DECLASSIFIED

HW--81003

DE93 003508

IRRADIATION PROCESSING DEPARTMENT MONTHLY REPORT

MAY 1964

Received by OSTI

NOV 23 1992

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

HANFORD ATOMIC PRODUCTS OPERATION

GENERAL ELECTRIC

RICHLAND, WASHINGTON

MASTER

DECLASSIFIED

DISTRIBUTION RESTRICTED TO U.S. ONLY

DECLASSIFIED

This document consists of
pages.

IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
MAY, 1964

DECLASSIFIED

By Authority of DR-24/R10-CC-4
02 Lewis 9-27-92
By TL Phillips 9-2-92
DG Kuehler 9-2-92

Compiled By
IPD Personnel
June 15, 1964

RICHLAND, WASHINGTON

Classification SECRET
classification SECRET
by EN 5-1-73

Work performed under Contract No. AT(45-1)-1350 between the
Atomic Energy Commission and the General Electric Company.

[REDACTED]

Route To:	P. R. No.	Location	Files Route Date	Signature and Date

GROUP 1
Excluded from Automatic Downgrading
and Declassification.

DISTRIBUTION

Copy Number

1	W. E. Johnson
2	H. M. Parker
3	APD, F. E. Crever
4-5-6-7-8	RLOO-AEC, J. E. Travis
9-10-11	AEC Production Division, F. P. Baranowski
12	SROO-AEC, R. C. Blair
13	R. L. Dickeman
14	R. S. Bell
15	O. H. Greager
16	R. T. Jessen
17	O. C. Schroeder
18	O. P. Amacker
19	W. N. Mobley
20	R. W. McMichael
21	300 Area Files
22	Records Center

DECLASSIFIED

DECLASSIFIED

HW-81003

TABLE OF CONTENTS

<u>SUMMARY</u>	A-1
<u>MANUFACTURING</u>	
Production and General	B-1
Reactor and Power Statistics	B-2
Reactor Operations	B-3
Applied Reactor Engineering	B-6
<u>PRODUCTION FUELS</u>	
AlSi Shop	C-1
Materials	C-2
Fuels Engineering	C-3
Plant Facilities	C-8
<u>RESEARCH AND ENGINEERING</u>	
Process and Reactor Development	D-1
Process Technology	D-7
Operational Physics	D-12
Testing	D-16
<u>FACILITIES ENGINEERING</u>	
Design Engineering	E-1
Equipment Development	E-3
Project Engineering	E-4
Reactor Plant Deactivation	E-7
<u>FINANCIAL</u>	F-1
<u>REPORTS, TRIPS AND VISITORS</u>	G-1

SUMMARY

MANUFACTURING

Reactor input plutonium production for May, 542.1 KMWDs, represents a new record exceeding the previous maximum (established in March, 1964) by 4.5%. Production at the six smaller reactors was 300.1 KMWDs and, at the two K Reactors, 242.0 KMWDs. The K Reactor production also represents a new record which is 2.6% above their March, 1963 record. Tritium input production for May was 6802 equivalent MWDs.

Power levels at the smaller reactors, other than H, were restricted by a bulk outlet water temperature limit of 95 C. The H Reactor power level was arbitrarily held below the bulk outlet water temperature limit because of fuel element failure considerations. Power levels at the K Reactors were limited by the AEC administrative limit of 4400 MW.

Over-all time operated efficiency was 85.9% (84.1% forecast), the highest since November, 1959. May efficiency at the smaller reactors was 84.6%, and at the K Reactors, 89.8%. High efficiency and the associated production record resulted from no extended outages, no outages for the correction of process tube water leaks and fewer unscheduled outages from miscellaneous causes.

Twelve failed I&E fuel elements were removed from the reactors: eight of enriched uranium and four of natural uranium. Two of the enriched failures were at B, two at C, two at F and one each at DR and H. Two natural metal failures were at DR, one at D and one (watermixer) at C. Seven of the enriched failures were "side hot-spot" failures; one has not yet been examined. Two of the natural metal failures were "side hot-spot" and two were "side-unknown". The enriched failures ranged from 37% to 77% of goal exposures and the natural failures from 64% to 94%. Six of the eight enriched failures were stuck in process tubes; none of the natural failures were stuck.

One process tube leak, at the rear Van Stone flange, was corrected. Six process tubes were installed.

PRODUCTION FUELS

A total of 621 tons of natural and enriched fuel elements was produced during May, 100% of the revised April forecast.

Canning line operation was at the rate of nine lines per day and efficiency was 98.3%. Bare core inventory at month's end was 841 tons, a 1.5 months' supply. Finished fuel inventory was 1380 tons, a 2.2 months' supply, including 25 tons of bumpered dingot fuel elements. The manufacturing yields of regular and self-support fuels remained at high levels during the month. Work in process was at normal levels at month's end. Approximately 5000 fuel elements were backlogged at both the support welders and at the sizing operations.

DECLASSIFIED

DECLASSIFIED

HW-81003

Initial processing of 12-inch natural fuel elements for the small reactors was completed in May.

One autoclave failure in the 12-inch fuel elements occurred on May 25. The failure resulted when an element with a very thin base was inadvertently mixed with acceptable elements at the facing operation and processed into the autoclaves.

On May 19, an electrical power outage caused criticality alarms in two NRD buildings. Evacuation of the 300 Area resulted in a production loss of 135 canning line minutes.

Ten columns of hot die sized fuel elements exposed to about 500 MWD/T under PT-IP-546-A, Supplement A, were discharged on April 28 from C Reactor. Nine of the columns were removed with high discharge forces, indicating a fuel diameter growth behavior similar to that experienced in the first two production tests.

Eleven columns of matched hot die sized and AlSi control fuel elements were charged in C Reactor on April 29 under PT-IP-665-A for exposure to 800 MWD/T. This test is designed to determine the effect, of substituting induction for resistance heating in the end bonding process, on hot die sized fuel element dimensional behavior.

RESEARCH AND ENGINEERING

The irradiation of thorium oxide target elements in the fringe zone at F Reactor has proceeded without difficulty and has reached an exposure of approximately 25% of the goal of 120 operating days. On these thorium columns the tube outlet temperatures are only about 5 C above the inlet temperatures.

Twenty columns containing ten-inch enriched uranium fuel elements have been charged into D Reactor. This test is the first step in evaluating the irradiation behavior of longer fuel cores.

A report on Np-237 production in Hanford production reactors has been prepared and will be issued as HW-72075.

FACILITIES ENGINEERING

Preparation of deactivation instructions and procedures for placing DR Reactor Plant on standby was started. Project proposals and Davis-Bacon work reviews relating to plant deactivation were completed and submitted for RLOO-AEC approval. Further information was developed relating to security, fire and safety, and peripheral facilities operation during deactivation and post-deactivation periods.

A design development and research contract to provide a thermal biological shield boring machine for the 105-K Reactors, in support of the VSR sleeving program, has been placed with the International Design Corporation, Tacoma, Washington.

The interim summary report (HW-81213) on the power recovery studies was issued. It includes the five cases studied to date. The general conclusion of these studies is that conversion is possible, but probably not economically justified. The uncertainties regarding a market for the electrical power and radioisotopes, the age of the plants, and the deteriorated condition of the graphite and shields all contributed to this general conclusion.

Studies to determine the feasibility of placing three compensated ion chambers side by side for the Intermediate Range Neutron Monitoring System were continued. A two-inch O.D. chamber is being developed to permit nesting of three chambers in one side shield entry. The prototype channel installed in F Reactor continues to operate satisfactorily.

Procurement effort for one prototype dose rate telemetry system was initiated. A bid request in the form of a design and development contract proposal was issued to 13 potential vendors on May 21, 1964. Proposals were requested by June 12, 1964.

Construction started May 18, 1964 on Project CGI-967, "High Speed Scanning System for Temperature Monitors, KW Reactor".

RESPONSIBILITY

There was no significant change in responsibility.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
General	8	2	10
Research and Engineering	88	53	141
Manufacturing	374	1301	1675
Production Fuels	100	394	494
Facilities Engineering	89	31	120
Financial	<u>17</u>	<u>13</u>	<u>30</u>
TOTAL	676	1794	2470

ORGANIZATION

Effective May 1, 1964, J. W. Frymier was appointed Manager - H Power, Manufacturing.

Effective May 15, 1964, M. B. Nelson was appointed Manager - Facilities Engineering, Plant Facilities, Production Fuels.

DECLASSIFIED

HW-81003

SAFETY, SECURITY AND RADIATION EXPERIENCE

There were 100 medical treatment injuries, no security violations, and no disabling injuries. A Maintenance Supervisor working in Special Outage Services, Manufacturing, received exposure in excess of the four-week operational control limit.

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 except as listed below. 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.

<u>Name</u>	<u>Date</u>	<u>Title</u>
R. A. Hemphill	4-27-64	Internal Pipe Seal

OC

OC Schroeder:DLD:bm

O. Schroeder
Acting General Manager

MANUFACTURING

PRODUCTION & GENERAL

Reactor Production

Record reactor input plutonium production for May, 542.1 KMWDs, was 4.5% above the previous record established in March, 1964. The K Reactor production of 242.0 KMWDs also represents a new high exceeding their March, 1963 maximum by 2.6%. Production at the six smaller reactors was 300.1 KMWDs. Tritium input production in the H Reactor E-N load was 5312 equivalent MWDs; incidental production in fringe poison at other reactors yielded an additional 1403 equivalent MWDs and production from a KER loop yielded 87 equivalent MWDs. Power levels at the smaller reactors, other than H Reactor, were restricted by a bulk outlet water temperature limit of 95 C. The H Reactor power level was held below the bulk outlet water temperature limit for fuel element failure considerations. Power levels at the two K Reactors were restricted by the administrative limit of 4400 MW.

Over-all time operated efficiency was 85.9%, the highest since November, 1959. Efficiency at the six smaller reactors was 84.6%, and at the two K Reactors, 89.8%. High efficiency and the associated production record resulted from no extended outages, no outages for the correction of process tube water leaks and fewer unscheduled outages from miscellaneous causes.

Fuel Exposure

There were no discharge goal exposure changes initiated during May. The average discharge exposure was about 100 MWD/ton lower than the average of previous 1964 output. The discharge of non-defense plutonium was nearly eliminated which accounts for 80% of this reduction. The remaining reduction was due to the premature discharge of several rupture-prone enriched uranium lots. The average exposures (MWD/T) of irradiated fuel discharged were:

	<u>Smaller Reactors</u>	<u>KE & KW Reactors</u>
Natural Uranium	609	668
Enriched Uranium	641	818

Reactor Personnel Certification

One reactor operating supervisor and seven specialists completed certification requirements during May and one Reactor Operating Studies Certificate was issued. Effective May 18, 1964, a Radiation Protection group, working within Manufacturing, was assigned to Reactor Certification. The reactor operator certification program and the radiation monitor training program both continued throughout the month.

REACTOR AND POWER STATISTICS - MAY, 1964

REACTOR DATA	B	C	D	DR	F	H	KE	KW	TOTAL
INPUT PRODUCTION - PU - KMWD	42.4	52.6	52.2	48.5	46.2	58.3	127.2	114.8	542.1
" " - TRITIUM - EQUIV. MWD	287	56	230	467	363	5312	87	0	6802
POWER LEVEL - MW (MAX.)	1975	2240	1955	1910	1910	1985	4400	4400	20775
" " - MW (AVG.)	1808	2101	1892	1835	1843	1949	4330	4369	20127
TIME OPER. EFFICIENCY - %	75.6	80.8	89.0	85.2	80.8	96.5	94.8	84.8	85.9
OUTAGES - ALL CAUSES	4	4	2	3	3	1	2	1	20
OUTAGE TIME ALLOCATION - %:									
CHARGE - DISCHARGE	7.1	4.9	5.2	3.3	5.9	0	2.6	12.6	5.2
FAILED FUEL REMOVAL	8.0	3.5	0.4	3.8	2.2	3.5	0	0	2.7
WATER LEAKS	0	0.8	0	0	1.8	0	0	0	0.3
TUBE REPLACEMENT	0.4	0	0.7	1.3	1.1	0	0	0	0.4
OTHER MAINTENANCE	6.4	8.1	3.2	5.6	7.7	0	1.3	0.7	4.1
PRODUCTION TESTS	0.5	0.9	1.0	0.2	0.5	0	0	0.8	0.5
PROJECT WORK	1.5	0	0	0	0	0	0	0	0.2
OTHER	0.5	1.0	0.5	0.6	0	0	1.3	1.1	0.7
TOTAL	24.4	19.2	11.0	14.8	19.2	3.5	5.2	15.2	14.1
WATER LEAKS - TUBE	0	0	0	0	0	0	0	0	0
" " - VAN STONE	0	0	0	0	1	0	0	0	1
NEW TUBES INSTALLED	2	1	0	2	1	0	0	0	6
FUEL CHARGE - TONS NAT. U.	194.9	181.6	195.7	181.2	187.1	3.1	412.2	420.9	1776.7
" " - TONS ENR. U.	28.5	39.3	27.1	38.3	33.1	197.2	47.6	40.0	451.1
FUEL ELEMENT FAILURES	2	3	1	3	2	1	0	0	12
HELIUM CONSUMED - M CU FT.	414.3	341.6	336.0	285.2	264.4	110.2	248.3	130.2	2130.2
POWER DATA									
RIVER WATER PUMPED - M GALS.	8125.8		7601.5		3585.5	4466.9	9123.5	8709.4	41612.6
WATER EXPORTED - M GALS.	658.0		0		0	0	0	0	658.0
WATER TREATED - M GALS.	3208.2	4257.9	4644.3	2806.2	3549.5	4464.0	9066.8	8709.4	40706.3
WATER TO REACTOR - M GALS.	3468.1	3437.4	3622.4	3323.6	3359.2	4107.3	8021.8	7932.5	37272.3
" " " - GPM (NORM)	89400	96000	88800	87700	80400	92010	207500	209500	
" " " - PH	6.70	6.60	6.61	6.70	6.76	6.63	6.67	6.71	
" " " - DICHROMATE (PPM)	1.00	1.00	1.00	.97	1.00	.98	.92	1.00	
STEAM GENERATED - M LBS.	55934		66638		34337	34771	22592	26100	
LBS. STEAM / LB. OF COAL	9.40		9.09		9.51	9.02			9.24
" " / GAL. OF OIL							98.8	95.2	97.1
ELECTRICITY GENERATED - MWH							1568.0	1601.6	3169.6

DECLASSIFIED

HM-81303

REACTOR OPERATIONS

Reactor & Power Statistics

These are tabulated on page B-2.

B-C Plant

The power level at B Reactor was restricted by the 95 C bulk outlet water temperature limit. Power level at C Reactor was restricted by the 95 C bulk outlet water temperature limit until May 29, when a 93.5 C bulk outlet water temperature limit was established as a precautionary measure because of a broken poison spline in a process tube.

One scheduled and three unscheduled outages were experienced at B Reactor. Major work accomplished during the scheduled outage (50.9 hours), in addition to charge-discharge, was as follows: seven process tubes were sector annulus gaged (PT IP-674-I), a vertical tube traverse was performed, the replacement of rear face crossheader differential pressure valves was completed, work was continued on changing oil in the VSR winches, and the hose and reel assemblies were replaced on one HCR. The first unscheduled outage (38.7 hours) resulted when a loose wire in the voltage regulator of a process pump caused the power failure relay to trip. During this outage, a graphite sample was discharged from a process channel, construction forces continued work on the rear crossheader expansion joints (MJA-53), and Inconel snap rings were installed on all front nozzles up through row 17. The second unscheduled outage (35.6 hours) was to remove a failed enriched fuel element. Since this lot of material was declared rupture prone, the remaining columns operating in the higher power zones were discharged. Other work performed during this outage, in addition to charge-discharge, was the changing of oil in four VSR winches, the installation of new sensing lines in the drip legs and the completion of the increased bulk outlet temperature instrumentation (DC-797). The third unscheduled outage (56.4 hours) was to remove a failed enriched fuel element of a different lot than that of the second unscheduled outage. This lot of material was also declared rupture prone and 11 of the 15 remaining tubes were discharged. A maximum force of 13,800 pounds was required during the removal of this rupture and at this force the tube parted. Extreme care was then required since it was necessary to discharge enriched fuel elements over bare graphite. The column was left as an air channel.

Four unscheduled outages occurred at C Reactor, three to remove failed fuel elements (two enriched and one natural) and one (0.3 hour) because of a trip on the C-1 loop when the instrument air was accidentally turned off. In addition, the reactor remained down for 38.0 hours in May completing an outage initiated in April. During the three failed fuel element outages (33.7, 35.7 and 35.1 hours) the following work, in addition to charge-discharge, was completed: a high velocity flush of the high tanks was performed, five ball 3X hoppers were functionally tested, new valves were installed in the rear cross-header differential pressure system, a universal flexible rod was installed in a VSR channel and drop-times of all VSRs were measured.

DECLASSIFIED

DECLASSIFIED

HW-81003

D-DR Plant

Power levels at the D and DR Reactors were restricted by bulk outlet water temperature limits of 95 C.

D Reactor had one scheduled outage (46.3 hours) for charge-discharge and one unscheduled outage (35.9 hours) caused by a failed fuel element. Principal work accomplished during the scheduled outage included charge-discharge of 347 process tubes, probing 76 process tubes and installing four additional rows of front adjust Panellit gages (program 87% complete). The process tube containing the failed fuel element (natural) was discharged with the charging machine. Other work accomplished during this outage included charge-discharge of 138 process tubes, repair of three rear face bellow leaks and one omega seal leak, and installation of eighty-two 0.344" venturis.

DR Reactor was not operating at the start of the month because of a continuation of the April 29 outage for a failed fuel element (6.3 hours in May). During May, DR had three unscheduled outages (33.1, 35.1, and 35.6 hours) caused by failed fuel elements (one enriched and two natural). The enriched element was removed by a pushing force of 12,000 pounds and the two natural elements were discharged with the charge machine. A total of 124 process tubes of rupture prone fuel elements was discharged during the three outages. Principal work accomplished during the outages included replacing two process tubes (one a former air channel), repairing ten rear face bellow leaks and several leaks on the top and far side of the rear neoprene seal, and repairing 21 thermocouples.

The No. 4 pump at the River Pump House was removed from service because of excessive vibration. Inspection revealed a damaged vane on the third stage impeller. A new third stage assembly was installed and the pump was returned to service.

New fluorescent lighting fixtures were installed on the discharge work platform and underneath the rear face catwalks at the 105-D Reactor Building to replace those which had gradually deteriorated because of contacts with decontamination chemicals.

The pH of process water was raised at the DR Filter Plant May, 19 from 6.6 pH to 7.0 pH to determine the effect on reactor effluent radioactivity.

F Plant

The power level at F Reactor was restricted by a bulk outlet water temperature limit of 95 C.

Two unscheduled outages and one scheduled outage were experienced. The two unscheduled outages to remove failed enriched fuel elements required 51.4 hours and 28.3 hours, respectively. The scheduled outage (charge-discharge) required 63.2 hours.

Principal work accomplished during the first outage was removal of the failed fuel element using hydraulic pushing forces, helium leak testing of the reactor

process tubes, and replacement of a process tube that had a failed rear Van Stone flange.

Major work accomplished during the second outage was removal of the failed fuel element using hydraulic pushing forces, charge-discharge of a rupture prone lot of enriched metal, and completion of MJA-47 - Installation of Front Adjust Panellit Gages.

Work accomplished during the third outage consisted of the charge-discharge of 666 tubes, probologging of 176 process tubes, installation of new valves in the rear face crossheader differential pressure system, mechanical inspection of the D platform, and installation of Inconel snap rings on five rows of front nozzles.

The pH of process and filtered water was increased May 19 from 6.6 to 7.0 in a program to determine the effect on reactor effluent radioactivity.

H Plant

Maximum power levels of the reactor were restricted by an administrative process tube power limit of 1310 KW (average of 10 hottest tubes) as a means of minimizing fuel element failures. In a further attempt to eliminate fuel element failures, the equilibrium power level was stabilized below the maximum attainable power level. Power level fluctuations, normally caused by short-term changes in the river temperature, were minimized by establishing a power level that yielded a bulk outlet coolant temperature 3 C below the 95 C limit. This level was then held without change until a significant increase in the river water temperature made a power reduction necessary.

The highest level attained was 1985 MW with an average operating level of 1950 MW and a resultant level efficiency of 98.2%. One outage (26.2 hours) was caused by a fuel element failure. The tube charge was removed by normal procedures.

Reactor process tube pressure increases due to film buildup were attributed to use of bauxite of high iron content in the water treatment process of the west half of the filters. Purging the reactor with a 30 ppm solution of diatomaceous earth returned process tube pressures to normal. Recurrence of the pressure buildup made necessary a change from the bauxite to liquid alum feed in the affected half of the filters to eliminate this undesirable situation. Results of liquid alum feed in the opposite half of the filter were satisfactory throughout the month.

KE-KW Plant

A new combined monthly input production record was achieved at the K Reactors exceeding the previous record of March, 1963 by 2.6%.

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

Operation at KE Reactor was interrupted twice during the month. An unscheduled outage (0.3 hour) was caused by a broken spline washing downstream and another

DECLASSIFIED

HW-81003

(38.4 hours) was caused by an unexplained Panellit trip. Major work accomplished during the second outage included removal of process tubes from two channels for planned later installation of graphite stringers, installation of two rows of Panellit gages having Delrin bushings and routine charge-discharge of fuel elements.

The one KW Reactor outage was a scheduled outage (113.4 hours) for charge-discharge of fuel elements and standards' checks. Other major work accomplished during the outage was as follows: two new Geminol sheathed front-to-rear graphite stringers were installed, a new flexible vertical safety rod was installed, a VSR channel was broached, Panellit gages in two rows were replaced with Delrin bushing gages, and four effluent water system leaks were repaired.

The motor stator for the submersible pump unit referred to in the March report was received from the manufacturer's repair shop. After an on-plant examination, the stator was returned for additional internal cleaning. During the month, a second submersible pump at the KE river pumping station was removed because of a suspected similar stator mechanism failure. Following an inspection to verify the condition, this motor stator was also shipped to the vendor for repair.

APPLIED REACTOR ENGINEERING

Plant Engineering

Electrical

Design Change 888 was issued, providing for a more reliable over-speed trip switch for the K Reactors' confinement exhaust fan diesels. This change also separates the over-speed trip from the oil pressure and water temperature trip circuit to eliminate an unnecessary delay time for oil pressure trip.

A design was prepared for packaging the portable "Sentinel" radiation alarm meters with a revolving beacon lamp and power supplies for 110 volt AC operation. These units are to be used for intermediate level radiation alarms on front and rear work platforms at all reactors until fixed radiation monitoring equipment is installed under Project CGI-125. A work order has been issued to the Hanford Laboratories for their shop fabrication of the required 12 units.

Minor Design Change No. E64D-PG015-D was issued to permit relocating the pump room annunciation to the filter floor at the D Filter Plant. This will permit operating the pump room from the filter floor.

A two-part addendum to the Acceptance Test Procedures for the safety circuit trip identification system is being prepared to check the safety circuit relays, flux monitor-pressure monitor interlock, and flux monitor system portions of the circuit modifications in this project (CGI-966). Also, data are being gathered to determine the effect that the additional resistance, from placing the pressure monitor system rows and columns in series, will have on the system. It appears that increasing the pressure monitor system supply voltage, and providing tighter tolerances on switch resistance and row resistance measurements, may be adequate.

Mechanical

The backup spacer ring used with the modified K Reactor nozzles on the rear face of H Reactor has provided an effective O-ring seal during reactor operation. When the cap is loosened, however, for chemical decontamination or for charge-discharge operations, this spacer occasionally becomes dislocated and if care is not used during retightening, an effective seal is not obtained. A new design which eliminates this spacer ring has been tested up to 1000 psig water pressure and to 20 inches Hg vacuum with satisfactory results. Development Test IP 679-S has been approved for evaluating this new design on the two tube rows supplied by crossheader No. 29.

A design for using pneumatic vibrators to keep discharged self-supported fuel elements moving down the chutes at the K Reactors has been prepared.

After ten months' cooling, the No. 2 half-rod removed from B Reactor was uncovered and examined from about five feet away. Earlier reports described this rod as possibly having a blister near the tip, but high radiation had prohibited a more definitive examination. The rod now is seen to have four blisters, one about six inches from the tip, two about two feet apart and back about six feet from the tip, and one near the back of the poison section or about twelve feet from the tip. The rear blister, the two central blisters, and the tip blister all appear significantly different and may have been caused by different mechanisms. Arrangements have been made with Radio-metallurgy at the Hanford Laboratories to examine at least an eighteen-inch tip section containing the near-tip blister.

Instrument

Procurement of magnetic amplifiers for replacement of meter relays in Zone Temperature Monitors has been negotiated with Sigma Instruments, and 122 mag-amps are scheduled for delivery in July. Testing of strap-on RTDs continues to be favorable. Both response time and accuracy are better than for the immersion-type RTDs currently being used.

The initial scope for the proposed intermediate-range flux monitors provided no means for bypassing any of the channels in the system. Design plans now include the addition of switches which would permit the bypassing of all but one channel after reaching a reactor power level where exponential rate is no longer the limiting safety factor. Detailed design of a circuit which would automatically make the equipment bypassable after reaching a preset point, and also automatically unbypass the equipment when levels dropped below that point, has been provided.

A study of both the halogen monitors and the iodine monitors of the reactor confinement systems has been initiated to determine whether spurious trips of the fog-spray system by these monitors can be eliminated. Resolution checks are being conducted on these systems with results to date ranging from very poor to very good.

DECLASSIFIED

DECLASSIFIED

HW-81003

Minor Design Change E64K-IC-007-A was prepared and issued to provide switching facilities for geminol stringers that are being added at the K Reactors. The new front-to-rear stringers increased the total number of geminol couples beyond the quantity that was planned for in the original geminol readout installation. This addition necessitated alterations to the original iron-constantan switching panel to provide readout facilities in the control room.

Industrial

Recommendations were issued for standard charge box unloading practices at the six smaller reactors. This provides for a uniform unloading method in transferring fuel elements from the charge box to the charging machine.

A scope document for Reactor Charging Procedures at the six smaller reactors was issued. A systematic study outline was presented to improve and standardize, insofar as possible, methods used for charging fuel elements at these reactors.

Phase 2 of the KW Reactor Outage Time Improvements Study was completed. This included recommendations, with supporting data, on functional problems that require management consideration in such areas as equipment, training, shift changes, communication and availability of manpower.

Additional pictures required for the sound-slide program for the K Reactor HCR channel renovation were taken. Due to the complex nature of the renovation work, several programs will be required for the over-all package. The draft of the script for the first program was completed and is being reviewed.

As in-service training, eight industrial engineers completed a two-hour course in Industrial Motion Picture Photograph and Film Analysis Techniques. The Photography Operation, HU&PO, provided a complete display of all photographic equipment available for Industrial Engineering work.

Engineering Studies & Analyses

At AEC request, the process water pH at the DR and F Reactors was increased to 7.0 on May 19 as a test to determine if the effluent activity is related to the pH. This increase is expected to at least double and probably triple, the aluminum corrosion rate. An analysis of the DR and F process tube condition and corrosion rates indicates that these reactors should be able to operate until January, 1965 without water leaks or a significant number of tube replacements. If the F Reactor corrosion rate at 7.0 pH is the same as previously experienced at that reactor, less than 100 tubes will need replacing or short-charging during the first half of CY 1965. If F has the same corrosion rate that the other reactors have had at 7.0 pH, as many as 300 tubes would have to be replaced or short-charged.

Report HW-81770 was issued, describing the ability of oversized regulating transformers to assist in overcoming transient voltage depressions on AC powered safety circuits. The use of regulating transformers is being proposed to reduce reactor scrams caused by safety circuit relay drop-out from voltage depressions.

Re-evaluation of 11 Engineering Requests by the originators has shown that four of these should be canceled. Together these four have an estimated engineering cost of \$73,200.

Summary report HW-82333 was compiled and issued, documenting the zirconium tube program at the K Reactors. The contributions of all participating components within and outside of IPD were included in this report.

Maintenance Standards & Manuals

The status of Equipment Maintenance Standards in May compared with that in April as follows:

	<u>April</u>	<u>May</u>
Issued to Date	122	136
Being Routed for Approval	27	9
In Comment Status	14	8
In Preparation	<u>46</u>	<u>46</u>
Total	209	199

Six Equipment Maintenance Standards were revised during May. Work has been initiated on Equipment Maintenance Standards for In-Reactor Test Facility equipment.

The following Service Manuals on electrical equipment were completed and issued:

HCR and Ball 3X Battery System Electrical Service Procedure, C and H Reactors.

Emergency Reactor Water Supply Battery System Servicing Procedures, Bldg. 182-K.

D.C. Power System Servicing Procedures, KE and KW Reactors.

Plant Personnel Training

Training activities at the White Bluffs' facilities were as follows:

The Temperature Data Logging System training program for K Plant personnel was completed. Six craftsmen were given 16 hours of instruction for a total of 96 training manhours.

Training material on reactor control instrumentation was prepared for the Reactor Operator's Certification Program. This material was presented to 44 operators in three-hour classes for a total of 132 training manhours.

A training course on the Model V Beckman was initiated. By month's end, 60 personnel had been given three hours of instruction for a total of 180 manhours.

DECLASSIFIED

DECLASSIFIED

HW-81003

As requested by Hanford Laboratories, PRTR personnel were trained in the use of Applied Reactor Engineering foaming equipment.

The last of the scheduled four-hour training classes on Work Sampling Theory and Applications was completed on May 6. A total of 26 exempt Processing and Maintenance personnel received this training in the four scheduled sessions of this program.

The last of the four 8-hour sessions scheduled for the Electrical Circuitry and Safety System Sections of the Reactor Personnel Certification Program was completed.

The training program for welders and craftsmen in the burning of foaming holes in the C Reactor gas bellows flanges was completed in May.

Manager, Manufacturing

RS Bell:DLD:bm

PRODUCTION FUELS

ALSI SHOP

Production

Canning line operating efficiency was 98.3 per cent, 1.3 per cent above forecast.

Manufacturing yields during May were above forecast in all categories except six-inch enriched self-support fuel, which was 1.0 per cent below forecast. The average self-support welding yield remained high at 98 per cent. The elliptical rail welding yield was also very satisfactory at 99 per cent.

Production of projection fuels during May was:

	<u>Natural U</u>	<u>Enriched U</u>
Tons Produced	214	96
Finished Inventory	308	168

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>	
2.4	-	213.6	251.9	22.3	-	14.5	34.5	81.6	620.8 ⁽¹⁾

Per Cent of Forecast

-	-	80	94	97	-	-	192	204	100
---	---	----	----	----	---	---	-----	-----	-----

Manufacturing Yields

May

-	-	91	93	92	-	88	95	91
---	---	----	----	----	---	----	----	----

Forecast

92	92	89	92	92	92	89	92	86
----	----	----	----	----	----	----	----	----

Previous Month

96	70	90	95	-	-	-	94	92
----	----	----	----	---	---	---	----	----

(1) Includes 6.9 tons of upstream fuels.

DECLASSIFIED

DECLASSIFIED

HW-81003

Operating Conditions, Incidents, and Improvements

Additional conveyors have been installed at the bare core testers which provide for storage of 14 additional pickle baskets. This increase in bare core storage capacity will provide sufficient tested material ahead of canning to discontinue the early morning set up on the UT-2 testers. Maintenance has been notified that the early maintenance may be discontinued.

On May 20, the duplex agitator on one canning line was found to be operating with approximately two seconds less than the specified minimum time in the lead layer. Since the actual time of failure was unknown, all material canned subsequent to the last known timecheck (about one and one-half hours) was held for examination and the suspect elements were removed from the production stream.

On May 19, a false alarm in the criticality alarm system of the 333 Building resulted when a temporary power failure occurred in the 303 Area. The evacuation of the Area which followed resulted in a production loss of 135 canning line minutes.

Several important programs to improve the over-all performance of the AlSi Shop were completed during May. The plate gage at the rail sizing station was approved as an over-all projected diameter gage, thus eliminating the need for a separate tube gaging operation for self-support elements. This reduces the work load at the sizing operation and will facilitate the incorporation of the rail sizing and gaging work into the final inspection station.

One automatic shear tester was installed on a self-support welder on May 25, and is working satisfactorily to date. The second automatic tester will be installed early in June and will complete this phase of the program. These improvements reduce the manpower required for self-support welding and free personnel for the expanded elliptical bumper program.

Autoclave Failures

One autoclave failure occurred on May 25 in an O6N twelve-inch fuel element. Failure was attributed to accidental mixing of a thin base reject (piece which failed) with good twelve-inch fuel.

MATERIALS

Fuel Recovery

The following amounts of AlSi fuel were recovered:

	<u>Pieces</u>
Eight-inch Natural	22,956
Six-inch Watermix	<u>1,640</u>
Total	24,596

Hanford Test Reactor

Available reactor time was utilized as follows: 314 routine production tests were performed (244 GO NO-GO and 70 drift tests) representing approximately 70 per cent of the available time, with the remainder being utilized for special testing. In addition, four groups of visitors were given tours of the 305 facility.

Scrap

Seven shipments of metallic uranium scrap were made during the month. Shipments totaled 40.6 tons AlSi normal scrap, 4.0 tons AlSi enriched scrap, 14.0 tons NRD enriched scrap, 1.9 tons HL normal scrap, and 169 barrels of uranium oxide. Six hundred eighty-four (684) empty core boxes and lids were also shipped.

FUELS ENGINEERING

Quality Control

The amount of upstream fuel accumulated since initiation of the program totals 29,398 fuel elements. Of these, 17,165 were reactor charged through April.

Rupture Experience

A total of twelve fuel elements failed during the month of May.

<u>Fuel Element Type</u>	<u>Tube and Reactor</u>	<u>Exposure % Goal</u>	<u>Rupture Classification</u>	<u>Failure Date</u>	<u>Canning Date</u>
Natural Nonbumper	1281-D	94	Side Hot Spot	5/2/64	1/23/64
Enriched Nonbumper	2958-DR	46	Side Hot Spot	5/2/64	9/24/63
Enriched Nonbumper	1290-F	37	Side Hot Spot	5/2/64	1/22/64
Enriched Nonbumper	3173-C	58	Side Hot Spot	5/4/64	6/3/63
Enriched Nonbumper	0662-F	63	Side Hot Spot	5/5/64	1/22/64
Natural Nonbumper	1179-DR	64	Side Unclassified	5/5/64	11/11/63
Enriched Nonbumper	3960-C	44	Side Hot Spot	5/10/64	2/4/64

DECLASSIFIED

HW-81003

Rupture Experience (continued)

Natural Nonbumper	1184-DR	82	Side Hot Spot	5/15/64	11/11/63
Enriched Nonbumper	3688-B	63	Side Hot Spot	5/19/64	1/16/64
Natural Watermix Nonbumper	3361-C	65	Side Hot Spot	5/20/64	1/31/64
Enriched Nonbumper	4071-B	77	Unkown Not examined	5/27/64	1/22/64
Enriched Nonbumper	2676-H	52	Side Hot Spot	5/28/64	2/7/64

Uranium Technology

National Lead routinely analyses one uranium core blank per day for surface hydrogen pickup in their heat-treat furnace. These analyses averaged 3.3 ppm hydrogen for the first two months of 1964. At the end of February the salt bath was changed, and the average analysis for March and April was 4.3 ppm. Surface hydrogen data on incoming core shipments will be watched closely for correlations with canning performance.

Nondestructive Testing

A task force effort, starting early in 1963, to improve the testing and operating effectiveness and efficiency of the nondestructive testers used in the AlSi Shop has now been completed. The results of this work are being documented. Measurement error data obtained on the "0" size natural fuel model over the term of the program indicate that (1) the total measurement error in the UT-2 uranium grain-size test has been reduced by a factor of about four, and (2) the total measurement errors in both the UT-4 braze closure and UE-1 bond and penetration testers were not significantly changed. In addition, significant model-to-model sensitivity biases, which routinely resulted in large inequities in testing sensitivity and hence reject rates between fuel models, have been eliminated through development of equivalent standards for all fuel models.

The Task Force recommendations for nondestructive testing of fuel elements, if implemented, contemplate a sizable reduction in the nondestructive testing program with concurrent savings in operating cost in the range of \$250,000 per year. Management decisions on the recommendations should be forthcoming in June.

AlSi Process Development

Investigation of an AlSi slopover problem experienced in the pilot plant while canning depleted uranium indicated the rejects were caused by longitudinal and spiral grooves on the inner surface of the steel sleeves being used. Since the inner sleeve surfaces did not conform with specifications, the vendor is correcting the problem by adding an extra honing operation. The current high slopover reject rate in the AlSi Shop should also be reduced by this change.

Excessive uranium warp was experienced in canning 300 twelve-inch natural cores in the pilot plant with 400 eight-inch control cores for an irradiation test. Straightening of the core blanks after heat treating at the feed site was necessary before machining to finished core dimensions. Average warp (double throw) of 87 cores from recovered canned rejects was 29.1 mils, ranging from 5 to 144 mils. Corresponding warp measurements on 40 finished fuel elements averaged 7.4 mils and ranged from 2 to 14 mils. Average warp on the twelve-inch core blanks prior to straightening was reported to be 56 mils with a range of 15 to 149 mils. Further analysis of the post-heat treat and the post-canning warp will be required before a decision can be reached in the disposition of the test material. In view of this problem, coupled with a lack of irradiation data on the stability of longer fuel elements, procurement of 3,500 "O" size and 1,500 "K" size enriched cores for in-reactor tests is being deferred until preliminary irradiation data becomes available on ten-inch enriched fuel charged in D Reactor. Six columns of this test are scheduled to be discharged at an intermediate goal of 600 MWD/T in July.

The feasibility of canning AlSi bonded fuel elements in tubing and wafer components was demonstrated in the pilot plant. All pieces were canned without difficulty. Metallographic examination of the bond quality is in progress.

DECLASSIFIED

DECLASSIFIED

HW-81003

Alternate Process Development

Ten columns of hot die sized natural self-supported fuel elements, end bonded by resistance heating and irradiated under authorization of PT-IP-546-A, Supplement A, were discharged from C Reactor on April 28, 1964, at an exposure of about 500 MWD/T. Nine of the columns were removed with high discharge forces, indicating a fuel diameter growth behavior similar to that experienced in the first two production tests. Measurement of the irradiated pieces is scheduled next month.

Eleven columns of matched hot die sized natural self-supported fuel elements with AlSi control pieces were charged in C Reactor on April 29 under PT-IP-665-A for exposures to 800 MWD/T. This test was designed to compare the effect of substituting induction for resistance heating in the end bonding operation on hot die sized fuel element dimensional behavior. The induction end bonding cycle was 4 minutes 10 seconds, as compared to 10 minutes 25 seconds for resistance end bonding.

Twelve columns of hot die sized fuels clad with tubing components and AlSi control fuels were prepared for irradiation testing under PT-IP-677-A. The yield was lower than on previous production test runs as a result of closure rejects caused by misalignment of the die sizing press.

Hot die sized and AlSi control fuel elements are currently being prepared for a production test designed to evaluate hot die sizing process parameters. This test will permit an analysis of the effects of pressure in the end-bonding operation and differences in core diameter and heat treatment on dimensional behavior.

Nickel plating laboratory activities were largely confined to preparation of plated uranium cores for hot die size cladding tests. Aimed at reduced processing times and improved quality, several cores were electrolytically etched and plated at a current density of 100 amperes/sq. ft., which is twice the current density normally employed. Evaluation of these cores is not complete; however, visual inspection revealed no defects and control of plate thickness is adequate.

Tests of the new plating rack module were initiated in both the plating bath and the electrolytic etch solution. Satisfactory mechanical functioning and ease of loading and unloading were demonstrated. Nickel thickness was controlled within present limits, and no defects of consequence were generated at core-rack contact points. Essentially, the only major problem with the rack involves the formation of an insulating film on the cores in the electrolytic etch bath. This film makes it difficult to obtain a good electrical contact. In the tests run so far, electrical contact has been erratic and has resulted in burning and pitting of the electrodes as well as a substandard etch. Methods of resolving the problem being investigated include (1) not rotating the cores, relying on the high resistance surface film to redistribute the current, thus producing etching in areas of low current density, and (2) special electrical contacts that scrape or in some other manner penetrate the film.

Alternate Product Development

Pu-240 Program: Approximately 14 tons (4,336 cores) of small reactor (O3D) depleted uranium fuel elements were canned in the AlSi Shop with an over-all yield of 88.6 per cent. The acceptable pieces have been segregated into twelve groups according to bond counts, shift, and canning line, and the monitor columns have been measured for reactor charging. Irradiation test authorization has been temporarily delayed pending recalculation of the enriched-depleted fuel ratios for the loading.

A total of 4,682 K Reactor (KLD) depleted cores were received, completing the present order. As for the O3D cores, heat-treat-induced warp and ingot chemistry data will be used as a basis for segregating these cores prior to canning early next month.

U-233 Program: As authorized in April 1964, arrangements are being made to can two tons of thorium in Production Fuels development facilities for a K Reactor loading. Approximately 1,800 pounds of thorium have been received, with additional shipments scheduled for delivery in June. The oxide appears to be equivalent in quality to that previously received, having a density of 7.2 g/cc, except for a lot (900 pounds) containing some agglomerates as a result of high firing temperatures caused by equipment malfunction.

Arch "T" section supports have been ultrasonically welded to modified K5N cans for target element assembly by inserting a steel mandrel into the cans before support attachment. Magnetic swaging techniques have also been developed to swage thorium-oxide filling wafers in the upper end of the cans.

Installation of necessary process and ventilation equipment was completed in 3732 Building to begin canning the K Reactor target elements at month end.

Equipment Design and Development

Capability for fabricating and ultrasonically welding arch "T" section self-support rails to the K Reactor fuel models has been fully demonstrated. Preparation of K Reactor natural and enriched fuel samples for ex-reactor tests have been completed. Deflection load tests are complete. Hydraulics tests have been completed on the K5NS fuel model with a significant reduction in flow resistance. Anticipating favorable results in the coefficient of friction, tube damage and reactor charging damage tests on the arch "T" section rail, plans are to initiate the fabrication of a pilot scale lot (approximately 110 tubes) of K Reactor natural self-supported fuel elements for in-reactor testing next month.

Design modifications have also been made to the feeder vibratory bowls and tracks for the pilot plant automatic ultrasonic welder to accommodate arch "T" section support rails. Mechanical modifications to the automatic shear tester have also been completed for the new support rail.

DECLASSIFIED

HW-8100?

An automatic plate-type maximum diameter gauge for self-supported fuel elements was designed and installed on the unload side of the automatic roll sizers. This gauge will replace the manually operated tube gauge and will require manual unloading only if sizing is inadequate. Fabrication of an automatic rail height gauge is scheduled for completion by mid-June. The prototype gauging equipment developed by Sheffield Corporation under DDI-171 was received May 13, 1964. This equipment is being set up for evaluation.

A pre-irradiation fuel measurement gauge was fabricated on site for beneficial use. This gauge offers not only an improved design, but the flexibility required to measure ten and twelve-inch fuel elements.

A contract has been negotiated with J. A. Jones for the installation of a new die sizing press and hydraulic unit, scheduled for delivery early in June. Installation in the 306 Pilot Plant is scheduled for completion by mid-July 1964.

PLANT FACILITIES

Status of Active Construction Projects

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

Directive No. AEC-214, Modification 2, dated May 22, 1964, provides interim authorization of \$805,000 to the AEC for construction of the 3720 Building (laboratory and machine shop). The directive completion date is December 13, 1965. Project Proposal Revision No. 1 had originally requested a total of \$955,000, including the Material Handling Facility (addition to 313 Building), which has been eliminated. Revision No. 2, now being prepared, covers the deletion of the 313 Building addition and adds the construction of a lunch-change building and partial modification of the existing 303 Area Change House. The bid package for construction of the 3720 Building is scheduled to be issued by the AEC June 3, 1964, with bid opening planned for mid-July. No additional funds have been authorized to the General Electric Company.

CAF-979 - Pilot Scale Plating Equipment - 300 Area

Additional funds of \$35,000, for a total of \$245,000, have been approved for the completion of this project, and the completion date has been extended to August 15, 1964. The Construction Service Contractor was provided additional funds on May 15, and work was again resumed May 18, 1964.

CAI-994 - Utilities Extension - 300 Area

Construction is on schedule and is 39 per cent complete. The sewer lines within the 300 Area fence are complete and excavation for the steam line was started May 6, 1964. Water and sewer lines along the

south side of the 300 Area parking lot are complete. Excavation for the lines through the parking lot is underway and re-routing of traffic will go into effect June 1, 1964.

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

Invitations to bid on the construction necessary for the installation of the new boiler, including removal of an existing boiler, were issued May 6, 1964, and the bid opening was held May 27, 1964. All bids received were considerably under the fair cost estimate of \$280,000, and the low bid was \$100,000 under fair cost. Bids are being evaluated by the AEC and the award should be made early in June.

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

The procurement specifications for the containment valve and the radiation monitoring equipment have been completed by the architect-engineer, Bouillon, Griffith, Christoferson, and Shairer. This completed the design portion. The General Electric Company may procure both of these items although it had originally been planned to procure the containment valve only.

Equipment Modification

Loss of canning line efficiency attributed to equipment malfunction was approximately 0.8 per cent, a decrease from April and the same as March. The major causes of this lost time were due to loader malfunctions, cycle control failures, and quench machine problems.

Drawings for the automatic feeders are being held up pending completion of prototype testing. Fabrication of the two new automatic shear testers has been completed and one unit has been tested and installed; however, operating time has not been sufficient to determine the reliability of this equipment or its affect on ultrasonic welder throughput.

A safety circuit has been designed for the etch machines to prevent the baskets loaded with fuel elements from being pushed off the rail when the machine is in the "up" position. This has been of great concern because of the possibility of injury to personnel and damage to equipment. Safety platforms and the special stainless steel gratings for use over the acid tanks are currently being installed.

Utilities

Operating difficulties with the west travelling grate on No. 6 Boiler led to its being removed from service for overhaul earlier than had been planned. Overhaul of No. 5 was completed, and No. 4 is complete except for several minor items which have been postponed because the boiler was needed May 25, 1964, when No. 6 was taken off the firing line. Third party inspection of No. 4 was performed on May 15, 1964.

DECLASSIFIED

HW-81003

The engine checkout for the emergency electrical generator was completed by the vendor's engineers on May 6, 1964. Minor problems with the electrical switchgear were evident during test and adjustment; however, installation work is essentially complete and the equipment was available for standby service May 25, 1964. There is still some testing to be done and operator training is under way. Final performance and acceptance testing is scheduled late in June.

Sandblasting and painting of the main breeching at the powerhouse was completed May 20, 1964. Cleanup required as a result of the sandblasting has also been completed.

Statistics

	<u>May</u>	<u>April</u>
Maximum steam generated (M lbs/hr)	92	113
Total steam generated (M lbs)	43,307	53,267
Total condensate returned (M lbs)	11,159	18,127
Coal consumed (tons)	2,065	2,728
Evaporation rate	10.46	9.76
Efficiency - actual	81.6	81.5
Efficiency - optimum	85.6	84.9
Import water (M gals)	102.0	108.5
Peak water flow (gpm)	5,900	5,400
Peak water consumed in 24 hours (M gals)	4.0	4.1
Compressed air produced (M scf)	67,414	68,108

Plant Services

Major jobs completed during the month included the fabrication of the dissolver for the 321 Building; installation of the cyclone exhaust system in 306 Building; conversion of the 3732 Building to thorium oxide production, including moving hoods from the 325 Building; fabrication and assembly of two fully automatic shear testers; fabrication of six new manual quench baskets for 306 Building; and, installation of two new 480 volt services to feed pilot plant equipment.

Three hundred and forty-four manhours of training were given during the period April 21, 1964, through May 22, 1964. This is exclusive of time spent by craftsmen for preparation on DeVry courses. Training was conducted on circuit analysis and trouble-shooting techniques for closed circuit TV systems. Eighteen craftsmen from the 100, 200, and 300 Areas attended this two-day training session.

for J. Shingen
Manager - Production Fuels

WN Mobley:JFH:gl

RESEARCH AND ENGINEERINGPROCESS AND REACTOR DEVELOPMENTREACTOR FUELSThorium Oxide

The second group of thorium oxide target elements, irradiated in fringe zone tubes in F Reactor, currently has an exposure equivalent to 26 full-reactor-power operating days. The elements are scheduled for discharge during the same outage that the supporting enriched uranium fuel reaches 1000 MWD/T. At that time, it is estimated that the thoria columns will have an exposure equivalent to 120 full-reactor-power operating days. The irradiation has proceeded without difficulty; tube outlet temperatures about 5 C above inlet temperatures are being observed on the thoria columns.

Depleted Uranium

Canning of depleted uranium elements for the smaller reactors has been completed, yielding approximately 3700 elements acceptable for reactor charging. A production test to authorize depleted irradiation is currently being prepared and charging of the test material at a smaller reactor is expected in early June 1964. Depleted uranium for the K Reactors is now arriving on-plant with canning scheduled for the latter part of May 1964. Irradiation of these elements should begin early in July 1964.

1.25 Enriched Fuel

Integration of physics and engineering aspects is proceeding to establish fuel element dimensions for the 1.25 enriched uranium for both the smaller and K Reactors. Preliminary studies indicate a balanced design for the smaller reactors; however, additional work is required for the case of the K Reactors.

Longer Fuel Cores

Twenty fuel columns containing ten-inch enriched uranium, 0.947 w/o U-235, fuel elements were charged into D Reactor during the April 22, 1964, outage. This test is the first step in evaluating the irradiation behavior of longer fuel cores. Before charging the test elements, each of the specified process tubes, all located below tube row 20, was probed with a simulated element slightly more restrictive than the actual fuel. Each tube successfully passed the probe.

These fuel elements currently are estimated to have accumulated an exposure of 240 MWD/T. Five columns of the test are scheduled for discharge at 600 MWD/T, the remaining columns to be discharged at either 800 MWD/T or 1000 MWD/T, according to the plan outlined in the test.

DECLASSIFIED

DECLASSIFIED

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.	120	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 CVN 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-546-A, Supp. A	Hot-die-sized diffusion-bonded elements.	10	C	500 MWD/T	540 MWD/T	Elements charged during February 26, 1964, outage to provide additional irradiation experience. Test columns discharged during April 28, 1964, outage.

HM-81003

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	120 operating days	26 operating days	First phase of irradiation of thorium in a six-ton demonstration load. Eighteen columns discharged and recharged during April 16, 1964, outage. At the time of discharge, the elements had an accumulated exposure equivalent to 62 operating days.
IP-654-A	Ten-inch enriched uranium elements.	20	D	600 MWD/T 800 MWD/T 1000 MWD/T	240 MWD/T	Evaluation of dimensional changes in longer fuel cores. Elements charged during the April 22, 1964, outage.

D-3

RECEIVED
APR 23 1964
HM-81003

HM-81003

DECLASSIFIED

HW-81003

REACTOR ENGINEERING

Moderator Stacks

A theory has been developed to explain the observed dimensional changes in the graphite stacks at the K Reactors. Additional graphite stack distortion data is being obtained at C Reactor to determine if the theory of graphite dimensional behavior at the K Reactors is also pertinent to C Reactor. Visual examination of VSR Channel 28 at C Reactor was completed this past month. This VSR channel contains polycrystalline graphite liner blocks. The liner blocks were in good condition with no cracks observed.

Seismic Studies

A production test has been prepared to yield seismic information regarding structures critical to reactor safety. The test outlines a method in which explosive charges are used to generate seismic vibrations and the building response to these vibrations measured in order to obtain data for evaluating the earthquake resistance of reactor facilities.

REACTOR PHYSICS

Neptunium-237

Six ingots of recycle enriched fuel have been canned and are being marked, measured, and weighed in preparation for irradiation, special dissolution, and special isotopic analysis. This controlled experiment will be used to obtain improved Np-237 buildup data. The possibility of obtaining special dissolution and isotopic analysis on individual fuel elements is also being investigated. Neptunium yield formulas have been derived which will be adequate for planning purposes when ideal recycle conditions are assumed. This study will be reported in HW-72075 which will be issued in about two weeks.

Thulium-170 (Boeing Request)

Arrangements are being made to measure the rise factor and axial flux distributions for the Tm-169 target in the PCTR. Graphite spacers will be used instead of beryllium; calculations indicate little difference in the average target flux with either moderator. Boeing scientists have indicated that they can have the test target prepared in two to three weeks. The PCTR irradiation is tentatively planned for the third week in June. The results of the tests will better enable an estimate of the flux level in the Tm target and, therefore, provide a basis for the required irradiation time.

Speed-of-Control - KIV Fuel in C Reactor

Since the Zircaloy-2 retubing in the K Reactors has been completed, the new ribless process tubes will not accept KIVE elements (no fuel supports). Consequently, all remaining KIVE fuel has been diverted to C Reactor use. The KIVE element in the C lattice has a higher void coefficient than the normally used CIIIE element in C Reactor. Temporary speed-of-control limits allowing for this effect have been set forth in HW-82080. The decrease in allowable reactor power for speed-of-control requirements is almost negligible.

VSR Testing

Seven samples of heats of boron steel for the new vertical safety rods were received from ESCO Corporation and checked in the Hanford Test Reactor against a BDF size standard. These samples complete the expected submission of samples from the supplier; however, other completed sub-assemblies must be checked before all testing is complete, and these latter assemblies have not arrived on plant. All of these samples were blacker than the standard worth of a VSR (21.835 ih) by a factor of 1.024-1.039.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation experience for critical IPD classifications through 17 weeks of the 1964 badge year:

<u>Classification</u>	<u>Total Dose</u>	<u>No. of Employees</u>	<u>Average Dose/Employee</u>	<u>Extrapolated Year End Average</u>	<u>No. of Employees Over 3R Extrapolated Exposure</u>
Radiation Monitors	98853 mR	78	1165 mR	3564 mR	67
Processing Operators	251712	239	1053	3222	159
Pipefitters	124640	104	1198	3665	75
Millwrights	101756	83	1226	3750	57

Routine processing of film badges following the March 27 to April 24, 1964, badge period revealed that an H Maintenance Shift Supervisor received an exposure of 1555 mR. He served as a supervisor for Special Outage Services work during a major portion of the period. Investigations conducted could not account for a dose in excess of 700 mR. The dose is in excess of the four-week operational control. The occurrence was formally investigated and reported.

DECLASSIFIED

Radiation Occurrence

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			2				2	5
Supplemental Crews			1						1
Maintenance	1		1	1	1				4
Central Maintenance					1				1
Reactor Plant	1						1		2
IPD General					1	1			2
Outside IPD	<u>1</u>								<u>1</u>
Totals	<u>4</u>	<u>0</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>14</u>

Vertical columns do not necessarily add up to the indicated totals because, in some cases, a Radiation Occurrence is chargeable to more than one component.

Effluent Activity Data

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

<u>Reactor</u>	<u>As⁷⁶</u>	<u>P³²</u>	<u>Zn⁶⁵</u>	<u>Cr⁵¹</u>	<u>Np²³⁹</u>
B	120	6.0	12	220	230
C	150	19.5	27	850	310
D	80	7.1	20	320	120
DR	130	8.6	33	740	280
F	140	14.7	20	420	270
H	33	11.7	16	290	170
KE	48	10.1	12	120	65
KW	64	10.4	11	130	75

During April 1964, the sodium dichromate addition rate was reduced at all reactors to provide a coolant concentration of 1.0 ppm.

PROCESS TECHNOLOGY

PROCESS STANDARDS

HW-46000 D, Process Standards - Reactor

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

Process Standard A-030 - "Pressure - Flow During Reactor Shutdown"

The ΔP table was updated for higher tube powers using revised heat decay information. Presentation of water shutoff curves was revamped and includes present higher tube powers.

Process Standard A-060 - "Horizontal Rod Cooling Water"

A manual scram is now required when rod coolant flow stops.

Process Standard G-010 - "Distortion of Graphite Moderator, Process Tubes and Reactor Shields"

Bowing measurements were revised to obtain currently significant information. Probing and shield motion requirements were deleted.

HW-46000 F, Process Standards - Reactor

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

Process Standard A-030 - "Pressure - Flow During Reactor Shutdown"

This revision was identical to that described under HW-46000 D, above.

Process Standard F-010 - "Process Material"

The required flow table was expanded to include higher tube powers.

HW-46000 H, Process Standards - Reactor

Two standards, A-030 and A-060, were revised and issued as described under HW-46000 D, above.

HW-46000 K, Process Standards - Reactor

One revised standard was issued during the report period. This was:

Process Standard C-110 - "Ball 3X System"

The test frequency was revised to once each three years.

DECLASSIFIED

DECLASSIFIED

HW-81003

HW-27155 Rev. 1, Process Standards - Water Plant

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

Process Standard 183-A-010 - "Water Quality and Sampling Requirements"

The required concentration of sodium dichromate during reactor operation was lowered to 1.0 ± 0.1 ppm.

Process Standard 190-B-070 - "Emergency Water Requirements - B, C, D, DR, F, and H Water Plants"

The more significant changes incorporated in this major standard's revision were: (1) last-ditch backup, both high tanks and export system, must be automatically available at all times during reactor operation; (2) secondary system backup sufficient to sweep out steam must be automatically available when front-face throttling is accomplished; (3) when both high tanks are valved off, primary supply of coolant must be from electric pumps with appropriate number of steam pumps on automatic backup; (4) normally, all four steam-driven export pumps must be automatically available; (5) provisions are included for maintenance of automatic controls and maintenance of one or two steam-driven export pumps; (6) an export pump trip-off test is required at least once each year and the steam export pumps' rotocheck valves are required to open slowly; (7) power failure relays on operating electric pumps must be in service throughout a reactor shutdown; (8) the export flushing flow rate was increased to 6,000 gpm; and (9) the surge suppressors' settings were modified as the result of many export system tests.

HW-77800, Process Standards - Hanford Test Reactor

Two new standards were issued during the report period. These were:

Process Standard D-020 - "Vertical Safety Rod System"

Process Standard D-030 - "Horizontal Safety Rod System"

Specifications are provided for maintaining and testing the vertical and horizontal safety rod systems.

PROCESS CHANGE AUTHORIZATIONS

Fourteen Process Change Authorizations were issued during the report period: twelve to permit deviation from Process Standards - Reactor, HW-46000; and two to permit deviation from Process Standards - Water Plant, HW-27155 Rev. 1. These were:

PCA #4-40 - "Butterfly Valve Controller - Fog Spray System - C Reactor"

Authorization was given to remove the automatic actuator on the butterfly valve provided immediate manual closure was available.

PCA #4-41 - "Graphite Temperature Limits - D Reactor"

Continued operation was authorized with graphite temperatures 40 C above the cold startup limit provided power level was not increased and inlet dewpoints were maintained within normal limits.

PCA #4-42 - "Graphite Temperature Limits - KW Reactor"

Continued operation was authorized with graphite temperatures 30 C above the cold startup limit provided in-limit operation was achieved within 24 hours.

PCA #4-43 - "Thermal Loop Low Trip Pressure - H Reactor"

This process change authorized lowering the low pressure trip for the thermal loop to 30 psig.

PCA #4-44 - "Fog Spray - C Reactor"

Manual activation of the fog spray system was authorized during the 24-hour period needed to repair the automatic actuator.

PCA #4-45 - "Charging KIVE Slugs in C Reactor"

This PCA specified the R value and mixer locations to use when charging KIVE fuel elements into C Reactor.

PCA #4-46 - "Graphite Temperature Limit - H Reactor"

Four hours of continued operation were authorized with graphite temperatures 30 C above the cold startup limit.

PCA #4-47 - "Graphite Temperature Limits - F Reactor"

Continued operation was authorized with graphite temperatures 25 C above the cold startup limit provided in-limit operation was achieved within 25 hours.

PCA #4-48 - "Crossheader Flow Reduction Before Two Outage Hours - DR Reactor"

Authorization was given to throttle one crossheader one hour after shutdown following an eight-hour operating period provided rapid scan temperature monitoring was employed and flow to the crossheader was maintained equivalent to 300 inches Δ P.

PCA #4-49 - "Rotocheck Valve - Emergency Raw Water Turbine Pumps - B, D, F, and H Areas"

This PCA waived the standards' requirement that the rotocheck valves open after the turbines reach full speed, until proper equipment is installed.

PCA #4-50 - "Manual Shutdown of KE Reactor Upon Loss of One KER Pump"

This process change requires a reactor shutdown at the normal rate when less

DECLASSIFIED

HW-81003

than two pumps in parallel are supplying a KER loop.

PCA #4-51 - "Secondary System Steam Driven Pump Outage - K Reactors"

Removing a steam-driven pump from automatic backup during reactor operation was authorized provided no critical power grades existed and automatic start of all three last-ditch diesel pumps was demonstrated.

PCA #4-52 - "Bypass Ball 3X VIP Trips During Operation - KE Reactor"

Bypassing the ball 3X pressure trips for 15 minutes during reactor operation was authorized provided manual tripping would be accomplished on specified conditions.

PCA #4-53 - "Confinement Fans - D Reactor"

Both emergency exhaust fans were authorized to be out of service for 2-1/2 hours during reactor operation provided all process tubes remained capped.

TEMPORARY NUCLEAR SAFETY SPECIFICATIONS

TNS #6-64 - "Processing of 1.47 w/o U-235 and 1.61 w/o U-235 Enriched Uranium Metal"

This TNS provides specifications for criticality control during receiving, transporting, packaging, and shipping of limited quantities of 1.47 and 1.61 w/o U-235 enriched uranium.

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 of Material</u>	<u>Tube Power at Failure (kw)</u>	<u>Exposure MWD/T</u>	<u>Type Failure</u>
5/2/64	1290-F	KY-596-V	I&E E (0.94%)	811	379	SH
5/2/64	2958-DR	KY-537-B	I&E E (0.94%)	1170	402	SH
5/2/64	1281-D	KZ-050-H	I&E N	1362	501	SH
5/4/64	3173-C	KC-242-A	I&E E (0.94%)	1403	405	SH
5/5/64	0662-F	KY-596-V	I&E E (0.94%)	1141	501	SH
5/5/64	1179-DR	KZ-033-B	I&E N	1274	348	SU
5/10/64	3960-C	KC-286-A	I&E E (0.94%)	1384	282	SH
5/15/64	1184-DR	KZ-033-B	I&E N	1262	436	SH
5/19/64	3688-B	KY-606-B	I&E E (0.94%)	1327	493	SH
5/20/64	3361-B	KL-069-A ¹	I&E N	1229	426	SH

¹Six-inch internally and externally cooled natural uranium element with attached water mixer spec.

FUEL FAILURE EXPERIENCE (Contd)

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Material</u>	<u>Tube Power at Failure (kw)</u>	<u>Exposure MWD/T</u>	<u>Type Failure</u>
5/27/64	4071-B	KY-596-V	I&E E (0.94%)	1240	593	UN
5/28/64	2676-H	KY-609-B	I&E E (0.94%)	1206	422	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.

U Unknown Location of failure is not known.

Second Character

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

U Unclassified No other character logically applies to the failure.

N Not examined Failure has not been examined.

DECLASSIFIED

DECLASSIFIED

HW-81003

OPERATIONAL PHYSICS

PILE PHYSICS PLANT ASSISTANCE

Flattening efficiency was lower and startup losses higher during the report period as a result of more unscheduled outages and associated nonequilibrium operation. Several remedial actions have been taken at the various plants to reduce rupture potential, including upstream charge displacement, revised rod configurations, administrative tube power limits, and additional scram recovery qualifications. Increased emphasis is being placed on longitudinal flux traversing, with all reactors approaching a five-traverses-per-operating-month schedule.

Enrichment ring modification is proceeding at both K reactors in accordance with economic incentives pointed out in a joint study by Process Technology and Operational Physics Subsections. The revision is nearly complete at KW.

Operation at H Reactor has returned to normal following discovery and correction of a large charging error; a total of 171 E-N columns had been charged with the target pieces in a nonconservative configuration during the April E-N core replacement.

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

Reactor	B	C	D	DR	F	H	KE	KW
ECT in May (1)	1490	1615	1465	1515	1465	1510	2490	2420
12-Month Average ECT	1490	1640	1500	1535	1500	1525	2480	2430
Equil Scram Time (2)	15-22	20-25	15-18	17-19	18-20	25-30	11-15*	20-25*
Recording Time:								
From:	4-21	4-12	4-21	4-22	4-22	4-22	4-20	4-22
To:	5-20	5-18	5-20	5-21	5-19	5-20	5-20	5-20

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

- (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

Operating continuity was interrupted several times during the report period; consequently, flattening and startup efficiency were somewhat lower than the actual potential for current conditions. An attempted hot startup was unsuccessful due to lack of reactivity after the extended downtime. One vertical safety rod has been temporarily removed from service due to interference from a protruding graphite block.

C Reactor - J. R. Heald

An unusually high rupture frequency caused considerable downtime and non-equilibrium operation during the report period; accordingly, startup and flattening efficiency were below the previous year's average. An attempted hot startup following a scram due to interruption of the instrument air supply was successful. During the same startup it was observed that initially neither subcritical monitor would have provided the intended function due to their setting in the "test" condition. Other low-level indications would have been available; however, this observation reinforces the arguments for current project proposals for nuclear safety instrumentation which would reduce procedure dependence.

D Reactor - R. L. Miller

Equilibrium operation was generally smooth and stable in the operating runs during the report period. Flattening efficiency (as measured by ECT) was relatively low, partially due to an intentional reduction in enrichment inventory in an effort to reduce rupture frequency. A nonconservative prediction error of ~ 4 mk was explained by a combination of a smaller calculational error and a distorted flux distribution which biased the control rod calibration.

DR Reactor - S. M. Skidmore

An unusually large number of unscheduled shutdowns occurred at DR during the report period; most of these were due to fuel element ruptures the majority of which occurred in enriched elements. Some improvement has been noted in the axial flux distribution as a result of intentional upstream displacement of near-side enrichment in conjunction with revision of the equilibrium rod configuration to eliminate upstream HCR's.

F Reactor - G. C. Masche

Although flattening efficiency was somewhat lower due to retention of part of the enriched block from the E-Q load (PT IP-659-AC), operation was fairly smooth. A revised rod configuration has been instituted to reduce rupture frequency; final assessment of the expected improvement will require considerable equilibrium flux traversing and subsequent examination of future rupture rates.

Persistent difficulty in charging poison splines for startup control has increased nonequilibrium losses.

H Reactor - E. L. Conner

Operation is essentially back to normal following correction of the large error made in charging the present E-N block. A second premature criticality was experienced on startup the following week after the charging error was corrected; this was due to an error of approximately 4 mk in calculating residual pile xenon poisoning in the distorted loading and flux distribution.

As an administrative measure to reduce rupture potential, maximum tube power limits have been lowered slightly; simultaneously, hot startup attempts have been eliminated.

KE Reactor - G. D. Baston

Although several scrams occurred during the report period, equilibrium operation has been smooth and flattening efficiency high. A hot startup attempt following a scram after 113,000 MWH operation was successful. Because of flux peaking and oscillation effects subsequent to scram recovery, the practice had been not to attempt hot startups after operation of 100,000 MWH; since this scram recovery was smooth and uneventful, a re-examination of the limit was made. A governing procedure issued jointly by the KE and KW physicists now provides for decision to attempt recoveries based on available reactivity at first indication rather than on a fixed exposure since startup.

Bottom thermal shield temperatures are currently limiting the nitrogen concentration in the reactor atmosphere; thermal shield temperature limits have been closely approached with maximum graphite temperature as much as 75 degrees from the operating limit.

KW Reactor - A. W. Medcalf

The inward movement of the side portions of the enrichment ring is now about 90 per cent complete; flattening efficiency is about as expected. Operation with the reduced flattening has been satisfactorily smooth; it appears that no further reduction in enrichment inventory is practical, due to control flexibility requirements at the "samarium dip" prior to long-term gains buildup.

PROCESS PHYSICS STUDIES

Reactivity and Control Studies

Analyses of lattice data obtained recently by Reactor Physics Operation show good agreement with absolute buckling values currently in use for the 8-3/8" lattice. New values for the 7-1/2" lattice indicate spline control worth to be approximately ten per cent greater than previously credited.

A number of calculational cases have been tried using the 9-ANGIE computer code to solve reactor control problems in three dimensions. Original startup criticality configurations have been closely calculated for the dry enriched reactor with all controls inserted; however, other survey cases must be successfully calculated with parameters allowed to vary before consistent results can be assured.

Computer runs for the Intermediate Range (Log N) Instrumentation Study have been completed using the Trip OC5 program. A document of the study is currently being prepared which will describe the degree of potential protection both at startup and at operating levels, and overlapping conditions of the linear rate and Log N systems.

DECLASSIFIED

DECLASSIFIED

HW-81003

Reactor Efficiency Studies

A final draft of a report on the Automatic Flux Distribution Control Demonstration Test was completed. It will be published as a formal report.

Publication and distribution was completed during the month of HW-50300-B REV, IPD Conversion Tables whose revision was effective in January 1964.

Production test preparation has been started on a one-ton thorium block test for a K reactor and on a larger scale E-D test (high-exposure plutonium from depleted uranium) for one of the smaller reactors. Reactivity feasibility determinations have been made, and nuclear safety considerations of the high-plutonium loading are currently under study.

TESTINGIRRADIATION TESTING

Irradiations - Routine sample irradiations were handled as follows:

Reactor	Test Hole	Facility	Request No.	No. of Samples	Material-Purpose
KW	2A	Quickie	HAP0-184	24	Washington Designated Program
KE	2D	Quickie	HAP0-184		Washington Designated Program
KE	2D	Quickie	HAP0-252	5	Arsenic (tracer isotope production)
KE	2D	Quickie	HAP0-254	1	Thorium (activation analysis)
DR		Process Channel	HAP0-098	20	Graphite (reactor oxidation rate determination)
B		Process Channel	HAP0-098	20	Graphite (reactor oxidation rate determination)
KE	3A,3C,3D	Bare Channel	HAP0-177	20	Graphite (neutron irradiation damage study)
KW	2A	Quickie	HAP0-223	1	Cobalt (radiography source)
KE	2B	Magazine	HAP0-263	1	Plutonium (neutron detector development)
KW	4B	Snout	HAP0-297	2	Boron-graphite (Fermi reactor graphite evaluation)
C		Process Tube	ORNL-184	64	Beryllium-nitride (carbon-14 production)
KE	2D	Quickie	Reed College	1	Tissue (cancer research)
		Gamma*		6	RTD leads and insulation (radiation damage study)
		Gamma		1	Organic inhibitor (radiation damage study)

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

Tungsten UO₂ Cermet Plates - HAP0-300 (2B Snout - KW) - Three tungsten UO₂ cermet plates were irradiated in the 2B Snout facility at KW Reactor. The facility was placed in the No. 1 safety circuit just prior to insertion and was removed from the safety circuit just after removal. The three irradiations were conducted without incident.

Creep Capsule Irradiations - HAP0-236 (3B General Purpose-KW) - One Zircaloy-2 creep capsule was removed from the 3B General Purpose facility at KW Reactor and a new creep capsule (304 stainless steel sample) installed.

Uranium Swelling Program - HAP0-222 (3674-KW) - One uranium swelling capsule was discharged from front-to-rear test hole 3674 and another uranium swelling capsule charged.

DECLASSIFIED

DECLASSIFIED

HW-81003

Borescoping Activities - In-reactor channels were examined with the borescope as follows:

<u>Reactor</u>	<u>Channel</u>	<u>Motion Picture Record</u>	<u>Purpose*</u>
KW	22	No	2
KW 2	24	No	2
C	VSR 28	Yes	1
B	VSR 21	No	2

- *1 - HCR-VSR problem
- 2 - Maintenance support

Vertical Bowing - Vertical displacement measurements were taken as follows:

<u>Reactor</u>	<u>Channel or Tube</u>	<u>Comparison to Previous Data</u>
B	3074	No previous data
KW	4170	No previous data
KW	8170	No previous data
KW	Z-3	Down .74" since 5-64

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

<u>Reactor</u>	<u>No. of Tubes</u>
DR	9
KW	11
B	4
D	6
F	8
C	9
H	11

C-1 Loop Operation - (High Temperature Aluminum Corrosion Studies PT-IP-623-D - The loop has continued to operate at the conditions specified for aluminum fuel cladding test No. C-1-4. During a reactor scram transient, the loop transferred to process water coolant because it was unable to maintain pressure due to leaking check valves in the rapid-fill pump. The test results will be unaffected since the loop was returned to recirculating operation within three hours.

COMPONENT TESTING

Irradiated IPD Fuel Examination, 105-C Facility - Examinations were completed on fuel elements from 69 tubes requiring 7415 individual examinations.

<u>No. of Tube Charges</u>	<u>Production Test</u>
29	IP-216-A, Evaluation of Performance of Normal Production I&E Fuel Elements
20	IP-581-A, Half-Plant High Flocculation pH at B Reactor
4	IP-634-A, Half-Plant Low pH Test Water Treatment at D Reactor

<u>No. of Tube Charges</u>	<u>Production Test</u>
7	None - Regular enriched fuel rupture charges, H Reactor
9	None - Regular enriched rupture prone fuel charges, F Reactor

Photographs of ruptured fuel elements were taken at the following reactors:

C - 2, D - 1, DR - 1, F - 3, and H - 7.

Irradiated N Fuel Examination, 105-KE Facility - Profile measurements were made as follows:

<u>No. of Elements</u>	<u>Kind</u>	<u>Measurement Status</u>	<u>Tube and Discharge Date</u>	
14	Inner	Complete	KER-4	1-23-64
11	Inner	Complete	KER-4	9-25-62
11	Inner	Complete	KER-3	9-6-62

UT-10 (ultrasonic) tests of cap and clad bond and core integrity were completed on 14 outer elements from KER-4 discharged 1-23-64. Results indicate the cap to core bond is consistently good. One core of questionable integrity as indicated by the tester will be checked at the Radiometallurgy Laboratory.

Irradiated Process Tube Measurement

Wall Thickness Gauge (eddy-current type) - WTG

<u>Reactor</u>	<u>No. of Tubes Measured</u>	<u>Report No.</u>	<u>HW No.</u>
DR	68	19	81953
F	44	20	81954
C	66	21	82210
D	50	22	82350

Total 228

Sector Gauge (eddy-current type) - SG

<u>Reactor</u>	<u>No. of Tubes Measured</u>
C	14
D	20
DR	8

Ex-Reactor Visual, Weight, and Micrometer Measurement

<u>Reactor</u>	<u>No. of Tubes</u>	<u>Tube Samples Measured</u>	<u>Reason Examined</u>
D	2	88	sector gauge calibration
DR	3	132	sector gauge calibration
HH	3	132	sector gauge calibration

DECLASSIFIED

DECLASSIFIED

HW-81003

Critical Reactor Component Examination - Fourteen KE and KW Reactor front flexible connectors were examined and pressure tested to failure. Three leaking DR Reactor front connectors were pressure tested and sectioned for examination at the leak location.

Panellit System Programs

Gauges repaired, calibrated by Maintenance	-	36	
Gauges meeting calibration criteria	-	32	(89%)
-previous month	-		(80%)
In-board Bourdon coil examination	-	5608	
Non-leaking coils	-	5607	(99.9%)
-average rate past two years	-		(99.8%)
Gauges receiving failure analysis	-	48	
2B-X1 switch examination	-	138	
-acceptance rate	-	129	(93%)
-previous month	-		(95%)
Gauges received from vendor and examined	-	575	
-acceptance rate	-	531	(92%)
-previous month	-		(93%)
Gauges received from Central Maintenance and examined	-	506	
-acceptance rate	-	444	(88%)
-previous month	-		(96%)

One hundred eighty-four gauges were removed from panels for new gauge installation and prepared for shipment to the vendor as exchange gauges.

COOLANT TESTING

KER Loop Operation

KER-1 - The eight 12-inch KSE5 fuel elements and thermocouple train assembly charged April 2 were discharged on April 27 because of several days operation at reduced temperature required by a piping leak. The loop was recharged with eight 12-inch KSE5 fuel elements and a thermocouple train assembly. Both charges were authorized by PT IP-544-A. The object of this test is to evaluate the swelling behavior of Zr-2 clad, thick-walled, enriched uranium tubular elements at high uranium temperatures.

KER-2 - Testing of eight 12-inch KSE5 fuel elements as authorized by PT IP-544-A continued. The objective of this test is to evaluate the swelling behavior of Zr-2 clad thick-walled, enriched uranium tubular elements at high uranium temperatures.

KER-3 - Testing of thirteen 26-inch co-producer elements as authorized by PT IP-645-D continued. 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 - Testing of Zr-2 clad thorium-uranium crud monitor and ten 23-inch NAEI fuel elements as authorized by PT IP-644-D and PT IP-477-A continued. The object of this test is to demonstrate and evaluate the design of the proposed N Reactor fuel surface crud monitor. The loop is being operated on single-pass.

Single-Pass Tube Operation - 1706-KE

<u>Tube</u>	<u>Production Test</u>	<u>Water Supplied</u>	<u>Corrosion Inhibitors & 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 1.0 ppm silicon dioxide	6.6
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 (4457)	IP-604-A	Service	2.0 ppm sodium nitrite 1.0 ppm silicon dioxide	6.6
SP-6 (4863)	IP-604-A	Service	2.0 ppm sodium nitrite 1.0 ppm silicon dioxide	6.6
SP-7 (4963)	IP-449-A	Deionized	None	
SP-8 (5063)	IP-449-A	Deionized	None	

*Ferric sulfate addition rate was increased from 2.0 ppm to 4.0 ppm on May 14. The balance of the flocculating agent is aluminum sulfate and pH is controlled by adding sulfuric acid.

KE Reactor Outage Time Requirements

A reactor scram occurred on April 26 as a result of the failure of a transformer in the KER-3 heat exchanger exit temperature indicator-controller. A total of 17 hours was charged to production testing as listed below.

<u>Production Test</u>	<u>Description</u>	<u>Hours</u>
IP-645-D	Reactor scram	3.9
IP-449-A	Charge-discharge single pass tubes SP-3,-4	0.7
IP-476-AL	Charge-discharge control tubes	1.5
IP-520-A	Charge-discharge single-pass tubes SP-3,-4	0.7
IP-544-A	Charge-discharge KER-1	4.5
IP-604-A	Charge-discharge single-pass tubes SP-2, -5,-6, and control tubes	5.7

DECLASSIFIED

DECLASSIFIED

HW-81003

Out-of-Reactor Facility Operation

TF-1 - The test to obtain cyclic corrosion data on the effects of the alkaline permanganate-inhibited sodium bisulfate decontamination process was completed on May 18. The loop will be operated for two weeks at pre-filming conditions before a new test using an alkaline permanganate-synthetic ammonium citrate decontamination process is initiated. Operating conditions are 1650 psig, 300 C and pH 10.0 adjusted with ammonium hydroxide.

TF-3 - A new test to evaluate crevice corrosion beneath Zr-2 fuel elements, corrosion of stainless steel and carbon steel alloys, and fretting corrosion of Zr-2 was started on April 30. Operating conditions are 1350 psig, 560 F and pH 10.0 adjusted with lithium hydroxide.

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

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

The test sections contain the following materials:

1. One PRTR fuel element for fretting corrosion studies
2. Two dummy Zircaloy-2 clad elements for uniform corrosion testing of supports
3. Two NIN1 fuel elements for uniform corrosion testing
4. One KSE3 fuel element for uniform corrosion testing
5. Two 26-inch co-producer elements for support fatigue testing
6. One sample holder containing stressed samples of Admiralty metal and 70-30 cupro-nickel alloy for intergranular corrosion testing
7. One Zircaloy-2 specimen for caustic attack testing
8. Stainless steel and Inconel coupons to be prefilmed for decontamination testing

TF-20 - Testing to determine the effects of heat transfer on aluminum corrosion in process water, the cause of resistance temperature detector corrosion and the effect of various coatings continued. Operating conditions are 120 C, 9.5 gpm flow and pH 6.6.

Legend

NIN1 - N Reactor, inner tube, natural, first model
NIE1 - N Reactor, inner tube, enriched, first model
NAE1 - N Reactor, assembly - tube and tube, enriched, first model
KSE3 - KER loops, single tube, enriched, third model
KSE5 - KER loops, single tube, enriched, fifth model

Manager, Research and Engineering

DECLASSIFIED

HW-81003

FACILITIES ENGINEERING

DESIGN ENGINEERING

Vertical Safety Rods - Graphite Distortion

A design development and research contract to provide a thermal and biological shield boring machine in support of the VSR sleeving program at the 105-K Reactors, has been placed with the International Design Corporation, Tacoma, Washington.

The obstruction was removed from VSR Channel #41 at 105-C Reactor, and enlargement completed through the top cast iron thermal shield and ball guide plate. The matrix of 3X balls and lead at the bottom of the channel was penetrated by drilling. Completion of channel enlargement and installation of sleeving in this channel is currently scheduled for the June outage at 105-C Reactor.

VSR Channel #28 at 105-C Reactor, was examined to determine the condition of graphite test sleeves. These sleeves, fabricated from excess NPR graphite and installed August 15, 1963 appear in good condition. Displacement measurements and full channel photographs were obtained during the examination. These data are currently being processed and will be available for detailed analysis in the near future.

A report, HW-81876, was issued describing the tests, the results to date, and the work which remains to be completed on the study of irradiation effects on ceramic materials suitable for use as VSR liners. This test program has been cancelled as a result of the apparent success of graphite liners. Attempts are being made to determine if other HAPO organizations have an interest in supporting examination of the remaining eight boats of irradiated samples.

Preliminary studies were initiated relating to the use of water cooled metal liners for permanent installation in the VSR channels as an alternative to the current graphite sleeving concept. Metal liners would resist graphite shifting, insure channel integrity for VSR entry and 3X ball retention. Initial efforts are concerned with a review of the problems associated with metal liners and feasibility of alternate materials and configurations. Because of the reactivity and control strength losses associated with water cooled metal liners, partial as well as full length liners are being considered.

Power Recovery Study

In support of HW-81667, "Interim Summary Report - Power Recovery Study - Existing Smaller Hanford Reactors," dated May 1, 1964, three engineering Study I Reports have been published. They are:

DECLASSIFIED

DECLASSIFIED

HW-81003

HW-81213, "Interim Report - Power Recovery Study - Existing Hanford Reactors," dated May 15, 1964.

HW-81387, "Preliminary Study - Sub-Atmospheric Power Recovery from 105-H Reactor," dated May 15, 1964.

HW-81832, "Preliminary Study - Conversion of 105-H Reactor for Production of Radioisotopes," dated May 15, 1964.

The engineering evaluation of Study II cases is essentially complete and cost estimating for the four major cases involved is under way. Work has started on the preparation of a final report covering the Study II cases and an over-all summary report covering Study I and II cases. The issuance of the additional reports at the end of the fiscal year will complete the currently authorized study program.

Replacement of Horizontal Control Rods

To date acceptable boron carbide elements for use in the 105-K Reactor prototype flexible horizontal control rods have not been received from the vendor. The lack of these poison elements is delaying completion of the rods and is causing a resultant delay in the over-all program.

Work toward development of a laboratory prototype of a by-product horizontal control rod, adaptable to all of the smaller reactors, has been initiated. This design is to be compatible with the flexible rod tips being designed as replacements for B and D Reactors, and can also be adapted to KE, KW, and C Reactors.

K Reactor Discharge Area Fuel Handling

The discharge port water jet test installation at the 105-KW Reactor is scheduled for the first convenient outage. Installation of the water supply piping and the fabrication of the jet piping sub-assemblies have been completed. Production test IP-678-AE authorizing and describing the installation and test operation of the jet system has been approved.

Deactivation of Peripheral Facilities

Work continued on the preparation of design criteria for facility changes required by the planned reactor shutdowns. Two of these, issued for comment, describe the changes required to provide a supply of fire and sanitary water from D Area to the facilities remaining in operation in F and H Areas following the planned reactor shutdown, and the facilities required to provide a backup source of raw river water to the 146-F Biological Facilities. Studies of other peripheral facility changes which will be required such as fire protection in the shutdown plants, heating boilers for the remaining facilities, and supporting electrical system alternatives are under way.

EQUIPMENT DEVELOPMENT

Self-supported Fuel Element (SSFE) Charging

Prototype plastic fuel magazines developed by off-site vendors were delivered for test and evaluation. The prototypes were fabricated from polystyrene foam encased in two types of plastic skin; one a rubber-based plastic and the other a high strength polystyrene. Evaluation prior to on-reactor tests has been initiated.

Prototype High Speed Scanner

Due to a power supply failure the prototype high speed scanner system has not operated since March 5. Replacement power supplies were received on May 22, and system repair has been initiated.

K Reactor Resistance Temperature Detector (RTD) Corrosion

Stress-cracking corrosion tests on several annealed RTD facsimiles were completed. Three test groups withstood 548 hours exposure to the magnesium chloride solutions without cracking. Metallographic examinations of these samples are under way.

Intermediate Range Neutron Monitoring

Development of a two-inch O.D. chamber to permit nesting of three chambers in one side shield entry is continuing. The prototype channel installed in F Reactor continues to operate satisfactorily.

Dose Rate Telemetry

Procurement effort for one prototype dose rate telemetry system was initiated. A bid request in the form of a design and development contract proposal was issued to thirteen potential vendors on May 21, 1964. Proposals were requested by June 12, 1964.

Design Test Service

The N Reactor program utilized 554 hours of engineering effort for design test service.

DECLASSIFIED

DECLASSIFIED

HW-81003

PROJECT ENGINEERING

CGI-103, Fuel Element Charging and Handling System, KE and KW Reactors

Several minor problems were experienced with the two metal hoisting cranes recently installed on the "C" platform at the 105-KW Reactor. These involved limit switch settings, cable block design, and jerky motion. The third party inspector observed operation of the hoists during fuel charging and later inspected the hoists. He recommended minor modifications. The recommended changes will be made and other discrepancies in the hoists' operation corrected before the next scheduled fuel charging outage at 105-KW.

Two magazines were dropped from their lifting yoke when they were over the charging machine. This failure was attributed to improper operation of the latch. The design has been revised and additional safety devices are being proposed.

CAI-105, Modifications for Use of Bauxite, KE and KW Water Plants

A revised design criteria to permit use of a less expensive bauxite was approved by the RLOO-AEC and formally issued. This revision requires that the bauxite feed equipment be sized to allow utilizing bauxite feed materials, which can vary from 50 to 80 per cent in aluminum oxide content.

CGI-125, Replacement and Improvement of Fixed Gamma Radiation Monitoring Instrumentation - Existing Hanford Production Reactors

The Vitro Engineering Company has reported 100 per cent complete on Title I design and 8 per cent complete on Title II design.

The order for the Log Radiation Monitors has not yet been placed by RLOO-AEC.

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

Mechanical work is proceeding slowly due to a lack of Type 316 stainless steel (certified) pipe and weld fittings.

Test of the "Y" block fittings has been delayed due to failure of 1/8 inch thermocouple probes. One-quarter (1/4) inch probes will now be tested. This testing must be completed before design of the in-loop thermocouple receptacles can be completed.

Byron-Jackson is now two weeks behind schedule in making the dynamic flow tests on the canned rotor loop pumps.

CAI-940, Installation of Oil-Burning Facilities in Lead Boiler, 184-B

A revised directive limiting the scope of project work to performance of Title I design was received from RLOO-AEC. The design criteria was approved by the RLOO-AEC and issue of the document will complete our Title I effort.

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

Brake and sprockets are now scheduled to arrive mid-July. Platform jack shafts are due mid-June.

Pre-shutdown work is 80-90 per cent complete except for brake support fabrication, which is 60-65 per cent complete.

Design changes to B, C, and D drawings have been started.

The revision to the project proposal to include work at the B, C, and D Reactors must be approved or an extension to the present directive will be required prior to June 30, 1964.

CGI-967, High Speed Scanning System for Temperature Monitors, KW Reactor

Construction start date was established at May 18, 1964 as a result of the start of major shop fabrication. Initial effort has been directed toward preparation of the new temperature monitor board panel for shipment to the scanner vendor for system testing.

MJA-42, Interior Painting, Process Water Storage Tanks, B and C Areas

The No. 1 tank at 190-B has been painted. Painting of the No. 2 tank at 183-C is half complete.

R-24008 (RTD and Cable Procurement for K Areas)

None of the three vendors who have orders for RTD cable has been able to make wire to meet the specifications. A visit to each of them by RLOO-AEC and GE personnel resulted in agreements for each of the vendors to perform experimental production to try to solve the manufacturing difficulties. These tests are predicted to take approximately two months.

Project Proposals Submitted to AEC

CGI-141, Reactor Plant Deactivation.

CGI-142, Coolant Backup Modifications Required by Reactor Deactivation, Three Small Reactors.

Directives Received

AEC-200, Mod. 3 - Installation of Oil Burning Facilities in a Lead Boiler, CAI-940 (reduced project authorization to preliminary engineering and investigation).

AEC-216, Mod. 2 - Fence Relocations, 100-K Area, CAI-975 (increased funds to \$32,000).

AEC-225, Mod. 1 - Emergency Storage Basin Coolant, CAI-108 (reduced project authorization to Titles I and II).

DECLASSIFIED

DECLASSIFIED

HW-81003

CPFF Construction Service Contractor-Liaison

Issued four new work orders and supplemented two old jobs, for a total of \$91,513 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 \$7,700.

REACTOR PLANT DEACTIVATION

With the submission of two project proposals this month, CGI-141, "Project Proposal - Reactor Plant Deactivation", and CGI-142, "Project Proposal - Coolant Backup Modifications Required by Reactor Deactivation - Three Small Reactors", further attention was given to other matters relating to reactor shutdown. Assistance was obtained from Research and Engineering on planning post-shutdown radiation surveillance and control. Recommended disposition of the test water filter at DR was requested of Research and Engineering. Information on post-deactivation fire and safety was furnished by the Specialist, Health and Safety. A general information letter on the deactivation program as presently envisaged was prepared for transmittal to HAPO Department General Managers to assist in planning.

A Plant Forces Work Review covering work planned under projects CGI-141 and CGI-142 and all other work to be performed during deactivation was submitted May 12, 1964.

Preparation of deactivation procedures was started. Four Special Outage Service people are assisting in this work. A schedule for preparation and approval of the several hundred procedures required for DR is being developed.

Manager, Facilities Engineering

RT Jessen:dgm

DECLASSIFIED

DECLASSIFIED

HW 81003

FINANCIAL

ACCOUNTING

Mr. Roger Johnston, General Accounting Office, has been discussing measurements activities and cost reduction items with Irradiation Processing Department Financial and other management personnel. He also visited the 100-H Area Maintenance and Central Maintenance Shop facilities.

The Irradiation Processing Department annual coal survey was completed during May, 1964.

An analysis of spare parts inventory reserve was made in preparation to adjust the reserve account to the 25 percent of the expected inventory balance at June 30, 1964.

An analysis of the FY 1966 budget and revision of FY 1965 budget was performed during the month. This included analysis and explanations of changes for use by RLOO-AEC Budget Division for submission to Washington AEC.

A cost comparison for placing a reactor in an abandonment status versus placing in standby, and maintaining a reactor in abandonment versus maintaining in standby, was prepared at RLOO-AEC request.

AUDITING

Revisions or new issues of Government instructions were reviewed as follows:

AEC Manual Chapters	7
RLOO-AEC Manual Chapters	7
AEC Procurement Regulations	2
RLOO-AEC Procurement Regulations	2

Violations of the Employee Product Purchase Plan resulted in disciplinary action for two employees. Courtesy discounts totaling \$70 were recovered and employee product purchase privileges were suspended for five years.

Manager-Finance

RW McMichael:WKH:slb

DECLASSIFIED

HW-81003

SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Class'n</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-79653	Secret	JJ Wick	11-13-63	E-N Super Fuel Elements
HW-82230	Secret	JJ Wick	1-13-64	Lithium-Aluminum Rod Stock Cost Report
HW-82046	Conf.	JD Schaffer	12-7-63	AlSi Slopovers - Studies, Method of Elimination and Results
HW-80604	Secret	WN Mobley	5-26-64	Production Forecast - Supplement 1
HW-72075	Secret	R Nilson	5-25-64	Np-237 Production in the Hanford IPD Reactors
HW-82080	Secret	JP Hamric	4-30-64	Temporary Speed-of-Control Limits for C Reactor
HW-81213	Secret	Staff of IPD	5-15-64	Interim Report - Power Recovery Study Existing Hanford Reactors
HW-81387	Secret	FJ Kempf	5-15-64	Preliminary Study - Sub-Atmospheric Power Recovery from 105-H Reactor
HW-81832	Secret	NF Fifer	5-15-64	Preliminary Study - Conversion of 105-H Reactor for Production of Radioisotopes
HW-82060	Secret	HW Heacock	4-29-64	100-K Coolant Backup Adequacy
HW-81667	Secret	Staff of IPD	5-1-64	Interim Summary Report Power Recovery Study - Existing Smaller Hanford Reactors
HW-81876	Conf.	DE Cooley	4-21-64	DT-IP-434-D Irradiation Effect on Ceramic Materials
HW-82050	Unclass.	RB Bixler RG Geier	4-30-64	PT-IP-678-AE, Installation and Testing of Hydraulic Jet System and Discharge Chutes - 105-KE Reactor
HW-82012	Secret	BW Herrman	4-27-64	Meeting Minutes - Intermediate Range Instrumentation Program Representatives Meeting No. 2, April 16, 1964

Number	Class'n	Author	Date	Title
HWS-7250	Unclass.	GL Erickson	4-28-64	Specification for Design, Workmanship, and Component Quality for Electronic Equipment
HWS-7397 Rev. 1	Unclass.	PJ Horvath	11-20-63	Radiation Dose Rate Telemetry and Integration
HWS-7371 Rev. 2	Unclass.	PJ Horvath	10-25-63	Dose Rate Telemetering System Specification
HW-82221	Unclass.	CA Munro JM Goff, Jr	5-7-64	Status Report - RTD Cable Testing
HW-81757	Unclass.	KG Hawkins	5-20-64	DT-1197 - Final Report Potential Chattering of Light Inactive Metal Columns
HW-ADL-2	Secret	RW Hyde FC Schora Arthur D. Little, Inc.	5-5-64	Study of Measures for Correction Graphite Distortion Problems
HW-82352	Secret	AP Vinther	5-1-64	Investigation Report, H Reactor Mischarging Incident
HW-80166	Secret	TW Hauff	4-29-64	Manufacturing Section Semiannual Summary Report (Period Ending December 31, 1963)
HW-81770	Unclass.	G Kestell	4-17-64	Methods for Overriding Transient Voltage Depressions on AC Safety Circuits
HW-81928	Secret	JR Young	4-21-64	Rear Hardware Modifications 105-B and 105-D Reactors
HW-82039	Secret	FF Vlacil	4-28-64	Inlet Nozzle Program, 105-C Reactor
HW-82264	Unclass.	WV Thompson	5-21-64	Development Test IP-679-S, Rear Cap Insert Modification O-Ring Seal, 105-H Reactor
HW-82290	Secret	JR Young	5-15-64	100-K Reactor Zirconium Spline Tubes
	Conf. Undoc.	JR Young	4-29-64	Classification of WTG Data

DECLASSIFIED

DECLASSIFIED

HW-81003

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
GA Huff	ASME Design Engineering Conference Chicago, Ill.	5/10-15/64	Attend conference on Machine Design, McCormic Place.
	Syntron Co. Chicago, Ill.	"	Discuss conveyors and parts handling equipment.
	Crown Rheostat & Supply Co. Chicago, Ill.	"	Discuss design of metal cleaning and finishing order.
	Link Belt Mfg. Co. Chicago, Ill.	"	Discuss equipment for the thorium oxide program.
	Mallinckrodt Chemical Works St. Charles, Missouri	"	Discuss thorium program.
LH Rice	Mallinckrodt Chemical Works St. Charles, Missouri	5/7-17/64	Discuss and observe preparation of thoria.
	National Lead Co. Cincinnati, Ohio	"	Contact PN McCreery to discuss uranium specifications, technology, and thoria production proposals.
	Savannah River Plant Augusta, Georgia	"	Discuss aluminum-lithium production and quality problems.
RL Roske JD Schaffer	Rem, Inc. Portland, Oregon	5/13-15/64	Discuss proposed design for arch rail self-supports.
	Custom Stamping, Inc. Portland Oregon	"	Discuss proposed design for arch rail self-supports.
	Mechanical Products Mfg. Co. Seattle, Washington		Discuss proposed design for arch rail self-supports.
	Renton Coil Spring Co. Seattle, Washington	"	Discuss proposed design for arch rail self-supports.

Name	Firm & Location	Date	Purpose
JR Carrell	Washington Society of Professional Engineers State Convention Longview, Washington	5-15-64	Attend convention as official delegate and member of the board.
JR Spink	Vallecitos Atomic Lab. General Electric Co. Pleasanton, Calif.	5-6-64	Discuss irradiation tests.
	San Francisco, Calif.	5/7-8/64	Attend meeting of Amer. Society of Mechanical Engineers.
OH Greager T. W. Ambrose	Argonne Nat'l Lab. Argonne, Ill.	5-7-64	Attend ACRS Meeting
PH Hutton	General Electric Cincinnati, Ohio ASME Meeting Chicago, Ill.	5/10-13/64	Review development work on uncooled control rod. Attend ASME Design Conference.
HW Heacock	WSPE Annual Meeting Longview, Washington	5/14-17/64	Attend WSPE Annual Meeting.
CA Munro	L. Frank Markel & Sons Norristown, Pa.	5-11-64	RTD cable procurement.
	Prestolite Company Hazelton, Pa.	5/12-13/64	Same
	Rockbestos, Inc. New Haven, Conn.	5-14-64	Same
	General Electric Co. Lowell, Mass.	5-15-64	Same
CA Munro	International Design Tacoma, Wash.	5-25-64	Contract DDR-172 - Discuss design of equipment for shield boring.
W Dalos	GE Switchgear Dept. Philadelphia, Pa.	4/27-15/64	Discuss NRD circuit breaker.
R Sherrard DF Arnold	Astrodata, Inc. Anaheim, Calif.	5/11-15/64	Technical review of progress on DDR-179.

DECLASSIFIED

HW-81003

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
JW Scoggin GP Stein	Farris Engineering Corp. Palisades Park, N. J.	4/27-5/6/64	For training and qualification in the adjustment and maintenance of safety valves.
	J. E. Lonergan Co. Philadelphia, Pa.	"	Same
	Manning, Maxwell & Moore, Inc. Alexandria, La.	"	Same
W Seeburger	General Electric Co. Lowell, Mass.	5/9-16/64	To discuss RTD cable manufacturing problems, and assure uniformity of testing requirements and techniques. (At request of RLOO-AEC).
	L. Frank Markel & Sons Co. Norristown, Pa.	"	Same
	Prestolite Company Hazelton, Pa.	"	Same
	Rockbestos Company New Haven, Conn.	"	Same
CE Harkins	Toronto, Canada	5/31-6/5/64	Attend the Annual Conference of the American Water Works Association.
JL Lorenzen	Spokane, Wash.	5/6-8/64	Attend the Pacific Northwest Conference of the Americal Water Works Association.
A McDonald	Byron Jackson Co. Los Angeles, Calif.	4/28-5/1/64	To investigate problems involved in the rewinding of the 600 HP submersible motor removed from 181-KE.
ML Faught	Spokane City Water Dept. Spokane, Wash.		To view pipe lining job by Pipe Linings, Inc.

VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
RV Jobe	Dow Industrial Service	4-24-64	To discuss "on-the-line" cleaning of boilers.
W Diez CT Philipp	Dow Industrial Service Midland, Michigan	4-24-64	To discuss "on-the-line" cleaning of boilers.
RM Wilkins	Conrad Corporation Tacoma, Washington	5/5-6/64	Steel sleeve quality problems.
EI Christensen	Alco Products Co., Inc. Auburn, New York	5/8-18/64	To assist in startup of emergency generator equipment.
M Forseth	Travelers Indemnity Co. Seattle, Washington	5-15-64	Third party inspection
FP Robinson	General Electric Co. Seattle, Washington	5/18-20/64	To make tests for start-up of equipment furnished with emergency generators.
F Morris	Turco Products, Inc. Spokane, Washington	5-19-64	Chemical compounds.
DM Guy	ALCOA Seattle, Washington	5-21-64	AlSi procurement.
G Schore	Abbey Automation Systems, Inc. Brooklyn, New York	5-20-64	Inspect and review operation of nickel plate equipment in 3716 Building.
E Beumeller	Western Communications, Inc. Spokane, Washington	5/21-22/64	Conduct training on closed circuit TV system maintenance.
W Hampton President W Decker Sales Mgr.	Hoffman Brothers Drilling Co. Punxsutawney, Pa.	4-27-64	To discuss core drilling of K Area shield.
RS Ebbert	Hoffman Brothers Drilling Co. Los Angeles (California Branch)	4-27-64	Same.
E Uynne, Jr	Cascade Construction Co., Seattle, Wash.	4-27-64	Same.

DECLASSIFIED

HW-81003

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
EW Colston RN Zogran	Atomics International Canoga Park, Calif.	5/12-13/64	Discuss future testing in KER loop.
ED Miller	Atomic Energy Commission, Washington, D.C.	5-27-64	Tour of B Area.
James Seguire	Crane Hoist Engineer- ing Co. Bell, Calif.	5/19-20/64	Inspected the transfer area cranes of B and C Reactor Buildings and the cranes in the main pump houses.
George Cobel	Dow Chemical Co. Midland, Michigan	5-26-64	Tour of F Area.
CE Carrall	Dow Chemical Co. Pittsburgh, Pa.	5-26-64	Tour of F Area.
WH Borman	Precision Instrument Co. Palo Alto, Calif.	5-14-64	To demonstrate multi- channel communication recording devices.
DC McMacken J Fields	Shell Oil Company Seattle, Washington	5/5-6/64	To explain application of Shell protective lubricants and preserva- tives for deactivated equipment.
HE Kingston	Dresser Manufacturing Co. Vancouver, Washington	5-5-64	To discuss Dresser coupling repair techniques and improved gasket material for effluent system repairs.
EW Legas	Chicago Pneumatic Co. Seattle, Washington	5-19-64	To test spline cap tooling.

**DATE
FILMED
01/22/93**