work to continue.

Under Production Test IP-635-S, the addition of sodium nitrite (100 ppm) was begun to one of the elevated reactor water storage tanks as a corrosion inhibitor.

KE-KW Plant

Maximum power levels at both KE and KW Reactors were restricted by the AEC administrative limit of 4400 MW.

On February 15, KE Reactor concluded a 23-day scheduled outage for process tube replacement. A total of 628 process tubes (575 zirconium, 53 aluminum)

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was installed. Other major work accomplished during this outage included installation of two front-to-rear Geminol sheathed graphite stringers, repair of two effluent water system leaks, installation of a flexible vertical safety rod, and repair of faulty resistance temperature devices and lead wire. There were two other KE outages: a start-up Panellit trip (0.5 hour) caused by a faulty spline, and a 35.4-hour outage resulting from an inadvertent interruption of electrical service to the high pressure recirculation loop pumps of the associated 1706-KER testing facility.

KW Reactor was shut down on February 13 for scheduled process tube replacement, concluding a 43.5-day period of continuous operation. During 41 days of this run, which is the second longest period of continuous operation for a K Reactor, power level was maintained at the 4400 MW limit. At month's end, the planned number of process tubes (principally zirconium) had been installed and related tube hardware work was on schedule. Other major jobs accomplished following shutdown included installation of three flexible vertical safety rods, repair of four effluent water system leaks, horizontal and vertical safety rod system rehabilitation work, and installation of additional improved Panellit gages (under DC 611).

Erection of a small prefabricated oil storage building adjacent to each main process water pump house is essentially complete. The structures are designed to provide adequate storage facilities for flammable material and will aid the housekeeping effort within the Plant.

APPLIED REACTOR ENGINEERING

Plant Engineering

Electrical

The contract has been awarded for rewinding the second 3,500 HP process water pump motor at C Plant. The spare stator coils have been shipped to the vendor. The motor scheduled for rewinding will be removed from C Plant during the week of March 1.

Design Change 858, No. 1 Safety Circuit Manual Trip Modifications, was issued. This design change provides for modifying the K Reactors' No. 1 safety circuit such that both positive and negative control leads to the main relays are opened by the manual scram push button. This method increases the reliability of the circuit to function on demand for grounded circuit conditions.

Design Change 870 was issued providing for improved holding force for the VSR latch assemblies at both K Reactors by modifying the latch assembly with a longer latch arm.

The over-speed trip device on the confinement diesels at the K Reactors operates into the same trip circuit as low oil pressure and high water temperature. A time delay exists in this circuit to allow oil pressure

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build-up during starting of the diesels. This same time delay is present when a trip signal is received. As this delay is undesirable for over-speed trip, the location of the trip contact is being changed to allow immediate trip under over-speed conditions.

Initial set-up operability checks have been completed on the 16 Industrial Television Incorporated portable television systems (two for each reactor) procured under AR P-25041. Fourteen of the systems are being set up at White Bluffs for additional acceptance testing. Portions of the remaining two systems have been returned to the vendor for repair or replacement.

Mechanical

Design Change 881 was issued which provided for replacing a non-code process water branch connection at the K Reactors with a forged welded coupling which meets the requirements of the ASA B 31.1 American Standard Code for Pressure Piping.

Assistance was provided the Special Outage Service Operation during the February zirconium tube replacement program at the K Reactors. Van Stone flanging problems associated with the explosive tool and the rolling tool were corrected while the tools were in use.

Movies taken during the January outage at H Reactor for rear face hardware modification were edited and shown to interested H Plant personnel. These movies provide a comprehensive recording of tooling and methods used to complete nozzle and thermocouple replacement and reaming of the Parker fittings. They are available for further showings.

The stress-corroded crossheader sample from H Reactor that was boiled in magnesium chloride for 155 hours has been vibrated an additional one million cycles of 27cps, 17g's load, and 0.5 inch total displacements. No failure has occurred on the crossheader or fittings. Visual inspection of the specimen at the original cracks, left by the severe chemical treatment, shows what has been called fretting corrosion.

Production Test PT-IP-633-IS, "Rotary Spline Inserter", was completed. This test proved the capability of the rotary spline inserter as developed, and a Design Change is in preparation to authorize its use on all reactors (replacing the existing reciprocating inserter which requires excessive maintenance).

Substantial effort is being expended to make the spline coiling operation more efficient and also to reduce the radiation exposure received by operating personnel. Development Tests are in progress to improve the spline coiler ejection system, eliminate traversing of the work platform at KE and KW Reactors, and increase spline coiling rates at the six smaller reactors.

The river stage recorder at the Allard Pump House has been calibrated and is operable.

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During the tube replacement outages at KE and KW Reactors, rear face Parker fittings and connectors were examined for corrosion and cavitation damage. These components are being replaced as a part of the tube replacement program. As evidenced by damage observed, the new components are expected to have a life of five to eight years.

Instrument

Work continued on the qualification testing of RTD cable using silicone, as obtained in test quantities from two vendors: Markel and Prestolite. An order for 4,000 feet also has been placed with General Electric. Full effort is being made to expedite delivery of acceptable cable.

Design has been completed for installation of new duct work and cable for the KE and KW Reactor temperature monitors. The Design Change and MJA have been issued for approval.

Design Change 859, Process Galvanometer System Improvement - F Reactor, was issued. This provides an independent DC power source and a spare ionization chamber for the system. The existing power source is subject to building power outages.

Industrial

Engineering observations of a current KW Reactor outage, which started on February 13, are being made to determine the controlling time breakdown for outage activities of all types. This is the fourth in a series of such studies to identify ways in which to reduce outage time. The data, by delay causes, are being plotted to determine the number of additional work shifts that should be observed to obtain the desired confidence factor and establish priority areas for improvement action.

The Processing Manpower Planning Guide, which has been in trial application at D Reactor for several months, was updated to reflect current manpower requirements for certain outage jobs and is being made available to all Processing Operations.

Moving pictures taken of the overhead charging machine drive at D Reactor were analyzed. It appears that such equipment would be economically justified on the basis of outage time saved for all the smaller reactors. A covering Design Change is planned.

A pictorial Standard Operating Procedure has been completed and copies produced describing in writing and pictures how to operate valves and equipment in the seal pits of the Confinement Filter Building at H Reactor.

Engineering Studies and Analyses

An economic analysis was made of the cost of setting boiler pressure relief valves using vendors' field representatives versus training and certifying our own people. This study showed a savings of \$13,000 per year for the latter

approach, after deducting the cost of training local inspectors. This work has been coordinated with other HAPO departments and with relief valve vendors, and plans have been made to send at least two IPD exempt people off site in March to become certified by the three primary suppliers of these valves.

Analysis of the economics of process water pH at the K Reactors shows that the sum of the sulfuric acid and tube replacement costs is constant and a minimum for any pH from 6.6 to 6.8. The optimum pH is the highest between 6.6 and 6.8 that results in no higher fuel failure rate than experienced at 6.6 pH. A significantly higher fuel failure rate is not expected at 6.8 as compared to 6.6 pH. However, to establish the relative failure rate at 6.6 versus 6.8 pH, a half-plant comparison of the two conditions would be required. This test has been recommended in document HW-80830.

Replacement of aluminum spline tubes with zirconium in the two K Reactors would cost at least \$489,000 out-of-pocket plus 440 hours outage time. The benefits would be a lower sulfuric acid cost, elimination of tube replacement costs and outage time, and a higher reactor conversion ratio. Economic analysis shows that the installation cannot be justified because the re-payment period is at least two-and-a-half years and probably is more than three years. A document presenting this analysis is in preparation.

Maintenance Standards and Manuals

The current status of Equipment Maintenance Standards is as follows:

	<u>January</u>	<u>February</u>
Issued to date	62	86
Being routed for approvals	88	48
In comment status	16	5
In Preparation	<u>40</u>	<u>60</u>
	206	199

New service procedures and service manuals were completed and distributed to the plants as follows:

- An instrument service procedure on the Model V Beckman.
- An instrument service manual on the Model W and Model J pH Meters.
- An electrical service procedure on the Horizontal Control Rod and Ball 3X Battery System - C and H Reactors.
- A mechanical service procedure on the new K Charging Machine.

Plant Personnel Training

Training activities at the White Bluffs facilities were as follows:

The Transistor Electronics classes for the instrument and electrical shift maintenance personnel continued with ten craftsmen attending three 8-hour classes.

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Classes on the servicing of the portable TV system were conducted for 69 electrical engineers, supervisors, and craftsmen for a five-day period. Each man received eight hours of training.

The mechanical craft instructor trained Special Outage Service assigned personnel at the K Reactors on the use of the Van Stone flanging equipment. All shifts were covered during a four-day period.

Industrial engineering training activities included:

One sound-slide program, New Deburring Tool, was approved and issued to the Special Outage Service Operation. Sound-slide programs have been issued on 72 subjects to date. Two sound-slide programs were revised to reflect changes in equipment and procedures.

Two instruction classes on Work Sampling Theory and Application were presented to 14 Maintenance and Processing Operations personnel.

Three instructors were provided for Fundamentals of Manufacturing classes in Training Media and Training Techniques, Value Analysis, and Job Methods and Work Measurement.

An instruction manual was prepared and issued for the Union Machine Works charging machines used at the KE and KW Reactors. This manual covers control functions, preparation for charging, operation, magazine make-up, and trouble-shooting.

Manager, Manufacturing

RS Bell:TWH:DLD:bm

PRODUCTION FUELS

ALSI SHOP

Canning line operating efficiency was 98 per cent, 1.0 per cent above forecast.

Manufacturing yields during February continued at the relatively high levels experienced in recent months. A record high yield was again set on the eight-inch K-Reactor self-support model at 91.2 per cent. The average self-support welding yield remained at the high level of 98 per cent.

Production of projection fuels during February was:

	<u>Natural U</u>	<u>Enriched U</u>
Tons Produced	210	18
Finished Inventory	547	114

Acceptable Fuel Elements (Tons)

<u>NATURAL</u>				<u>ENRICHED</u>					<u>Total</u>
<u>C</u>	<u>K</u>	<u>K5NS</u>	<u>Reg.</u>	<u>C</u>	<u>K</u>	<u>K5ES</u>	<u>Reg.</u>	<u>Bumper</u>	
121.8	-	203.6	217.4	31.8	-	17.9	65.8	-	658.3 ⁽¹⁾

Per Cent of Forecast

123	-	135	84	138	-	76	95	-	105
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Manufacturing Yields

February

96	-	91	93	94	-	89	95	-
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Forecast

91	91	87	91	91	91	87	91	-
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Previous Month

96	94	90	94	-	-	90	93	
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(1) Includes 4.9 tons of upstream fuels.

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Operating Conditions, Incidents, and Improvements

Support welding equipment has operated satisfactorily the entire month. One new welder table and drum is in place and ready for production. The other two replacement welder tables are on plant and will be installed one at a time during the month of March.

With the introduction of "degreased only" rails, the average tensile peel strength of the welds has increased about 20 pounds. There also has been a significant decrease in the reweld rate.

The average welder throughput rate for the month increased to approximately 800 elements per welder shift.

The first two-plunger, two-footed shear tester was placed in service on February 14, 1964. It operated in an acceptable manner. The second two-plunger tester was found to be in need of minor modification. This work will be completed by month end at which time the old four-footed shear tester will be removed from the area.

Autoclave Failures

A complete autoclave failure (the first in fourteen months) occurred in a K-Reactor natural self-supported fuel lot. The failure was caused by a pinhole in the cap closure. Three pieces in the same lot with similar defects were rejected at weld inspection. All of the defects were too small to be detected by the UT-4 braze closure integrity testers.

MATERIALS

Fuel Recovery

The following amounts of AlSi fuel were recovered:

	<u>Pieces</u>
Eight-inch Natural	8432
Six-inch Enriched	7616
Six-inch Watermix	0
Total	16,048

Hanford Test Reactor

Available reactor time was utilized as follows: 215 routine production tests were performed (174 GO NO-GO and 41 drift tests), representing approximately 50 per cent of the available time with the remainder being utilized for special testing.

Inventories

Bare Core Inventory	1050 tons
Finished Fuel Inventory	1480 tons
Work in Process	269 tons

Scrap

Seven shipments of metallic uranium scrap were made during the month. Shipments totaled 43 tons of natural AlSi scrap, 3 tons of enriched AlSi scrap, and 28 tons of enriched N-Reactor fuel scrap. A total of 782 empty core boxes with lids was also shipped during February.

FUELS ENGINEERING

Quality Control

The amount of process produced upstream fuel increased by 1,307 elements in February. Fuel accumulated since August 30, 1963, totals 12,685 elements.

Arrangements have been made to irradiate the remaining natural bumpered dingot fuel (20,201 elements which had been held for upstream charging) in full length fringe columns. About half of this fuel has been shipped to the reactors. Approximately 3,500 elements were charged in February. It is expected that all bumpered dingot fuel will be charged by year end.

Rupture Experience

A total of six fuel elements failed in the reactors during the month of February.

<u>Fuel Element Type</u>	<u>Tube and Reactor</u>	<u>Exposure (MWD/T)</u>	<u>Rupture Classification</u>	<u>Failure Date</u>	<u>Canning Date</u>
Enriched Non-Bumper	3781F	535	Side Hot Spot	2/7/64	10/21/63
Enriched Non-Bumper	3465C	680	Side Hot Spot	2/9/64	11/20/63
Natural Non-Bumper	3473D	694	Side Hot Spot	2/20/64	10/18/63
Enriched Non-Bumper	1377H	351	Side Hot Spot	2/22/64	12/11/63

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Rupture Experience (continued)

Enriched Non-Bumper	1987H	343	Side Hot Spot	2/23/64	12/5/63
Enriched Non-Bumper	2257F	741	Side Hot Spot	2/24/64	10/17/63

Radiometallurgical examination of overbore fuel elements showing evidence of the cladding being "necked down" at the ends of the cores during irradiation indicated little or no bonding between the uranium and AlSi braze metal on the end caps. Further testing of a large sample of unirradiated overbore pieces from a rupture prone lot has further confirmed the presence of unbonded areas on about six per cent of the pieces tested. This condition appears to have resulted from larger than usual impurity stringers in the ends of the cores, which in most cases were filled with lead during the canning operation. Tests are currently being run in the pilot plant to improve bonding process parameters and resolve this problem.

Uranium Technology

The producer-site specifications for beta heat treating I&E core blanks were revised to provide a standard 20-second transfer time from the salt bath to quench for both natural and enriched uranium. Formerly the specifications were 43 seconds for natural and 20 seconds for enriched uranium. This change permits National Lead to heat treat enriched cores in the same facility as the natural, i.e. the Amsler-Morton furnace, and will eliminate the grain-size variation observed within enriched cores. This variation was apparently due to nonuniform quench conditions caused by the poor condition of the racks in the furnace formerly used for enriched uranium.

AlSi Process Development

Ten-inch enriched elements have been fabricated, measured, and assembled into charges for the initial production test (IP-654-A). Since large differences in fuel element warp measurements were obtained using N-Reactor and AlSi Shop gauges, the accuracy of these measurements is being checked in the Standards Laboratory.

Components drawings are being prepared and material procurement has been initiated for the assembly and irradiation testing of at least 2,500 small reactor ten-inch (O4E) fuel elements and 1,000 K-Reactor ten-inch enriched (K6E) fuel elements.

Projection rails were ultrasonically welded on 1,000 fuel elements in a pilot plant test using a roughened sonotrode tip. The test results showed a significant reduction in weld shear test rejects. Two production welders are being modified for further evaluation of the roughened tip design.

Radiograph inspection (Quality Control Standard C-311.0) of lithium-aluminum alloy target element weld closures has been eliminated. Justification for

this action is based on no defects being detected by radiography in over a year's production, coupled with the cost and maintenance of the operation.

Alternate Process Development

Hot die sized fuel elements for a third production test were prepared and charged in C-Reactor. This test is designed to obtain temperature data and to verify fuel dimensional changes experienced in previous production tests. The test consists of five columns of natural self-supported hot die sized fuel elements and five columns of alternate natural self-supported hot die sized fuel elements and AlSi control pieces. Rail support height on the test pieces was reduced five mils to permit normal discharge after irradiation.

Studies are continuing in an attempt to determine why the average mid-diameter of hot die sized fuel elements irradiated in the initial production tests increased six to eight mils more than that of the AlSi control pieces. Significant results obtained thus far in the examination of unirradiated test and control pieces are as follows:

1. Uranium texture coefficients obtained from X-ray diffraction data reveal a slight difference between hot die sized and AlSi brazed cores. Longitudinal measurements at the center indicate the growth index of the hot die sized cores is higher near the outer surface and less negative near the inner surface than AlSi bonded cores.
2. Metallographic examination also indicates a slight difference in uranium structure. There is some evidence of hot working, recrystallization and increased twinning in the hot die sized cores.
3. Dimensional changes of hot die sized cores have been detected in pieces removed and stripped after various process steps. In general, pieces processed completely through all process operations show a decrease in external diameter and an increase in internal diameter. The statistical significance of these changes is being analyzed.
4. Grain size of hot die sized fuel cores were measured with a UT-2 tester. There does not appear to be any difference in the "large grain" measurements taken, but there may be a slight difference in the "peak" measurements for the end bonded and water quenched cores.
5. Exploratory thermal cycling tests to determine effects on hot die sized fuel dimensions and diffusion bonding are underway. Fuel dimensions did not change when cycled up to fifty times between 10 C and 350 C. Cycling between 10 C and 450 C produced an increase in length, a slight change in external diameter and warp, and an increase in internal diameter.

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Radiometallurgical examination of hot die sized fuel samples has revealed no evidence of bond deterioration. Limited measurements of fuel elements irradiated in column positions #15 and #16 show a reduction in length of 0.028 inches and 0.025 inches in hot die sized fuel pieces, as compared to a reduction of 0.014 inches and no change in length, respectively, in the matched AlSi control pieces.

Preliminary development work was started on high silicon-aluminum alloy cladding using inner tubing which had been prepared on site. Fuel samples assembled with the high silicon alloy inner tubing and end caps were bonded successfully.

Efforts during this period were largely confined to work supporting the installation and operation of the new plating facility in 3716 Building. Construction of the pit and drain trenches for the nickel-plate machine was completed.

Alternate Product Development

National Lead has experienced difficulty in controlling the carbon content and grain size of the depleted uranium on order (28 tons) to produce high Pu-240 product. Of the 71 ingots cast initially, only 48 meet the specified minimum carbon content of 350 ppm. National Lead is rolling the ingots that meet the carbon specification and will absorb the anticipated 20 per cent reject rate for grain size. It is hoped that the 48 acceptable ingots will yield enough material to produce 13 tons of small reactor (03D) cores. In order to prevent the need for more derby feed, National Lead will be permitted to recycle low-carbon ingots, reject cores, and bar ends from the 03D run to produce the 15 tons of K-Reactor cores on order. One ingot of 03D cores has been received for canning studies, and the balance will be shipped the first week in March. The K1D cores will be delivered by the end of March.

Approximately four tons of thorium oxide were received from Mallinckrodt Chemical Works in January under a program to demonstrate IPD capability for producing clean U-233. Over three tons were delivered as high-density, "Sol-Gel" thoria and about one ton as low-density, direct-denitrated thoria.

The Hanford Laboratory has canned two tons of "Sol-Gel" thoria at a bulk density of 65 ± 1 per cent of theoretical and about one-fourth ton at 80 ± 2 per cent of theoretical. One ton of the 65 per cent material was charged in the fringe of F-Reactor starting in January. One ton of the higher density material will be charged into the central zone of a small reactor in March.

Delivery of the two tons of thorium metal on order has been delayed for various technical and economic reasons. Further delays may result in "Sol-Gel" thoria being substituted for the metal.

Equipment Design and Development

The alternate "T" section fuel support rail underwent extensive welding and load deflection tests to optimize support design and control of support height during welding. An optimum design of the "T" section support has been determined to consist of a die-stamped rail from either 25 or 32 mil 8001 aluminum alloy flat stock. Fabrication of a "T" section self-support stamping die is 80 per cent complete. Test quantities of the "T" section supports are scheduled for delivery by mid-March.

A prototype automatic roll sizer for K-Reactor natural self-supported fuel (K5NS) was placed in operation this period. Similar equipment is being fabricated for K-Reactor enriched self-supported fuel (K5E) and is scheduled for delivery by mid-March. Fabrication of an universal rail height gauge for K-Reactor self-supported fuel models was also completed this period and certified for service.

Initial testing of the automatic support weld shear tester has been completed. Results of this test point out several changes which are necessary to improve the reliability of this equipment. These modifications are under way in the test lab.

PLANT FACILITIES

Status of Active Construction Projects

CAF-961 - Consolidated 303 Area Services Facility - Phase I

Detailed design drawings and specifications for the new 3720 Building (laboratory and machine shop) have been completed by the Architect-Engineer. Total detailed design completion is pending review of these drawings and specifications for compliance with Design Criteria. Action on the revised project proposal requesting the construction funds of \$889,000 (total project \$955,000) was deferred by the AEC Review Board.

CAF-973 - Steam Distribution Line Modifications - 300 Area

Some minor items of work covered by a work order from the AEC are yet to be completed by the Labor Service Contractor.

CAF-979 - Pilot Scale Plating Equipment - 300 Area

Construction work for the installation of the electroplating equipment was started January 27, 1964, by the Construction Service Contractor. Upon completion of the concrete pouring, work was stopped by the AEC due to shortage of authorized funds. The installation cost estimate submitted by Labor Service Contractor had indicated the authorized funds would be overrun. Pending receipt of a revised estimate of installation cost and the subsequent determination of available funds, continuation

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of the project has been suspended. A revised project proposal submitted by the AEC to revise the completion date to April 15, 1964, has been approved.

CAI-994 - Utilities Extension - 300 Area

The fixed-price contract bids were evaluated and the low bid of \$108,400 was awarded to George A. Grant, Inc. This bid was far below the fair cost estimate of \$150,000. Notice to proceed has been acknowledged by the contractor, and layout work was started on February 13, 1964. Excavation was started on February 28, 1964. The contract completion date of August 2, 1964, exceeds the directive completion of June 15, 1964. Vitro Engineering is responsible for the Title III services for the project.

CAI-107 - Boiler Replacement for Additional Steam Generating Capacity -
384 Building - 300 Area

Detailed design completion by the Architect-Engineer is dependent upon equipment specifications to be furnished by the vendor.

The continued receipt of unresponsive bids on the new boiler led to revision of the design criteria which was approved by the AEC January 31, 1964. Total project funds of \$610,000 were approved by directive modification dated January 31, 1964. The purchase order for the procurement of the boiler was issued February 10, 1964, with a scheduled delivery date of August 15, 1964.

CAI-120 - Utilization of PRTR Waste Steam in 300 Area Distribution System

Preliminary design is underway by the Architect-Engineer, Bouillon, Griffith, Christoferson, and Shairer of Seattle. Preliminary drawings are to be submitted for comment early in March.

Equipment Modification

Loss of canning line efficiency due to equipment malfunction has approximated 1.1 per cent. Nearly half of this lost time was attributed to solenoid valve failures. To reduce efficiency losses from this cause, all of the solenoid valves are being overhauled.

The first revised welder table and new drum have been installed. The second table is in the shop ready for installation and the third is enroute from the Seattle vendor.

Utilities

The ash disposal line from the powerhouse became plugged on February 19, 1964, and was not completely cleared until February 24, 1964. Considerable overtime and holiday pay were required to accomplish this. Operating procedures have been modified to further insure against a recurrence of this plugging.

The power unit for the emergency electrical generator was rescheduled for shipment February 26, 1964, and the control unit the week of March 16, 1964. The concrete foundation work was completed February 14, 1964, and installation of the grounding grid is underway.

An appropriation request for \$25,300 was prepared for the procurement and installation of an additional 800 cfm air compressor at the powerhouse. The AR has been approved by the Department Acting General Manager.

The sanitary sewer modifications to ease overloaded conditions have been completed and are in use.

Statistics

	<u>February</u>	<u>January</u>
Maximum steam generated (M lbs/hr)	118	132
Total steam generated (M lbs)	67,458	70,041
Total condensate returned (M lbs)	26,054	29,205
Coal consumed (tons)	3,213	3,323
Evaporation rate	10.50	10.54
Efficiency - actual	81.7	82.0
Efficiency - optimum	85.0	85.2
Import sanitary water (M gals)	106.7	114.1
Peak water flow (gpm)	5,000	5,000
Peak water consumed in 24 hours (M gals)	4.3	4.1
Compressed air production (M scf)	56,232	52,959

Plant Services

Major jobs completed during the month included the fabrication and replacement of 40 feet of damaged zig-zag conveyor guard in 313 Building; fabrication and installation of housing and associated ductwork for a large booster coil in the main ventilation duct for the north half of the 333 Building; fabrication of large rectangular exhaust ductwork to be installed for the HX-1 enclosure in PRTR during the next scheduled reactor outage; fabrication of six new basket assemblies for experimental use in 306 Pilot Plant; fabrication of an experimental plating rack for alternate process development; installation of new fire alarm enunciator panel in PRTR; repair of the west high tank water level gage; cleanout of the plugged ash disposal line from the powerhouse to the ash disposal basins; fabrication of new canning line truck pallets and new six-inch fuel element pallets; 333 Building chemical bay walls and ceilings and painted with an acid and alkali fume resistant paint.

Two hundred and eighteen (218) hours of training were presented to electrical craftsmen by a field engineer from Lepel High Frequency Laboratories. The DeVry courses on semi-conductors and basic electricity are being conducted for instrument and electrical craftsmen. A total of 415 manhours of training was given during the period January 20 through February 20, 1964.

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Service Manual writing includes preparation of manuals covering the NRD 333 Building autoclaves, the roll sizer in 313 Building, and revision of the shear tester manual.

Manager - Production Fuels

WN Mobley:WKW:gl

RESEARCH AND ENGINEERINGPROCESS AND REACTOR DEVELOPMENTREACTOR FUELSThorium Oxide Target Fabrication

Fabrication of the second 20-tube charge of thorium oxide target elements to be irradiated under Production Test IP-648-AC has been completed. These will be used to replace the first charge, now being irradiated in F Reactor, about April 1. These two charges are "low density" material, with an effective density of 6.6 g/cc.

The first 19-tube charge of "high density" material is being fabricated. Earlier indications were that it would be possible to achieve densities of approximately 82-85 per cent of theoretical. It now appears that 78-82 per cent will be a more realistic range. This reduction is the result of greater than expected variations in the sol-gel material. Attainable densities, using the as-received oxide, range from 75-85 per cent of theoretical. By screening and blending, it is possible to get the 78-82 per cent density mentioned above. It is also planned to use some "Nu-Pac" material which has higher density than the "as-received" sol-gel oxide. It has been found necessary to re-fire the denitrated oxide before it can be compacted. High nitrate and moisture content in the as-received denitrated oxide has caused excessive gas release during heating of the Dyna-pac cans.

Overbore

Destructive examination of overbore elements with suspected bond defects in the Radiometallurgy Laboratory has revealed the presence of lead in the bond layer on the ends of the fuel cores. The lead is apparent in two locations -- as globules in the bond itself and also adhered to the surface of "pores" on the end of the uranium core. Two lots of fuel elements have shown evidence of this bonding defect and both have been discharged from C Reactor as of the February 9, 1964, outage.

REACTOR ENGINEERINGExamination of Moderator Stacks

VSR distortion data collection has been essentially completed at the K reactors. To date, measurements have been made on three VSR channels at C Reactor, and five channels have been photographed. Similarity of the distortion pattern at C and K Reactors suggests that C can be analyzed in much the same way the K data are being analyzed.

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STATUS REPORT OF PRODUCTION TESTS

<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-216-A	Normal prod. natural and enriched fuel elements.	52	All	Normal variable goal.		Provides for monitoring the performance of a sample of all normal production material to assist in development of a Quality Index for production fuel. Test is continuous.
IP-272-A	I&E self-supported fuel.	69	C	Variable plus 200.		Provides for testing of CIVN model fuel in C Reactor ribless zirconium tubes.
IP-381-A and IP-431-A	I&E self-supported fuel over-bore size.	62	C	800 MWD/T		Provides preliminary qualitative data regarding irradiation behavior of larger fuel element designs.
IP-607-A	Oil-quenched enriched uranium elements.	15	F	600 MWD/T	230 MWD/T	Second step in evaluating irradiation effects on dimensional stability of oil-quenched enriched uranium. Elements charged during outage of January 14, 1964.
IP-610-A	Induction heat-treated fuel core.	10	DR	600 MWD/T	450 MWD/T	Provide data for evaluating dimensional stability of induction heat-treated fuel cores. Test elements charged on December 26, 1963.

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STATUS REPORT OF PRODUCTION TESTS (cont'd.)

<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-648-AC	Thorium oxide target elements.	20	F	78 Operating Days	21 Operating Days	First phase of irradiation of thorium in a six-ton demonstra- tion load. Elements charged during January 14, 1964, outage.

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Instability Limits for K Reactor Zircaloy Tubes

Data obtained in heat transfer experiments performed in an electrically-heated mock-up of the K Reactor Zircaloy process tube system confirm an earlier result, obtained with the overbore equipment, that the present method of determining instability limits for ribbed process tube fuel charges is not adequate for self-supported fuel charges. The data show that at given initial operating conditions, flow instability occurs with less coolant flow reduction in smooth-bore process tubes with self-supported fuel than in ribbed process tubes with smooth fuel. Thus, the Panellit low trip pressures must be set higher to achieve the same level of protection normally provided a fuel charge in a ribbed process tube. Current limits for self-supported fuel charges in the K and C Reactors are based on the C-overbore data and provide the desired degree of protection.

REACTOR PHYSICSNeptunium-237

All reactors continue on 100 per cent recycle for their enrichment. Additional yield data from the third E-N core has been obtained. The new data, together with that reported last month (part A), is listed below.

NEPTUNIUM PRODUCTION IN THIRD E-N CORE

<u>Part A (45.1 tons)</u>		<u>Part B (68.1 tons)</u>
g NP-237/ton U	3.71	3.86
Exposure, MWD/T	878	878

Six-Ton Thoria and Thorium Irradiation Test (Fringe Load)

Twenty tubes of thoria ($\rho = 6.65$) were charged in the bottom lattice row and 40 tubes of E-metal (0.947 w/o U-235) in F Reactor on January 14, 1964. The predicted tube powers in the E-metal directly adjacent to the thoria using the multigroup diffusion theory code HFN is approximately 600 kw/tube. The measured tube powers were 573 kw/tube.

Spline traverses in the thoria and E-metal will be made to check the predicted fluxes in the thoria and can then be used to determine the actual irradiation time for 1 ppm of U-232 and the expected yield of U-233.

Gram Irradiations in Graphite - DR Reactor

Gram samples of thoria were irradiated in DR Reactor for 15 days. The samples were encased in graphite instead of aluminum to test the hypothesis that significant U-232 contamination in the earlier gram sample tests

came from the absorption of high energy gamma rays from the aluminum. The preliminary results bear out this hypothesis very well; compared to the results from the aluminum encapsulated thorium, these results indicate that the gamma reaction accounted for about 48 per cent of the U-232.

Sample No.	ppm Th-230	Tube Position	Grams U-233/ Ton Thorium ⁽¹⁾	ppm U-232 ⁽¹⁾
3925	1.2	Fringe	422	0.30 ± 0.06
3927	0.2	"	319	0.30 ± 0.05
3947	0.4	"	371	0.26 ± 0.05
3945	0.4	"	322	0.23 ± 0.04
3950	0.4	Center	983	0.77 ± 0.07
3935	80.0	"	994	9.63 ± 0.28
3939	80.0	"	1024	9.98 ± 0.24
3928	0.2	"	Sample crushed during transfer.	

(1) Extrapolated to 200 days decay.

New Vertical Safety Rod Testing

Testing of samples from new safety rods in the HTR continued during the month. Forty-five heats out of 70 have now been tested (all were satisfactory) and 41 rods have been accepted for reactor use. The new rods continue to be approximately seven per cent stronger than the original BDF size rods due to the B₄C inserts.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience for critical IPD classifications through four weeks of the 1964 badge year:

Classification	Total Dose	No. of Employees	Average Dose/ Employee	Extrapolated Year End Average	No. of Employees Over 3R Extrapolated Exposure
Radiation Monitors	17894 mR	78	229 mR	2977 mR	42
Processing Operators	53362	247	216	2808	113
Pipefitters	20582	107	192	2496	35
Millwrights	20545	85	242	3146	39

Radiation Occurrences

Distribution by Reactor and Component

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>Totals</u>
Processing	1*	1			4	1			7
Maintenance	1*				1				2
Supplemental Crews					1				1
Special Outage Service					1				1
Central Maintenance						1			1
IPD Total	1	1	0	0	7	2	0	0	11
Outside IPD					1				1
Total	1	1	0	0	8	2	0	0	12

* Share responsibility in the same occurrence.

Effluent Activity Data

The table below shows average concentrations of selected radionuclides from reactor effluent samples taken during January 1964. All units are 10⁻¹² curies/ml.

<u>Reactor</u>	<u>p32</u>	<u>As76</u>	<u>Zn65</u>	<u>Np239</u>	<u>Cr51</u>
B	11.1	114	7.2	260	340
C	14.1	135	12.7	250	750
D	16.8	91	8.7	140	530
DR	10.8	122	15.2	170	1050
F	12.1	167	--	240	670
H	5.0	23	4.2	50	240
KE	6.0	49	5.0	80	220
KW	7.4	76	5.5	110	240

There were no significant changes in the treatment of coolant during the month of January 1964.

PROCESS TECHNOLOGY

PROCESS STANDARDS

HW-46000 B, Process Standards - Reactor

Three revised standards were issued during the report period. These were:

Process Standard B-010 - "Gas Composition, Pressure, and Flow"

The inlet dewpoint requirement was lowered to -5 F and the requirement to shut down the reactor if water collection exceeds 24 gallons per day was deleted.

Process Standard C-070 - "Horizontal Rod Withdrawal, Power Increase"

The power level range where the rise in power is first halted for a temperature map was increased.

Process Standard C-140 - "Speed-of-Control Criterion"

The correction factor to convert stringer temperature to filler block temperature was revised to 85 C. VSR drop time was redefined to specify measuring drop time from the opening of the LXX-LXXA relays. A reactivity test is now required on new VSR's.

HW-46000 D, H, and F, Process Standards - Reactor

Two revised standards were issued for each of these manuals during the report period. These were:

Process Standard C-070 - "Horizontal Rod Withdrawal, Power Increase"

This revision was identical to that described under HW-46000 B.

Process Standard C-140 - "Speed-of-Control Criterion"

This revision was essentially the same as that described under HW-46000 B.

HW-46000 K, Process Standards - Reactor

Three revised standards were issued during the report period. These were:

Process Standard C-040 - "Graphite Temperature Limits"

This standard was completely rewritten to specify the limits which have been in effect under test authorizations. Pertinent changes include: (1) higher graphite temperature limits based on reactor atmosphere of N₂ and He only; (2) restrictions on graphite temperatures if reactor is wet or inlet dewpoint is above -40 F; (3) requirements on side-to-side stringers and five front-to-rear stringers; and (4) prohibition of spline insertion within one lattice unit of a front-to-rear thermocouple stringer.

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Process Standard C-070 - "Horizontal Rod Withdrawal, Power Increase"

This revision was identical to that described under HW-46000 B.

Process Standard C-140 - "Speed-of-Control Criterion"

This revision was essentially identical to that described under HW-46000 B.

PROCESS CHANGE AUTHORIZATIONS

Fourteen Process Change Authorizations were issued during the report period: twelve to permit deviation from Process Standards - Reactor, HW-46000; one to permit deviation from Process Standards - Water Plant, HW-27155 Rev1; and one to permit deviation from Process Equipment Standards, HW-41000. These were:

PCA #4-5 - "Shipment of Irradiated Slugs, Air-Cooled Casks - C Reactor"

Shipment of up to 10 specially irradiated slugs per air-cooled cask was authorized provided 40 days decay time had occurred and time out of water did not exceed 24 hours.

PCA #4-6 - "Vertical Traverse of Process Tube #4674 - C Reactor"

Authorization was given to defer vertical traverse measurements until the next minimum outage.

PCA #4-7 - "Graphite Temperature Limits - B Reactor"

This process change authorized continued operation with graphite temperatures no more than 35 C above the limit in PITA IP-26-I provided: (1) power level was not increased; (2) inlet dewpoint was maintained below -5 F; (3) He concentration was not reduced; and (4) positive action was taken to achieve in-limit operation as reactivity status permitted.

PCA #4-8 - "Water Shutoff Times - F, K, C, D, and DR Reactors"

An extension of PCA #3-61 was authorized to allow time for completion of the water shutoff study. PCA #3-61 required obtaining water shutoff information from Process Technology for other than standard aluminum process tubes in normal sized channels.

PCA #4-9 - "Reactor Startup - Gas Atmosphere Per Cent O₂ Questionable - B Reactor"

This PCA authorized continued operation with the indicated oxygen content higher than the limit provided specified procedures were followed, and the reactor be shut down if in-limit readings could not be obtained within a specified time.

PCA #4-10 - "Confinement Exhaust Fans - C Reactor"

Authorization was given to remove the steam supply to the confinement exhaust fans for four hours to repair a steam line leak provided BPA electrical service was normal and no process tube caps were removed.

PCA #4-11 - "Removal of Process Water Backup to KER Loops During Reactor Shutdown"

This process change authorized replacing automatic process water backup to KER-1 with backup via manual valving and operation of rapid fill pumps provided graphite temperatures were below 100 C.

PCA #4-12 - "Raw Water Grove Valve Operation - H Reactor"

This PCA authorizes closing the guard valve in the raw water supply line provided procedures are established to assure manual admittance of raw water within 15 minutes after the high tanks begin to drain during an emergency.

PCA #4-13 - "Graphite Temperature Limits - B Reactor"

A ten-hour extension of PCA #4-7 (described above) was authorized to allow time for reactivity gains sufficient to achieve in-limit graphite temperature operation.

PCA #4-14 - "Borescopic Examination of KER-1"

This process change authorized deferring the required borescopic examination until the present charge in KER-1 is discharged.

PCA #4-15 - "Gas Atmosphere Control - K Reactors"

This PCA supplements Standard B-010 by authorizing deletion of water collection and N₂ content restrictions and requiring certain restrictions on oxygen and argon content during reactor startup and operation.

PCA #4-16 - "Oil Leaks and Low Oil Pressure, Last-Ditch Diesel Pumps - K Reactor"

Authorization was given to remove one diesel at a time from automatic backup without operating the other two diesels provided an operator was stationed to start the diesels if needed.

PCA #4-17 - "Steam-Driven Export Pump Maintenance - F Area"

Removal of the F Area export steam turbine for necessary repairs was authorized provided the other three export turbines were automatically available and procedures existed for restricting 200 Area and N Area export water flow within 15 minutes after a BPA power interruption.

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PCA #4-18 - "Confinement System, Fog Spray, Butterfly Valve - C Reactor"

Authorization was given to deactivate automatic controls to the butterfly valve to accomplish necessary repairs provided this valve would be manually closed if the fog spray is actuated.

MEMORANDUM OF PROCESS STANDARDS RELAXATION

This memorandum authorized the establishment of a 91-point zone temperature monitor matrix at DR Reactor and conducting simulated safety circuit tests.

PROCESS ASSISTANCE

One engineer audited conformance to Process Standards on all Processing Operations' shifts by making 15 inspections at each reactor during the report period.

FUEL FAILURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type or Material</u>	<u>Tube Power at Failure (kw)</u>	<u>Exposure MWD/T</u>	<u>Type Failure</u>
2/7/64	3781-F	KY-564-V	I&E E (0.94%)	1283	535	SH
2/9/64	3465-C	KC-279-A	I&E E (0.94%)	1340	680	SH
2/20/64	3473-A	KZ-699-B	I&E N	1234	694	SH
2/22/64	1377-H	KY-585-B	I&E E (0.94%)	1270	351	SH
2/23/64	1987-H	KY-586-B	I&E E (0.94%)	1320	343	SH
2/24/64	2257-F	CY-029-V	I&E E (0.94%)	1277	741	SH

Legend

I&E E - This is the symbol for internally and externally cooled production reactor fuel elements with uranium cores enriched in U-235. The fuel is irradiated in ribbed process tubes. The weight per cent U-235 in the core material is stated.

I&E N - This is the symbol for internally and externally cooled production reactor fuel elements of natural uranium. The fuel is irradiated in ribbed process tubes.

First Character

S Side Failure occurred on the side of the fuel element.

Second Character

H Hot-Spot Failure caused by accelerated high temperature corrosion attack.

OPERATIONAL PHYSICSPILE PHYSICS PLANT ASSISTANCE

Operating continuity was generally good during the report period, with exceptionally long runs at B, H, and KW largely offsetting a number of unscheduled outages at other production reactors. Flattening efficiencies averaged slightly lower than the previous 12 months' average, with operation under bulk and administrative power level limits and the associated reduced incentive to flatten. A general reduction in goal exposure has taken place in line with earlier product quality observations; average spike enrichment requirements will be slightly higher.

The zirconium retubing program at the K reactors is essentially complete.

A successful demonstration of automatic flux distribution control was completed at D Reactor; two 3-hour runs and one 22-hour run indicated excellent over-all control consistency (with power level held in general to ± 0.25 per cent around the mean) with the input signals derived from representative tube outlet temperatures.

SUMMARY OF OPERATIONAL DATA OF PHYSICS INTEREST
FOR THE MONTH OF FEBRUARY, 1964

Reactor	B	C	D	DR	F	H	KE	KW
ECT in February (1)	1495	1630	1495	1545	1470	1525	--**	2460
12-Month Average ECT	1500	1660	1510	1520	1505	1520	2480	2480
Equil. Scram Time (2)	15-23	20-25	15-18	17-19	15-20	20-25	20-25*	20-25*
Recording Time								
From:	1-23	1-20	1-23	1-23	1-21	1-23	1-24	1-22
To:	2-19	2-17	2-19	2-20	2-17	2-19	2-18	2-18

*Equilibrium scram recoveries are not attempted at the K Reactors.

**No equilibrium operation; down most of report period for zirconium retubing.

- (1) Effective Central Tubes: This value is defined as pile power level divided by the average power of the ten most productive tubes in the reactor.
- (2) This is defined as the maximum time in minutes which may elapse between scram and first indication while still permitting a successful scram recovery.

B Reactor - C. E. Hughey

A scheduled outage on 2-16-64 terminated a 25-day continuous run, characterized by average ECT and stable operation at the administrative power limit of 1940 MW. Due to a planned program of ex-reactor VSR testing, a large number of compensating splines was required for total control purposes during the ensuing outage, thereby affecting operating economics.

C Reactor - P. D. Gross

Several unscheduled outages interrupted operating continuity; a high incidence of enriched element ruptures led to discharge of a suspect lot of fuel; in addition, the last lot of rupture-prone overbore elements was discharged. The relatively large fraction of nonequilibrium operation resulted in decreased flattening efficiency and high nonequilibrium losses; however, startup critical results indicated prediction improvement, largely due to a detailed study of reactivity transients associated with high-CO₂ operation.

D Reactor - G. D. Baston

Operation was nearly continuous during the report period. The concept of automatic flux distribution control was satisfactorily demonstrated in a total of 28 hours of operation.

The current PCCF system (reduced to six operable ball-valved process tubes) will be retained at D Reactor for continued use in minimizing nonequilibrium losses and spline requirements for total control compensation.

DR Reactor - S. M. Skidmore

Despite unscheduled outages, the reactor operated generally at an administrative power limit of 1925 MW, with good flattening efficiency and low prediction errors and startup losses; the low startup losses (NEL) following recent outages have been achieved with use of both splines and the PCCF system.

F Reactor - G. C. Masche

Subsequent to the tube-replacement outage during the first part of the report period, operation was nearly continuous; power level was restricted by bulk outlet temperature. The galvanometer system is being upgraded by installation of a spare ionization chamber and conversion to a battery power supply.

H Reactor - E. L. Conner, Jr.

H Reactor operated continuously through the report period. Process coolant flow was increased about ten per cent by the extensive plumbing modifications during the January outage. Preliminary evaluation of effectiveness of the simplified E-N charge makeup indicates an improved front-to-rear flux distribution, and reactivity effects about as calculated. A program to reduce helium usage has, as expected, been restricted by biological shield temperatures rather than by graphite temperatures.

KE Reactor - D. G. Albertson

The reactor was down for tube replacement (completing zirconium retubing) for most of the report period, operating only the last three days. Initial operation indicated a favorable reactivity status for an intended long operating period.

KW Reactor - A. W. Medcalf

A scheduled outage was taken on 2-13-64, concluding 43 days of continuous operation. A record high residual exposure accompanied the record production; associated reactivity transients were well handled by the operating crews. The current outage will conclude the zirconium retubing program.

PROCESS PHYSICS STUDIES

Reactivity and Safety Control Studies

Assistance to N Reactor was resumed February 16 for the full reactor low-level physics testing program; this assistance will be completed with the conclusion of the low-level temperature coefficient test, which is expected to be carried out in late February or early March.

Documents reporting the results of the octant monitor study and the ZTM requirements for the C and H Reactors have been prepared for publication. A document summarizing nuclear safety instrumentation progress has also been prepared for issue in the near future.

Control Efficiency Studies

The automatic flux distribution control experiment (PT IP-578-C, Part II, Phase II) was successfully carried out in the D Reactor during the report period. The system, designed by Facilities Engineering Equipment Development, sampled eight representative process tube outlet temperatures (RTD's) on a time cycling basis. If any temperature was outside its half-degree dead band, the rod tip associated with the given zone was automatically repositioned a fixed amount (approximately one-half inch per increment). The system also had built-in logic for half-rod movements in case of simultaneous occurrence of near-side and far-side temperatures outside the dead bands in opposite directions. The system was quite effective in smoothing out the effects of a deliberate one-degree upset from equilibrium conditions. During a one-day test the only operator action taking place was for deliberately inducing some upset to tease the automatic system into greater activity. The one-day test was concluded after 22 hours when a capacitor in the system failed; in a permanent system some such components would be upgraded, but the system as assembled was successful in demonstrating the feasibility of both the physics and electronic concepts employed. In a permanent system a somewhat faster cycling time than the 24 seconds used would also be desirable; the three-degree upset test was not performed for this reason; it was felt that without modification of the parameters built into the existing circuitry the temperatures would oscillate about the dead band more than desired. Over-all control on total level was within ± 0.25 per cent even though no attempt was made to control total pile level as such. Should N Reactor experience and incentives indicate the need for automatic distribution control, these test results should provide a basis for project action; the N Reactor rod system was earlier provided with leads and switching arrangements which would be compatible with such a system.

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The SSA accountability codes (SSA100, -200 and -210) were normalized on January 31, 1964, and the new normalization factors were used to calculate the reactivity discharge and in-pile product inventories for January production. A new subroutine was required for separate accounting of H Reactor fringe E-columns; this subroutine has now been tested and is expected to be in working order for use in the February run, eliminating additional steps required with the H Reactor January data. Tables in HW-50300-B (the "Green Book") are being revised in accordance with the above normalization. The format, explanatory material, approval forms, and computer in-put program have all been completed. The program is to be run with print-out on reproducing masters, and the revised tables are expected to be published and issued in early March.

Plutonium yield data have now been received for the entire third E-N core. Because of the Redox fire these data were received in two parts. The initial results were substantially higher than expected, but tentative results from the second part of the run agree exactly with the plutonium conversion value listed for H Reactor in the revised accountability code. Tritium yield data from the lithium-aluminum in the fourth E-N core has been received from Savannah River and the indicated ratio was essentially the same as for the second and third cores. In other words, the most recent plutonium and tritium conversion information reinforces our earlier "best" yield data.

A rough draft of a production test authorizing the charging of an E-Q core load in the F Reactor has been completed and will soon be routed for signature. The thorium elements are expected to be available in time for charging into the F Reactor prior to March 15.

Operating Physics Training

A 12-hour refresher program for pile operators has been tentatively scheduled for starting in March. This program will include six hours covering the nuclear physics portion of the certification program.

TESTINGIRRADIATION TESTING

Irradiations - Sample and experiment irradiations were handled as follows:

<u>Reactor</u>	<u>Test Hole</u>	<u>Facility</u>	<u>Request No.</u>	<u>No. of Samples</u>	<u>Material-Purpose</u>
KW		Process Channel	HAP0-098	22	Graphite (burnout rate determination)
C		Process Channel	HAP0-098	40	Graphite (burnout rate determination)
KE		Process Channel	HAP0-098	44	Graphite (burnout rate determination)
KE	3C	Hot Graphite	HAP0-177	1	Graphite (irradiation damage study)
KW	2A	Quickie	HAP0-184	25	Washington Designated Program
KE	2D	Quickie			
KE	2B	Magazine	HAP0-263	1	Plutonium (neutron detector development)
KE	2B	Magazine	ORNL-193	5	KCl (isotope production)
KE	2B	Magazine	ORNL-204	1	HgO (isotope production)
KW	3674	General Purpose	HAP0-222	2	Uranium (swelling experiment)
KW	4C	Snout	HAP0-243	8	Iron (fast neutron damage study)
KW	2A	Quickie	HAP0-249	1	Flux monitors (neutron flux monitor development)
KW	4B	Snout	HAP0-251	1	Cobalt (isotope production)
KW	2A	Quickie	HAP0-252	5	Arsenic (tracer isotope production)
KW	4B	Snout	HAP0-263	1	Neutron detector (neutron detector development study)
F	E	Quickie	HAP0-219	1	Strontium (tracer isotope production)
C		Process Tube	HAP0-283	2	Thorium (thorium production rate in C overbore tube)
		Gamma*		8	Insulation (radiation damage study)

*Gamma irradiation facility is located in Building 105-KE storage basin

Vertical Bowing - Vertical displacements measurements were taken as follows:

<u>Reactor</u>	<u>Process Tube</u>	<u>Remarks</u>
F	4676	Down .06" since 10-63

Borescoping Activities - In-reactor channels and tubes were examined with a borescope as follows:

<u>Reactor</u>	<u>Channel or Tube</u>	<u>Motion Picture Record</u>	<u>Purpose*</u>
KE	VSR # 49	Yes	1
KE	KER 4	Yes	3
KE	KER 3	Yes	3
KE	KER 2	Yes	3
KE	Process Tube 4586	No	2
KE	Process Tube 4376	No	2
KE	Process Tube 3681	No	2

- *1 - VSR-HCR channel problem
- 2 - Maintenance support
- 3 - Routine examination

Spline Traverses - Front-to-rear flux distribution data were taken as follows:

<u>Reactor</u>	<u>No. of Tubes</u>
F	12
KW	6
H	9
DR	3

C-1 Loop Operation - (High Temperature Aluminum Corrosion Studies) - Test No. C-1-1, PT IP-623-D, Operation of the C-1 Loop Facility with Aluminum Clad Plutonium-Aluminum Alloy Fuel Elements, was discharged on February 10 after 52 hours at reference temperature (554 F). Test No. C-1-2, PT IP-623-D, was charged on February 10. Test C-1-2 reached reference temperature (550 F) on February 11.

COMPONENT TESTING

Irradiated IPD Fuel Examination, 105-C Facility - Examinations were completed on fuel elements from 32 tube charges requiring 30.6 fuel examination units. Individual examinations completed were 868.

<u>No. of Tube Charges</u>	<u>Production Test</u>
12	IP-431-A, Irradiation of Oversize Fuel Elements In The C Reactor Overbore Process Channel Facility
20	IP-581-A, Half Plant High Flocculation pH Test, B Reactor

Most of the month was devoted to completing installation of a new fuel handling system and modifying existing equipment.

Photographs of two B, two C, and one F Reactor fuel ruptures were taken.

Irradiated N Fuel Examination, 105-KE Facility - Visual, weasel, length, warp, and weight data were obtained on N fuel elements in accordance with PT IP-477-A as follows:

<u>No. of Elements</u>	<u>Tube and Discharge Date</u>
13 (inner)	KER-3 1-23-64
13 (outer)	KER-3 1-23-64
14 (inner)	KER-4 1-23-64
14 (outer)	KER-4 1-23-64

Profile measurements will be obtained as soon as a replacement transducer is installed and calibrated.

Irradiated Process Tube Measurements

Wall Thickness Gauge (eddy-current type) - WTG

<u>Reactor</u>	<u>No. of Tubes Measured</u>	<u>Report No.</u>	<u>HW Number</u>
D	85	7	80610
DR	193	8	80890
B	500	9	80959
Total	778		

Sector Annulus Gauge (eddy-current type) - SAG

<u>Reactor</u>	<u>No. of Tubes Measured</u>
B	9
DR	9

Ex-Reactor Visual, Weight, Micrometer Measurements

<u>Reactor</u>	<u>No. of Tubes</u>	<u>Tube Samples Measured</u>	<u>Reason Examined</u>
D	1	39	Leaking

Critical Reactor Component Examination - Examination of KE front flexible connectors and sensing lines was completed after tube replacement. KW front tube sleeve retaining rings were examined. Twenty-five KE front connectors were examined at 108-B. Of the 25 connectors examined 24 of them were retained for reuse. The one connector not returned had ten wires broken mechanically.

Panellit System Programs

Gauges repaired, calibrated by Maintenance	-	70	
Gauges meeting calibration criteria	-	61	(87%)
In-board gauge reliability examination	-	84	
Gauges meeting examination criteria	-	78	(92%)
-average for past year	-		(96.7%)
Response time determination	-	84	
Gauges meeting response criteria	-	84	(100%)
-average for past year	-		(99.9%)
Gauges receiving failure analysis	-	33	
2B-X1 switch examination	-	1048	
-acceptance rate	-	979	(94%)
-previous month	-		(90%)
Gauges received from vendor and examined	-	575	
-acceptance rate	-	512	(89%)
-previous month	-		(83%)
Gauges received from Central Maintenance and examined	-	466	
-acceptance rate	-	404	(87%)
-previous month	-		(83%)

Six hundred fifty-nine gauges were removed from panels for new gauge installation and prepared for shipment to the vendor as exchange gauges.

COOLANT TESTINGKER Loop Operation

KER-1 - Testing of four stainless steel clad crud detectors and four 17-inch NIEL fuel elements as authorized by PT IP-601-D continued. The objective of this test is to further evaluate the effects of ammonium hydroxide for coolant pH control, particularly the crud forming and decomposition characteristics of ammonium hydroxide at conditions approximating those expected at N Reactor.

KER-2 - The loop was charged with four NIEL fuel elements, two 18-inch lithium-aluminum target elements and one Zircaloy-2 clad thorium-uranium crud monitor as authorized by PT IP-536-A, Supplement D, PT IP-584-I, Supplement A, and IP-644-D. PT IP-536-A, Supplement D authorizes the irradiation of NIEL fuel elements with modified end closures. The objective of the testing authorized by PT IP-584-D, Supplement A, is to gain additional exposure information on the irradiation of the lithium-aluminum target alloys. PT IP-644-D authorizes the irradiation of the proposed N Reactor fuel surface crud monitor to demonstrate and evaluate its design. The loop pressure and temperature conditions more closely simulate those expected at N Reactor as authorized by IP-638-D.

KER-3 - The loop was charged with thirteen 26-inch co-producer elements as authorized by PT IP-645-D. The objective of this test is to demonstrate and characterize multi-product production by the irradiation of simulated N Reactor co-product fuel assemblies. The loop is being operated at temperature and pressure conditions authorized by PT IP-638-D.

KER-4 - The loop was placed on single-pass operation with the process tube empty February 14 because the pressurizer was damaged due to overheating during the reactor outage.

Single-Pass Tube Operation - 1706-KE

<u>Tube</u>	<u>Production Test</u>	<u>Water Supplied</u>	<u>Corrosion Inhibitors and Chemical Additions</u>	<u>pH</u>
SP-1 (2952)	IP-476-AL	Process	1.8 ppm dichromate	6.6
SP-2 (3050)	IP-604-A	Service	2.0 ppm sodium nitrite	6.6
			1.0 ppm silicon dioxide	
SP-3 (4355)	IP-520-A	Pilot plant	1.8 ppm dichromate	6.6
SP-4 (4456)	IP-520-A	Pilot plant	1.8 ppm dichromate	6.6
SP-5 (4557)	IP-604-A	Service	2.0 ppm sodium nitrite	6.6
			1.0 ppm silicon dioxide	
SP-6 (4863)	IP-604-A	Service	2.0 ppm sodium nitrite	6.6
			1.0 ppm silicon dioxide	
SP-7 (4963)	IP-449-A	Process	1.8 ppm dichromate	6.6
SP-8 (5063)	IP-449-A	Process	1.8 ppm dichromate	6.6

KE Reactor Outage Time Requirements - No unscheduled outages were charged to production testing. A total of 32.1 outage hours was charged to production tests as listed below:

<u>Production Test</u>	<u>Description</u>	<u>Hours</u>
IP-449-A	Charge-discharge single-pass and control tubes, remove and install coupon holders and corrosimeter probes	11.4
IP-476-AL		
IP-520-A		
IP-530-AL		
IP-604-A		
IP-477-A	Tray discharge KER-3 and KER-4	4.5
IP-644-D	Install a crud probe assembly in KER-2, charge and repair front nozzle leak	8.0
IP-645-D	Charge KER-3 and repair front and rear nozzle leaks	8.2

Out-of-Reactor Facility Operation

TF-1 - Testing was started to obtain cyclic corrosion data on the effects of the alkaline permanganate-inhibited sodium bisulfate decontamination process on an NPR process tube-to-nozzle rolled-joint specimen. Prefilming operating conditions are 1650 psi, 300 C and pH 10.0 adjusted with ammonium hydroxide.

TF-2 - Testing to evaluate crevice corrosion beneath Zircaloy-2 fuel element supports with ammonium hydroxide used for pH control continued. Testing of NPR steam generator tubing to determine the leak rate and corrosion effects of leakage and uniform corrosion testing of NPR silver-plated components and copper continued. Operating conditions are 288 C, 1340 psi and pH 10.1.

TF-3 - Testing to evaluate crevice corrosion beneath Zircaloy-2 fuel element supports with ammonium hydroxide used for pH control was continued. Operating conditions are 314 C, 1985 psi and pH 10.0.

TF-4 - Testing to obtain cyclic corrosion data on the alkaline permanganate-inhibited sulfamic acid decontamination process continued. Prefilming operating conditions are 1600 psi, 300 C and pH 10.0 adjusted with ammonium hydroxide.

TF-7 - Fretting corrosion testing of various materials continued. Operating conditions are 277 C, 1125 psi and pH 10.0 adjusted with lithium hydroxide.

The test sections contain the following materials:

1. A PRTR fuel element for fretting corrosion studies
2. Two dummy Zircaloy-2 clad elements for uniform corrosion testing of supports
3. Two NINL fuel elements for uniform corrosion testing
4. One KSE3 fuel element for uniform corrosion testing
5. Two 23-inch and one 12-inch NAE1 fuel elements for support fatigue and fretting corrosion testing
6. Type 316 stainless steel tubing fittings for caustic cracking testing
7. One Zircaloy-2 specimen for caustic attack testing
8. A section of NPR steam generator tubing for determining the leak rate and the size propagation of a pin-hole leak formed by intergranular corrosion
9. Stainless steel and Inconel coupons to be prefilmed for decontamination testing

TF-5 and TF-8 - Additional testing was performed to further evaluate the effects of a proprietary cleaning solution on N Reactor fuel elements.

TF-20 - Testing to determine the effects of heat transfer on aluminum corrosion in process water and the cause of resistance temperature detector corrosion and the effectiveness of various coatings continued. Operating conditions are 120 C, 9.5 gpm, and pH 6.0.

Legend

- NIE1 - N Reactor, inner tube, enriched, first model
NAE1 - N Reactor, assembly - tube and tube, enriched, first model
NIN1 - N Reactor, inner tube, natural, first model
KSE3 - KER Loops, single tube, enriched, third model

Manager, Research & Engineering

FACILITIES ENGINEERINGDESIGN ENGINEERINGVertical Safety Rods - Graphite Distortion

An attempt was made to clear a second VSR channel (No. 41) at the 105-C Reactor to permit subsequent installation of liner sleeves. Several difficulties and obstructions were encountered, with ultimate channel clearing - successful down to Layer 9. Remaining outage time permitted only small drill (P 23/64") penetration to the top of Layer 3.

Effort continues to be expended in testing the 105-C Reactor VSR channel reamers in the 195-D Test Tower mockup. Tests of simulated channel configurations (VSR Channel No. 41) have been completed with an average graphite removal rate of 7 cu.in./min. Data obtained in the third mockup channel test indicate that enlargement can be accomplished with negligible damage to process tube channels. All data to date indicate that if VSR Channel 41 can successfully be enlarged, all other channels at C Reactor can be drilled without damage to the process tube channels.

A vendor contract for design and fabrication of a 105-K Reactor thermal and biological shield boring machine is being negotiated. A study, HW-80862, reviewing a number of questions that were raised regarding the graphite stack forces theory developed earlier has been issued. This study also provides a theory for the recently observed failures of the VSR channel liner blocks in the three old reactors.

Process Piping System Studies

The program to assess the integrity of critical reactor process piping includes metallurgical and radiographic examination of selected samples in the various process water systems; visual inspection of pipe line interiors, supports and hangers, dye-penetrant examination; and vibration and stress analyses.

On-site inspections and discussions with Dr. Earl R. Parker, of the University of California, have been held concerning the brittle fracture susceptibility of some of the material samples previously tested.

Power Recovery Studies

All of the engineering studies on the concept of a high pressure recirculating system based on NPR technology have been completed; fuel cycle and operating and maintenance cost evaluation completed; and the capital cost estimates are being prepared. These studies indicate the conversion of the older reactors is technically feasible; however, the economic attractiveness of the conversion proposal will be dependent largely upon the load factor developed for the power generating system and the availability of some economic return from the sale of the various by-products produced in the reactor.

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For the cases considered in this portion of the study program, net electrical outputs ranging from 500 to 950 MWe were obtained.

Work is under way on all of the additional concepts included in this fiscal year's study program. These are:

1. Direct Cycle Steam Generation
2. Organic Coolant Cycle
3. In-Reactor Boiling
4. Nuclear or Fossile Superheat

PACE Budget Studies

To support the FY-1965 Revision and the FY-1966 PACE and Maintenance Budget submissions, budget studies were prepared to review the preliminary scope and justification of the proposed items. Items for which studies were made included:

VSR Channel Rehabilitation - 105-KE-KW and C Reactors
Replacement HCR's - 5 Reactors
By-Product HCR's - 5 Reactors
Intermediate Range Nuclear Instrumentation - 5 Reactors
Irradiated Fuel Element Handling Facilities - 105-KE-KW
Dose Rate Telemetering - 5 Reactors
Safety Circuit Modifications - 5 Reactors
Miscellaneous Fire Protection Facilities - All 100 Areas
High Speed Scanning Instrumentation System - 105-KE Reactor
Reactor Gas System Improvements - 105-KE-KW Reactors
Electrical Distribution System Improvements - 5 Reactor Areas

The conclusions reached in these studies indicated that not all of the items had sufficient justification at this time to warrant budgetary action.

Reactor Rear Crossheader Expansion Joints

Vibration and strain gage readings have been taken from selected locations on the 105-H Reactor rear face crossheaders to determine effectiveness of the recent expansion joint installation. The data obtained have been partially evaluated, and findings thus far indicate that a definite reduction of vibration and stress values have resulted from the installation.

Replacement Nozzle Caps - Old Reactors

New low nickel - cast iron nozzle caps similar to the K Area type have been designed as replacements for the existing weld fabrication caps utilized at the smaller reactors. These new caps would be utilized as spare parts replacements for the existing caps. They should provide longer life and less cost than the present design. Prototype quantities have been received and are being tested in the laboratory prior to installation on the reactor.

Fuel Element Shipment Monitoring

In order to prevent the recurrence of a recent incident involving the shipment of improperly aged irradiated metal to the Separations Areas, instrumentation is being developed to monitor fuel activity as a function of decay. The most feasible method appears to be the measurement of $I_{\alpha 140}$ gamma energy decay for use in the experimental verification of the proposed instrumentation system. The collimator required has been fabricated. Special buckets of segregated metal will be collected during the next fuel discharge at 105-C Reactor. The decay activity of these fuel element buckets will then be monitored for a five-month period to verify the feasibility of the proposed system.

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EQUIPMENT DEVELOPMENT

Self-supported Fuel Element (SSFE) Charging

The two prototype charging machines designed and fabricated by the Union Machine Works, Incorporated, were utilized to charge approximately 1300 tubes at KE Reactor on February 10 and 11. The machines functioned satisfactorily during the displacement discharging operation on goal exposed fuel. Abnormally high forces continue to be encountered on columns irradiated beyond goal. These higher-than-goal-exposure columns continue to cause difficulty and materially reduce charge-discharge rates. Minor modifications continue to be made to obtain incremental improvement in machine operation.

Ten all-magnesium fuel magazines were received from the Dow Metals Company and placed in service during the KE Reactor charging operation. Each magazine was cycled through the fueling operation approximately twelve times and exhibited no damage to either the fuel or the magazine during or after the fueling operation. The balance of the order, approximately 390 magazines, was received from the vendor on February 13. These magazines will be used during the next fueling operation at KW Reactor.

The development effort initiated to obtain lightweight, inexpensive plastic magazines for use with the existing prototype charging machines has been completed. Prototypes have been received and tests completed to evaluate the strength, flexibility, and general handling characteristics. It is our tentative conclusion that light, friable plastic magazines are not compatible with the current charging concept. One prototype vendor, General Plastics of Los Angeles, California, states he will be able to encase a polystyrene foam structure in a tough, plastic covering. Sample magazines are scheduled for shipment early in March. However, due to the increased cost of fabrication, this concept can no longer be considered an inexpensive, disposable magazine.

Prototype High Speed Scanner

The high speed scanner prototype system has operated 26,572 hours; no unusual incidents have occurred.

K Reactor Resistance Temperature Detector (RTD) Corrosion

A preliminary report, HW-80893, covering the investigative work performed to date on the K Reactor RTD corrosion problem was issued on January 31, 1964. Fabrication of an out-of-pile recirculating test loop has been completed with the exception of installation of the heat exchanger. Installation of test samples of Monel, aluminum, stainless steel, Inconel and Incoloy stems will be initiated upon completion of loop fabrication. These test samples are intended to provide a means to measure galvanic characteristics of the various stem materials in a simulated reactor environment. Additional samples of Inconel 600 and Incoloy 800 RTD seals are undergoing flow vibration endurance tests prior to installation on-reactor.

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Intermediate Range Neutron Monitoring

The prototype intermediate range neutron monitor installed on F Reactor recorded a scram shutdown in January 1964, with satisfactory results. Test data show that this system meets all basic requirements. The special Westinghouse gamma compensated (electrically compensating) thermal neutron chamber shows gamma background compensation of approximately 1-1/2 decades during startup conditions. Preparation of the technical specification covering the electronic equipment is proceeding.

Design Test Service

The N-Reactor program utilized 639 hours of engineering effort for design test service.

E-5

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PROJECT ENGINEERINGCGI-103, Fuel Element Charging and Handling System, KE and KW Reactors.

Bids are being reviewed for the two sit-down type fork lift trucks. Bids were received on the steel pallets for holding the magazines.

CAI-108, Emergency Storage Basin Coolant

Title II design drawings for this work in K and 100-B/C have been received for final review and approval for conformance to the design criteria. Detail design for the other areas has been deferred by the Commission pending the reactor deactivation schedule decision.

CGI-839, Modification of Fuel Element Test Facilities, 1706-KEE

On February 11, 1964, General Nuclear Company supplied three copies of a manual on the Log Count Rate Meter. The manual appears to fit the specification and the RLOO-AEC representative was so informed.

The vendor agreed to supply directions for correction and parts to correct the errors made in fabricating the annunciator for the safety circuit system which they supplied.

CGI-960, "C" and "D" Work Platform Safety Improvements, All Reactors

All phases of work are in progress. Procurement of brakes and sprockets has lagged. This will cause a project delay and the certified schedule is being revised. Rear platform preparation work at KW this month duplicated effort at KE last month. Pre-shutdown preparation work is progressing on plan.

CGI-966, Safety Circuit Trip Identification System, 105-B,C,D,DR,F, and H

Modification No. 2 to the Directive for this project has been received from the Commission, changing the scope of the work from a six to three small reactor installation.

The first pair of static switching assemblies (sufficient for one area installation) was received early in the month on schedule.

MJA-42, Interior Painting, Process Water Storage Tanks, B, F, H, DR, and C

J. A. Jones contractor has been advised to re-open Contract No. 185-JAJ, to start painting of the 190-B Tanks and the 183-C Tanks only.

AR-P-25041, Portable Closed Circuit Television Systems, All 105 Buildings

No word has been received from the vendor relative to expected return shipment dates of components rejected and returned to him in January. In the interim, five more zoom lenses have failed and must be repaired or replaced. Numerous errors and omissions have been found in the drawings supplied in the instruction manuals. Corrected manuals have been requested through RLOO-AEC Purchasing.

100-K Zirconium Retubing Program

Work is progressing on the installation of 625 zirconium tubes at 105-KW. This will bring the total to 2,351 zirconium tubes installed in 105-KE and 2,358 in 105-KW. A total of 5,253 zirconium tubes has been received from the vendor and 174 tubes have been returned to the vendor for a net receipt of 5,079 tubes.

The extruded spline tube nozzles have not been received. The first shipment possible appears to be near the middle of March.

Directives Received

HW-552, Mod. No. 5, Fuel Element Charging and Handling System -
KE and KW Reactors.
(Authorized total project)

HW-539, Mod. No. 2, Safety Circuit Trip Identification System
105-B, C, D, DR, F and H Buildings, dated
February 11, 1964.
(Reduced the scope from six to three reactors)

CPFF Construction Service Contractor-Liaison

Issued seven new work orders and supplemented one old job, for a total of \$58,057 to J. A. Jones Construction Company.

Plant Forces Work Review

The Labor Standards Board approved one job for assignment to plant forces, estimated to cost \$5,670.

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REACTOR PLANT DEACTIVATION

Engineering studies have been prepared or are in preparation on the following subjects.

1. Lay-away study on the "readiness" case, with the reactor plant held at low flow, with no fuel load, buildings heated and systems exercised to permit rapid resumption of production. This study was completed February 25, 1964.
2. Classification of all facilities, systems, and equipment in a typical reactor plant as to treatment for lay-away. This study has been started.
3. Export water system study. This study is to establish requirements for system changes and equipment additions resulting from reactor plant shutdown and increased separations needs. This study is in preparation.
4. Peripheral facility study. This study is to establish the practicality and economics of moving or continuing in operation in place the non-process facilities located in reactor plants to be shut down or affected by such shutdown. This study is in preparation.

In addition to the studies specifically mentioned above, investigations of such subjects as decontamination, fixing contamination, shielding and fire protection of deactivated plants, dehumidification by heating, and the use of packaged electric boilers, are being undertaken.

Manager, Facilities Engineering

RT Jessen:hrr

FINANCIAL

ACCOUNTING

An extensive analysis of the costs of burial of radioactive wastes in IPD was prepared and submitted to Financial Consolidations for inclusion in an AEC requested report. The information will be submitted twice annually.

Bonneville Power Administration has submitted a new electrical contract which reduces the HAPO firm demand from 406 megawatts to 370. HAPO can supplement this with 43.3 Mw of dump power if necessary. Assuming HAPO holds at the new firm, a monthly savings of about \$53 000 can be realized. IPD has been actively working toward the attainment of a new contract which will contain the best possible terms.

Work is continuing on the preparation of FY 1965 Revised Budget and FY 1966 Budget estimates.

AUDITING

During the month, revisions of six Department and six HAPO OPG's were issued. In addition, seven revisions of AEC Manual Chapters and three revisions of procurement regulations were reviewed and appropriate action taken.

The annual certification of proper administration of the Company Suggestion Award Plan was prepared for the Department. The certification was based on similar certifications obtained from Section Managers for their respective Sections.

Information relative to comments in the audit memoranda submitted by the Company Traveling Auditors was compiled for transmittal to the AEC.

Manager-Finance

RW McMichael:RET:imh

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SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Class'n</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-78942	Secret	PH Hutton	2-10-64	Feasibility Study - By-Product Horizontal Control Rods - All Reactors
HW-79027	Unclass.	WR Thorson	11-8-63	Design Criteria - Replacement and Improvement of Fixed Radiation Monitoring Instrumentation - Existing Hanford Production Reactor Areas
HW-80169	Secret	DA Armstrong GF Howden WK Alexander	12-26-63	Production Test IP-650-M - Installation of Flat Horizontal Control Rod Track Blocks - KW Reactor
HW-80258	Unclass.	RB Bixler RG Geier	1-6-64	Production Test IP-649-AM - Replacement Nozzle Caps - B, C, D, DR, F and H Reactors
HW-80425	Secret	JE Boyd	2-11-64	Budget Study - Improved Reactor Gas System, 100-KE and KW Areas
HW-80426	Secret	MH Schack	1-27-64	FY-1965 Plant Acquisition & Construction Budget, Discharge Chute Clearing Equipment, 100-K Area
HW-80431	Secret	PH Hutton	2-3-64	Budget Study, FY-1966, Horizontal Control Rod Renovation - All Production Reactors
HW-80441	Secret	FJ Kempf	2-3-64	Budget Study, Vertical Rod System Improvements, C, KE & KW Reactors
HW-80453	Secret	EW Herrman	2-3-64	Intermediate Range (Nuclear) Monitoring System Budget Study, FY 1966 and Revision of FY-1965
HW-80462	Conf.	WR Thorson	2-3-64	Safety Circuit Modifications - All Reactors - Budget Study FY 1966 and Revision of FY-1965
HW-80561	Secret	PH Hutton	2-3-64	Budget Study, FY-1966, By-Product Horizontal Control Rod - All Production Reactors

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<u>Number</u>	<u>Class'n</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-80606	Unclass.	GE Peck	1-29-64	Miscellaneous Fire Protection Facilities, IPD Budget Study, FY-1965
HW-80687	Conf. Undoc.	CP Cabell	2-3-64	Budget Study - FY-1966 and Revision of FY-1965 PACE Budget - High Speed Scanning Temperature Monitor System - KE Reactor
HW-80887	Secret RD	NF Fifer	2-17-64	Calculations - Improvements to Gamma Monitoring System, KE & KW Reactors
HW-80862	Secret	DE Cooley	2-14-64	Internal Graphite Moderator Forces Study - Supplemental Information
HW-80911	Unclass.	PB McCarthy	2-17-64	Magnesium Magazines for Self-supported Fuel Elements
HW-80893	Unclass.	DB Lovett	1-31-64	Interim Report - RTD Corrosion Studies
HW-79739	Unclass.	W Dalos	12-31-63	AC Power Supply for Instrument and Safety Circuit
HW-80546	Unclass.	RL Woodward	1-27-64	DT-1194 - Extended Fatigue and Creep of Aluminum Van Stone Gaskets, 100-K Zirconium Re-tubing Program
HW-80684	Conf.	KG Hawkins	2-12-64	DT-1208, VSR Winch Performance, 105-B, D, and F
HW-80720	Unclass.	WEB Lander	2-5-64	DT-1193 - Determination of Rib Wear Per Charge for Standard Aluminum Process Tubes
HW-80680	Unclass.	KG Hawkins	2-13-64	DT-1172 - Thermal and Bending Test of Grayloc Connection for ARCO ATR Gas Loop
HW-80286	Conf.	KG Hawkins	2-19-64	DT-1154, Push Forces of SSFE in K Zircaloy - 2 Tube Mock-up
Memo	Unclass.	DF Arnold	1-24-64	Development, Construction, Calibration, and Testing of Oil Bath Type Calibration Equipment for CGI-939, Data Logging and Temperature Monitor Board

Number	Class'n	Author	Date	Title
	Class. Unclass.	WA Blanton	1-17-64	Fuel Fabrication Methods and Cost Estimates Study I - Reactor and Power Recovery
HW-80675	Unclass.	PA Haxel	2-3-64	Piping Requirements for the Nickel Plating Pilot Plant
HW-80787	Secret	WN Mobley	2-3-64	Uranium Delivery Schedule, Production Fuels Section, Irradiation Processing Department
HW-80667	Secret	WN Mobley	2-3-64	Production, Receipts, and Inventories, Production Fuels Section, Irradiation Processing Department
HW-80581 C	Secret	WN Mobley	2-6-64	Monthly Report for February, Production Fuels Section, Irradiation Processing Department
HW-80932	Secret	WN Mobley	2-17-64	Procurement of Enriched Li-Al for E-N Loading
HW-80115	Unclass.	EJ O'Black	12-20-63	Analysis of IPD Breaker Re- closure Practices (Plant Distribution Systems) 13.8 KV to 2300 KV
HW-80601	Unclass.	WV Thompson	2-13-64	H Area Adaptor Pigtail Nut Torque Test
HW-80830	Secret	JR Young	2-14-64	Economics of Higher 100-K Reactor Process Water pH
HW-80845	Secret	HW Acker	2-13-64	Reactor Inlet Water Temperature Measurement

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TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
JM Fox, Jr.	ASTM Committee Work Philadelphia, Pa.	2/1-4/64	Attend meeting as alternate on Committee A-10 and participate on Committee A-1.
	Astrometals New York, New York	2/5-6/64	Discuss control rod material.
LB Brinkman FE Panisko	Metallurgical Engineers Incorporated, Portland, Oregon	2-20-64	To direct performance of Charpy impact tests on pressure piping specimens.
DR Arnold R Sherrard	Astrodata, Inc. Anaheim, California	2/17-20/64	Discuss Contract DDR-179.
FW VanWormer	Philadelphia, Pa.	2/2-5/64	Attend ASTM Committee Meetings.
OH Greager	AEC Washington, D.C.	2/12-13/64	Discuss international inspection for shutdown reactors.
	General Electric New York, N.Y.	2-14-64	Meet with Engineering Services.
	GE-APED San Jose, Calif.	2/20-21/64	Attend GETHC Council Meeting.
CG Lewis JR Spink	Atomics International Canoga Park, Calif.	2-24-64	Discuss Atomics International's program at Hanford.
EV Padgett	GE Management R&D Institute, Crotonville, New York	2/24-28/64	Attend Quality Control and Process Control Engineering course.
EV Padgett	GE Research Laboratories, Schenectady, New York	3-1-64	Discuss research laboratory activities.
EV Padgett	Aeroprojects, Inc. West Chester, Pa.	3/2-3/64	Discuss advances in ultrasonic welding.
HF Tew	Savannah River Operation Aiken, South Carolina	2/10-12/64	Discuss alternate process technology.

Name	Firm & Location	Date	Purpose
JW Green	L. Frank Markel and Sons Norristown, Penn., and Minco Incorporated, Minneapolis, Minn.	2/20-22/64	To resolve problems in the fabrication of RTD cable. To discuss problems on strap- on RTDs.
CF Quackenbush	Committee on Nuclear Piping - ASA B31 - Code for Pressure Piping, New York City, NY	2/23-27/64	Attended meeting.
BC Benedictson	Eastman Kodak Co., Seattle, Wash.	2/13-15/64	Attended Industrial Photography Symposium and review data and equipment for training classes.
BC Benedictson	Dictaphone Corp. & Federal Aviation Adm., Seattle, Wash.	2/13-15/64	Observe and evaluate in- stalled communication re- cording system.
BC Benedictson	Chicago Pneumatic Tool, Seattle, Washington	2/13-15/64	Test and evaluate installed torque controlled air tools for use on reactor spline cap hardware.

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VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
C Reusser Ferd Nist	Seattle Box Company Seattle, Washington	2-20-64	Discuss plastic magazines.
EL Bartee	General Plastics Corp. Los Angeles, Calif.	2-14-64	Discuss plastic magazines.
LC Cole	Francis L. Moseley Instruments, Pasadena, California	1-21-64	Discuss Moseley recorder applications.
GM Rick	AEC Publication & Visual Aid Branch Washington, D.C.	2-4-64	To acquaint Mr. Rich with equipment and operation of the Duplicating Shop.
GI Parker	Lepel High Frequency Laboratories, Inc. New York City, N.Y.	2/3-7/64	Conduct training course on Lepel equipment.
J Segraime	Crane Hoist Engrg. Co. Los Angeles, Calif.	2-12-64	To make third party inspection on hoist in 313 Building.
TP Convors	Travelers Indemnity Co. Portland, Ore.	2-14-64	To make third party inspection on autoclaves and water heater
C Hoehne	Bridgeport Brass Riverside, Calif.	2/17-18/64	Aluminum components.
PN Burkhard D Tuel	Wyandotte Chemical Wyandotte, Michigan	2-18-64	Cleaning compounds.
P Berner	Star Machinery Co. Seattle, Washington	2-19-64	Magneform process.
DW Edmundson	Gen. Dynamics Corp. San Diego, Calif.	2-19-64	Magneform process.
Dr. K Newman	Turco Products Wilmington, Calif.	2-24-64	Cleaning compounds.
SS Moore	S. S. Moore and Associates Portland, Oregon	2-5-64	Inspect the compressor and hopper-car vibrators in H Plant which were provided by his company.

**DATE
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01/22/93**