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IRRADIATION PROCESSING DEPARTMENT

MONTHLY REPORT

NOVEMBER 1960

HANFORD ATOMIC PRODUCTS OPERATION

GENERAL ELECTRIC

RICHLAND, WASHINGTON

MASTER

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IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
NOVEMBER, 1960

Compiled By
IPD Personnel

December 14, 1960

RICHLAND, WASHINGTON

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

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SUMMARYRESEARCH & ENGINEERING OPERATION

Test irradiations of projection fuel elements in B, C, and D Reactors continued without failures or other unusual experiences.

Tests to determine the effect of increased Alum feed rate and substitution of aluminum nitrate for Alum in the water treatment process on the reactor-effluent activity were continued at B and H Areas, respectively. The increased Alum feed rate test has showed a reduction in output of As-76 and P-32 of 70% and 50%, respectively. Fuel elements which were exposed in H Reactor to the water treated with nitrate instead of sulfate did not have the characteristic iron oxide film; the test was continued to investigate this phenomenon.

The primary limit to reactor power levels during this report period has been rupture control considerations.

The minimum samarium content specification for the N Reactor 3X system's ceramic balls was increased 10% to compensate for uncertainty in the chemical analyses of the manufacturers.

N Reactor decontamination processes were specified to firm up waste disposal studies and design of equipment.

MANUFACTURING OPERATIONProduction

Record reactor input production exceeded the previous maximum (May, 1960) by 0.3 percent. Forecast was exceeded by 9.1 percent, 5.9 percent at the six old reactors and 13.7 percent at the K's, due to high time operated efficiency and improved operating levels.

Over-all time operated efficiency was 85.3 percent (82 percent forecast); 84.7 percent at the six old reactors and 87.0 at the K's. Efficiency was high due to the effective utilization of unscheduled outage time which minimized the number of scheduled outages.

The combined reactor instantaneous power level was increased 325 megawatts (18255 to 18580). The individual reactor power levels were increased 70 megawatts at KW (3840 to 3910), 55 at KE (3800 to 3855), 45 at B (1730 to 1775) and 20 at D (1765 to 1785).

Eleven ruptures, eight I&E regular, two solid regular and one I&E enriched were removed from the reactors. Three of the I&E regular ruptures were at B, two at KE and one each at C, D and F. The two solid ruptures were at DR and the I&E enriched at KW.

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Engineering

During the month spare parts inventory increased \$2,173. An interim report was issued on the survey for combustible gases in and around the reactor block. A request was issued to reactivate engineering work for the modification of the 105 Buildings' C and D elevators. A request was issued for a gas purification proposal study as part of the over-all Helium Loss Reduction program. Information relative to the history of craft training was provided for a brief to be sent to the Ching Panel. Mechanical craft training courses were presented to 121 mechanical maintenance people and 18 instrument people. Procedures or manuals were issued for Foxboro recorders, Horizontal Control Rod systems, and Ball 3X systems. Two serious accident investigations were conducted. Assistance was provided 100-H Maintenance Operation in preparing and expediting bid packages for replacement of rear face pigtailed.

Planned work continued on the inspection requirements and testing of modified inlet nozzles for bumper fuel elements in D and H Reactors. Criteria for Audible Alarms have been issued for comments. Work continued toward programmed installation of Beckman-Panellit Interlocks, Geminol Thermocouple Readout Instrumentation, and Radiation Monitoring Instrumentation.

FACILITIES ENGINEERING OPERATION

Design studies for modifying the export water system continued with completion of scope design of the 182 Building steam driven pumps, receipt of surge suppressor settings from G. R. Rich and extension of the contract with Mr. Rich to engage his services during the design and testing of the system modification.

Study drawings of the inlet and outlet process tube assemblies for modifying C Reactor for use of self-supported fuel elements were transmitted for comment. This concept provides for a rigidly fixed rear assembly with total expansion allowed at the inlet end.

Two front thermal shields were overbored 550 mils at C Reactor; one rear centering flange was cut open and the rear donuts extracted. The number of remote operable valves installed on the rear face in KE Reactor was increased to 50 and an order for 100 ball valves was placed. High speed scanning equipment completed the acceptance test in the vendor's plant.

The sixth process tube rupture test, of the 1960 series, was run.

Specifications and requisitions for stop-gap rear face connectors have been prepared pending completion of development of improved connectors.

Modifications of the power demand metering system have been completed.

A performance test indicated that Knight Ideal Coal is satisfactory for burning in the 100 Areas.

The new filter buildings for CGI-791, "Reactor Confinement," have been connected to the reactor buildings at 105-B, C, F, and H Areas. Installation of particulate filters in these buildings has started.

Project CGI-865, "Continuous Air Monitoring - All Reactors," was closed out with no exceptions on November 27, 1960.

NPR PROJECT OPERATION

Phase II construction started on the 105-N reactor building October 31, 1960, with Kaiser Engineers forces.

Production of notched graphite bars was started using the Arrowsmith machine at a limited rate while debugging continued. Trial runs on process tube autoclaving continued while improvements in material handling and processing equipment were being made. Shipment of graphite and zirconium continued to meet or exceed on-site needs.

No primary loop piping has yet been fabricated in the HUICO shop. Initial reactor shield crate fabrication failed to meet tolerance requirements.

Processing of design material continued at a high rate.

Design activities continue to shift from the detail design drawing effort, now nearing completion, to procurement. All aspects of procurement on the NPR Project require a higher than anticipated consumption of design manpower resulting in schedule difficulties. The program of acceptance test procedure preparation is now active. Studies of primary and secondary loop operating characteristics are under way as vendor equipment data and Burns and Roe information becomes available.

FINANCIAL OPERATION

HOO-AEC was verbally advised of the inadequacy of Project 791 Reactor Confinement funds November 23, 1960.

FY 1961 Miscellaneous Capital Work Order fund allocation data was provided to Contract Accounting November 29, 1960 with a request for additional funds.

Essential material price lists were issued for use in the second quarter of FY 1961. An expected decrease in coal prices on the new contracts was offset by increased freight rates effective October 24, 1960.

Total personnel assigned to the Department at the end of November was 2,265, an increase of seven from last month.

A report covering a follow-up of an audit of procurement activities was issued. Correction of unsatisfactory conditions found in the audit was noted.

RELATIONS PRACTICES OPERATION

Two technically trained candidates and one PhD candidate were interviewed during the month with no offers extended. Four monthly employees transferred into the Department from another HAPO component; one monthly employee transferred to another HAPO component. Four IPD employees retired during November. IPD sustained its first disabling injury in 612 days on November 18, 1960. One security violation was reported during the month.

GENERAL

RESPONSIBILITY

There was no significant change in responsibility.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non Exempt</u>	<u>Total</u>
General	7	2	9
Research & Engineering Operation	107	63	170
Manufacturing Operation	388	1364	1752
Facilities Engineering Operation	124	46	170
NPR Project Operation	82	26	108
Financial Operation	17	14	31
Relations Practices Operation	<u>6</u>	<u>19</u>	<u>25</u>
TOTAL	731	1534	2265

SAFETY, SECURITY AND RADIATION EXPERIENCE

The first disabling injury in 612 days occurred November 18 when a pipe-fitter fell about 15 feet from a plenum chamber to the floor in the 105-KW Building. There were 75 medical treatment injuries, one security violation and no 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.

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<u>Date</u>	<u>Name</u>	<u>Title</u>
11-22-60	W. C. Ban	Wide Range Current Detection Circuit.

General Manager
IRRADIATION PROCESSING DEPARTMENT

AB Greninger:OCS:cs

RESEARCH AND ENGINEERING OPERATION

PROCESS AND REACTOR DEVELOPMENT OPERATION

REACTOR FUELS

Present Reactor Technology

Projection Fuel Testing

No unusual irradiation experience was noted during the month in the 69 tubes and 11 tubes of self-supported fuel elements in the C and B Reactors, respectively. Thirty-two tubes of these elements were discharged from C Reactor during the November 6 outage without difficulty. The average exposure of the fuel elements discharged was 782 MWD/T.

The prototype of the charging machine for bumper fuel elements did not work successfully during the November 12 outage at D Reactor. Further modifications are necessary.

Thirty-three tubes of material charged under authorization of Supplement A to PT-IP-262-A were discharged from D Reactor and are being examined for hot-spot frequency at the 105-C Metal Examination Facility. Sixteen of these tubes were charged with bumpered fuel elements; seventeen with normal elements. The exposures ranged from 1100 to 1200 MWD/T for these fuel elements. As reported last month, the irradiation performance indicated a 38-fold improvement in rupture resistance at a 95% confidence level or 15-fold improvement at the 99% confidence level for the bumpered fuel elements.

Advanced Reactor Technology

High Temperature Irradiations

KER-1 loop is temporarily empty due to the unsuccessful attempt in charging thermocouple and heater elements on November 11.

KER-2 loop was charged on November 11 with four single-tube elements with brazed end-closures under PT-IP-363-A. These elements are designed to simulate the behavior of N Reactor outer fuel tubes. The elements are enriched at the 1.6 w/o U-235 level and have iron supports.

An additional defected element for the fuel failure-testing studies being carried on at the ETR facility was charged in KER-3 loop. The total number of this type of element in the tube is now seven. Elements at two different exposures will thus be provided for the ETR tests.

Eight natural uranium, tube-and-tube elements with hot-headed closures, were discharged from KER-4 loop on November 11. Their exposure was 2030 MWD/T. Detailed examinations are being made. The KER-4 loop was recharged with identical charges as KER-2.

STATUS REPORT OF PRODUCTION TESTS

<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-84-A	Projection self-supported fuel in ribless aluminum tubes					Preliminary evaluation of self-supported fuel elements. Routine charging to continue until tubes are replaced. Ultrasonically attached supports currently being used. Goal exposure increased from 900 MWD/T to 1200 MWD/T.
	a. Supports at 1/7 position	2	B	1200 MWD/T	Varies with charge date	
	b. End spider	9	B	1200 MWD/T		Initial charging of end-spider supports.
IP-171-A	a. I&E X-8001 OIIN	6	F	Variable	300 MWD/T	Provide for evaluation of alternate aluminum component vendors. Control columns are only ones carried special. Rest are lot charged. Cliff Manufacturing components are now under irradiation.
IP-216-A	Normal Prod. Nat. OII, CII & KIII fuel elements	72	All	Normal Variable Goal		Provides for monitoring the performance of a sample of all Natural Uranium Lots to assist in development of a Quality Index for Production use. Test is continuous.
IP-255-A	Solid Black Mint	7	H	2 Years	13 Months	Provides for long term irradiation of solid black mint for conversion ratio, and fuel performance determination. Three control columns discharged for special extraction.

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<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-262-A	a. Bumper supported fuel in ribbed process tubes.	0	D	1200 MWD/T	Discharged	Provides for testing of bumper type fuel elements in ribbed process tubes. Each of the bumper columns is paired with a control column. All pairs are awaiting examination.
b. 100 tube		24	D	To be determined.		Provides for determining handling problems associated with bumper fuel elements.
IP-272-A	CIVN Geometry I&E self-supported fuel	69	C	Variable		Provides for testing of CIVN geometry fuel in C Reactor ribless zirconium process tubes.
IP-300-A	8 Nat. U- Hot-headed tube-and-tube elements	1	KE	2500 MWD/T	2030 MWD/T	Charged April 25, 1960 in KER Loop 4. Discharged 11 Nov. 60 because test objectives had been achieved.
IP-309-A& IP-309-A Supp.A	Four heavy walled single tube elements; three heavy walled single tube elements with capped jacket defects for failure testing.	1	KE	2500 MWD/T	1605 MWD/T on elements charged 3 July; 345 MWD/T on elements charged 11 Nov 60	Six elements charged in KER-3 on July 3, 1960; one element added to charge on 11 Nov 60.
IP-363-A	Four 18-inch KSE-3 elements	2	KE	4000 MWD/T	365 MWD/T	KER-2 and 4 charged 11 Nov 60.

REACTOR PHYSICS

Present Reactor Technology

E-N Conversion Ratio Test

E-metal from three additional columns of the E-N conversion ratio test (PT-IP-255-A-9-FP) was shipped to REDOX on November 7. This material has been dissolved and samples taken for analysis. The results of the analyses will give additional conversion ratio data on the striped and fringe part of the E-N load. The results from the single column of the earlier dissolutions have been received and indicate higher Pu-239 conversion ratio and U-235 burnout than previously assumed. Final reporting of the E-N conversion ratios will await the receipt of the results now being obtained in CPD.

Advanced Reactor Technology

Ceramic Balls

Our original specification of samarium content in the ceramic balls for the N Reactor SX system was 0.345 gm/cm³. Recent 305 tests of samples from the Electric Autolite Company and the Corning Glass Works indicate that the Sm content was ten to twenty percent lower than that claimed by the two companies for the particular samples. Chemical analyses of the samples by Corning verify the 305 results; Autolite chemical analyses indicate Sm contents ten percent higher than the 305 results. Therefore, there appears to be about a ten percent uncertainty in the chemical analyses; to reduce the possibility of the Sm content in the final ball product falling below the 0.345 gm/cm³ value, the minimum quantity has been increased ten percent to 0.380 gm/cm³. This additional Sm will increase the cost of the balls by \$8000.

REACTOR ENGINEERING

Present Reactor Technology

Materials and Fabrication

Purchase orders have been let to procure process tubes for the 20-tube overbore demonstration for C Reactor. The particulars of the orders are shown below.

<u>Vendor</u>	<u>Type of Tube</u>	<u>Number Ordered</u>
Allegheny Inidium	Smooth Bore	12
	Zircaloy-2	
Bridgeport Brass	Smooth Bore	20
	Zircaloy-2	
Alcoa	Ribbed Aluminum	20
	Smoothbore Aluminum	15 (+20 for exponential pile measure- ments)

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Process Tube Outlet Fittings

The following combinations of outlet sizes have been determined to be compatible with requirements for process tube flow protection by the Panellit gauge system.

FLOW INCREASES POSSIBLE WITH ENLARGED
OUTLET FITTINGS

<u>Reference Number</u>	<u>Header Parker Fitting ID (inch)</u>	<u>Pigtail Type and Size (inch)</u>	<u>Nozzle Parker Fitting ID (inch)</u>	<u>Type Nozzle</u>	<u>Flow Increase Percent</u>
1	.469	duPont 5/8	.469	BDF	0
2	.469	J 3/4	.650	BDF	4.3
3	.610	J-2 5/8	.610	BDF	8.0
4	.610	J 3/4	.650	BDF	10.2
5	.650	J 1	.870	K	15.0
6	.870	J 1	.870	K	15.2

The flow increases in the above table are based on a front header pressure of 580 psig. Reference 5 in the table represents the maximum enlargement which can be obtained at the header Parker-fitting without replacing the rear crossheader.

Advanced Reactor TechnologyMaterials and Fabrication

In addition to the 67 tubes received from Harvey Aluminum on their N Reactor pilot process tube order, 27 tubes have been received from Allegheny Ludlum. Chase Brass & Copper is behind schedule; to date 21 tubes have been received. The first 30 out of the total of 800 N Reactor tubes in the Harvey production order have been shipped on schedule.

The initial lots of tubes from the pilot orders (21 Chase, 27 Allegheny, 10 Harvey) have all been inspected on-site by Vidagage, x-ray, ultrasonic and Zyglo tests. Harvey tubes were all acceptable. Chase and Allegheny tubes all had Zyglo indications and sixteen have been rejected. Thirteen of the sixteen were rejected on the basis of weld faults and two on the basis of thin walls.

Decontamination - N Reactor

Decontamination processes have been specified to firm up waste disposal studies and design of waste disposal equipment. One process is a once-through, front-and-rear-face decontamination using Turco 4512 at a concentration of ten percent by volume. A second process is a three-step process for decontaminating a full reactor or single loop. This is a recirculation process involving three separate solutions whose contents are given below:

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Solution No. 1

Hydrogen peroxide	32 gm/gal*
Sodium bicarbonate	80 gm/gal
Sodium carbonate	100 gm/gal
EDTA	20 gm/gal
8 - Hydroxyquinoline	4 gm/gal

Solution No. 2	Sodium hydroxide	680 gm/gal
	Potassium permanganate	115 gm/gal
	Isophenyl 2-Hydroxy	12 gm/gal

Solution No. 3	Wyandotte FE-1112	340 gm/gal
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*Concentrations are all on the basis of 100% concentration.

Additional studies are in progress to determine if specified chemicals can be omitted or replaced with others in each solution. However, the processes specified will not be changed unless waste disposal problems are found to be insolvable. The specified processes will work and are compatible with reactor piping integrity for at least limited periods of use.

N-Reactor Waste Disposal

Laboratory studies of the treatment of phosphoric acid decontamination waste indicated that precipitation of the phosphate would carry the radionuclides in the precipitate, but would produce a sludge volume about three times as great as the original volume of decontamination solution. Because iron floc produces a much smaller volume of solids and excellent removal of radionuclides from the supernatant liquid, it was decided that disposal of nonradioactive phosphate solution would be considered a separate problem. Release of phosphates to the river is undesirable especially during the critical fall months because of the likelihood of activation of phosphorus in downstream reactors.

NPR Graphite Procurement

Reprocessing of graphite from Great Lakes Carbon Corporation to improve the purity to meet our +1.25 dth specification has been satisfactory. Sample bars from the last gas-purifying furnace heats were found to have acceptable dth purity values in the range of +0.7 to +0.8. Shipment of the bars in December will complete the order of top and bottom reflector graphite from Great Lakes.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience of critical IPD classifications for the year to the date of the last badge exchange (November 4, 1960 - 44 weeks):

<u>Classification</u>	<u>Total Dose</u>	<u>No. of Employees</u>	<u>Average Dose/Employee</u>	<u>Extrapolated Year End Average</u>	<u>No. of Employees Over 3r Extrapolated Exposure</u>
Radiation	197442 mr	85	2323 mr	2746 mr	10
Monitors					
Processing	511410 mr	257	1990 mr	2352 mr	28
Operators					
Pipefitters	163091 mr	93	1754 mr	2073 mr	6
Millwrights	128037 mr	77	1663 mr	1966 mr	1

Lapse of Control

Lapses of Radiation Control Distribution by Reactor and Component

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>IPD Totals</u>
Processing	0	0	0	1	2	0	1	0	4
Maintenance	0	0	0	0	2	1	0	0	3
Supplemental Crews	0	0	0	1	0	0	0	0	1
Research & Engineering	0	1	0	0	0	0	0	0	1
Facilities Engineering	0	0	0	0	0	0	0	0	0
Central Maintenance	0	0	0	0	0	1	0	0	1
Reactor Areas	0	0	0	1	0	1	0	0	2
Assigned Totals	0	1	0	2	3	3	1	0	10
IPD General									
Outside IPD				1					1

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

Average Concentration of Radioisotopes in Reactor Effluent Water

The average concentration of radioisotopes in reactor effluent water from samples taken during October, 1960. Concentration in units of pc/cc (10^{-12} curies per cubic centimeter).

<u>Reactor</u>	<u>P32**</u>	<u>As⁷⁶**</u>	<u>Zn⁶⁵**</u>	<u>Np²³⁹**</u>	<u>Cr⁵¹***</u>
B	11	160	48	130	390
C	14	320	18	280	310
D	11	320	16	280	610
DR	13	440	27	150	520
F	9	160	32	190	2400
H	6	105	19	92	420
KE*					
KW	5	66	12	150	250

*No samples taken at KE during period.

**Average of weekly samples taken.

***One analysis made for each reactor during period.

Reduction of Reactor Effluent ActivityIncreased Alum Feed Rate for B Reactor

Sampling difficulties were corrected at 100-B. On the basis of data obtained to date, a 50% reduction in output of P-32 and a 70% reduction in output of As-76 can be expected if the aluminum sulfate feed rate in water treatment is increased to 11 ppm and about 0.011 ppm filter aid is used.

Use of Aluminum Nitrate in Place of Aluminum Sulfate

During examination of fuel elements which had been charged under this test at 100-H, it was observed that the fuel elements which had been exposed to the nitrate treated water did not have the characteristic iron oxide film. Those from the control side of the reactor did have the characteristic discoloration. It is not known whether this absence of iron film resulted from the substitution of the nitrate ion for the sulfate ion in the water or to abrasion by the water turbidity. Since the absence of this film could have a fundamental effect on effluent water activity and heat transfer, the test will be continued.

RECEIVED

PROCESS TECHNOLOGY OPERATIONREACTOR POWER LEVEL LIMITATIONS

The primary limit to reactor power levels during this report period has been rupture control considerations. D, DR, and H Reactors were additionally restricted for a portion of the month by bulk outlet temperature limits.

PROCESS STANDARDSHW-46000 B, Process Standards - Reactor

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

Process Standard A-020 - "Tube Outlet Temperature Limits, Trip-After-Instability"

Process tube outlet temperature limits are currently determined by the "Trip-After-Instability" concept. This temperature limit, in conjunction with pressure monitor low trip specifications was developed to prevent boiling in a process tube should water flow to the tube be reduced.

The former, simplified and conservative presentation of the "Trip-After-Instability" concept, was revised to gain better limits by consideration of all factors involved in the concept which are variables, rather than selection of some of these functions as conservative, arbitrary constants.

Process Standard C-120 - "Poison Splines"

Many changes to both spline equipment and splining techniques have been made since the original issue of this standard, therefore a new edition was prepared. The standard was generally up-dated. All requirements related to the swelling problems of boron-carbide filled splines were deleted since only sintered boron splines are now used during operation.

Several monitoring requirements were revised to allow splines to be inserted during the rise to equilibrium power level.

HW-46000 D, Process Standards - Reactor

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

Process Standard C-120 - "Poison Splines"

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

HW-46000 F and H, Process Standards - Reactor

One revised standard was issued for each of the above reactors during the month. This was:

Process Standard A-020 - "Tube Outlet Water Temperature Limits - TAI"

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

HW-46000 K, Process Standards - Reactor

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

Process Standard C-100 - "Inoperable Rods - Ball 3X Hoppers and Rod Testing During Outages"

The standards was extensively revised to clarify intent and up-date requirements necessary to meet shutdown reactivity control and total control concepts based on a water loss incident. Major changes to the standard are:

1. The reference to rod testing with low water pressure trips set to automatically drop the vertical safety rods upon loss of water pressure, which permitted nearly half of the vertical rods to be out of the reactor for testing, was deleted. This is no longer permissible under the total control concept.
2. The number of rods permitted out immediately after shutdown was increased, and the time extended from one to eight hours. This was accomplished by utilizing the xenon transient during this period.
3. Boron splines were added to the list of vertical safety rod substitutes.
4. A provision that the Reactor Physicist be consulted prior to horizontal rod removal was specified.
5. The ball 3X system requirements were revised to permit only temporary hopper lock-out for a specified time. After the specified time, a manual or automatic ball hopper trip is required in event of total water loss to the reactor.

PROCESS CHANGE AUTHORIZATIONS

Four Process Change Authorizations were issued during the month to permit temporary deviation from Process Standard - Reactor, HW-46000. These were:

PCA #0-95 - "Water Leak, H-Reactor"

On October 6, 1960, the water collection at H Reactor increased slightly over that permitted in Process Standard B-010. No loss in reactivity was observed, and a survey of tube powers did not show excessive amounts of water in the moderator. These data indicated the water leak was in the rear section of the reactor and would not significantly affect reactor life.

In order to permit efficient job and manpower scheduling for the impending outage, continued operation was authorized by this process change until October 10, 1960, provided the following specifications were met:

1. The dewpoint of the inlet gas to the reactor should be maintained at less than 15°F,
2. The water collection rate should not exceed 50 gallons per day,
3. Reactor shall be shut down on any tube power reduction which could be attributed to water in the reactor moderator.

PCA #0-96 - "Storage Of Unirradiated .96 Enriched Uranium - H Reactor"

Process Standard H-010 limits stacking of unirradiated uranium containing .96 U-235 or less, to three pallets high. A delay in charging of Production Test IP-350-C, "E-N Demonstration Load," resulted in a temporary storage problem for enriched fuel elements.

Storage of unirradiated .96 U-235 enriched uranium five pallets high was permitted until April 15, 1961, provided:

1. An empty pallet is placed between the bottom two pallets and the top three.
2. Lateral spacing restrictions specified in the referenced standard shall apply.
3. Use of water for extinguishing fires in the metal storage room shall be prohibited.

PCA #0-97 - "Thermal and Biological Shield Cooling Water Temperature Checks, F Reactor"

Standard A-070 requires checking the outlet water temperature and flow on the shields once very hour. Due to the failure of both outlet water temperature thermocouples, the required temperature check could not be made at F Reactor. This process change authorized continued operation at F Reactor until November 21, 1960, without monitoring the thermal and biological shield cooling water temperature, provided:

1. Shield water flow was maintained at least 80 per cent of the normal flow,
2. Hourly checks were made of the maximum thermal shield temperatures in at least three locations in the reactor,
3. The thermal and biological shield outlet water temperature thermocouples will be repaired on the next minimum outage at F Reactor.

PCA #0-98 - "Upstream Seating Charge on Spline Tubes - K Reactors"

Standard C-120 permits using an upstream seating charge consisting of perforated dummies to act as a guide for easier spline insertion.

The K Reactors have been using a seating charge consisting of a combination

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of tubular and perforated dummies. Although this is not believed to be of immediate reactor safety or life concern, further evaluation of this practice is necessary prior to its acceptance.

This process change authorizes continued operation at the K Reactors with upstream seating charges consisting of a combination of tubular and perforated dummies until January 20, 1961. During this period, the use of tubular dummies in the upstream seating charge will be evaluated.

PROCESS ASSISTANCE

Auditing

One engineer audited conformance to Process Standards by making 10 inspections at each reactor during the report period.

Graphics

Graphic services prepared 33 charts, graphs, and visual aids for various IPD and HLO components.

RUPTURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Material</u>	<u>Exposure</u>	<u>Type of Failure</u>
11/6/60	1361-B	KL-491-D	I&E N	662	Side Hot Spot
11/6/60	2180-C	CJ-855-C	I&E N	651	Hole
11/11/60	1559-KE	KR-284-D	I&E N	532	Unknown
11/11/60	3275-KW	KS-209-F	I&E E (0.94%)	668	Side Hot-Spot
11/12/60	1366-D	KO-108-C(1)	I&E N	635	Side-Other
11/14/60	1166-B	KL-536-D	I&E N	500	Side Hot-Spot
11/20/60	1192-DR	CA-161-H	SN	457	Split-Long
11/22/60	2455-DR	CA-902-H	SN	614	Split-Long
11/27/60	1471-KE	KR-279-D	I&E N	667	Hole
11/30/60	3566-B	KL-561-D	I&E N	633	Side-Other
11/30/60	1677-F	KL-512-D	I&E N	599	Unknown

(1) Six inch fuel element with attached water mixer spool.

Legend:

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

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

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

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

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

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

Hole - Failure occurred on the internal surface of an internally and externally cooled fuel element. The failure was probably caused by water penetration through a weld or other unknown mechanism.

Split-Longitudinal - The failure was caused by cleavage of the uranium along the axis of the core.

PILE PHYSICS ASSISTANCE

Average equilibrium flattening efficiency as measured by ECT reached a new high level of nearly 78.5 per cent of all reactor tubes; consistently good flattening at most reactors and favorable residual exposure distribution at KE Reactor were primary contributing factors.

Insufficient reactivity associated with unusually low residual exposure at KW Reactor and with the first full central zone discharge at H Reactor required about a 10 per cent reduction in power levels at each of these reactors for one to two weeks.

With the installation of spline caps on DR Reactor all reactors except H are now equipped to use splines; however, only the C, D, and K Reactors have adequate spline removal equipment for unrestricted use. F Reactor continued to realize significant flattening and startup efficiency gains through its limited use of splines.

Production Test IP-358-AC, authorizing the experimental use of nitrogen as one of the constituents of the KE atmosphere, was approved during the month.

SUMMARY OF OPERATING DATA OF PHYSICS INTEREST
FOR THE MONTH OF DECEMBER, 1960

Reactor	B	C	D	DR	F	H	KE	KW
ECT in November (1)	1510	1715	1495	1540	1460	1620	2600	2535
12-Month Avg. ECT	1455	1690	1495	1555	1440	1620	2500	2485
Equil. Scram Time (2)	14-16	25-30	15-17	30-50	14-20	12-18*	25-30**	20-25**
No. of Scrams and Recoveries (3)	1/1 0/0	0/0 2/1	1/1 0/0	1/1 0/0	1/1 0/0	4/4 0/0	0/0 3/1	1/1 0/0
No. of Non-Scram Outages (4)	3/0	2/0	2/0	2/0	2/0	3/0	2/0	1/0
Recording Period - From:	10-21	10-21	10-20	10-21	10-22	10-21	10-21	10-21
To:	11-18	11-18	11-16	11-18	11-18	11-21	11-17	11-17

* For the initial period of operation following the block discharge the low reactivity status of H Reactor precluded hot startups.

** 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 - S. L. Stewart

Although three outages - one for a water leak and two caused by ruptures - limited operating continuity, operation was steady and a new high average ECT of 1510 was maintained. Nonequilibrium losses averaged only 0.30 equilibrium day's production per startup.

Total control limits for the reactor restrict the amount of enrichment to its present value unless splines are used for startup reactivity compensation; the extra enrichment that will be required for higher winter power levels may require either that the flattened zone size be reduced or that splines be routinely used for temporary total control poison to be withdrawn while the reactor is operating shortly after startup.

C Reactor - D. E. Newbrough

A new high average ECT of 1715 tubes was achieved. Nonequilibrium losses almost doubled to an average of 0.45 of a day's production per startup as a result of higher power levels, a revised equilibrium rod configuration (necessitating conservative operating procedures during its initial application), a scram following one startup, and malfunction of the flexowriter tube outlet temperature recorder.

As a result of recent flux traverse data the special upstream enrichment pattern to compensate for 3X balls in the lattice is being shifted three lattice units to the far side. A more predominately downstream rod configuration was adopted to aid in the flux readjustment. The current number of 95 special upstream loadings will be maintained until the benefit from the above two changes can be more clearly evaluated.

D Reactor - J. F. Jaklevick/J. H. Ferguson

Flattening efficiency was limited for one operating period due to charging omission of seven enrichment charges and four natural uranium columns; the resulting shortage of control rod in the far side of the reactor also contributed to a minor distributional flux cycling problem.

A new low nonequilibrium loss of 0.17 of a day's production was attained during one startup.

A combination of events including an unexpected ruptured rear ball valve control line resulted in the opening of a ball valve (tube 1178) and the rapid discharge of a full column of lead-cadmium slugs; the reactor was automatically scrambled by two coincident Beckman trips.

During the power rise following one startup at about 850 megawatts the number two half-rod was inadvertently inserted fully into the reactor thus "uncovering" the upper near corner; the "stop-gap power rate meter" momentarily registered full scale (indicated 300 megawatts per minute for a few seconds). Although near side tube temperatures increased substantially during these few seconds, the flux distortion was corrected by rapid rod readjustment, and limits were not exceeded at the resulting peak level of 1100 MW.

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DR Reactor - D. G. Montague

The reactor entered the latter third of the exposure range of the block discharge cycle, a more difficult period for maintenance of control stability. The flexibility for limited spline usage made possible with the installation of 50 spline caps should permit smoother control than during the high exposure portion of the previous cycle. However, spline use will be restricted to compensating for long term gains since the lack of withdrawal equipment requires their discharge during outages.

Difficulty was encountered in achieving a balanced flux distribution following a scheduled outage; about a week was required to resolve the necessary reactivity distribution readjustments.

F Reactor - C. D. Wilkinson

Marked startup efficiency improvements have been made with achievement of a startup loss of only 0.25 of a day's production following the last outage of the report period; increased TAI limits from completion of fringe venturi changes and increased experience with spline usage resulted in this performance. Further gains should be realized when improved spline removal equipment is obtained. The insertion of splines continued to be a problem with only about half of the insertion attempts being successful; the new self-aligning caps are being installed to correct this condition.

Reactor operation was interrupted by two full term outages, one for a rupture and the other for a water leak.

H Reactor - A. R. Kosmata/D. W. Constable

As reported last month a very low reactivity condition followed the first block discharge. However, following a shutdown for a rupture about a week after this first startup, a slightly lower initial equilibrium power level and already apparent long term gains permitted sufficient control. Subsequently, the power level was increased to bulk effluent limits within a few days.

KE Reactor - G. F. Bailey

The reactor operated with a favorable discharge cycle. The center portion was at low exposure and the fringe portion at a significantly higher exposure than normal; the result was a flattening efficiency and a high power level which exceeded previous maximums for the K Reactors.

The operability of the control systems still presents a problem. 3X balls were cleared out of two horizontal rod channels; however, the HCR's in three other channels cannot be completely inserted. Although an obstruction was removed from one outer ball channel and the hopper was returned to service shortly thereafter, an adjacent hopper tripped inadvertently and was subsequently removed from service; as a result additional supplemental control continued to be necessary to meet total control requirements.

KW Reactor - R. A. Chitwood

A large central zone discharge resulted in an extremely low central residual exposure and a shortage of reactivity following the November 11 outage. To maintain sufficient reactivity for control it was necessary to obtain approval to operate with graphite temperatures up to 50 degrees over normal limits. Slight power cuts were initiated to bring the graphite temperatures within limits as soon as practical; within a week after start-up long term gains permitted resumption of power level increases. The reactor maintained an excellent tube power distribution.

PROCESS PHYSICS STUDIES

Safety Control Studies

Reports have been completed on the successful experimental test results of the subcritical monitor and the power rate meter and will be issued shortly. Results of the subcritical monitor test confirm preliminary recommendations previously made for its incorporation in Process Standards. Power rate meter test results indicate that this system gives the desired protection even in the case of periods as short as four seconds in the low megawatt region. Total control calculations for the K Reactors have been reviewed to take account of the locking out of one ball 3X hopper and its associated VSR in the outer system due to channel obstruction. Although its effect on enrichment allowances is significant this reduction in control capacity will not require supplementary poison for total control requirements under normal conditions.

File Reactivity Studies

A low-level small-block reactivity measurement is being planned for further assurance of E-N reactivity matching. A production test is being prepared to permit such a test during the next H Reactor block discharge outage in January.

A meeting on automatic control was held during the month with HLO and Equipment Development personnel to designate responsibilities for a closed-loop demonstration test. As a result of suggestions in that meeting a preliminary production test is being prepared to simulate automatic control by means of fixed rules for operator action.

Assistance provided for PRTR startup activities consists of one data taker on each of two shifts. Because of the week-end time involved, time away from IPD work is the equivalent of one person full time.

Control Efficiency Studies

Four winches of the six-tube prototype poison column displacement system installed on KW Reactor have been removed for modification. A binding problem has resulted from moisture entry into the winch housings; the problem is being overcome by protective covers and drain holes in the housing assemblies.

Shielding Studies

Shielding experiments are continuing in conjunction with overbore channels 14590, 14640, and 24880. Variations have been made in ring and donut compositions, tolerance and deflections, and bayonet compositions; before and after dosimetry measurements are being made in each case. Results to date have been favorable in indicating that, in spite of increased gaps, an improvement of shielding effectiveness has resulted from the hydrogenous material added to the rings and donuts.

A masonite sample obtained from the second most inner cycle of the top DR bulk shield shows the expected shrinkage and brittleness in that location. This sample was obtained from a horizontal core recently drilled adjacent to the DR test well to provide a shield sample exposure facility.

Reactor Fundamentals Training

The Fall session of classes for non-operating specialists was completed during the month. In addition to the subject of reactivity transient control, guest presentations were given on supplementary control, nonequilibrium losses, total control and subcritical monitoring.

TESTING OPERATIONIRRADIATION TESTING OPERATIONDR-1 Loop

DR-1 Loop was operated without a test element for 100 hours during the month to test loop components.

H-1 Loop

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

Test Hole Irradiations

The uranium swelling capsule in test hole 3865 at KW Reactor was discharged on November 10 (PT-IP-296-D). Three capsules have been irradiated since the beginning of this program in February 1960.

The first of a series of irradiation tests of defected four-rod-cluster UO₂ fuel elements was discharged from test hole 3865-KE on October 26 after reaching goal exposure (PT-IP-333-D).

Sample Irradiations

The following samples were irradiated or undergoing irradiation during the month:

<u>Reactor</u>	<u>Test Hole</u>	<u>Facility</u>	<u>Request No.</u>	<u>No. of Samples</u>	<u>Material - Purpose</u>
KE	2D	Quickie	HAP0-184	12	Washington-designated program
KE	2D	Quickie	HAP0-172	3	Effluent water (radioisotope concentration study)
KE	2D	Quickie	HAP0-252	1	Arsenic (tracer isotope production)
KW	4C	Snout	HAP0-249	3	Graphite (damage studies)
KW	2B-2C	Hot Graphite	HAP0-177	11	Graphite (damage studies)
KW	4C	Snout	HAP0-248	3	Effluent water (radioisotope concentration study)
DR		PCCF	HAP0-223	1	Sodium-beryllium (neutron source activation)
KW	2D	Magazine	ORNL-204	2	Mercury (isotope production)
C	D	Hot Graphite	HAP0-237	2	Inconel-stainless steel (PRTR gas loop material study)
KW	3A	General Purpose	HAP0-236	1	Zirconium (creep test)

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Reactor	Test Hole	Facility	Request No.	No. of Samples	Material - Purpose
KW	4B	Snout	HAPO-243	18	Reactor structural materials (fission damage study)
F	E	Quickie	HAPO-219	3	Strontium (separation plant waste product study)
DR-D		PCCF	HAPO-218	4	Natural U(fission product release study)
F	E	Quickie	HAPO-229	12	UO ₂ (thin films)
F	E	Quickie	HAPO-249	1	Graphite (damage studies)
KE		Gamma	HAPO-171	17	Plastics and rubber (damage studies)
KE		Gamma		1	PRTR shim motor (damage studies)
KE		Gamma		4	Nylon (damage studies)
KE		Gamma		5	Tubes, glass (damage studies)
KE		Gamma		2	Organic liquids (damage studies)
KE		Gamma		2	Zirconium (corrosion test)

Borescoping Activities

Process Channel 4163, 105-H - The channel is blocked at 14 feet in from the inlet tube sleeve by a large piece of graphite tube block. There are also some small chips of aluminum in cracks in the tube blocks.

Process Channel 3666, 105-DR - The channel is clear to a point 22 feet in from the inlet tube sleeve, where a drill is located.

KER-Loop 2, 105-KE - The in-reactor tube was inspected for possible damage. No scratches were observed on the tube inner surface. A light brown film was observed on the tube surface.

Vertical Bowing Measurements

Following is a summary of vertical bowing measurements. All distances are measured from the process tube inlet flange:

Area	Tube No.	Date	Distance	Remarks
105-B	4574	11-14-60	36 feet	Up .06" at 9'2" since 8-28-60 Down .01" at 19' since 8-28-60
105-B	4391	11-14-60	34 feet	Up .02" at 9'4" since 4-8-60 Down .09" at 20' since 4-8-60
105-B	4454	11-14-60	31 feet	Up .05" at 9'10" since 6-5-60 Down .09" at 20' since 6-5-60

COOLANT TESTING OPERATION

KER Loop Operations

KER-1 - The loop was on single-pass operation with dummies until the outage of November 11, when an attempt was made to charge the thermocouple fuel element assembly as authorized by PT-IP-314-A, Supplement E. The assembly became stuck after approximately 14 feet of the 24 foot train had been inserted. The assembly was removed and the loop returned to single-pass operation with dummies.

The out-of-reactor portion of the loop was decontaminated prior to the attempt to charge the thermocouple train.

KER-2 - The loop was on single-pass operation with dummies until November 11, when four 1.6 per cent enriched single tube elements with brazed end closures and four coupon holders containing carbon steel, stainless steel, and Zircaloy-2 corrosion samples as authorized by PT-IP-363-A, were charged. The test is to determine the behavior of simulated NPR outer tubes with brazed end closures.

The process tube was borescoped prior to charging and no scratches or other defects were apparent.

KER-3 - Testing, as described and authorized by PT-IP-309-A and PT-IP-309-A, Supplement A, of a Zircaloy-2 fretting corrosion sample and NPR-type fuel elements and the irradiation of defected fuel elements for failure testing in 278 C, pH 10 water continued throughout the month. On October 27, a 16-inch Zircaloy-2 defected fuel element was added upstream of the charge.

The defective primary heat exchanger exit tee section which developed a leak on October 21, was replaced. A detailed radiometallographic examination is underway.

KER-4 - The tube-in-tube fuel elements with "hot-headed" end closures, authorized by PT-IP-300-A, were discharged on November 11, after reaching approximately 70 per cent of goal exposure. The tube was charged with four 1.6 per cent enriched single tube elements with brazed end closures as authorized by PT-IP-363-A. The fuel elements are identical to the elements charged in KER-2 and will be discharged at approximately 50 per cent of the goal exposure planned for the KER-2 charge.

Just prior to reactor start-up on November 13, the loop depressurizing valve failed which necessitated placing the loop on single-pass operation until the next outage.

Radiographs of the primary heat exchanger exit tee section which failed in September revealed cracks in both weld and pipe sections. Radiometallurgical examinations are continuing.

1706-KE Single-Pass Tube Operation

Corrosion and effluent activity testing, as authorized by FE-IP-197-A, Supplements B and C, continued in two central-zone tubes supplied by 1706-KE high-head pumps. The tubes operated under the following conditions:

<u>Tube</u>	<u>pH</u>	<u>Water</u>	<u>Dichromate</u>
4355	7.0	Filtered	1 ppm
4356	7.0	Filtered	1 ppm

Outage Performance

There were no unscheduled outages charged to Coolant Testing during the month. A total of 8.3 outage hours was charged to Coolant Testing as listed below:

<u>Production Test</u>	<u>Description</u>	<u>Time</u>
IP-309-A, Supplement A	Charge one additional element in KER-3	.6
IP-314, Supplement E and IP-363-A	Discharge dummies from KER-1 and KER-2. Recharge KER-2 and attempted charge of KER-1	2.7
IP-363-A	Borecope KER-2 and swab tube	2.0
IP-300-A and IP-363-A	Tray discharge KER-5 and recharge	3.0

Ex-Reactor Facility Operation

1706-KE Mock-up Tubes - Tests to determine the corrosion characteristics of aluminum and carbon steel with a quachrome glucosate inhibitor were completed during the month. The following tests were continued throughout the month:

1. Corrosion characteristics of improved nickel-plated fuel elements.
2. Corrosion characteristics of aluminum cermet.
3. Prefilming of carbon steel samples at different exposure temperatures in process water for later testing of candidate decontamination procedures.

ELMO-5 - Testing of Zircaloy-2, Haynes Alloy No. 41, and carbon steel subjected to various heat treatments to determine the uniform corrosion in 290 C and pH 10 water was continued during the month. A capsule containing stress coupons in LiOH was discharged.

ELMO-6 - Corrosion testing on aluminum alloys X-8001 and A-288 at 300 C and pH 6 to pH 7 were initiated on November 9 and continued throughout the remainder of the month.

ELMO-7 - Thermal cyclic tests on two KER inner tube fuel elements were continued throughout the month. Tests on a full size FRER fuel element to

investigate fretting corrosion of Zircaloy-2 were initiated. Cyclic testing of sealed gaskets for KER process tube nozzles, Design Test 1079 was started, and one test of the skinner metallic spring seal was successfully completed. Tests on dummy fuel elements to determine corrosion rates on various types of "suit-case handle" supports were initiated.

The PRTR fuel element was damaged when it was dropped into the test section during charging. The fuel element will be returned to Hanford Laboratories Operation for repair.

CEP-1 - Samples of carbon steel welded to stainless steel were charged to evaluate the effects of cyclic decontamination and operation on corrosion rates on galvanically coupled welds. Corrosion testing of samples of carbon steel and Zircaloy-2 mechanically coupled to stainless steel and carbon steel mechanically coupled to Zircaloy-2 were initiated.

CEP-2 - Testing was initiated to determine fretting corrosion characteristics on Zircaloy-2 at 20 C.

CEP-3 - Acceptance Test Procedures have been completed and the loop is operating at 350 C and 3200 psi on initial shakedown runs..

CEP-4 - Two decontamination cycles to determine the effects of a de-oxygenated system on corrosion of stainless to carbon steel welds were completed. The decontaminants were AP-1 and Bisulf-1.

REP-1 - Panel relocation and loop revisions as required to accommodate Project CGI-839 work have been completed and the loop is being conditioned prior to resumption of decontamination tests.

COMPONENT TESTING OPERATION

Irradiated Material Examination

Examinations were completed on the fuel elements from the following 49 tubes during the month of November in the Metal Examination Facility (105-C).

<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>
84A	0672-B	255A	0568-H	255	4373-H	263A	1583-DR*
	0767-B		0668-H		4374-H		2383-DR*
216A	0970-KE		0768-H		4472-H		2481-DR*
	1074-D		1986-H		4572-H		3285-DR*
	1261-KE		2086-H	262A	3284-D		3386-DR*
	2564-KE		4172-H		3185-D		3873-DR*
	2774-KE		4173-H		3281-D	272A	1069-C
	4344-KE		4174-H		3363-D		1076-C
	4354-KE		4272-H		3462-D		2264-C
255A	0268-H	255	4273-H		3561-D		2289-C
	0368-H		4274-H		3679-D		3467-C
	0468-H		4372-H		3878-D		3873-C
							3874-C

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*The fuel elements from these tubes were examined before and after cleaning.

Irradiated Material Examination Equipment

Two new pieces of equipment were installed in the Metal Examination Facility. One of these will be used to determine whether the power generation of fuel elements is symmetrical or asymmetrical, and the other will determine the internal diameter of I&E fuel elements. Shakedown runs are now in progress.

Process Tube Corrosion Monitoring Program

In-reactor measurements of 269 process tubes were completed during the month. Listed below are the number of tubes measured for each reactor and document numbers of the reports issued.

<u>Reactor</u>	<u>No. of Tubes Probologged</u>	<u>Report No.</u>	<u>HW Number</u>
D	59	56	67186
F	47	57	67204
B	24	58	67341
H	20	59	67369
C	8	61	67424
D	37	62	67425
F	74	63	67454

Visual examination, wall thickness and rib height measurements were completed on five tubes from B Reactor and three tubes from H Reactor. Tubes 1590-B, 2265-B, 3764-B, 0570-H and 4383-H were removed because they contained leaks in the rear tube flange, and tubes 2384-B and 3772-B because of suspected tube leaks. No leak was found in tube 2384-B. In tube 3772-B, the leak was found on the top half, caused by external corrosion. Tube 4281-H was removed for routine examination.

Panellit Programs

Gauges repaired and calibrated by Maintenance personnel during the month totaled 393. Of this number, 29 gauges were rejected for failure to meet inspection criteria, for a rejection rate of 7.4 per cent. This is an unusually low rejection rate and reflects additional effort during the month by Maintenance personnel involved.

In-board reliability examinations were performed on 1517 gauges. A total of 156 gauges were found to be sub-standard, and were removed from service. This is a percentage requiring renovation of 10.3, approximately 5 per cent below the yearly average and 6 per cent below last month.

Response times were determined on a total of 1517 gauges during the month. Of this number, 23 gauges showed slow response and received corrective action. This amounts to a 1.5 per cent slow response. Response time determination activities continue to show excellent gauge response times. Monthly performance percentages are shown below:

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November, 1959	12.0 (start of program)
December, 1959	9.5
January, 1960	12.5
February, 1960	7.5
March, 1960	4.8
April, 1960	4.9
May, 1960	2.7
June, 1960	3.6
July, 1960	3.8
August, 1960	1.2
September, 1960	0.9
October, 1960	2.0
This month	1.5

In-board Bourdon coil leak examination of 6015 gauges during the month resulted in detection of 20 leaking coils. This constitutes a leak failure incidence rate of 0.30 per cent, substantially below the average rate of 0.46 per cent which has been experienced during the past two years and 0.01 per cent below last month's performance.

"Critical component" inspection of Panellit gauge components, for warehousing and direct-to-user availability, was as follows:

	<u>Switches</u>	<u>Bourdon Coils</u>
Inspected	287	0
Rejected	80	0
Rejection Rate	27.9%	0

Rejection rate for switches was approximately normal, as related to the past year's switch inspection activities.

E. M. Reid

PRODUCTION, ENGINEERING & REACTOR OPERATIONS

PRODUCTION OPERATION

PRODUCTION PLANNING & SCHEDULING OPERATION

There were no discharge exposure adjustments initiated during November. The overall discharge exposure level reached a new high for CY 1960 at 714 MWD/Ton, exceeding the previous high (September) by 6 MWD/Ton.

Discharge Exposure Comparison (MWD/T)

	<u>Regular Solid</u>		<u>Regular I & E</u>		<u>Enriched I & E</u>	
	<u>6 Old</u>	<u>2 K's</u>	<u>6 Old</u>	<u>2 K's</u>	<u>6 Old</u>	<u>2 K's</u>
Sept.	697	745	687	706	842	720
Oct.	740	752	693	679	796	744
Nov.	713	749	709	700	849	681

PRODUCTION COMPUTING OPERATION

A new, faster read-punch unit for the IBM 604 Electronic Calculator was installed.

ESSENTIAL MATERIALS

Rail and truck shipments received in November were as follows:

Carload shipments for IPD	- 157
Carload shipments for other Depts.	- 204
Truck shipments for IPD	- <u>202</u>
Total	563

PRODUCTION REPORTS & STATISTICS

The IPD contribution to the 1960 HAPO Annual Report was prepared.

MISCELLANEOUS ACTIVITIES

Review of the work assignments being used with IPD's ten first-year men in the Manufacturing Training Program (MTP) was completed. Substitutions of more appropriate assignments are being made in three instances. A firm schedule was prepared and issued covering the moves of all 15 MTP men now at HAPO into their second 6-month assignments here. Trainee performance appraisals were conducted on schedule.

REACTOR OPERATIONS STATISTICS - PROCESSING														
MONTH	November, 1960													
INPUT PROD.-PU (% OF FORECAST)	108.5	111.8	110.4	97.2	107.1	99.9	111.8	115.5	109.1					
TIME OPER. EFF. (% OVERALL)	86.3	87.7	86.1	82.4	84.6	81.4	83.6	90.4	85.3					
NO.OF REACTOR OUTAGES & HOURS	NO.		HRS.		NO.		HRS.		NO.		HRS.		HRS.	
SCHEDULED	0	65.0	78.1	0	61.5	0	87.6	49.5	0	101.5	0	54.6	0	533.8
UNSCHEDULED - SCRAMS	1	3.2	1	0.4	0	0	2	3.5	0	0	0	0	13	16.1
- OTHER	3	30.8	1	10.2	1	38.3	4	35.7	4	61.7	1	88.6	2	296.9
TOTAL	4	99.0	2	88.7	1	99.8	6	126.8	4	111.2	10	133.6	2	846.8
BREAKD'N OF REACTOR OTGE HRS.	NO.		HRS.		NO.		HRS.		NO.		HRS.		TOTAL HRS.	
PLANNED													TIME	
CHARGE-DISCHARGE	28.6	32.3	20.2	21.1	14.4	21.5	48.7	38.1	224.9	3.9				
TUBE REPLACEMENT	8.2	-	12.0	0	8.3	1.9	-	-	30.4	0.5				
PROJECT WORK														
PRODUCTION TEST	-	20.7	4.0	1.7	-	2.0	46.1	6.3	80.8	1.4				
MAINTENANCE	28.2	25.1	25.3	64.8	26.8	10.6	6.7	9.2	196.7	3.4				
MISCELLANEOUS	65.0	78.1	61.5	87.6	49.5	36.0	101.5	54.6	533.8	9.3				
SUB - TOTAL														
UNPLANNED														
CHARGE - DISCHARGE	-	-	0.1	0.4	1.7	0.7	-	1.3	4.2	0.1				
PRODUCTION TEST														
RUPTURE REMOVAL	29.2	9.8	11.5	10.1	2.0	-	16.8	4.4	83.8	1.4				
WATER LEAK	1.6	-	26.7	22.4	40.3	13.4	-	-	104.4	1.8				
MAINTENANCE	3.2	0.8	-	2.8	17.7	174.5	-	8.5	107.5	1.8				
INSTRUMENTATION														
PANELLIT	-	-	-	1.6	-	9.0	-	-	10.6	0.2				
MISCELLANEOUS														
SUB - TOTAL	34.0	10.6	38.3	39.2	61.7	97.6	16.8	14.8	313.0	5.4				
TOTAL	99.0	88.7	99.8	126.8	111.2	133.6	118.3	69.4	846.8	14.7				
NO.SLUG RUPT. (ALL TYPES)	3	1	1	2	1	0	2	1	11					
NO.NEW TUBES INSTALLED	3	0	7	2	4	2	0	0	18					
TYPE OF WATER LEAK - TUBE	0	0	2	1	2	1	0	0	6					
VAN STONE	0	0	1	0	1	4	0	0	6					
Helium Used-MCU-F	466.9	599.7	527.8	239.1	606.1	644.7	259.0	304.0	8647.3					

(1) Rear face fitting leaks.

[REDACTED]

MONTH
November, 1960

TYPE MATERIAL	TUBE NO.	TYPE RUPTURE	REMOV HRS.	CHARGE DATE	RUPTURE DATE	ACT. CONC.	LOT NO.	REMOVAL METHOD				REMARKS	
								QUIC.	CHG. MACH.	HYD. JACK	TUBE PIECE		
I&E Reg.	1361-B	Hot Spot	9.4	7-23-60	11-6-60	662	KL491D		X				
I&E Reg.	2180-C	Hole Failure	9.8	8-10-60	11-6-60	651	CJ855C		X				PT IP-324-C
I&E Reg.	1559-KE	Unknown	6.5	9-9-60	11-11-60	532	KR284D		X				
I&E-E	3275-KW	Hot Spot	4.4	9-6-60	11-11-60	668	KS209F		X				
I&E Reg.	1366-D	Side Other	11.5	8-7-60	11-12-60	635	K0108C				X		Water Mixer (Leak)
I&E Reg.	1166-B	Hot Spot	14.0	8-27-60	11-14-60	500	KL536D		X				
Solid Reg.	1192-DR	Split	9.0	7-30-60	11-20-60	457	CA161H		X				
Solid Reg.	2455-DR	Split	1.1	6-30-60	11-22-60	614	CA902H		X				
I&E Reg.	1471-KE	Hole Failure	10.3	9-9-60	11-27-60	667	KR279D		X				
I&E Reg.	3566-B	Side Other	5.8	8-27-60	11-30-60	633	KL561D		X				
I&E Reg.	*1677-F	Unknown	2.0	8-30-60	11-30-60	599	KL512D		X				
	* Plus	4.0 hrs. additional		time charged to 3566-B									
	** Plus	3.0 hrs. additional		time charged to 1677-F									

MONTH	REACTOR OPERATIONS STATISTICS - POWER										SHEET 1	
	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL			
November, 1960												
RIVER WATER (BLDG. 181)												
TO RESERVOIR (BLDG. 182)	16277		4280		3643	2571	-	-	26771			
TO FILTER PLANT (BLDG. 183)	72963		89413		79064	78500	162100	173500	655540			
TO FILTER PLANT (C&DR)	103930		61650						165580			
TO R & E (KER) & FEO			203				469		672			
TOTAL	193170		155546		82707	81071	162569	173500	848563			
TOTAL	8344.9		6719.6		3572.9	3502.3	7023.0	7495.2	36657.9			
RESERVOIR WATER (BLDG. 182)												
TO POWER HOUSE (BLDG. 184)	27		60		407	83			577			
TO COND. SYSTEM (BLDG. 190)			1560		3140	2488			7188			
TO COND. SYSTEM (190DR & 183F)			2660		96				2756			
TO EXPORT SYSTEM Inc NPR	16250		0		0				16250			
TOTAL	703.1		184.9		157.4	111.1			1156.5			
FILTER WATER (BLDG. 183)												
TO POWER HOUSE (BLDG. 184)	164		181		113	151			609			
TO PROCESS (BLDG. 190)	78381	87260	76783	72196	77377	73140	159629	171050	795816			
TO 108	2800	4500	3		1052	1210			9565			
TO 108DR			4						(21378)			
TO FILTER PLANT (BLDG. 183DR & B)		10266	11112									
TO F & S SYSTEM	101		277		161	79		50	668			
TO R & E (KER) and FEO			153				314		467			
BACKWASH	1783	1904	900	566	361	3920	2157	2400	13991			
TOTAL	3595.5	4489.8	3862.6	3143.3	3415.6	3391.2	7002.7	7495.2	36395.9			
PROCESS WATER (BLDG. 190)												
TO REACTOR	77981	86860	76383	71796	76977	72640	154700	166600	783937			
TO REACTOR	84600	95400	84800	85000	86800	85800	180000	181800	884200			
POWER HOUSE (K AREA)							31	11	42			
108 (KE - KW)							4429	4039	8468			
T & R & E (KER)							69		69			
BUILDING USAGE	400	400	400	400	400	500	400	400	3300			
TOTAL	3386.1	3769.6	3317.0	3118.9	3342.7	3159.6	6896.0	7389.4	34379.3			
RIVER DATA												
ELEVATION (MSL, FT.)	388.6		381.8		368.9	372.4		384.2				
(MAX.)												
(MIN.)	385.4		378.1		365.0	369.9		379.1				
(AVG.)	386.8		379.3		366.6	371.3		381.1				
TEMPERATURE	53.5		55.0		56.3	55.9		53.9				
AVG. °F												

MONTH November, 1960	REACTOR OPERATIONS STATISTICS - POWER										SHEET 2	
	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL			
<u>WATER TREATMENT DATA</u>												
MM GALS												
MM GALS												
AT BLDG. 182	3152.0	4489.8	3862.6	2663.3	3415.6	3391.2	7002.7	7495.2			35472.4	
BLDG. 183												
<u>CHEMICAL CONSUMPTION</u>												
LBS.												
CHLORINE (BLDG. 182)												
(BLDG. 183)												
AVG PPM												
	13747	11448	1200	740	14542	13830	28300	33800			117607	
	0.5	0.3	0.04	0.03	0.5	0.5	0.5	0.5			0.4	
(2) Aluminum - Nitrate												
Lbs												
AVG PPM												
						289093					289093	
						(a) 23.2					23.2	
(1) Alumina												
ALUM												
LBS	68944	24792		62212	106361	46572	198400	270700			93736	
AVG PPM	44082	6671	108099	2.8	3.7	2.9	3.4	4.3			843097	
	12.2	2.8	3.4								4.4	
SEPARAN												
LBS	300	0	0	0	0	250	0	0			550	
AVG PPM	.011	-	-	-	-	(a) .020	-	-			.014	
LBS						117192					117192	
AVG PPM						(b) 7.4					7.4	
SULPHURIC ACID (AS 100%)	246520	354750	311645	209711	239531	28731	530800	512000			2433688	
	9.4	9.5	9.7	9.5	8.4	2.3	9.1	8.2			8.7	
DICHROMATE	50568	43755	48352	45463	50300	48000	100200	107900			494538	
PURGE MATERIAL CONSUMPTION												
SOLIDS	0	900	400	2000	0	0	0	0			3300	

(1) Alumina and alum combined for PPM in alum column.

(2) PPM feed rates based on actual water treated due to PT IP-347-A.

(a) 1,494.7 MM gals.

(b) 1,896.5 MM gals.

MONTH November, 1960		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	8.0	7.8	8.2	8.2	8.2	8.0	7.6	7.5				
TURBIDITY	PPM AVG	3	3	3	4	4	1	7	7				
FINISHED WATER													
PH	PH AVG	7.0	7.1	7.1	7.1	7.0	7.1	7.0	7.0				
TURBIDITY	PPM AVG	.004	.007	.006	.007	.008	.005	.007	.008				
CL ₂ RESIDUAL	PPM AVG	.05	.05	0	0	.07	.06	.05	.06				
DICHROMATE	PPM AVG	1.80	(3) 1.34	1.80	1.80	1.81	1.85	1.80	1.80				
STEAM DATA		100-B	100-D	100-F	100-H	B-D-F-H TOTAL	KE	KW	KE-KW TOTAL				
GENERATED (MAX)	LBS/HR	92000	132000	82000	74000	380000	69000	58000	127000				
(NOR)	LBS/HR	81100	81000	54000	57000	273100	-	-	-				
(AVG)	LBS/HR	84200	95561	54850	55917	290528	38375	34092	72467				
TOTAL	M LBS	60680	68804	39491	40260	209235	27630	24546	52176				
TO PLANT	M LBS	51456	58345	34752	34140	178693	24867	22091	46958				
COAL RECEIVED	TONS	3462	3565	2438	2383	11848	-	-	-				
CONSUMED	TONS	3242	3707	2119	2450	11518	-	-	-				
IN STORAGE	TONS	16978	18640	14039	16769	66426	-	-	-				
GEN. STEAM/LB. OF COAL		9.36	9.28	9.32	8.22	9.08	-	-	-				
OIL RECEIVED	GALLONS						715855	0	715866				
CONSUMED	GALLONS						248700	223566	472266				
IN STORAGE	GALLONS						1236270	1057854	2294124				
GEN. STEAM/GAL. OF OIL							111.1	109.8	110.5				
ELECTRICAL DATA													
TOTAL GENERATED KW HRS.													

APPLIED REACTOR ENGINEERING OPERATIONINDUSTRIAL ENGINEERING OPERATIONEstablishment of Resident Industrial Engineers

The principle item of record in November consisted of assigning an Industrial Engineer to resident duties in each of the dual areas. One engineer is assigned to each of the following: B-C, D-DR, F-H, KE-KW. The basis for and guide to resident engineering is contained in a letter to R. S. Bell et al, "Resident Industrial Engineers", dated October 14, 1960. The assigned engineers each received numerous requests for service assistance during this first month of residency.

Program of Charge-Discharge Improvement

Recent performance of charge-discharge using the recommended methods, equipment, crew size and deployment at 100-F reactor operation is consistent at charging rates in excess of 60 tubes per hour.

Industrial Engineering effort is being re-directed to secure the best rates possible on bumper elements. The material handling system (fuel clip) for fuel elements, that has been under development for some time for smooth cylindrical fuel elements, is being incorporated into the charging machinery which is being prepared for bumper elements.

Program of Tube Replacement Improvement

A training program is scheduled for 100-F Reactor Operation Processing and Maintenance personnel on tube replacement equipment, methods, crew size, deployment and control. The objective is to produce tube replacement rates in 100-F Reactor that consistently are below 0.80 hours per tube which has already been demonstrated. The training program is a joint venture of Craft Instructors (Maintenance Practices), Radiological Engineering Instructors (Research and Engineering) and Industrial Engineers. Basis for the training and improved performance is the tube replacement improvement study prepared recently by Industrial Engineering.

Processing Supervisor and Operator Training

Classroom work and on-the-job training in Methods Appreciation and Work Simplification and in charge-discharge activity has been continued as planned. Another course is being prepared for presentation to Processing supervisors. This course is being designed to assist supervisors and specialists in their work of supervising radiation monitors.

Reactor Outage Reporting Procedure

The desired improvements in Reactor Outage Reporting Procedure have been reviewed and comments included in a final draft which is ready for "Approval Issue".

Power Operation Study

A study is under way to determine what improvements can be made in the Power Operations. The engineering work is called "Planning" and consists of definition of standard method and time for performance of all work tasks in the power business. The work is being conducted first in 100-F Reactor Operation. "Planning" is complete in building 181-F and is being performed in Building 182-F now.

Cyclic Painting

The study of cyclic painting in 100-F Reactor Operation, as requested by the Manager, H Reactor Operation, is 95 per cent complete.

Savings Studies

A Purchase Order for 342,000 dummy fuel elements, according to the recently prepared design, has been submitted to vendors for bid. Procurement according to the new design is expected to result in an annual out-of-pocket saving of \$50,000 in the Section.

MAINTENANCE PRACTICES OPERATIONSpare Parts Inventory

During the month, revisions to spare parts inventory were as follows:

Increase	
Plants	\$5,366.08
Projects	2,190.79
	<u>7,556.87</u>
Decrease	5,383.62
Over-all Increase	<u>\$2,173.25</u>

A direct charge requisition was prepared to establish unit price and delivery time for additional front face nozzles, which will be required for the Bumper Fuel Element Program. Direct charge requisitions were prepared to establish unit prices on newly designed nozzle lug rings and shield pieces for the Counter Tube Positioner, which is a component of the Low Level Neutron Monitoring System.

Helium Loss Reduction

The Helium Loss Reduction study and work is continuing. The objective of this study is to provide a comprehensive study of sources and reasons for gas loss, explore means for reduction of this loss, provide recommendations to reduce helium usage, and assist the individual plants in effecting remedial action.

Current efforts in this study are being directed toward revisions to Process Standards, which may provide for economies in the area of usage associated with make-up and purging. A review is presently being made with Process Technology Operation personnel for this purpose.

Survey for Combustible Gases

A survey for combustible gases was initiated at the request of the Process and Reactor Development Operation to determine if combustible gases could be found in the vicinity of the reactors.

An interim report was completed on November 9, 1960, and forwarded to the Manager, Applied Reactor Engineering, for transmittal to Process and Reactor Development Operation, as they requested. A verification of some of the results is planned along with recommendations for maintaining better ventilation conditions.

Code Compliance

Irradiation Processing Department OPG 33.46 is currently being reviewed for revision to reflect changes in the HAPO OPG 4.2 on Pressure Vessels and Pressure Systems which expands the scope of equipment covered and re-delegates certain responsibilities. Proposed changes will be submitted on or about December 1, 1960.

Third Party Inspection

The Maintenance Practices Operation accumulates the requirements within Irradiation Processing Department for the services of the Third Party and integrates the resulting schedule with the other HAPO departments.

Three boilers, two elevators, and five pressure vessels were inspected during November. The inspector also reviewed the plans for widening the D elevator in 105-D Building. A data inspection is anticipated when the modifications have been completed. The cooperation of other departments enabled us to keep the inspector busy in spite of the cancellation of some, and the re-scheduling of other, elevator inspections.

The next Third Party visit is scheduled for December 12 and 13.

Ram Type Charge Seaters

A letter suggesting the commitment of engineering effort to produce a production model machine as a replacement for the present units, was forwarded to the Plant Engineering Operation.

Mechanical Inspection Procedure - Elevators

A survey of the field practices with regard to the inspection of elevators suggested the need for a detailed inspection procedure and check list which is being prepared.

Rupture Removal Procedure

In order to pinpoint the differences in the rupture removal methods used in the different areas, a step by step analysis has been made. A summary of this

analysis will be completed this month. This analysis will be used to attempt to discover the reasons for the different practices and a basis for a Manufacturing Section procedure acceptable to all areas.

Insulation Coating Test

Arrangements have been completed for a test installation of an insulation coating with a glass cloth reinforcement on an outside steam line elbow in D Area. This coating system has been suggested for the protection of the insulation (equal to the aluminum jackets on straight runs) on the irregular surfaces of outside lines. The test was requested by the Supervisor, Maintenance Practices Operation. The service of the coating will be observed for about a year.

Rear Face Connectors.

A revision was made to the rear nozzle to header J-2 connector drawing to minimize the ratcheting effect being experienced. Low bid of \$5.56 per unit was obtained for these, as requested by 100-H Maintenance Operation, with delivery of three weeks after receipt of purchase order. Bid packages were also prepared and sent for duPont-style stainless steel pigtails and Inconel tubing. The bid opening date on these is December 5, 1960.

The accelerated failure rates of rear face connectors and the associated water leaks influenced Maintenance Practices Operation to take a more active part in the selection and obtaining of rear face connectors. The J-2 connectors at 105-H have shown an unusually high failure rate. This, accompanied by the experience with other O-rings in trying to maintain a leak free rear face connection, demonstrated a need to obtain bids for spare pigtails of the old duPont style.

Samples of originally installed duPont style pigtails were obtained for both front and rear connectors and are currently being cleaned and Zyglo checked for cracks. These are being checked for possible interim or emergency use on the rear face of 105-H Reactor.

Service Manuals and Procedures

Manual Writer Selection Tests have been evaluated and interviews are being held for obtaining manual writers for assignment to N Plant and Maintenance Practices Operation.

Servicing procedures covering the various types of Foxboro recorders, including the EMF to current converter, are being prepared.

Assistance was provided to 100-DR, H, and C Areas on the modifications and calibration of the Crossheader Differential Gauges and spare part requirements for the modifications were established.

Assistance was provided to H Area Engineering on potting bulbs and sockets in epoxy resin for use in underwater lighting.

The Horizontal Control Rod System Manual for D, DR, and F Areas is completed in rough draft form and routed to these areas for comments. Comments from B Area are being evaluated.

Ball 3X System Service Manuals for B, D, F, and H Areas were routed to the electrical engineers for comment. Part of the material has been returned and the comments are being evaluated.

Craft Training

Information relative to the history of craft training was provided for the Relations Operation. This information was used in preparing a brief to be sent to the Ching Panel.

Maintenance craft training was provided on the following items:

Mechanical Craft

Silicone Foaming: Fifty-nine craftsmen and supervisors attended four scheduled 2-hour sessions. This training program has been completed. A total of 112 maintenance people attended 16 class sessions. Additional effort was expended in providing Methods Analysts with training material and assisting with the procurement of tools and equipment for the application of silicone foam to leaking bellows.

Ramset: Sixty-two maintenance people attended three scheduled 2-hour sessions and thus qualified for updated permits to operate Powder Actuated Hand Tools.

Tube Replacement: A series of classes in tube replacement - F methods - will be presented to the craftsmen and supervisors expected to work the January tube outage at 105-F. This training effort is in support of the Industrial Engineering Operation effort to improve tube replacement rates. This is also considered an opportunity to measure training effectiveness when the method is standardized.

Instrument Craft

Twelve instrument trainees completed the training course on Theory and Application of Automatic Control, and were tested for proficiency in this phase of instrumentation. A training program covering the proper use and maintenance of test equipment began on November 15. Eight 4-hour training classes were presented to the instrument trainees this month. Six trainees attended each class.

The Mechanical Craft Instructor provided three days of assistance to engineering and maintenance personnel, utilizing the reactor mockups.

Instrument Craft Testing

The Instrument Specialist Selection Program for this period was completed on November 15. Sixteen instrument technicians participated in this qualifying

program. Eight participants achieved passing grades and are qualified for instrument specialist positions when openings occur.

Safety Specialists' Activities

During the month, the following Serious Accident Investigations were conducted:

IPD 60-17 - During Turco decontamination work in 105-DR, the solution became overheated and filled the valve pit and instrument shop with steam.

IPD 60-18 - An operator was struck by a bolt while operating a 2-ton chain hoist in the 105-DR storage area. The brake failed to hold under a load due to lack of maintenance.

PLANT EQUIPMENT ENGINEERING OPERATION

Bumper Fuel Element Program

Recommendations for the inspection of inlet nozzles, after modification for bumper fuel elements, have been submitted to D and H Plants. The inspection will include fluorescent penetrant tests for detection of cracks, dimensional checks, and visual inspection of log rings and nozzle caps for broken welds and deformed logs. Test work to determine the strength of the modified nozzles is in progress.

Beckman-Panellit Interlock

Pre-Scope report, HW-67388, has been issued. Project Engineering has accepted management of the procurement and installation. Complete scope, including drawings, will be completed by November 30, 1960 by Plant Equipment Engineering, Maintenance Engineering engineers, and Electrical Development.

Geminol Stringer Thermocouple Instrumentation

An Appropriation Request has been completed covering funds for this work and is being routed for approvals. It has been necessary to carefully review the cost estimate for the installation phase of the job to make certain that it can be done for under \$5,000 direct labor in all involved reactors.

Audible Alarm Standardization

A recommendation covering "Criteria for Audible Alarms" has been issued for comments. This is recommended for HAPO as well as Irradiation Processing Department. Comments will be reviewed to determine feasibility of this approach.

Radiation Monitoring Instrumentation

"Functional Requirements for Remote Area Monitoring Instrumentation" has been received from Hanford Laboratories Operation. A request has been directed to B-C Reactor Operation to have 100-B act as the lead reactor for this installation. Work is continuing with Radiological Engineering and B-C Maintenance Engineering to develop necessary details.

B-C REACTOR OPERATIONOPERATING EXPERIENCE

Equilibrium power levels at B Reactor reached a record high of 1775 MW on November 29 and contributed to the achievement of a new, high 24-hour average operating level of 1772 MW. Additional increases were prevented by graphite temperatures and tube power limitations. C Reactor power levels were maintained within rupture control limitations.

EQUIPMENT EXPERIENCE

A B Reactor scram resulted when rust particles partially obstructed the water flow to tubes No. 3895 and No. 3992. The associated water-supplying crossheader was flushed to eliminate any additional particles dislodged during a previous cleaning operation on the high tank line.

Ninety-eight B Reactor process tubes were hydrostatically tested; one leaking tube and two with thin walls were replaced. Rear Parker fittings on 33 low-flow tubes were reamed to original size to restore normal flow conditions.

A large break in the rear neoprene seal was repaired at B Reactor and a major portion of the neoprene was coated with sealant in the continuation of efforts to reduce helium losses.

At C Reactor, silicone rubber foam was injected in 65 rear gas seal bellows as a leak stoppage measure. External leakage of water was reduced by repair of 20 rear face nozzle elbows.

Failure, in October, of a bearing in the 900 HP motor of No. 10-C pump at Building 181-C was determined to be the result of inadequate lubrication. A rectifying change in design of the lubricating system was performed on the motors of both No. 1-C and No. 10-C pump units by Reed Electrical Company of Portland, Oregon. Test runs of both units are being continued in connection with Project CGI-845, "Increased Pumping Capacity - 181-C."

At Building 190-C, a prototype impeller in No. 11-C pump was inspected after three months service; only slight cavitational wear was apparent. A replica of the prototype has been installed in No. 4-C pump.

IMPROVEMENT EXPERIENCE

At B Reactor, work was continued on Project CGI-861, "Expansion of Electrical Distribution Systems." Progress on Project CGI-791, "Reactor Confinement," included completion of the tie-in of the 117-B Filter Building facilities with the 105-B ventilation system.

Development Test IP-357-A, "High Alum Feed - B," and Production Test 321, "Reduction of Dichromate - C," were routinely continued.

A prototype machine for reclaiming usable dummies (perfs) and poison pieces functioned satisfactorily during initial tests at B Reactor.

Two C Reactor channels were overbored 550 mils on the inlet thermal shield. The rear centering flange on one channel was cut for do-nut removal. Both channels were left as "air" channels to permit studies of requirements for shielding materials.

Installation of the replacement Central Viewer was completed at C Reactor, and a recently initiated program of installing surge suppressors in pressure monitor sensing lines was also completed during November.

RADIATION MONITORING EXPERIENCE

A Maintenance employee's cheek was contaminated during removal of an assault mask following rupture removal work. The level of the radioactive particle (corrected for source size) was 5 rads/hr. Maximum localized skin exposure to the individual was 157 mrad.

A gross spread of contamination occurred on the experimental level at C Reactor during discharge of a sample. Details are reported in HW-67432, Radiation Occurrence Investigation Report.

No personnel overexposures were experienced.

D-DR REACTOR OPERATIONOPERATING EXPERIENCE

Operating levels during November were limited at D Reactor mainly by rupture control tube power and at DR Reactor by graphite temperature. New records in power level and daily production were established at D Reactor and maintained through the end of the month.

A water leak and a rupture caused the two outages at D. There were six outages at DR beginning with the chute liner installation continued from October, a water leak, venturi change, Panellit scram, two ruptures and a manual scram. The latter was because of mechanical failure in the poison column control facility, when poison charging was required and there was insufficient rod for control. Six poison splines were inserted after the last startup for DR Reactor's first spline control experience and are to remain in during the current operating period.

EQUIPMENT EXPERIENCE

At D Reactor a problem channel, out of service five years, was cleared of obstructions and retubed. Three sphincter seals on vertical safety rods were replaced.

DR Reactor installed 50 spline caps in preparation for continued use of poison splines. A Ledeen charging machine, featuring a seating stroke was used for the first time at DR on 40 tubes. Two vertical safety rods, that had been binding in their channels from shifting of the graphite stack, were repaired by lubrication and filing of the wedge.

IMPROVEMENT EXPERIENCE

Injection of liquid alum into the raw water flumes, by means of water jets in place of electrically driven pumps, was started at 183-D during November. The installation provides an economical and virtually maintenance-free system of chemical addition.

RADIATION MONITORING EXPERIENCE

There were no lapses of radiation control and no overexposure of personnel during the month. Maximum dose rates received were 1 r/hr at D Reactor and 2.5 r/hr at DR in removing ruptured elements, 2 r/hr handling a vertical safety rod tip, and 3 r/hr transferring a decanned HAPO 218 sample to a shipping cask.

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F REACTOR OPERATION

OPERATING EXPERIENCE

Reactor level was controlled by rupture control tube power limits. The reactor was down at the end of the month to remove a ruptured fuel element from tube 1677.

EQUIPMENT EXPERIENCE

Significant items replaced were: 27 rear water connectors, 6 rear bellows gas seal boots, 3 rear ball valves, 28 size .320 tube inlet venturis, 44 process tube thermocouples, and 9 pressure monitor Panellit gages. Two tubes were found to be leakers and a third one had a sheared rear Van Stone. All three tubes were removed and the channels blanked. In addition, three tubes were replaced out of a total of 74 tubes probologged for evidence of external corrosion.

The coolant flow through process tube 1888-F was blocked for a period of sixteen hours when the rear face nozzle fitting was capped to facilitate replacing a deteriorated rear gas seal bellows after the reactor had been down for ten hours. As a precautionary measure, the metal in the column was discharged with normal procedures and the tube replaced.

Flow tests were made to determine the maximum possible flow through the 183-F filters. The test proved that the filters could take more water than ten river pumps could supply under ideal river water conditions.

Inspection of the No. 2 annex cone valve in the 190 building revealed that the seats on both the valve plug and the valve body were severely scored. Repairs were made and the valve was reassembled.

IMPROVEMENT EXPERIENCE

Four rear crossheader Parker fittings were reamed to 0.610" diameter under PT-318-E, "Reaming of Rear Face Parker Fittings".

New remodeled lunchroom, change room, clothes storage, locker, shower, and toilet facilities have been completed in the east wing of the 105-F building.

The individual turbine by-pass system in the 190 building pump room was replaced with a free-blow connection and valve on the discharge side of each turbine trap lateral to prevent steam from blowing through each system.

RADIATION MONITORING EXPERIENCE

Three lapses of radiation control were sustained during the month. A beam of 500 mr/hour plus 200 mrem/hour fast neutrons was detected from air channel 2083 during a routine "C" elevator start-up survey. The reactor was shut down to permit replacement of inadequate internal shielding installed during the previous outage.

Personal exposure rates up to 2500 mr/hour encountered during routine spline removal operations were attributed to chips adhering to the side of the collecting hopper of the spline chopper. Minor revision of equipment was accomplished to eliminate this unnecessary exposure.

H REACTOR OPERATION

OPERATING EXPERIENCE

Equilibrium power levels reached 1820 MW. Bulk outlet temperature prevented further increases.

Ten unscheduled production interruptions during the month resulted in four minimum reactor outages. One was caused by the grounding of the Panellit system while a gauge was being changed. The other three were necessary to correct water leaks.

EQUIPMENT EXPERIENCE

Five reactor process tube leaks were discovered and corrected. One was in an original tube which had a calculated wall thickness of 40 mils. The other four were rear Van Stone leaks and occurred on tubes which had been installed during the October 10, 1960 outage. All tubes installed during the October 10 outage were subsequently examined and one additional defective Van Stone was found. Improper application of tube Van Stoning methods caused the defects. A tube replacement refresher training course is planned for personnel engaged in this type activity to minimize future incidents of this nature.

Number 60 vertical safety rod failed during a reactor startup when the magnetic clutch on the rod winch failed. The rod was removed from service for a complete overhaul.

Two-hundred and thirty-eight rear face connector leaks were corrected. One-hundred and ninety-nine required new J-2 connectors and adaptors.

Moisture from reactor rear face leaks, as a result of connector failures, is causing accelerated deterioration of rear elevator electrical equipment. Increased corrosion has also been noted on the elevator chains and brake drum. Wherever possible, exposed equipment is being covered with plastic.

Production Test IP-347-A, "Use of Aluminum Nitrate in Place of Aluminum Sulphate for Water Treatment," was modified on November 4, 1960, by reducing aluminum nitrate feed from 26 to 20 ppm and adding 0.02 ppm separan to further evaluate the effectiveness of this method of water treatment.

IMPROVEMENT EXPERIENCE

Revision of the 105-H lunchroom to provide increased space, seating capacity, and improved housekeeping was completed.

A new bus feeder rack was installed on the number four 4500 hp 190 Annex motor and fabrication of another for installation on the number seven unit was started.

Seventy-six J-2 rear face connectors, made from Inconel tubing, were installed on the reactor to evaluate their resistance to stress corrosion.

RADIATION MONITORING EXPERIENCE

No unusual or significant radiation exposure problems occurred during the month.

CENTRAL MAINTENANCE OPERATION

The Ball 3X Systems Modification, MJA-8, was completed during the month with the exception of some miscellaneous minor items.

Work on the reactor process channel overboring program consisted of the development, fabrication, and testing of miscellaneous tools and equipment.

KE-KW REACTOR OPERATION

OPERATING EXPERIENCE

A new record power level of 3910 megawatts and a monthly average operating level record of 3703 were attained at KW Reactor.

Power levels were limited by the planned rupture control program at both reactors with exception of nine days at KW Reactor when graphite temperatures were the limiting factor.

EQUIPMENT EXPERIENCE

Three single pass process tubes associated with the 1706-KE testing facility were removed and replaced with ribless zirconium tubes at KE Reactor.

The KW Reactor effluent line developed a leak at the Dressler Coupling outside the reactor building near the railroad track on November 10. During the rupture outage, temporary repairs were successfully made with lead sticks, lead wool and copper wire. The excavation was shored up to permit safe access of cask cars into the transfer area for metal shipment. Plans were made for permanent repairs to be accomplished at the next reactor outage.

IMPROVEMENT EXPERIENCE

Utilization of the "C" elevator top deck to reduce reactor outage time was expanded to include spline insertion, spline cap installation and miscellaneous maintenance. This effort reduced outage time by six hours at KW Reactor during the month.

Operating responsibility for the ethylene glycol heating system in all buildings was assumed by the Power Operation. A number of vents and drains in the system were capped to avoid leakage and to prevent unnecessary blowoff of air and glycol.

The 900 HP low lift motor of the Number 2 pump at 190-KW was replaced with a motor re-wound for 1500 HP service, thereby completing the fourth such change in the program to upgrade all low lift pumps.

RADIATION MONITORING EXPERIENCE

During cask loading operations at KE Reactor, the transfer area monitoring alarm was tripped by abnormally high background radiation. Follow-up radiation surveys revealed dose rates on the cask locking nut up to 200 rads/hr. Origin of the contamination was traced to the 200 Area facilities.

OC Schroeder
 Manager
 Manufacturing Operation

OC Schroeder/

FACILITIES ENGINEERING OPERATIONREACTOR MODIFICATION DESIGN OPERATIONRESEARCH AND DEVELOPMENT

Design studies to further define the modifications required for improvement of the export water system were continued. The following ~~items~~ were accomplished:

1. Completed a preliminary design providing delayed automatic start of the 182 Building steam driven pumps.
2. Received recommended settings for the surge suppressors from Mr. G. R. Rich, Consulting Engineer.
3. Extended the contract with Mr. Rich to engage his services during the design and testing of proposed export water system modifications.

Budget studies were initiated for Reactor Modification Program - 100-C, Reactor Modification Program - 100-K, and Earthquake and Bomb Blast Protection.

Study drawings of proposed inlet and outlet process tube assemblies for modifying C Reactor for use of self-supported fuel elements were transmitted for comment. This concept provides that the rear assembly be fixed rigidly to the rear tie straps with total process tube expansion allowed at the inlet end. Seals, both gas and water, are fabricated from materials other than elastomers.

DESIGN PROJECTSCGI-791 - Reactor Confinement

The asphalt covering applied to the 117 Filter Building shielding berm for erosion control has been found to be unsatisfactory. A design change has been issued requesting the berm slopes be extended and covered with rock with the exception that a 60 foot section at 100-D and F Areas will be covered with a two inch concrete surface.

A design change has been issued to install self priming pumps in the operating gallery of all filter buildings. Since the present pump requires a positive suction head, replacement of the pump is less costly than providing foot valves on individual suction lines.

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

Electrical design drawings have been revised to provide for a synchronous induction type drive motor for the 1706-KER instrument voltage supply. The KER cell piping drawings are being revised for the new pump connections which allows the pump bases to be flush with the floor to accommodate the pump service dolly.

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Comments on the drawings for the loop pumps service dolly have been returned to the vendor. In general these comments pertained to additional caster wheels on the tractor dolly to permit disconnecting the tractor from the service dolly.

Design tests to investigate possible replacements for solid "O" rings in the KER nozzles have been resumed. One seal has been tested and is satisfactory. An existing nozzle is being modified to permit additional testing.

Interference mockups of the KER Loop 3 and 4 nozzle assemblies have been completed. All connectors and nozzles clear existing equipment with the exception of two rear header wye fittings which must be rotated 90 degrees to clear the new nozzle flange.

CGI-844 - 100-K Coolant Backup System

Detail design which is 46 percent complete has progressed more rapidly than scheduled. Purchase specifications have been prepared for the condensers for the 190 Main Pump House, air compressors for the 182 Building, and storage and day tanks for the diesel fuel. Bids received on the turbine pump unit have been reviewed. Design information for integration of diesel components has been delayed due to a request from the vendor that the engines to be rehabilitated be delivered to his plant for examination prior to contract approval.

The Project Representatives have recommended the following changes in the project scope:

1. Deletion of the proposed new steam leader in each 165 Control Building, utilizing existing piping instead.
2. Relocation of the new steam turbine pump to the west end of each 190 Main Pump House to minimize steam supply piping.
3. Retention of existing service water pump capacity by reinstalling the service water pump, which is being displaced by the steam turbine pump.

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

Detail design which is 56 percent complete, is approximately 5 percent behind schedule due to the lack of required vendor information on various items of electrical equipment.

Contract negotiations have been completed with Washington State University for the performance of hydraulic testing to obtain basic data for the design of the downcomer orifice plate and to conform the design of a proposed replacement crossheader expansion joint. This model testing is a portion of a design study of the effluent system from the K Reactors. A preliminary analytical study of the effluent system capabilities has been issued as document HW-67444.

Testing of the third prototype impeller in the high lift pump at the 190-KE Main Pump House has been delayed until December due to the failure of the casting to pass inspection. An exact shipping date has not been received from the vendor.

CGI-884 - Rear Face Crossunder Lines B, D, DR, F, and H Reactors

Detail design has been completed for all items as scoped. A recommendation to install air motors rather than electric motor valve operators is being evaluated.

EQUIPMENT DEVELOPMENT OPERATIONEXISTING REACTOR WORKReactor Modification Program

During the C reactor outage the week of November 7 two front thermal shields were overbored 550 mils with the first model dual bore equipment. At the same time on one of the tubes the rear centering flange was cut and the rear do-nuts extracted. These, unlike the front do-nuts, were found to be corroded in place, but not severely. The tubes were left as air tubes. During the operating period following the outage one of the front gunbarrels was moved forward out of the thermal shield to determine the increase in radiation levels. This proved to be very moderate -- data are still being reviewed.

Remote Rear Face

Additional valves were installed in the rear face in KE reactor, bringing the present total to 50, of which 46 are flapper valves and four are ball valves. Following indications that a re-designed valve seal had probably resolved this problem, an additional 100 ball valves were ordered. The newly designed seals on both ball valves and the flapper valves appear to be functioning satisfactorily.

A prototype nozzle was designed and built for use with the balanced hydraulic charging machine; it is sized for K reactor bumper slugs and incorporates the flapper valve and tube inlet sampling valve that the charging machine requires.

High Speed Scanner

After careful examination of the test records and the status of the equipment it was determined that the acceptance test of this equipment in the vendor's plant was being conducted as specified as of September 30. Accordingly the test was completed on November 21; after 1250 hours the vendor reports successful completion.

Other Existing Reactor Work

A bumper slug charging machine was tested satisfactorily in the laboratory. Since it requires that the operator orient the slug properly before feeding the machine, the charging rate will be slower and the operation will be more fatiguing than at present. A nozzle broaching machine is reported shipped from the vendor's plant November 22.

NEW PRODUCTION REACTOR WORKDesign Tests

The sixth NPR Process Tube Rupture Test run, of the 1960 series, was completed. The loop has been returned to automatic thermal cycling in order to complete testing of NPR fittings before resumption of process tube rupture tests. No design tests were reported complete.

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Instrumentation

A shield plug and gamma compensated chamber were installed in DR reactor for use in experimental work appropriate to the intermediate range period monitor and the duo-deca monitor. Design review and assistance activity continues.

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PLANT ENGINEERING OPERATION

DRAFTING OPERATION

Summary of services provided by the Drafting Operation is as follows:

New Engineering Drawings	121
Revisions, Layouts and Sketches	73
Microfilm prints reproduced	426
Microfilm drawings added or retired	1360
Ozalid check prints reproduced	713
Customers serviced - Microfilm files	255
Customers serviced - Catalog files	32
Catalogs added to files	32

WATER PLANT AND UTILITIES ENGINEERING

Electric Power Demand Metering System

As part of the program to provide improved equipment for more accurately monitoring electric demand, sensing relays were installed at the 300 Area Substation on November 16. Further, the equipment located at 165-KW has been modified to accept 300 Area demand simultaneously with Midway demand. For improving readout accuracy the total HAPO demand is displayed as units and tenths of a unit.

4500 HP Motors

One rewound 4500 HP stator equipped with Class B coils was received and has been installed in D Area. The replaced stator was sent offsite for installation of Class B coils. The first shipment of modified Class A coils for the 4500 HP rehabilitation program is enroute from the vendor's shop. The third spare stator was shipped late in November by the manufacturer.

Engineering in Support of Power Forecasting

A rough draft of the Semi-Annual Five-Year Electric Power Forecast was assembled for approval. This forecast forms a basis for system planning to meet future load requirements and for budget action. It includes estimated increases in demand for approved projects at 100-K and 100-N Areas. The Reactor Modification Program expected loads has been included in the forecast.

Coal Studies

At the request of Manufacturing Operation, a study was made to assist them in improving coal purchase specifications. The study involved an analysis of data and determination of the standard deviation of the size consist of the coal from each of the three vendors which supplied coal during 1960.

Results of a recent test made on Knight Ideal coal indicated favorably performance for use in the 100 Areas. This coal, however, showed some tendency for clinkering which is believed due to a deficiency in some of the middle sizes of the coal consist.

REACTOR, PLANT ENGINEERING

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

Vibration of the crossheaders and thermally induced stress at the crossheader riser joints are two major rear face piping problems at the subject reactors. It has been proposed to eliminate these problems by installing flexible joints at the ends of the crossheaders and appropriate guides and supports along the length of the crossheaders. Design for a prototype installation at H Reactor is complete. A mockup has been fabricated for testing the mechanical integrity of the flexible joint prior to installation on the reactor. Materials for the flexible joint are on order.

Noise Abatement C & K Main Pump Houses and K Pump Control Building

Noise levels in the subject buildings previously exceeded HAPO criteria for noise control, SDC-9.1. Noise abatement work is being done under a Maintenance Job Authorization. Installation of acoustical material has been completed at the KE Main Pump House and Control Building. Sound level measurements show that a satisfactory reduction in noise level has been accomplished. Based on studies of readings taken and evaluated relative to criteria limits, the design of a special enclosure to control high frequency motor noise in the C Pump Room has been completed and forwarded to Manufacturing Operation for review prior to processing appropriate authorization.

Rear Face Connectors - Older Reactors

An improved rear face connector for the older reactors is being developed by the Materials Development Operation for use during the interim prior to replacement of the system piping. An acute need for a connector has become evident, particularly at the 105-H Reactor, and since a tested revision of an improved connector is not available, necessary specifications have been provided to the Manufacturing Operation.

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PROJECT ENGINEERING OPERATION

PROJECTS

CGI-706 - Installation of Improved Reactor Gas Instrumentation - 100-B, C, D, DR, F, and H

This project was authorized to provide for improvements in the reactor gas analysis systems, gas pressure measuring systems, gas make-up control systems, gas purge systems, and the gas system drip leg level measuring devices. All work except relatively minor punch list items has been completed at 105-B, C, D, DR, and F Areas. Work remains at 105-H as well as 105-KE and KW. The project, on which Central Maintenance is performing the installation work, is 93 percent complete as compared with the schedule of 96 percent.

CGI-791 - Reactor Confinement

Filter buildings 117-B and H were connected into their reactor exhaust systems. Buildings 117-C and F were previously connected. This is in line with the present target schedule.

A review of the testing methods and additional testing of the particulate filters has indicated that they meet the specifications, and installation of these filters has started.

Beneficial use of the confinement facilities will be achieved upon the installation of these filters.

Revision 5 of the project proposal was forwarded to HOO-AEC on November 28. An addition of \$720,000 to the currently authorized funds was requested.

The vaneaxial fans in the filter building have not successfully met specifications when tested as installed. One of these fans is being returned to the manufacturer for witnessed testing.

CGI-802 - Process Safety Monitoring System - High speed Scanning Type for Temperature Monitoring

The purpose of this project is to initiate the design for a high speed scanning temperature system and to procure a 116-point system prototype which would be capable of demonstrating the feasibility of high speed scanning as applied to reactor control. Procurement of the prototype scanner was negotiated with Monitor Systems, Inc., a subsidiary of Epsco, Inc., located in Fort Washington, Pennsylvania. This very complex and unique piece of equipment has been completed by the vendor and as of November 21, 1960, was released for shipment. Prior to this release for shipment, a comprehensive acceptance test was completed which included successfully passing a continuous 1250 hour test run. This test contained very restrictive requirements with respect to component failure or any malfunction of the system.

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

The purpose of this project is to modify the 1706-KER test facilities to provide for testing of full charges of NPR size fuel elements and other similar sized prototype fuel elements. The scope of work includes a maintenance shop for servicing and repairing irradiated equipment. Progress during this period included the award of a fixed price construction contract for this service and repair shop on November 2, 1960, to Frank Lohse, General Contractor, of Pasco. Physical work was started by this contractor on November 9, 1960.

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

The scope of this project includes increasing the pumping capacity of the 181-K river pump stations, alteration to the filter plants, replacement of the primary process pumps, upgrading of the primary process pump motors to 1500 HP, servicing and modification to the secondary high pressure process pumps. Physical work being performed at the present time is limited to the upgrading and installation of the primary process pump motors. This work, which is being accomplished by the Westinghouse Electric Corporation in Portland, is proceeding ahead of schedule. One of the upgraded motors was installed in the Number 2 primary pump position, 190-KE, on November 29, 1960.

R-30144 - 105-C Overboring

Scheduling efforts are currently being directed toward optimum sequencing for work and obtaining time study data on individual items of work. This information will be used to determine tooling requirements.

Donuts removed from 105-C were successfully decontaminated to the point where they can be reworked with very little exposure.

PROJECT PROPOSALS

Project Proposals Returned Unapproved

CGI-900 Modifications for Use of Self-Supported Fuel Elements - C Reactor

Returned by AEC on November 22, 1960 per request of General Electric Company. Elements of scope may be modified.

CGI-905 Interim Modification to High Tank and Raw Water Systems for Improved Coolant Backup, 100-B, C, D, DR, F, and H Reactors

Returned to General Electric Company on November 16, 1960 to permit scope changes: deletion of high tank work and expand scope of export and surge suppressor work. Proposal for high tank portion may be submitted later after further tests.

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Project Proposals Submitted to AEC

CGI-791 Reactor Confinement
Rev. 5

CPFF CONSTRUCTION SERVICE CONTRACTOR - LIAISON

We have issued one new work order, one new project release, and supplemented nine old jobs for a total of \$854,399 to J. A. Jones in the month of November.

PLANT FORCES WORK REVIEW

The Labor Standards Board approved nine jobs for assignment to Plant Forces, which are estimated to cost \$282,314.

MANAGER
FACILITIES ENGINEERING OPERATION

RT Jessen:dgm

PROCESS DESIGNResearch and Development

Members of the NPR Project Section met with the Staff of the Joint Committee on Atomic Energy on November 15, 1960, to answer questions on the NPR. The committee was primarily concerned with conversion aspects particularly in respect to questions of:

1. Is preliminary work as agreed between the Joint Committee and the Atomic Energy Commission last April progressing satisfactorily so that dual-purpose operation can still be started in October, 1964 if authorization is received?
2. Will the feasibility of conversion in the updated Federal Power Commission report be significantly changed from the original report?

On November 17 and 18, a General Electric representative was present at a meeting in San Francisco with the Federal Power Commission, Atomic Energy Commission, and Burns and Roe, Inc. to resolve questions of the Washington Atomic Energy Commission office and select the conversion cases to be included in the updated Federal Power Commission report. The cases selected were A5 (794 MW gross electrical output with six reactor primary loops during both dual-purpose and power-only operation) and two alternates of A5 with stepwise conversion to dual-purpose operation.

The study being carried out on optimization of Phase III fuel element design has been concentrated mainly on determining the fuel cycle for the seven rod cluster. Three enrichment levels are being investigated: 1.3, 1.9, and 2.5 percent. The actual physics parameters are being computed with the IDIOT Program Code and the MELEAGER BURNUP CODE. Although the initial investigations have been made on uranium oxide fuel, the thorium-uranium and the metallic uranium fuels will be studied also. The concentric tube-in-tube fuel elements will also be studied as there seems to be some incentive for their use from the fabrication and fuel handling aspect.

Project CAI-816

Extensive attention has been applied to the preparation of the Burns and Roe procurement, instrument, and control specification and discussions on possible methods. General Electric engineers have been at Hempstead during the month to discuss mutual technical control problems related to the reactor and heat dissipation system. Discussions on possible procurement techniques for this instrumentation have been held with the Atomic Energy Commission and Burns and Roe in an effort to develop a contractual approach suitable to all parties.

Project CAI-816 (Continued)

Approximately three tons of boron steel plate is available at Jones and Laughlin Steel and approximately nineteen tons are at the A. M. Byers Co. Testing of the Jones and Laughlin plate samples indicates that it will adequately meet the chemical and physical test requirements of the specification. Tensile tests of the A. M. Byers plate indicate that it does not meet the elongation requirements; however, heat treated cropped ends tested by A. M. Byers indicates that the plate could be heat treated to improve the tensile elongation to within acceptable limits.

A Grayloc coupling similar to the type of coupling to be used on the NPR connector piping failed on a test loop not related to NPR work. Intensive investigation of the incident has indicated faulty heat treatment in the failed bolt and also in one bolt in an adjacent coupling. The problem therefore is one of quality control and discussions have been held with the vendor to determine necessary procedures to insure that this type of failure will not occur on the NPR application.

DEVELOPMENT AND TESTING

Listed below are significant developments for the New Production Reactor primarily reported by the Equipment Development Operation of Facilities Engineering.

The Component Test Loop was thermally cycled, automatically, during the month to evaluate various joints and fittings. One test section, incorporating two Grayloc type zirconium process tube-to-nozzle joints, was thermally cycled more than 1,600 times, and after disassembly showed no evidence of leakage. This Grayloc type sealing concept is a leading candidate for the critical, front-face, process tube-to-nozzle joint.

High-speed movies have been taken of simulated fuel element discharges onto an underwater chain-link mat supported on truck inner-tubes to give buoyancy to the net. These movies show favorable energy absorbing reactions of the mat such that additional tests have been scheduled to establish design parameters for the air chambers.

Correlation has been obtained between chemical analyses and nuclear analyses (305 Pile) for samarium in ceramic materials such that the specification for ceramic balls for the ball safety system for the New Production Reactor can be issued employing commercial chemical (not nuclear) procurement.

A shield plug and gamma compensated chamber were installed in DR Reactor on November 1, 1960, for use in experimental work appropriate to the intermediate range period monitor and the high power level duo-deca monitor. The minimum background current was 1.15×10^{-9} amperes without compensation and 1.6×10^{-10} amperes with compensation. Full power current is 6.5×10^{-4} amperes.

The prototypic sub-critical monitor positioner for the New Production Reactor has been cycled vertically more than 1,100 times. This testing has revealed several features that need modification in a generally acceptable design, namely, (a) inclusion of a braking device due to the low friction of the ball bearing "Saginaw" screw, (b) inclusion of a second bearing (or other device) to reduce wobble, and (c) improvements in insulators.

HW-66913, "Time Delay Relays for NPR Control Circuits," was issued. This document contains test results for four small commercially available time delay relays and a description of the development of a dropout type relay that is being utilized in the NPR control circuit design.

Edison and Engelhard resistance temperature detector prototypes were subjected to vibration testing. One Edison immersion type and one Engelhard strap-on type resistance temperature detectors failed with an open circuit.

Progress on procurement activities that invoke prototype requirements include:

Grayloc connector fittings were forwarded to the four companies engaged in the prototypic process tube inlet and diversion valve program for use in testing their concepts. Progress reports from these firms indicate that testing will start in December.

In flow monitoring, agreement was reached on the technical content of prototype development contracts with Barton and Swartwout on transducers and signal generators and with Avien, Stromberg-Carlson, and Swartwout on controllers. Daystrom withdrew from the prototypic controller program, for engineering reasons, leaving a hole in the program which would have evaluated a magnetic amplifier concept.

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FIELD AND OPERATIONS ENGINEERING

Construction

105-N and 109-N Buildings

The storage basin walls from the west end to a point 80 linear feet east have been poured to an elevation (+)0'-6". Also, a floor slab for the left outer rod room has been poured.

The original estimate of 16,790 feet of electrical conduit in Phase I has now been exceeded.

Kaiser Engineers started work on Phase II October 31, 1960. A swing shift consisting of laborers and carpenters started work on November 14, 1960. As of November 22, the control room walls and half of the control room roof slab had been poured. Forming has been started for the blue tool room and hot shop.

In the past month a total of about 6,880 cubic yards have been placed in the 105-N and 109-N Buildings for a total of about 22,230 cubic yards, including 13,000 cubic yards in the 105-N Building, 160 cubic yards in Phase II by Kaiser Engineers, and 9,070 cubic yards in the substructure of the 109-N Building.

151-N Building

The basic structural work on this building is now essentially complete and work is in progress on the ventilation, plumbing and heating.

153-N Building

The roof slab was poured in this building during this reporting period.

163-N and 183-N Building

The demineralization building footings and the service building wall footings are now in place and the substation fire walls are in place.

166-N Building

The installation of the fuel oil storage tanks is in progress and the underground piping has been started.

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181-N Building

A preliminary acceptance inspection of the underwater portion of this building was performed. The sluice gate vendor visited the site and was present while the main sluice gates were raised and lowered. Final operational checking of these gates will be done during the high water period in June, 1961. The pumping operations in the excavation were discontinued November 23. The building has been deliberately flooded in preparation for completing the removal of the dike and excavating the forebay.

184-N Building

All Phase I work on this building has been completed and accepted from the subcontractor. The superstructure subcontractor has started work.

1734-N Building

The roof structure, including the precast concrete slabs, has been erected and the building is being painted. The cylinder racks and the sprinkler system have been installed.

230 Kv Transmission Line

The work on this line has proceeded slowly during this reporting period.

Temporary Construction

New drawings and specifications have been prepared for utilizing a two-story building at Camp Hanford for General Electric TC facilities.

Graphite

Production of notched moderator details was initiated on November 2, with a total of 187 details completed by November 7. At this time the Arrowsmith machine was dismantled and modified to permit more precise indexing and clamping. Following completion of these modifications, production was again initiated on November 16. Daily production rate has averaged approximately 95 bars per shift for the ten days of actual operation; however, rates have improved rapidly with a high of 305 acceptable bars fabricated on November 23. During this period, the over-all reject rate has averaged nearly 20 percent; however, many of these details are salvable at reject inspection and the net reject rate will probably reduce to about 5 to 8 percent. While this rate is somewhat high, it should gradually decrease as machining problems are resolved.

As of November 26, 25.8 percent of the total NPR graphite order has been received at 2101 Building, compared to the scheduled 30.1 percent. As of the same date, 18.7 percent of the completed moderator details have been fabricated compared to the scheduled 53.4 percent. Inasmuch as machining is now on a production basis, Kaiser Engineers has indicated their intention to

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initiate a second shift during the first week of December. Also, work is proceeding on modification of two Sundstrand travelling head mills at Stetson-Ross Company in Seattle. After these are placed in service in late January, it is expected that production rates will be sufficient to insure completion of all details by the target date of June 30, 1961.

Zirconium

One hundred forty-eight NPR process tubes and 12 cooling tubes have been received to date. Pilot orders received are: Allegheny-Ludlum Steel - 27; Chase Brass - 21; Harvey Aluminum - 69. Harvey has also delivered the first 31 tubes of the production order.

All pilot order tubes have been tested by Immerscope, Vidigage, X-ray (welded tubes only), and 57 tubes have been tested in dye penetrant. Sixty tubes await dye penetrant test. Of the tubes tested, 13 did not meet weld specifications, one had a pit over maximum allowable size, and two had walls below minimum thickness. Fifty-four of the 57 tubes which had the dye penetrant test contained defects. Fifteen of these tubes have been conditioned and are now defect free; they are in storage awaiting etching and autoclaving.

The inspection station has been installed and is currently in use. Two boroscopes have been modified to black light.

The acid circulation pumps have been plagued with seal failures. The seals supplied with the pumps have been replaced with Hastaloy-C seals and were functioning satisfactorily at month end.

Two tubes were etched for test autoclaving, and 11 tubes were etched for defect removal. The two tubes autoclaved during the month displayed good black film, except for marks from the hooks that supported the tubes in the acid bath and a mineral deposit on the ID which resulted from water evaporating while the tube was in the autoclave. Corrective action is being taken to eliminate both of these items.

Bovay Consulting Engineers have been called upon by Kaiser Engineers to investigate and make recommendations for solution of autoclave problems. The investigation will cover correction of warping of autoclave No. 1, prevention of warping of autoclave No. 2, and elimination of temperature differential of the walls and the interior of the autoclaves.

Progress by the zirconium tube fabricators was as follows:

Chase Brass: Progress remains slow. Approximately 20 welds in 13 tubes now being fabricated were rejected due to porosity and other defects. Chase submitted a firm schedule for the balance of the tubes on the order on October 10, 1960. They are already falling behind this schedule.

Allegheny-Ludlum: Fifty-four tubes are to be shipped in December. This will complete Allegheny's contract at 81

Harvey Aluminum: Two pilot order tubes were shipped November 30. This will complete this order at 71 tubes. Harvey also shipped 75 production order tubes this same date..

Wolverine Tube: Twelve graphite cooling tubes have been received. Approximately 100 additional have been fabricated. All others are in various stages of fabrication. Wolverine does expect some delay in meeting the final delivery date of December 15, due to changes required to improve the tube reducing operation.

Primary Loop

Following is the status of approval data on the HUICO subcontract as of November 28, 1960:

Total number of items received	403
Number approved	16
Number approved with exceptions	78
Number not approved	172
Number currently being reviewed	137

To date, no primary piping components have been processed through the subcontractor's shop. Since the last report, manufacturing procedures and vendor drawings have been approved to allow HUICO's lower-tier contractor, Ladish, to proceed with the manufacture of some items of welded pipe and fittings.

HUICO has not submitted for review and approval the shop procedures that are required before fabrication can commence in the HUICO shop or the construction site.

Shield Crates

Yuba Manufacturing Division of Yuba Consolidated Industries, Benecia, California, started production of the primary shield crates. They are experiencing serious difficulty in meeting required tolerances.

Administration

The following data was processed by Drawing and Specification Control during the period from October 24, 1960 through November 27, 1960:

Drawings	564
Specifications	31
Criteria	14
Requisitions	72
ATP's	4
Other	48

Total 733

Accumulative total since March 25, 1959: 11,968

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

On detailed drawings	103
On specifications	16
On scope	0
On criteria	0
On ATP's	0
Total	119

Accumulative total since June 23, 1959: 5,297

Operational Planning

An estimate of office furniture required for General Electric personnel to be located in TC facilities at 100-N was prepared for the use of the Office Equipment Operation of CE&UO. Office furnishing requirements for the 100-N operating staff after start-up is being estimated.

The maintenance manual format was received from Maintenance Practices. A detailed review of intended application has been initiated.

Fourteen requisitions for spare parts were processed with a total cost of \$12,969.39. A review of spare process tube requirements is being made.

Design, Physical and Technical Data card forms, for use in equipment descriptions, were completed and have been sent to Printing Operation for reproduction.

CONSULTING ENGINEERS

A draft copy of the report, HW-67473, "Evaluation of Beloyarsk (URAL) Reactor," was transmitted to the AEC, Division of Reactor Development.

PROGRAM EVALUATIONDesign StatusReactor Plant as of 12/1/60Title I

Scope

<u>Wt'd.</u>	<u>Certified</u>	<u>Actual</u>
<u>Total</u>	<u>Schedule</u>	<u>% Complete</u>

100

100⁽¹⁾Title II

Drawings

70

79.0

82.4

Specifications

8

97.0

82.8

Requisitions

8

42.0

30.4

ATP's

4

21.0

13.3

Development and Testing

10

77.0

72.5

Total

100

75.0

74.5

Heat Dissipation Plant as of 12/1/60Title I

Scope Criteria

100

98.75

Title II

Detail Design

71.0

85.0

Criteria

23

23

21

Preliminary Drawings (bid)

801

634

637

Detail Drawings (for const.)

864

536

536

Specifications (bid)

155

131

131

Requisitions

170

137

137

ATP's

-

0

0

Composite Design Completion as of 12/1/60
(Reactor and Heat Dissipation Combined)

<u>Certified</u>	<u>Actual</u>
<u>Schedule</u>	<u>% Complete</u>

Total

77.0

82.0

Cost Estimate

The next scheduled cost review meeting will begin on January 9, 1961, with the budget estimate to be issued about February 15, 1961.

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

The AEC has requested that the A-E's (General Electric Company and Burns and Roe, Inc.) review and analyze change order itemized cost breakdowns submitted by Kaiser subcontractors and the itemized fair cost estimates prepared by Kaiser Engineers. This represents AEC's efforts to culminate their desire of having agreement between the A-E's and Kaiser as to the change order fair cost estimate since this is the figure which Kaiser will use for negotiation. Two of these change order itemized breakdowns have been received to date.

Schedules

Kaiser Engineers and AEC will issue revised construction schedules after completion of the budget estimate in January.

The AEC has requested Kaiser Engineers to submit a detailed construction schedule for the 105 superstructure construction work that is being accomplished with Kaiser forces.

MANAGER
NPR PROJECT

JS McMahon:mf

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FINANCIAL SECTION

GENERAL ACCOUNTING SECTION

HOO-AEC was verbally advised of the inadequacy of Project 791 Reactor Confinement funds November 23, 1960.

FY 1961 Miscellaneous Capital Work Order fund allocation data was provided to Contract Accounting November 29, 1960 with a request for additional funds.

During November, five employees attended professional and trade society meetings. Total expenditures amounted to \$1 167.58.

One employee attended an Indirect Labor Measurements Instructors class at a cost of \$602.18. A supplemental billing of \$9.05 was received for a former trip. Net expenditures amounted to \$611.23.

PRODUCTION COST & BUDGET SECTION

Essential material price lists were issued for use in the second quarter of FY 1961. An expected decrease in coal prices on the new contracts were offset by increased freight rates effective October 24, 1960.

Special studies were prepared of overtime hours, helium usage and costs, and effluent contamination control costs.

PERSONNEL ACCOUNTING

Total personnel assigned to the Department at the end of November was 2 265, an increase of 7 from last month.

Absenteeism in the Department is 2.2% of available hours for the calendar year to date.

Calendar year to date the Department has paid \$5 545 in suggestion awards.

AUDITING

Information required by the AEC following foreign travel at their expense was transmitted to the sections.

A report covering a follow-up of an audit of procurement activities was issued. Correction of unsatisfactory conditions found in the audit were noted.

In a recent test of HAPO first-aid records, there were several IPD employees whose frequency of call was much greater than the average. The names of these employees were given to the appropriate Section Managers.

SHS Mall

Manager - Finance
IRRADIATION PROCESSING DEPARTMENT

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RELATIONS PRACTICES OPERATION

Two technically trained candidates and one PhD candidate were interviewed during the month with no offers extended. Two offers were accepted and offers to two PhDs remained open at month end. Four monthly employees transferred into the Department from Hanford Laboratories and one transferred to another HAPO component.

A total of \$755 was paid for 19 suggestions. The largest award was \$405.

Communications included publication of eight Management News Bulletins, one Round Table Guide, four priority messages and five Headliners. GE NEWS coverage included fourteen items about IPD activities totaling 220 column inches. One Management Information Meeting was held during November. Seven HAPO-OPGs were issued during the month.

Four IPD employees retired during November.

Four recommendations for General Manager's Awards were processed.

The first disabling injury in 612 days occurred on November 18 when a pipefitter fell 15'2" from a plenum chamber to the floor in the 105-KW Building. His condition is critical. ~~Seventy-five~~ medical treatment injury cases were reported during the month. One security violation occurred in November.

J. M. A. Shanks

SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-67385	Secret	HR Kosmata HD Lenkersdorfer	11-24-60	Comments on HW-65023 - NPR Fuel Element.
HW-57043 REV1 RD	Secret	HR Kosmata	11-14-60	100-N Design Bases- Part I - General
HW-66630	Unclassified	WD Bainard	11-15-60	Report on Trip to Discuss Operation of Carbon Steel ALW Reactor.
HW-67224	Unclassified	KW Norwood GE Wade	11-1-60	Summary of NPR Confinement Closures.
HW-67259	Unclassified	GE Wade	11-1-60	105-N Confinement System Shear Pin Latches.
HW-67419	Secret	DL Condotta	11-16-60	Reactor Design Analysis Monthly Report.
HW-67513	Secret	WL Bunch	11-23-60	An Evaluation of Five Possible HCR Sleeve Materials for K Reactor.
	Unclassified	WJ Love	11-4-60	Trip Report - "Hot Loop Pump Test, Bingham Pump Company, Portland, Oregon, November 1, 1960"
	Unclassified	WJ Love	11-17-60	Notes on Meeting with Division of Reactor Development Representatives, Russian Superheat Reactor Study.
HW-66273	Secret	MH Schack	11-1-60	Design Criteria - Increased Process Water Flow, 100-K Area, Project CGI-883.
HW-67039	Unclassified	EL Etheridge	11-30-60	CGI-791 Reactor Con- finement Project Rep- resentatives Meeting No. 22, 9-12-60.

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<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-67071	Unclassified	CE Jones DE Newby	11-22-60	CGI-791 Reactor Con- finement Operating Manual, 100-B, D, and F Areas.
HW-67309	Unclassified	ER Rudock	11-4-60	Design Test No. DT-1084, 105-KH Rod Zr-2 Sleeve
HW-67330	Secret	HW Heacock	11-7-60	Modifications for Increased Production, C Reactor - Alternate Programs.
HW-67331	Unclassified	WJ Tupper	11-7-60	Capacity of 183-K Filter Effluent Structure.
HW-67444	Secret	MH Schack	11-18-60	Effluent System Capacity - Project CGI-883, Increased Process Water Flow 100-K.
HW-67471	Unclassified	EL Etheridge HC Copeland WW Porter	11-30-60	Procedure for Field Checking CGI-791 Filter Installations.
HW-67506	Unclassified	ER Rudock	11-23-60	Summary of Project Proposal Scope Meetings, Project CGI-839, Phase II KER Safety Circuit.
HW-67019	Unclassified	LM Keene	11-1-60	Project CG-775 and CGI-883 Representa- tives Meeting No. 10 9-23-60.
HW-67310	Unclassified	PB McCarthy	11-3-60	Production Test IP- 341-AP, Hardware for 0.550 Inch Oversized Tube Equipment.
HW-67393	Unclassified	AN Iverson	11-7-60	Instrument Evaluation Report, GE Log N Period Amplifier and Dual High Voltage Power Supply.

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-62449 SUP.	Unclassified	AN Iverson	11-10-60	Portable Dose-Rate Integrator - Mark I.
HW-67421	Unclassified	CD Emmons	11-14-60	Interim Report No. 7 Design Test 1024 - NPR Fuel Handling.
HW-67306 RD	Unclassified	A. McDonald	11-3-60	Program for Modification of 4500 HP Stators.
HW-67386	Unclassified	VG Blanchette	11-10-60	A Summary Review of Normal Electric Power Loads 1706 KE, KER Testing Facilities.
DC-420	Unclassified	VG Blanchette	11-21-60	4500 HP Motors, Remove Thermal Relay (IRT) Trip 190-B, D, DR, F and H Areas.

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
J. E. Stice	Baldwin-Lima-Hamilton Philadelphia, Pa.	11-16-60	Review production facilities and plans for boron plate thermal shield fabrication.
C. E. Love	Pioneer Broach Company Los Angeles, California	11/1-2/60	Discuss graphite fabrication equipment.
	Cincinnati Milling Machine Company Los Angeles, California.		
	Arrowsmith Tool Company Los Angeles, California		
	Harvey Aluminum Company Los Angeles, California	11-3-60	Review progress on NPR zirconium tubes.
R. C. Walker	Stetson-Ross Company Seattle, Washington	11-2-60	Discuss purchase of graphite fabrication equipment.

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
D. C. Wheeler	General Electric, APED San Jose, California	11/14-18/60	Attend GE Plant Maintenance & Engineering Conference and discuss training, maintenance manuals and maintenance methods with APED personnel.
G. T. Haugland	Baldwin-Lima-Hamilton Eddyston, Pennsylvania	11-16-60	Determine adequacy of plant to fabricate thermal shield, insulation layer and aluminum reflector components.
M. H. Russ	Burns & Roe, Inc.	11-14,15-60	To expedite design progress.
R. A. Rohrbacher	Hempstead, New York	11-9 -14-60	
R. A. Rohrbacher	General Engineering Lab Schenectady, New York	11-11-60	Discuss NPR analog studies and heat exchanger instrument and control problems.
M. H. Russ	General Engineering Lab. Schenectady, New York	11/16-17/60	Attend "System Design" Symposium.
F. J. Mollerus, Jr.	Burns & Roe, Inc. Hempstead, New York	11/7-12/60	Discuss NPR Primary and Secondary Loop Control.
D. L. Condotta	Burns & Roe, Inc. Hempstead, New York	11/12-18/60	Discuss instrumentation specification content and schedule.
E. M. Kratz	Federal Power Comm. AEC and Burns & Roe, Inc. San Francisco, California	11/17-18/60	Resolve questions of Washington AEC office and select conversion cases to be included in updated FPD report.
W. J. Love	Bingham Pump Company Portland, Oregon	11-1-60	Witness hot loop pump tests.
E.L. Etheridge J. R. Samuel	Army Corps of Engineers Warden, Washington	11-9-60	Discuss application of concrete coverings for erosion control and inspect locations where it had been applied.

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
L. M. Keene M. H. Schack	Albrook Hydraulic Lab. Pullman, Washington	11-2-60	Discuss proposed hydraulic testing in support of design for Project CGI-883.
R. R. Henderson R. F. Scheloske	LaPointe Machine Tool Co. Hudson, Mass. AO Smith Corporation Milwaukee, Wisconsin	11/1-5/60	Discuss engineering problems associated with broaching equipment for bumper fuel elements.
C. A. Munro	Norfin, Inc. Seattle, Washington	11/16-18/60	To review overboring machine designs in connection with DDR-109.
J. H. Fastabend	Ingersoll-Rand Company Huntington Rubber Co. Willamette Iron & Steel Co. Iron Fireman Mfg. Co., Portland, Oregon	11/9-11/60	To meet with various vendors to discuss special tooling problems pertaining to NPR.
R. W. Gilmore	Phillips Petroleum Co. ETR-MTP Idaho Falls, Idaho	11/4-11/60	To participate in fuel rupture testing with respect to instrumentation - at the request of Ray Call, HLO.
R. Sherrard D. F. Arnold	Monitor Systems, Inc. Ft. Washington, Pa.	11/5-11/60	To test and evaluate the high speed scanner system and to check Monitor Systems acceptance test data to date to determine when they would be on acceptance test.
G. L. Erickson	Coates Electric Mfg., United Controls Corp. Seattle, Washington	11/11-13/60	To review capability of vendor as a nearby source for making experimental and prototype photo etched printed circuit boards for certain Instrument Development developmental prototypes.

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
A. McDonald	Reed Electric Company Portland, Oregon	11/3-4/60	Assist in the appraisal of problems in the 181-C Building motors being installed under Project CG-845.
V. G. Blanchette	BPA Customer Meeting Spokane, Washington	11-28-60	Attended meeting relative to future electric power demands and availability to IPD.
H. A. Kramer	Water Quality in the Columbia Basin, WSU, Pullman, Washington	11/28-30/60	Determine the feelings of the public and of scientific people in the field of water pollution as such may be related to the HAPO operation.
J. P. Corley	Dr. E. Roy Tinney Washington State Univ. Pullman, Washington	11-29-60	To review rear-face hydraulic data as related to potential flow increases.
W. Seeburger	Mine Safety Appliance Co. Pittsburg, Pa.	11/15-21/60	To investigate humidity testing methods and facilities for filters to be used on Project CGI-791 - Reactor Confinement.
J. E. Hanson	Gray Tool Company Houston, Tex.	10/31- 11/2/60	Observe test of heater vessel for the ELMO-15 test loop.
D. H. Curtiss	Bridgeport Brass Co. Riverside, Calif. Harvey Aluminum Co. Torrance, California Reynolds Metals, Inc. Phoenix, Arizona	11/6-10/60	Discuss NPR fuel and process tubes.
	Allegheny Ludlum Steel Watervliet, N.Y. Tube Reducing Corporation Wallington, N.J. Bridgeport Brass Co., Bridgeport, Conn. Bridgeport Brass Co., Riverside, California	11/13-18/60	Zirconium tube procurement.

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
H. G. Spencer	General Engineering Lab. Schenectady, N.Y.	11/14-18/60	Attend Systems Engineering Symposium.
R. W. Pitman	Pullman, Washington	11/17-18/60	Attend Filter Plant Operators' School Meeting.
L. W. Lang W. I. Neef	Washington, D.C.	11/29- 12/1/60	Attend seminar on "Quantitative Analyses of Atomic Energy Operations."
F. F. Vlacil R. W. Willmott R. M. Scott	General Electric, APED San Jose, California	11/15-17/60	Attend G.E. Eleventh Regional Plant Engineering & Maintenance Meeting.
F. F. Vlacil	Vallecitos Laboratory Vallecitos, California	11/8/60	Discuss maintenance problems and practices.

VISITORS

G. G. MacLay	Ladish Company Cudahy, Wisconsin	11-22-60	Discuss manufacture of fittings, welded pipe, and extrusions for the primary loop.
V. McCormick	Ingersoll-Rand Portland, Oregon	11-2-60	Maintenance tooling
J. Keller	Hydraulic & Air Equipment Company Portland, Oregon	11-3-60	Maintenance tooling
B. R. Depka	Renton Coil Spring Co. Renton, Washington	11-14-60	Dummy springs
B. Barton	American Machine and Foundry Greenwich, Conn.	11-29-60	Metal handling
E. G. Haswell R. F. Webster R. A. Perry	U. S. Steel Corp. Ellwood City, Penn. U. S. Steel Corp. Spokane, Washington	11-8-60	Discuss manufacture of seamless pipe 10 inches and below for the primary loop.

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
D. E. Erb C. Raseman D. Thomas A. Mravca J. Finke	Division of Reactor Development of AEC Washington, D.C. Chicago Operations Office AEC, Chicago, Illinois Kaiser Engineers Oakland, California	11-16-60	Discuss decontamina- tion and use of carbon steel in boiling water and pressurized water reactors.
R. Shanks [illegible]	Automation Products Spokane, Washington	11-16-60	To conduct a Craft Training Program and demonstration for Swagelok tube fittings.
G. N. Flannagan J. A. Smith	E. I. DuPont Savannah River	11-2-60	PC Jerman arranged a meeting between R&E and Instrument Development with Mr. Flannagan. The status, past experi- ence, and future plans regarding nuclear instrumentation for Savannah River reactor and HAPO reactors were discussed.
Dr. E. R. Tinney	Washington State Univ. Pullman, Washington	11-21-60	To review rear-face hydraulic data as related to potential flow increases.
John Watt Chief Eng.	Grey Co. Houston, Texas	11/29-30/60	To discuss quality control of materials used in fabrication of Greyloc connectors.
B. L. Bailey L. H. Juel	Great Lakes Carbon Niagara Falls, N.Y.	11/8-9/60	Technical discussions on graphite.
C. W. Wheelock R. C. Westphal	Atomics International Canoga Park, California	11/11/60	Discuss possible fuel element irradi- ation in H-1 Loop.

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