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IRRADIATION PROCESSING DEPARTMENT

MONTHLY REPORT

APRIL 1961

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HANFORD ATOMIC PRODUCTS OPERATION

GENERAL ELECTRIC

RICHLAND, WASHINGTON

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IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
APRIL, 1961

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Compiled by
IPD Personnel

May 15, 1961

RICHLAND, WASHINGTON

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

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SUMMARY

RESEARCH AND ENGINEERING

During this period power levels were restricted by rupture control considerations at all but D Reactor. At D Reactor, power levels were restricted by bulk outlet temperature considerations. Operational efficiency, as measured by equilibrium effective central tubes, was somewhat reduced from the high performance of the past few months due to the transition to Li-Al material in peripheral tubes at H Reactor, a low fringe residual exposure at DR Reactor, and transition from 34 to 32-piece charges in the central zone of B Reactor.

Four more channels were overbored at C Reactor and charged with overbore-size self-supported fuel elements which brings the test facility up to the maximum size authorized. The next column will be discharged at an exposure of 400 MWD/T and is scheduled to reach that goal about month's end. Operating characteristics of the overbored channels continue to agree well with predictions.

Ten NINL elements were discharged from KER-1 loop at an exposure of 1050 MWD/T. The loop was recharged with a UO₂ tubular element but discharged shortly afterward at an exposure of only 145 MWD/T because of a nozzle-to-tube leak on the reactor outlet assembly. The loop was not recharged. Four NINL elements and one NIEL element were discharged from KER-4 at exposures of 985 and 270 MWD/T, respectively, due to a rupture indication; the rupture could not be located during the preliminary visual examination in the basin. N- Reactor fuel development tests in KER-2 and KER-3 have reached exposures of 635 and 2645 MWD/T, respectively.

Test operation of KE Reactor with a nitrogen-helium reactor-gas atmosphere has been satisfactory since its start last December. The nitrogen concentration has been in the range of 10 to 25 percent and samples of condensate from the silica gel driers have shown no higher concentration of nitrate than at other reactors.

MANUFACTURING

Production

Reactor input production (MWD) was 2.1% above forecast. Production at the six old reactors was equal to forecast and at the K's 5.2% above.

Over-all time operated efficiency was 81.0% (82.3% forecast), 80.3% at the six old reactors and 83.1 at the K's.

There was no increase in the combined reactor instantaneous power level or the individual reactor record power levels. Input production records were achieved at B and F Reactors exceeding their previous maximums by 0.4 and 7.4%, respectively.

Twelve ruptures, ten I&E regular, one I&E enriched and one solid regular metal were removed from the reactors. Three of the I&E regular metal ruptures were at H, two at each B, C and D and one at KW. The I&E enriched and solid regular metal ruptures were at KW.

Engineering

Initial deliveries of replacement rear connectors were received, and orders were placed for the remaining connectors required.

The schedule for conversion to bumper fuel was revised to exclude C Reactor, and advance the conversion of B, DR, and F Reactors.

The work on Operations Planning in F Power was terminated.

FACILITIES ENGINEERING

Four more channels were overbored in the 105-C Reactor for a total of 20. The work proceeded smoothly and was completed in 15.1 hours.

Study drawings for two alternate concepts of oversized smooth bore process tube assemblies for future overbored fuel channels at C Reactor are 80 percent complete. Purchase requisitions for prototype procurement are being prepared. A testing program has been initiated to evaluate these concepts and has been supplemented by development work in the event the program is extended to full pile. Analytical studies concerning the heat distribution, gas composition, coolant flow distribution, shield loadings and overbore tolerances are also in progress.

Detail design for Project CGI-883 is 92 percent complete. Lack of vendor information has caused the progress to fall four percent behind schedule. Revisions to accommodate prospective bidders in the purchase specifications for the submersible pumps for the 181-K River Pump House has delayed placement of the purchase order. The final revision was approved April 25, 1961, with the bid closing date established for May 17, 1961.

Inspection of impellers in 16 of the forty 4500 HP motor driven primary pumps was completed. Three of these impellers with cracks indicating potential failure were replaced. Data obtained from the inspections are being utilized in the development of a program to upgrade this equipment.

The vendor for the halogen filter frames, being procured on Project CGI-791, was permitted to forward two filter frames without final acceptance. These are being inspected on site for possible acceptance. If found satisfactory, these would be the first two accepted, more than two months behind schedule.

NFR PROJECT

An exploratory investigation of zirconium clad fuel elements indicates that the integrity of the cladding exists even at temperatures where the uranium is molten.

An investigation has been initiated to evaluate the advantages of installing the sixth loop during the current construction program.

Action has been taken to eliminate or assure correct heat treatment of 17-4 PH stainless steel applications in NPR where metallurgical problems may be encountered.

General Electric has been requested to assume the design responsibilities for the decontamination waste disposal facilities.

Construction on the 105-109 Building continued at a high rate. Roof structural work over the reactor area in the 105 Building was started and substantial progress was made during this reporting period.

Work was started on the primary loop piping in the HUICO shop. Preliminary field work relating to clips and hangers for this system was started.

Functional testing of 230 kv electrical equipment at the 151-N substation was completed satisfactorily.

Structural work in the boiler plant, 184-N Building, and the water treatment buildings, 163-N and 183-N, was essentially completed. Pump installation and diesel engine installation continued at the 181-N river pump house. Work on the fuel oil and diesel oil storage tank and piping installations is virtually complete.

Zirconium tube processing continued to improve in efficiency and yield. Delivery from vendors continued satisfactorily.

Delivery of graphite is nearing completion well within schedule requirements. Notching on the modified Sundstrand machines continued to be satisfactory.

FINANCIAL

PA&C FY 1962-FY 1963 Budget approved by the IPD General Manager was transmitted to Contract and Accounting Operation March 24, 1961. The Equipment Not Included in Construction Projects Budget for FY 1962 and FY 1963 approved by the IPD General Manager was also transmitted to Contract and Accounting Operation March 28, 1961.

Revision was made to the FY 1962 Research and Development budget reflecting the reduction of the O2 Program to \$10.653 million total HAPD R&D costs. The revision was submitted to Contract Accounting on April 17, 1961.

The total number of personnel assigned to the Department at month end was 2,277, a decrease of six from last month.

RELATIONS PRACTICES

Three PhDs were interviewed with no offers extended. Three college students accepted summer jobs. Two employees retired during the month.

GENERALRESPONSIBILITY

There was no significant change in responsibility.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non Exempt</u>	<u>Total</u>
General	7	2	9
Research & Engineering	107	61	168
Manufacturing	410	1356	1766
Facilities Engineering	122	45	167
NPR Project	82	30	112
Financial	17	14	31
Relations Practices	6	18	24
 TOTAL	 751	 1526	 2277

SAFETY, SECURITY AND RADIATION EXPERIENCE

There were 77 medical treatment injuries, no security violations, or radiation exposures exceeding operational control. One disabling injury occurred in Manufacturing when a processing operator sustained slight bone damage to the tip of the right middle finger during material handling work.

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.

W. R. Moon 4-21-61

Electrical Indicating Instrumentation
For Use in Controlling Plant Electrical
Power Demand.

OC Schneider for

General Manager

AB Greninger:OCS:cs

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RESEARCH AND ENGINEERINGPROCESS AND REACTOR DEVELOPMENT OPERATIONREACTOR FUELSPresent Reactor TechnologyOverbore Fuel Development

Four more columns of CVIN fuel elements were charged into C Reactor during the 4-9-61 outage bringing the total to twenty. This installation brings the test facility up to its maximum authorized size, and the twenty channels are comprised of the following fuel-tube combinations:

<u>Tube</u>	<u>Fuel Type</u>	<u>Columns</u>	<u>Remarks</u>
a) Ribbed aluminum	3-rail bumper	2	2 T/c probes
b) Smooth-bore aluminum	self-supported	10	2 T/c probes
c) Smooth-bore Zircaloy	self-supported	8	2 T/c probes

The twenty tubes are broken into two groups, one piloting high specific powers and one piloting powers typical of existing central zone tubes. The first group consists of four smooth-bore Zircaloy tubes containing 18 CVINS fuel elements. The tubes are located at the corners of a 4 x 6 block in the central zone and are currently operating at around 110 kw/ft. The second group contains the remaining sixteen tubes and is located at the third lattice unit in from the outside edge of the reactor. These tubes operate at an average specific power of 75 kw/ft and contain 32 fuel elements.

The next column to be discharged will be 0954 C at an exposure of 400 MWD/T. The current exposure is 372 MWD/T and the tube will reach goal around 4-30-61.

Self-Supported Fuel Development

No unusual irradiation experience has been noted for several months from the self-supported fuel charged at B and C Reactors. One column was recharged at B Reactor during this period.

The eleven-tube test facility at B (smooth-bore aluminum) will be closed out in the next few months due to tube corrosion.

Bumpered Fuel Development

A total of 1030 bumper fuel columns are now under irradiation at D Reactor. Of this total 121 are enriched columns. The loading in D Reactor will be further expanded to cover the central zone over the next few weeks.

Advanced Reactor TechnologyHigh Temperature Irradiations - KER Facility

KER-1 - The ten nominal NIN1 elements irradiated in KER-1 to evaluate the

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-84-A	Projection self-supported fuel in ribless aluminum tubes					Preliminary evaluation of self-supported fuel elements. Routine charging to continue until tubes are replaced.
IP-216-A	a) Supports at 1/7 position	11	B	1200 MWD/T	Varies with charge date	Resistance welded supports currently being used.
	b) End spider	0	B	1200 MWD/T		All columns with end-spider supports discharged.
	Normal prod. natural & enriched fuel elements.	65	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 use. Test is continuous.
IP-255-A	Solid black Li-Al	7	H	2 yrs.	18 mo.	Provides for long term irradiation of solid black Li-Al for conversion ratio, and fuel performance determination.
IP-262-A	Bumper fuel in ribbed process tubes	14	D	Normal variable goal		Provides for testing of bumper type fuel elements in ribbed process tubes to determine handling problems associated with bumper fuel elements.
IP-272-A	CIVN Geometry I&E self-supported fuel	69	C	Variable		Provides for testing of CIVN geometry fuel in C Reactor ribless zirconium tubes.
IP-363-A	Four 18 inch KSE3 elements	1	KE	3500 MWD/T	2645 MWD/T	KER-3 charged December 15, 1960.

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<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-377-A	Four 24-inch NIN1 elements, one 24-inch NIEL element in loop 4. After discharging replaced with 5 NIEL elements.	2	KE	3500 MWD/T	KER-4 985 MWD/T discharge exposure	KER-4 charged Jan. 14, 1961 to evaluate N Reactor inner fuel tubes. Loop discharged with failure April 8, 1961, and recharged with five NIEL elements.
IP-378-A	Five NIN1 elements in KER-2				KER-2 635 MWD/T	KER-2 charged Feb. 23, 1961.
	Ten nominal 15-inch NIN1 elements	1	KE	2000 MWD/T	1050 MWD/T	KER-1 charged Dec. 8, 1960, to evaluate different heat treatments, discharged April 8, 1961.
IP-381-A	CVIN geometry I&E overbore size fuel		C			Provide preliminary qualitative data regarding irradiation behavior of larger fuel element designs. Last 4 columns installed on April 9, 1961. Three types of process tubes are represented: smooth-bore aluminum, and ribbed aluminum. First column discharged on 2-25-61 at 168 MWD/T.
	a) CVINS b) CVINB	18 2		Variable 800 MWD/T	160 MWD/T	
IP-401-A	One tubular UO ₂ element; two KSE3 elements	1	KE	3000 MWD/T	195 MWD/T	PT-401 charged April 8, 1961 and discharged April 19, 1961.

effect of different heat treatments on fuel distortion were discharged normally April 8, 1961, at an exposure of 1050 MWD/T (goal exposure was 1000 MWD/T).

KER-1 was recharged on April 8, 1961, with one UO₂ tubular element, and two KSE3 elements to supply heat to the loop. The UO₂ element is being irradiated to determine the behavior of a UO₂ tubular element with a thick fuel section irradiated in the horizontal position. The test was terminated April 19, 1961, at an exposure of 145 MWD/T because of a serious leak in KER Loop 1.

KER-2 - The NIN1 elements in KER-2 reached an exposure of 635 MWD/T on April 20. There have been no abnormalities in the behavior of this charge.

KER-3 - The four KSE3 elements in KER-3 reached an exposure of 2645 MWD/T on April 20. These elements will be irradiated until the loop is modified, probably sometime in June, 1961.

KER-4 - Four NIN1 elements charged January 14, 1961, and one NIEL element charged March 20, 1961, both under PT-IP-377-A, were discharged April 8, 1961, after a neutron monitor trip at an exposure of 985 on the NIN1 elements and 270 MWD/T on the NIEL element.

Examination of the five elements in the KE viewing basin failed to disclose the area of failure.

KER-4 was recharged with five NIEL elements under PT-IP-377-A.

(Nomenclature: KSE3 - KER sized single tube enriched pieces.)
(NIN1 - NPR sized inner tubes - natural uranium.)
(NIEL - NPR sized inner tubes - enriched uranium.)

REACTOR ENGINEERING

Present Reactor Technology

C Reactor Overbore

Operating characteristics of the overbored channels continue to agree well with predictions. Performance data previously reported continues to be valid and applies to the most recently charged channels as well as the original channels.

Use of Nitrogen Atmosphere

Operation of KE Reactor with a nitrogen-helium reactor gas atmosphere under PT-IP-358-AC which started December 5, 1960 continues to be satisfactory. The nitrogen concentration in the reactor atmosphere is in the range of 10 to 25 percent most of the time. Samples of condensate from regeneration of the silica gel driers at KE and at other reactors operating with the standard carbon dioxide-helium atmosphere are being analyzed for nitrate content in an effort to determine whether a nitrogen-helium atmosphere gives rise to a

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greater potential for corrosion of reactor hardware than that which exists with a carbon dioxide-helium atmosphere.

No higher concentration of nitrate has been indicated in the condensate from the KE Reactor than in the condensates from the other reactors. The pH of the condensates has ranged from 6.4 to 8.8.

On April 13 as Supplement A to PT-IP-358-A, a test was conducted at KE Reactor which demonstrated that measurement of the activity of argon-41 using the existing Beckman radiation monitor on the outlet reactor gas is a dependable method of detecting a change in rate of air leakage into the reactor gas stream when operating with a nitrogen-helium reactor gas atmosphere. The test was performed by deliberately introducing a known amount of argon-40 into the inlet gas stream.

Advanced Reactor Technology

KER Connector Integrity

Preliminary visual examination of the stainless steel front-face connector removed from KER-3 revealed only minor indications of cracking. This material was subsequently subjected to a rigorous metallographic examination which revealed much more significant cracks on the outside surface. The cracks are apparently stress cracks and extend through a significant fraction of the tube wall. Since the other connectors on the loops have been subjected to the same service conditions as the one examined, early replacement will be made. In the interim, the pressures and temperatures of the stainless steel loops (2, 3 and 4) have been reduced to the minimum practical values.

NPR Graphite Procurement

With the exception of less than 10% of the order placed with National Carbon Co., all of the graphite for the NPR has been received. The remaining bars will be delivered in the next few weeks.

NPR Tube Testing

A new variation of the ultrasonic test for defects in NPR process tubes has been developed and is being evaluated in tests being carried out at the Hanford tube shop in White Bluffs.

REACTOR PHYSICS

Present Reactor Technology

Control Studies

The preliminary formulation of the spatially dependent speed-of-control problem has been completed. The starting point for the reactor kinetics is the time dependent diffusion equation. It is assumed that the ∇^2 term can be adequately approximated by a finite difference technique. Thus, the

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reactor is divided into regions, with time dependent kinetic equations governing each region.

The initial model consists of 18 vertical slab regions across the front of the reactor. Assuming the flux distribution to be symmetrical about the center, it thus requires ten nodal points to describe the flux during transient conditions.

For each region, three groups of delayed neutrons will be used. This model will be used to study the local flux perturbations when one or more VSR fail to enter the reactor during a scram.

Since the kinetic equations consume a large amount of analog equipment, the temperature model has been greatly simplified. The five-region fuel element model used previously has been replaced with a one-region fuel element.

The circuit diagrams have been completed and the problem boards have been hooked up. Initial runs will determine if such a simulation can give adequate solutions to the problems of interest.

Overbore Studies

The physics aspects of the C overbore program have received continuing attention. The advantages of various possible locations for the tubes to be installed from the standpoint of conversion ratio information is under study. Efforts have also begun to determine more precisely the burnout and buildup of isotopes as a function of exposure and graphite temperature with the aim of identifying the needed graphite temperature control insofar as that control can affect production.

Hazards analysis for the overbore reactor continued.

Advanced Reactor Technology

NPR Secondary System

As a check on other calculations, a linear model of the dump condenser and the surge tank has been developed. The model is simple and can be investigated on a small analog device. Dynamic response of the system at low heat dissipation rates will be investigated.

NPR Fuel Storage Limits

Experimental values for the material bucklings in water lattices supplied by Hanford Laboratories have been used to determine the critical mass of uranium for the following geometries.

- 1) Isolated row, infinitely long (Lbs. U per foot of length)
- 2) Isolate cylinder, infinitely long (Lbs. U per foot of length)
- 3) Isolate sphere (Lbs. U)
- 4) Infinite slab (Lbs. U per square foot of storage area)

Limits have been determined for both the tube-in-tube assembly and the outer tube only.

NPR Ball 3X - Partial Failure

A total control study was made to determine the number of ball 3X channels which can be out of service in the central part of the control region and still keep the reactor sub-critical even in the case of optimum flooding of the NPR lattice. A conservative number of twelve ball 3X channels out of service was arrived at for the case of a 24 lb/ft fuel element.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience of critical IPD classifications for the first 12 weeks of the 1961 badge year:

<u>Classification</u>	<u>Total Dose</u>	<u>No. of Employ- ees</u>	<u>Average Dose/ Employee</u>	<u>Extrapo- lated Year End Average</u>	<u>No. of Employ- ees over 3r Extrapolated Exposure</u>
Radiation Monitors	52861 mr	87	607 mr	2628 mr	24
Processing Operators	140139 mr	267	525 mr	2273 mr	37
Pipefitters	37779 mr	91	415 mr	1796 mr	11
Millwrights	30728 mr	76	404 mr	1749 mr	4

A localized exposure exceeding operational control was experienced by a maintenance employee at KE Reactor on March 23, 1961. Following work in the discharge area he was found to have a radioactive particle on his face which could have contributed a dose as high as 4.6 rad to one square centimeter of skin area.

Lapse of Control

Lapse of Radiation Control
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>IPD Totals</u>
Processing	1	1	0	0	0	0	3	0	5
Maintenance	0	1	0	0	0	0	3	1	5
Power	0	0	0	0	0	0	0	1	1
Supplemental Crews	0	0	0	0	0	0	0	0	0
Research & Engineering	0	0	0	0	0	0	0	0	0
Facilities Engineering	0	0	0	0	0	0	0	0	0
Reactor Areas	0	0	0	0	1	0	1	1	3
Assigned Totals	1	1	0	0	1	0	6	3	12
IPD General									
Outside IPD	1								1

Vertical columns do not necessarily add up to the indicated totals, because in some cases, a Lapse of Control may be chargeable to more than one component.

Average Concentration of Radioisotopes in Reactor Effluent Water

The average concentrations of radioisotopes in reactor effluent water from samples taken during March, 1961 are given. Concentration is in units of (10⁻¹² curies per cc).

<u>Reactor</u>	<u>As⁷⁶</u>	<u>P32</u>	<u>Zn⁶⁵</u>	<u>Np²³⁹</u>	<u>Cr⁵¹</u>
B	190	29	52	66	220
C Control	500	29	120	120	370
C Test	180	36	110	160	210
D	230	32	40	180	360
DR	160	25	40	210	330
F	870	45	120	210	1400
H	300	35	75	160	430
KE	180	18	24	230	140
KW	130	20	48	140	170

Nomenclature:

C Control) Half of C Reactor is operating on reduced dichromate
 C Test) feed ("test" samples) while the other half is subjected
 to normal dichromate feed ("control" samples).

Testing of the KER Reactor Confinement System Iodine Monitor

Known quantities of radio-iodine-131 were introduced into KE reactor confinement system iodine monitor with argon-41 present in an attempt to calibrate the instrument for automatically triggering the discharge area fog spray system. This was done at the completion of the air in-leakage test described above. A portion of the reactor atmosphere was vented to the reactor exhaust air stream. This supplied a source of argon-41, which emits a 1.29 Mev gamma, to the iodine monitor. At the same time, 1 microcurie per cubic foot of iodine-131 was introduced into the iodine monitor. This causes 25% of full scale response of the iodine monitor within 10 minutes. A second injection of 5 microcuries per cubic foot of iodine-131 caused a 60% response in 5 minutes and a full scale response in 7 minutes. It was apparent that the iodine sublimates and accumulates in the sample chamber in the same manner as it does in the exhaust duct.

It is apparent from the above that the fog spray trip on the iodine monitor can be set at 20% of full scale and be indicative of 1 microcurie per cubic foot of iodine-131 in the sample chamber. The presence of argon-41 should not interfere.

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PROCESS TECHNOLOGY OPERATION

REACTOR POWER LEVEL LIMITATIONS

During this report period the power levels at all reactors, except D reactor, were restricted by rupture control considerations. D reactor power levels were restricted by bulk outlet temperature conditions.

PROCESS STANDARDS

HW-46000 D, Process Standards - Reactor

One revised standard was issued during the month. This was:

Process Standard A-050 - "Panellit System Control"

A new venturi size for process tube flow monitoring was added to the standard and an obsolete size was deleted.

HW-46000 K, Process Standards - Reactor

Three revised standards were issued during the month. These were:

Process Standard A-021 - "Tube Outlet Temperature Limits - TOA or Hole Boiling Limits"

TOA (top of annulus) boiling limits are specified to prevent boiling in the space between the top of the fuel element and the top of the tube. This limit is based on the local pressure at the furthestmost downstream fuel element and is corrected for temperature unbalance resulting from eccentricity of the fuel element with respect to the process tube. Less conservative boiling limit curves were provided in the revision by discarding the present simplified but conservative boiling limit requirements and replacing them with more rigorously determined requirements. A reduction in the top-of-annulus boiling limit was specified when the downstream dummy charge is shortened below a specified length.

Process Standard C-050 - "Process Tube Temperature Monitoring"

During reactor shutdown, continuous temperature monitoring was formerly required on crossheaders that were throttled for reduced flow if the graphite temperature was over 100°C and when less than four hours had elapsed since shutdown. Re-evaluation of fission product heat decay curves shows that the four-hour-after-shutdown time requirement accomplishes the intent of the graphite temperature specification. The graphite temperature requirement was therefore deleted.

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Because of the valving arrangement at the K Reactors will permit close control over shutdown reactor flows, the temperature monitoring requirement of "once per hour" for all tubes has been deleted from this standard.

Coincident with the deletion of the requirement for hourly tube temperature monitoring during shutdown, the specification was deleted that tube temperature monitoring equipment could be out of service for only one-hour periods. No time limit is imposed in the revision when specified conditions exist.

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

Manual trips of the Ball 3X system were all included in the first section of the revised standard for ready reference.

The former specification, which required a manual Ball 3X trip if the rapid-water-loss timing relays failed to function, was deleted. Emergency assessment of whether conditions existed for the timing relay to function as designed is very difficult. A decision on whether the 3X balls should be manually dropped following a reactor scram, is now based only upon the front riser pressure reduction to below 25 psig top-of-riser pressure. Ball 3X trips under this circumstance are normally initiated automatically through riser pressure trips set at 25 psig top-of-riser pressure.

Revisions were made to permissible times that the Ball 3X system may have the hopper trip function deactivated. This change resulted from the present, higher degree of reactor enrichment.

Present permissible graphite temperatures necessitated the requirement that the reactor be shut down if one or more Ball 3X hoppers trip during reactor operation. This was done to eliminate the possibility of ball deformation due to their intimate contact with the hot graphite, should 3X balls be inadvertently dropped into the reactor.

The lowest Ball 3X water pressure trip setting was reduced from 30 psig to 25 psig to obtain greater spread between normal shutdown riser pressures and the pressure where the Ball 3X hoppers-trip. This lower value will still assure ball insertion before initiation of bulk boiling.

PROCESS CHANGE AUTHORIZATIONS

Six Process Change Authorizations were issued during the month to permit temporary deviation from Process Standards - Reactor, HW-46000 and one Process Change Authorization was issued to permit temporary deviation from Process Equipment Standards, HW-41000. These were:

PCA #1-15 "Thermal and Biological Shield Cooling Water Temperature Checks - F Reactor"

Process Standard A-070 requires that the shield outlet water temperature be

checked each hour. Thermocouple failure in the shield coolant discharge water has made this impossible until thermocouple replacement is accomplished during an outage.

Authorization was given to continue operation until April 3, 1961, or until the next minimum outage, whichever occurred first, provided:

1. The reactor was shut down if the shield coolant flow drops 20 per cent.
2. Biological and thermal shield temperatures were monitored hourly.

PCA #1-16 - "Zone Temperature Monitor, C Reactor"

The Zone Temperature Monitor (ZTM) equipment is designed for improved reactor control and nuclear safety during the changing operating conditions that are incurred during reactor startup. The maximum number of RTD's in this system which can be faulty without reducing its reliability, is considered to be ten. Therefore, Process Standard C-050 specifies that operation shall not be resumed with more than ten faulty Zone Temperature Monitor RTD's.

A survey of the ZTM systems revealed that installation of this equipment is not completed at C Reactor; therefore, compliance with the standard is not possible. It is estimated that installation will be completed in approximately six months.

This Process Change, which expires September 31, 1961, recognizes that C Reactor is necessarily exempt from the Process Standard requirement that the reactor shall not be started up with more than ten faulty Zone Temperature Monitor RTD's.

PCA #1-17 - "Ball 3X Functional Testing, KE Reactor"

This PCA extends the provisions of PCA #1-8. Functional testing of the remaining five Ball 3X hoppers was scheduled on KE Reactor's next scheduled reactor outage, but because of difficulty in the operation of certain equipment, only two hoppers were tested. Therefore, it is not possible to complete the testing within the provisions of PCA #1-8. The provisions of PCA #1-8 are repeated below:

"Process Standard C-110 specifies the frequency and method of function tests of the ball hoppers. Following the testing of 45 hoppers at KE Reactor, difficulty was experienced in operation of four horizontal control rods due to 3X balls in the rod channels. Flux peaking problems can also result with increased fuel element rupture potential. More enrichment is also necessary to offset the reactivity loss due to 3X balls in the graphite. Conventional methods of 3X hopper testing are thus becoming less attractive with time."

An alternate method of testing hoppers is being developed which eliminates the need for full channel ball drops. The main requirements of the new test methods are as follows:

1. All balls must be removed from the hopper and be replaced with a clean charge.
2. The hopper gate shall be tripped when empty.
3. The ball valves at the bottom of the Ball 3X channels shall be tested for proper closure.
4. A positive check must be made to be certain that the channel is clear, by dropping a few 3X balls through the channel.

Authorization was given to postpone further hopper testing until the next scheduled outage, at which time, the three remaining hoppers will be tested using improved techniques.

PCA #1-18 - "Speed of Control, B, D, F Reactors"

A technical basis for speed of reactor shutdown has been recently issued (Basis Number C-3, HW-55500 RD) for B, D, F Reactors.

Present startup levels are sufficiently high that B, D, and F Reactors could exceed the speed-of-control limit. Additional limits, specified in PCA #1-18, are necessary to ensure that adequate speed-of-control is always available.

PCA #1-19 - "Water Shutoff Times, C, F, and K Reactors"

During a reactor shutdown it is often necessary to remove shutdown flow from individual charges or complete crossheaders while maintenance is performed on process water pipes and fittings, or when removing a stuck or ruptured fuel element. Process Standard A-030 provides specifications for water shutoff which will ensure that the slug surface temperatures are maintained within acceptable limits. The water shutoff curves in this standard are based upon data for an aluminum process tube in a normal process channel; consequently, the data is not applicable to zirconium process tubes or to aluminum process tubes in overbored or cored process channels. For purposes of this PCA, a normal process channel at a K Reactor is considered to be a channel in which the maximum powered slugs lie in the region of the graphite which is cored 30 mils.

This Process Change specifies that water shutoff on process tubes other than aluminum process tubes in a normal sized process channel (no overbore) shall not be calculated from information contained in Process Standard A-030, but must be obtained from the Process Technology Operation.

This PCA will expire on September 29, 1961, or on revision of the reference standard, whichever is sooner.

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PCA #1-20 - "C Elevator Photocell Interlock, KW Reactor"

Process Equipment Standard D-050 specifies that a photocell interlock be provided for C (charging) elevator which will prevent elevator movement if an object interrupts the photocell beam. This device is required to insure that accidental breakage of front-face nozzles or water connectors does not occur.

The photocell interlock at KW Reactor failed during reactor startup on March 29, 1961. At this time, continued use of the front elevator was necessary to complete spline work for reactivity adjustments. The desired protection against accidental breakage of front-face nozzles or water piping can be insured without the photocell interlock in service, provided the procedural controls specified in this PCA are observed.

Authorization was given to operate without this elevator interlock for one day.

PROCESS ASSISTANCE

One engineer audited the conformance to process standards by making sixteen inspections at each reactor during the report period.

RUPTURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Material</u>	<u>Exposure</u>	<u>Type of Failure</u>
4-4-61	2486-H	CL-955-A	I&E N	386	Hole
4-6-61	3272-B	ML-005-H	I&E N	623	Side Hot-Spot
4-7-61	0893-D	OL-010-D	I&E N	745	Unclassified
4-8-61	4286-KE(1)	IP-377-A	NIN & NIE	820	Unknown
4-10-61	2461-KE	KS-264-A	I&E E (0.94%)	422	Side Hot-Spot
4-12-61	5653-KE	MA-315-A	SN	622	Split-Long.
4-21-61	2269-C	KJ-188-C	I&E N	382	Side-Other
4-22-61	1065-B	ML-001-A	I&E N	639	Side Hot-Spot
4-24-61	1989-H	KL-608-A	I&E N	542	Side Hot-Spot
4-25-61	5045-KW	KR-304-A	I&E N	744	Hole
4-26-61	2857-H	CL-956-A	I&E N	536	Unclassified
4-28-61	0460-D	OL-010-D	I&E N	761	Hole
4-30-61	2270-C	KJ-188-C	I&E N	444	Unknown

(1) KER Loop #4

Legend

I&E N - This is the symbol for internally and externally cooled production reactor fuel elements of natural uranium.

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

SN - This is the symbol for production reactor fuel elements having a solid cylindrical core of natural uranium.

NIN - This is the symbol for NPR inner tube fuel elements of natural uranium.

NIE - This is the symbol for NPR inner tube fuel elements of enriched uranium.

Hole - Failure on the internal surface of an I & E piece probably caused by water penetration through a weld or other unknown mechanism.

Side Hot-Spot - Failure probably caused by accelerated corrosion of the external can wall in a localized region of high temperature.

Unknown - Failed piece could not be located or had not been examined at the time of writing.

Unclassified - The failure did not logically fall into any of the usual types.

Split-Long - Failure caused by uranium cleavage along the axis of the core.

Side-Other - Failure probably caused by corrosion or water penetration of the external can wall or other unknown mechanism.

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OPERATIONAL PHYSICS OPERATION

PILE PHYSICS ASSISTANCE

The over-all flattening efficiency as measured by total effective central tubes was somewhat reduced from the high levels achieved during the past several months. This reduction was a result of the transition to Boli material in all peripheral tubes in conjunction with the E-N demonstration load at H Reactor, a very low relative fringe residual exposure at DR Reactor, and the transition which is now near completion of the central zone from 34 to 32-piece charges at B Reactor. Spline coiler removal system installation was initiated at H, F, B and C Reactors, and installation was scheduled to start at DR Reactor in May.

Spline traversing was performed at C, D, KE and KW Reactors; analysis of the results at C Reactor indicated excellent agreement between spline flux traverses in the operating reactor and traverses from subsequent monitoring of the natural uranium charges in these tubes.

SUMMARY OF OPERATING DATA OF PHYSICS INTEREST FOR THE MONTH OF APRIL, 1961

Reactor	B	C	D	DR	F	H	KE	KW
ECT in April (1)	1470	1695	1515	1485	1465	1560	2525	2595
12-Month Average ECT	1495	1710	1495	1560	1450	1605	2510	2520
Equil. Scram Time (2)	14-16	25-32	18-21	25-30	14-20	25-30	20-25*	25-30*
No. of Scrams and Recoveries (3)	0/0	0/0	0/0	0/0	0/0	1/1	2/2	1/1
No. of Non-Scram Outages (4)	0/0	3/1	3/2	2/0	0/0	0/0	0/0	0/0
Recording Period								
From:	3-22	3-22	3-23	3-23	3-23	3-24	3-23	3-23
To:	4-20	4-20	4-20	4-20	4-20	4-20	4-20	4-20

*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 of the ten most productive tubes in the reactor.
- (2) This is defined as the maximum time available in minutes between scram and first indication of startup.
- (3) The first pair of numbers shows the number of brief outages from which secondary cold startups would be made and the number of successful startups. The second pair shows the number of brief outages from which hot startups would be made and the number of successful recoveries.
- (4) The first number shows the number of ordinary outages (including those initiated by scrams followed by unsuccessful recovery attempts), and the second shows the number of additional outages to discharge temporary poison.

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B Reactor - J H Ferguson

The transition from 34 to 32-piece charges was completed in the central zone without incident; the limiting tube powers of the few remaining central zone 34-piece charges during most of the report period resulted in a three percent lower flattening efficiency than usual. Reduced total control restrictions with the 32-piece charge will permit greater flexibility with the use of enrichment to improve the flux flattening.

Operating continuity was interrupted by two rupture outages during the report period.

C Reactor - D. E. Newbrough

In conjunction with the planned eventual replacement of C Reactor cadmium rods discussed in the March report, a rod calibration test of the number 7 HCR indicated that it had lost about half its original reactivity strength, about what would be expected if the cadmium 113 were nearly 100 per cent burned out. This loss of effectiveness over the past 2 or 3 months has resulted in a slight reduction in control efficiency. Replacement of this rod and number 1 and 13 HCR's, which have been calculated to be nearing 90 per cent burnout, is scheduled for May. Current plans call for the replacement of No. 4 and 10 rod within the next 3 or 4 months.

Following the hot startup of March 23, insufficient far side control several hours later resulted in far side tube temperatures reaching limits thus requiring shutdown for a minimum outage. Detailed control procedures following hot startups were developed to apply in similar control situations in the future.

The nonequilibrium losses averaged less than 0.3 day per startup for the four outages during the report period, an improvement over last month's 0.4 day average loss.

D Reactor - D. W. Constable

The operating efficiency was limited by three outages and an equilibrium scram followed by a hot startup during the first portion of the report period. Of three hot startup attempts during the report period one failed because of an unsuccessful attempt to purge CO₂ into the reactor; a second was successful but subsequent control was quite difficult and a shutdown was initiated several hours later by a fuel element failure in a region of the reactor that had operated at higher than normal power after the recovery.

During the setup for discharge of one of the PCCF columns following turnaround, a full column of Pb-Cd was inadvertently discharged prematurely; the power rise of approximately 125 MW was quickly corrected by appropriate control rod action. Although instantaneous tube power data were not obtained, the reduced limits for PCCF discharge being administered at the time assured that tube temperatures would not exceed normal limits in the event of this type of occurrence.

DR Reactor - J. F. Jaklevick

A block discharge cycle was completed at the end of the report period. Despite several outages and the high exposure condition, control was fairly smooth and no significant operating problems arose during the report period. Poorer average flattening efficiency was the result of shorter operating periods (permitting insufficient time for fine flattening adjustments), relatively low fringe exposure and thus lower fringe reactivity, and a flux distortion resulting from water in the lattice during one operating period. Two hot startup attempts were unsuccessful, and minimum outages resulted.

Near the end of the block cycle, long-term reactivity losses required that a 15 per cent power reduction be made to discharge and recharge PCCF columns to gain sufficient reactivity for adequate operating control flexibility. Subsequent recovery to normal operating levels over the next two days was uneventful.

F Reactor - C. D. Wilkinson

Startup efficiencies continued to increase with a new low nonequilibrium loss of less than 0.15 equilibrium days being achieved following one outage. Flattening efficiency continued to be about normal but is expected to decrease during the transition from 34 to 32-piece natural uranium charges which has been initiated; the power level should not be significantly affected by this decrease of flattening efficiency since reactor operation will be approaching bulk effluent limits.

Point labeling of the 6-point tube outlet temperature deviation recorder became unsynchronized, resulting in indications which could lead to erroneous flux distribution control maneuvers. A warning light is being installed to alert the operator to such a recorder failure in the future. The failure mentioned was detected before efficiency losses were encountered.

Operating continuity was interrupted by three outages for water leaks during the report period.

H Reactor - S. L. Stewart

Charging of the fringe poison portion of the E-N demonstration load was completed; as expected, the flattening efficiencies decreased about 5 percent. Increased spline usage and the return to the full 24-column PCCF system resulted in improvement in the average nonequilibrium loss to less than 0.25 days per startup; several PCCF columns had been temporarily returned to production during the low exposure portion of the current block discharge cycle.

Operating continuity was interrupted by three outages during the report period, two for ruptures and one for a water leak.

KE Reactor - A. R. Kosmata

Only two relatively short periods of equilibrium operation were achieved during the report period, one of ten days duration the other of seven days duration; during the remainder of the report period the reactor was in either nonequilibrium or shutdown status. Despite the irregular operation the average nonequilibrium loss for the report period was only 0.215 equilibrium days per startup.

The Flexowriter outlet tube temperature recorder did not operate properly during most of the report period; printed temperatures were often in error and considerable maintenance work was required to keep it operating.

KW Reactor - R. A. Chitwood

As a result of a much higher than average residual exposure, flux distribution was quite sensitive; however, a high flattening efficiency and a record power level were maintained up to the scheduled shutdown near the end of the report period.

The two downstream 60 per cent half-rods are being replaced with the new half-rods having poison in only 40 per cent of their length. Present plans call for waiting on replacement of the longer upstream half-rods with the shorter half-rods until graphite studies indicate whether or not a major shift in the heat distribution to the upstream cored region would be acceptable; such a shift would result from controlling with upstream "inboard" rods in place of the currently used upstream "outboard" rods. The decreased rupture potential with a flux distribution flattened and skewed to the front provides the incentive for this adjustment.

PROCESS PHYSICS STUDIES

Safety Control Studies

Revised enrichment loading graphs were provided for Pile Physicists' use at the B, D, and F Reactors. Total control restrictions as a function of enrichment loading will be relaxed somewhat as the column loading is returned from 34 to 32 pieces. A document establishing the technical bases for vertical channel malfunctioning allowances and appropriate poison substitutions to meet total control requirements was published as HW-68940.

Pile Reactivity Studies

Conversion data from the eleven 2-ton batches have now been published by Accountability. Critical examination by Operational Physics of the technical parameters in the machine program for conversion calculations is currently underway.

NPR Startup Studies were concentrated on planning for diffusion testing of the unfueled stack. It is quite possible that the measurement tolerance adequate

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to ensure against poisoning of the graphite stack will permit a less complex and less time-consuming diffusion test program than was carried out at the K Reactors.

Control Efficiency Studies

Spline coiler installations are near completion at the B, F, and H Reactors. Scraping of the spline as it enters the coiler has caused a radiation problem which is being resolved by reversal of the reel rotation.

The standard method of determining ECT (effective central tubes) is to divide total power level by the average power of the 10 most limiting tubes. A study of ECT accounting with tube-by-tube methods indicates a recent drift between the values obtained by the two methods. The reason for this discrepancy has not been pinpointed but it is suspected that faulty thermocouples may contribute to this difference.

Charging of the fringe blanket portion of the E-N loading at H Reactor is essentially complete. The production test for two successive striped core loadings has been approved (HW-66300 PT2); a preliminary core of approximately 270 tubes will be charged early in May and the rest of the first core loading the latter half of May.

Automatic control simulation studies during the month at D Reactor under PT IP-383-C were inconclusive. Access time was limited partly by lack of long operating runs and partly by performance of auxiliary monitoring equipment. Observations during one test run indicated that better control results would have been obtained with fewer control points (four rather than six) but more frequent temperature sampling (such as 15 rather than 48 seconds per cycle).

Shielding Studies

A Fortran program for use in iron-masonite shield deterioration analysis has been completed and debugged and is now operable. This program has been arranged so that input data can be taken by key-punch personnel directly from data sheets prepared routinely by reactor processing people.

A high temperature graphite test using a helium-nitrogen atmosphere, circulating for approval as PT IP-389-AC, is being expedited so as not to conflict with overbore testing in the fall of 1961. The overbore tubes in the top fringe will increase top biological shield temperatures as will also the addition of nitrogen.

Reactor Fundamentals Training

Reactor Specialist and Pile Operator classes in Reactor Fundamentals continued during the month as scheduled. Pile Physicists served as guest speakers on topics directly related to physics assistance in the Hanford reactors.

A 30-page sample program of the type used in teaching machines has been written as an illustration of the adaptability of this technique to reactor fundamentals training and personnel evaluation.

TESTINGIRRADIATION TESTING OPERATIONDR-1 Loop

The DR-1 Loop was operated continuously in this report period with the exception of 8.3 hours during reactor outages. Reference test conditions were maintained for 342 hours, bringing the total time at reference conditions to 1600 hours. The test element was cycled three times from 1500 F to ambient temperature, for a total of 10 cycles.

Operational testing of the No. 1 motor-generator set continued throughout the report period.

H-1 Loop

The H-1 Loop was cooled by single-pass process water during the entire report period.

Sample Irradiations

Reactor	Test Hole	Facility	Request No.	No. of Samples	Material - Purpose
KE	2D	Quickie	HAPO-184	14	Washington designated program
DR		PCCF	HAPO-184	5	Washington designated program
C	Y	Hot Graphite	HAPO-177	1	Graphite (damage studies)
F	E	Quickie	HAPO-177	1	Graphite (damage studies)
B		PCCF	HAPO-218	2	Uranium (fission product release study)
F	E	Quickie	HAPO-223	1	Titanium (radioactive buildup, decay of NPR control rod material)
F	E	Quickie	HAPO-229	6	UO ₂ (thin films)
KW	4C	Snout	HAPO-249	2	Graphite (damage studies)
KE	2D	Quickie	HAPO-252	2	Arsenic (tracer isotope production)
KW	0074	General Purpose	HAPO-255	12	Cobalt (production of Cobalt 60 for HLO Gamma Facility)
KE	2D	Quickie	HAPO-256	2	Plutonium (fission yields of heavy plutonium isotopes)
KE	2D	Quickie	HAPO-223	1	Flux monitors (facility calibration)
KW	3A	General Purpose	HAPO-236	2	Zirconium (creep test)
KW	4C	Snout	HAPO-238	1	Cobalt (production of radio-graphy source for CPD)
KW	4B	Snout	HAPO-243	3	Reactor structural materials (fission damage study)
F	E	Quickie	HAPO-177	3	Al ₂ O ₃ (radioactive buildup and decay of graphite compression boat material)

Reactor	Test Hole	Facility	Request No.	No. of Samples	Material - Purpose
		Gamma*	HAPO-148	2	Plastics and rubber (damage studies)
		Gamma*	HAPO-171	4	Plastics and rubber (damage studies)
		Gamma*		3	Probes, epoxy resins (damage studies)

*Gamma Irradiation Facility in Building 105 KE storage basin.

COOLANT TESTING OPERATION

KER Loop Operation

KER-1 - Testing of ten 15-inch fuel elements (NIN1) with electron-beam-welded end caps authorized by PT-IP-378-A was completed with discharge of the loop on April 8. One 18-inch UO₂ and two KSE3 elements were recharged on April 8 for testing as authorized by PT-IP-401-A and PT-IP-363-A. During the outage of April 19, the UO₂ and KSE3 elements were discharged because of a nozzle-to-tube leak on the reactor outlet assembly. The tube was not recharged.

KER-2 - Testing of five 24-inch fuel elements (NIN1) with brazed-end closures as authorized by PT-IP-377-A continued throughout the month. Loop operating conditions were 240 C, 1600 psi, and pH 10.

Radiography of the heat exchanger exit tee section on April 19 disclosed cracking in the tee. The tee and approximately four feet of piping were replaced. In addition, an expansion loop was installed on the heat exchanger exit leg to provide greater flexibility.

KER-3 - Testing of four 18-inch, 1.6 per cent enriched fuel elements (KSE3) as authorized by PT-IP-363-A continued throughout the month. Loop operating conditions were 190 C, 1600 psi, and pH 10.

KER-4 - Testing of four 24-inch fuel elements (NIN1) with brazed-end closures and one 23-inch fuel element (NIE1) as authorized by PT-IP-377-A was completed with discharge of the ruptured charge on April 8. Five 23-inch elements (NIE1) were recharged on April 8 and testing continued throughout the remainder of the month. Loop operating conditions were 210 C, 1600 psi, and pH 10.

A thirty-inch section of the heat exchanger exit tee and piping was replaced during the April 8 outage when cracks were found by radiography. Pump #1 was replaced when high current and low differential pressure were observed during routine outage functional checks.

KER Loops General - During the April 8 outage the heat exchanger exit tee sections of all four KER loops were radiographed, and on the April 19 outage the tee sections of KER-2, KER-3, and KER-4 were radiographed. No defects except the cracks in the KER-4 tee were found.

1706-KE Single-Pass Tube Operation

All eight tubes were supplied normal process water from 105-KE Reactor throughout the month.

KE Reactor Outage Time Requirements

One unscheduled outage was charged to production testing in the KER loops during the month. A total of 17.7 hours was charged to production tests as listed below:

<u>Production Test</u>	<u>Description</u>	<u>Hours</u>
PT-IP-377-A	Rupture - Loop 4	12.2
PT-IP-363-A	Reactor scram-operating error	.3
PT-401-A, 378-A	Discharge of Loop 1	4.2
PT-IP-361-A	Thermocouple lead installation	1.0

Out-of-Reactor Facility Operation1706-KE Single-Pass Mock-Up Tubes

Three mock-up tubes were operated during the month. Corrosion testing of aluminum cermet continued. Corrosion testing of improved nickel-plated fuel elements was completed. Prefilming carbon steel samples for later testing of candidate decontamination procedures was also performed.

Dowtherm - Pump failure resulted in the loop's being down most of the month. During operation, testing of the effect of raw water film buildup on the heat exchanger tubes and corrosion testing of carbon steel and aluminum coupons was continued.

ELMO-4 - The facility remained shut down during the month. The repaired pump rotor has been received from the vendor.

ELMO-5 - Corrosion testing of Monel, Carpenter Ferral, 316 stainless steel, Hastelloy C and 420 stainless steel was continued during the month. On April 13 Teflon coupons were added to determine the corrosion characteristics of the material.

ELMO-6 - Corrosion testing of aluminum X-8001 coupons began on April 5 and continued during the month. Molybdenum trioxide is being used as a corrosion inhibitor with the loop pH at 4.5.

ELMO-7 - The following test work was continued during the month:

1. Corrosion testing of suit-case-handle supports on two Zircaloy-2 clad dummy fuel elements.

2. Prefilming of 304 stainless steel and A-212 carbon steel coupons prior to decontamination testing.
3. Corrosion testing of one KSE3 element.

The following test work was started during the month:

1. Fretting corrosion testing of a PRTR element on April 4.
2. Corrosion testing of Zircaloy-2, carbon steel, and 304 stainless steel coupons on March 28.

ELMO-8 - Rebuilding of the loop has been completed with minor exceptions. Acceptance testing is in progress.

ELMO-10 - Two decontamination tests on coupons conditioned in CEP-1 were made. Decontamination testing also continued with thirteen tests being completed.

CEP-1 - The sixth prefilming run was completed on samples of carbon steel welded to stainless steel, carbon steel, stainless steel, Zircaloy-2, Stellite 6 and 12, and Haynes Alloy No. 41. Testing of carbon steel, stainless steel, and Zircaloy-2 stress crevice coupons was continued during the month.

CEP-2 - The gold-plated carbon steel against Zircaloy-2 fretting test was continued during the month.

CEP-3 - Work is continuing on rebuilding the loop.

CEP-4 - Corrosion testing of aluminum, carbon steel, Zircaloy-2, and stainless steel in high oxygen water was continued during the month. Oxygen is being supplied by the addition of hydrogen peroxide to the loop.

REP-1 - Gross fission product contamination-decontamination studies were performed during the first part of the month. Operation of the loop has been delayed since decontamination of the REP casks has been postponed until contractor personnel complete installation of the decontamination tank exhaust fan.

COMPONENT TESTING OPERATION

Irradiated Fuel Element Examination - Examinations were completed on fuel elements from the following forty-two tubes during the month in the Metal Examination Facility (105-C).

PT. No.	Tube No.	PT. No.	Tube No.	PT. No.	Tube No.	PT. No.	Tube No.
39A	0879-D	216A	0957-DR	216A	1780-KE	216A	1951-KW
171A	1259-F		1169-DR		3481-KE		2584-KW
216A	1475-B		0384-F		3576-KE		2777-KW
	3488-B		2059-F		3670-KE		2871-KW
	2177-C		3584-F		3764-KE		3948-KW

<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>
	2263-C		3691-F		4287-KE		3952-KW
	2290-C		0372-KE		4352-KE		4483-KW
	2569-C		0375-KE		4589-KE		4494-KW
	2679-C		0376-KE		4960-KE	217A	2480-B
	3984-C		0559-KE		0861-KW		
	2470-D		1066-KE		1379-KW		

In addition to the above listed tubes, sixteen fuel elements from PT-216-A were stripped of their aluminum jackets and their bare core was identified and measured on the profilometer.

During the reported period, eight working days were lost due to maintenance required on equipment. It was found necessary to remove, straighten, and recalibrate the weigh rod on the weigher. Other minor maintenance items were taken care of during this outage.

Process Tube Corrosion Monitoring Program In-reactor measurements of 173 process tubes were completed during the month. Listed below are the number of tubes measured for each reactor and the document numbers of reports issued.

<u>Reactor</u>	<u>No. of Tubes Probologged</u>	<u>Report No.</u>	<u>HW Number</u>
KE	74	27	69013
F	28	28	69036
H	5	29	69042
B	6	30	69056
H	6	31	69213
B	3	32	69241
KW	51	33	69312

Visual examination, wall-thickness and rib-height measurements were completed on process tubes as follows:

<u>Reactor</u>	<u>Number of Tubes</u>	<u>HW Number on Unclassified Reports</u>
C	4	69026
KW	1	69065
DR	3	69198
H	1	69229

The tubes from C Reactor were examined to obtain additional corrosion data. The three tubes examined from DR Reactor and one from H Reactor were removed because they were leakers. In tube 0988-DR two pinhole leaks were found located between 7-1/2 and 7-3/4 feet from the outlet tube flange, caused by external corrosion. In tubes 1185-DR and 3974-DR leaks were found at 10:30 and 1:30 o'clock position in the tube located between 11 and 12 feet from the outlet tube flange. The leaks were caused by an accelerated internal corrosion. In tube 2990-H, two pinhole leaks were

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found located at the 11 o'clock position between 12 and 12-1/2 feet from the outlet tube flange. The holes were conical in shape with the apex at the exterior surface of the tube; however, the cause was not apparent.

Panellit System Program

Gages repaired, calibrated by Maintenance	-	229	
Gages meeting examination criteria	-	177	(77%)
-previous month	-		(70%)
In-board gage reliability examinations	-	539	
Gages meeting examination criteria	-	474	(88%)
-previous month	-		(93%)
-average for past year	-		(89%)
Response time determinations	-	539	
Meeting response criteria	-	528	(98%)
-last two months			(98%)
In-board coil leak examinations	-	8020	
Non-leaking coils	-	7975	(99.4%)
-average rate for past two years	-		(99.5%)

During the month, 474 spare gages were examined, identified and made available for shipment to Panellit, Inc. according to provisions of the Panellit improvement-exchange gage program.

PCCF gages received from Panellit, Inc. and examined	-	67	
Gages meeting criteria	-	55	(82%)

Manager, Research & Engineering

MANUFACTURINGPRODUCTION OPERATIONPRODUCTION PLANNING & SCHEDULINGDischarge Concentrations

There were no discharge goal adjustments effected during April. Overall exposure of metal was down slightly from the previous month due to a lower discharge exposure for solid fuel elements. This was the result of fringe discharging at H Reactor to permit charging of the Li-Al blanket and extra solid metal discharging from KE Reactor as a rupture control measure.

Discharge Exposure Comparison (MWD/T)

	<u>Regular Solid</u>		<u>Regular I&E</u>		<u>Enriched I&E</u>		<u>Overall Exposure</u>
	<u>6 Old</u>	<u>2 K's</u>	<u>6 Old</u>	<u>2 K's</u>	<u>6 Old</u>	<u>2 K's</u>	
February	757	783	715	689	804	715	717
March	762	766	691	691	865	661	714
April	679	659	716	682	817	692	703

Non-Representative Plutonium

Unusually high exposure material has been segregated and accumulated in the reactor basins since October 1960 for use in an AEC program to supply production quantities of non-representative plutonium. A significant part of this requirement was obtained by means of a combination visual and weasel separation of a large KW Reactor discharge.

Segregation of such material in reactor basins is continuing and considerable material, particularly at DR Reactor, has already been accumulated for the next campaign.

ESSENTIAL MATERIALS

Rail and truck shipments received in April were as follows:

Carload shipments for IPD	-	173
Carload shipments for other Depts.	-	160
Truck shipments for IPD	-	<u>174</u>
Total		507

MISCELLANEOUS ACTIVITIES

Manufacturing Training Program consultations with W. H. Coleman on April 17-18 were arranged. These related principally to placement of Program graduates and application of the special MTP progressive appraisal system. Information regarding IPD, HAPO, the Tri-Cities and the Pacific Northwest was assembled and sent to all eleven of the MTP men scheduled into IPD this summer. Transfer-out arrangements were initiated for the MTP members now in the department.

Evaluation of IPD's pilot course in "Fundamentals of Manufacturing" was completed. This comprehensive course gives first-line supervisors and associated specialists a self-development opportunity to acquire an understanding of all elements of IPD manufacturing work. Only one-third of the forty-nine 2-hour sessions were held during working hours.

1964-1965

MONTH		REACTOR OPERATION STATISTICS - PROCESSING																					
APRIL, 1961		B	C	D	DR	F	H	SIX OLD	KE	KW	K'S	TOTAL											
PUT PU (% OF FORECAST)		118.9	98.1	97.0	71.3	114.8	103.0	100.0	99.9	110.6	105.2	102.1											
TIME OPER. EFF. (% OVERALL)		84.3	81.8	78.7	65.6	87.6	83.5	80.3	80.7	85.6	83.1	81.0											
NEW TUBES INSTALLED		11	0	9	49	2	0	71	1	1	2	73											
WATER LEAKS- TUBE		0	0	2	7	2	1	12	0	0	0	12											
- VAN STONE		0	0	0	2	0	0	2	0	0	0	2											
SLUG RUPTURES		2	2	2	0	0	3	9	2	1	3	12											
HELIUM CONSUMED- M CU.FT.		466.3	640.4	507.0	224.4	527.5	355.1		218.1	305.7		3244.5											
CAUSES OF REACTOR OUTAGES		NUMBER OF REACTOR OUTAGES AND HOURS																					
REACTOR OUTAGES		NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.
OPERATIONAL CAUSES																							
FAULTY INST. OR CIR.								2	40.5														
FAULTY PROC. EQUIP.																							
UNEXPLAINED																							
KER Facility																							
190 Pump Motor																							
CHARGE-DISCHARGE																							
RUPTURE		2	113.0	2	51.0	2	106.1	3	100.2	9	370.3	2	56.6	1	68.9	1	68.9	3	91.2	12	461.5	6	353.1
WATER LEAK						1	46.4	2	207.1	2	81.5	1	18.1	6	353.1								
TUBE REPLACEMENT																							
MAINTENANCE																							
Production Test																							
TOTAL		2	113.0	6	130.6	5	153.2	4	118.3	24	851.7	5	138.9	2	103.5	7	242.4	31	1094.1				
UTILIZATION OF REACTOR OUTAGE HOURS		UTILIZATION OF REACTOR OUTAGE HOURS																					
CHARGE - DISCHARGE <td>37.0</td> <td>38.6</td> <td>56.6</td> <td>52.8</td> <td>24.4</td> <td>51.5</td> <td>260.9</td> <td>60.8</td> <td>56.2</td> <td>117.0</td> <td>377.9</td> <td>6.6</td>		37.0	38.6	56.6	52.8	24.4	51.5	260.9	60.8	56.2	117.0	377.9	6.6										
RUPTURE REMOVAL		19.3	14.2	10.3	5.1	-	12.9	61.8	24.3	26.8	51.1	112.9	2.0										
WATER LEAK		-	-	15.0	71.8	38.6	16.1	141.5	1.0	-	1.0	142.5	2.5										
TUBE REPLACEMENT		23.9	0.8	13.1	63.4	7.2	1.8	110.2	-	16.3	16.3	126.5	2.2										
MAINTENANCE		18.2	32.7	54.3	50.2	18.8	34.2	208.4	15.1	2.7	17.8	226.2	3.9										
STANDARD CHECK		0.3	1.0	3.7	2.8	-	-	7.8	2.0	1.0	3.0	10.8	0.2										
PRODUCTION TEST		0.8	38.3	-	-	-	-	39.1	26.0	0.5	26.5	65.6	1.1										
PROJECT WORK		13.5	4.1	-	-	-	1.8	19.4	(3) 9.7	-	-	19.4	0.3										
OTHER			0.9	0.2	1.5			2.6			9.7	12.3	0.2										
TOTAL		113.0	130.6	153.2	247.6	89.0	118.3	851.7	138.9	103.5	242.4	1094.1	19.0										

- (1) 130.0 hrs. for Block Discharge.
- (2) KER Facility.
- (3) 7.7 hrs. charged to KER Maintenance.

FACTORS AFFECTING OPERATION STATISTICS

[illegible]

REMOVAL METHOD: Q - QUICKIE: CM - CHARGE MACHINE; HJ - HYDRAULIC JACK, TP - TUBE & PIECE

MONTH		REACTOR OPERATIONS STATISTICS - POWER										SHEET 1	
APRIL, 1961		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL			
RIVER WATER (BLDG. 181)													
TO RESERVOIR (BLDG. 182)		13294		2271		2910	2565			21040			
TO FILTER PLANT (BLDG. 183)		66573		90353		84778	79700	165700	171700	658804			
TO FILTER PLANT (C&DR)		107246		51236						158482			
TO R & E (KER) & F.E.O.				203				661		864			
TOTAL		187113		144063		87688	82265	166361	171700	839190			
TOTAL		8083.3		6223.5		3788.1	3553.9	7186.8	7417.4	36253.0			
RESERVOIR WATER (BLDG. 182)													
TO POWER HOUSE (BLDG. 184)		30		60		398	43			531			
TO COND. SYSTEM (BLDG. 190)				525		2506	2522			5553			
TO COND. SYSTEM (190DR & 183F)				1686		6				1692			
TO EXPORT SYSTEM INCL. NPR		13264		0		0				13264			
TOTAL		574.3		98.1		125.7	110.8			908.9			
FILTER WATER (BLDG. 183)													
TO POWER HOUSE (BLDG. 184)													
TO PROCESS (BLDG. 190)		153		169		107	143			572			
TO 108		75140	85456	76303	61870	80417	74800	159853	166175	780014			
TO 108DR		2500	4500	4		1070	1200			9274			
TO FILTER PLANT (BLDG. 183DR & 183-B)				5						5			
TO F & S SYSTEM		81	13663	11560						(25223)			
TO R & E (KER) & F.E.O.				331		243	100	239	50	805			
BACKWASH				153				5608		392			
TOTAL		2362	3627	1828	926	2941	3457	5608	5475	26224			
TOTAL		3466.2	4633.0	3903.2	2712.8	3662.4	3443.0	7158.2	7417.4	36396.2			
PROCESS WATER (BLDG. 190)													
TO REACTOR		74740	85056	75903	61470	80037	74300	155300	161300	768106			
TO REACTOR		86000	95500	86800	86700	88000	85200	182000	182000	892200			
POWER HOUSE (K AREA)								37	12	49			
108 (KE - KW)								4022	4463	8485			
TO R & E (KER)								94		94			
BUILDING USAGE		400	400	400	400	380	500	400	400	3280			
TOTAL		3246.0	3961.7	3296.3	2672.8	3474.0	3231.4	6905.6	7178.8	33696.0			
RIVER DATA													
ELEVATION (MSL, FT.)		392.1		383.7		370.5	375.7		387.0				
		388.4		379.6		366.0	372.4		381.5				
		390.7		382.1		368.4	374.4		385.0				
TEMPERATURE		47.3		47.8		48.6	48.0		47.1				

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RECORD FOR OPERATIONS STATISTICS - POWER

SHEET 2

	100-L	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL
WATER TREATMENT DATA									
MM GALS	2876.0	4633.0	3903.2	2213.4	3662.4	3443.0	7158.2	7417.4	35306.6
MM GALS									
CHEMICAL CONSUMPTION									
LBS.	14276	19840	12890	5960	16340	18214	48400	56800	192720
LBS	0.6	0.5	0.4	0.3	0.5	0.6	0.8	0.9	0.6
AVG PPM									
ALUMINIA									
ALUM	31851	50404	238096	145731	220501	206096	375000	384700	82255
LBS	9396	12188							1591708
AVG PPM	*5.7	*5.5	7.3	7.9	7.2	7.2	6.3	6.2	6.7
SEPARAN									
LBS	450	450	500	350	500	500	900	950	4600
AVG PPM	.019	.012	.015	.019	.016	.017	.015	.015	.015
SULPHURIC ACID									
(AS 100%)	228542	375894	243845	127215	234125	221800	504900	478800	2415121
LBS	9.5	9.7	7.5	6.9	7.7	7.7	8.5	7.7	8.2
AVG PPM									
DICHROMATE									
LBS	48357	42850	46700	37830	52110	49415	100600	104500	482362
PURGE MATERIAL CONSUMPTION									
LBS	0	350	0	13350	0	0	0	0	13700
SOLIDS									

*Alumina & alum combined for PPM in alum column.

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REACTOR OPERATIONS STATISTICS - POWER										SHEET 3	
MONTH	APRIL, 1961										
ANALYTICAL DATA											
RAW WATER											
PH	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW			
	8.00 12	8.00 13	8.21 14	8.21 15	8.19 14	8.12 13	7.56 16	7.45 20			
PH AVG											
PPM AVG											
FINISHED WATER											
PH	7.10	7.10	7.11	7.08	7.05	7.07	7.01	7.03			
TURBIDITY	.011	.012	.007	.008	.010	.007	.008	.008			
CL ₂ RESIDUAL	.05	.05	TRACE	TRACE	.07	.08	.19	.17			
DICHROMATE	1.8	1.4	1.8	1.8	1.8	1.8	1.8	1.8			
STEAM DATA											
GENERATED (MAX)	136000	124000	107000	66000	433000	67000	65000	132000			
(NOR)	81000	81000	53000	53609	268609	-	-	-			
(AVG)	79400	86761	50158	52953	269272	37033	34167	71200			
TOTAL	57166	62468	36114	38126	193874	26664	24600	51264			
TO PLANT	48476	52972	31780	32331	165559	23998	22140	46138			
COAL RECEIVED	3638	3351	2450	0	9439	-	-	-			
CONSUMED	3100	3340	1994	2594	11028	-	-	-			
IN STORAGE	18642	20642	16540	10395	66219	-	-	-			
GEN. STEAM/LB. OF COAL	9.22	9.35	9.06	7.35	8.79	-	-	-			
OIL RECEIVED						472873	0	472873			
CONSUMED						236825	213528	450353			
IN STORAGE						1181964	1180368	2362332			
GEN. STEAM/GAL. OF OIL						112.6	115.2	113.0			
ELECTRICAL DATA											
TOTAL GENERATED KW HRS.										1500800	3102400
Peak Demand Control										60800	222400

APPLIED REACTOR ENGINEERING OPERATION

INDUSTRIAL ENGINEERING OPERATION

Work Sampling by supervision was carried out in B-C Power and Processing Operations routinely during the month. This technique for determining the work distribution of employees permits comparisons of the distribution from year to year and between different groups. The data are entered directly on IBM porta-punch cards and the data reduction and report preparation are accomplished by the IBM 7090 using a program developed to permit consistent and comparable results to be obtained by any using component. Initial reports were received, and include results on work distribution by time of observation, and location of observations or work activity by individual supervisors.

Purchase requisitions were placed for the additional 6800 connectors to permit the planned replacement of existing connectors for the five oldest reactors.

Orders have been placed for eight spare parts impellers for the 190 Annex process water pumps. The spare parts stock has been exhausted by replacements of impellers which were found to contain cracks during planned inspections. Initial deliveries are expected by late June.

GENERAL

Additional analyses of the costs and incentive for conversion to bumper fuel elements were completed. The schedule for conversion was modified by dropping C Reactor and advancing the scheduled conversion of B, DR, and F Reactors.

B-C REACTOR OPERATION

WELDING EXPERIENCE

Input production by B Reactor during April was 100.4 percent of the recorded previous high for production, by B, in a calendar month. Two unscheduled outages at B were necessitated by fuel element failures. Equilibrium power levels were regulated primarily in consideration of tube powers.

At C Reactor, significant interruptions of production were required for: 1) the overboring of four tube channels, 2) removal of two ruptured fuel elements, 3) replacement of a failed rear nozzle connector elbow, and 4) the replacement of cross-threaded connectors on several front nozzles. Equilibrium power levels were regulated in accordance with the Operating Severity Index for control of ruptures.

EQUIPMENT EXPERIENCE

At B Reactor, eleven new process tubes were installed as replacements for five with thin walls, two damaged during rupture removal, and four PCCF tubes being returned to production status.

Erratic operation of the power calculator at B Reactor necessitated reliance on alternate instrumentation during repair of faulty cables from the inlet RTD. New cable has been ordered and the services of a Foxboro Company engineer scheduled for May 15 to perform desired testing of power calculators at both B and C Reactors.

At C Reactor, new connector fittings were installed on 36 front face nozzles in replacement of cross-threaded fittings.

A new vertical safety rod (B Reactor type) was installed in VSR channel No. 29 at C Reactor. Speed of entry for the standard C Reactor VSR was being retarded by distorted graphite in the channel. Three "B type" rods are now in service at C Reactor.

A connector elbow was blown from a rear face nozzle at C Reactor when threads on the elbow failed. A new connector and elbow were installed during the subsequent 1.3-hour outage.

A surge on the export water system was experienced on April 7 when a cycling of surge suppressors at Building 182-F was inadvertently triggered during work on electrical facilities. The resulting drop in system pressure, to 95 psi, caused the surge suppressors at 182-B to cycle, reducing system pressure to 50 psi. Resumption of normal conditions was accomplished in approximately two minutes.

IMPROVEMENT EXPERIENCE

Design Change No. 391-B was completed providing new safety-circuit by-pass switches installed in a central control panel in the B Reactor control room.

Four additional channels at C Reactor were overbored 550 mils. Two of these were retubed with smooth bore zircaloy and two with smooth bore aluminum. All four were equipped with new hardware and charged with oversize elements, thus bringing the total of oversize tubes in production at C Reactor to twenty.

Installation of the spline coiler (Project CGI-906) is 95 percent completed at B Reactor.

The emergency filtered water high tanks and associated piping at 105-C were flush-cleaned in connection with progress on Design Change No. 451-B-C.

A chemical decontamination test (PT-IP-323-AE, Series 1) was completed at C Reactor, involving a six-tube, through-the-pile application.

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Quick-disconnect bus bars were installed in the electrical power supply system of No. 1 process pump motor at Building 190-B Annex in accordance with specifications for Design Changes No. 398 and No. 420.

In continuation of the programmed reduction of reactor gas leakage, eleven rear bellows at B Reactor and 14 at C Reactor were filled with silicone foam; also, new gas seals were installed on two vertical safety rods and one horizontal control rod at B Reactor.

RADIATION MONITORING EXPERIENCE

Personnel dose rates of 2 and 3 r/hr. were experienced during spline and rupture removal work; planned dose rates of 5 r/hr. were received by two employees during removal of an octant monitor sleeve. Two cases of skin contamination (maximum of 2000 c/m) were easily decontaminated. Two cases of shoe contamination (up to 750 mrad/hr.) resulted from a contaminated step-off pad. No personnel overexposure occurred.

Portions of the roadway to the 105-B burial ground were contaminated up to 1.3 rads/hr., including 45 mr/hr., by water spillage during a routine burial operation. Details are presented in document HW-69309.

D-DR REACTOR OPERATION

OPERATING EXPERIENCE

Operating levels were regulated at D Reactor by bulk outlet temperature and at DR by limits of the Operating Severity Index. Toward the end of the block run at DR Reactor reactivity conditions required a power level reduction to control flux distribution and heat cycling.

The five outages at D Reactor resulted from power interruption to a coolant pump, two ruptures, mechanical failure in a ball valve and tube leakage. D Reactor began the month in a continuation of a March outage, then experienced two water leak outages, a Panellit scram and a manual scram to repair a defective rear face thermocouple.

EQUIPMENT EXPERIENCE

Installation of reamed nozzles for bumper fuel elements continued with 301 installed at D and 81 at DR. D Reactor now has 1422 reamed nozzles installed with 1143 tubes charged with bumper fuel elements.

High velocity flushing of the high tank discharge lines at DR Reactor was facilitated by installing 12" drain lines in place of smaller lines in the pipe tunnels.

Reconditioned stators were installed in 4500 hp pump motors in each 190 Building. The replacement in 190-D followed a motor failure that shut down D Reactor.

A pump impeller was replaced when several inches of cracks were found. One blade of an Ingersoll Rand test pump impeller was found with a 1-1/2" crack.

IMPROVEMENT EXPERIENCE

A second independent charge-discharge communications circuit was installed at DR Reactor to assure continuity of communications between front and rear elevators and the control room.

Several purges of the DR Reactor were made with diatomaceous earth to remove contaminants within the rear face piping by its abrasive effect. Measured dose rates taken in front of the rear tube caps indicated a reduction of rear face dose rates by 25 percent. Initial dose rates at the entry to the discharge area were reduced by a factor of 2.

A vertical safety rod channel, distorted by graphite movement, was successfully cleared using a newly designed broach attached to a rod tip.

Inspection of rear face equipment was improved by installation of two spot lights remotely operated by cables from the rear viewer. The lights can traverse horizontally or vertically and can be concentrated on one spot.

RADIATION MONITORING EXPERIENCE

There were no lapses of radiation control and no overexposure to personnel during the month.

F REACTOR OPERATION

OPERATING EXPERIENCE

A new production record for F Area was established this month. Reactor level during the month was based on tube powers determined from rupture control considerations. Reactor water flow was improved to 88.5 M gpm due to minor venturi changes in March, and conversion of some tube charges to 32-piece charges in April.

The reactor had to be shut down on April 30, when several rear face water connectors failed.

A power surge on April 4, caused by switching at Midway, accelerated the 190 turbines and tripped the 105 power loss annunciator; however, there was no production loss.

EQUIPMENT EXPERIENCE

The effluent line developed a significant leak at the first dresser coupling upstream from the concrete anchor when the reactor was shut down on April 30. Temporary repairs were made before start-up.

Twelve Van Stone sealing inserts with Hycar rubber seals were removed without difficulty by the charging machine. During the outages of April 17 and 19, leaking process tubes 2875 and 2174 were removed and replaced.

Ninety-two process tubes were probologged; however, no tubes with severe external corrosion were found.

Overhaul of the No. 4 boiler equipment was completed on April 13.

On April 19, the No. 4-A motor burned out during a start-up at 5:10 a.m. A fault was found in the No. 4 coil of "A" phase. The motor was returned to service at 12:31 a.m. on April 20 after the failed coil was jumpered.

A thorough inspection of front face nozzles and pigtails failed to reveal any cross-threaded connections.

Significant items replaced, in addition to the 2 process tubes, were: 13 process tube thermocouples, 18 rear face water connectors, and 7 pressure monitor Panellit gages. Two rear face boots and 4 rear face lug rings were also replaced. Nine hundred and ninety-three Panellit gages were adjusted. Repairs were made to one gasket leak and 10 cap leaks.

IMPROVEMENT EXPERIENCE

High tank water temperature instrumentation was installed and connected to a recorder in the control room.

Installation of new bus bars for the No. 4-A motor was completed on April 18. This work is in connection with Design Change No. 366 - "4500 HP Motors Electrical Power Connection".

Work on Project CGI-884 (Crossunder Line) continued. Principal effort during the month was devoted to cutting through concrete back-fill under the near riser room.

The steam turbine on the 1608-F pump was equipped with an automatic controller which is designed to shut off the steam supply to the turbine in the event the pump fails for any reason.

The 15 cfm vacuum pump on the 105-F helium leak detection system was replaced with a 50 cfm vacuum pump to shorten the response time during the leak testing operation.

One remotely operated poison spline coiler, provided for under Project CGI-906, was installed and put to beneficial use on April 19.

RADIATION EXPERIENCE

One lapse of radiation control was sustained in April by F Reactor area personnel.

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Utilization of spline coiling equipment has sharply reduced personnel exposure during spline removal operations.

Rear face dose rates in the 24-hour period following shutdown, have increased following the usual trend of increasing with spring river runoff. An increase of chlorine addition on the far side of the water plant and 60 ppm diatomaceous earth purge of the reactor for one hour were attempted to see if any reduction of this dose rate could be realized. Effectiveness of these treatments has not been evaluated.

H REACTOR OPERATION

OPERATING EXPERIENCE

Input production was 103.0 percent of forecast. Time operated efficiency was 83.5 percent. The highest level attained was 1845 MW. The limiting factor was rupture control consideration. There were 118.3 outage hours, all unscheduled, during the month as a result of four unscheduled outages. These were due to three fuel element ruptures and a process tube leak.

EQUIPMENT EXPERIENCE

Broached nozzles were installed on 364 additional process tubes in the preparatory program for bumper fuel element loading. Installation is now 77 percent complete.

Inspection of the rotating elements in 190 Annex pump motors No. 2 and No. 3 revealed minor cracks in the first stages of both units. None were considered serious. This completes inspection of five of the eight pump units.

Inspection of the 190 Annex cone bypass valve No. 1 revealed heavy seat corrosion. This, coupled with galled seat thread difficulties, necessitated replacement of the entire valve.

Results from the inspection of the far 105 elevated reactor process water back-up tank, which was drained, cleaned, and flushed in March (see March report), indicated corrosion pitting to a depth of .025 to .065 inches. The structural framework, ladders, and catwalks were in good condition.

An inspection of the No. 36 vertical safety rod unit, prompted by difficulty in lifting it out of the reactor, revealed faulty bearings in the winch brake oil pump mechanism. The bearings were replaced and the rod returned to service. An inspection is underway to determine if a similar condition exists in the remaining winches.

IMPROVEMENT EXPERIENCE

A total of 187 J-type rear face connectors (pigtaills) was replaced with new type Inconel spiral connectors. These new type connectors will replace with J-type which are failing and releasing excessive quantities of water vapor into the discharge area.

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An automatic steam inlet valve was installed on the No. 2 emergency steam turbine in the 183 Building as part of Project CGI-791, "Reactor Confinement". Installation of the valve will insure continuity of water to the 105 discharge area fog spray system in case of electrical power failure.

Screened coal from the coal stock pile was burned exclusively during the month. Twenty-four hundred tons were utilized for a total reduction of 7,000 tons since initiation of the screening program last February. Screening of stock pile coal will be completed during May.

RADIATION PROTECTION

A portable water-filled shield for protection of standby personnel from radiation in the discharge area was completed and installed. A 65 percent reduction in dose rates is being realized thus far from the 10-inch thickness of water in the shield.

CENTRAL MAINTENANCE

Broaching of front nozzles in support of the bumper fuel element loading program was continued. A total of 966 was completed during the month.

Four process channels were overbored at 105-C Reactor, and machine and shop work were continued in support of the overboring program.

KE-KW REACTOR OPERATION

OPERATING EXPERIENCE

Power levels were limited by the planned rupture control point at both reactors except for three days at KW Reactor when graphite temperatures were limiting. A stuck enriched metal rupture at KE Reactor required the removal of the tube and charge. One additional fuel element rupture occurred in each reactor and was discharged with charging machine forces.

EQUIPMENT EXPERIENCE

The recent probologging of 225 tubes in the K Reactors to obtain data for the tube replacement program indicated that the average range of tube wall thickness was from 42 to 48 mils between the ribs where the original minimum thickness was 55 mils. Data obtained from thermocouple probes installed in four tubes to measure the temperature distribution around the inner circumference of the tubes indicated a heat unbalance that might be reduced through use of flow mixer elements.

Three fringe vertical safety rods (normally used only for extended outage poisoning) in each reactor remained out of service due to binding caused by graphite movement. This problem was included in a Section-wide engineering study to be pursued by Facilities Engineering

Through metallurgical examinations, evidence of stress corrosion was found in the piping and associated fittings and connectors of KER loops Number 1, 2 and 3. During the April 26 outage at KE Reactor, these items were replaced.

IMPROVEMENT EXPERIENCE

Horizontal control rod Number 17 at KE Reactor was cleared of its binding restrictions and returned to normal service. Some improvement was made to the operation of rod Number 19; however, more work is required. To increase flexibility of control at KW Reactor a horizontal control rod tip with neutron absorption materials along 40 percent of its length was placed on rod Number 11 replacing a 60 percent tip.

Under the program to increase coolant water flows, a re-wound, upgraded motor (900 to 1500 hp) was installed in the Number 5 low-lift pump at 190-KW. Four K Reactor low-lift motors remain to be upgraded.

RADIATION MONITORING EXPERIENCE

Rear face work associated with the discharge of a stuck rupture resulted in the spread of contamination up to 200 rads/hr. to the protective clothing of a Maintenance craftsman. Subsequently, removal of the clothing resulted in facial contamination which was readily removed. The incident was investigated and reported in document HW-69371.

O. Schroeder

Manager, Manufacturing

FACILITIES ENGINEERINGREACTOR MODIFICATION DESIGN OPERATIONRESEARCH AND DEVELOPMENT

Results of the design testing program performed on the inlet nozzle reinforcing sleeve to be used on reamed nozzles at 105-B, D, DR, F, and H Reactors indicate them to be satisfactory. These sleeves were designed to strengthen the reamed nozzles used with the bumper fuel element should reaming render the present nozzle unsatisfactory. A prototype forged nozzle for possible use at K Reactor with the bumper fuel element is being fabricated. The design of this nozzle would permit future reaming should smooth bore zirconium process tubes and self supported fuel replace the ribbed aluminum process tube and bumper fuel element.

Preparation of study drawings for two alternate concepts of oversized smooth bore process tube assemblies for 105-C Reactor, described in last month's report, continued. The drawings are now 80 percent complete, and purchase requisitions are being prepared for procurement of prototype equipment to be utilized at 105-C Reactor on the next group of overbored fuel test channels. A testing program to evaluate these various process tube assembly designs has been initiated, as well as additional development work in the event this program is extended to full reactor.

Analytical studies in support of the 105-C Reactor Overbore Program are progressing. These studies concern the anticipated heat distribution, gas composition, overbore tolerances, graphite coring, coolant flow distribution, and shield loadings for the test program. They are also being extrapolated for full reactor application.

Detail design drawings showing the proposed modification of an existing spare 105-C Reactor vertical safety rod assembly for flexible operation have been approved and transmitted to B-C Maintenance Operation. The rod, modified to permit entry into the distorted graphite stack, will be tested prior to installation.

DESIGN PROJECTSCGI-791 - Reactor Confinement

The vendor has started fabrication of the replacement wheels for the 105-C Reactor Building exhaust fans. Although the fans will be operated at 980 RPM, wheel speeds have been specified at 1100 RPM to permit safe operation for setting the steam turbine over speed trip.

A separate specification has been prepared for a lump sum contract for construction of the 1615-F Decontamination Building. The building is to be used for disassembly and disposal of the dust loaded filters removed from the filter building.

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HW-69491

CGI-839 - Modification of Fuel Element Test Facility - 1706-KER

All drawings and purchase requisitions have been completed. A negotiated purchase order for the KER loop primary pump service dolly has been placed with the pump manufacturer.

A high temperature to cold water thermal shock test of the first 275 horsepower pump was completed. Instrumentation, test procedures, and observed pump performance were satisfactory; however, inspection following disassembly revealed a cracked seam weld on the interstage bushing. This joint has been modified and the test will be repeated.

CGI-844 - 100-K Coolant Backup System

Detail design is 98 percent complete. A contract is being negotiated with Midwest Piping Company to design and fabricate the special heavy duty fittings required for the connection joints between the new diesel pump house line, the existing cross-tie, and the new parallel cross-tie line.

Recommendations have been made that bids be accepted for the ball valves, steam valves, flow transmitters, and recorders.

CGI-883 - Increased Process Water Flow 100-K

Detailed design which is four percent behind schedule is 92 percent complete. Four drawings and two specifications were approved; one specification, one drawing, and two acceptance test procedures were issued for comment. As a result of delays in receiving vendor information on the 500 KVA transformers and voltage regulators and the 4.16 and 13.8 KV switchgear, design progress has fallen behind schedule.

Placement of the purchase order for the submersible motor driven pumps for the 181 River Pump Houses continues to be delayed. The latest revision was approved and invitations to bid were sent out April 25, 1961, with a bid closing date of May 17, 1961.

Inspection of the third prototype impeller removed from the high lift pump in the 190-D Main Pump House following field testing, revealed the impeller to be in good condition with only slight frosting on the vanes. Negotiations with the vendor to supply ten additional process pump sets have been completed.

A development test was performed to test the capacity of the filter effluent structure in the 183-D Filter Building for proposed project flows. Water surged intermittently through the floor openings in the lime house structure and splashed over the vent at the clearwell entrance weir and along the distribution flume at the sedimentation basins. The water reached a level approximately 14 inches above the pipe gallery floor and resulted in some flow reduction through the No. 6 filter. Recommendations for corrective action will be included in the final report.

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EQUIPMENT DEVELOPMENT OPERATIONEXISTING REACTOR WORKReactor Modification Program

On April 17, four 105-C Reactor tubes were overbored. These were the last of the 20 tubes authorized. The work took 15.1 hours; no machines failed; some sequencing of operations was accomplished and there was considerably less confusion than on the earlier 13-tube outage. This completes the first phase of overboring development.

Remote Rear Face Equipment

The program to develop an actuator and valve that will permit remote opening of a rear tube closure continued. On test on the reactor are: (a) two ball caps supplied by vendors; (b) 53 HAP0-designed ball caps with 'O' ring seals; (c) 63 flapper caps. There are also 30 ball caps and 25 flapper caps awaiting installation of new seals, and 11 ball caps ready for installation when convenient.

Spline Monitoring

Tests are being conducted to evaluate the feasibility of monitoring splines, as they are being withdrawn from the reactor, to determine the front to rear flux distribution. This can be done in a very simple way. Slug junctions are shown by breaks in the activity curve and this fact eliminates the necessity for a motion recorder. Splines can be monitored during operation, after the reactor is shut down, or after they have been withdrawn for some time. For those monitored as they are withdrawn during operation, corrections to the readings must be calculated.

High Speed Scanner

The vendor is modifying amplifiers that were found to be unsatisfactory. The vendor supplied one re-worked amplifier, re-worked a second, and returned a third amplifier to the factory for revision and re-design. These changes have made a substantial improvement in performance; reliability of the equipment so far has been excellent. A program of testing and evaluating performance of aluminum in-core chambers installed in the 105-KW Reactor is continuing.

Design Test and Service Activity

Activity was reported on the following design tests:

- DT-1099 - Bumper Nozzle Reinforcing Sleeve Test
- DT-1100 - Flexible Vertical Safety Rod 105-C
- DT-1101 - Outlet Gas Seal Tests for C-Overbored Tubes

Results in these activities were reported to the Design component responsible for the test.

In addition, the following tests are in progress without formal design test procedures:

- (a) Operational Test - Bumper Slug Charging Machine
- (b) B-D-F Rear Header Adapter Repair Method
- (c) Broached Nozzle Strength
- (d) CGI-904 Rupture Monitor Flow Regulator

NEW PRODUCTION REACTOR WORK

NPR Design Test Activity

Final reports were issued on:

- DT-1065 - Pile Motion Transducer
- DT-1083 - NPR Pressure Test for Electrical Connectors
- DT-1087 - NPR Lighted Push Button Heat Test
- DT-1089 - NPR Horizontal Control Rod Gas Seal

Activity was reported on:

- DT-1021 - NPR Hydraulic Control Rod
- DT-1024 - NPR Fuel Handling
- DT-1051 - NPR Process Tube Rupture Test
- DT-1060 - Evaluation of Strip Chart Recorder
- DT-1062 - In-Core Flux Monitor (Neutron Sensitive)
- DT-1073 - Cables for High and Intermediate Level Nuclear Monitoring
- DT-1085 - Analysis of Vendor's NPR Prototype Inlet and Diversion Valves
- DT-1094 - NPR Control Rod Tip Weld Fatigue Test
- DT-1095 - NPR Limit Switch Tests for Underwater Use
- DT-1102 - NPR Prototype Flow Transducers

Results were reported to the responsible Design component.

Design tests awaiting final report:

- DT-1036 - Cooling of Cast Iron Thermal Shields
- DT-1052 - Ceramic Balls for 105-N Safety System
- DT-1067 - Dump System Evaluation
- DT-1076 - Power Rate Meter

Inactive Tests (waiting material, equipment, or in unattended operation):

- DT-1026 - NPR Header to Nozzle Connectors
- DT-1056 - Evaluation of Power Range Safety Amplifiers
- DT-1068 - High Temperature Cable
- DT-1069 - Process Tube Flow Monitor
- DT-1072 - Resistance Temperature Detectors
- DT-1075 - NPR Water Sample Flow Regulator
- DT-1086 - NPR Ball Safety System

Tests being formulated between Equipment Development and Design component:

- DT-1090 - NPR Clare Mercury Wetted Relay Test
- DT-1096 - NPR Flow Restriction Meters
- DT-1097 - NPR High Temperature Cable End Seals
- DT-1098 - NPR Fuel Element Spacers
- DT-1103 - NPR Prototype Insert Resistance Temperature Detectors
- DT-1104 - NPR Prototype Clamp-on Resistance Temperature Detectors
- DT-1105 - NPR Prototype Graphite Flow Monitor
- DT-1106 - NPR Prototype Rod Flow Monitor
- DT-1107 - NPR Micropositioner Relay

Cancelled Test:

- DT-1088 - Sub-Critical Monitor Chamber Positioner for NPR

Nuclear Instrumentation

Laboratory assembly is well advanced on the reflector-mounted flux monitoring system being developed as a backup to that being procured for NPR on functional specifications. Completion of the prototype will follow testing and installation of dual indicating meters which were just received. The system contains level indicators for each of the eight corners of the reactor for monitoring flux distribution, high limit trips for each corner and for combinations, and two power rate devices for inter-comparison. Results of this development will also be applicable to the octant monitoring system being developed for the existing reactors.

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PLANT ENGINEERING OPERATION

DRAFTING OPERATION

Services provided during the month:

New and revised drawings	175
Layouts and sketches	132
Microfilm prints reproduced	423
Microfilm drawings added or retired	2594
Ozalid check prints reproduced	1576
Customers serviced, Microfilm files	284
Customers serviced, Catalog files	47
Catalogs added to files	220

EQUIPMENT APPLICATION ENGINEERING

Rear Face Crossheader Fitting Repair - Older Reactors

Repair methods, techniques, and tools for making both temporary and permanent repairs to rear face crossheader fittings are being studied. Tests are underway to evaluate the use of Dresser and strap saddles, as well as various gasket materials.

Bumper Fuel Charging Machine & Material & Handling System

The prototype bumper charging machine operated satisfactorily in tests without a fuel magazine at a rate of 42 strokes per minute. Extruded aluminum sections for fabrication of bumper fuel element magazines were received, and one magazine fabricated. It will be used in further testing of the charging machine.

REACTOR PLANT ENGINEERING

Rear Face Piping Studies - B, D, DR, F, and H Reactors

A test installation of flexible joints and guides to reduce thermal stresses and suppress vibration has been in service on one rear crossheader at 105-H Reactor for two months. The flexible joint utilizes Dresser couplings. The installation has been inspected three times and shows no evidence of deterioration or leaking. Data indicate an approximate 50 percent reduction in low frequency vibration and a factor of three reduction in stress at the crossheader riser connection. A similar installation had been completed on crossheader 23-1/2 at 105-DR Reactor.

WATER PLANT & UTILITIES ENGINEERING

4500 HP Motor Stator Program

Three stators with modified Class A windings were installed. There are now eight Class B and nine modified Class A units in service. At present the replacement program is somewhat ahead of the schedule indicated in HW-67306.

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Number four 4500 HP motor in 100-F Area was repaired after failure of a coil. The faulted coil (Coil 4 in A phase) was isolated and the unit returned to service. Plans were made to replace this unit with a rewind stator during the next scheduled outage.

De Laval Pump Impellers

In a continuing program, impellers in 16 of the 40 De Laval process water pumps have been inspected. Cracks of sufficient magnitude to indicate failure potential were found in three impellers (each pump has two impellers). These three were replaced and returned to the vendor; all others were returned to service.

No impact on production is foreseen as sufficient impellers of old design are available if needed, and eight replacement impellers are on order.

Interim Water Plant Flow Increase

The addendum to HW-66954, "Short Range Modification Program for Improved Productivity," which consolidates all the pertinent features of the Short Range Water Plant Modification Program into one, has been issued. A study is also underway for reviewing related technical questions and defining associated maintenance problems.

Lead Installation of Auxiliary Oil Burners

Development of preliminary engineering in preparation for a project proposal relating to a test installation of oil burners and associated equipment in one boiler at 100-B Area continues. Contacts have been made with Weller Reed, Consultant, and vendors to assist in determining optimum approach.

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PROJECT ENGINEERING OPERATION

PROJECTS

Phase III - Ventilation Modifications and Tie-ins

100-KE - Preparations are being made to start Acceptance Tests in this area. Equipment installation in 119-KE Sample Building is 95 percent complete. Pipe identification in the 117-KE Filter Building has been completed, and ladders and seal pit sight glasses have been installed.

General - The first linear dual differential count rate meter that automatically actuates the fog spray has been tested and found satisfactory. Victoreen Instrument Company has been requested to ship the seven units which were under option to purchase.

The halogen filter frame vendor has been given the option to ship two filter frames to HAPO. These frames have not been accepted without qualification, but will be inspected for acceptance on site.

CGI-844 - 100-K Area Coolant Backup

Installation of the 183-KW clearwell cofferdam was completed. This work is preliminary to the installation of a new gate valve for the low pressure cross-tie line.

The bid package for the pumping station and cross-tie line work, which will be subcontracted by the J. A. Jones Company on a Fixed Price basis, is being reviewed prior to issuance.

CGI-871 - Improvement to Dummy Decontamination Facilities, 105-B, C, D, DR, F, and H

Extensive tests were conducted on the completed installation at 105-C. Trial runs indicate that in addition to the reduced exposure to personnel claimed in the project proposal justification, dummies may be reclaimed that have been discarded under the present method.

CGI-883 - Increased Process Water Flow - 100-K.

The sixth primary process pump motor which had been upgraded to 1500 HP was installed in the No. 5 pump position in 190-KW on April 18, 1961. Six new desert coolers located above each of the primary process pumps in 190-KE and KW have been installed by The Royal Company, subcontractor to J. A. Jones. These units are now ready for acceptance testing. The basic building modifications have been completed at 181-KW in preparation for the six new submersible pumps. Similar work is in process at 181-KE.

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CGI-906 - Poison Spline Coilers

Coiler installation is now complete in 105-F and 105-H. 105-F personnel have pulled ten splines satisfactorily with their unit. The 105-B installation will be ready for test early in May. Work had started at 105-DR, but has been delayed due to radiation conditions and an extended outage.

MJA-21, 25, 29 - Pressure Monitor Modifications and Repair

Four hundred-fourteen gauges have been forwarded to the vendor, in addition to the 69 previously sent, in an effort to expedite receipt of revised gages following HAPD approval of prototypic gages. Prototypes are expected to be ready for HAPD approval early in May.

CPFF CONSTRUCTION SERVICE CONTRACTOR - LIAISON

Four new work orders were issued and four old jobs supplemented for a total of \$83,000 to J. A. Jones during the month.

PLANT FORCES WORK REVIEW

The Labor Standards Board approved one job for assignment to Plant Forces, which is estimated to cost \$14,300.

PROJECT PROPOSALS

Project Proposals Submitted to AEC

CGI-839 Modification of Fuel Element Test Facilities, 1706-KER
Rev. 3

Manager, Facilities Engineering

RT Jessen:dgm

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NPR PROJECTPROCESS DESIGN OPERATIONResearch and Development

Studies to evaluate the hazards due to the loss of coolant to a process channel have, in the past, assumed release of fission products into the piping system at a time when the fuel element reaches a temperature equal to the melting point of the uranium. The NPR fuel elements have a relatively thick zirconium cladding and therefore an exploratory program has been initiated which will indicate the effectiveness of the zirconium cladding in retaining the molten uranium. Preliminary results have been promising, and it has been demonstrated that zirconium cladding is effective in containing molten uranium. A more elaborate testing program is planned to investigate the phenomena in greater detail. Such data will be helpful in evaluating hazards which in the past have conservatively been based on the uranium melting point.

A study has been initiated to review possible modifications to the NPR for conversion in regard to timing, schedules, cost and the incentive from the standpoint of reducing downtime and increasing dual purpose plant factor. Preliminary information has been given to the Atomic Energy Commission indicating that it may be possible to obtain a large part of the advantage of early installation of a sixth loop without installing the major equipment, and that a second boiler may be of an advantage in initial cleaning of piping systems.

A document, HW-68502, has been issued pointing out that at the time of conversion to Phase III operation, it may be possible to obtain steam pressures higher than those used in previous studies. The economic incentive for providing a generating plant that will allow the use of the higher pressure is shown.

A request was issued to Chemical Effluents Technology of HLO for an IBM study of the predicted path of liquid wastes beneath the 100-N crib. A possible result of the study is the elimination of an underground cut-off barrier from the design with a resultant cost saving.

Project AEC-179

A work authority has been received from the Commission for General Electric to coordinate reactor operation aspects with the Burns and Roe preparation of turbine-generator specifications. The first draft of the specification is due May 1.

Project CAI-816

Metallurgical problems at other reactor installations concerning the use of 17-4 PH stainless steel have been evidenced. Kaiser Engineers have

Project CAI-816 (Continued)

been instructed to inform NPR vendors that 17-4 PH stainless steel having a H 900 heat treatment will not be acceptable for critical NPR applications. The 17-4 PH heat treatments will be acceptable in the heat treatment identification of H 1025 and H 1100. Components made from 17-4 PH materials involve items such as miscellaneous portions of valves and graphite cooling pump shafts.

Burns and Roe completed an economic study of the two proposed sites for the emergency dump tank. Site 1 is located approximately 125 feet north of the 105-N Building and under the railroad service tracks to the 105-N Building, and Site 2 is approximately 100 feet west of the 105-N - 109-N Buildings. It was indicated on April 6, 1961 that Site 2 was the most desirable from an economic standpoint and that detail design would proceed on this basis.

A revision to the specification for the 109 freight elevator has been prepared. The purpose of the revision is to make the design compatible with the 105-N elevators for greater safety and for maintenance and operating convenience.

General Electric has been requested to proceed with the design of decontamination waste disposal facilities. These facilities, previously a design responsibility of Burns and Roe, include storage tanks and provisions to prevent the phosphorus in the waste from returning to the river upstream of other reactor cooling water in-take points. Most promising approach to date appears to be a plastic pipe line to a disposal crib near Gable Mountain. A revised work authority has been requested of the AEC.

Design activities on the 105 instrumentation have been particularly active during the month. The five vendors participating in the flow monitor program were visited to review their prototype design, fabrication, and testing methods. Design recommendations have been made for the vendor selection of process tube temperature detectors. Bids have been received and are being reviewed on the turret assemblies for the rupture monitor system. Extensive proposals have been received for the data logging system and a design review is under way.

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DEVELOPMENT AND TESTING

It is estimated that NPR development and testing is 83.2 percent complete as compared to a schedule of 85 percent.

The prototype inlet and diversion valve program is near completion with three out of four vendors in the final stages of testing and report preparation. One manufacturer has been given verbal notice that his diversion valve has not performed satisfactorily in test and hence it will not be offered as a contender in later bidding. The first diversion valve tested at Hanford has been found satisfactory. One of the prototype diversion valves failed to meet the flow coefficient specification. All vendors' plants were visited to inspect data, tested components, and review elements of the final report. Kaiser Engineers has extended the prototype program completion into early May.

Top priority continues to be assigned the problem of transporting fuel elements in a relatively undamaged condition from process tubes to the discharge chute. Three vertical and two horizontal drops were made at D area. Varying degrees of minor damage to the respective 24-inch fuel elements were observed. More tests are scheduled as soon as additional fuel elements can be obtained. Significant time was spent in repairing and improving test facilities.

Five program drafts have been prepared and routed for comment relative to instrumentation design tests. This area of activity involves the first of many prototype instrumentation systems and components which will be given final tests before installation in the N Reactor. Testing plans currently are being made for flow and temperature monitoring equipment.

Rolled, front, tube-to-nozzle joints have been fabricated successfully with the use of a backup clamp on the receiving piece. In order to study effects of making such joints without a clamp, one was rolled to 12 percent wall reduction with the backup clamp loosened. Later examination showed longitudinal cracking in the receiving piece. This was detected initially with a helium leak test. Confirming an earlier belief, it appears rather conclusive that all rolled tube-to-nozzle joints must be made with properly adjusted backup clamps. Further testing of rolled joints indicated that tube scratches to .030 inches in depth can be rolled out satisfactorily during joint formation. Testing of effects of scratched tubes on rolled joints is continuing.

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FIELD AND OPERATIONS ENGINEERING OPERATION

Construction

105-N and 109-N Buildings

As of April 25, 1961, Kaiser Engineers had placed a total of approximately 12,200 cubic yards of concrete in the 105-N superstructure. This represents an average placement rate from March 29 through April 25, 1961, of approximately 180 cubic yards per working day.

The two 72-inch box girders which are the main roof support members have been set in place and the trusses have been placed on the left side of the reactor. Work is currently under way on the ceiling slab beams and "Q" decking.

Approximately 30 percent of the concrete in the 109-N superstructure has now been placed to the +30 foot elevation.

Coates Electric Company, under subcontract to the Todd Shipyard Corporation, started work April 17, 1961 on the installation of the exposed conduit for the "W" elevator.

The Bay Company has increased the progress rate on the installation of the drainage piping below -16 feet and has started fabrication in Tacoma of the gas system piping.

Harder Industrial and Kaiser Engineers are proceeding with the installation of building service piping in the 105 building. Kaiser Engineers' efforts in this regard have been primarily on embedded items.

HUICO now has a small work force at the job site and has started work on the installation of clips and hangers.

The Zone I supply fan has arrived at the job site and has been placed on its base in the 105 building.

The first primary heat exchanger arrived on the project on April 7, 1961 and the second arrived on April 28, 1961.

A few electrical conduit joints have been made up on an experimental basis to test the effectiveness of various cleaning solvents and sealants for use in conjunction with the confinement sealing specifications. The preliminary results have been satisfactory.

151-N Substation

Functional testing of the 230 kv equipment in the switchyard (air switches, lightning arrestors, oil circuit breaker and transformer) has been completed and all equipment was found to be satisfactory.

153-N Building

The work on the installation of switchgear and cable trays has continued.

163-N and 183-N Buildings

The concrete and structural work has been essentially completed. Work has continued throughout the past month on the installation of piping, and, to a lesser extent, on placing of equipment.

181-N Building

The main water supply pumps and discharge heads have been installed, including two of the four 3500 HP electric motors. Work is continuing on the diesel engine installation and the housing structure of these engines.

182-N Building

Work has not yet been started on the building; however, the bottom and the first three rings of steel plate are now in place on the demineralized water storage tank.

184-N Building

The structural steel framing has been completed and work has continued on the erection of the boiler. All the boiler tubes are now in place, and the installation of the refractory materials has started.

The deaerating heat exchanger has been set in place and the piping started for the boiler feed system.

230 Kv Transmission Line

Little progress was made this month in completing the small amount of remaining work. Temporary guard-wires over the temporary construction road to the east of 151 Substation are in place.

Underground Electrical and Piping Distribution System

To facilitate moving the heat exchanger to the 109-N Building, work on the underground electrical system between the 151 Building and the 105 Building has been suspended. Elsewhere in the area, the work has continued to progress on the electrical ducting and some of the underground valve houses and manholes.

166-N Building

The installation of the fuel and diesel oil storage tanks and their directly-connected piping are essentially complete, including the dikes around the tank area. Work is under way on the valve and pump house associated with these tanks.

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Sealwell

The base slab and the first ten feet of the walls of this structure have now been placed.

Pile Erection

All bottom membrane plates except one are in place and welded, and ready for air test. The "I" beams next required for installation have been delayed in fabrication, which will delay start of crate erection.

Yuba Consolidated Industries is progressing fairly well with crate fabrication, with some delay experienced from lack of delivery by sub-vendors. Assembly of the first close tolerance crate is proceeding.

Establishment of the air lock requiring completion of the roof assembly over the "W" elevator and metal preparation room is progressing satisfactorily.

Temporary Construction

The first section of the nurses' headquarters designated for General Electric TC facilities is in place on the foundation, and the balance was moved to 100-N the weekend of April 29, 1961.

Graphite

Based on the latest official schedule, over-all production of completed details as of April 22 was 51 percent complete, compared to the scheduled 60 percent.

Work on the Arrowsmith machine is continuing toward final adjustment and alignment which will permit the machine to be used for limited applications.

Production of notched bars on the modified Sundstrand machines has now reached 106 bars per shift, with an over-all reject rate of 7.4 percent. The machines have been producing bars steadily with relatively few problems. The two additional machines of this type are scheduled for delivery to the 2101 Building during the latter part of May.

The compression test of a representative portion of the active zone was completed. Results have not been completely analyzed. However, it appears that there is very little dimensional build-up due to variations in block cross-section.

Mock-up is officially scheduled to start on May 15. The master layer has been positioned and is now being recorded for "as-built".

The design change for improving material utilization was completed during the month. This change effected a savings of 770 6"x 6"x 48" solid bars.

Procurement status is as follows:

The Speer Carbon order is now complete, except for eleven 8"x 9" reflector blocks which are scheduled for delivery during May.

Deliveries from National Carbon continue at the scheduled rate and well ahead of machining requirements. Final delivery, including the recent increase in drilled bars, is scheduled for about June 1.

Kaiser Engineers have advised the Commission that there has now been adequate material procured to fulfill NPR moderator requirements.

Zirconium

A total of 348 tubes have been processed through the autoclave operation; 285 of these tubes have been accepted as complete. Approximately 50 tubes require rework by grit blasting and reautoclaving.

Both autoclaves are operating satisfactorily after having been repaired. These repairs consisted of relagging approximately 75 percent of autoclave No. 1, and 25 percent of autoclave No. 2. Heating elements that had pulled away from the vessel shell were also refastened. The repairs made a considerable improvement in the heat distribution for both vessels.

All other testing work in the shop is proceeding as scheduled.

Six hundred and eighty-four NPR process tubes and 685 graphite cooling tubes have been received to date. Custody of the graphite cooling tubes has been transferred to Kaiser Engineers and are now being stored at the 100-N warehouse.

Status of the tube procurement orders is as follows:

Chase Brass

Twenty-one tubes have been received and an additional 55 tubes have been completed and are awaiting shipment orders from the AEC.

Allegheny Ludlum

Delivery is completed at 79 tubes.

Harvey Aluminum

Delivery of the pilot order is complete at 71 tubes. Five hundred and thirteen tubes have been delivered on the production order and an additional 100 are ready for shipment.

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Wolverine Tube

Delivery of the graphite cooling tubes has been completed and fabrication of the 13 flux monitoring cooling tubes is proceeding on schedule.

Primary Loop

The following was the status of approval data on the HUICO subcontract as of April 24, 1961:

Total Number Received	929 (include 281 received for information only)
Number Approved	262
Number Approved with Exceptions	54
Number not Approved	277
Number Currently being Reviewed	55 (include 45 resubmittals)
Number Received for Information Only	281
No Approval Required	
Number of Resubmittals Received	717 (include 109 information only resubmittals)
Number of Resubmittals Returned	563

Fabrication work has been started on primary piping in the HUICO shop. Small quantities of pipe from several suppliers are currently being received.

Administration

The following material was processed by Drawing and Specification Control during the period of March 19, 1961, through April 23, 1961:

Drawings	409
Criteria	21
Specifications	35
Requisitions	176
ATP's	6
Other	<u>32</u>
Total	679

Reviews were completed and formal comments were offered on engineering material as follows:

On Drawings	88
On Specifications	16
On Scope	0
On ATP's	<u>5</u>
Total	109

PROGRAM EVALUATIONDesign Status

	<u>Wt'd Total</u>	<u>Certified Schedule</u>	<u>Actual % Complete</u>
<u>Reactor Plant as of 5/1/61</u>			
<u>Title I</u>			
Scope		100	100 (1)
<u>Title II</u>			
Drawings	70	87.5	87.9 (2)
Specifications	8	100.0	91.7
Requisitions	8	68.5	68.3
ATP's	4	39.0	22.2
Development and Testing	<u>10</u>	<u>81.0</u>	<u>83.2</u>
Total	100	82.5	83.6
<u>Heat Dissipation Plant as of 5/1/61</u>			
<u>Title I</u>			
Scope		100	98.75
<u>Title II</u>			
Detail Design		84.5	89.0
	<u>Req'd</u>	<u>No. Issued to 4/15/61</u>	
		<u>Scheduled</u>	<u>Actual</u>
Scope Drawings	51	51	50
Preliminary Drawings (bid)	922	881	881
Detail Drawings (for const.)	979	855	855
Specifications (bid)	153	145	145
Requisitions	170	162	162
ATP's	-	0	0
<u>Composite Design Completion as of 5/1/61</u>			
(Reactor and Heat Dissipation Combined)		<u>Certified Schedule</u>	<u>Actual % Complete</u>
Total		85.5	87.8

(1) This percentage represents only the completion of 44 criteria and does not include updating or revising.

(2) The number of required drawings is changed from 2250 to 2300.

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Cost Estimate

The first post-budget estimate cost review meeting was held April 25, 1961. Individual cost accounts were analyzed with Burns and Roe and General Electric representatives presenting known changes in costs affecting their areas of assigned cost responsibility. All adjustments were reconciled. The next scheduled cost estimate review meeting will be held June 20, 1961.

Schedules

No revisions have been made to the over-all project schedule during this reporting period.

The construction status as of 5/1/61 is as follows:

	<u>Schedule of 2/13/61</u>	<u>Actual</u>
Temporary Construction	54.0%	54.0%
General Area Systems	15.0%	11.0%
105-N Building	12.0%	12.0%
109-N Heat Exchanger Building	10.0%	8.6%
163N-183N Water Treatment	23.0%	32.0%
181-N River Water Pump House	61.0%	85.0%
184-N Standby Power House	14.0%	18.0%
NPR Project (CAI-816)	14.0%	14.3%

MANAGER
NPR PROJECT

JS McMahon:mf

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SUMMARY

An exploratory investigation of zirconium clad fuel elements indicates that the integrity of the cladding exists even at temperatures where the uranium is molten.

An investigation has been initiated to evaluate the advantages of installing the sixth loop during the current construction program.

Action has been taken to eliminate the use of 17-4 PH stainless steel applications in the NPR where metallurgical problems may be encountered.

General Electric has been requested to assume the design responsibilities for the decontamination waste disposal facilities.

Construction on the 105-109 Building continued at a high rate. Roof structural work over the reactor area in the 105 Building was started and substantial progress was made during this reporting period.

Work was started on the primary loop piping in the HUICO shop. Preliminary field work relating to clips and hangers for this system was started.

Functional testing of 230 kv electrical equipment at the 151-N substation was completed satisfactorily.

Structural work in the boiler plant, 184-N Building, and the water treatment buildings, 163-N and 183-N, was essentially completed. Pump installation and diesel engine installation continued at the 181-N river pump house. Work on the fuel oil and diesel oil storage tank and piping installations is virtually complete.

Zirconium tube processing continued to improve in efficiency and yield. Delivery from vendors continued satisfactorily.

Delivery of graphite is nearing completion well within schedule requirements. Notching on the modified Sundstrand machines continued to be satisfactory.

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MONTHLY RECORD REPORT
NPR PROJECT
APRIL, 1961

RESPONSIBILITY

There has been no change in responsibility since last month's report.

ORGANIZATION AND PERSONNELForces

	<u>3-31-61</u>	<u>4-30-61</u>	<u>Net Change</u>
Employees on Permanent Roll	109	111	+2
Technical Graduates	4	6	+2
Technical Trainees	0	0	0

	<u>NPR</u>	<u>Tech Grads (Rotational)</u>
Transfers into Operation	5	2
Transfers out of Operation	0	0
Payroll Removals	3	0

The following personnel changes were made in the NPR Project:

Field and Operations Engineering: C. E. Enslow transferred from B-C Reactor Operation to Field Engineering and Inspection; F. R. Mattison transferred from H Reactor Operation to Special Materials - NPR; G. W. Smoot transferred from B-C Reactor Operation to Special Materials - NPR; Karen G. LaRock left on a leave of absence; R. M. Barnhill, Tech. Grad, to Pile Erection Engineering; Edna L. Munson, Clerk, left on a leave of absence.

Process Design: C. W. Ward transferred from Transportation to Reactor Plant Design; W. E. Seginski, Tech Grad, was permanently assigned to Reactor Plant Design; D. H. White, Tech. Grad, to Reactor Plant Design; Vonda L. Simmons, Secretary, terminated; Lucy H. Love, Secretary, transferred within the Section to Process Design.

SAFETY AND SECURITY

No disabling injuries were reported during the month and no security violations were reported.

INVENTIONS OR DISCOVERIES

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.

NPR PROJECTVISITORS

<u>Name</u>	<u>Firm and Location</u>	<u>Date</u>	<u>Purpose</u>
E. Peters	Instrumentation Engineering Seattle, Washington	4-27-61	Discuss radiation detection equipment for 109-N.
W. R. Thomas R. D. Ragle	Bailey Meter Company Cleveland, Ohio	4-26-61	Discuss 109-N instrumentation
E. J. Strapp	Pratt and Whitney Co. Hartford, Connecticut	4-25-61	Discuss technical features of the outlet nozzle.
W. F. Rehmke N. M. Richardson	Union Machine Seattle, Washington	4-17-61	Discuss design and purchase order require- ments of the inlet and outlet tube sleeves.
H. E. Francis W. J. Peterson N. Sarchin	Chandler-Evans Hartford, Connecticut	4-12 and 4-13-61	Review drafts of inlet and diversion valve proposals.
W. M. McLean	Crane Company Chicago, Illinois	4-17-61	Review drafts of inlet and diversion valve proposals.
J. T. Rayner	Bingham Pump Company Portland, Oregon	4-12-61	Discuss general pump problems.

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NPR PROJECT

TRIPS

<u>Name</u>	<u>Firm and Location</u>	<u>Date</u>	<u>Purpose</u>
W. J. Love H. R. Kosmata	ARCO, Idaho Falls, Idaho	4-13 and 4-14-61	Attend Fourth AEC-DRD Superheat Meeting
G. L. Swezea	Crawford Fitting Co. Cleveland, Ohio	4-11-61	Discuss manufacturers' recommendations in regard to flareless fittings for NPR instrumentation service.
G. L. Swezea J. R. Carrell J. S. McMahon	Bailey Meter Company Cleveland, Ohio	4-11 and 4-12-61	Review manufacturing and design facilities and to discuss prototype work for 109-N instrumentation and control system.
H. S. Davis	Benecia Plant of Yuba Consolidated Industries Benecia, California	3-27-61	To review fabrication progress and discuss technical problems relative to crate fabrication.
	North Pacific Division Laboratory - Troutdale, Oregon	3-28-61	To review progress on the development program concerned with high-density concrete for the primary shields.
G. A. Newell	Rucker Company Oakland, California	3-30 to 3-31-61 and 4-15-61	Discuss horizontal rod drive design and fabrica- tion problems.
	Harvey Aluminum Co. Los Angeles, California	4-13 and 4-14-61	Discuss horizontal rod equipment design and fabrication problems.
	Vinson Engineering Co. Los Angeles, California	4-14-61	
	Tools, Inc. Los Angeles, California	4-13-61	
G. T. Haugland	Baldwin-Lima-Hamilton Co. Eddystone, Pennsylvania	4-6 and 4-7-61	Observe fabrication of insulation layer I-section and development of shop techniques for welding cooling pipes to boron steel thermal shield plat-

NPR PROJECTTRIPS (Continued)

<u>Name</u>	<u>Firm and Location</u>	<u>Date</u>	<u>Purpose</u>
J. F. Nesbitt H.D. Lenkersdorfer W. J. Morris	A.M.F. Atomics Greenwich, Connecticut	4-4 to 4-7-61	Technical review of the underwater metal handling system.
J. F. Nesbitt	Todd Shipyards Seattle, Washington	4-25-61	Design review of the 105-N confinement and shield doors.
J. D. McCullough	Barton Instrument Corp. and Hydro-Aire Div. of Crane Co. - Los Angeles	4-10 to 4-12-61	Witness tests on Barton flow transducer prototype and check progress on Hydro-Aire flow monitor controller prototype program.
	Epsco-West Division of Epsco, Inc. Anaheim, California	4-12-61	Technical discussions related to the procure- ment of the rod position display instrumentation.
	Swartwout Company RdF Corporation Foxboro Company Ad Vac, Inc. Engelhard Stromberg-Carlson Avien, Inc. (All firms on the East Coast)	4-17 to 4-21-61	NPR instrumentation items.
L. P. Reinig W. J. Morris	Crane Company Chicago, Illinois Chandler-Evans Hartford, Connecticut Mason-Neilan Norwood, Mass.	4-4 to 4-7-61	Discuss prototype inlet and diversion valves.
	Mason-Neilan Norwood, Mass.	4-17-61	Discuss inlet and diversion valves.
J. S. McMahon N. O. Strand	Ladish Company Cudahy, Wisconsin	4-4 and 4-5-61	Meet with Ladish on inspection problems.
	Taylor Forge and Pipe Cicero, Illinois	4-6-61	Observe manufacture of pipe.
J. S. McMahon	E. I. duPont deNemours Aiken, South Carolina	4-10 and 4-11-61	Discuss reactor operating problems

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NPR PROJECT

TRIPS (Continued)

<u>Name</u>	<u>Firm and Location</u>	<u>Date</u>	<u>Purpose</u>
R. E. Hubbard	Canadian G.E. Co. Peterborough, Ontario, Canada	4-10-61	Discuss the tooling program.
	Ingersoll-Rand Company Athens, Pennsylvania	4-12-61	Discuss assembly of Grayloc couplings and nozzle caps.
	Airetool Company Springfield, Ohio	4-13-61	Discuss air tool equipment.
J. E. Stice	Yuba Consolidated Industries, Benecia	4-24 to 4-26-61	Review progress of work on fabrication of primary shield crates.
C. E. Love	Harvey Aluminum Company Los Angeles, California	4-12 to 4-14-61	Review fabrication of NPR process tubes.
N. W. McKay G. W. Smoot	Wilkins and Associates Tacoma, Washington	4-27 and 4-28-61	Review fabrication of NPR graphite inspection equipment.
W. M. Harty	Atwood and Morrill Boston, Massachusetts Chapman Valve New York, New York Philadelphia Gear Philadelphia, Pennsylvania Henry Pratt Company Chicago, Illinois	4-17 to 4-26-61	Contact vendors of valves.

NPR PROJECTSIGNIFICANT DOCUMENTS ISSUED

<u>HW Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
None	Unclassified	W. J. Love	4-12-61	Progress Report Location and Treatment 17-4 PH Materials in NPR
None	Unclassified	W. J. Love	4-18-61	Trip Report - Fourth AEC-DRD Sponsored Nuclear Superheat Meeting - Idaho Falls, Idaho, April 13 and 14, 1961.
HW-69049	Secret	W. J. Dowis N. F. Fifer W. J. Tupper	4-5-61	Constant Production Study
HW-69237	Unclassified	W. J. Dowis W. J. Tupper	4-12-61	Operation of the Reactor Complex at Production Levels Less than Full Predicted 1965 Capacity.
HW-69288 RD	Unclassified	G. L. Swezea	4-17-61	109-N Instrumentation and Control Scope
HW-69037	Confidential	D. L. Condotta	4-3-61	Comments on GEAP-3651, An Engineering Review of the New Production Reactor Design.
HW-69041	Unclassified	M. C. Fraser	4-3-61	Review of Control Rod Tip Material Criteria
HW-69227 RD	Unclassified	H. G. Johnson C. L. Goss	4-25-61	NPR Primary Loop Hydraulic Transient Program
HW-69318	Secret	D. L. Condotta	4-16-61	Reactor Design Analysis Monthly Report - 3-61
HW-68503	Confidential	R. K. Robinson	4-28-61	Interrelations of Operating Conditions and Steam Pressures for NPR Phase III
HW-57043 REV 1	Secret	H. R. Kosmata	4-27-61	100-N Design Bases Part I - General
HW-68441 ADD 1	Unclassified	W. E. Seginski W. J. Love	3-22-61	Graphite Model Deflection Test - NPR
HW-57008 REV 2 RD	Unclassified	C. E. Bonham	4-12-61	Process Tube Assembly Criteria

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FINANCIAL SECTION

GENERAL ACCOUNTING SECTION

Two employees submitted expenses for attendance at Professional and Trade Society meetings in the amount of \$231.34. In addition, two employees attended training courses for a total of \$916.84.

PA&C FY 1962-FY 1963 Budget approved by the IPD General Manager was transmitted to Contract and Accounting Operation March 24, 1961. The Equipment Not Included In Construction Projects Budget for FY 1962 and FY 1963 approved by the IPD General Manager was also transmitted to Contract and Accounting Operation March 28, 1961.

PRODUCTION COST & BUDGET SYSTEM

Revision was made to the FY 1962 Research and Development budget reflecting the reduction of the O2 Program to \$10.653 million total HAPO R&D costs. The revision was submitted to Contract Accounting on April 17, 1961.

Cost studies have been completed to determine the effect on FY 1961 and FY 1962 costs of the directive from the Commission to increase alum feed.

N Startup personnel were revised April 1. Eighty people are now assigned to Startup and no increase is expected before July 1.

PERSONNEL ACCOUNTING

The total number of personnel assigned to the Department at month end was 2 277, a decrease of six from last month.

Calendar year to date \$967.90 in suggestion awards have been paid to Department employees.

PROCEDURES

During April, a parallel program for handling essential materials documents in the two K Areas was initiated.

The duties of the power clerk in K Area have been analyzed with the result that with the revision of certain forms, upon the retirement of the present power clerk, these duties can be assumed by existing personnel without replacing the power clerk.

AUDITING

Paid salary rates at January 31, 1961 for 155 exempt employees and at January 22, 1961 for 380 nonexempt employees were compared with IPD records. No discrepancies were found.

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Manager - Finance
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RELATIONS PRACTICES

Three PhDs were interviewed with no offers extended. Three previous offers to college students for summer jobs were accepted and one was rejected.

A total of \$317.50 was paid to 24 suggesters. The largest award was \$40.

Communication activities included publication of eight Management News Bulletins, two Headliners, five priority messages, and one letter to IPD secretaries in observance of National Secretaries Week. One Management Information meeting was held in April. GE NEWS coverage included 13 items about IPD activities totaling 315 column inches.

Two employees retired during the month.

One disabling injury occurred April 14, 1961 in the 105-KW Building when a pile operator sustained slight bone damage to the tip of his right middle finger when it got pinched between a metal basket and the table. Seventy-seven medical treatment cases were reported. No security violations were reported for the second consecutive month. There were no radiation exposures in excess of operational control during April.

W. E. Shanks

Manager, Relations Practices

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SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-69154	Secret	MH Schack	4-6-61	Supplementary Report of Preliminary Testing, Production Test IP-234-AE, Sup. 2, Project CG-775, Prototype Testing of the 100-K Process Pumping Units
HW-69049	Secret	WJ Dowis NF Fifer WJ Tupper	4-5-61	Constant Production Study
HW-69237	Secret	WJ Dowis	4-12-61	Operation of the Reactor Complex at Production Levels Less Than Full Predicted 1965 Capacity
HW-69086	Unclassified	AJ Lindsay	4-4-61	Development Report - Numerical Indicators
HWS-8127	Unclassified	RR Cone DB Lovett MR Wood	4-6-61	Specification for Neutron Sensitive Ionization Chamber Cable Assembly
HW-69079	Unclassified	JK Rawlins	4-4-61	Design Test 1089 - Final Report - Test of Production Gas Seals for NPR Horizontal Rods
HW-69179	Unclassified	WEB Lander	4-7-61	Determination of Strain Concentration in the Experimental Loop Model Out-of-Pile (ELMO 15) Heating Vessel
HW-69207	Unclassified	JD Maguire	4-10-61	Design Test 1099 - Bumper Nozzle Reinforcing Sleeve Test Report
HW-69244	Unclassified	JD Maguire	4-13-61	EDO Test Request No. 11 Broached Nozzle Strength Test
HW-69310	Unclassified	JK Rawlins	4-18-61	Design Test 1087 - Lighted Push Button Heat Endurance Test for 105-N Final Report

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-69066	Unclassified	W Dalos	4-6-61	Development of Equipment for Spline Monitor
--	Unclassified	JH Fastabend	4-18-61	Trip Report - NPR Tooling
--	Unclassified	JH Fastabend	4-25-61	Status Report - NPR Fitting Program
HW-69070	Unclassified	WR Moon	4-4-61	Peak Demand Display System
--	Unclassified	JC Baudendistel	4-10-61	Budget Reason Sheet - Facilities for Feeding Bauxite with Sulfuric Acid at 183-B, C, D, DR, F, H, KE, and KW
--	Unclassified	HT Sawyer	4-13-61	Combustion Control and Instrumentation Report
HW-66954 Add	Secret	LB Brinkman VG Blanchette	4-24-61	Short Range Modification Program for Improved Productivity.
--	Unclassified	WJ Love	4-12-61	Progress Report Location and Treatment 17-4 PH Materials in NPR
--	Unclassified	WJ Love	4-18-61	Trip Report - Fourth AEC-DRD Sponsored Nuclear Superheat Meeting - Idaho Falls, Idaho, April 13 and 14, 1961
HW-69288 RD	Unclassified	GL Swezea	4-17-61	109-N Instrumentation and Control Scope
HW-69037	Confidential	DL Condotta	4-3-61	Comments on GEAP-3651, An Engineering Review of the New Production Reactor Design
HW-69041	Unclassified	MC Fraser	4-3-61	Review of Control Rod Tip Material Criteria
HW-69227 RD	Unclassified	HG Johnson CL Goss	4-25-61	NPR Primary Loop Hydraulic Transient Program

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<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-69318	Secret	DL Condotta	4-16-61	Reactor Design Analysis Monthly Report - 3-61
HW-68503	Confidential	RK Robinson	4-28-61	Interrelations of Operat- ing Conditions and Steam Pressures for NPR Phase III
HW-57043 REV 1	Secret	HR Kosmata	4-27-61	100-N Design Bases Part I - General
HW-57008 REV 2 RD	Unclassified	CE Bonham	4-12-61	Process Tube Assembly Criteria

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
R Nilson	University of Washington Seattle, Washington	4/5-7/61	PhD Recruitment
RV Dulin	Illinois Water Treat- ment Company Rockford, Illinois	4/11-13/61	Review drawings for the Deionizer facility
DH Curtiss	Harvey Aluminum Co. Torrance, California	4/12-16/61	NPR zirconium tube inspection and testing
WS Nechodom	GE-APED San Jose, California Dresden Nuclear Power Station Morris, Illinois Argonne National Lab. Lemont, Illinois Atomic Energy of Canada Chalk River, Ontario	4/16-22/61	Discuss the methods of nuclear materials accountability, buildup and burnout computation and power calculation
OH Greager	GE-APED San Jose, California Vallecitos Atomic Lab. Pleasanton, California	4/18-21/61	Attend meeting of the Test and Pool Reactors Subcouncil of the GE Technological Hazards Council
OH Greager RW Reid	E. I. duPont Company Aiken, South Carolina	4/22-27/61	Review technological plant assistance func- tions for recirculating reactors.

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
R Nilson	American Physical Society Meeting Washington, D.C. Engineering Register New York, New York	4/23-29/61	PhD Recruitment
RW Pitman	Pacific Northwest Section of American Water Works Association Victoria, B.C.	4/26-29/61	Attend convention
LM Keene MH Schack	Washington State University Pullman, Washington	4-17-61	Discuss testing of the 100-K downcomer orifice plate and crossheader expansion joints under Contract DDR-111
ER Rudock	Byron Jackson Pumps, Inc. Los Angeles, California	4/8-12/61	Witness thermal shock pump tests, Project CGI-839
DL Hovorka	Norfin, Inc. Seattle, Washington	4/3-4/61	To discuss overboring machine design
JH Fastabend	Canadian GE, Ltd Peterborough, Ontario, Canada	4/10-15/61	To observe and discuss Zr-2 tube expanding and cutting problems and reactor maintenance tooling applications with Canadian GE
	Atomic Energy of Canada, Ltd. Toronto, Ontario		To discuss stress analysis of the Zr-2 rolled joint with AECL
	Airetool Manufacturing Co. Chicago, Illinois		To discuss ZR-2 tube expanding and cutter problems
	Western Gear Seattle, Washington		To discuss gear train drives for tube cutters
DE Newby	Norfin, Inc. Seattle, Washington	4-4-61	Discuss tribore machine specifications
JM Fox, Jr	Ladish Company Cudahy, Wisconsin	4/3-6/61	Discuss NPR piping metallurgy

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
AJ Lindsay	Barton Instruments, Inc. Los Angeles, California	4/9-13/61	To review and consult with NPR Project representatives and the vendors on flow transducers and other items on order
	Epsco-West Anaheim, California		
	Hydro-Aire, Los Angeles, California		
	Collins Company Long Beach, California		Contact concerned some problems in a differential transformer for Swartwout's prototype flow transducer
HA Kramer	Western Snow Conference Spokane, Washington	4/11-13/61	To obtain information on conditions in the Columbia River Water Shed
PH Hutton	Endevco Corp., Minneapolis-Honeywell, No. American Aviation, Space Technology Labs., Los Angeles, California	4/12-14/61	To review improved methods and equipment for processing engineering data for the purpose of upgrading FES data processing system
DM Diediker	Byron Jackson Pumps Co. Los Angeles, California	4/9-12/61	Witness canned rotor pump testing for CGI-839
CF Quackenbush	DeLaval Steam Turbine Company Trenton, New Jersey	4-24-61	Conference on performance of process water pumps now installed
	American Standards Association New York City, N. Y.	4-25-61	Preparation and approval of codes and standards for nuclear piping
WJ Love HR Kosmata	ARCO Idaho Falls, Idaho	4/13-14/61	Attend Fourth AEC-DRD Superheat Meeting
GL Swezea	Crawford Fitting Co. Cleveland, Ohio	4-11-61	Discuss manufacturers' recommendations in regard to flareless fittings for NPR instrumentation service

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
GL Swezea JR Carrell JS McMahon	Bailey Meter Company Cleveland, Ohio	4/11-12/61	Review manufacturing and design facilities and to discuss prototype work for 109-N instrumentation and control system
GA Newell	Rucker Company Oakland, California	4-15-61	Discuss horizontal rod drive design and fabrication problems
	Harvey Aluminum Co. Los Angeles, California Vinson Engineering Co. Los Angeles, California Tools Inc. Los Angeles, California	4/13-14/61 4-13-61	Discuss horizontal rod equipment design and fabrication problems
GT Haugland	Baldwin-Lima-Hamilton Co. Eddystone, Pennsylvania	4/6-7/61	Observe fabrication of insulation layer I-section and development of shop techniques for welding cooling pipes to boron steel thermal shield plates
JF Nesbitt HD Lenkersdorfer WJ Morris	A.M.F. Atomics Greenwich, Connecticut	4/4-7/61	Technical review of the underwater metal handling system
JF Nesbitt	Todd Shipyards Seattle, Washington	4-25-61	Design review of the 105-N confinement and shield doors
JD McCullough	Barton Instrument Corp. and Hydro-Aire Div. of Crane Company Los Angeles, California	4/10-12/61	Witness tests on Barton flow transducer prototype and check progress on Hydro-Aire flow monitor controller prototype program
	Epsco-West Division of Epsco, Inc. Anaheim, California	4-12-61	Technical discussions related to the procurement of the rod position display instrumentation

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
JD McCullough	Swartwout Company RdF Corporation Foxboro Company Ad Vac, Inc. Engelhard Stromberg-Carlson Avien, Inc. (All firms on the East Coast)	4/17-21/61	NPR instrumentation items
LP Reinig	Crane Company Chicago, Illinois	4/4-7/61	Discuss prototype inlet and diversion valves
WJ Morris	Chandler-Evans Hartford, Connecticut Mason-Neilan Norwood, Mass.		
	Mason-Neilan Norwood, Mass.	4-17-61	Discuss inlet and diversion valves.
JS McMahon NO Strand	Ladish Company Cudahy, Wisconsin	4/4-5/61	Meet with Ladish on inspection problems
	Taylor Forge and Pipe Cicero, Illinois	4-6-61	Observe manufacture of pipe
JS McMahon	E. I. duPont deNemours Aiken, South Carolina	4/10-11/61	Discuss reactor operating problems
RE Hubbard	Canadian G.E. Co. Peterborough, Ontario, Can.	4-10-61	Discuss the tooling program
	Ingersoll-Rand Company Athens, Pennsylvania	4-12-61	Discuss assembly of Grayloc couplings and nozzle caps
	Airetool Company Springfield, Ohio	4-13-61	Discuss air tool equipment
JE Stice	Yuba Consolidated Industries, Benecia	4/24-26/61	Review progress of work on fabrication of primary shield crates
CE Love	Harvey Aluminum Co. Los Angeles, California	4/12-14/61	Review fabrication of NPR process tubes
NW McKay GW Smoot	Wilkins and Associates Tacoma, Washington	4/27-28/61	Review fabrication of NPR graphite inspection equipment,

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
WM Harty	Atwood and Morrill Boston, Massachusetts Chapman Valve New York, New York Philadelphia Gear Philadelphia, Pennsylvania Henry Pratt Company Chicago, Illinois	4/17-26/61	Contact vendors of valves
HJ Finch	Victoria, B.C.	4/26-29/61	Attended a meeting of Pacific Northwest Section of the American Water Works Assoc.
OC Schroeder	University of Wyoming Laramie, Wyoming	4-4-61	To address the ASME Chapter at the Univ. of Wyoming
	General Electric Co. New York, New York	4-6-61	Consultation on organization
	Yankee Reactor Rowe, Massachusetts	4-7-61	Reactor familiarization
WM Mathis	General Electric Co. New York, New York	4/5-6/61	To discuss reactor operating problems and visit Manufacturing Services personnel.
	Yankee Reactor Rowe, Massachusetts	4-7-61	
	Du Pont Savannah River Plant Augusta, Georgia	4/7-11/61	
	Bailey Meter Company Cleveland, Ohio	4-12-61	

VISITORS

BE Woodward	General Electric Co. APED, San Jose, California	4/12-13/61	Discuss solid state and logic circuit application for Project CGI-839.
E Legas	Chicago Pneumatic Chicago, Illinois	4-5-61	Visited 189-D laboratory to demonstrate and discuss application of air-powered tools to NPR.

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
GR Tanner	Epsco-West Anaheim, California	4-11-61	To install and test modified first rank amplifier in the high speed scanner, to collect data for further modifications, and revise and test a second rank amplifier.
LC Keir	L. C. Keir, Inc. Issaquah, Washington	4-5-61	To consult with engineers regarding tooling for the overboring program
JR Wolcott HH Hendon AL Scheideler	GE-APED San Jose, California	4-28-61	To discuss nuclear instrumentation and development research.
GL Nicholls Jack Wright	The Electric Storage Battery Company Seattle, Washington	4-4-61	Presented a training session for craftsmen and engineers on electric storage batteries.
HT Sawyer	Consultant Los Angeles, California	4/18-22/61	Provided consultation in the field of power operations.
James Lee	Victoreen Inst. Co. Cleveland, Ohio	4/17-20/61	To correct mechanical deficiencies in the air particulate samplers and repair the capstan on one unit in 119-C in connection with CGI-791.
Paul DeRienzo	Burns & Roe Hempstead, New York	4-6-61	Discuss NPR piping metallurgy
James Smith	Division of Compliance AEC, Washington, D.C.	4-24-61	Visited HAPO for familiarization with reactors.
Charles Hunt	General Electric Co.	4-24-61	Visited HAPO to review training program assignments for Tech. Grads and Assignment Engineers
WH Coleman	General Electric Co. Fort Wayne, Indiana	4/17-18/61	Visited HAPO to discuss the Manufacturing Training Program.

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