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IRRADIATION PROCESSING DEPARTMENT

MONTHLY REPORT

AUGUST 1961

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HANFORD ATOMIC PRODUCTS OPERATION

GENERAL ELECTRIC

RICHLAND, WASHINGTON

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September 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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SUMMARYRESEARCH AND ENGINEERING

The power levels at all reactors are currently limited by bulk outlet temperature restrictions. The effectiveness of present techniques for utilizing enrichment and supplemental control to reduce production losses from special incidents was demonstrated at DR and F Reactors. At DR the loss of reactivity due to the ball drop in July is necessitating use of extensive enrichment and compensating supplemental control to maintain a normal operating level. Water from a severe leak at F late in July was dried out rapidly through the use of increased enrichment and resulted in reducing the loss to an equivalent of one week's production.

At C Reactor, eight columns of overbore-size fuel were discharged and recharged without difficulty on August 1. Discharge exposures ranged from 616 MWD/T to 828 MWD/T. During the August 20 outage the first 20 of a 40-tube block of C Reactor process channels were overbored and Zircaloy-2 overbore tubes installed and loaded.

The first two columns of coextruded fuel elements were discharged from KW Reactor at an average exposure of 680 MWD/T. Six additional columns of the material were charged during the outage.

Seven enriched N-size inner tubes are being irradiated in KER-1 Loop for future PRTR rupture loop testing. Five of the tubes, two of which have capped jacket defects, have reached an average exposure of 1320 MWD/T; the other two which also have capped jacket defects have reached an exposure of 360 MWD/T. The KER-2 Loop was discharged on July 31 after failure of an ion exchange column retaining screen permitted resin to enter the loop piping. The N-size inner tubes in the loop had reached exposures of 2090 MWD/T, 905 MWD/T and 150 MWD/T. KER-3 and KER-4 Loops remained shut down for Project CGI-839 revisions.

MANUFACTURINGProduction

Reactor input production (MWD) was 2.2 per cent below forecast; 11.6 per cent below at the six old reactors and 12.2 per cent above at the K's.

Over-all time operated efficiency was 77.0 per cent (79.0 per cent forecast); 75.3 per cent at the six old reactors and 82.2 per cent at the K's. Efficiency was low at the old reactors due largely to process tube water leaks.

There was no increase in the combined reactor instantaneous power level or the individual reactor record power levels.

Six ruptures, three I&E regular metal and three I&E enriched, were removed from the reactors. Two of the I&E regular metal ruptures were at DR and one at D. Two I&E enriched ruptures were removed from H and one from KW.

Engineering

A Maintenance Job Authorization was prepared for the modifications required to convert B, DR, and F Reactors to full use of bumper fuel elements and to modify KE and KW Reactors for the use of bumper fuel in the stable portion of the enrichment pattern. This work was classified as Contingency Maintenance and a letter requesting Commission approval was routed to AEC-HOO on August 18, 1961. The task force appointed to study tube leak problems held an information meeting to review their findings and recommendations on August 31, 1961.

FACILITIES ENGINEERING

Twenty process tube channels were overbored at 105-C Reactor and equipped with inlet clamp nozzle and fixed outlet nozzle assemblies following successful in-service testing of the prototype unit. An investigation of high and fluctuating process tube inlet water pressures, observed subsequent to reactor startup, revealed the process tube assemblies were satisfactory. The testing program for the overbored process tube assemblies is 90 per cent complete and results indicate the equipment as satisfactory for on-reactor service.

Graphite distortion data collection activities were continued at 105-C Reactor with boroscopic examinations of vertical safety rod channels, process tube channels and traverse measurements on one vertical rod channel. Process Channel No. 3364 was traversed both before and after overboring and no visible damage was evident. Two additional 105-B Reactor type VSR's have been installed in C Reactor to increase the total installed to six. Rod drop measurements showed all VSR's to be operating within insertion times specified by Process Standards.

Operational fueling with dummy fuel elements is being tested on the 105-KE Reactor. Four cycles were completed with only one minor malfunction of the charging machine.

Inspection of the impellers in the DeLaval Process water pumps has now been completed in 38 of the 40 pumps (two impellers per pump). Replacement of a total of 24 impellers has been recommended, with ten already having been replaced.

The absence of J. A. Jones Company pipefitters since August 28, during their contract negotiations, is retarding progress on Projects CGI-791, CGI-839, CGI-844, CGI-884, and CGI-889.

NPR PROJECT

An IBM 7090 Computer program has been developed to determine combined thermal and load stresses in hollow cylinders such as NPR process tubes.

At the request of General Electric, HAPO, a proposal from General Electric's General Engineering Laboratory has been received for the technical appraisal of the stability of the NPR cooling system.

General Electric participated in Instrumentation Task Force meetings and analog program discussions at Bailey Meter Company.

A prototype horizontal rod test is now under way at 189-D.

Good progress has continued to be made on the general construction of the area facilities with the exception of installation of primary piping, which is being handicapped by the shortage of material delivered to the job site. Tubing runs for the flow monitor system have been installed from the valve rack through the wall penetration into the left side inlet pipe space. Two additional heat exchangers have been moved into the 109-N Building. Excavation for the 117-N Filter Building has been completed.

Installation of the outlet and side biological shield crates is proceeding with four crates set on each side and two on the outlet at this time. Fabrication difficulties of boron steel plate have been corrected at the vendor's plant and fabrication is now proceeding satisfactorily. All bottom plates have been shipped. Inlet crate erection is delayed pending receipt and installation of these remaining plates.

Mock-up of the graphite moderator has been completed through Layer 79, completing mock-up necessary for determining shield erection dimensions. The work crew at the Graphite Shop has been considerably reduced; therefore, mock-up of the remaining ten layers consisting of top reflector material will progress at a slower rate in order to maintain a standby crew until unit packing.

Processing of zirconium process tubes is continuing with 704 tubes now accepted as complete. A total of 970 have now been delivered. The Vacu-Blast equipment is now installed and being tested.

GENERAL

RESPONSIBILITY

There was no significant change in responsibility.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
General	7	2	9
Research and Engineering	113	64	177
Manufacturing	416	1347	1763
Facilities Engineering	125	44	169
NPR Project	95	37	132
Financial	17	14	31
Relations Practices	6	17	23
TOTAL	779	1525	2304

SAFETY, SECURITY AND RADIATION EXPERIENCE

There were 85 medical treatment injuries, two serious accidents, three security violations, and no disabling injuries.

INVENTIONS

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

<u>Name</u>	<u>Date</u>	<u>Title</u>
A. N. Iverson	7-17-61	A DC Cathode Follower
C. E. Frantz	8-17-61	Operational Fueling Facility Charging System

General Manager

AB Greninger:OCS:kn

RESEARCH AND ENGINEERING OPERATIONPROCESS AND REACTOR DEVELOPMENTREACTOR FUELSPresent Reactor TechnologyOverbore Fuel Development

Eight columns of overbore size fuel were discharged and recharged without difficulty at C Reactor during the 8-1-61 outage. Column makeup and discharge exposures were as follows:

<u>Tube No.</u>	<u>Type Tube</u>	<u>Pieces</u>	<u>Charge Date</u>	<u>Discharge Exposures</u>
2863	SB-Zr	18	4-9-61	828 MWD/T
2866	SB-Zr	18	4-9-61	770 MWD/T
1453	SB-Zr	32	1-17-61	776 MWD/T
1494	SB-Zr	32	2-25-61	643 MWD/T (2nd cycle)
4463	SB-Al	32	3-6-61	616 MWD/T
4472	SB-Al	32	3-6-61	640 MWD/T
4475	Ribbed-Al	32	3-6-61	648 MWD/T (Bumper)
4478	Ribbed-Al	32	3-6-61	646 MWD/T (Bumper)

Post-irradiation examinations and measurements have been completed and the data are being prepared for machine processing.

Visual observations have revealed some hot-spots and hot-areas of medium severity. No hot-spots or hot-areas were observed in the two high-powered charges. Light surface bumping, mild ellipticity and some corrosion were observed. Of 186 elements observed, only six showed corrosion penetration greater than 10 mils.

Channel 1494-C was equipped with an overbore size smooth-bore Zircaloy-2 process tube and fitted with Design I hardware during the 8-1-61 outage. The tube was charged with 18 CIVINS elements.

Self-Supported Fuel Development

Thirty-three columns of CIVINS fuel were discharged and recharged during the 8-1-61 outage at C Reactor without difficulty. Six columns were picked up special for post-irradiation examination, and five new monitor columns were charged.

Two K-size smooth-bore Zircaloy-2 process tubes were installed and charged with KVN self-supported fuel elements at KW Reactor during the 8-14-61 outage.

Bumpered Fuel Development

The ten columns of KIVN bumper fuel elements which were charged in KW Reactor on 6-27-61 are estimated to be at about 400 MWD/T, 33 per cent of the scheduled goal exposure.

Twenty-six columns of OIIINB fuel elements were charged into D Reactor on 8-6-61 under authorization of PT-310. The test is designed to evaluate the dimensional stability of fuel element cores segregated by the UT-2 on the basis of uranium grain size. There are eight columns of large grain material, nine columns with a variation of grain size, and nine columns with small grains. Nine of the 26 columns are equipped with downstream T/c trains to evaluate the performance of the bumper fuel element in new ribbed process tubes with: 1) No mixer, 2) mixer in 10th position, 3) mixers in seventh and 15th positions.

To date, 1075 tubes of bumper material have been successfully irradiated and discharged from D Reactor; 1423 tubes are currently under irradiation.

A failure in a bumper charge was reported the day this report was prepared. No details are now available.

Coextruded I&E Fuel

The initial two columns of coextruded fuel elements which were charged into KW Reactor on 6-25-61 were discharged during the 8-14-61 outage at an average exposure of 680 MWD/T. Six columns were charged during the outage.

Advanced Reactor Technology

N Reactor Fuel Development

Three seventeen-inch NIEL elements and two seventeen-inch NIEL elements with capped jacket defects for failure testing in the PRTR rupture loop have been irradiated in KER-1 to an average exposure of 1320 MWD/T. Two more seventeen-inch NIEL elements with capped jacket defects added to the charge on 7-19-61, have reached an exposure of 360 MWD/T.

The fuel loading in KER-2 was discharged 7-31-61, because of loop operating difficulties. The five twenty-three inch NINL elements had reached an exposure of 2090 MWD/T. The one twenth-three inch NIEL element added to the charge on 5-28-61, was discharged at 905 MWD/T, and the second twenty-three inch NIEL element added to the loading on 7-19-61 was discharged at 150 MWD/T.

Loops 3 and 4 are currently undergoing modification.

Nomenclature: (NIEL - NPR sized inner tubes - enriched uranium)
(NINL - NPR sized inner tubes - natural uranium)

REACTOR ENGINEERING

Present Reactor Technology

C Reactor Overbore

During the C Reactor outage the week of August 20, the first 20 of a 40 tube block of process channels were overbored, large Zircaloy-2 tubes installed

STATUS REPORT OF PRODUCTION TESTS

Test No.	Type Metal	Tubes	Reactor	Goal		Current		Remarks
				Exposure	Exposure	Exposure	Exposure	
IP-183-A	K-size bumper fuel. KIVN-B	10	KW	1200 MWD/T	400 MWD/T			Repeat of an earlier inconclusive test to evaluate the reduction of hot-spot frequency associated with bumper fuel elements in a K ribbed process tube. Ten tubes of bumper and ten tubes of non-bumper control elements charged on 6-25-61.
IP-216-A	Normal prod. natural and enriched fuel elements.	105	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.	22 mos.			Provides for long term irradiation of solid black Li-Al for conversion ratio, and fuel performance determination.
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-310-A	OIIIN-B three-rail bumper in new tubes	26	D	Variable				Determination of the dimensional stability of uranium fuel cores classified by the fuel core tester (UT-2). Obtains process tube corrosion data for bumper fuel elements with various mixer arrangements.
IP-377-A	Five 23-inch NINL elements One 23-inch NIEL element One 23-inch NIEL element	1	KE	3000 MWD/T	2090 MWD/T			KEER-2 charged 2-23-61 with five NINL elements; one NIEL elements added to the charge on 5-28-61; one NIEL element added 7-19-61. Tube was discharged 7-31-71, because of loop operating difficulties.

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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-381-A	CVIN geometry I&E overbore-size fuel a) CVINS b) CVINB	18 2	C	800 MWD/T		Provide preliminary qualitative data regarding irradiation behavior of larger fuel element designs. Eight columns discharged on 8-1-61.
IP-377-A	Five 17-inch NIEL elements, two with capped jacket defects Two 17-inch NIEL elements with capped jacket defects	1	KE	2000 MWD/T	1320 MWD/T	KER-1 charged 5-28-61, with five NIEL elements; two NIEL elements added to charge 7-19-61.
IP-397-A	Zircaloy clad enriched I&E fuel elements	6	KW	Variable	360 MWD/T	Provide irradiation experience for elements fabricated by NPR manufacturing process. Two tubes initially charged on 5-25-61 were discharged on 8-14-61 at 680 MWD/T.
IP-409-A	KVNS geometry I&E self-supported fuel in K Reactor.	2	KW	800 MWD/T	70 MWD/T	Provide qualitative data to confirm the fuel geometry design.

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and outfitted with overbore clamp-nozzle hardware, and loaded with large size fuel elements. Initial difficulties associated with these tubes have apparently been satisfactorily resolved. The installation of these tubes is being accomplished under the authorization of Production Test IP-431-A., "Expansion of Overbore Test Facilities, C Reactor".

Overbore Zircaloy-2 Tube Procurement

Fourteen overbore Zircaloy-2 tubes have been delivered by Reactive Metals Inc. under contract AT(45-1)1560. Two additional tubes are available for shipment under this contract.

Twenty tubes, meeting all specifications, have been delivered by Reactive Metals Inc. under contract AT(45-1)1591. An additional 18 tubes have been delivered, with waivers of length and wall thickness specifications. Acceptable length was reduced from 43 feet to 42 feet, 4 inches; and wall thickness was reduced from 0.040 inch minimum to 0.036 inch minimum.

Advanced Reactor Technology

Technical Bases for NPR Standards

Work continues on the preparation of Technical Bases for NPR Process Standards. A total of 30 such bases now exist in "first rough draft" form and additional bases are in various stages of completion.

NPR Hazards Review

The first section of the Hazards Review has been prepared in rough draft form. Work continues on this review. Hazards evaluations will be extended to include not only design reviews but also operational safety questions.

N Reactor Simulator

A report is in preparation which reviews the various aspects of procurement and use of an analog simulator for support of NPR operation. Although the report has not been completed, the incentive for such a machine appears very large. A computer being excessed by the ANP project appears suitable for NPR application and an initial attempt to secure that machine has been made. This subject will receive continuing attention.

REACTOR PHYSICS

Present Reactor Technology

C Overbore Performance

Three-group flux and power distributions across the overbore block in C Reactor have been calculated. The preliminary results indicate a fairly flat power distribution across the block; the higher fast and epithermal contributions to the fission power tend to compensate for the lower thermal

contribution. The maximum power generation expected is 112 kw/ft in the peripheral overbore columns (normalized to a 70 kw/ft maximum in the CIIN columns).

The actual performance in C Reactor cannot yet be assessed precisely, but power generations appear to be in reasonably good agreement with theoretical predictions. As equilibrium is achieved and splining operations are reduced, more precise evaluation will be possible.

Poison Material Considerations

Several studies concerned with the assurance of adequate control in poison materials are being pursued. The change in spline strength as a function of nvt has been calculated. A ten percent decrease in strength is indicated after 10^5 MWD of reactor production. To confirm the calculations, a spline is to be irradiated and its worth measured before and after the irradiation. The measurement will be made in the PCIR.

The change in reactivity due to lithium burnout in boll slugs in the present E-N load in H Reactor has been calculated to be 1.3 mk for a goal exposure of 750 MWD/T.

A study on the feasibility of using a neutron-attenuation scheme to measure boron concentration in splines has indicated that contained neutron sources (Pu-Be, for example) in a moderator will not yield sufficient intensity to distinguish variations in boron composition of ten percent. As an alternative, the use of the pile neutrons from a test hole is being considered for a stronger source.

Speed-of-Control Studies

During the month both F and DR Reactors operated with less than 1500 ECT's. Special speed-of-control limits were specified to meet the conditions.

Initial results have been obtained with the nodal model for the speed-of-control problem. Both the problem of inoperable rods and the effect of the rods arriving at the bottom of the reactor considerably later than at the top are being investigated.

Special Products

The study of the effect of recycled enriched uranium on reactor operation was continued during the month. The metal selected for discharge under production test IP-420-A was discharged from 105-KE Reactor on July 17, 1961. Preliminary viewing of the fuel elements has verified the fact that they are from lot KK055A.

Overbore - Basic Studies

An eight-foot exponential pile has been constructed by HLO for the C Reactor measurements. The first measurement of the dry material buckling with the CIIN fuel element has been completed. The program will include measurements

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in both present and overbore geometry and the effect of overbore on control strengths will be determined.

Advanced Reactor Technology

Graphite Damage

Recent data on the anisotropic scattering of neutrons on Cl² which indicates a maximum effect of 12 percent on the fast flux (2-3 Mev) is being investigated by the Monte-Carlo code to ascertain if there is any significant effect on our results on neutron slowing down spectrum in the NPR and present reactors.

Wilkins Effect in NPR Fuel Elements

PCTR measurements have been made by HLO to evaluate the end effects on flux impinging on a fuel element. In the measurements, the inner tubes were separated axially by 220 mils, whereas the outer tubes were butted together. The water between the end caps of the inner tubes adds materially to the peaking effect. The outer-to-inner tube, surface-flux ratio in the middle of the fuel element was 1.37. This ratio decreases to 1.17 and 1.13 at 240 and 100 mils, respectively from the end of the fuel element. The effect of the steam vents on the axial flux distribution was small.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience of critical IPD classifications for the first 32 weeks of the 1961 badge year:

Classification	Total Dose	No. of Employees	Average Dose/ Employee	Extrapolated Year End Average	No. of Employees Over 3r Extrapolated Exposure
Radiation Monitors	146431 mr	85	1723 mr	2800 mr	28
Processing Operators	389859	257	1517	2465	35
Pipefitters	125138	87	1438	2337	19
Millwrights	96658	71	1361	2212	14

Lapse of Control

Lapse of Radiation Control Distribution by Reactor and Component

	B	C	D	DR	F	H	KE	KW	IPD Totals
Processing	0	0	0	1	1	1	1	0	4
Maintenance	0	1	1	1	1	1	0	0	5
Supplemental Crews	0	0	0	0	0	0	1	0	1
Power	0	0	0	0	0	0	0	0	0
Research & Engineering	0	1	0	0	0	0	0	0	1
Facilities Engineering	0	1	0	0	0	0	0	0	1
Central Maintenance	0	0	1	0	0	0	0	0	1
Reactor Areas	0	0	2	0	1	1	1	0	5
Assigned Totals	0	3	3	2	2	3	2	0	15
IPD General									

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.

Effluent Water Data

The table below shows the average concentrations of radioisotopes in reactor effluent water from samples taken during July, 1961. The units are (10^{-12} curies per cc).

<u>Reactor</u>	<u>As⁷⁶</u>	<u>P³²</u>	<u>Zn⁶⁵</u>	<u>Np²³⁹</u>	<u>Cr⁵¹</u>
B	73	8	11	63	370
C	98	7	19	82	350
D	51	13	22	150	800
DR	49	14	4	14	340
F	42	9	17	57	400
H	103	6	18	62	130
KE	55	6	14	18	260
KW	37	8	12	48	250

NPR Waste Disposal

Calculations were made which indicate the NPR radioactive waste streams entering the Columbia River from the local crib will contribute only about one-third of the maximum allowable radioactivity established by the design criteria. The design criteria provides that the radioactivity introduced to the river by NPR waste streams shall not contribute more than 3×10^{-4} MPC for any radioisotope at Ringold, the point of first use of the river.

<u>Type of Reactor Decontamination</u>	<u>Total Activity in Curies*</u>
One step single pass in-pile for one process tube	2
One step single pass in-pile for total reactor	2×10^3
Two step out-of-pile portion of primary loop	63

*Exclusive of fission product burden

Special Studies - VSR Channel Dose Rates

Assistance was given in making dose rate measurements within DR Reactor VSR channel #14 containing irradiated balls. A small dose rate device was calibrated and installed in a TV camera which was lowered into the channel. The dose increased during the first 16 feet of travel and remained constant throughout the remaining 19 feet of travel. The indicator exceeded the maximum calibration point of 7×10^6 r/hr but by projecting the calibration curve the maximum dose rate was established at 3×10^7 r/hr. The dose received by the camera lens and the scintillator of the dose rate instrument appreciably darkened them. Glass rod dosimeters were also placed in the camera which, when processed, will indicate the integrated dose.

PROCESS TECHNOLOGY OPERATION

REACTOR POWER LEVEL LIMITATIONS

The power levels at all reactors are currently limited by bulk outlet temperature restrictions.

PROCESS STANDARDS

HW-46000 B, Process Standards - Reactor

One new and two revised standards were issued during the month. These were:

Process Standard A-021 - "Top-of-Annulus Boiling Limit"

The C-III-E fuel element was added to existing boiling limit curves. These curves are appropriate for application to the geometry of this relatively new fuel element. An additional curve was supplied to permit obtaining top-of-annulus boiling limits when a water mixer slug is the eleventh piece from the downstream end of the metal charge.

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

This new standard is needed because present operating conditions at the B, D, and F Reactors have approached speed-of-control power level limits. Speed-of-control considerations require that enough VSR strength be available for automatic insertion at a rate sufficient to limit fuel core temperatures during power level excursion (resulting from water loss at equilibrium levels) from reaching the melting point of uranium.

The two major causative factors contributing to the necessity for a speed-of-control standard at this time are block charge-discharge techniques which tend to increase the reactor plutonium inventory, and faster rates of power level increase during reactor startups, which result in significantly higher power levels while graphite temperatures are relatively cool. Power level limits have been presented as a function of graphite temperatures for startups, and as a function of plutonium inventory (flux squared weighted exposure) for higher power level operation.

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

Unit motion measurements that are no longer considered significant have been dropped from the standard for B, D, and F Reactors. The deleted measurements were shield motion check points that are adequately covered by other instrumentation. Descriptions of several of the measurement locations were rewritten for clarification.

HW-46000 D, Process Standards - Reactor

One new and two revised standards were issued during the month. These were:

Process Standard A-070 - "Thermal and Biological Shield Cooling Water"

The standard was revised to include all specifications of Technical Basis Number A-1, "Thermal and Biological Shield Cooling Water, HW-55500 RD." The following specific changes were made to the standard:

1. Minimum flow requirements were given for individual shield cooling tubes.
2. Shield temperature limits were provided.
3. Functional checks of the equipment were deleted since this information appears in the Process Equipment Standards.
4. Fringe tube power limits were raised for continued operation following coolant loss to a single or two adjacent shield cooling tubes.

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

Revisions to this standard are identical to those made for HW-46000 B, above.

Process Standard G-010 - "Distortion of Graphite Moderator"

Revisions to this standard are identical to those made for HW-46000 B, above.

HW-46000 H, Process Standards - Reactor

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

Process Standard A-070 - "Thermal and Biological Shield Cooling Water"

Revisions to this standard are identical to those made for HW-46000 D, above.

Process Standard F-050 - "Charge-Discharge During Reactor Operation, PCCF"

Present metal coefficients of reactivity, which are smaller than formerly used, require a re-evaluation of temperature margins that must exist between poison column control facility (PCCF) tubes and process tubes within five lattice units prior to discharge of the PCCF tube.

Curves showing necessary temperature margins that were based on the former criterion, that TAI limits would not be exceeded in the event of an inadvertent sudden flush of the entire column, were impractically restrictive. Therefore, curves were prepared based on a new criterion which specifies sufficient temperature margins, prior to PCCF discharge, that process tube saturation temperatures will not be reached in event of an inadvertent full column flush.

PROCESS CHANGE AUTHORIZATIONS

Sixteen process change authorizations were issued during the month to permit temporary deviation from Process Standards - Reactor, HW-46000. These were:

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PCA #1-46 - "Thermal Shield Cooling, K Reactors"

Process Standard A-070 specifies the bottom thermal shield cooling water temperature to limit the temperature gradient through the concrete pad. Present operating conditions are such that the specifications of the reference standard have been difficult to meet.

Following a study of the problem, it was concluded that some relaxation could be made of the previously specified temperature gradient through the bottom concrete pad without incurring significant damage to the pad. This process change authorized, until September 8, 1961, a 30 per cent increase in the maximum outlet temperature for the bottom thermal shield cooling water.

PCA #1-47 - "Flow During Reactor Shutdown - H Reactor"

Process Standard A-030 specifies that front crossheaders may not be throttled until two hours after shutdown, except for poison outages.

H Reactor shut down during June, after three hours of operation, to replace two leaking front-face nozzle caps. Procedures have been established in the reference standard whereby throttling is permitted following the brief operating period during a poison shutdown. Accordingly, authorization was given to throttle crossheader number 13 without waiting two hours provided specified restrictions on cap removal time, riser pressure, front cross-header pressure, and tube temperatures on crossheader number 13 were observed.

PCA #1-48 - "Horizontal Bowing Measurements - DR Reactor"

Process Standard G-010 specifies that horizontal bowing shall be measured annually in channels located on both the near and far sides of the reactor near the horizontal centerline. The purpose of these data is to monitor trends in moderator distortion. Recent traverses have been incomplete due to equipment limitations in severely bowed graphite channels. Authorization was given until July 1, 1961, to delay taking these data. During the delay, evaluation will be made of improved procedures and equipment and, if necessary, other traverse channels will be selected.

PCA #1-49 - "Flow During Reactor Shutdown - H Reactor"

Authorization was given to throttle crossheaders 23 and 41 for leaking front-face fitting repairs, following a short operating period, without waiting the normally required two hours after shutdown. Justification is identical to that stated above in PCA #1-47 for H Reactor.

PCA #1-50 - "Installation of Larger Emergency Backup Coolant Supply Line to KER Loops - Project CGI-839, KE Reactor"

Process Standard K-040 specifies coolant backup requirements for the KER loops on recirculation during reactor shutdown. In order for the KER loops to obtain the increased emergency backup coolant flow required by Project CGI-839, it

will be necessary to replace existing supply piping. This will require removal of emergency coolant backup to the KER loops and the 1706-KER single-pass tubes, as well as complete coolant removal to the reactor's horizontal control rods and water-cooled test holes. This process change authorized removal of the emergency process water backup supply to the KER loops after KE Reactor graphite temperatures were below 100 C, and in accordance with a detailed procedure which provided for an alternate supply of coolant in the event of failure of the normal coolant source.

PCA #1-51 - "Flow During Reactor Shutdown - F Reactor"

Authorization was given to throttle front crossheader number 11 before two outage hours had elapsed to make possible replacement of a leaking front-face cap. Conditions and justifications were similar to those specified in PCA #1-47 for H Reactor.

PCA #1-52 - "Water Shut-off Time During Helium Leak Testing - F Reactor"

Process Standard A-030 requires that the water shut-off times used during helium leak testing be determined from specific curves which limit slug temperatures in a drained tube to less than 170 C. The curves specified are based on heat generation rates following shutdown from an extended operating period.

F Reactor shut down on July 17, 1961, for approximately a three day leak testing outage. After two short operating periods (a two and one-half hour period and a 12-hour period), the reactor was shut down again because of continued high condensate collection, for further leak testing. Leak testing of the reactor during this second leak testing outage, using the helium leak detection system, would be unnecessarily delayed by requiring that the curves specified in the reference standard be used for calculation of water shut-off times. Calculations of the heat decay in process tubes at F Reactor, considering actual operating history preceding the last shutdown, showed that the heat generation was approximately 65 per cent of that which occurs following an extended operating period.

This process change authorized until July 23, 1961, the use of adjusted water shut-off times at F Reactor (based upon F Reactor's current operating history) which calculations indicate will prevent the slug surface temperature on a drained tube from exceeding 170 C.

PCA #1-53 - "Biological Shield Temperature, DR Reactor"

Process Standard A-070 specifies a maximum permissible temperature limit for the far side and top biological shields. This limit is necessary because accelerated deterioration of the shield occurs at operation above this limit.

Operation of DR Reactor was severely handicapped during their past operating period because of ball 3X balls trapped in the moderator as a result of a recent ball drop. Also, it was suspected that some of the reactivity loss was due to water in the moderator. To continue operation, it was necessary

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to operate with a high concentration of CO₂ in the reactor atmosphere; this resulted in higher than authorized biological shield temperatures. Because the higher temperatures were confined to a localized region in the top shield, it was believed that continued operation at elevated temperatures for a short period would not significantly affect reactor life.

This process change authorized, for approximately 24 hours, operation at DR Reactor with temperatures in top biological shield a maximum of 20 C higher than the limit specified in the reference standard.

PCA #1-54 - "Graphite Thermocouple Stringers - K Reactors"

Process Standard C-040 requires that the K Reactors contain nine serviceable graphite thermocouple stringers. The standard also requires replacement of graphite thermocouple stringers within three months whenever the stringer is no longer serviceable. Serviceability is defined in the standard. Normally, a three-month period is sufficient time to schedule replacement of failed stringers. However, great difficulty has been experienced at the K Reactors in removing failed stringers. Part of the trouble is attributed to shifting of the graphite stack. Some failed stringers become bound in their channels to the extent that pushing forces up to the breaking strength of the graphite blocks will not move the stringers.

Installation of a new type of thermocouple stringer at the K Reactors, which does not have graphite spacers, is authorized under Supplement C to PT-IP-313-N. Until this type stringer is installed on all channels it will not be possible to maintain the required number of stringers in service.

The number of thermocouples presently available for graphite temperature monitoring is less than desirable because of the accumulation of failed thermocouples in localized areas. However, it is believed that on an interim basis, the information obtained from the present operable thermocouples, together with information obtained by calculation of temperature in unmonitored regions of the moderator, is sufficient to indicate if any excessive damage is occurring to the moderator.

This process change authorized operation with less than the specified number of serviceable stringers until July 31, 1962, with certain restrictions stated which included a specific schedule of stringer replacement.

PCA #1-55 - "Flow During Reactor Shutdown - F Reactor"

Authorization was given to throttle crossheaders before two outage hours had elapsed to make loading changes necessitated by a flux distortion due to water in the moderator, which originated from a recent process tube leak. Circumstances and justification were similar to those stated in PCA #1-47 for H Reactor.

PCA #1-56 - "Monitoring of Converted KER Process Tubes - KE Reactor"

Process Standard A-050 stipulates that coolant pressure for process tubes containing any material in the active zone of the reactor must be monitored

in the number one safety circuit. High and low trip requirements are also specified. KER loop tubes 3565 and 4268 were recently removed from the recirculation loop and returned to the normal process water system as front-to-rear test channels. Both tubes presently contain solid aluminum charges and are operating in critical flow condition, which does not afford low trip protection in the event of a front connector failure.

Process Standard K-020 permits irradiation of non-fissionable material in zirconium tubes without being monitored in the number one safety circuit, since a coolant failure would not result in a tube meltdown.

Authorization was given until the next minimum outage to operate zirconium tubes 3565 and 4268 in critical flow condition.

PCA #1-57 - "Process Tube Temperature Monitoring - B, D, F, and H Reactors"

Process Standard C-050 specifies hourly temperature monitoring of the outlet water temperature on process tubes during reactor shutdown. This specification was designed to minimize hot header incidents arising from a flow reduction to a header without control room personnel being cognizant of the flow change. Since any stated monitoring frequency will not eliminate a hot header incident and the frequency is subject to considerable difference of opinion as to what is adequate, this specification has been removed from the K Reactor standards and is being removed from the remaining process standard books. The revised standards specify that after the reactor has been down four hours, temperature monitoring will be done as necessary to maintain tube temperatures below 60 C.

This process change authorized omission of the hourly process tube temperature monitoring requirement during reactor outages.

PCA #1-58 - "Ball 3X Functional Testing - C Reactor"

Process Standard C-110 specifies that the operability of the ball 3X system be tested annually including operation of the hopper gates and dropping the balls into the reactor. Experience has shown that due to numerous cracks and voids in the graphite moderator, an unacceptable number of balls would be permanently retained in the stack.

This process change authorized a method of testing the system where the balls are vacuumed from each hopper and the hopper gates tested under simulated load conditions. The channel is verified as unobstructed, by dropping a few balls through the entire channel into the ball recovery tray under the reactor. Clean balls are then returned to the hopper. A specified schedule of hopper testing was stipulated in the process change authorization.

PROCESS ASSISTANCE

One engineer audited the conformance to process standards by making 20 inspections at each reactor during the report period.

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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>
8-8-61	2476-H	KH-289-D	I&E EB (0.94%)	663	Hole
8-24-61	1363-KW	KK-081-A	I&E E (0.94%)	554	Side Hot-Spot
8-29-61	1163-D	KZ-064-E	I&E NB	795	Hole
8-30-61	1379-H	KH-273-A	I&E EB (0.94%)	745	Hole
8-31-61	2470-DR	CZ-814-A	I&E N	768	Hole
8-31-61	2478-DR	PZ-010-A	I&E N	786	Hole

Legend:

I&E EB - This is the symbol for internally and externally cooled production reactor fuel elements which have projections (bumpers) welded to the fuel element jackets. The uranium cores are enriched in U-235 and the weight per cent U-235 in the core material is stated.

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 U-235 in the core material is stated.

I&E NB - This is the symbol for internally and externally cooled production reactor fuel elements of natural uranium which have projections (bumpers) welded to the fuel element jacket.

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

OPERATIONAL PHYSICS OPERATION

PILE PHYSICS ASSISTANCE

The reactivity loss from the F Reactor tube leak on July 27 was the most severe experienced to date. Rapid drying was accomplished, however, by extensive use of enrichment and supplementary control, and bulk limit operation was achieved by mid-August. The large reactivity loss observed at the DR Reactor following the Ball 3X drop in July continued; operating levels approaching bulk limits were achieved the latter part of August after successive additions of enrichment in a relatively uniform array.

Nonequilibrium losses at the other reactors averaged less than 0.25 effective day per startup; reduced equilibrium levels due to higher inlet temperatures and full use of splines at all reactors contributed to this performance. Frequent level changes corresponding to daily inlet temperature changes have been carried out successfully.

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

Reactor	B	C	D	DR	F	H	KE	KW
ECT in August (1)	1525	1685	1480	1350 ⁽⁵⁾	1455 ⁽⁶⁾	1505	2610	2540
12-Month Average ECT	1505	1705	1495	1540	1455	1570	2525	2545
Equil. Scram Time (2)	14-16	30-35	14-16	18-22	14-20	35-45	20-25*	20-25*
No. of Scrams and Recoveries (3)	0/0	0/0	0/0	0/0	0/0	3/3	0/0	0/0
No. of Non-Scram Outages (4)	3/0	2/0	3/0	4/0	4/0	3/0	2/0	1/0

Recording Period -

From:	7-20	7-20	7-23	7-21	7-21	7-22	7-22	7-21
To:	8-22	8-22	8-22	8-23	8-25	8-23	8-23	8-21

*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.

- (5) The low ECT value at DR Reactor reflects the flattening loss following the July Ball 3X trip.
- (6) No ECT value is reported at F Reactor because the flattening was distorted through the period by the water leak, and by compensating enrichment and supplementary control.

B Reactor - J. H. Ferguson

A new high flattening efficiency of 1540 ECT was attained over a smooth two-week operating period; subsequently, operation was interrupted by a scram and two water leaks. Nonequilibrium losses averaged 0.18 equilibrium day per startup compared to July's 0.29 equilibrium day. Following the scram of August 14, a hot startup attempt failed as a result of two VSR's dropping back into the reactor during the rise to power.

C Reactor - D. E. Newbrough

The original cadmium control rods in the Numbers 1 and 13 positions were replaced with boron rods in accordance with the replacement schedule. Since rods to be replaced were left out of service for the operating period prior to their removal, downstream poison was charged to prevent downstream peaking where the rod had been positioned; longitudinal flux traverses have verified the effectiveness of this technique. Radial flattening efficiency has been only slightly reduced as a result of the changeover.

All VSR's were functioning satisfactorily with the smaller B type rods in six channels. Operating continuity was interrupted only by two scheduled outages and a scram from which a hot recovery was successful.

D Reactor - D. W. Constable

An average nonequilibrium loss of 0.18 equilibrium days was achieved for three startups; efficiency during one of these startups was hindered significantly by about six mk of water in one corner of the reactor. Continuity was interrupted by three outages for water leaks and one for repair of a loose front cap; the hot startup recovery following the latter outage was unsuccessful because of extra time required for withdrawal of one of the VSR's.

DR Reactor - J. F. Jaklevick/L. L. Grumme

The enrichment investment required to compensate the reactivity loss following the July Ball 3X drop indicates a continuing loss of at least 1.5 per cent δk . Only very minor gains could be attributed to water removal and initial ball removal attempts by means of a magnet. Radial temperature maps and longitudinal spline flux traverses to date have not indicated gross localized poison effects.

Initial enrichment was added centrally to permit specific levels capable of water removal from the graphite; the operating level under these

conditions was approximately 800 MW early in the month. Two subsequent enrichment steps permitted operation near 1600 MW near the end of the month. The present enrichment inventory of 460 columns is approximately 200 greater than normal during the high exposure portion of the block discharge cycle.

The residual poisoning has been conservatively assumed to date to "shadow" the safety system strength by its entire worth. Much of the additional enrichment has consequently been compensated by splines, or effectively "cancelled", during startups to fulfill total control requirements.

F Reactor - R. B. Heiple

Production was severely limited during early August due to the large water leak in tube 3062-F on July 27. High header pressure requirements for this tube for several hours after shutdown resulted in a reactivity loss of approximately two per cent δk due to water in the graphite of the lower two-thirds of the near side of the reactor.

It became apparent after two initial attempts at criticality, one of which followed the addition of 30 E-columns, that criticality and subsequent operation could not be attained without enrichment in excess of normal total control administrative practices. Under the circumstances of the long time required to recover the reactivity loss in the wet lattice in event of coolant loss, it was deemed reasonable to depend on the HCR's for scrammable safety control. Following appropriate management and AEC contacts, such a process change authorization was put into effect, and additional enrichment was accordingly charged in the most reactive part of the reactor and about the fringe of the wet zone; spline caps were installed liberally in the enriched region to permit cancelling of the enrichment effects as reactivity would be regained. Altogether 120 E-columns were charged.

Bulk limits at around 1700 MW were reached on August 13; approximately one week's nonequilibrium losses, including outage time for enrichment loadings, were experienced during the two-week recovery period. The flexibility permitted by enrichment and splines resulted in a much lower loss than would have been encountered under comparable conditions in the past. During an outage later in the month sufficient of the additional enrichment was discharged to resume normal total control administrative practices under which withdrawn HCR's are not counted as scrammable safety control.

H Reactor - S. L. Stewart

A major contributing factor to the continued stable operation with the E-N load has been the lack of change in hot reactivity during the operating cycle; no hot reactivity loss trend has been observed up to an uranium exposure of 690 MWD/T. In the exposure range of 600-700 MWD/T, the cold reactivity loss rate has been about one mk per 50 MWD/T increase in exposure.

Because the power level was limited by bulk outlet water temperature, fine flattening adjustments were not attempted during the month. Nonequilibrium losses during the month averaged less than 0.2 equivalent day per startup. Three outages interrupted continuity.

KE Reactor - A. R. Kosmata/J. W. Hagan

Operation was interrupted by only two near-minimum-time outages.

Procedure preparations have been underway for a trial of an "inboard" control rod configuration in the "upstream" rod banks after the August 30 outage. A moderate flattening and upstream shift in the flux distribution would presumably reduce rupture potential, tube corrosion and front graphite growth.

KW Reactor - R. A. Chitwood

Operation was interrupted by only one scheduled outage. Flattening efficiency was reduced temporarily due to the localized reactivity loss from a large central discharge; however, with operation on bulk effluent temperature limits no production loss resulted.

PROCESS PHYSICS STUDIES

Safety Control Studies

The poison remaining in the DR Reactor subsequent to the July Ball 3X drop has conservatively been assumed to shadow the vertical safety system by an equivalent amount. Thus the reactivity regained through additional enrichment has added directly to total control requirements. Much of this additional enrichment must be effectively nullified by splines until residual heat buildup from several hours of operation would sufficiently change the potential reactivity vs meltdown time sequence following water loss. Approaches being investigated for possible relief include more exact determination of E-metal vs spline reactivity compensation effects, and possible calibration tests to define the degree of safety system shadowing by the residual poison.

As explained in the section on F Reactor previously in this report, the HCR's were counted on as scrammable safety control during the water leak recovery. The method for establishing added enrichment allowances was based on equivalent local bucklings in the region of control of the HCR system. In other words, enrichment "salting" to increase local bucklings up to 60 μ b were permitted between 14 and 33 rows.

In an instrumentation criteria study being carried out jointly with Reactor Physics Unit, a speed-of-control analog program is being used to generate relationships between power level at time of trip and allowable ramp rate for a given safety limitation on the excursion. The program will be extended to include geometry effects as well.

Data from the intermediate range logarithmic system under test at KE Reactor in conjunction with octant monitor tests indicate good period agreement with the subcritical monitor but less range than anticipated. Activation of the chamber during its six-year history in the reactor has increased the background sufficiently to reduce its effective range from the expected six decades to five.

Pile Reactivity Studies

Load-out measurements from both Purex and Redox for July were in good agreement with IPD plutonium yield predictions based on recently initiated accountability renormalizations. Because of recovery variables from month to month, several months' correlation data will be required to justify firm conclusions on the renormalization's working accuracy.

NPR startup planning activities during the month have included liaison and planning on both the stack purity test and later startup, and detailed startup test and operational calculations. Present indications are that the stack purity test will take place in late December, 1961, or early January.

Control Efficiency Studies

Instrument Development Operation has prepared specifications for detection and trip functions of a prototype automatic control system and has sent them out for vendor estimate.

The recommended charge pattern for the next core cycle of the H Reactor E-N loading will increase the ratio of lithium-aluminum to enriched slugs slightly - from 16 N slugs per five columns to seventeen. The observed lack of hot reactivity losses during the first cycle will permit uniform reactivity reduction equivalent to the number of lithium-aluminum poison columns loaded during the first cycle.

Shielding Studies

A survey of biological shield temperatures for the past four years shows that without exception the maximum temperatures in the uncooled iron-masonite top and far-side shields are lower than they were in 1958. The reductions have resulted in part from increased fringe poison but in large measure from increased helium concentration in the reactor atmosphere.

DR top-shield temperatures were temporarily allowed by PCA to go above the 160 C limit during the latter part of July when high CO₂ concentration was desired for maximum graphite temperature effects for aiding possible water removal. A maximum temperature of 176 C was reached, whereas normal DR top-shield maximum temperatures are currently less than 100 C.

Reactor Fundamentals Training

A refresher program for reactor specialists will be initiated September 13. The program will be carried out in two four-month sections, the fall section to include operating specialists and the spring one to include those with day or training assignments.

The Reactor Fundamentals Training Program for pile operators will be resumed starting September 15. Approximately half of the pile operators

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were given this training during the fall and spring of 1960-61.

Assistance is being provided in acquainting reactor supervisory personnel with the self-teaching machine which will be circulated among the reactor areas over an eight-week period beginning in September.

A series of three-hour lectures on elementary reactor physics and one and one-half hour lectures on nuclear safety considerations were given to four groups of AEC personnel during the past month. Other parts of the reactor orientation series included sessions by Process Technology Operation on measures to ensure water continuity and tours by Manufacturing Operation of the reactor and water plant facilities.

TESTING OPERATION

IRRADIATION TESTING OPERATION

DR-1 Loop

The DR-1 Gas Loop was operated continuously during the report period with the exception of 42.4 hours during reactor outages. Reference test conditions (1500 F cladding temperature) were maintained for 32 hours, bringing the total time at reference conditions to 2714 hours. The test element was cycled twice from reference to ambient temperature, for a total of 20 accumulated cycles.

The DR-1 Gas Loop initiated a reactor shutdown when a primary loop rupture disc failed.

The circulator repaired last month was sent to Technical Shops to correct excessive thrust bearing clearance. The adjustments were completed and the circulator returned to DR-1 for operational tests.

C-1 Loop (Inhibitor Studies)

The C-1 Loop recirculation pump, which was returned to the vendor for repair last month, has not been returned to HAP0.

Borescoping Activities

Process Channel 3063, F Reactor - The channel, which contained a leaking tube, was examined to determine its condition prior to retubing. There was a grayish powder in the third and fourth tube blocks. The fourth tube block was coated so heavily that its condition could not be observed. The remainder of the channel was in fair condition.

Process Channels 2658, 3183, and 3584, DR Reactor - These channels were inspected to determine the effectiveness of a new type rotary broach. Small spiral broach marks were evident throughout the channels, indicating that the broach was cutting even in the split tube-blocks.

Process Channel 3364, C Reactor - The channel was inspected prior to overboring to determine its condition. It was in excellent condition with the exception of a three-inch separation between the fourth tube block and the fourth trunion block.

Process Channel 0889, H Reactor - The channel was inspected to determine why a tube could not be inserted. Several block separations and split blocks were observed, but blockage which would prevent retubing was not evident.

Overbore Channels, C Reactor - Several channels were examined to assist in the installation of tubes in the overbore channels.

The following samples were handled:

Reactor	Test Hole	Facility	Request No.	No. of Samples	Material-Purpose
KE	2D	Quickie	HAPO-184	12	Washington designated program
KE	2D	Quickie	HAPO-172	1	Effluent water(activation analysis study)
H		PCCF	HAPO-172	1	Effluent water(activation analysis study)
D		Process Channel	HAPO-098	15	Graphite(damage studies)
DR-H		PCCF	HAPO-218	4	Uranium(fission product release study)
KE	2D	Quickie	U of W-104	1	Yttrium(isotope production)
KW	4B	Snout	HAPO-243	6	Reactor structural materials(fission damage study)
F	E	Quickie	HAPO-229	11	Uranium(thin films)
C	D	Bare Channel	HAPO-237	1	Inconel(PRTR Gas Loop material study)
F	E	Quickie	HAPO-223	1	Chromium(isotope production)
F	E	Quickie	HAPO-223	1	Titanium(radioactive buildup and decay of NPR control rod material)
KE	2D	Quickie	HAPO-252	3	Arsenic(tracer isotope production)
H		PCCF	HAPO-254	2	Phosphorus(tracer isotope production)
KE	2D	Quickie	HAPO-256	3	Plutonium(fission yields of heavy plutonium isotopes)
KW	4C	Snout	HAPO-223	1	Antimony(half-life determination)
KW	2B	Hot Graphite	HAPO-177	2	Graphite(damage studies)
F	E	Quickie	HAPO-250	2	Aluminum silicate(ceramic rod channel liner material study)
KW	2B	Hot Graphite	HAPO-253	1	Al ₂ O ₃ -MgO ceramics(damage study)
C	Y	Hot Graphite	HAPO-177	10	Graphite(damage studies)
		*Gamma	HAPO-171	11	Plastics and rubber (damage studies)
		*Gamma		1	Concrete(damage study)

*Gamma Irradiation Facility in Building 105-KE storage basin.

Vertical Bowing Measurements

A summary of the results of vertical bowing measurements follows. All distances were measured from the process tube inlet flange or reactor face.

<u>Date</u>	<u>Tube</u>	<u>Distance</u>	<u>Results</u>
8-4-61	4674-H	36 feet	Up at no point Down .25" at 19' since 3-29-61
8-9-61	Z5-KE	40 feet	Up at no point Down .26" at 22' since 7-16-60
8-18-61	4574-B	36 feet	Up at no point Down .10" at 20' since 3-15-61
8-20-61	3364-C	36 feet	No previous data

COOLANT TESTING OPERATION

KER Loop Operation

KER-1 - Operation of the loop with three 17-inch NIN1 and four 17-inch NIEL defected elements as authorized by PT IP-377-A and 377-A, Supplement A and the fretting corrosion testing of a Zircaloy-2 wire-wound rod in a 9-inch Zircaloy-2 coupon holder continued. Loop operating conditions were 230 C, 1600 psi, and pH 10.0.

KER-2 - On August 1 the charge consisting of five 23-inch NIN1 fuel elements and one 23-inch NIEL fuel element was removed because of the presence of ion exchange resin in the loop piping which resulted from the failure of an ion exchange column retaining screen on July 20. The loop piping has been cleaned by flushing and screening by out-of-reactor recirculation.

KER-3 and KER-4 - These loops remained shut down for Project CGI-839 revisions.

1706-KE Single-Pass Tube Operation - All eight tubes were supplied normal process water from 105-KE.

During the outage of August 8, a 45-minute decontamination of SP-7 (4963) and SP-8 (5063) was performed as authorized by PT IP-197-A and the tubes recharged with normal fuel loadings. Trace amounts of EDTA are being added to the SP-7 process water as part of the effluent activities test program. SP-8 is the control tube for the test.

KE Reactor Outage Time Requirements - No unscheduled reactor outages were charged to production testing. A total of 12.3 hours was charged to production testing as listed below:

<u>Production Test</u>	<u>Description</u>	<u>Hours</u>
PT IP-377-A	Discharge KER-2	2.0
PT IP-360	Charge-discharge SP-3 and SP-5	1.9
PT IP-377-A	Flare leak - KER-1	4.2
PT IF-197-A	Charge-discharge and decontaminate SP-7 and SP-8	4.2

Removal of front and rear face KER-3 and KER-4 crossheaders and fittings during the outage of August 8 resulted in an outage time charge of 2.4 hours to Project CGI-839.

Out-of-Reactor Facility Operation

TF-1 (CEP-1) - Testing of stress crevice corrosion of AMS-5616 coupons and crevice attack on 410 and 420 stainless steel coupons using non-deoxygenated high purity water continued.

TF-2 (CEP-2) - Testing of the effect of contact area on the fretting corrosion between two Zircaloy-2 surfaces at 300 C was completed. Another test using the same materials at an operating temperature of 200 C was started on August 16.

TF-3 (CEP-3) - Rebuilding of the loop has been completed with the exception of lagging and installation of the enclosure doors. Acceptance tests have been completed.

TF-4 (CEP-4) - The cyclic decontamination test was continued. The seventh of eight scheduled decontaminations is in progress. Materials undergoing corrosion testing are 304 stainless steel; A-212 carbon steel; carbon steel welded to stainless steel; Stellite 6 and Stellite 12; Haynes Alloy 41; AMS-5616, barstock and cast; Zircaloy-2; 420 stainless steel; and mechanically-bonded carbon steel, stainless steel, and Zircaloy-2 prestressed coupons.

TF-5 (ELMO-5) - Corrosion testing of Hastelloy C, Zircaloy-2, carbon steels 1031, 1051 and A-212 and sensitized and non-sensitized 304 stainless steel coupons continued. Corrosion tests of 406 stainless steel were completed.

TF-6 (ELMO-6) - Corrosion testing of aluminum X-8001, sensitized stainless steel, and Zircaloy-2 at pH 9.5 using a slurry of molybdenum trioxide as the corrosion inhibitor continued.

TF-7 (ELMO-7) - The following test work was continued:

1. Corrosion testing of suit-case-handle supports on two Zircaloy-2 clad fuel elements.
2. Corrosion testing of one KSE3 element.
3. Fretting corrosion testing of a PRTR fuel element.

A test to determine stress cracking of 316 stainless steel by the deposition of lithium hydroxide on the surface of the stressed material began on August 8.

Corrosion tests of Zircaloy-2, carbon steel, and 304 stainless steel coupons were completed.

TF-8 (ELMO-8) - Testing of water quality control capabilities with hydrazine and ammonium hydroxide additions were completed. Corrosion testing of 304 stainless steel, Admiralty metal, 70-30 copper-nickel, and A-212 carbon steel was started in water with hydrazine addition and the pH controlled at 9 with ammonium hydroxide addition.

TF-9 (ELMO-4) - Rate and mechanism of rupture testing using coextruded uranium Zircaloy-2 fuel rods continued.

TF-10 (ELMO-10) - Four tests in support of ion exchange resin dissolution were performed.

TF-11(REF) - One gross fission product contamination-decontamination test was completed on stainless steel, carbon steel, and Zircaloy-2 test coupons.

TF-13 (Dowtherm) - Testing of the effect of raw water film buildup on the heat exchanger tubes and corrosion testing of carbon steel, 304 stainless steel, and aluminum coupons continued.

COMPONENT TESTING OPERATION

Irradiated Fuel Element Examination - Examinations were completed on fuel elements from the following 26 tubes at the 105-C Metal Examination Facility:

<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>
216A	2453-KE	216A	4160-KW	216A	4963-KW	381A	2866-C
	3686-KE		4161-KW		4964-KW		4463-C
	3496-KW		4181-KW		4965-KW		4475-C
	4158-KW		4873-KW		4966-KW		4478-C
	4159-KW		4962-KW	381A	2863-C	Reg.Metal	7 tubes

Process Tube Corrosion Monitoring Program - In-reactor wall-thickness measurements of 372 process tubes were completed. Listed below are the number of tubes measured for each reactor and the document numbers of the reports issued:

<u>Reactor</u>	<u>No. of Tubes Probologged</u>	<u>Report No.</u>	<u>HW Number</u>
B	107	63	70540
F	79	64	70610
H	14	65	70662
D	50	66	70704
DR	89	67	70720
KE and KW	5	68	70749
B	5	69	70771
D	19	70	70803
C	4		Not reported

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

<u>Reactor</u>	<u>Number of Tubes</u>	<u>HW Number of Unclassified Report</u>
C	3	70631
F	1	70748
KE	1	70840
DR	2	Not reported

Tubes 0671-C and 0769-C were removed because they were leakers; thorough examination revealed no leaks. Tube 0965-C was removed and examined to verify probolog measurements. Actual measurements and probolog measurements agreed.

A large hole in leaker tube 3063-F was found located between 31 feet 8 inches and 31 feet 10 inches from the tube outlet flange. The hole was caused by chattering of the charge in the tube. There were also pinhole leaks, caused by external corrosion, located at 24 feet 10 inches from the tube outlet flange.

Tube 4783-KE was removed because the probolog trace from this tube contained a severe blip corresponding to a position 18 feet from the tube outlet flange. Visual examination revealed a bulge in the tube at this location; a fuel element rupture had occurred at this location. The remaining wall-thickness in the center of the bulge was 28 mils.

Critical Reactor Component Examination - All of the Truarc snap rings on the inlet tube sleeve flanges of both KE and KW Reactors were examined. In addition, the stainless steel Truarc snap rings at both reactors were examined once a week.

Panellit System Programs

Gages repaired, calibrated by maintenance	-	272	
Gages meeting calibration criteria	-	174	(64%)
-previous month	-		(94%)
In-board gage reliability examination	-	920	
Gages meeting examination criteria	-	895	(97%)
-previous month	-		(94%)
-average for past year	-		(91%)
Response time determination	-	920	
Meeting response criteria	-	919	(99.8%)
-last two months	-		(99.7%)
In-board Bourdon coil leak examination	-	19 693	
Non-leaking coils	-	19 673	(99.8%)
-average rate for past two years	-		(99.7%)

During the month, 77 gages received failure analysis.

Twenty-four PCCF gages were received from Panellit, Inc. This completes the PCCF gage procurement program.

Examination of Panellit gage components for warehousing and direct-to-user availability are as follows:

SECRET

HW-70952

	<u>DT-100-T Switches</u>	<u>2B-X1 Switches</u>
Examined	25	150
Rejected	2	15
Rejection rate	8%	10%

Manager, Research & Engineering

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 11-11-81 BY 1043

MANUFACTURINGPRODUCTION OPERATIONPRODUCTION PLANNING AND SCHEDULINGDischarge Concentrations

There were no discharge goal exposure adjustments effected in August. The overall exposure of material discharged increased from previous months due to a reduction in premature discharging for probolog and process tube replacement work.

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>	
June	691	704	675	678	785	704	692
July	808	739	642	682	841	753	682
Aug.	773	748	706	707	851	760	735

Off-Plant Shipments

Ten casks of Polonium were shipped to Mound Laboratory.

ESSENTIAL MATERIALS

Rail and truck shipments received in August were as follows:

Carload shipments for IPD	- 243
Carload shipments for other Depts.	- 127
Truck shipments for IPD	- <u>277</u>
Total	647

MISCELLANEOUS ACTIVITIES

By August 31 all eleven of the Manufacturing Training Program (MTP) members scheduled into IPD this summer had arrived and been assigned to the using components. Ten are in Manufacturing and one is in Facilities Engineering. MTP transfers from IPD to other GE locations were completed.

Six regular IPD employees (five Manufacturing, one Facilities Engineering) were selected for enrollment in the 1961-62 first-year courses of the Manufacturing Studies Program.

The one 1961-62 class in IPD's 33-session Fundamentals of Manufacturing course was composed, with 14 men from Manufacturing and one each from Facilities Engineering and Research & Engineering. Plans were completed for the first session of this class on September 11.

IPD comments on the General Section of a new local Classification Guide were supplied the Hanford Laboratories Operation.

MONTH		REACTOR OPERATION STATISTICS - PROCESSING																
AUGUST, 1961																		
		B	C	D	DR	F	I	SIX OLD	KE	KW	K'S	TOTAL						
INPUT RU (% OF FORECAST)		87.8	73.6	97.7	94.7	92.6	88.3	88.4	137.3	93.7	112.2	97.8						
TIME OPER EFF. (% OVERALL)		75.8	60.8	70.8	81.4	89.4	73.7	75.3	85.0	79.3	82.2	77.0						
NEW TUBES INSTALLED		7	0	93	7	7	20	134	1	0	1	135						
WATER LEAKS - TUBE		4	0	3	0	1	5	13	0	1	1	14						
- VAN STONE		5	0	0	0	0	2	7	0	0	0	7						
SLUG RUPTURES		0	0	1	2	0	2	5	0	1	1	6						
HELIUM CONSUMED -M CU.FT.		134.3	335.2	417.3	183.4	236.6	142.1		118.3	241.3		1808.5						
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.	
OPERATIONAL CAUSES																		
FAULTY INST. OR CIR.					1	47.7										1	47.7	
FAULTY PROC. EQUIP.												1	41.3			1	41.3	
UNEXPLAINED				1	0.2			1	0.2							1	0.2	
BPA System		1	42.3	1	0.2			2	42.5							2	42.5	
Prod. Test								1	40.5									
Loose Cap Gasket								2	3.7							1	70.2	
CHARGE - DISCHARGE																2	3.7	
RUPTURE								1	88.4							3	208.8	
WATER LEAK		3	138.0					1	66.3	1	12.2					1	40.7	
TUBE REPLACEMENT				2	150.7			2	57.8	4	136.3					5	177.0	
MAINTENANCE								1	73.4	2	132.0	8	494.1			1	33.4	
Prod. Test (Overbore)																		
Enrich. Adjustment																		
TOTAL		4	180.3	4	291.8	4	217.2	4	138.5	1	79.2	7	195.8	2	111.5	3	154.0	
		UTILIZATION OF REACTOR OUTAGE HOURS																
		TOTAL HOURS																
		% OF TIME																
CHARGE - DISCHARGE		18.3	57.9	46.1	26.9	19.2	41.2	209.6	48.9	39.9	88.8	298.4						5.0
RUPTURE REMOVAL				1.0	6.0		18.7	25.7		3.1	3.1	28.8						0.5
WATER LEAK		100.1	5.6	32.0	3.9	30.3	67.1	239.0		51.1	51.1	290.1						4.9
TUBE REPLACEMENT		1.9		106.7	35.2	6.8	29.9	180.5	4.5	1.5	6.0	186.5						3.1
MAINTENANCE		50.6	20.8	18.6	48.8	21.4	32.2	192.4	16.6	36.9	53.5	245.9						4.1
STANDARD CHECK		3.3		2.9	0.3	0.5	1.8	8.8	2.5	0.4	2.9	11.7						0.2
PRODUCTION TEST				9.2	17.4	1.0		220.3	18.5	21.1	39.6	259.9						4.4
PROJECT WORK		5.8	1.7				1.2	8.7	2.4		2.4	11.1						0.2
OTHER		0.3	13.1	0.7			3.7	17.8	18.1		18.1	35.9						0.6
TOTAL		180.3	291.8	217.2	138.5	79.2	195.8	1102.8	111.5	154.0	265.5	1368.3						23.0

* Continuation of July outage.

** Faulty RTD in stator of #1 low lift motor at 190 Bldg.

SECRET

MONTH
AUGUST, 1961

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

1990

MONTH		REACTOR OPERATIONS STATISTICS - POWER										SHEET 1	
AUGUST, 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)		15910		2130		2451	2632			23123			
TO FILTER PLANT (BLDG.183)		69158		94813		90484	76600	173400	171300	675755			
TO FILTER PLANT (CSDR)		95794		62003						157797			
TO R & E (KER) & FEO				203				168		371			
TOTAL		180862		159149		92935	79232	173568	171300	857046			
TOTAL		8073.7		7104.4		4148.6	3536.9	7748.1	7646.8	38258.5			
RESERVOIR WATER (BLDG.182)													
TO POWER HOUSE (BLDG.184)		28		79		355	40			502			
TO COND-SYSTEM(BLDG.180)		-		1158		2003	2592			5753			
TO COND-SYSTEM (190DR & 183F)				893		93				986			
TO EXPORT SYSTEM INCL. NPR		15882		-		-				15882			
TOTAL		710.2		95.1		109.4	117.5			1032.2			
FILTER WATER (BLDG. 183)													
TO POWER HOUSE (BLDG.184)		154		165		87	142	169516	167672	548			
TO PROCESS (BLDG. 190)		77135	75077	75319	77651	82742	70900			796012			
TO 10B		2500	4500	260		1059	1250			9569			
TO 10BR				259						259			
TO FILTER PLANT (BLDG. 183DR & 183B)			12401	16554						(28955)			
TO F & S SYSTEM		138		315		467	172		50	1142			
TO R & E (KER) FEO				153				165		318			
BACKWASH		1632	3816	1788	906	6129	4136	3719	3578	25704			
TOTAL		3640.8	4276.2	4232.5	3506.8	4039.2	3419.4	7740.6	7646.8	38502.3			
PROCESS WATER (BLDG. 190)													
TO REACTOR		76735	74677	74919	77251	82362	70400	159500	157300	773144			
TO REACTOR		88300	100000	88000	88200	88800	85100	184000	185000	907400			
POWER HOUSE (K AREA)								19	12	31			
10B (KE - KW)													
TO R & E (KER)								9597	9960	19557			
BUILDING USAGE		400	400	400	400	380	500	-	400	3280			
TOTAL		3443.3	3351.4	3362.2	3466.3	3693.6	3165.0	7567.2	7484.9	35533.9			
RIVER DATA													
ELEVATION (MSL,FT.)		392.3		384.9		371.4	375.8			336.9			
		386.2		379.1		367.0	370.9			381.0			
		389.5		381.4		368.0	373.7			382.8			
TEMPERATURE		66.7		69.0		70.0	68.4			68.2			

THE

REACTOR OPERATIONS STATISTICS — POWER											SHEET 2
WATER TREATMENT DATA											
MM GALS											
MM GALS											
AT BLDG. 182											
BLDG. 183											
3087.2											
4276.2											
4232.5											
2767.8											
4039.2											
3419.4											
7740.6											
7646.8											
37209.7											
LBS.											
LBS											
AVG PPM											
CHLORINE (BLDG. 182)											
(BLDG. 183)											
12280											
19216											
34770											
22580											
29017											
29983											
102000											
105000											
354846											
0.5											
0.5											
1.0											
1.0											
0.9											
1.1											
1.6											
1.6											
1.1											
107366											
149234											
59656											
81105											
397361											
LBS											
AVG PPM											
ALUM											
18000											
1506											
661549											
420336											
371141											
325054											
1181821											
1137452											
4116859											
*17.4											
*16.8											
18.8											
18.2											
*18.1											
*22.8											
18.3											
17.9											
18.4											
LBS											
AVG PPM											
SEPARAN											
350											
550											
800											
190											
1000											
325											
1200											
1910											
6325											
.014											
.015											
.023											
.008											
.030											
.011											
.019											
.030											
.020											
LBS											
AVG PPM											
SULPHURIC ACID											
(AS 100%)											
216521											
299005											
125500											
202584											
224748											
168529											
256685											
558822											
2052394											
8.4											
8.4											
3.6											
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6.7											
5.9											
4.0											
8.8											
6.6											
LBS											
DICHROMATE											
28540											
39154											
47620											
49100											
29125											
26560											
57720											
103395											
381214											
(Filter Aides)											
22350											
LBS											
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*Alumina and alum combined for PPM in alum column.

MONTH		REACTOR OPERATIONS STATISTICS — POWER										SHEET 3	
AUGUST, 1961		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW				
<u>ANALYTICAL DATA</u>													
<u>RAW WATER</u>													
PH	PH AVG	8.30	8.10	8.36	8.36	8.29	8.22	7.07	7.04				
TURBIDITY	PPM AVG	6	4	6	6	4	3	8	10				
<u>FINISHED WATER</u>													
PH	PH AVG	7.00	7.00	7.10	7.00	6.90	7.01	6.85	6.59				
TURBIDITY	PPM AVG	.006	.006	.005	.005	.005	.004	.005	.006				
CL ₂ RESIDUAL	PPM AVG	.05	.05	.05	.05	.05	.15	.18	.18				
DICHROMATE	PPM AVG	1.00	1.41	1.80	1.80	1.00	1.01	.92	1.66				
<u>STEAM DATA</u>													
		100-B	100-D	100-F	100-H	B-D-F-H TOTAL	KE	KW	KE-KW TOTAL				
GENERATED (MAX)	LBS/HR	135000	118000	54000	72000	379000	52000	70000	122000				
(NOR)	LBS/HR	81000	81000	40000	54800	256800	-	-	-				
(AVG)	LBS/HR	77700	83485	42521	51319	255025	31100	33000	64100				
TOTAL	M LBS	57873	62113	25512	38181	183679	22968	24221	47189				
TO PLANT	M LBS	49076	52671	22451	32377	156575	20671	21799	42470				
COAL RECEIVED	TONS	1862	2180	1077	1640	6759	-	-	-				
CONSUMED	TONS	3393	3328	1346	2078	10145	-	-	-				
IN STORAGE	TONS	13939	18372	14884	6415	53610	-	-	-				
GEN. STEAM/LB. OF COAL		8.53	9.33	9.48	9.19	9.05	-	-	-				
OIL RECEIVED	GALLONS						18249	230598	248847				
CONSUMED	GALLONS						219294	222954	442248				
IN STORAGE	GALLONS						913215	894852	1808067				
GEN. STEAM/GAL. OF OIL							104.7	108.6	106.7				
<u>ELECTRICAL DATA</u>													
TOTAL GENERATED KW HRS.													

APPLIED REACTOR ENGINEERINGPLANT EQUIPMENT ENGINEERING OPERATIONK Reactor Gunbarrel Flange Retaining Rings

A gauge was designed to aid in the routine inspection of installed rings in order to more positively identify those which are not properly seated in the groove. Tests are in progress to experimentally determine the effect of various degrees of improper seating on the strength of the assembly.

Inlet Nozzle Assembly Tests

Scheduled testing of inlet nozzles of both CG-558 and K Reactor design was completed. Tests were performed on the existing nozzles and on nozzles which were broached to pass bumper fuel elements. All nozzles withstood hydrostatic test pressures of at least five times working pressure without measurable distortion or damage. The average bending moment for fracture of the nozzle at a snap ring groove is tabulated below.

<u>Nozzle Style</u>	<u>Average Breaking Moment</u>
Existing CG-558	1526 ft-lb
Broached CG-558	1346 ft-lb
Existing K	1326 ft-lb
Broached K	1216 ft-lb

MAINTENANCE PRACTICES OPERATIONRear Face Pigtaills - Old Reactors

The second phase order of rear face pigtaills for the old reactors started arriving on plant August 29, 1961.

C-Elevator Modifications

Data on elevator weights have been collected and interim corrective action has been tabulated in three phases:

1. Removal of items which may be accomplished at essentially no cost.
2. Removal of items at a one-time modification cost, but with no production penalty.
3. Removal of items which will result in production losses.

The plants are removing specific equipment recommended in categories 1 and 2 above.

~~SECRET~~
DECLASSIFIEDB-C REACTOR OPERATIONOPERATING EXPERIENCE

At B Reactor power levels were controlled during the first half of the month to limit bulk outlet temperatures; non-equilibrium conditions limited levels achieved during the remainder of the period. Power levels at C Reactor were controlled to limit bulk outlet temperatures.

Both reactors scrambled August 14 as a result of electrical disturbances caused by lightning striking a line on the 13.8 KV power system. Three additional outages at B Reactor were required for elimination of water leakage from Van Stone flanges and internal tube faults. Three C Reactor outages were required for work connected with the overbore test program.

EQUIPMENT EXPERIENCE

At B Reactor nine leaking tubes were removed; seven new tubes were installed and two channels left temporarily as air channels. Two defective rear Parker fittings were repaired.

At C Reactor new vertical safety rods (B Reactor type) were installed in two channels. Six B-type rods are now in service and all VSR's are operable at C Reactor.

New horizontal control rods were installed in two channels at C Reactor; with poisoning effect depleted, the old rods were buried.

Sixteen faulty thermocouples were repaired or replaced at C Reactor.

Effluent water leaking through failed packing glands undermined the earth around a junction box in the C Reactor effluent piping system. Repair work is in progress.

A replacement stator was installed in the 4500 HP motor of No. 3 process water pumping unit at Building 190-B following failure of the original equipment on August 22. Seven of the eight 4500 HP motors at 190-B have now been supplied with upgraded stators.

The supplying of process water to C Reactor with nine 190-C pump units was started August 31 when excessive vibration of the flywheel component necessitated removal of No. 9-C pump unit from service. Cause of the vibration was undetermined at the end of the report period.

IMPROVEMENT EXPERIENCE

At B Reactor 57 reamed venturis were installed to complete a program initiated in May, 1961 to increase the process water flow rate by enlarging the venturi pattern.

The installation of leak-preventing inserts in rear Van Stone flanges of the final few of ~80 pre-1956 tubes in B Reactor was completed during August outages.

At C Reactor twenty channels were overbored; oversized tubes were installed, equipped with new hardware and charged as authorized by PT IP-431-A. A prior internal decontamination of rear face piping and fittings reduced average dose rates at tube caps from 70 mr/hr to 32 mr/hr.

In connection with Project CG-884 (Rear Face Crossunder Lines), valved 20-inch stubs were welded into downcomers at 105-B and C.

Successful acceptance tests of the Flux Monitor - Pressure Monitor Intertie (Design Change No. 498) were completed at C Reactor. The intertie prevents bypassing of the pressure monitor unless three flux monitors are functioning within sensitivity settings prescribed by Process Standards.

RADIATION MONITORING EXPERIENCE

No personnel overexposure occurred. Maximum dose rates encountered were 3.0 rem/hr during spline removal and 25 mr/hr during discharge area work in connection with the 20-channel overbore outage at C Reactor. Six cases of low level skin contamination (maximum-5000 c/m) were easily corrected.

D-DR REACTOR OPERATION

OPERATING EXPERIENCE

Power level limitations in August were bulk outlet and graphite temperature at D and DR Reactors, respectively. Water leaks, a rupture and a Panellit scram caused four outages at D. DR was also down four times with a leaking Panellit Bourdon, a scram caused by failure of a rupture disc in the gas loop, a rupture outage and a scheduled outage to increase enrichment.

Magnets were used to recover 3X balls from four 105-DR vertical safety rod channels during one outage. About 500 balls were removed. Some reactivity gains were realized from this activity and from water removal.

EQUIPMENT EXPERIENCE

A Class "A" overhaul of a 181-D pump revealed a cracked pump casing and a shaft in need of straightening. The casing was repaired and reinforced by welding 10 gussets, evenly spaced around its circumference. A rock had wedged between lower impeller blades, damaging a blade and requiring a replacement impeller.

Six additional bundles of rear thermocouples have been fabricated for D Reactor in the replacement program. Thirty-five remain to be installed.

D Reactor installed 93 process tubes and 104 Inconel rear face connectors in the current program for replacement of these equipment items.

IMPROVEMENT EXPERIENCE

Both reactors are now equipped with a system that continuously monitors inlet and outlet dewpoint of the reactor gas flow. The total rate of water collection can be rapidly determined and collection trends can be determined shortly after starting up wet reactors.

The transfer areas of both reactors are now equipped with drip pans that conduct cask car water to the storage basins and keep contamination from the decks of cars.

Ammeters have been installed on all vertical safety rod winches and wired to the control room to show overload when a VSR is binding in its channel.

RADIATION MONITORING EXPERIENCE

Two lapses of radiation control occurred at each reactor. At D a contaminated electromagnet, used in VSR channels, was repaired without monitoring and contamination was found in a trash burning pit. At DR the trough used to transfer 3X balls outside the building broke when being disassembled, contaminating an employee up to 6,000 c/m. A lapse also occurred when a radiation alarm system, used in spline removal, was found denegized.

Gamma exposure is accumulating at a rate 92 per cent of the 3 r/year trend line for D Reactor operators and 109 per cent for DR operators. Radiation monitors are accumulating exposure at 109 per cent of the trend line at D and 124 per cent at DR.

F REACTOR OPERATION

OPERATING EXPERIENCE

The reactor was shut down on August 1 to charge additional enrichment (total 120 columns) to attain sufficient reactivity for satisfactory operation, as an aftermath of the severe coolant leak in process tube 3063-F. The reactor was limited by bulk outlet temperatures during the last three weeks of the month and not by reactivity and heat distortion problems, as was the case during the first week of August.

EQUIPMENT EXPERIENCE

Two problems encountered in operating the new acid-bauxite system have been unstable acid feed and the removal of reaction fumes. Removal of fumes was accomplished by converting the water jet evacuators to a combination of air and water. Piping changes made to the acid feed system corrected the second problem. (See "Improvement Experience" below.)

The silica gel in No. 1 Gas Drier was replaced and rusted original baffles were replaced in No. 1 and No. 3 Driers in an attempt to improve drying efficiency in the 115 Building driers. These actions had very little effect and arrangements were made to bring in a factory representative to investigate drier efficiency.

Seventy-seven tubes were probologged. Significant items replaced were: seven process tubes, nine process tube thermocouples due to failure, 40 process tube thermocouples on full replacement program, and 17 rear face water connectors. Nine Panellit gauges were replaced and approximately 346 gauges were adjusted. A total of 42 rear face Inconel pigtails was installed.

Difficulty was again experienced with the 105-F flexowriter and associated components. Moving parts are badly worn and replacement parts are not readily available.

The sixth 190 Annex process motor stator, No. 7, was replaced with one of a modified Class "A" insulation during the outage of August 23.

IMPROVEMENT EXPERIENCE

A shield was fabricated and installed on the spline coiler on "C" elevator. The shield provides necessary radiation protection for the flux monitoring of splines when removed from the reactor.

Probes for measuring the rib height in process tubes were designed and fabricated. These probes determine when process tubes should be replaced due to rib wear.

Bauxite feed was started to the west side of 183-F on August 2 and was in service for a total of 15 days during August. Feed was discontinued at intervals to make necessary equipment changes.

Corrections made to the acid feed system include installation of larger feed lines, more grade to the feed lines, and the installation of vented mud-legs ahead of the rotometers.

RADIATION EXPERIENCE

Radiation exposure trends have increased slightly and radiation monitors and operators are now averaging an exposure slightly above the 3 r/yr trend line. This trend reflects recent operating difficulties. F Reactor Operation was charged with one lapse of radiation control during August.

H REACTOR OPERATION

OPERATING EXPERIENCE

Input production was 88.3 per cent of forecast. Time operated efficiency was 73.7 per cent. The highest level attained was 1630 MW and was limited by bulk outlet temperature.

There were seven reactor outages, all unscheduled. Two were caused by internal process tube leaks, two by fuel element ruptures in E-N loaded tubes, two from Panellit scrams and one to repair two leaking front face pigtails.

EQUIPMENT EXPERIENCE

The reactor was shut down twice because of process tube leaks. A total of seven leaking tubes was removed, including two found when the reactor was shut down for a rupture on August 30. Two of the tubes had rear Van Stone leaks and five had internal leaks including two with transverse cracks.

There were two ruptured fuel elements. Both were bumpered enriched fuel elements in E-N loaded tubes and both were caused by center hole failures.

A total of twenty process tubes was installed. Ten of these were in air channels replacing tubes which had been removed because of leaks over the past three months.

On August 3, the upstream process water effluent discharge line unplugged itself permitting the normal flow of effluent water to the river (see the July report). On August 6, the downstream line unplugged, thus returning the facility to normal operation. Continued study of the problem is being made to provide recommendations concerning procedures to be followed during similar conditions of water flow in the future.

A broken oil gauge line on the number one 190-H Annex process water pump necessitated its removal from service for a thirty-minute period on August 26 to effect repairs. Repairs were made without incident and operating continuity was not affected.

The second series of 190-H Annex process pump impeller inspections was started with the number four unit. Results indicated that the first stage impeller cracks had not increased since the last inspection, in March, 1961, but that new cracks had formed in the second stage impeller. Examinations indicated that these cracks were not serious enough to warrant replacing the impeller. The unit was reassembled and returned to service.

IMPROVEMENT EXPERIENCE

The interim bauxite feed facility at the 183-H Building was improved by replacing the wooden containment chambers and glass reaction vessels with steel lead lined containment chambers and all lead reaction vessels. The change eliminates the personnel safety problem associated with potential breaking of the glass reaction vessels and provides improved operating reliability.

A 30 KVA transformer was installed in the metal storage area of the 105-H Building replacing the existing 15 KVA unit as part of the electrical upgrading program for the Building. The new unit will satisfy increased electrical load for improved underwater lighting and additional metal hoists and will permit the separation of the power and lighting loads. With this installation, the upgrading is about 83 per cent complete.

There were no significant contamination problems and dose rates to personnel were adequately controlled.

The radiation zone over the near process water effluent line in the 105-H exclusion area was eliminated by shielding with sand and gravel, which reduced the radiation level from 200 mr/hr to less than 5 mr/hr.

OPERATING EXPERIENCE

Equilibrium power levels at both reactors were limited by bulk outlet temperatures. In addition to one scheduled outage by each reactor for metal processing, KE Reactor experienced a scram due to a faulty resistance temperature detector and KW Reactor experienced outages to discharge a ruptured fuel element and to locate and replace a leaking process tube.

Increasing numbers of Panellit gage water leaks required frequent inspections to locate and replace the defective gauges before electrical short circuits occurred from the leakage.

A faulty resistance temperature detector in the stator of the Number 1 low-lift pump motor at 190-KE caused a spurious relay trip, shutting down the motor and subsequently tripping the companion high-lift pump motor, thereby causing a KE Reactor scram. The unit was returned to service with a visual temperature indicator pending installation of dual trip circuitry under Project CG-883.

The Number 1 KE high-lift pump was dismantled for examination of the CG-883 prototype impeller and casing. The condition of these was found to be excellent with relatively little cavitation in evidence.

Two zirconium ribless tubes were installed in KW Reactor and charged with self-supported elements to evaluate installation and charging techniques.

At KE Reactor three graphite stringers were removed. One naked Geminol wire thermocouple stringer and two iron constantan stringers were installed. A similar Geminol wire stringer was installed at KW Reactor.

A basic chromatograph gas analyzer unit was installed in the gas instrument room of each 105 building as a means of refining the control of reactor atmosphere and reducing gas usage.

SECRET

O. Schneider
Manager, Manufacturing

FACILITIES ENGINEERINGREACTOR MODIFICATION DESIGNRESEARCH AND DEVELOPMENT

Graphite distortion data collection activities at 105-C Reactor consisted of the following: 1) borescopic examination of vertical safety rod channels Nos. 22 and 47; 2) traverse measurements on vertical safety rod channel No. 22; 3) borescopic examination of process channels Nos. 3364, 3368, 3167. Process channel No. 3364 was borescoped both before and after over-boring; there was no detectable evidence of damage.

105-B Reactor type vertical rods have been installed in VSR channels Nos. 41 and 22, bringing to six the number of "B" rods in service at C Reactor. Rod drop measurements subsequent to "B" rod installation showed all VSR's to be operating within insertion times specified by Process Standards.

Eleven vertical rod channels at 105-DR Reactor were borescoped subsequent to the recent third safety system ball drop. The data are currently being evaluated and additional observations are planned for the next reactor outage.

On August 3, 1961 an overbored process tube assembly consisting of zircaloy process tube, prototype inlet clamp nozzle and fixed outlet nozzle assemblies was installed in overbored process tube channel No. 1464 at 105-C Reactor. Following the satisfactory performance of the prototype installation, 20 additional process tube channels were overbored during a subsequent outage. These channels were equipped with similar oversized zircaloy tubes and process tube assemblies. This installation completes the first half of the 40 tube block proposed in the overbore test to evaluate overbored size fuel conversion ratio and performance.

Subsequent to the reactor startup following the outage a high inlet water pressure on one of the overbored tubes required the reactor to be shut down. The ensuing investigation revealed that the process tube assemblies had been functioning satisfactorily and that the abnormal pressure was due to the dummy loading in the process tube.

The testing program for the overbored process tube assemblies is 90 per cent complete. These tests include impact, tensile and torque tests on the nozzles, gas and water leakage rates on the seals, cycle and pressure tests on the connectors and pressure and flow tests on the assemblies. Results of these tests indicate the equipment to be satisfactory for on-reactor service. All components of the prototype assemblies installed on the reactor were successfully tested prior to installation.

DESIGN PROJECTSCGI-839 - Modification of Fuel Element Test Facilities 1706-KER

Performance tests have been satisfactorily completed on two 275 horsepower pumps. These pumps are now being dismantled for interior inspection of

bearing and wear surfaces prior to shipment.

CGI-844 - 100-K Coolant Backup System

Design activity has involved review and approval of contractor shop drawings, equipment brochures and welding procedures. Vendor testing of the pumps for the 183-K Emergency Pump House has been postponed. The gears supplied to the pump vendor were found to be of incorrect rotation and have been returned to the supplier for rework.

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

A contract (DDR-135) has been negotiated with Washington State University to provide for model studies of the downcomer approach section and entrance elbow of the 105-K Reactor downcomer. This contract is for performance of work recommended in the recently completed contract (DDR-111) reporting on sizing the 100-K downcomer orifice plate.

In an effort to improve the process pumping units in K Area, three prototype pump impellers were previously installed under the authorization of Project CG-775. The third of these impellers was inspected following approximately six months of operation and showed a marked improvement over the two earlier prototypes. The severe cavitation damage noted on the earlier models was not evident on this impeller; however, the small amount of cavitation noted on the back of the vane was greater than that permitted by the specification.

A study to determine the probable operating conditions for the 190-K Main Pump House process water pump sets during pump modification has been completed. It was concluded that these pump sets could be modified one at a time in each area and that existing and modified pumps would operate satisfactorily in parallel provided the pump speeds were adjusted to prevent excessive flow rates.

EQUIPMENT DEVELOPMENT

EXISTING REACTOR WORK

Tube Replacement

A 1/8 inch scale model of a work area elevator was built for demonstration and test of concept.

Operational Fueling Facility

105-KE Reactor was scrambled by an operational fueling test on July 31. The scram resulted from circuit difficulties connected with a time delay that is not required for uranium charging but was desirable for the dummy charging of this experiment. During the subsequent startup August 2, two successful cycles were completed. Two more cycles were performed after an unrelated outage August 9. On one of these, a minor malfunction in the charging machine made it necessary to discharge the half-charged tube and start over.

105-DR Ball Drop

Equipment was expedited to remove many scattered balls remaining in 105-DR Reactor following an inadvertent drop of the 3X system balls in July. The most successful devices were a pair of powerful electro-magnets equipped with microphones to register the collection of balls and winches for removing them, and a TV camera which can be lowered into the reactor to give a complete view of the rod channel.

NEW PRODUCTION REACTOR

Design Test Activities

A final report was issued on DT-1081, NPR Inlet Barrier Wall Sleeve Seal Blocks. The production horizontal drive was received and testing began in accordance with DT-1112.

PLANT ENGINEERING OPERATION

DRAFTING

Services provided during the month:

New and revised drawings	223
Layouts and sketches	109
Microfilm prints reproduced	669
Microfilm drawings added	1300
Microfilm drawings voided	575
Ozalid check prints reproduced	1043
Catalogs added to files	67
Customers serviced - Microfilm files	256
Customers serviced - Catalog files	48
BPF's and Specifications added to files	13

REACTOR, PLANT ENGINEERING

Rear Crossheader Vibration - B, D, F, DR and H Reactors

Periodic inspection of prototypic flexible joints and crossheader guides installed on a rear crossheader at H Reactor and at DR Reactor to relieve thermal stress and control header vibration has continued. The units are still functioning satisfactorily after five and a half months' service at DR Reactor. One joint at H Reactor showed leakage when last inspected; however, this was remedied by retorquing the coupling tie bolts to the specified value.

Gunbarrel Flange Snap Ring Failure - K Reactors

The flange on the front and rear gunbarrels to which the nozzles are attached at the K Reactors is held in place with snap rings. In-service cracking of several of these rings has prompted an investigation to determine the cause and a remedy. It appears at this time that the problem is one of relating suitable material to the practical factors of maintainability, safety, and ease of installation. A sample lot of 100 cadmium plated carbon steel rings has been obtained for test use on the reactors and for comparison with a 15-7 Mo stainless ring also under study. Other possibilities such as alternate nozzle or retainer designs and related physical testing are in the planning stages.

Preliminary Engineering: Hi-Speed Scanning Temperature Monitoring System 105-KE

The preliminary engineering study has been completed with the issuance of HW-70655, "Engineering Concept and Study Report, Hi-Speed Scanning Temperature Monitoring System for 105-K Reactor", (Secret). Estimated cost was \$1,048,000 showing a 2.2 year amortization period for the full-scale system.

WATER PLANT & UTILITIES ENGINEERING

4500 HP Motor Stator Program

Three stators with modified Class A windings were installed. In addition to the eight Class B units, 19 modified Class A stators are now in service. A revised schedule indicating completion of the subject program in early 1962 has been issued.

4500 HP DeLaval Pump Impellers

The impellers (two per pump) in 38 of the 40 DeLaval pumps have now been inspected. Defects sufficient to recommend replacement have been found in 24 impellers. Of these, 10 have already been changed. One reworked impeller has been placed in service and currently nine others are at the vendor's plant awaiting repair.

In an effort to reduce the maintenance time required to make the actual change-out of a defective impeller, complete rotating pump units are being assembled prior to disassembly of a pump for inspection.

1904-H Outfall Line Blockage

Essentially complete blockage of the 1904-H outfall lines was detected in July through observations of unusual reactor effluent discharge through the overflow flume at the shoreline. Although the blockage no longer exists, another fathometer survey was made this month. This indicated that the river bed was generally 3-4 feet lower in elevation than during surveys made on July 18-19, although still 1-2 feet higher than indicated on construction drawings. No trace of any depression around the end of the lines, as shown in the drawings, could be found. An inspection of the apron below the concrete flume revealed that although some cracking of the concrete riprap has occurred, the apron appeared to be in good condition. The only evident scouring had occurred on one side of the apron adjacent to the shore, and this hole has now been filled by large rock. Further investigation of the over-all problem is continuing.

~~SECRET~~

PROJECT ENGINEERINGPROJECTSGeneral

The absence of J. A. Jones Company pipefitters since August 28, during their contract negotiations is retarding progress on Projects CGI-791, CGI-839, CGI-844, CGI-884, and CGI-889.

CGI-791 - Reactor ConfinementPhase II-B

The R. J. Britton Company started work on the berm stabilization at the 117-KE Filter Building on August 22, 1961.

Phase III - Ventilation Modifications and Tie-Ins

Acceptance Tests on the ventilation system balance are 90 per cent complete in 105-KE, KW, and B Buildings; 85 per cent complete in 105-C Building. Ventilation balancing has been started in 105-D and DR Buildings.

General

The actual completion for the total project is 2.4 per cent behind schedule, due to the failure of the inflatable seals for the charcoal filter frames. These are being corrected by the vendor. Five of the seals have been returned to the plant, to be installed when labor is available.

The contractor for the decontamination building, Cecil H. Hill, started work on August 22, 1961.

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

This job, scheduled to be 38 per cent complete, is actually 32 per cent complete. A revised construction completion schedule was issued to the Commission on August 10, 1961. Two of the four zero leakage recirculating pumps required for Loops 3 and 4 are now scheduled for shipment from the vendor's plant in Los Angeles on September 11, 1961. The remaining two pumps are scheduled for shipment two weeks later. An outage at 105-KE on August 30 would have allowed completion of many items of work, which can only be performed by the pipefitters. Two zirconium process tubes for the through-pile portion of the loop have been obtained from the NPR supply.

CGI-844 - 100-K Area Coolant Backup

Pump relocation work in 190-KE Building, pipe support work in 165-KE and KW and secondary backup steam driven turbine pump installation have all been delayed due to the pipefitter shortage. Subcontractor George Grant Company has officially advised J. A. Jones Company that the strike will necessitate a time extension to their contract.

CGI-889 - Effluent System Modifications - 100-B/C

A leak in the 105-C far down comer diversion box at the building necessitated routine 105-C effluents to the near line and into 107-CW tank until repairs can be made. The use of 107-CW tank will hold up the installation of the #1 diversion box and the tie-in to the new 66" line installed into 107-CW tank.

CGI-933 - Water Treatment Pilot Plant - 100-K Area

Purchase orders for the flocculator assembly and the metering pumps are being routed for approval. Design has started on 1706-KE clearwell portion of the work. Design is five per cent behind schedule because it was necessary to revise the design of the head house to accommodate the equipment.

CGI-939 - Analog to Digital Converter System for Temperature Monitoring, B, C, D, DR, F, and H Reactors

Design instructions and equipment specifications are ready for comment issue.

AR P-15030 - Beckman-Panellit Interlock System

The first area installation of this equipment was made at 105-C during the week of August 21, 1961. No difficulty was encountered and the installation and acceptance tests were performed on schedule.

CPFF CONSTRUCTION SERVICE CONTRACTOR-LIAISON

Issued 21 new work orders and supplemented six old jobs for a total of \$146,582 to J. A. Jones Construction Company.

PLANT FORCES WORK REVIEW

The Labor Standards Board approved three jobs for assignment to Plant Forces, which are estimated to cost \$49,550.

PROJECT PROPOSALSProject Proposals Submitted to AEC

CGI-942 Modifications to Balance Process Water Flow Capabilities for Increased Production, 100-B, D, DR, F, and H Areas.

Manager, Facilities Engineering

RT Jessen:dgm

NPR PROJECTPROCESS DESIGN OPERATIONResearch and Development

A program has been written for the IBM 7090 Computer which will calculate thermal and load stresses in hollow cylinders. Input data consist of cylinder dimensions, internal pressure and circumferential temperature distribution on the outside of the cylinder. The program assumes the temperature is constant along the axis of the tube. Output consists of axial, radial and circumferential stresses at various locations through a cross section of the cylinder. The locations are selected by the programmer through input data control cards. This program can be used for stress analysis in pipes and process tubes.

Project CAI-816

The 109 Instrumentation Task Force met on August 16, 1961, in Cleveland, Ohio, and the Bailey Meter Company schedule was discussed in detail. As a result of this meeting, both Burns and Roe, Inc. and Bailey Meter Company are proceeding on design on an overtime basis. Analog work by Bailey Meter Company is proceeding and General Electric has provided consultation during the initial effort.

Technical assistance to Baldwin-Lima-Hamilton has been sufficiently completed to permit return of General Electric technical personnel to Hanford. Welding procedures and fabrication sequences are now adequate to permit production of thermal shield plates in accordance with original specifications. All 50 bottom plates have now been shipped from the vendor's plant. Production welding of pipe to side thermal shield plates is now in progress. Fabrication of special inlet and outlet fringe thermal shield plates has been initiated.

All aluminum extrusions for the horizontal rod tips have been shipped. The vendor has completed 40 titanium tubes for the tip section and is preparing them for final inspection.

In accordance with a request by General Electric, HAP0, a proposal has been prepared by General Engineering Laboratory, General Electric, to provide a technical audit of the stability and control of the over-all NPR cooling system. A request has been submitted to the Commission for approval of this effort. This contract will provide for a review of both the General Electric and Burns and Roe, Inc. design portions of the complete heat removal system from the reactor to the river, including the control and operation of each system.

DEVELOPMENT AND TESTING

It is estimated that NPR Development and Testing is 88 per cent complete, on schedule.

Testing continued on the prototype flow monitor high and low limit controllers and pressure-to-electrical transducers. With test work approximately 80 per cent complete, the Avien controllers meet most of the specification requirements. The General Dynamics and Hydro-Aire controllers do not perform as well as the Avien controllers. Barton transducers do not meet specification requirements due to excess hysteresis and sensitivity to ambient temperature variation. All Barton units were returned to the factory for correction of these problems. Deviations experienced with Swartwout transducers have been communicated to the vendor. Discussion of the deviations continued.

The Component Test Loop operated for ten days thermal-cycling fittings before being interrupted by line heater failure. Work was initiated to repair the damaged equipment. The newly installed 200 HP pump was started for the first time and operated uneventfully at hot and cold conditions for three days. Vibration, seal leakage and temperature rise of the 200 HP pump were found to be satisfactory.

Substitute materials have been found for certain hardened stainless-steel parts used in the inlet and diversion valve prototypes and later declared sensitive to stress corrosion cracking by Hanford metallurgists. Critical sliding surfaces exposed to the primary coolant will consist of Stellite-6 and AMS-5616 hardened to approximately 33 Rockwell C. This material combination was selected after compatibility was demonstrated by wear tests at the General Engineering Laboratory, and prototypes performed satisfactorily at the diversion valve vendor's plant and Hanford. Appropriate changes have been included in the production programs.

Test installation was completed for an early production unit of a horizontal rod drive and performance evaluation was started. The chief difficulty experienced with the drive thus far has been abrupt starting as opposed to smooth initiation of slow speed travel. The cause of this trouble has been traced to a pilot controlled check valve and the manufacturer of this component is participating in resolution of the problem. Performance of the drive to scram a rod into a normal channel has been satisfactory thus far, although testing has not been completed in this area of investigation. Plans have been made to scram a rod into a distorted graphite channel and measure the effects on the drive. Forces of acceleration and deceleration have been checked in factory tests and plans have been made to repeat these tests at Hanford.

FIELD ENGINEERING OPERATION

Construction

105-N and 109-N Buildings

The concrete pour rate has continued to drop off as the structural phase of the work nears completion. Work has been underway this month on pouring conventional concrete around the numerous block-outs which were left for shielding doors.

The basic structural steel framing for the remainder of Area No. 1 is now completed.

The application of elastomeric coatings was temporarily interrupted due to procurement difficulties. This work has been resumed and is in progress.

Work is in progress on sealing many of the confinement zone penetrations. It has been necessary to remove several of the penetration seals which had been installed earlier because the caulking material used has failed to pass the radiation exposure tests. These include the seals in the outlet pipe spaces.

Efforts were continued this month by Kaiser Engineers to qualify the instrument fitters on the silver braze capillary action joints. There has been no significant improvement in this regard during this reporting period. The problem has been reviewed with the Naval Shipyard at Bremerton and materials have been ordered to put into effect their suggestions.

The stainless steel tubing runs for the flow monitor system have been installed from the valve rack through the inlet-pipe-space wall penetration on the left hand side of the reactor.

The installation of electric trays, conduit, and the building lighting system has continued to progress throughout the month. The installation of armored cable was started during the week of August 28.

Harder Industrial under subcontract SC-78 has been making good progress on the installation of service piping and miscellaneous process piping. The sheet metal work being performed under this same subcontract has shown a noticeable improvement in the quality of workmanship.

Two of the primary loop heat exchangers were moved into their final locations on August 26 and 27. There have now been six of these units moved into the 109-N Building. Four are permanently attached to the supporting piers and the other two are in the process of being bolted down.

Erection of structural steel framing for the turbine and dump condenser bays of the 109-N Building has made good progress. All the 16 dump condensers are now resting on temporary staging in approximately their final locations. Practically all of the concrete ceiling slabs over the heat exchanger cells of the piping gallery in the 109-N Building are now in place.

116-N Ventilation Stack for 105-N Building

The concrete for the chimney is now in place to a point 76 feet above the top of the foundation.

117-N Filter Building

The excavation for the filter building was completed August 28 and approximately 600 cubic yards of concrete have been placed in the exhaust ducts included with the building.

181-N Building

To date all of the pumps in this building are in place. Two of the four primary pump drive motors are in place and work is under way on the diesel engines for the emergency pumps to complete them to an operable condition.

182-N Building

The concrete walls to the 0'-0" level are approximately 95 per cent complete and slabs and footings are now being placed at the minus 20 foot level.

163-N and 183-N Buildings

A total of six of the process tanks have now been installed in the demineralizer area and work is continuing on piping. Control panels are also being installed and the electrical work is continuing.

184-N Building

The building structure is essentially complete. The turbine-generator set is now in place on its foundation and the alignment work for this set is progressing satisfactorily.

Sealwell and Outfall Structure

The walls of the sealwell are now in place and the floor of the overflow flume has been placed for approximately 100 feet toward the river from the sealwell structure.

Underground Piping and Electrical

The work on this subcontract has continued. The majority of the large piping from the river pump house and back to the outfall structure is now in place.

Chemical Unloading and Storage Facility

The car support structure for unloading railroad tank cars is now in place and several chemical storage tanks have been installed.

Pile Erection

The installation of outlet and side crates is progressing satisfactorily. Inlet crate installation is delayed pending the receipt of the last thermal shield bottom plates.

Primary Shield crate fabrication at Yuba Consolidated Industries is complete with only rework being done as indicated by inspection.

Fabrication difficulties at Baldwin-Lima-Hamilton have been corrected and the last shipment of fifteen boron bottom plates was made by air freight August 31, 1961 to expedite an early start of front crate erection.

Graphite

Overall production of completed details is now 96.8 per cent complete compared to the scheduled 96.7 per cent based on the revised production schedule issued during July. Inasmuch as the critical portion of the mock-up operation is now complete, fabrication shop work has been significantly curtailed and is being performed on day shift only, 40 hours per week (effective 8-21-61).

Mock-up of completed details has now been completed through Layer 79. Since the remaining ten layers consist entirely of top reflector and has no bearing on crate erection dimensions, the work crew has been reduced.

The 200 additional cooling tube bars were received August 17, 1961. All material deliveries are now complete and it is apparent that enough material is on hand to complete NPR requirements.

Zirconium

A total of 992 process tubes have now been processed through the auto-clave, 704 of which have been accepted as complete. The actual completion of process tubes is now 69.3 per cent versus a scheduled completion of 78.7 per cent.

Seventy-six additional tubes were received on August 10, bringing the total on hand to 970 and leaving a balance to be delivered by Harvey Aluminum of 97.

NPR tube processing was shut down from 2:15 PM August 23, until 4:30 PM August 25, when construction pipefitters walked out as a result of a jurisdictional dispute at 100-N.

The new Vacu-Blast equipment for removal of the oxide film is continuing with test runs and minor modifications. A total of 139 tubes require grit blasting and re-autoclaving at this time.

Administration

The following material has been issued during the period of July 24, 1961 through August 20, 1961:

Drawings	460
Criteria	11
Specifications	20
Requisitions	87
ATP's	4
Other	33
Total	<u>615</u>

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

Drawings	22
Specifications	3
Scope	0
ATP's	5
Total	<u>30</u>

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DECLASSIFIEDSPECIAL ASSIGNMENTPrimary Loop Engineering

Progress in the HUICO shop and in the field has been slow. To date, 46 spools have been shipped to the field.

A total of 12 circumferential joints have been completed in the field.

All piping work in the shop and field stopped for the balance of August (four days) when the pipefitters went on strike August 28.

The following was the status of approval data on the HUICO subcontract as of August 31, 1961:

Total Number Received	1622 (include 864 received for information only)
Number Approved	485
Number Approved with Exceptions	39
Number Not Approved	230
Number Currently being Reviewed	4
Number Received for Information Only -	864
No Approval Required	

Cost Estimate

No cost estimate review meetings were held during this reporting period.

Schedules

No revisions to the over-all project schedule were issued during this reporting period.

The construction status as of 9/1/61 is as follows. (Reference AEC Certified Construction Schedule dated 2/24/61.)

	<u>Scheduled</u>	<u>Actual</u>
Temporary Construction	70.0	70.0
General Area Systems	36.0	24.0
105-N Building	23.0	21.0
109-N Heat Exchanger Building	28.0	23.0
163N-183N Water Treatment	51.0	68.0
181-N River Water Pump House	92.0	94.0
182-N High Lift Pump House	9.0	16.0
184-N Standby Power House	<u>39.0</u>	<u>60.0</u>
NPR Project (CAI-816)	29.0	27.0

Manager, NPR Project

JS McMahon:mf

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EVALUATIONDesign StatusReactor Plant as of 9/1/61Title I

	<u>Wt'd Total</u>	<u>Certified Schedule</u>	<u>Actual % Complete</u>
Scope		100	100 (1)

Title II

Drawings	70	91.5	89.7 (2)
Specifications	8	100.0	96.2
Requisitions	8	82.0	79.3
ATP's	4	54.0	35.2
Development and Testing	<u>10</u>	<u>85.0</u>	<u>88.8</u>
Total	100	88.0	87.2

Heat Dissipation Plant as of 9/1/61Title I

Scope	100	98.75
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Title II

Detail Design	92.0	91.5
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	<u>Req'd</u>	<u>No. Issued to 8/19/61</u>	
		<u>Scheduled</u>	<u>Actual</u>
Preliminary Drawings (bid)	934	928	928
Detail Drawings (for const.)	1037	940	940
Specifications (bid)	153	151	151
Requisitions	173	170	170
ATP's	-	0	0

Composite Design Completion as of 9/1/61
(Reactor and Heat Dissipation Combined)

	<u>Certified Schedule</u>	<u>Actual % Complete</u>
Total	91.5	90.5

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

The number of drawings is changed from 2440 to 2450.

FINANCIAL

GENERAL ACCOUNTING OPERATION

The annual Personnel Recruitment and Government Advisory Committee reports were issued during August.

Review and recommendations regarding requests for fund allocation, financial classification etc., on nine Project Proposals or Appropriation Requests totaling 900 000 were transmitted to IPD and C&AO management.

PRODUCT COST AND BUDGETS OPERATION

Essential materials consumption was estimated for the last few days of the month to enable Contract and Accounting to issue August cost reports earlier.

The physical inventory of essential materials and frozen lunches was observed in H Processing.

PERSONNEL ACCOUNTING

The total number of personnel assigned to the Department as of August 31, 1961 was 2 304, a decrease of three from last month. Included in these figures are 779 exempt, 200 non bargaining nonexempt and 1 325 bargaining nonexempt employees.

Calendar year to date \$2 933 of Suggestion Awards have been paid to Department employees. The Department's allocation for 1961 is \$7 000.

PROCEDURES

An experiment was conducted in KE Area during the month of August which, when fully installed, will materially reduce the clerical effort of the Processing Clerks, provide a higher degree of accuracy in maintaining the record of fuel lots in the reactor tubes, eliminate some of the work of the supervisor on the front face during outages, and provide a means of mechanizing the accountability records of Nuclear Materials.

AUDITING

Revisions to twenty-three AEC Manual Chapters were reviewed for their effect on IPD Operations.

The Department cash fund of \$3 000 maintained for travel advances was counted at the end of the fiscal year and found to be in order.

S H Small
Manager - Finance

RELATIONS PRACTICES

Three PhDs were interviewed with no offers extended. Two monthly salaried employees transferred into the Department; one from Hanford Laboratories and one from Construction Engineering and Utilities. One employee transferred to Hanford Laboratories. Four terminated to work for other companies.

A total of \$405 was paid to 17 suggesters. The largest award was \$180.

Communication activities included the publication of five Management News Bulletins, two Headliners and three priority messages. GE NEWS coverage included 6 items about IPD activities totaling 164 column inches. Twenty-six HAPD-OPGs and five IPD-OPGs were issued.

During August, one employee died and three retired.

There were 85 medical treatment injuries, no disabling injuries and three security infractions reported.

A major reorganization of Relations Practices with the transfer of functions and reduction of personnel is in progress.

Manager - Relations Practices

RECEIVED

SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-70849	Secret	MH Schack	8-28-61	Process Water Pump Operating Conditions During Project CGI- 883 Pump Modifications
HW-WSU-5	Secret	CC Lomas	8-16-61	Sample Calculations K Downcomer HAP0 Contract DDR-111
HW-70416	Unclassified	HF Jensen EJ Nesselson RB Hall	7-17-61	Production Test Authorization IP-427- AE Rear Face and Through Reactor Chemical Decontamina- tion in Support of Overbore Program
HW-70437	Unclassified	HF Jensen JR Pierce	7-19-61	Detailed Procedure for the Performance of PT IP-427-AE, Rear Face and Rear Tube Chemical Decontamina- tion, 105-C Reactor
--	Unclassified	JH Fastabend	7-13-61	Criteria for NPR Process Tube-to- Nozzle Joint
HW-70713	Secret	WR Moon PB McCarthy	8-3-61	Operational Fueling Facility, KE Reactor Test Data for August 3, 1961 outage
HW-70687	Secret	PB McCarthy PA Carlson	8-28-61	Operation Fueling Facility with Uranium Charges PT IP-429-AK
HW-70228	Secret	ES Grubin	7-17-61	Introducing Air Into the Process Tube During the Charging While Operation Action
--	Unclassified	ES Grubin	8-17-61	Summary Report, Reactor Coolant Flow Monitor Studies

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-70683	Unclassified	DF Arnold R Sherrard	8-9-61	Development Test KP-430-F High Speed Scanner Isolation of Temperature Monitor Power Supplies
HW-69510	Unclassified	WEB Lander	8-1-61	Design Test 1075 - NPR Water Sample Flow Regulator Test Report
HW-70709	Unclassified	WEB Lander	8-11-61	Design Test 1127 - NPR Fuel Canister Functional Test Final Report
HW-70734	Unclassified	JD Maguire	8-16-61	Design Test 1081 - Test of NPR Sealing Plug for Inlet Barrier Wall Penetration Sleeves
HW-70808	Unclassified	JL Rusk	8-21-61	Supplemental Bending Test on 558 and 105-K Nozzles
HW-70785	Unclassified	JD Maguire	8-22-61	Design Test 115 - 105-C Overbore Gas Tube Assembly and Seal Test Final Report
HW-70655	Secret	JL Diechman	8-21-61	Engineering Concept and Study Report, Hi-Speed Scanning Temperature Monitoring System For 105-KW Reactor
HW-70594	Unclassified	PH Hutton	7-31-61	Interim Report, 105-K Gunbarrel Flange Retaining Ring Investigation
--	Unclassified	JH Hoage	7-14-61	Trip Report - To Poison Spring Vendors and Grunwald Plating Co., July 30 - August 6, 1961
--	Unclassified	VG Blanchette	8-21-61	Proposal for 4160 KV Bus Modification - 165 KE/KW

~~SECRET~~
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HW-70952

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-70873	Unclassified	JP Corley HA Kramer	8-28-61	River Water Temperature Forecast Through September 1961
HW-70541	Confidential	RK Robinson	8-22-61	A Preliminary Analysis of Charge-Discharge Cooling Requirements for the NPR During Phase I and II
HW-70128	Secret	FJ Mollerus, Jr.	8-9-61	Process Tube Expansion - 105-C Conversion to Self-Supported Fuel Elements
HW-69755	Secret	JD Agar	8-10-61	CGI-844 Diesel Pump Flow Transients
HW-68503 Supp. 1	Confidential	RK Robinson	8-8-61	Interrelations of Operating Conditions and Steam Pressures for NPR Phase III, Supplement I
HW-70701	Secret	DL Condotta	8-16-61	Reactor Design Analysis Monthly Report - July 1961
HW-70766	Secret	WL Bunch	8-30-61	Diametrical Clearance Considerations for C-Overbore Project
HW-70775	Unclassified	D Marinos	8-17-61	Visit to Enrico Fermi Atomic Power Plant
--	Unclassified	CL Buckner HE Hylbak	7-17-61	Exhibit No. 9 - Taylor Forge and Pile Works Electric-Fusion-Welded Table IV Pipe
--	Unclassified	CL Buckner HE Hylbak	7-21-61	Exhibit No. 11 - Major Weld Repairs
--	Unclassified	CL Buckner HE Hylbak	7-26-61	Exhibit No. 12 - Inspection Points
--	Unclassified	CL Buckner HE Hylbak	7-25-61	Exhibit No. 13 - Welder Qualification, Procedure Qualification, and Filler Material

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-70602	Secret	JR Young	8-1-61	Water Leak Prevention Program

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
HW Heacock	General Electric Co. APED, San Jose, Calif.	8/15-19/61	Discuss assistance to Hanford on C Reactor VSR problem
	Byron Jackson Pumps, Inc. Los Angeles, Calif.		Review performance tests of 1706-KER process pumps
R Sherrard	Epsco-West (Astrodata) Anaheim, California	8/8-11/61	Review work done on high speed scanning design Contract DDR-133
RR Cone	General Electric Co. APED, San Jose, Calif.	8/4-9/61	Review APED initial work for the NPR nuclear instrumentation order
WR Moon	Western Electronics Show and Convention San Francisco, Calif.	8/22-26/61	To attend WESCON Show and interview vendor's representatives for mechanisms required by Operation Fueling Facility, including a possible vendor
JH Fastabend	Atomic Energy Commission Ltd., Deep River Ontario, Canada	8/7-15/61	To witness on-pile rolling of zirconium process tubes and discussion of stress relaxation of rolled joint
JP Cooke JH Greer	Columbia Machine Co. Vancouver, Wash.	8/8/61	To discuss construction of two electro magnets
HA Kramer	Grand Coulee Dam Grand Coulee, Wash.	8/4/61 8/17/61 8/24/61	To measure thermoclines in Lake Roosevelt, the Columbia River and tributaries
JP Corley RT Jaske PH Hutton	The Albrook Hydraulic Laboratory, Washington State University Pullman, Washington	8/23/61	To observe and discuss initial runs on rear-face flow study model

Name	Firm & Location	Date	Purpose
JL Deichman	Epsco-West (Astrodata) Anaheim, California	8/8-11/61	To review progress of Preliminary Design Contract (DDR-133) for Hi-speed Scanning Temperature Monitoring System
FJ Mollerus	AIEE Pacific General Meeting	8/22-24/61	Perform function as Secretary, 9th District Attend appropriate technical sessions
JM Fox, Jr.	General Electric Co. APED, San Jose, Calif.	8/31- 9/1/61	Review experiences on primary piping on the Dresden Reactor
GL Gray	Puget Sound Naval Shipyards, Bremerton, Wash.	8/20-21/61	To investigate inspection and fabrication techniques for the silver braze capillary action tubing joints
GI Henjum	Baldwin-Lima-Hamilton Philadelphia, Pa.	8/8-25/61	To assist in development of welding procedures and supervise welding effort
TR Riggins	" "	8/22- 9/1/61	" "
GT Haugland	Baldwin-Lima-Hamilton Philadelphia, Pa.	8/7-31/61	To give technical assistance on thermal shield fabrication
RB Ryder	Canadian General Elec. Petersboro, Canada	8/7-13/61	To witness the production rolling of process tubes for Chalk River Reactor
JE Stice	Union Machine Co. Seattle, Washington	8/14/61	To determine progress of fabrication of tube sleeves
RC Walker	Enrico Fermi Atomic Power Plant Lagoona Beach, Michigan	8/11/61	Visit requested through AEC-HOO and AEC-COO for the purpose of consultation on current graphite problems
GL Swezea FJ Mollerus	Bailey Meter Company Cleveland, Ohio	8/15-19/61	Task Force Meeting - 109 Instrumentation

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Name	Firm & Location	Date	Purpose
JF Nesbitt	May-Fran Company Cleveland, Ohio	7/26/61	To witness tests being performed on prototype conveyor for the irradiated metal handling system
EM Kratz WJ DOWIS	Bonneville Power Admin. Portland, Oregon	8/17/61	To discuss the alternate source of reactor plant power from the generating plant export lines
J Maruoka	Boulder, Colorado and APED, San Jose, Calif.	8/27- 9/1/61	Attended ASME-AICHE Heat Transfer Conference and conferred on once-through superheat reactor experiments
WJ Love	Bingham Pump Company Portland, Oregon	8/25/61	To discuss 17-4 materials heat treatment
	Boulder, Colorado	8/28/61	Attend ASME Conference on heat transfer
	APED, San Jose, Calif.	9/1/61	To discuss steam water heat transfer and separation tests
WW McIntosh	APED, San Jose, Calif.	8/31- 9/1/61	To review the specifications, the selection of A-E's, fabricators and erectors, and the administration of quality control of primary loop piping by APED as compared to HAPO-NPR.
NT Hildreth WL Stiede	Savannah River Plant Aiken, S. Carolina	8/8-13/61	Discuss reactor nuclear instrumentation and safety circuitry
WR Conley	Bailey Meter Co. Cleveland, Ohio	8/15-19/61	Discuss NPR design
	Enrico Fermi Reactor Monroe, Michigan		Discuss analog computer
FD Robbins	Bonneville Power Admin. Portland, Oregon	8/16-17/61	Discuss NPR electrical system intertie with BPA
SS Jones	Denver, Colorado	8/27-31/61	Attend International Heat Transfer Conference

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VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
JH Gilkey	Ratron, Inc. Van Nuys, Calif.	8/11-12/61	To assist in placing gas chromatographs in service at 105-C and K Areas
WK Henricks	Loe Engineering Co. Altadena, Calif.	8/23/61	To complete the helium purification system initial servicing and instruction
G Jurst J Williams	Gordon Hurst, Inc. San Leandro, Calif.	8/10/61	To discuss the Gordon Hurst, Inc., ball caps as rear tube closures
BA Pearson L Mattson	Norfin, Inc. Seattle, Wash.	8/1-2/61	For acceptance tests of machines procured under Contract DDR-129 for the overboring program
CH Barnard	Bailey Meter Company Cleveland, Ohio	8/11/61	Discussed 109-N instrumentation, reliability concepts, and failure rate data and reliability of standby boiler
HO Nielsen	Cambridge Instrument Co. Cleveland, Ohio	8/21/61	Discussed dissolved gas analyzers
L Schieb R Shustrin W Pitman	AMF Atomics Greenwich, Connecticut	8/15/61	Gave presentation on irradiated metal handling system
HS Blumberg	New York City, N. Y.	8/31- 9/1/61	Consulted on primary piping
J Schneeman	Pico-Rivera, California	8/31- 9/1/61	Consulted on primary piping
AEC	HOO Employees	8/2/61	Reactor familiarization tour
JP Jones	Travelers Ins. Co. Portland, Oregon	8/9/61	Inspection of pressure vessels
CR Holm KW Bergstrom	Cleveland Tramrail N.W. Division of Star Iron & Steel Co. Tacoma, Washington	8/31/61	Inspect 105-H Tramrail and provide technical assistance for same

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