HW--71584

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IRRADIATION PROCESSING DEPARTMENT

MONTHLY REPORT

OCTOBER 1961

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HANFORD ATOMIC PRODUCTS OPERATION

GENERAL ELECTRIC

RICHLAND, WASHINGTON

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HW-71584

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IRRADIATION PROCESSING DEPARTMENT MONTHLY REPORT OCTOBER, 1961

80332

Compiled By
IPD Personnel

November 17, 1961

RICHLAND, WASHINGTON

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

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SUMMARY

RESEARCH AND ENGINEERING

The power levels at all reactors are currently restricted by bulk outlet water temperature limits. The reactivity losses resulting from keeping thin-walled tubes out-of-service pending replacement was reduced by charging many of them with shortened uranium columns.

Nine columns of overbore fuel were discharged from C Reactor at exposures ranging from 766 to 951 MWD/T. One of the columns would not discharge at 5,000 pounds, but discharged successfully after backseating. The tube appeared sound upon leak-testing, but was left empty pending examination by borescope. The fuel is currently being examined.

As a result of increased P-32 activity in KW Reactor effluent, possibly associated with the reduction of process water pH at that plant, changes in alum feed rate have been explored. A test using low pH process water at KE Reactor also was initiated; after three weeks no unusual increase in P-32 concentration has been apparent. The general increase in P-32 concentration at all plants is attributed primarily to an increase in phosphate concentration in the river water.

Irradiation of N-size inner tubes at the 1706 KE-KER facility continued without incident. Of the seven 17-inch NIE1 elements in KER-1, five have reached an average exposure of 2180 MWD/T (including two with capped jacket defects for failure testing in PRTR); the others, also with capped jacket defects, have reached 1040 MWD/T. The five 23-inch NIE1 elements in KER-2 which are scheduled for a long-term irradiation have reached an exposure of 420 MWD/T. A black oxide film was observed on the exterior surface of the Zircaloy-2 tube removed from KER-3 last August and samples have been submitted to the Radiometallurgy Laboratory for further examination and analysis of the film.

MANUFACTURING

Production

Reactor input production (MWD) was 1.1 per cent above forecast; 3.3 per cent below at the six old reactors and 6.7 per cent above at the K's.

Over-all time operated efficiency was 75.9 per cent (78.4 per cent forecast); 72.8 per cent at the six old reactors and 85.2 at the K's. Efficiency was low at the old reactors due to process tube water leaks and fuel element ruptures.

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

Eleven ruptures, eight I&E enriched metal and three I&E regular, were removed from the reactors. Five of the enriched ruptures were at DR, two at C and one at H. Two regular metal ruptures were at F and one at D. Two of the enriched ruptures were caused by charging machine damage.

Engineering

The Water Leak Task Force concluded its responsibilities by issuing recommendations for action to each of the concerned component managers. A Design Change was approved and issued to cover renovation of moisture monitor (Dewcel) systems.

FACILITIES ENGINEERING

Studies of the problem of graphite distortion at 105-C Reactor progressed with:

(1) A television traverse and displacement measurements of No. 47 VSR channel, and horizontal and vertical traverses of four process tubes.

(2) Adaption of a broach for trial on one vertical rod channel.

(3) Negotiation of a contract with the General Engineering Laboratory to conduct graphite distortion studies.

Two refueling cycles with aluminum dummy fuel elements were complete during equilibruim operations at 105-KE Reactor.

A specially adapted 2-1/2 inch television camera was used to examine one VSR channel at 105-DR Reactor and one at 105-C Reactor. This device permits remote viewing of the conditions within the channels from locations such as the Reactor Control Rooms.

Noise level measurements made in the 190-C and both 190-KE and KW pump rooms and the 165-KE and KW control rooms, following the completion of sound absorbent material on MJA-28, indicate a reduction of from 50-80 per cent in acoustic energy at these locations.

All Reactor Confinement project halogen filters have been installed and beneficial use of the ventilation systems was obtained October 20.

Work on Project CGI-839 (Modification of Fuel Element Test Facilities - 1706-KER) has progressed on schedule since the delay caused by the absence of construction workers early in September.

Recommendations have been made by the Haughton Elevator Company to double the allowable load on the charge platforms at 105-B, D, DR, F, and H Reactors and to increase the allowable load by 33 per cent at 105-C.

NPR PROJECT

ATH arrangements with General Engineering Laboratory are complete for a technical appraisal of the entire NPR heat removal system.

Studies are under way to predict cobalt content and the associated radioactivity in the primary loop during operation.

Preparation of Title III tests and ATP's for the primary and secondary loop is proceeding.

The AMF discharge conveyor for fuel element handling is undergoing test.

Investigations have been conducted to determine potential damage to components as a result of heat treating full-size connector assemblies.

A test batch of ceramic balls containing samarium oxide has indicated acceptable nuclear properties.

Prototypical tests on flow monitoring components have demonstrated an acceptable transducer.

Machining of all auxiliary graphite moderator details is now essentially complete and fabrication of spares is now underway.

A total of 1,014 zirconium process tubes has been delivered and 840 have been prepared and accepted for installation. Vacu-Blast equipment is now in operation for the ID blasting of the zirconium tubes. Malfunction of this equipment was the cause of the one reject tube because of failure of the drive mechanism. The equipment has been modified to preclude future difficulties of this nature.

At the request of the AEC, Field Engineering assumed technical direction of the qualification of two welders and a procedure for brazing copper tubing joints. This work has now been completed.

Except for piping, general progress of the construction of area facilities is proceeding satisfactorily.

GENERAL

RESPONSIBILITY

W. J. Ferguson, Manager - C Processing Operation was appointed Manager - B-C Reactor Operation, effective October 2, 1961.

R. E. Dunn transferred from HLO to Manager - C Processing Operation, effective October 23, 1961.

R. F. Corlett was appointed Manager - KW Processing Operation, effective October 2, 1961.

FORCE SUMMARY

	Exempt	Non-Exempt	Total
General	7	1	8
Research and Engineering	109	59	168
Manufacturing	412	1359	1771
Facilities Engineering	125	42	167
NPR Project	101	36	137
Financial	19	13	32
Employee Relations	2	3	5
TOTAL	775	1513	2288

SAFETY, SECURITY AND RADIATION EXPERIENCE

There were 76 medical treatment injuries, three security violations, and no disabling injuries or radiation exposures exceeding operational control.

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.

Name	Date	Title
John W. McLaughlin	8-28-61	Die Forming Tool for Sweat Tubing Fittings to Meet ASME Code Section IX
Michael Pociluyko	10-6-61	Bellows Flange Puller (HWIR-1425)

A B Greninger
General Manager

AB Greninger:OCS:kn

RESEARCH AND ENGINEERING

PROCESS AND REACTOR DEVELOPMENT

REACTOR FUELS

Present Reactor Technology

Overbore Fuel Development

Nine columns of overbore-size fuel elements were discharged, and eight new columns charged. Forces up to 4000 pounds were required to discharge eight of the columns. Normal charging forces on these heavy fuel elements ran as high as 3000 pounds.

Tube #4484-C would not discharge with 5000 pounds force applied from the front. Four thousand pounds applied from the rear, followed by 4200 pounds from the front were required to discharge this tube. The tube was leak-tested, found not to leak, and left empty pending a visual examination of its internal surface with the Boroscope.

Fuel exposures in the nine tubes discharged ranged from 766 to 951 MWD/T. The fuel elements are being examined at the 105-C MEF.

Self-Supported Fuel Development

Two columns of KVN-S fuel elements charged into smooth-bore Zr-2 process tubes on 8-14-61 reached an average exposure of about 400 MWD/T on 10-20-61.

Bumper Fuel Development

Ten columns of KIVN-B fuel elements charged into KW Reactor on 6-27-61 reached an estimated exposure of 800 MWD/T on 10-20-61. Scheduled goal exposure is 1200 MWD/T.

Twenty-six columns of OIIIN-B fuel charged into D Reactor on 8-6-61 as part of the UT-2 Fuel Core Tester evaluation have reached an estimated exposure of 470 MWD/T.

To date, 1660 tubes of bumper fuel elements have been irradiated and discharged from D Reactor; 1550 tubes (both natural and enriched) are currently under irradiation.

Nickel Plated Fuel Program

Seventy columns of nickel plated OIIN fuel elements charged into DR Reactor during the 9-5-61 outage have reached an exposure of about 300 MWD/T.

Coextruded I&E Fuel

Six columns of coextruded I&E fuel elements charged into KW Reactor on 8-14-61 have reached an estimated exposure of 530 MWD/T.

STATUS REPORT OF PRODUCTION TESTS

Test No.	Type Metal	Tubes	Reactor	Goal Exposure	Current Exposure	Remarks
IP-183-A	K size bumper fuel. KIVN-B	10	KW	1200 MWD/T	800 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 6-27-61.
IP-216-A	Normal prod. natural and enriched fuel elements	96	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-225-A	Solid black Li-Al	7	H	2 yrs.	24 mo.	Provides for long term irradiation of solid black Li-Al for conversion ratio, and fuel performance determination.
IP-263-A Supp. A	Nickel-plated OIIN fuel	70	DR	Twice normal variable goal	300 MWD/T	Demonstrate on a pilot scale that satisfactory nickel plate adhesion has been attained and that reducing nominal plate thickness from .6 mil to .2 mil does not affect this parameter. Seventy columns were charged into DR Reactor on 9-5-61.
IP-272-A	CIVN geometry I&E self-supported fuel	69	C	Variable +200		Provides for testing of CIVN geometry fuel in C Reactor ribless zirconium tubes.
IP-310-A	OIIINB three-rail bumper in new new tubes	26	D	Variable	470 MWD/T	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.

Test No.	Type Metal	Tubes	Reactor	Goal Exposure	Current Exposure	Remarks
IP-381-A & IP-431-A	CVIN geometry I&E overbore-size fuel		C	800 MWD/T		Provide preliminary qualitative data regarding irradiation behavior or larger fuel element designs. PT-431-A expands the test facility up to 65 tubes. Nine tubes discharged on 10-12-61.
	a)CVINS	40				
	b)CVINB	2				
IP-377-A	Five 17-inch NIE1 elements, two with capped jacket defects	1	KE	2000 MWD/T	2180 MWD/T	KER-1 charged 5-28-61, with five NIE1 elements
	Two 17-inch NIE1 elements with capped jacket defects				1040 MWD/T	Two NIE1 elements added to charge 7-19-61.
	Five 23-inch NIE1 elements	1	KE	3000 MWD/T	420 MWD/T	Elements charged in KER-2 on 9-17-61 for high exposure test.
IP-397-A	Zircaloy clad enriched I&E fuel elements	6	KW	Variable	530 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-402-A	1.6% enriched Zr-2 jacketed rod samples in capsules	3	DR	2000 MWD/T	100 MWD/T	Test discharged with failure after about three days of operation
IP-409-A	KVNS geometry I&E self-supported fuel in K Reactor	2	KW	800 MWD/T	400 MWD/T	Provide qualitative data to confirm the fuel geometry design.

Advanced Reactor Technology

N Reactor Fuel Development

Three seventeen-inch NIE1 elements and two seventeen-inch NIE1 elements with capped jacket defects for failure testing in the PRTR rupture loop have been irradiated in KER-1 to an average exposure of 2180 MWD/T. Two more seventeen-inch NIE1 elements with capped jacket defects added to the charge on July 19, 1961, have reached an exposure of 1040 MWD/T.

KER-2 was charged on September 17, 1961, with five twenty-three inch NIE1 elements for a long-term irradiation. These elements have an exposure of 420 MWD/T.

Twenty-one capsules containing Zr-2 jacketed rod samples for the evaluation of the effect of jacket thickness and uniformity on localized jacket straining were charged in three process tubes in DR Reactor on 10-2-61. A failure occurred in one of the capsules on 10-6-61, and the test was discharged. Examination of the failure capsule showed that the failure was caused by inadequate coolant flow to the capsule. Cause of the limited flow to the capsule has not yet been determined.

Nomenclature: (NIE1 - NPR sized inner tubes - enriched uranium)

REACTOR ENGINEERING

Present Reactor Technology

Zircaloy-2 Process Tube Procurement

A final report has been received from Tube Reducing Corporation, describing the results of their development contract (DDR-122) to resize C-Reactor smooth-bore tubes for use in the K Reactors. Tube Reducing Corporation has developed a method to resize the tubes, in two steps, on the elongator. There are now 216, C-size, Zircaloy-2 tubes in inventory that can be resized.

Two of the thirty-eight, C-Overbore, Zircaloy-2 process tubes received from Reactive Metals Incorporated, under contract AT (45-1)1591, failed to pass either ID or OD tests during on-site inspection.

Advanced Reactor Technology

KER Tubes

Visual examination of the exterior surface of the Zircaloy-2 process tube removed on August 9, 1961 from KER Loop-3 revealed that a black oxide film was formed while the tube was in-reactor. The tube was sectioned in the 105-KE basin and samples provided to Radiometallurgy for further examination. Visual, in-cell examination of the samples confirms the presence of the oxide film. The grain structure of the sample has not permitted a conclusive determination of hydride concentration by metallographic techniques. The samples are to be anodized for better resolution in the determination of hydride concentration.

Technical Bases for Standards

Forty-five technical bases have been completed in rough draft form. This represents about 27 percent of the known bases requirements.

NPR Hazards Review

Rough drafts of seven sections of the Hazards Review, Volume I, have been completed. The remaining four sections are in an advanced state of preparation. One appendix (for Volume II) has been completed in rough draft form; the other six appendices are in various stages of completion.

Carbon Steel Piping

A section of 14-inch, schedule-100, carbon-steel pipe was removed from the large pump test loop in the 314 Building for inspection. This loop had been operated intermittently for about 2.7 years at temperatures and pressures comparable to NPR operating conditions using demineralized water and hydrazine for oxygen control. No special precautions were taken during pump changes to prevent oxygen entering the system through the free water surface. Infrequent lapses of water quality control occurred during the operating period.

The pipe appeared to be undamaged, beyond a general metal discoloration and deposits of powdery red-brown iron oxide at crevices near flanges and fittings. No pitting was observed. The machining ridges on the ID of flange fittings were clean, regular and smooth.

REACTOR PHYSICS

Present Reactor Technology

Spline Poison Assurance

The initial PCTR measurements for the spline sections in the K lattice are completed. Irradiation Testing will irradiate four of the spline sections in a K Reactor test hole. Each spline section will receive a different exposure. The reactivity of irradiated spline sections will be measured in the PCTR with a K lattice. The results of these measurements will give a curve of spline reactivity as a function of exposure.

Safety Circuit Reliability Study

Operations Research has continued work on reliability calculations of coincidence circuits represented by the Beckman flux monitor two-out-of-four logic. A new method of mathematical analysis that promises to be a significant contribution to the solution of reliability problems has been developed for this problem.

E-N Load

Discharge of the first E-N core was completed on September 25. Discharging difficulties resulted in some intermingling of the desired four separate

batches. As much data as possible will be reclaimed. Original planning of the E-N test was for the majority of the yield data to be acquired from the second core loading. Data were to be obtained from the first core loading as a backup and to permit earlier verification of E-N incentives. Difficulties with the first core will require special efforts to insure the procurement of adequate data from the second loading.

Advanced Reactor Technology

Ceramic Balls for NPR

A sample of the pilot order for NPR ceramic balls was compared in the HTR to previously measured samples. The test results showed that the poison strength of these balls is about one percent higher than required to match one percent boron-steel balls, and the samarium oxide concentration is probably about .394 grams/cc.

Ball 3X Control Strength

Preliminary results of the exponential pile testing of a single column of NPR ceramic balls are now available. The measured strength of a single-ball column in the exponential assembly is 65 - 72 μb. This compares to a theoretical value between 54 - 59 μb. Using the same calculational techniques, the full-pile strength of the Ball 3X system for one-percent boron-steel balls or equivalent is between 6.8 - 9.3 % k. The exponential pile values for samarium oxide ceramic balls then convert to a value between 7.5 - 10 % k for the full-pile strength. It then appears that the NPR ceramic balls will be slightly stronger than predicted and will satisfy all NPR control requirements.

Xenon Oscillations

Work is now in progress on the spatial instability inside a reactor which is caused by the delayed effect of the xenon poisoning. A number of theoretical presentations have been given of this effect, and the purpose of the present study will be to simplify the calculations and extend the results to the Hanford lattices. Particular emphasis will be given to discussing the problems to be faced at NPR.

RADIOLOGICAL ENGINEERING

The following table summarizes the radiation exposure experience of critical IPD classifications for the first 40 weeks of the 1961 badge year:

Classification	Total Dose	No. of Employees	Average Dose/ Emplcyee	Extrapolated Year End Average	No. of Employees Over 3r (Extrapolated Exposure)
Radiation Monitors	174729 mr	81	2157 mr	2804 mr	16
Processing Operators	477586	252	1895	2463	15
Pipefitters	162380	91	1784	2319	8
Millwrights	128927	76	1696	2204	5

Lapse of Radiation Control

Lapse of Radiation Control
Distribution by Reactor and Component

	B	C	D	DR	F	H	KE	KW	IPD Totals
Processing	1	0	0	0	0	0	0	1	2
Maintenance	1	0	1	0	1	2	0	0	5
Supplemental Crews	1	0	0	0	0	0	0	0	1
Power	0	0	0	0	0	0	0	0	0
Research and Engineering	0	0	0	0	0	0	0	0	0
Facilities Engineering	0	0	0	0	0	0	0	0	0
Central Maintenance	0	0	0	0	1	0	0	0	1
Reactor Areas	0	0	0	0	0	0	0	0	0
Assigned Totals	3	0	1	0	2	2	0	1	9

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 September 1961. Concentrations are in units of 10^{-12} curies/cc.

Reactor	As^{76}	P^{32}	Zn^{65}	Np^{239}	Cr^{51}
B	64	5.5	14	82	390
C	55	4.9	22	56	390
D	66	5.8	27	100	970
DR	81	4.3	17	90	670
F	55	10.9	29	*	*
H	52	5.1	9	63	240
KE	50	4.7	12	55	400
KW	75	12.3	13	70	280

*No valid results

Changes were made in the alum feed rate at KW in an attempt to reduce the concentration of P^{32} which had been higher than that experienced during the same period of 1960. Instead of attempting a fixed feed rate, the objective in water treatment was set at producing water with minimum turbidity. This resulted in a reduction in alum feed rate and produced an increase in the P^{32} concentration in the effluent water. A step-wise increase in alum feed concentration was then begun and is still continuing.

KW Reactor has been feeding low pH (6.6) process water under a production test to reduce process tube corrosion. A similar test was recently initiated at KE Reactor. Although the P^{32} activity from KW remains higher than that

observed in the other reactors, a similar increase has not been apparent three weeks after the initiation of low pH at KE.

The general increase in P^{32} concentrations is attributed to an increase in phosphate concentration in the river water and to occasional difficulties with bauxite-feed equipment. Operational difficulty with bauxite-feed equipment is to be expected while experience in operation is being obtained and equipment faults corrected. The phosphate concentration in river water increased from a low in mid-July of 0.024 ppm to a high in late August of 0.070 ppm. The concentration of phosphate remained constant at 0.070 ppm until the last week in September, then it dropped to 0.050 ppm.

DECLASSIFIED

PROCESS TECHNOLOGY OPERATION

REACTOR POWER LEVEL LIMITATIONS

During this report period the power levels at all reactors were restricted by bulk outlet temperature limits.

PROCESS STANDARDS

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

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

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

Specifications and actions following horizontal rod water loss during reactor operation were established for higher graphite temperatures and process tube powers.

Continued reactor operation following indication of water loss to a rod has been limited to 10 seconds to determine whether the rod-water-failure warning signal is spurious or real. If real, a manual scram is required. The revised standard also required immediate horizontal rod withdrawal, following the reactor scram, of any rod or rods which have lost their coolant supply.

Scram recoveries are not permitted following water loss to more than one horizontal control rod since such a situation presents numerous problems requiring thorough evaluation before resuming operation. The revision specifies as an added precaution that the flux monitors be constantly monitored and that the reactor physicist be consulted before ball 3X hopper lockout, whenever horizontal control rods are withdrawn before the vertical rods (as is done when rod coolant is lost).

Process Standard C-090 - "Number of Inoperable Rods and Ball 3X Hoppers During Reactor Operation"

Total control and speed-of-control calculations have been reviewed for all reactors. As a result of this work, revised limitations for some reactors were placed upon the number of vertical rods and ball 3X hoppers that may be locked out. In addition, poison substitution must be made for each ball channel out of service, and no adjacent ball 3X channels are permitted to be locked out during operation.

HW-46000 H - Process Standards - Reactor

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

Process Standard C-040 - "Graphite Temperature Limits"

Thermocouple stringer temperature monitoring specifications for the graphite

stack were established when many filler-block thermocouples were still serviceable. The number of required thermocouple stringers was increased, in the revised standard, to replace the failing filler-block thermocouples.

Process Standard C-090 - "Number of Inoperable Rods and Ball 3X Hoppers During Reactor Operation"

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

HW-46000 K - Process Standards - Reactor

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

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

Revisions to this standard are essentially the same as those made for HW-46000 B, above.

PROCESS CHANGE AUTHORIZATIONS

The number of process change authorizations issued during the month was nine to permit temporary deviation from Process Standards - Reactor, HW-46000; two to permit temporary deviation from Process Equipment Standard, HW-41000; and four to permit temporary deviation from Water Plant Standards, HW-27155 Rev1. The process change authorizations were:

PCA #1-67 - "Ball 3X Testing - K Reactors"

Process Standard C-110 specifies the operability of the ball 3X system be tested annually. Numerous cracks and voids in the graphite moderator retain an unacceptable number of balls when they are dropped into the ball channels; therefore, revised testing methods have been approved where ball introduction to the graphite stack is unnecessary.

This PCA authorizes postponing completion of ball 3X hopper testing until February 22, 1962, provided the calculated ball 3X system strength be diminished for purposes of total control calculation, if a specified number of hoppers are not successfully tested during the period of the PCA.

PCA #1-68 - "Ball 3X Testing - C Reactor"

Ball 3X hopper testing requirements have not been met at C Reactor due to work on clearing VSR channels and the overbore program which utilized some components of the ball 3X testing equipment. The PCA authorized temporary relaxation of the testing requirements. The PCA is essentially identical to PCA #1-67 for K Reactors.

PCA #1-69 - "Flow During Reactor Shutdown - F Reactor"

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

During the month, after two hours of operation, F Reactor was shut down to remove a stuck poison piece from the front nozzle of a PCCF tube which could not be removed without crossheader throttling. Since throttling is authorized during poison outages which follow a short operating period, throttling was justified in this similar case where the reactor had operated at less than 50 per cent of the normal power level for approximately two hours.

Special procedural requirements were specified in the PCA.

PCA #1-70 - "Water Shutoff Times - C, D, F, and K Reactors"

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

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

This PCA will expire on January 31, 1962, or on revision of the referenced standard, whichever is sooner.

PCA #1-71 - "Export Line Backup - B, D, F, and H Reactors"

Water Plant Standard 190-B-070 specifies that in the event of electrical power failure in B, D, F, or H Areas, a steam pump shall be placed on the export system within ten minutes and in the area where the power outage occurred. A further requirement of this standard stipulates that only one area's surge suppressors may be isolated from the export system at one time. Draining of the export system at a reactor constitutes surge suppressor removal at that reactor. During the completion of Design Change #497 (Interchange of Export Pumps at B and F Reactors), it will be necessary to drain the export header at F Reactor twice and the export header at B Reactor once. During these intervals the first requirement of 190-B-070 cannot be met.

Due to the remote possibility of an extended loss of BPA power at B, D, F, and H Areas concurrent with loss of steam at one of the three areas which have their steam turbines in service, continued operation at the reactors where backup adequacy is affected is believed justified. Detailed requirements for continued operation of B, C, D, DR, and H Reactors during the outage of the B and F Area's export systems were provided by the PCA.

PCA #1-72 - "Zone Temperature Monitor - B Reactor"

Process Standard C-050 specifies that ten resistance temperature detectors (RTD's) may be inoperable prior to reactor startup.

At B Reactor, in recent months, the failure rate of resistance temperature detectors has averaged four to five per month due to corrosion of connector pins. At reactor startup time, 16 RTD's were inoperable and approximately ten outage hours would have been required for repairs.

Authorization was given to operate with 16 faulty RTD's until September 27, 1961, since six faulty RTD's would not significantly further reduce the systems' effectiveness.

PCA #1-73 - "Removal of Backup Coolant to KER Loop During Reactor Shutdown - KE Reactor"

In order to obtain the increased emergency coolant flow provided by Project CGI-839, it is necessary to modify existing components in the backup system. This will require removal of the backup system during one or more reactor outages.

This process change authorizes removal of process water backup to KER 1 and 2, two hours after reactor shutdown, and contains the auxiliary specifications under which the backup may be removed. The PCA will expire following completion of backup system modifications or January 2, 1962, whichever occurs first.

PCA #1-74 - "C Work Platform Control Circuit, H Reactor"

Process Standard D-050 specifies that during reactor operation an electrical or mechanical device shall be in service that is designed to prevent work platform movement until obstructions with the process tube pattern are cleared. This device, a photocell interlock, at H Reactor, failed during reactor startup on October 1, 1961. At this time, continued use of the front work platform was necessary to complete PCCF and spline work for reactivity adjustments. Procedural controls can be utilized to provide the desired protection against accidental breakage of front face nozzles on water piping.

This PCA authorized for one day continued use of the front work platform at H Reactor with the photocell interlock out of service provided the rigorous procedural controls specified in the PCA were observed.

PCA #1-75 - "C Work Platform Control Circuit, DR Reactor"

The requirements and circumstances of this PCA are similar to PCA #1-74 above, for H Reactor.

A new "C" work platform obstruction-scanning device which will not be completed until December of 1961 is presently being installed at DR Reactor. This PCA authorizes operation without a C work platform obstruction-interlock until December 29, 1961, or until completion of the scanning installation, whichever is sooner.

PCA #1-76 - "Horizontal Bowing Measurement - B 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. Recent traverses have been incomplete due to equipment limitations in severely bowed graphite channels.

Authorization was given to delay until October 31, 1961, taking these data to allow necessary modifications to be made to newly developed traversing equipment.

PROCESS ASSISTANCE

One engineer audited conformance to process standards by making 14 inspections at each reactor during the report period.

RUPTURE EXPERIENCE

Failure Date	Tube Number	Lot Number	Type of Material	MWD/T Exposure	Type of Failure
10/5/61	1978-H	KY-057-D	I&E EB (0.94%)	109	Mechanical Damage
10/10/61	3985-DR	KY-029-A	I&E E (0.94%)	582	Side Hot-Spot
10/10/61	2762-D	KZ-024-B	I&E NB	758	Hole
10/12/61	2576-C	KC-081-A	I&E E (0.94%)	230	Side Hot-Spot
10/15/61	1460-DR	KY-096-A	I&E E (0.94%)	285	Mechanical Damage
10/20/61	2658-DR	KY-006-A	I&E E (0.94%)	498	Side-Other
10/23/61	4173-DR	KY-056-D	I&E EB (0.94%)	1017	Hole
10/26/61	2271-C	KC-081-A	I&E E (0.94%)	386	Side Hot-Spot
10/27/61	2987-DR	KY-096-A	I&E E (0.94%)	389	Side-Other
10/29/61	2377-F	HZ-046-B	I&E N	274	Split-Transverse
10/31/61	2369-F	PZ-019-H	I&E N	337	Split-Transverse

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.

Mechanical Damage - Failure probably caused by mechanical damage to the fuel element prior to irradiation.

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

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

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

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

Split-Transverse - Failure caused by uranium cleavage across or at an angle to the axis of the core.

DECLASSIFIED

OPERATIONAL PHYSICS OPERATION

PILE PHYSICS ASSISTANCE

The successful operation with the modified inboard rod pattern at KE Reactor was particularly significant in demonstrating that poison splines and control rods could be used to complement each other in maintaining a stable flux distribution during a period of very high distributional flux cycling potential.

The high outage frequency and increased number of thin-walled tubes maintained out of service limited flattening efficiency. The cost in reactivity of maintaining thin-walled tubes out of service pending replacement was reduced markedly by charging many of these tubes with shortened uranium columns thus nearly eliminating further corrosion while maintaining the majority of the reactivity and power contribution of a full column of uranium.

Malfunction of the automatic temperature data transcriber (Flexowriter) at several reactors continued to cause relatively small but frequent production losses. With the Flexowriter out of service initial startup levels must be restricted until the detailed tube temperature distributions can be determined by less efficient means.

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

Reactor	B	C	D	DR	F	H	KE	KW
ECT in October (1)	1495	1645	1465	1485	1470	1490	2570	2505
12-Month Average ECT	1505	1695	1495	1510	1455	1550	2540	2555
Equil. Scram Time (2)	14-16	30-35	14-16	15-18	14-20	45-55	20-25*	20-25*
No. of Scrams and	0/0	0/0	0/0	3/3	1/1	1/1	1/1	1/1
Recoveries (3)	0/0	0/0	1/1	0/0	0/0	0/0	0/0	0/0
No. of Non-Scram Outages (4)	5/0	2/0	4/0	6/0	3/0	4/0	3/0	0/0
Recording Period -								
From:	9-21	9-20	9-25	9-23	9-22	9-21	9-22	9-21
To:	10-20	10-20	10-17	10-23	10-23	10-20	10-23	10-21

*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.

B Reactor - J. H Ferguson

Operating continuity was interrupted by five outages for water leaks. The relatively short operating periods together with several thin-walled tubes, which were either out of service or charged with short columns of uranium, resulted in lower than normal flattening efficiencies. Average non-equilibrium losses for the five startups was maintained at 0.21 equivalent day per startup.

C Reactor - D. E. Newbrough

The combination of operating with the first third of the uranium charges moved two feet downstream (see September's report) and the compensating change to rear control rods resulted in transitional control problems which limited operating efficiency. Nonequilibrium losses averaged nearly 0.6 equivalent day for the two startups during the report period; flattening efficiency as measured by ECT fell to three per cent below the previous 12-month average although the power level continued to be limited by bulk effluent temperatures. With the completion of the charge displacement in about one or two months these control problems should be corrected.

Two enriched fuel element ruptures upstream of the center of the reactor and in tubes located in and adjacent to the dismantled "operational charge-discharge" zone, where splines cannot be inserted, could be partially the result of moderate upstream peaking during this first portion of the charge displacement. To reduce the peaking in this zone the number 8 control rod (central rod) was substituted as the longer control rod for the number 7 rod (downstream rod) in the "operational charge-discharge" zone until the charge transition nears completion.

Flux traverses obtained from spline traversing in regular tubes adjacent to overbored tubes have shown negligible flux peaking and that the maximum specific power in the overbored tubes has not been exceeding 110 kw/ft.

D Reactor - D. W. Constable

The average nonequilibrium loss increased to approximately 0.4 equivalent day as a result of flux distortions from water in the lattice following two startups. Flattening efficiency was reduced slightly and the enrichment inventory was increased a limited amount to compensate for nonfissionable or shortened uranium charges in nearly 30 thin-walled tubes. One hot startup was successful following a scram from equilibrium conditions.

DR Reactor - J. W. Hagan

The possible reactivity gains from burnout of the boron in the residual 3X balls was masked by rapid long-term reactivity gains and frequent outages during the report period. A more exact evaluation of the boron burnout will

be possible just prior to the next block discharge which is scheduled for December.

An analysis of the radial tube power distribution has not indicated where any significant concentration of 3X balls might be located. At higher exposures when more reactivity is available extensive longitudinal traverses are planned using poisonous splines to determine if flux depressions can be located which might indicate significant concentrations of the balls. Only very short operating periods were achieved due to six full term outages, four of which resulted from ruptures.

F Reactor - R. B. Heiple

Operation was relatively good with only two outages occurring to interrupt continuity, one of which was to correct a water leak and the other was scheduled. Average nonequilibrium losses were maintained at less than 0.2 equivalent day and the flattening efficiency remained high.

H Reactor - L. L. Grumme

Operating continuity was limited by four outages; two for water leaks, one for a rupture, and one for a scheduled outage to complete charging of the second cycle of the E-N stripe loading. The reactivity status following charging of the second E-N cycle has not been clear because of the residual water which has been left in the reactor during startups. However, as during the first cycle, the normally expected initial cold reactivity loss attributed to samarium buildup was not apparent.

The PCCF facility did not function properly during the report period which limited startup and flattening efficiency slightly; however nonequilibrium losses continued to average about 0.2 equivalent day.

KE Reactor - A. R. Kosmata

A stable flux distribution with the new upstream inboard rod pattern was maintained despite very high fuel exposures during one operating period. Effective control flexibility utilizing previously inserted splines was achieved by sliding the spline back and forth in the reactor on a semi-continuous basis to compensate for the significant front-to-rear flux cycling tendencies. Although the control was significantly more sensitive than with the outboard pattern the performance during this critical period fairly well established the feasibility of control with the inboard configuration. Flattening efficiency was high and nonequilibrium losses continued to average less than 0.3 equivalent day although they were somewhat higher than previous record performances primarily due to the high exposure status of the reactor.

KW Reactor - R. A. Chitwood

Operation was continuous from September 24 to the end of the report period. Minor sticking problems were experienced with four HCR's, some of which could have resulted from balls left in the reactor following functional

testing of two ball 3X channels late in September. Charging of mixer elements to reduce corrosion was initiated; the calculated reactivity loss for the full pile load of mixers in the twelfth fuel element position, which was equivalent to 25-30 enrichment columns, appeared to be substantially correct.

PROCESS PHYSICS STUDIES

Safety Control Studies

Based on results from the matching experiment between poison splines and enriched fuel elements in the Hanford Test Pile the compensating effectiveness of one spline was increased from 1.9 to 2.25 enriched columns in the older reactor lattice and to 2.0 enriched columns in the K Reactor lattice; these new values are conservative by at least ten per cent.

An analysis of the H Reactor reactivity status, considering the greater reactivity of the dry E-N lattice than a dry natural uranium lattice, showed that the normal safety system control strength is adequate for most outages but that in the xenon-free pile supplemental control was necessary to augment either the VSR's or the Ball 3X system with the former 19.37 to 1 length ratio of E to N. However, with the present 18.14 to 1 ratio the Ball 3X system is adequate and supplemental poison is only necessary when the 3X system is locked out leaving the VSR's and HCR's for control.

A determination of the total control aspects of moving the enrichment outside the vertical control zone on the near and far sides of the nine-control-rod reactors revealed that it was conservative but not unduly restrictive to consider this same amount of enrichment as being just inside the control zone in determining supplemental control requirements.

Pile Reactivity Studies

Recent test results and theoretical calculations of the NPR ball system indicated a control strength of approximately 80 mk which system strength will be fully adequate to satisfy postulated control requirements.

Results of the feasibility test carried out in the 300 Area NPR mock-up for determining stack purity showed that this technique should positively detect any lumped poison of greater than 0.05 mk reactivity value to the reactor. This sensitivity will be fully satisfactory.

Control Efficiency Studies

Specifications have been tentatively proposed for half-strength and partial-poison-length splines. Initial theoretical studies indicate that the rupture potential with the proposed splines should be less than for tubes with no splines; i.e., the poison effect of the splines should offset the flow reduction. Yet to be demonstrated before the weaker spline specification can be frozen is that the leakage problem between the spline and seal with narrower splines can be resolved.

Although the reactivity status was clouded by numerous water leaks both the hot and cold reactivity of the second cycle modified E-N loading at H Reactor

appeared to be six to eight mk lower than with the greater E-to-N ratio of the first cycle. This result is consistent with previous theoretical determinations.

An acceptable but informal design was received for the magnetic amplifier circuits for the prototype automatic control system. The order for the equipment will be placed as soon as the acceptable design details have been received from the manufacturer.

Shielding Studies

A fortran program (TEC 350) has been completed to routinely calculate, from input temperature gas composition, and power level data, the temperature and accumulated deterioration of each layer of the masonite shield of the resulting changes in radiation leakage through the biological shields.

The variation of local thermal shield temperature as a function of flow in adjacent thermal shield cooling tubes was measured for the H Reactor bottom shield; the results were reported in HW-66130. Further testing in various shield locations will be required before the results can be accurately extrapolated to other shield positions or to other reactors.

Reactor Fundamentals Training

The teaching machine demonstrations received very favorable response from operating groups for this type of presentation. Several operating malfunctions limited the full-time use of the machine; however, a newer and improved model was received and placed in service to continue the scheduled one-week demonstrations at each reactor plant.

TESTING OPERATION

IRRADIATION TESTING OPERATION

DR-1 Gas Loop

The DR-1 Gas Loop was operated continuously throughout the report period with the exception of 37.7 hours during reactor outages. Reference conditions were maintained on the test element for 336 hours. The total time at test reference conditions is now 3463 hours, with 2870 hours at 1500 F, 97 hours at 1550 F, 146 hours at 1600 F, 122 hours at 1650 F, and 228 hours at 1700 F. The test element was cycled six times from reference conditions to ambient temperature for a total of 29 cycles.

The DR-1 Gas Loop initiated a reactor scram when power to the primary coolant circulator was interrupted by a brush failure on the No. 2 motor-generator set.

H-1 Loop

Modifications to the H-1 Loop were started in preparation for the planned non-fueled corrosion and crud buildup tests. Installation of three renovated KER pumps was started.

Defected UO_2 Test

A four per cent enriched, defected UO_2 fuel element was charged into test channel 4268 KE Reactor for the study of zircaloy hydriding.

Borescoping Activities

Horizontal Rod Channel 8, KW Reactor -The channel was examined to determine why the control rod would not enter all the way. The rod was rubbing the filler layers in the top of the channel from 12 feet in to 40 feet in. There was considerable graphite powder in the track and three balls at 40 feet in and some pieces of broken graphite at the end of the channel.

Process Channel 2658, DR Reactor - The channel was examined to determine its condition prior to broaching. There were the usual block separations and cracked tube blocks, but nothing unusual was noted.

Sub-Critical Monitor Tube, "A" Test Hole, D Reactor - The tube was examined to determine why the traveling screw contained in it was sticking. Borescoping disclosed a large amount of film and metal shavings in the tube.

Sample Irradiations

The following irradiation samples were handled:

Reactor	Test Hole	Facility	Request No.	No. of Samples	Material-Purpose
KE	2D	Quickie	HAPO-184	12	Washington designated program
DR		PCCF	HAPO-218	1	Natural uranium (fission product release study)
KE	2B	Magazine	HAPO-119	34	Graphite (damage study)
H		Process Channel	HAPO-098	15	Graphite (burnout rate study)
KE	2D	Quickie	U of W-104	1	Yttrium (isotope production)
F	E	Quickie	HAPO-223	2	Aluminum-nickel and silver (radioactive buildup and decay study for H-1 discharge system)
F	E	Quickie	HAPO-223	2	Ceramics (radioactive buildup and decay study for C discharge facility)
KW	3C	General Purpose	HAPO-236	2	Zirconium (creep test)
KE	4268	General Purpose	HAPO-241	1	UO_2 (defected UO_2 test)
DR		Shield	HAPO-247	2	NPR RTD's (radiation damage study)
KE	2D	Quickie	HAPO-252	5	Arsenic (tracer isotope production)
H-DR		PCCF	HAPO-252	2	Arsenic (tracer isotope production)
KE	2B	Magazine	HAPO-265	4	Aluminum boron splines (boron burnout rate study)
KW	4B	Snout	HAPO-243	3	Reactor structural materials (fission damage study)
KE	2D	Quickie	HAPO-260	2	Aluminum crystals (radiation damage study)
		*Gamma	HAPO-171	10	Plastics and rubber (damage study)
		*Gamma		1	pH electrodes (damage study)

*Gamma Irradiation Facility is located in Building 105-KE storage basin

Vertical Bowing Measurements

A summary of the results of vertical bowing measurements taken with the mercury manometer follows. All distances are measured from the process tube inlet flange.

Date	Tube	Distance	Results
10-1-61	4674-D	38 feet	Down .01" at 9'4" since 6-26-61 Down .01" at 22' since 6-26-61
10-25-61	Y2-KW	42 feet	Down .09" at 11' since 3-14-61 Down .76" at 27' since 3-14-61
10-25-61	3275-KW	36 feet	No previous data

Process tubes 4053, 4092, 4093, and 4094 at C Reactor were measured using the new optical traverse device to evaluate its performance in determining horizontal and vertical displacement of the process tubes. For comparison, two of the tubes, 4053 and 4092, were measured for vertical displacement using the standard mercury manometer traverse device. Further refinements of the advanced equipment are being made.

COOLANT TESTING OPERATION

KER Loop Operation

KER-1 - Operation of the loop with three 17-inch NIEl elements and four 17-inch NIEl defected elements as authorized by PT IP-377-A and PT IP-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. During the period October 11-16, the pressure and temperature were reduced to minimum values because of a leak at the front-face pressure-sensing connection adaptor. The Y-block was replaced during the October 16 outage. Normal loop operating conditions were 230 C, 1600 psi, and pH 10.

KER-2 - Operation of the loop with five 23-inch NIEl elements authorized by PT IP-377-A continued. During the outage of October 16, primary pump No. 2 indicated a reduction of discharge head and was replaced with a spare unit. Loop operating conditions were 210 C, 1600 psi, and pH 10.

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

KER General - During the outage of October 16, the delayed neutron monitoring system No. 2, provided by Project CGI-839, was tied into the safety circuit. This provides parallel delayed neutron monitors to reduce scrams from instrument malfunctions.

1706-KE Single-Pass Tube Operation

All eight tubes in KE Reactor were supplied normal process water from 105-KE.

Trace additions of ammonium citrate to SP-7 (4963) were completed on October 14. This completes the testing authorized by PT IP-197-A, Supplement D.

The fuel charge in SP-6 (4863) reached variable goal exposure and was discharged during the October 16 outage. It was recharged with 30 CIVN elements.

KE Reactor Outage Time Requirements

No unscheduled outages were charged to production testing. A total of 0.8 hours was charged to production tests as listed below:

Production Test	Description	Hours
PT IP-377-A	Replaced KER-1 front face Y-block	0.4
PT IP-363-A	Charge-discharge SP-6	0.4

A total of 6.7 hours was charged to Project CGI-839 during the outage of October 16 for relocation of the RTD's surrounding KER-3 and KER-4.

Out-of-Reactor Facility Operation

TF-1 - Cyclic decontamination test No. 6 for corrosion of carbon steel welded to stainless steel, normal carbon steel, stainless steel, Zircaloy-2, Stellite 6 and 12, Haynes Alloy No. 41, and stress-crevice samples of AMS 5616 continued. The fifth decontamination cycle was completed.

TF-2 - A second fretting corrosion test of Zircaloy-2 at 200 C began on October 17.

TF-3 - The first test was started on September 29 to determine the behavior of X-8001 aluminum cladding under conditions of heat transfer. The heat transfer cell element failed on October 11 because of cladding rupture. Testing of a second heat transfer cell began on October 19 with the loop operating conditions being reduced from 690 F to 600 F at 3200 psi. Corrosion coupons of aluminum X-8001, 304 stainless steel and Zircaloy-2 were charged on October 19.

TF-4 - Cyclic decontamination test No. 6 began on September 28 to determine the corrosion of carbon steel welded to stainless steel, normal carbon steel, stainless steel, Zircaloy-2, Stellite 6 and 12, Haynes Alloy No. 41, and stress-crevice samples of AMS 5616. One decontamination cycle was completed.

TF-5 - Uniform corrosion tests of carbon steels 1031, A-212, and 1051, sensitized and non-sensitized stainless steel, and stress-crevice samples of stainless steel were completed. Uniform corrosion tests on Zircaloy-2 coupons continue.

TF-6 - Loop conditioning began on October 17 for corrosion testing of aluminum X-8001, Zircaloy-2, and 304 stainless steel at pH 4.5 using a chromate for pH control.

TF-7 - The following test work continued:

1. Corrosion testing of suit-case-handle supports on two Zircaloy-2 clad fuel elements and two Zircaloy-2 dummy pieces
2. Corrosion testing of one KSE3 element
3. Fretting corrosion testing of a PRTR fuel element
4. Stress cracking of 316 stainless steel by the deposition of lithium hydroxide on the surface of the stressed material.

Testing of the nozzle-to-tube joint of a prototype CGI-839 nozzle assembly for use on KER-3 and KER-4 continued.

TF-8 - Corrosion testing of 304 stainless steel, Admiralty metal, 70-30 copper-nickel and A-212 carbon steel continued, and silicon bronze coupons were charged on October 6. Loop operating conditions were 160 C and 1000 psi

using ammonium hydroxide for pH control and hydrazine to scavenge oxygen. These conditions duplicate the NPR secondary cooling system.

TF-10 - Thirty-six decontamination scanning tests were completed.

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

COMPONENT TESTING OPERATION

Irradiated Fuel Element Examination - Examinations were completed on fuel elements from 57 tubes at the 105-C Metal Examination Facility. Of this group, there were 31 tubes for the Quality Certification Program PT IP-216-A, seven tubes of oversize C Reactor fuel elements PT IP-381-A, 18 tubes of enriched fuel elements of the Birch Analysis Program PT IP-420-A, and one tube of standard fuel elements in which a rupture occurred. Also, 51 fuel elements from the SORT test PT IP-219-A and Dingot test PT-IP-280-A were dejacketed, and diameter, warp, length and ID measurements taken of the bare uranium core. Photographs were taken of six ruptured fuel elements - one at C Reactor, three at DR Reactor and two at F Reactor.

Process Tube Corrosion Monitoring Program - In-reactor measurements of 1288 process tubes were completed. Listed below are the tubes measured for each reactor and document numbers of the reports issued.

Reactor	No. of Tubes Probologged	Report No.	HW Number
KW	149	83	71175
KE	10	84	71176
D	11	85	71195
H	150	86	71218
DR	154	87	71234
B	174	88	71249
D	228	89	71288
B	40	90	71300
H	13	91	71317
F	114	92	71318
B	82	93	71328
D	50	94	71352
KE	96	95	71381
B	17	96	71415

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

Reactor	Number of Tubes	HW Number of Unclassified Report
B	6	Not reported
F	4	Not reported
H	14	71423
KW	1	Not reported

The tubes examined from B Reactor were all leakers. In the majority of the tubes internal corrosion had occurred between the ribs 9 1/2 and 11 1/2 feet upstream of the tube outlet flange. One of the tubes had a leak that occurred in the top half section.

Two of the four tubes removed from F Reactor were leakers because of external corrosion. The remaining two tubes were examined to correlate probolog traces and the severity of external corrosion.

The tubes examined from H Reactor were removed as leakers; however, the leaks were not found in two tubes. Cause of leaks in the remaining 12 tubes were as follows:

Number of Tubes	Cause
2	Internal corrosion
2	External corrosion
4	Transverse cracks
3	Crack in rear outlet flange
1	Ruptured fuel element had blown hole in tube

Panellit System Programs

Gages repaired, calibrated by maintenance	-	186	
Gages meeting calibration criteria	-	130	(70%)
-previous month	-		(94%)
In-board Bourdon coil examination	-	3 340	
Non-leaking coils	-	3 335	(99.8%)
-average rate for past two years	-		(99.6%)

During the month, 45 gages received failure analysis.

Nine-hundred and forty-two gages, of those gages currently being processed for the exchange gage program, were received and examined. Results were as follows:

	Model 154-100-C	Model 154-100-K	Model 156-100-H
Examined	167	525	250
Rejected	43	75	55
Rejection rate	25.7%	14.3%	22%

J. W. Brown for
Manager, Research and Engineering

MANUFACTURING

PRODUCTION OPERATION

PRODUCTION PLANNING & SCHEDULING

Discharge Concentrations

There were no discharge exposure adjustments effected in October. The Pu-240 content of October discharges was in control on the basis of existing conversion Tables.

Discharge Exposure Comparison (MWD/T)

	Regular Solid		Regular I&E		Enriched I&E		Over-all
	6 Old	2 K's	6 Old	2 K's	6 Old	2 K's	Exposure
August	773	748	706	707	851	760	735
September	776	770	730	707	817	739	740
October	765	767	695	736	796	755	733

Off-Plant Shipments

Twenty casks of Polonium were shipped to Mound Laboratory.

One cask of isotope production was sent to ORNL.

The casks for use in shipping enriched lithium-aluminum material from the first H Reactor E-N core load were received. Batching of the material and cask loading began in October and off-plant shipment is scheduled for early November.

ESSENTIAL MATERIALS

Rail and truck shipments received in October were as follows:

Carload shipments for IPD	-	177
Carload shipments for other Depts.	-	146
Truck shipments for IPD	-	239
	Total	562

MONTH	REACTOR OPERATION STATISTICS — PROCESSING										
October, 1961	B	C	D	DR	F	H	SIX OLD	KE	KW	K'S	TOTAL
INPUT PU (% OF FORECAST)	84.6	117.7	100.2	66.4	105.4	110.5	96.7	104.4	108.9	106.7	101.1
TIME OPER EFF. (% OVERALL)	70.1	80.1	76.9	59.3	68.5	81.9	72.8	81.2	89.2	85.2	75.9
NEW TUBES INSTALLED	13	1	28	6	62	1	111	0	0	0	111
WATER LEAKS – TUBE	8	1	5	0	2	7	23	0	0	0	23
– VAN STONE	1	0	0	1	0	1	3	0	0	0	3
SLUG RUPTURES	0	2	1	5	2	1	11	0	0	0	11
HELIUM CONSUMED – M CU. FT.											

CAUSES OF REACTOR OUTAGES		NUMBER OF REACTOR OUTAGES AND HOURS																			
		B NO.	B HRS.	C NO.	C HRS.	D NO.	D HRS.	DR NO.	DR HRS.	F NO.	F HRS.	H NO.	H HRS.	SIX OLD NO	SIX OLD HRS.	KE NO.	KE HRS.	KW NO.	KW HRS.	K'S NO.	K'S HRS.	TOTAL NO.	TOTAL HRS.
SCRAMS	OPERATIONAL CAUSES							3	1.8					3	1.8							3	1.8
	FAULTY INST. OR CIR.																						
	F/ JLTY PROC. EQUIP.			1	54.1									1	54.1							1	54.1
	UNEXPLAINED	1	0.3	1	0.7	1	0.2							3	1.2	2	64.8	1	1.2	3	66.0	6	67.2
	Oscillating Gauge			1	0.6									1	0.6							1	0.6
	Prod. Test (DR-1)							1	43.2					1	43.2							1	43.2
CHARGE – DISCHARGE																1	75.1	1	79.5	2	154.6	2	154.6
RUPTURE				2	92.3	1	53.5	5	213.4	2	47.9	1	37.2	11	444.3							11	444.3
WATER LEAK		5	222.1			1	116.2			1	63.4	3	97.2	10	498.9							10	498.9
TUBE REPLACEMENT										1	123.1			1	123.1							1	123.1
MAINTENANCE																							
Abnormal Tube Press.						1	1.7							1	1.7							1	1.7
Prod. Test (IP-402)								1	44.7					1	44.7							1	44.7
TOTAL		6	222.4	5	147.7	4	171.6	10	303.1	4	234.4	4	134.4	33	1213.6	3	139.9	2	80.7	5	220.6	38	1434.2

UTILIZATION OF REACTOR OUTAGE HOURS	B	C	D	DR	F	H	SIX OLD	KE	KW	K'S	TOTAL HOURS	% OF TIME
CHARGE – DISCHARGE	28.9	24.4	52.4	60.5	46.3	15.8	228.3	54.2	40.4	94.6	322.9	5.4
RUPTURE REMOVAL		41.2	1.4	70.6	5.2	2.0	120.4				120.4	2.0
WATER LEAK	95.8		43.5	22.8	24.3	91.6	278.0				278.0	4.7
TUBE REPLACEMENT	28.7	21.5	48.6	28.6	71.8	5.6	204.8	6.8	5.7	12.5	217.3	3.7
MAINTENANCE	60.4	28.7	17.8	88.0	78.2	13.9	287.0	14.5	21.6	36.1	323.1	5.4
STANDARD CHECK	0.3	4.3	4.3		7.0		15.9		7.6	7.6	23.5	0.4
PRODUCTION TEST	0.3	12.9	1.2	23.8		5.5	43.7	15.3	3.1	18.4	62.1	1.1
PROJECT WORK	7.7		0.5	1.2	1.6		11.0	44.5		44.5	55.5	0.9
OTHER	0.3	14.7	1.9	7.6			24.5	4.6	2.3	6.9	31.4	0.5
TOTAL	222.4	147.7	171.6	303.1	234.4	134.4	1213.6	139.9	80.7	220.6	1434.2	24.1

BM-5000-050 (7-61) AEC-GE RICHLAND, WASH.

MONTH
October, 1961

REACTOR OPERATION STATISTICS – SLUG RUPTURES

TYPE MATERIAL	TUBE NUMBER	TYPE FAILURE	CANNING DATE	CHARGE DATE	RUPTURE DATE	CONCENTRATION ACT. CONC.	CONCENTRATION % OF GOAL	FACTOR	TUBE POWER AT RUPTURE	LOT OR PT. NUMBER	CLADDING	REMOVAL METHOD* Q	CM	HJ	TP	REMOVAL HOURS	REMARKS
I&E-E	1978H	Chg. Mach.	5-11-61	9-10-61	10-5-61	109	11	1.126	857	KY-057-D	X-8001-F		X			2.0	
I&E-E	3985DR	Hot Spot	4-18-61	7-27-61	10-10-61	582	74	1.312	1219	KY-029-A	X-8001-F				X	17.9	
I&E Reg	2762D	Hole	3-16-61	6-11-61	10-10-61	758	104	1.351	1106	KZ-24B	X-8001-F		X			1.4	
I&E-E	2576C	Hot Spot	7-21-61	9-16-61	10-12-61	230	40	1.219	1217	KC-081-A	X-8001-F			X		17.1	
I&E-E	1460DR	Chg. Mach.	8-12-61	9-5-61	10-15-61	285	29	1.191	1141	KY-096-A	X-8001-F		X			0.8	
I&E-E	2658DR	Side Other	4-10-61	8-14-61	10-20-61	498	57	1.222	1170	KY-006-A	X-8001-F				X	24.8	
I&E-E	4173DR	Hole	5-12-61	5-28-61	10-23-61	1017	89	1.189	1151	KY-056-D	X-8001-F			X		9.6	
I&E-E	2271C	Hot Spot	7-21-61	9-16-61	10-26-61	386	46	1.207	1242	KC-081-A	X-8001-F				X	24.1	Leaker
I&E-E	2987DR	Side Other	8-12-61	9-5-61	10-27-61	389	52	1.360	1274	KY-096-A	X-8001-F				X	17.5	
I&E Reg	2377F	Split	8-23-61	9-12-61	10-29-61	274	37	1.154	1139	HZ-046-B	X-8001-F		X			3.4	
I&E Reg	2369F	Split	6-21-61	9-5-61	10-31-61	337	51	1.195	1118	PZ-019-H	X-8001-F		X			1.8	

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

BM-5000-051 (2-61) AEC-GE RICHLAND WASH

MONTH: October 25, 1961

REACTOR OPERATIONS STATISTICS — POWER

SHEET 1

		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)	GPM AVG.	14486		2440		2179	2474			21579
TO FILTER PLANT (BLDG.183)	GPM AVG.	60550		92693		75695	72600	186270	181430	669238
TO FILTER PLANT (C&DR)	GPM AVG.	108783		49996						158779
TO R & E (KER) & FEO	GPM AVG.			203				308		511
TOTAL	GPM AVG.	183819		145332		77874	75074	186578	181430	850107
TOTAL	M GAL.	7941.0		6278.3		3364.1	3243.2	8060.2	7837.8	36724.6
RESERVOIR WATER (BLDG.182)										
TO POWER HOUSE (BLDG.184)	GPM AVG.	36		65		301	69			471
TO COND.SYSTEM(BLDG.190)	GPM AVG.			1545		1774	2405			5724
TO COND-SYSTEM (190DR & 183F)	GPM AVG.			830		104				934
TO EXPORT SYSTEM INCL NPR	GPM AVG.	14450		0						14450
TOTAL	M GAL.	625.8		105.4		94.1	106.9			932.2
FILTER WATER (BLDG. 183)										
TO POWER HOUSE (BLDG.184)	GPM AVG.	154		172		97	150			573
TO PROCESS (BLDG. 190)	GPM AVG.	63260	90377	76026	60916	70344	65400	181139	177439	784901
TO 108	GPM AVG.	2500	4500	869		1071	1161			10101
TO 108DR	GPM AVG.			869						869
TO FILTER PLANT (BLDG. 183DR&B)	GPM AVG.		9001	11806						20807
TO F & S SYSTEM	GPM AVG.	109		326		308	134		50	927
TO R & E (KER) & FEO	GPM AVG.			153				177		330
BACKWASH	GPM AVG.	3528	4905	2472	886	3875	5755	4954	3941	30316
TOTAL	M GAL.	3004.6	4699.4	4004.3	2669.8	3270.0	3136.3	8046.9	7837.8	36669.1
PROCESS WATER (BLDG. 190)										
TO REACTOR	GPM AVG.	62860	89977	75626	60516	69964	64900	167300	167300	758443
TO REACTOR	GPM NOR.	88400	100000	88000	88500	89100	84700	184500	184700	907900
POWER HOUSE (K AREA)	GPM AVG.							21	12	33
108 (KE - KW)	GPM AVG.							13418	9727	23145
TO R & E (KER)	GPM AVG.							0		0
BUILDING USAGE	GPM AVG.	400	400	400	400	380	500	400	400	3280
TOTAL	M GAL.	2732.8	3904.3	3284.3	2631.6	3038.8	2825.3	7825.2	7665.4	33907.7
RIVER DATA										
ELEVATION (MSL,FT.)	(MAX.)	387.5		382.5		368.8	372.4		381.8	
	(MIN.)	384.3		377.4		364.0	369.5		378.9	
	(AVG.)	385.4		378.2		364.8	370.4		379.8	
TEMPERATURE	AVG. °F	59.6		64.0		64.2	63.9		61.5	

C-4

MONTH
October 25, 1961

REACTOR OPERATIONS STATISTICS — POWER

SHEET -

		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL
WATER TREATMENT DATA										
AT BLDG. 182	MM GALS									
BLDG. 183	MM GALS	2615.8	4699.4	4004.3	2159.8	3270.0	3136.3	8046.9	7837.8	35770.3
CHEMICAL CONSUMPTION										
CHLORINE (BLDG.182)	LBS.									
(BLDG.183)	LBS	17669	24040	17600	5900	18357	21634	52022	57533	214755
	AVG PPM	0.8	0.6	0.5	0.3	0.7	0.8	0.8	0.9	0.7
ALUMINIA	LBS.	78418	168524	145863	83000	99025	116590			691420
ALUM	LBS	59800	59498	74556	39022	102165	52376	1060634	663972	2112023
	AVG PPM	*17.1	*18.7	*19.7	*20.6	*18.3	*19.9	*15.8	10.2	*16.4
SEPARAN	LBS	250	650	700	225	750	425	1600	1200	5800
	AVG PPM	.011	.017	.021	.013	.028	.016	.024	.018	.019
SULPHURIC ACID (As 100%)	LBS	288495	522206	362112	201920	338770	285245	741437	880684	3620869
	AVG PPM	13.2	13.3	10.9	11.2	12.4	10.9	11.1	13.5	12.1
DICHROMATE	LBS	22650	45100	46500	37270	25489	27123	104033	103837	412002
PURGE MATERIAL CONSUMPTION										
SOLIDS	LBS	0	8750	0	4850	2000	0	0	(Filter Aids) 77	15677

*Aluminia & alum combined for PPM in Alum Column.

BM-5700-024 (9-58) AEC-GE RICHLAND, WASH.

MONTH
October 25, 1961

REACTOR OPERATIONS STATISTICS — POWER

SHEET 3

ANALYTICAL DATA		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW
RAW WATER									
pH	pH AVG	8.20	8.00	8.26	8.26	8.26	8.19	7.11	7.26
TURBIDITY	PPM AVG	4.0	2.0	4.0	5.0	2.9	4.0	6.2	7.7
FINISHED WATER									
pH	pH AVG	7.00	6.90	6.97	6.95	6.91	6.98	6.59	6.60
TURBIDITY	PPM AVG	.005	.006	.004	.004	.004	.004	.005	.004
Cl_2 RESIDUAL	PPM AVG	.05	.05	TRACE	TRACE	.11	.13	.21	.17
DICHROMATE	PPM AVG	1.00	1.39	1.80	1.80	1.01	1.07	1.73	1.73

STEAM DATA		100-B	100-D	100-F	100-H	B-D-F-H TOTAL	KE	KW	KE-KW TOTAL
GENERATED (MAX)	LBS/HR	101000	118000	71000	85000	375000	60000	73000	133000
(NOR)	LBS/HR	81000	81000	49000	59105	270105			
(AVG)	LBS/HR	79700	86804	49175	53768	269447	34400	33600	68000
TOTAL	M LBS	57429	62499	35406	38713	194047	24549	24505	49054
TO PLANT	M LBS	48700	52999	31157	32829	165685	22094	22055	44149
COAL RECEIVED	TONS	4461	2831	0	2053	9345			
CONSUMED	TONS	3136	3452	2143	2311	11042			
IN STORAGE	TONS	16089	18429	12108	6702	53328			
GEN.STEAM/LB.OF COAL		9.16	9.05	8.26	8.38	8.79			
OIL RECEIVED	GALLONS						402815	89021	491836
CONSUMED	GALLONS						199636	235104	434740
IN STORAGE	GALLONS						1432032	1083020	2515052
GEN.STEAM/GAL.OF OIL							123.0	104.2	112.8

ELECTRICAL DATA

	KE	KW	KE-KW TOTAL
TOTAL GENERATED KW HRS.	1619000	1753600	3372600
Peak Demand Control	179000	313600	4926

DECLASSIFIED

DECLASSIFIED

C-6

HW-71584

APPLIED REACTOR ENGINEERING OPERATION

MAINTENANCE PRACTICES OPERATION

Reactor Confinement Instrumentation

Reactor confinement instrumentation has been serviced and calibrated at all reactors except H.

Charging Platform

Weight removal from all charging platforms has been progressing on schedule. Individual charging platforms have had from 3,000 to 7,000 pounds of miscellaneous equipment and materials removed.

PLANT EQUIPMENT ENGINEERING OPERATION

Water Leak Task Force

The Task Force recommendations have been summarized and issued in letters to concerned Irradiation Processing Department component managers as a basis for obtaining agreement on action to be taken. This completes the Task Force responsibilities except for one additional meeting to establish where rear Van Stone seal inserts should be installed.

Tube Replacement

Assistance was provided to C Reactor on development of a process tube corrosion monitoring program. A recommendation was issued, on the modification of tube rib height, for replacement tubes at C Reactor during early 1962. The current practice of reducing the rib height by 0.013 inch will be continued with CII size fuel elements.

Moisture Monitor System

Design Change No. 509 was approved and issued, to provide information to renovate all moisture monitor systems, in accordance with the modifications developed and demonstrated by B-C Maintenance Engineering.

Miscellaneous

Assistance was provided to B-C Engineering and Reactor Modification Design in obtaining traverse data on VSR channel 47-C.

The specifications and drawing for the rear face resistance temperature detector connector and cable assembly were revised and issued to facilitate procurement of spare parts from additional vendors.

OPERATING EXPERIENCE

Equilibrium power level limitations were imposed by bulk outlet temperatures at both reactors. B Reactor levels were limited at times by non-equilibrium operating conditions.

B Reactor experienced five significant interruptions of production as result of in-pile water leaks. Three significant outages at C Reactor were necessitated by two fuel element ruptures and the failure of a rear pigtail connection.

EQUIPMENT EXPERIENCE

Major equipment experience at B Reactor included the installation of 13 new process tubes in replacement of nine leaking tubes and four having thin walls. Bumper fuel element nozzles were installed on 128 tubes, and 75 rear face connectors were replaced with inconel pigtails.

The replacement and/or repair of hydraulic valves controlling five B Reactor horizontal control rods was required to eliminate their intermittent failure to respond to a scram impulse.

At C Reactor a scram was experienced when a defective rear face pigtail broke loose from a nozzle. Rear nozzle assemblies on two tube rows were equipped with new pigtail retainer bands and "O" rings.

The G-hole subcritical monitor at C Reactor was removed for replacement of a faulty drive mechanism.

A routine inspection revealed a crack in the pump impeller of No. 8 process water pumping unit at Building 190-C. A replacement impeller assembly was installed.

IMPROVEMENT EXPERIENCE

At B Reactor Design Change No. 176-B was completed, increasing the reliability of instruments through improvement of the emergency power supply system.

The transfer area at B Reactor was equipped with a new drip pan to control the spread of contamination during the loading of well cars.

Auxiliary equipment and tools weighing 5000 pounds were removed from the charging area work platform at B Reactor.

The programmed replacement of C Reactor's metal spline stubs with plastic stubs was completed.

Exposed surfaces of the earth embankment around the 117-C filter building was sealed with a gunite application and charcoal filters were installed in the A and B cells in continuation of progress on Project CG-791, Reactor Confinement.

Preliminary electrical work was started at Building 182-B in connection with Maintenance Job No. 36, Export Water System, Pump Exchange.

RADIATION MONITORING EXPERIENCE

No personnel overexposure occurred. Maximum dose rates experienced were 100 mr/hr during poison charging and 2.0 r/hr during burial of dummies and tubing. Two instances of contamination spread (up to 10,000 c/m) were experienced in uncontrolled zones at B Reactor. Two new portable air samplers were placed in service at C Reactor.

D-DR REACTOR OPERATION

OPERATING EXPERIENCE

Operating levels at D Reactor were limited by non-equilibrium conditions, bulk outlet temperatures and an administrative limit placed on outlet temperatures of thin walled tubes. The predominant limitation on power level at DR Reactor was non-equilibrium due to numerous start-ups.

The four unscheduled outages at D Reactor resulted from water leaks, a rupture, a pressure monitor scram of undetermined cause and a manual shutdown because of increasing pressure on the Panellit gauge of a newly charged tube. Pressure on the tube returned to normal after replacing the metal charge. Although this was a bumpered charge, inspection of the metal revealed no cause for the pressure increase. The one rupture was of the internal hole type on a bumpered element.

DR Reactor experienced 10 unscheduled outages, 6 from ruptures, 2 from Panellit scrams, a Beckman trip and a scram due to failure of the DR gas loop compressor. One of the ruptures was a hot spot type, two were side-other, one was caused by charging machine damage, one was a bumpered slug of the internal hole type and one a special element undergoing a process test (PT IP-402-A).

Seventeen traverses were made at DR Reactor, three adjacent to rupture tubes, to study flux distribution. Peaking appears evident in the top far quadrant.

EQUIPMENT EXPERIENCE

The replacement of J type with Inconel pigtails is 25 per cent complete at D Reactor and 96 per cent at DR. The bumper nozzle installation program at DR is 43 per cent complete. Rear face thermocouple replacement remains at 40 per cent completion at D Reactor.

The bauxite feed systems at both D and DR water plants have increased in efficiency through improved maintenance techniques and the use of corrosion resistant materials. As a result alum cost in October has been reduced 55 per cent from that in September.

A gas filter was removed from the system in 115-D for repair of a large leak in the outer shell. Gas usage has decreased 6,000 cu. ft. per day under operation with the filter removed, indicating the magnitude of the leak.

IMPROVEMENT EXPERIENCE

The tank in the C work platform pit at D Reactor, used for storing used splines, was set in a recess in the pit floor. As a result dose rates for spline removal have been reduced by a factor of 5.

Former difficulties in tube installation at DR have been reduced by boring channels with an air motor driven boring tool. The improvement is indicated by the reduction of tube installation forces to the 2,000-pound range on seven tubes.

All process tubes installed at both D and DR Reactors are being gauged following installation by using a 1.50" ball gauge resting on top of the ribs. To date all tubes installed since the start of this testing program will pass the gauge.

RADIATION MONITORING EXPERIENCE

One lapse of radiation control occurred at D Reactor when a maintenance craftsman performed tube replacement work on the discharge work platform without a beta-gamma film badge. Estimated exposure was 100 mr.

F REACTOR OPERATION

OPERATING EXPERIENCE

Power level throughout the month was controlled by the bulk outlet temperature limit. Production was limited by a series of four outages, including a scheduled outage for tube replacement. A water leak and two ruptures were the causes of three unscheduled outages.

During the outage of October 24, helium checks verified tubes 0166 and 0185 to be leakers. These, and tubes of similar age in channels 0184 and 1176, were removed and the four channels blocked off.

Efforts to improve the number of effective central tubes are progressing on schedule with the exception of four ball valve tubes which were not returned to production in October as planned.

EQUIPMENT EXPERIENCE

A failure of the 4500 HP No. 9 vertical pump motor at the River Pump House was experienced on October 3. The motor was removed and sent off-site for rewinding and was reinstalled on October 13.

The No. 6 process pump motor stator in the 190 Building was replaced with a rewound stator on October 6. This leaves only one to be exchanged.

One hundred eighty-one tubes were probologged in October. Significant items replaced were: 62 process tubes, 36 process tube thermocouples due to failure, 65 rear face water connectors, 64 reamed nozzles for bumper fuel elements, 10 loop header bellows, and seven front face nozzle lug rings. A total of 58 regular and three zone temperature Inconel outlet nozzle connectors was installed, making a total of 861 Inconel connectors installed to date.

Other reactor equipment experience included: replacement of the graphite stringer in tube channel 2662, vertical traverses in tube channels 4676 and 3292, and adjustment of approximately 150 Panellit gauges.

The flexowriter digi-coder head was replaced and the read-out stepping switch in the temperature monitor system was readjusted to improve the equipment reliability.

Boroscopic inspection of the interior of 24 rear face Parker fittings and the interior wall of the crossheader opposite the fittings revealed only slight damage from cavitation. Pits observed were not more than five mils deep.

The No. 4 boiler in the 184-F Building required extensive repairs during the month, including the replacement of 250 grates and four side bars.

IMPROVEMENT EXPERIENCE

A second and final lead reaction chamber was installed in the bauxite system in the 183 Building.

Utilization of a new tube puller-guillotine during the planned tube replacement outage revealed gains in time required to remove tubes. An over-all reduction in radiation exposure was also realized.

RADIATION EXPERIENCE

F Reactor Operation incurred one lapse of radiation control when an Instrument Mechanic failed to wear prescribed protective clothing. Two cases of clothing contamination were experienced during the month.

Continuing radiation exposure reduction was provided by lowering the spline removal disposal tank below grade level in the "C" work platform pit. An over-all reduction of 30 per cent in rear face dose rates was obtained in the initial use of the external decontamination facility.

H REACTOR OPERATION

OPERATING EXPERIENCE

Equilibrium power levels were limited by bulk outlet temperature. The highest power level attained was 1740 MW.

Four outages, all unscheduled, occurred during the month. One of these resulted from a fuel element rupture in an E-N loaded tube, two from tube leaks and one from a Panellit scram as a result of a sudden tube leak.

EQUIPMENT EXPERIENCE

Eight leaking process tubes were removed. Seven of these had internal leaks, including three with transverse cracks, and one had a rear Van Stone leak.

There was one bumpered enriched fuel element rupture. Charging machine damage caused the failure.

Twenty rear face tube temperature monitor thermocouples were repaired, including replacement of eight thermohm wells and one wire lead from the terminal block to a well. In addition, twenty-nine rear face zone temperature monitor wire leads were replaced.

As the result of a faulty relay unit the 105 Building seismoscope caused a high alarm annunciator trip. Repairs were made within the five-minute time limit allowed by the Process Standard and the system put back into service without interrupting reactor operation.

The river elevation at 181-H increased 3.4 feet in a seven-hour period on October 30, 1961, in conjunction with power generation tests at the Priest Rapids Dam. No adverse effects were observed.

Process water pump No. 10 at the 181-H Building was removed for routine inspection and overhaul. The pump bowl and impellers were found in good condition. Preventative maintenance repairs were made and the pump returned to normal service.

IMPROVEMENT EXPERIENCE

Replacement of Panellit gauges, MJA-29, "New Front Adjust Panellit Gauge," was initiated during the month with the installation of ninety-two front adjusting ten-ninety range gauges. Removed gauges were returned to the vendor for conversion to the front adjusting type.

Modification of the 1720-H Building, including building renovation and revisions to electrical circuits to accommodate IBM computer equipment, for use by the Production Computing Operation was completed.

Five hundred feet of aluminum foil covering was installed on outside of steam lines. The covering is permanent and will eliminate the need for periodic waterproofing of the insulation surrounding the lines.

RADIATION MONITORING EXPERIENCE

There were no significant contamination problems. A lapse of radiation control occurred when a cobalt 60 source reading 1.0 r/hr at two inches was improperly stored. There was no significant exposure to personnel.

KE-KW REACTOR OPERATION

OPERATION EXPERIENCE

Equilibrium power levels were limited by bulk outlet temperatures at both reactors.

In addition to one scheduled outage and a Panellit trip during start-up at KE Reactor, a Panellit trip occurred during equilibrium operation. The latter outage was extended for the retubing of KER loop channel 3674 with an N Reactor type tube under Project CGI-839. KW Reactor was shut down 5.5 hours before a scheduled outage date because of a heat cycle. Following completion of the scheduled outage work, a short duration Panellit scram occurred during the subsequent start-up.

EQUIPMENT EXPERIENCE

Investigation of movement restriction of Horizontal Control Rod Number 8 at KW Reactor indicated that the rod was rubbing the filler layers in the top of the channel from 12 feet to 40 feet from the step-plug. Shim pieces

were removed from beneath the rack section in the outer rod room and the binding was relieved.

Lower than normal resistance measurements from the leads of the resistance temperature detector system to ground were experienced at KW Reactor. The condition was traced to a section of lead wire duct in the experimental level ceiling where moisture from the rear face atmosphere condensed to cause partial shorting of the leads in the duct. The condition was relieved by removing the duct covers to allow entry of dry air to carry away the moisture. To prevent a recurrence, a baffle was built into the duct to admit a continuous flow of air.

IMPROVEMENT EXPERIENCE

Under the Panellit system modification project, the first group of approximately 230 remodeled, front adjustment Panellit gauges was installed in each K Reactor.

The KER neutron monitoring system for fuel element rupture indications was modified to require that two trips (either high or low or one of each) be experienced before a KE Reactor scram was initiated. This parallel instrumentation prevented an outage during the subsequent operating period when a spurious scram occurred on one system.

The Number 6 low lift motor at 190-KE was changed out with a rewound, upgraded motor, thereby completing the change of all 12 low lift motors in K Plant from 900 to 1500 HP capacity.

O C Schroeder

Manager, Manufacturing

OC Schroeder:DLD:bam

FACILITIES ENGINEERING

REACTOR MODIFICATION DESIGN

RESEARCH AND DEVELOPMENT

Studies of the problem of graphite distortion at 105-C Reactor are progressing. Distortion data were collected by television traverse and displacement measurements of No. 47 vertical safety rod channel and vertical and horizontal traverses of four process tubes located in the top portion of the reactor. The vertical rod channel broach used successfully at 105-DR Reactor has been adapted for use at C Reactor. Controlled channel broaching and debris removal have been scheduled for trial on one vertical rod channel during the next scheduled reactor outage. Also, contract ATH-IP-1-62 was negotiated with the General Engineering Laboratory to conduct graphite distortion studies and to evaluate alternate solutions to the associated problem of blockage of the vertical safety rod channels.

An up-to-date evaluation of methods for removing Third Safety System balls from the bottom of a reactor has been completed. Results indicate a definite lack of justification for further action. This is due primarily to improved electrical circuitry which has appreciably reduced the number of spurious ball drops since the initial studies were made in 1957. Various methods alternative to vacuum removal of balls following their release into a reactor were evaluated at that time, indicating a minimum payout period of 3.2 years. Current conditions show the payout period has increased to 10.9 years.

PROJECT RELATED EFFORT

CGI-844 - 100-K Coolant Backup System

The 48-inch pipe being supplied by a firm in Portland, Oregon, was inspected for surface pits, and rejected because the pits exceeded the maximum permitted by the specification. Since the wall thickness on the pipe was specified for corrosion limitations rather than strength, the decision was made to accept pits 25 mils or less in depth and repair those exceeding this depth.

EQUIPMENT DEVELOPMENT

EXISTING REACTOR WORK

Tube Insertion Problem

Tests were made on aluminum process tubes from two suppliers to determine galling tendencies. In both cases galling could not be induced, even though forces up to 2000 pounds were applied normal to the tube wall.

Tests involving anodizing of five process tubes were deferred at the request of the Manufacturing Operation until additional tubes can be provided.

Operational Fueling

Two refueling cycles with aluminum dummy fuel elements were completed during equilibrium operations at 105-KE Reactor.

Vertical Safety Rod Channel Rehabilitation

Development of three critical pieces of equipment is in progress; a mock-up for testing machinery; a thermal shield boring machine; a channel shaping tool. A model of the first shaping tool was fabricated for test of concept. Following tests, revisions to this model are being made while fabrication is continuing on a second concept.

Television Device for VSR Channel Examination

A 2½ inch television camera has been adapted, with special lighting and leads, to permit examination of vertical safety rod channels. This device not only has appreciably improved the optical conditions of such examinations, but permits location of the viewing device in such areas as the Reactor Control Room. The device was used successfully in examining channels in both the 105-DR and 105-C Reactors.

NEW PRODUCTION REACTOR WORK

Design Tests

One test, DT-1095 - NPR Limit Switch Tests for Underwater Use, was completed. Principal elements of design test activity continued to be process tube flow monitoring, fuel handling, production horizontal rods, and ball safety equipment. Activity was reported on a total of 17 NPR design tests.

PLANT ENGINEERING

DRAFTING

Services provided during the month:

New and revised drawings	223
Layouts and sketches	208
Microfilm prints reproduced	618
Microfilm drawings added	2372
Microfilm drawings voided	627
Ozalid check prints reporduced	1328
Catalogs added to files	76
Customers serviced - Microfilm files	301
Customers serviced - Catalog files	42
B.P.F.'s and Specifications added to files	25

EQUIPMENT APPLICATION ENGINEERING

Charge Platform Modification Program

Authorization has been provided by the Haughton Elevator Company to permit increase in the allowable load on the charge platforms of the six old reactors. For the 105-B, D, DR, F, and H Reactors the recommended maximum load has been increased from 8,000 pounds to 16,000 pounds, subject to positioning of the load. At 105-C the recommended maximum load has been increased from 18,000 pounds to 24,000 pounds, subject to the same conditions. No change was recommended in the allowable load of 29,000 pounds for the 100-K charge platforms.

Poison Splines

A spline-straightener device, to aid in the recovery and re-use of splines utilized during reactor start-up,was given acceptance tests and is ready for demonstration.

REACTOR, PLANT ENGINEERING

Noise Abatement

Measurements of sound levels were made at the 190-C, 190-KE, and 190-KW pump rooms and basements as well as the 165-KE and 165-KW control rooms as a follow-up to the completion of work on MJA-28. This work included installation of sound absorbent material in the pump rooms and basements, open top enclosures around process pump motors at 190-C, and floating panels in the 165 Control Rooms. The measurements indicate a reduction in acoustic energy in the range of 50-80 per cent as a result of the above work.

Rear Face Piping Examination

Planning and procurement for removal of a crossheader at 105-DR Reactor for metallurgical examination has been completed. The timing for the actual replacement is being studied to determine that most convenient in light of reactor outage schedules.

WATER PLANT & UTILITIES ENGINEERING

Disaster Planning Study

The task force study of operational and shelter requirements for maximum reactor safety in the event of enemy attack was reactiviated. The task force comprises representatives of the Manufacturing, Research & Engineering, and Facilities Engineering Operations; its chairman is the Supervisor-Water Plant and Utilities Engineering. Two meetings were held at which basic criteria were reviewed and individual responsibilities allotted. The study basis is retention, and shelter in the areas, of minimum crews for safe operation under shut-down conditions.

Peak Power Control

An evaluation of power peak control showed electrical power savings of $28,000 for the first quarter of FY-1962.

PROJECT ENGINEERING

PROJECTS

CGI-791 - Reactor Confinement

Phase II-B

The contractor, R. J. Britton, completed the berm stabilization on the 117 Buildings on October 12, 1961. This phase of the project is now complete.

Phase III

Beneficial use of the balancing of the ventilation systems in all the 105 Buildings was achieved on October 20, 1961. All charcoal filters have been installed. Acceptance Tests on the Sample Building Instrumentation have been completed in KE, KW, B, DR, and are 95 per cent complete in D and C, and 50 per cent complete in F and H.

General

Erection of the Decontamination Building at 100-F Area is 93 per cent complete.

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

Most of the remaining work for startup of Loops 3 and 4 that required a KE reactor shutdown was accomplished during two outages (October 9 and 27). One more NPR size Zircaloy tube and its hardware and the loop connections still must be installed. One more reactor shutdown is necessary early in the month of December to complete the work and to test Loops 3 and 4. The job is 64 per cent complete compared to a 72 per cent schedule.

CGI-844 - 100-K Area Coolant Backup

This project, scheduled to be 47 per cent complete, is now actually only 40 per cent. The process piping, which required meeting specific Charpy V-notch tests, has been delayed. This pipe is being procured from three different vendors and the reasons for delay for two are caused by unconfirmed mill commitments for the base steel plate or pipe billets. In one case, special high pressure pipe fittings to be manufactured from forged or welded plate failed. The company was forced to place a new mill order and this phase of our work will be delayed approximately three months. Most of the other pipe which was expected on plant site during October will not arrive until December or January. Because of these pipe delays, the project is falling behind schedule and a revised certified completion schedule will be prepared. Actual pipe delivery will determine the validity of the final project date of May 31, 1962. Other phases of the project are proceeding satisfactorily.

CGI-861 - Expansion of Electrical Distribution Systems, 105-B, D, and F Buildings

One transformer at 105-B has been put in service. Three thousand feet of armored cable is yet to be received from Westinghouse Manufacturing Company.

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

A revised Certified Progress Schedule has been transmitted to HOO-AEC, reflecting the extended completion date of March 1, 1962, authorized by HOO-AEC Directive No. HW-501, Modification 1. Design funds have been released to Construction Engineering and Utilities Operation for a redesign of 105-B, D, and F bucket inverters.

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

This project, scheduled 98 per cent complete, is actually 78 per cent. A revised proposal is being prepared to request an extension of time. The failure of a diversion box at 105-C has forced the use of the west effluent line instead of the east line. In order to install the last diversion box in the B effluent line, it is necessary to wait until the 105-C diversion box is repaired.

CGI-904, Rev. 1 - Improvements to Gamma Monitoring Systems, 105-B, C, D, DR, F, and H

A revised Certified Progress Schedule is being prepared reflecting the additional time and redistribution of funds authorized by HOO-AEC Directive HW-516, Modification 1, dated October 9, 1961. Work in progress at this time includes shop pre-assembly work for 105-C Building, core boring of access holes at 105-H, and installation of cooling water supply and drain lines at 105-D.

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

Three drawings have been approved and six drawings received for approval. The Construction Specification is 85 per cent complete. The remaining ten drawings have been issued for comment. A revised Design Progress Schedule was transmitted to the HOO-AEC for approval.

MJA-21, 25, 29 - Pressure Monitor System Improvements, 105-C, H, KE and KW Buildings

As of October 30, 1961, new Panellit gages have been installed as follows: 105-C - 192; 105-KE - 239; 105-KW - 230; 105-H - 70. There are 95 "C" type 61 "K" type, and 152 "H" type gages available for installation. To date 1549 switches have been accepted.

 [redacted]

CPFF CONSTRUCTION SERVICE CONTRACTOR-LIAISON

Issued seven new work orders and supplemented three old jobs for a total of $67,244 to J. A. Jones Construction Company.

PLANT FORCES WORK REVIEW

The Labor Standards Board approved six jobs for assignment to Plant Forces, which are estimated to cost $105,900.

PROJECT PROPOSALS

Project Proposals Submitted to AEC

CGI-861, Rev. 1 - Expansion of the Electrical Distribution Systems, Buildings 105-B, D, and F

RT Jessen

Manager, Facilities Engineering

RT Jessen:dgm

NPR PROJECT

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PROCESS DESIGN OPERATION

Research and Development

NPR Heat Removal System

The removal of heat from the NPR Reactor requires a precise balance between the reactor power, the rate that the steam is generated, and the rate at which the steam is condensed and the rate at which the ultimate heat removal by the river water during steady-state and transient conditions. An ATH has been arranged with the General Engineering Laboratory to provide a technical appraisal of the entire NPR heat removal system. Design work on this heat removal system is being done by General Electric, Burns and Roe, Inc., and to some extent by Bailey Meter Company. Such an analysis is only as good as the assumptions used in the calculations and only recently has firm design information become available on all parts of the system. General Electric analog studies at HAPO to date have pointed out problem areas particularly related to surge tank capacity of the secondary loop.

This complex study is made up of the following work:

1. Provide a critical review of the design of the complete heat removal system from the reactor to the river including the control and instrumentation of each system.

2. Review all of the system analysis studies performed to date and indicate any areas where further system analysis work is believed necessary.

3. Review the functions of the major components in the heat dissipation system, particularly those components being required to perform unique and critical functions such as the large steam pressure control butterfly valves, the dump condensers, the surge tank, etc.

NPR Valves

An investigation to select hard seating materials for the NPR valves involved testing and the review of the experience of others. The conclusion of this investigation was that Stellite would provide the best over-all hard seating material for the majority of the NPR valves. One disadvantage of Stellite results from its high cobalt content and detailed studies are under way to determine the total cobalt contribution by all materials to the primary loop. Once the cobalt contribution has been established, predictions of primary coolant reactivity can be made. Calculations indicate that stainless steel contributes 29 per cent of the cobalt content to the primary loop, carbon steel 48 per cent and hard seating materials 23 per cent. The relative comparison of surface areas of these materials in the same order is 7,790, 13,400, and 1.

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ATP's and Title III Tests

Extensive testing will be required of the primary loop and to a lesser extent the secondary and tertiary loop prior to startup. In order to expedite the development of this information, a draft of a criteria for hydrostatic testing of the primary loop has been developed by General Electric and forwarded to Burns and Roe, Inc. for comments. This hydrostatic test will be a Title III test, and General Electric is also preparing portions of the ATP's for the primary and secondary piping systems. The preparation of these ATP's by Burns and Roe, Inc. has been delayed complicating the coordination and planning effort. The testing of the piping loops has been a major problem with other reactor sites. Based on information on similar testing experience at other reactor sites, eight months to more than a year of test work has been required after the completion of the primary cooling loop.

Fuel Element Handling System

The AMF discharge conveyor has undergone extensive testing at the vendor's plant. This conveyor transfers the discharged fuel from the trampoline to the sorting equipment. Testing has disclosed some difficulties in removing the full 50 feet of fuel and fuel spacers in the one minute discharge time for each tube. The 35 feet per minute rate of this conveyor is such that some fuel tends to pile up and testing both in air and underwater indicates that a jamming problem can result. Revisions have been made to the conveyor and a means of clearing the jams has been developed. This prototype discharge conveyor will be shipped to Hanford to be used in coordinated tests in conjunction with the fuel trampoline. The sorting machine by AMF is partially fabricated but no testing has been accomplished to date.

Connector Assemblies

The proposal to heat treat the whole connector assemblies brings about many problems with components which are integral to the connectors. Tests have indicated that the Grayloc hubs and, in particular, the gasket seating surfaces are reduced in hardness as the result of the proposed heat treatment. Short-term tests indicate that a satisfactory seal is still possible with the heat treated hub. Based on these tests, the full-sized outlet connectors can be heat treated from a component damage standpoint. The venturis which are integral to the front connectors have been subjected to similar heat treat tests.

Ball 3X

Ceramic balls containing samarium oxide will be utilized in the Ball 3X system. A test batch has been received and tests indicate that adequate samarium oxide is present in the ceramic balls to meet the specification and nuclear requirements. A strike in the vendor's plant has not permitted full scale production to proceed. A representative sampling system is being developed to obtain representative material from all lots and batches for the nuclear verification tests.

Instrumentation

Pressure signals from the flow monitoring venturis act through a transducer to convert this information into electrical signals, which in turn feeds to the flow controllers where the safety trips are accomplished. Prototypical tests indicate that the Barton transducer best meets the requirements and General Electric has informed Kaiser Engineers to proceed with this critical procurement.

DEVELOPMENT AND TESTING

It is estimated that NPR development and testing is 91 per cent complete, on schedule.

An evaluation program of fuel element support to front nozzle surface wear resistance was organized and partially executed. A production run front nozzle section was placed in a test fixture and subjected to 1700 passes at normal force to be expected during fuel charging. The passes were made with prototype carbon steel clad Zircaloy supports along a single line 12 inches in length in the nozzle. The contact surface was water soaked as will be the case during operating conditions. Wear resistance was judged to be excellent for the given test conditions, but plans have been made to evaluate an autoclaved nozzle surface under similar circumstances for added assurance of compatibility between these materials.

The Component Test Loop operated eight days thermal cycling and actuating the prototype diversion valve and seven days at testing flow restrictions. On October 16, 1961, the loop was shut down to facilitate full tube mock-up assembly. A 30 HP pump was received from Byron-Jackson on October 27, 1961 with the shipping crate severely damaged. The pump was returned to Byron-Jackson on October 31, 1961 for inspection and repair as needed. In the interim, the 15 HP pump, which had been removed, was reinstalled and tied into the full tube mock-up.

The following items were accomplished on the full process tube mock-up:

1. Production components of the thimble assembly were fabricated and installed at the inlet face.

2. A production model front nozzle was installed at the inlet with the resulting 5-1/4° rolling twist locked into the tube.

3. A production venturi nozzle was installed in the inlet connector with the throat pinned through the throat pressure tap.

4. Pressure taps were placed at strategic locations on the inlet and outlet nozzles and connectors for use in differential pressure determinations in conjunction with the fuel element spacer flow test.

5. The inlet and outlet connector welds were X-rayed and the welds and bends of both connectors were stress relieved.

6. The venturi was calibrated by diverting flow to the 189-D Test Tank.

Design Test # 1131 was prepared and issued. This test specifies long-term environmental testing of NPR primary loop components and evaluation of longitudinal tube scratching in the rolled joint. Procurement of components to be tested was initiated. Three inlet nozzles, three outlet nozzles, three inlet valves, three diversion valves, and 14 Grayloc couplings will be subjected to operational conditions. In order to evaluate further the effect of locked in rolling twist on the rolled joint, a test assembly loaded in torsion was included in the Design Test.

Venturi calibration runs were made using prototypical Barton Flow Transducers for the purpose of determining the effect of stress relieving temperatures on the venturi. Two venturis were so tested - both having the throat pinned by a dowel penetrating half-way into the throat sleeve wall and seal welded to the outer shell surface. The tests showed very little effect on calibration characteristics resulted from the stress relief conditions. Flow data from the venturis after stress relieving fell within the required one-half per cent accuracy.

Horizontal rod drive performance has met specification requirements during tests at Hanford on an early production model. This level of performance has been achieved after minor modifications to the test assembly to refine the rod acceleration function.

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FIELD ENGINEERING OPERATION

Construction

105-N and 109-N Buildings

The application of roofing and insulated siding and the erection of interior concrete block partitions has been in progress throughout the month of October in 105-N.

The confinement seal testing program in the 105-N Building is progressing very slowly due to the large number of leaking seals and resulting retesting.

On October 4, 1961, at the request of the AEC, G.E. Field Engineering assumed technical direction of the contractor forces for the copper tubing brazing procedure. This technical direction was restricted to the problem of producing a qualified brazing procedure and two (2) qualified welders for brazing. This work has now been completed.

The work on the 105-N Building service piping by Harder and Bay Companies has continued to make good progress through October. The Bay Company has now completed testing of the drainage system below minus 16 feet and has started cleaning and flushing these lines. The Bay Company is currently preparing to start testing the Reactor Gas System.

The pulling of interlocked armoured cable was completed in the 105-N Building on October 24, 1961, and final strapping and the work on the cable terminations is in progress. Four out of a total of 11 motor control centers required in the 105-N Building have now been installed. Also the main DC distribution panel has been installed.

The flow monitor system valve racks were received from Hoke Inc. It was found that racks D, E, and F were piped incorrectly and not in accordance with the approved Hoke drawing. Rather extensive repiping will be necessary on these three racks, which are now located in the right side valve rack room.

A dark film of unknown material has been found on the inside surface of considerable portions of the flow monitor tubing. About 100,000 linear feet of this tubing has been returned to the vendor for cleaning. This tubing was bought per ASTM specifications without inspection, which is normal practice for this type material.

Work has now been started on the copper tubing lines for the pile gas instrument system and for the first time is being done in accordance with an approved and qualified brazing procedure.

The placement of concrete for the roof slab for the 109-N Building over the turbine and dump condensers bays has continued throughout October. Concrete placement is also underway on the pressurizer enclosure and the pressure relief valve pent houses above the roof.

The repair work on the dump condensers continued throughout October in an attempt to bring these vessels up to the specification requirements.

Eight of the 10 primary loop heat exchangers have now been installed and several of the blockouts left in the cell walls for this installation have now been poured.

116-N Stack

All work on this stack has now been completed and the subcontract is being closed out.

117-N Building

The underground concrete ducts are now complete from the 105-N Building through the filter area and to the stack. The subcontractor has continued to make good progress on the placing of the concrete in the filter building.

151-N Building

No change since the last report period.

153-N Building

The conduit runs between this building and the 184-N Building are now being installed.

181-N Building

The installation of the primary pump discharge piping was started and good progress made during the month of October. One of the primary pump units is being set up for pump test.

163 - 183-N Buildings

All of the process tanks are now in place in the demineralizer building and work is in progress on the piping and electrical work.

166-N Building

A preliminary subcontract acceptance inspection of the fuel oil pump house was held on October 27, 1961. It was found that considerable clean up will be required in order to determine the status of building and equipment.

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182-N Building

Approximately one-half of the floor slab at the 0'-0" level has now been placed.

The application of thermal insulation on two of the water storage tanks has been completed and the heating system is being installed in the other tanks.

184-N Building

Work has continued in this building on the turbine generator set and boiler auxiliaries.

Outfall Structure

The earth filled jetty in the river for the installation of the effluent line has now been brought to a higher elevation and widened. The elevation of the top of this fill is now 395 feet. It was necessary to increase the height due to power generation tests being conducted by up-stream hydro plants, which has caused short periods of abnormally high river flows for this time of year.

Underground Piping and Electrical

Considerable progress was made on the installation of the large underground raw water supply and discharge pipe lines. The majority of this piping is now in place.

Pile Erection

Setting of all side and outlet primary shield crates has been accomplished with pouring of No. 7 outlet now in progress.

Cleaning in preparation for installation of aluminum reflector shield and right side boron plate is now in progress.

Fabrication of inlet and outlet boron plate assemblies at Baldwin-Lima-Hamilton was completed. All top plates should be shipped by December 1, 1961.

Cast iron thermal shield blocks are all cast, and are in machining at Skookum Rotary Machine Company in Yakima and the 2101 Building. Delivery of graphite thermocouples from Thermo Electric Company in New Jersey threatens to delay packing with only 12 of the 104 shipped. Vendor's technical difficulties have been solved and fabrication and testing are controlling the delivery rate.

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Graphite Moderator

Machining of all moderator details is now essentially complete. Fabrication of spare details is now underway; remachining of Layer No. 11 to final thickness will be started following review of primary shield "as-builts" by Process Design.

Zirconium Process Tubes

Of the 1,014 process tubes on plant, 840 have been accepted as complete, 15 are awaiting final inspection, 45 require grit blasting and reprocessing, 62 have either been rejected or are held pending further vendor negotiations and the remainder are in process.

Twenty-two additional tubes were received from Harvey Aluminum on October 6, 1961. Since 15 tubes were returned to Harvey for repair or replacement on October 11, this leaves a balance of 46 tubes to be delivered for completion of both the pilot and production orders.

The Vacu-Blast equipment operated intermittently throughout the month. Excessive wear of abrasive handling components caused numerous outages and unsatisfactory blasting. Failure of the drive mechanism on October 13, resulted in blasting a thin spot in Tube AT-50 of sufficient magnitude to cause rejection of the tube for reactor installation. Instrumentation to preclude over-blasting has been procured. Installation is in progress.

Administration

The following material has been issued during the period of September 18, 1961, through October 22, 1961:

Drawings	484
Criteria	13
Specifications	21
Requisitions	148
ATP's	3
Other	39
Total	708

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

Drawings	8
Specifications	4
Scope	0
ATP's	0
Total	12

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Bailey Meter Material processed as of October 22, 1961, is as follows:

Released as noted for fabrication drawings	19
Released for comments drawings	21
Total	40

SPECIAL ASSIGNMENT

Primary Loop

Progress in the HUICO shop has been slow. Total tonnage to the field is 55.7 tons, or 2.4 per cent of the total. Shipments to HUICO from HUICO's suppliers now total 677 tons, of which 212 tons represent high-pressure primary pipe.

The following is the status of approval data on the HUICO subcontract as of October 31, 1961:

Total Number Received	1667	(Include 930 received for information only)
Number Approved	536	
Number Approved with Exceptions	52	
Number Not Approved	229	
Number Currently Being Reviewed	11	
Number Received for Information Only - No Approval Required	930	

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PROGRAM EVALUATION

Design Status

	Wt'd Total	Certified Schedule	Actual % Complete
Reactor Plant as of 11/1/61			
Title I			
Scope		100	100 (1)
Title II			
Drawings	70	94.0	92.2 (2)
Specifications	8	100.0	97.2
Requisitions	8	86.0	82.6
ATP's	4	61.5	36.7
Development and Testing	10	87.0	90.5
Total	100	90.0	89.4
Heat Dissipation Plant as of 11/1/61			
Title I			
Scope		100	98.8
Title II			
Detail Design		95.5	92.5

		No Issued to 10/28/61	
	Req'd	Scheduled	Actual
Preliminary Drawings (bid)	1199	1029	1026
Detail Drawings (for const.)	1199	1008	1007
Specifications (bid)	168	165	164
Requisitions	182	178	178
ATP's	-	0	0

Composite Design Completion as of 11/1/61 (Reactor and Heat Dissipation Combined)	Certified Schedule	Actual % Complete
Total	93.6	92.0

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

(2) The number of required drawings is changed from 2440 to 2475.

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Cost Estimate

A cost review meeting was held during the first two weeks of October with Kaiser Engineers, General Electric, Burns and Roe, Inc., and the Atomic Energy Commission. Kaiser Engineers are now finalizing this review prior to issuance of a new cost estimate early in November.

Schedules

On October 26, 1961, HOO-AEC approved and transmitted copies of Preliminary Revision # 3 to the NPR Construction Status Chart to Washington AEC. Total project cost on the referenced schedule is shown as $165 million with a March 1, 1963 completion date.

The construction status as of 11/1/61, based on Preliminary Revision # 3 to the Construction Schedule, is as follows:

	Scheduled	Actual
Temporary Construction	60.0	60.0
General Area Systems	32.0	36.0
105-N Building	27.0	26.0
109-N Heat Exchanger Building	31.0	30.0
163N-183N Water Treatment Facilities	77.0	78.0
181-N River Water Pump House	97.0	99.0
182-N High Lift Pump House	27.0	29.0
184-N Standby Power House	68.0	67.0
NPR Project (CAI-816)	33.0	33.0

Manager, NPR Project

JS McMahon:mf

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GENERAL ACCOUNTING OPERATION

The physical inventory of fixed property in 100-B was started in October and was approximately 20% complete at October 31, 1961.

The procedure for transferring NPR spare parts from Kaiser to General Electric has been revised to provide for inspection of the parts by a General Electric representative at the time title and custodial responsibility pass from Kaiser to General Electric.

The Irradiation Processing Department's PA&C, Equipment, and Planned Maintenance Budgets for FY 1964 are in progress.

PRODUCT COST AND BUDGETS OPERATION

Major item of work accomplished during October consisted of planning, organizing and preparation of the FY 1962 Midyear Review budget.

The procedure for taking power essential material inventories was changed in September to permit earlier reporting. With this change, all IPD essential materials will now be reported as of the 25th of the month and will no longer be a deterrent to early reporting. Arrangements were made with Production Operation to report power data for the same period.

Essential materials and frozen lunch physical inventories were observed in 100-B and C Processing Operations.

PERSONNEL ACCOUNTING

Total number of employees assigned to the Department at month end was 2 288, a decrease of 16 from last month.

AUDITING

During the month the following work was done in connection with Organization and Policy Guides:

	HAPO	IPD
New issues	1	1
Revisions issued	12	14
Cancellations	2	5
Up-dated without change	4	

A review of periodicals assigned to the Department resulted in cancellations by the several Sections of 14 subscriptions.

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Manager - Finance

SIGNIFICANT REPORTS ISSUED

Number	Class'n.	Author	Date	Title
ATP-2588	Secret	DF Watson	10-24-61	Total System Operational Test
HW-71438	Unclass.	DF Watson	10-24-61	CGI-844, 100-K Coolant Backup System, Project Representatives Meeting Minutes No. 7
HW-71240	Conf.	WJ Tupper	10-5-61	Diesel Emergency Drive Evaluation
HW-71384	Unclass.	ER Rudock	10-16-61	CGI-839, KER Safety Circuit Modifications, Project Representatives Meeting Minutes No. 3
HW-62602	Unclass.	ER Rudock	10-2-61	Pressure Flow Characteristics of the KER Loop Systems after Completion of Project CGI-839 Modifications.
HW-SA-2287	Unclass.	HW Heacock CE Jones	10-10-61	The Hanford Reactor Confinement Program
HW-71055	Unclass.	ER Rudock	9-14-61	CGI-839 KER Safety Circuit Modifications, Project Representatives Meeting Minutes No. 2
HW-71049	Unclass.	ER Rudock	10-3-61	Owner Operator Process and Functional Requirements for Project CGI-839, Rev. 3, 1706-KER Safety Circuit Improvements.
HW-69705	Unclass.	LM Keene	5-23-61	Project CGI-883, Representatives Meeting Minutes No. 12
Interim Report	Unclass.	AJ Lindsay	9-22-61	DT-1102, Prototype Flow Transducer for NPR Flow Monitor System
Interim Report	Unclass.	AJ Lindsay	10-2-61	DT-1105, Prototype Flow Monitor for Graphite Flow Monitor System
HW-71314	Unclass.	AN Iverson	10-16-61	A 2-1/2 Inch Diameter TV Camera
HW-70843 SUPP A	Unclass.	HF Jensen	10-4-61	Supplement A to Reactor Test of Van Stone Seal Insert Modifications

Number	Class'n.	Author	Date	Title
HW-68688 SUPP D	Unclass.	HF Jensen	10-16-61	DT-466-AE, Reactor Test of Connector Sealants
HW-71341	Secret	RS Hammond	10-13-61	On-Reactor Test of Operational Fueling Facility, October 11
HW-70902 SUPP 1	Unclass.	JD Maguire	9-29-61	DT-1092 - 105-C Modification Outlet Connector Test Report Supplement
HW-71205	Unclass.	LC Cole	10-9-61	DT-1095 - NPR Limit Switch Tests for Underwater Use - Final Report
HW-71224	Unclass.	JD Maguire	10-3-61	DT-1101 - Outlet Gas Seal Tests for C Overbored Tubes - Final Report
HW-71513	Unclass.	WEB Lander	10-26-61	Truarc Retaining Ring Integrity Tests - Final Report
Letter Report	Unclass.	W Dalos	9-29-61	Spline Modifications
Letter	Unclass.	HC Copeland	10-2-61	In-Place Testing of High Efficien Filters
Undoc.	Conf.	RT Jaske	10-6-61	Power Demand Forecast
Undoc.	Conf.	NL Jones	10-17-61	HAPO's Electrical Demand Curves
HW-71392	Unclass.	VG Blanchette	10-20-61	2400 Volt Electrical Systems - Ungrounded Versus Grounded - 100-B, D, F, and H Areas
HW-SA 2301	Unclass.	HA Kramer JP Corley	10-26-61	Use of Lake Roosevelt Storage to Lower River Temperature
HW-71238	Conf.	WL Bunch	10-4-61	Activation of NPR Control Rod Titanium
HW-71250	Conf.	DL Condotta	10-5-61	Proposed Pressure Relief Settings for Initial NPR Operation
HW-71308	Conf.	RK Robinson	10-11-61	Primary Coolant Temperatures Versus Power Level During Phase I Operation of the NPR
HW-70225	Unclass.	CL Goss	9-28-61	Reliability of the NPR Emergency Cooling System

Number	Class'n.	Author	Date	Title
HW-71340	Secret	DL Condotta	10-16-61	Reactor Design Analysis Monthly Report - 9-61.
HW-71154	Conf.	DD Stepnewski	10-19-61	NPR Pile Gas Purification
HW-71391	Conf.	FJ Mollerus, Jr.	10-19-61	Flow Compensation for NPR Primary Coolant Temperature Control
HW-71210 ADD1	Unclass.	FJ Mollerus, Jr.	10-13-61	NPR Process Tube Load and Thermal Stresses Add. 1
HW-71418	Unclass.	CE Bonham JH Fastabend	10-20-61	Design Test 1130, NPR Inlet Nozzle Key
HW-71229	Unclass.	WJ Love	10-3-61	Performance of Spherical Nut-Clamp Seating Geometries in Connector Couplings for the NPR-Gray Tool Company
HW-71523	Unclass.	WJ Love	10-31-61	Stiction-Friction and Compressibility in a Hydraulic Cylinder-Rod Drive Case Analysis
Undoc.	Unclass.	WJ Love	10-18-61	Nil Ductility Temperature

TRIPS

Name	Firm & Location	Date	Purpose
RW Benoliel	National Carbon Co. New York, N.Y.	10/15-21/61	Discuss VSR channel liners
	Norton Company Worcester, Mass		" " " "
	GEL Schenectady, N. Y.		" " " "
	Coors Porcelain Co. Golden, Colorado		" " " "
	General Electric Co. Detroit, Mich.		" " " "
	Lerma Engrg. Corp. Northampton, Mass.		Inspection of optical equipment

DECLASSIFIED

Name	Firm & Location	Date	Purpose
TW Evans	Detroit, Michigan	10/19-29/61	Attend annual meetings of ASM and AIME and Metals Show
	National Lead Co. of Ohio Cincinnati, Ohio		Consult on fabrication and processing of uranium
	Mallinckrodt Chemical Works St. Louis, Mo.		" " "
DH Curtiss	Detroit, Michigan	10/22- 11/4/61	Attend ASM Meeting and Metals Show
	Alum Co. of America Pittsburgh, Pa.		Discuss Zr-2 process tubes
	Atomic Energy of Canada Chalk River, Ont.		" " "
	GERL & Turbine Division Schenectady, N. Y.		" " "
JH Brown	AEC Washington, D.C.	10/24-27/61	Consult on reactor confinement
WA Burns	Seattle, Wn.	10/26-28/61	Attend NW Meeting of AIChE
	Univ. of Wash. Seattle, Washington		Discuss NPR problems
DF Watson	Tank & Pipe Co. Portland, Oregon	10/18/61	Inspect 48" pipe being procured for Project CGI-844
LM Keene	AIEE-ASME National Power Conf. San Francisco, Calif.	9/25-27/61	Conference concerning steam and electrical power generation
LM Keene	Byron Jackson Pumps Inc., Los Angeles, Calif.	9/28/61	Engineering discussion concerning the submersible-motor driven pumps for Project CGI-883
HW Heacock	Brookhaven National Laboratory	10/10-12/61	Present paper, "The Hanford Reactor Confinement System to the Seventh AEC Air Cleaning Conference
HW Heacock	General Engineering Lab., Schenectady, N.Y.	10/9/61	Discuss graphite distortion problems

Name	Firm & Location	Date	Purpose
FJ Kempf	National Carbon Corp.	10/15-21/61	Discuss fabrication problems and possible materials for vertical safety rod channel sleeve installation at C Reactor
	General Electric Metallurgical Products Detroit, Michigan		" " "
	Coors Porcelain Co. Golden, Colorado		" " "
	Norton Refractories Worcester, Mass.		" " "
	General Engineering Laboratory, Schenectady, N. Y.		Discussions with GEL were with regard to work they are performing under Contract ATH-IP-1-62 on graphite distortion
CH Gydesen	Pacific Steel Products, Seattle, Wash.	10/9-11/61	Pre-requisition discussion regarding VSR overboring machine design and fabrication
	Union Machine Co. Seattle, Wash		" " "
	Product Engineering Co. Portland, Oregon		" " "
	Iron Fireman Portland, Oregon		" " "
RR Cone	GE - APED San Jose, Calif.	9/29-10/4/61	Review and consultation on nuclear instrumentation work being done on project purchase order. Trip requested by NPR Project Section
A McDonald	General Electric Co. Spokane, Wash.	10/9/61	Inspect Westinghouse 450 HP motor in shop for rewind. Evaluate insulation condition and determine cause of failure. Make bridge readings to locate the position of the fault

Name	Firm & Location	Date	Purpose
HA Kramer	Grand Coulee Dam Washington	10/3/61	To measure thermocline in support of Columbia River Cooling Program
RT Jaske	Pacific Northwest Pollution Control Association Tacoma, Wash.	10/25-27/61	Conduct technical liaison in order to develop appropriate appraisal of public position on pollution control activities and to observe technical demonstration of water line inspection
HA Kramer JP Corley	Pacific Northwest Pollution Control Assoc. Tacoma, Wash.	10/25-26/61	Present a technical paper on "Use of Lake Roosevelt Storage to Lower River Temperatures."
JM Fox, Jr.	Metallurgical Eng'g. Inc., Portland, Ore.	10/24/61	Physical testing
FJ Mollerus	AIEE 9th District Executive Committee Annual Meeting Spokane, Wash.	10/6/61	Perform duties as Secretary 9th District, AIEE
CF Quackenbush	Meeting of Committee on Nuclear Piping ASA B31 - Code for Pressure Piping, New York, N. Y.	10/4-5/61	To consider a new national safety code for nuclear piping
JF Nesbitt DH White	AMF Atomics Greenwich, Connecticut	10/2-5/61	Witness tests, view fabrication, and review specifications and manuals on the irradiated metal handling system
JD McCullough	Information Systems, Inc., Los Angeles, Calif.	10/11-18/61	Discuss instrumentation problems
	Astrodata, Inc. Anaheim, Calif.	"	"
	Barton Instrument Corp. Monterery Park, Calif.	"	"
	Hydro-Aire Div. of Crane Co. Burbank, Calif.	"	"

Name	Firm & Location	Date	Purpose
JD McCullough	Western Piping & Engrg. San Francisco, Calif.	10/11-18/61	Discuss instrumentation problems
	Allied Engineering Alameda, Calif.		" "
	GE - APED San Jose, Calif.		" "
WJ Morris	Astrodata, Inc. Anaheim, Calif.	10/13-14/61	Discuss data logging and temperature monitoring and review process tube assembly thimble fabrication.
	Information Systems, Inc. Los Angeles, Calif.		
	Allied Pacific Compton, Calif.		" "
AB Dunning	Fick Foundries Tacoma, Washington	10/9/61	Determine progress of cast iron blocks
	Union Machine Works Seattle, Wash.		Determine progress of tube sleeves
JE Stice	Baldwin-Lima-Hamilton Philadelphia, Pennsylvania	10/9-11/61	Review progress of fabrication of thermal shield components
NO Strand	Taylor-Forge Cicero, Illinois	10/16-20/61	Review and approve manufacturing procedures

VISITORS

FE Kruesi WM Olliff	duPont Company Savannah River, Ga.	10/11-13/61	Information exchange
JA Scott	Illinois Water Treatment Company Rockford, Illinois	10/23-11/7/61	Assist in startup of the deionizer facility
WB Cottnell	Oak Ridge National Laboratory Oak Ridge, Tennessee	10/26/61	Discuss Reactor Confinement System philosophy
Paul Berner	Star Machinery Co. Seattle, Wash.	9/27/61	To discuss centering flange cutters
Howard Schrock	Ex-Cell-O Corp. Downey, Calif.	9/27/61	To discuss centering flange cutters

Name	Firm & Location	Date	Purpose
WF Carmody	Farrell Birmingham Co. Buffalo, N. Y.	10/12/61	To review maintenance problems on gear drives supplied by the G. E. Co.
W Wallering CA Ferguson	Ladish Company Cudahy, Wisconsin	10/6-7/61	NPR piping metallurgy
Del Buono J Wilson	Taylor Forge & Pipe Chicago, Illinois	10/1/61	Piping metallurgy. Metallurgy of carbon steel
P DeRienzo	Burns & Roe Co. New York, N. Y.	10/31- 11/1/61	NPR piping metallurgy
CD Eiselbohn	Midwest Piping Co. Los Angeles, Calif.	10/25/61	Metallurgy of carbon steel
CA Pursel	AEC Chicago, Illinois	10/13 & 10/16/61	Discuss NPR confinement and Advanced Reactor Study
FC Hackett	Allegheny-Ludlum Steel Pittsburgh, Pennsylvania	10/10-12/61	Witness reconditioning of pit type defects in six Allegheny zirconium process tubes.
SA McCaskey, Jr.	" "	10/24/61	Discuss contract problems with AEC-HOO relative to the defective zirconium tubes supplied by his company.
WB Contrell	Editor of Nuclear Safety Oak Ridge, Tennessee	10/26-27/61	Discuss reactor confinement

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