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IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
JULY, 1960

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RICHLAND, WASHINGTON

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SUMMARY**DECLASSIFIED**RESEARCH AND ENGINEERING OPERATION

Fifty smooth bore Zircaloy tubes were installed in C Reactor bringing the total to 69. Installation rate was comparable to that for aluminum tubes.

A study of the effects of cladding thicknesses on the NPR fuel element surfaces was completed. Results indicate that increasing the thickness to 30 mils on any or all of the four surfaces of the 22 lb/ft NPR element would cause no appreciable losses other than the increase in zirconium costs.

Two columns of end spider supported fuel elements were charged into B Reactor and required only normal charging force. This experience tended to substantiate the suspicion that oversized fuel elements were the cause of high charging forces required last month.

Ten columns of nickel plated fuel elements have reached half the goal exposure without incident.

Traverse data at both B and F Reactors indicates that the inlet hump of the top few rows of tubes is becoming increasingly severe and will likely require use of four inch elements next year.

Tests to determine the effect of water quality on radioactive isotope retention were started at the city of Pasco filter plant. The use of the microphotometer to monitor water quality is also being demonstrated.

The primary power level limit was based on fuel element failure control at C, F, KE and KW Reactors. The others were restricted by bulk outlet temperature limits.

MANUFACTURING OPERATIONProduction

Reactor input production was 0.4 percent above forecast; 1.1 percent below forecast at the six old reactors and 2.4 percent above at the K's.

Over-all time operated efficiency was 79.3 percent (82 percent forecast); 78.3 at the six old reactors and 82.4 at the K's. Efficiency was low at the old reactors due to the replacement of process tubes.

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

Nine ruptures, four I&E regular three I&E-E and two solid regular were removed from the reactors. Two of the I&E regular metal ruptures were at B and one each at D and KW. The three I&E-E metal ruptures were at C, D, and DR and the two solid regular metal ruptures were at C and H. A thermocouple slug failure was removed from loop KER-1 and a tube in tube failure from KER-2.

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Engineering

An inspection of front face piping and fittings is being made. Recent minor incidents indicate a possibility, if these are neglected, of affecting reactor safety.

Equipment for rear face nozzle cap handling is being received from vendors. Engineering work is 90 percent complete on preparation of methods and time standards for tube replacement in 105-F Reactor. An engineer has been assigned to make lead reactor installation at 105-F of fuel clip material handling system. A new captive "O" ring nozzle cap gasket has been developed by Equipment Development Operation and is ready for on-reactor tests.

Vendor bids have been evaluated for provision of background music service in 105-F Area.

The base painting load is being determined for IPD cyclic painting needs.

NPR is proceeding with recommendations to combine the best features of two systems developed by different groups on the fuel element rupture monitor system.

Justification for an installation of the Epsco analog-to-digital converter for the six older reactors has been established and will be issued shortly.

A study of overboring feasibility both from a technical as well as timing standpoint is being made in conjunction with Equipment Development and Research & Engineering Operations.

FACILITIES ENGINEERING OPERATION

The total CGI-791 project is estimated at 64 percent actual completion compared to 60 percent on the revised construction status chart. Over-all design is 98 percent complete and all purchase requisitions except two have been issued.

Examination of 27 crossheader fittings from H reactor failed to reveal any significant cavitation damage in the Parker fittings.

The remaining scope drawings for Project CGI-844 have received Design Council approval. Detail design has been initiated by issuance of a design work release.

Scope design for Project CGI-884 is approximately 80 percent complete.

Acceleration and maximum load tests on No. 2 boiler in 184-D were completed and results are being studied.

Downcomer verification tests performed at Washington State University have established that the prototype downcomer model is similar in performance to the prototype downcomer in use at DR Reactor.

The bids on flapper valves were opened July 29, 1960 and an order was placed with the low bidder.

Contract negotiations are in progress to obtain Mr. George R. Rich, Consulting Engineer, to evaluate the adequacy of the export water system.

NPR PROJECT OPERATION

The design work level continues high as a result of numerous procurement problems, increasing field activities, and the expedited preparation of the Phase II superstructure bid package. The magnitude of these activities has resulted in the necessity of maintaining a larger design force than had been previously anticipated for this stage of the project.

Project Representatives have recommended the general concept of a Burns & Roe proposal to discharge the primary loop during the emergency dump procedure, into a large underground water filled tank. While similar systems have been designed, the NPR operating conditions require that the dumping system be accomplished at higher temperatures and pressures and some supporting development tests will be required. The design approach for the rupture monitor system has been selected and detail design can now proceed in accordance with project schedules.

Construction work on the 105-109 Building accelerated somewhat during July, 1960. Work was resumed on the 184 Building. Foundation work was under way on the 163 and 183 Buildings. Excavation was completed for the 153 Building and concrete was being placed for the basement of the 151 Building.

Graphite deliveries from vendors continued on schedule. On-site notching of graphite bars awaited completion of adjustment and debugging of the Arrowsmith notching machine. The notched bar inspection station has been completed.

Sixty-one pilot order process tubes have been received. Some tubes exhibited weld defects under X-ray inspection. No rejects have been necessary to date from dye penetrant or ultrasonic inspection.

The study of the effect of cost reduction on plant operating characteristics was completed.

FINANCIAL OPERATION

The results of the Physical Inventory of Irradiation Processing Department's Movable Equipment were issued during the month. There were 3,311 items of record at the beginning of the physical inventory. Only 21 were not located. There were 32 items added to record. Unlocated items represent 0.3 percent of the asset balance and unrecorded items amounted to 0.6 percent of asset balance.

Contract & Accounting Operation has been advised that accumulation of Space Occupancy (rent, light and heat) cost by building can be changed from monthly to yearly resulting in clerical savings of six to eight hours per month for Contract & Accounting Operation.

Liquidation of IPD supplemental crew cost was mechanized. This will reduce Contract & Accounting Operation month end clerical effort and provide analysis material through the work order "cost-to-date" report.

Total number of personnel in the Department at July 31, 1960 was 2,276, an increase of 16 from the number on hand at the end of June, 1960. Included in the number on hand at July 31, 1960 were 16 temporary employees hired as summer replacements.

A total of \$4,391 in Suggestion Awards has been paid to Department employees during the calendar year-to-date. Authorized allocation for the year is \$12,000.

During the month of July a cost of living increase of 1.18% was given to all non-exempt employees. Cost of living increases since October 1955 have amounted to 11.80%.

The absence and injury records pertinent to the third consecutive HAPO General Manager's Safety Award were reviewed. Nothing which would disqualify the Department from achieving the award was found. In addition to the report for the latest period, a report summarizing the work done in connection with all safety awards during fiscal year 1960 was issued.

RELATIONS PRACTICES OPERATION

Four of the eight technically trained candidates interviewed during the month were made job offers. Three accepted. Three exempt employees resigned from the Company.

GENERAL

RESPONSIBILITY

There was no significant change in responsibility.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non Exempt</u>	<u>Total</u>
General	1	3	4
Research & Engineering Operation	111	68	179
Manufacturing Operation	382	1377	1759
Facilities Engineering Operation	125	46	171
NPR Project Operation	74	28	102
Financial Operation	18	15	33
Relations Practices Operation	<u>7</u>	<u>21</u>	<u>28</u>
TOTAL	718	1558	2276

Effective July 1, in NPR Project Operation, J. R. Carrell was appointed Manager, Process Design and W. J. Morris was appointed Supervisor, Reactor Plant Design.

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DECLASSIFIEDSAFETY, SECURITY & RADIATION EXPERIENCE

Three security violations occurred. There were no disabling injuries or radiation exposures exceeding operational control. Sixty-six medical treatment injury cases were treated.

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.

M. Pociluyko	-	Interference Scanning Trolley for Reactor Charge Elevator.
R. W. Pitman	-	A Scheme of Analyses for Low Levels of Chlorides, Sulfates, Carbonates, and Probably Other Anions by Light Scattering.
W. R. Conley	-

GENERAL MANAGER
IRRADIATION PROCESSING DEPARTMENT

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RESEARCH AND ENGINEERING OPERATION

PROCESS AND REACTOR DEVELOPMENT OPERATION

REACTOR FUELS

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Present Reactor Technology

Projection Fuel Testing

Two additional columns of end spider supported fuel elements were charged into B reactor. Normal charging forces occurred tending to substantiate the suspicion that oversized fuel elements were the cause of high charging forces reported last month.

Fifty additional smooth bore Zircaloy tubes are now in place in C reactor and will be charged with self-supported fuel during the outage currently in progress. A total of 69 Zircaloy tubes are now in place in C reactor.

The eight tubes of the run-to-rupture portion of PT-262 Supplement B were charged into B reactor on July 9, 1960.

One control and one test column of the 20 tube demonstration loading have been discharged at about 400 MWD/T and are awaiting examination.

Nickel Plated Fuel

Ten columns of nickel plated fuel elements under PT-IP-263-A-FP have been irradiated for two months without incident.

Dingot Uranium Testing

The final report of the analysis of the initial seven tubes of dingot uranium material will be issued soon and contain the conclusion that dingot is not inferior to ingot uranium with respect to dimensional instability.

Advanced Reactor Technology

KER Testing

The thermocouple train being irradiated in KER-1 to evaluate crud film effects was discharged on July 7, following indication of a fuel element failure. The enriched tubular elements providing heat to the loop had reached an exposure of 1030 MWD/T, while a natural uranium thermocouple element had reached 435 MWD/T. The location, nature and cause of the failure have not yet been determined.

The four enriched tube-and-tube elements in KER-2 were discharged following failure indications at an exposure of 3150 MWD/T (138 days operation and 272 C coolant). The failure appears to be a longitudinal split in the Zr-2 jacket on the outer surface of the inner tube of the upstream fuel element in the charge.

Six heavy walled single tube elements were charged into KER-3 on July 3 under PT-IP-309-A and PT-IP-309-A, Supplement A. The test will evaluate the

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Test No.	Type Metal	Tubes	Reactor	Goal Exposure	Current Exposure	Remarks
IP-84-A	a. Projection Self-Supported fuel in ribless aluminum tubes	10	B	1200 MWD/T		Preliminary evaluation of self-supported fuel elements. Routine charging to continue until tubes are replaced. Ultra-sonically attached supports currently being used. Goal exposure increased from 900 MWD/T to 1200 MWD/T.
	b. End Spider	5	B	1200 MWD/T	270 MWD/T	Initial charging of end-spider supports.
IP-171-A	a. Solid X-8001 & C64-F	1	B	Variable 500 MWD/T	676 MWD/T	Provide for evaluation of alternate aluminum component vendors. Control columns are only ones carried special. Rest are lot charged.
	b. I&E X-8001 OIIN	0	D	Variable	772 MWD/T	Provide for evaluation of alternate aluminum component vendors. Control columns are only ones carried special. Rest are lot charged. Bridgeport Brass wrought blank components are now under irradiation. Six columns were discharged 7-10-60 from D Reactor.
IP-216-A	Normal Prod. Nat. OII, KII & KIII fuel elements	82	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	9 Mos.	Provides for long term irradiation of solid black mint for conversion ratio, and fuel performance determination. Three control columns discharged for special extraction.
IP-262-A	a. Bumber Supported fuel in Ribbed process Tubes	19	D	1200 MWD/T ~400 MWD/T 1 pr at 400 MWD/T 2 pr at 800 MWD/T		Provides for testing of bumper type fuel elements in ribbed process tubes. Each of the 20 bumper columns is paired with a control column. First pair discharged on 7-9-60.

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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>
	b. Bumper fuel run-to-rupture test	8	D	Rupture	~50 MMD/T	Provides for demonstrating a rupture resistance improvement of a factor of 40 at the 95% level.
IP-263-A	Nickle Plate Demonstration Loading	10	DR	800 MMD/T	400 MMD/T	Provides for testing to determine if the spalling affects in nickle plate has been eliminated.
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. First two columns discharged.
IP-292-A	Four Zr-2 jacketed 1 18-inch enriched tube-and-tube elements	1	KE	3500 MMD/T	3150 MMD/T	Elements discharged with failure on July 3, 1960. Cause of failure was a longitudinal split of jacket on upstream element.
IP-300-A	8 Nat. U Hot-headed tube-and-tube elements	1	KE	2500 MMD/T	1000MMD/T	Charged April 25, 1960, in KER Loop 4.
IP-309-A & IP-309-A Supp. A	Four heavy walled single tube elements; two heavy walled single tube elements with capped jacket defects for failure testing	1	KE	2500 MMD/T	290 MMD/T	Charged in KER-3 on July 3, 1960.
IP-314-A	One thermocouple 1 element; two thirty-six inch tubular heater elements	1	KE	Not over 2000 MMD/T at failure	1030 MMD/T	Charged in KER-1 on May 14, 1960. Train discharged with failure on July 7, 1960. Location and nature of failure have not been determined.

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behaviour of tubular elements whose size and geometry approximates those of a KER inner tube. Exposure to date is approximately 145 MWD/T.

The natural uranium tube-and-tube elements with hot headed end closures have attained an exposure of 1000 MWD/T in 288 C coolant in KER-4.

Fuel Design Analysis

Studies of the effects produced by the various combinations of cladding thicknesses on the surfaces of NPR fuel elements have been carried out. Computer results indicate that, outside of added zirconium costs, no other losses of appreciable magnitude would result from increasing cladding thickness to 30 mils on any or all of the four surfaces of the 22 lb/ft NPR element. Slightly higher coolant pressure drops are offset by slightly higher conversion efficiencies while increases in fuel temperature and heat fluxes are negligible.

REACTOR PHYSICS

Present Reactor Technology

Ceramic Ball Tests

Five samples each of four different ball materials were charged into KW reactor July 6; discharge date is approximately August 7. PCTR reactivity measurements will follow irradiation to determine percent poison burnout.

E Metal Storage

The limits on storage of unirradiated .947 percent U²³⁵ were revised to allow 300 hole pallets to be stacked three high. The change is based on experimental data and the fact that both a flooding of the normally dry storage area plus redistribution of the E metal into a less safe geometry would be required for a critical mass incident.

E-N Conversion Ratios

Analytical results on plutonium conversion from three batches of metal from the E-N test are anticipated in August.

Calculations are being completed to obtain radial flux traverses in uranium and lithium pieces of the stripe load. These will be combined with experimental axial flux traverses to allow calculations of the thermal utilization of the stripe load.

High Fast Flux

Calculations are underway to determine in a qualitative manner the fast flux obtainable on graphite samples located inside a highly enriched uranium oxide fuel element. Preliminary results are encouraging in that some gain in fast flux ($E > 1$ mev) can be achieved over that presently available in test holes. Further work will define better the upper limit.

DECLASSIFIEDAdvanced Reactor TechnologyAnalog NPR Model

The primary loop model is being put in final form. Both equations and constants have been provided to the analog programmers.

Exponential Experiments

The graphite for the exponential assembly has arrived and been stacked up for the open lattice pile. Performance of the experiment awaits receipt of part of the NPR fuel components. PCTR measurements likewise await receipt of this material.

Control Rod Measurements

Titanium tubes have been obtained and the Boron carbide sleeves are available which insures control rod experiment work will proceed without delay.

REACTOR ENGINEERINGPresent Reactor TechnologyZirconium Tube Procurement

A total of 69 Zircaloy process tubes are now in place in C reactor. Installation rate was comparable to that experienced with aluminum tubing.

Harvey Aluminum expects to complete fabrication of the remaining 85 smooth-bore process tubes for C reactor by August 15.

Graphite Distortion at B and F Reactors

A traverse through the top center at F reactor indicated a further increase in elevation of the top of both the inlet and outlet humps, and the low point in the center depression. In total the depression has arisen approximately 1/4 inch since the traverse taken in September, 1959. Power level increases at F during the last year have required increased helium concentrations to maintain maximum graphite temperatures within process standards. Data on power level temperature measurements and helium concentrations are under examination to determine if low temperature expansion of some of the tube block graphite has occurred.

Traverse data at both B and F reactors continue to indicate that the bend in the inlet hump for the top few rows of tubes will become sufficiently severe to require four inch fuel elements next year. Continued manometer traverse and probe length data will be gathered to permit orderly preparation for four inch elements.

Export System

Two suggestions were obtained from consultant Dr. George Rich with respect to possible modification of the export system. These were: (1) the use of a surge tank to absorb energy normally resulting in water-hammer to prevent

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loss of pump flow, and (2) the use of slow closing check valves in place of the current surge suppressors. These suggestions will be explored in detail.

Advanced Reactor Technology

Corrosion

A visit to Idaho Falls revealed that operation of a carbon steel piped reactor has been very successful from a corrosion point of view. Crud levels were low, dissolved oxygen content has been well controlled and the level of reactivity of the external system appears not appreciably different from that of a similar reactor with stainless steel piping. A complete trip report will be issued.

Graphite

Sample bars from the last two furnace loads of tube and bottom reflector graphite from Great Lakes Corporation indicate diH purity values in the range of +.1 to -.7, which is below the specification value of +0.25. At least nine other furnace loads have met this specification with purity values of +.25 to +.8. Measurement of the graphite from the two heats will be checked further.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience of critical IPD classifications for the first 28 weeks of the 1960 badge year.

Classification	Total Dose	No. of Employees	Average/Dose Employee	Extrapolated Year End Average	No. of Employees over 3r Extrapolated Exposure
Radiation Monitors	134162 mr	86	1560 mr	2897 mr	41
Processing Operators	339382 mr	250	1357 mr	2520 mr	15
Pipefitters	106886 mr	93	1149 mr	2134 mr	8
Millwrights	84233 mr	76	1108 mr	2058 mr	12

Lapse of Control

	<u>Lapse of Radiation Control</u> <u>Distribution by Reactor and Component</u>								<u>IPD Totals</u>
	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	
Processing	1	2	0	3	1	1	1	0	9
Maintenance	0	0	0	0	0	0	0	0	0
Supplemental Crews	0	0	0	0	1	0	0	1	2
Research & Engineering	0	0	0	0	0	0	0	0	0
Facilities Engineering	0	0	0	0	0	0	0	0	0
Central Maintenance	0	0	1	0	0	0	0	0	1
Reactor Areas	0	0	0	0	0	0	0	1	1
Assigned Totals	1	1	1	3	2	1	1	2	12
IPD General									
Outside IPD						1			1

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

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Average Reactor Effluent Activity Output

	<u>July, 1960</u>	<u>June, 1960</u>	<u>July, 1959</u>
107-B	45,000 uc/sec.	37,000 uc/sec.	33,000 uc/sec.
107-C	38,000 "	47,000 "	47,000 "
107-KW	33,000 "	61,000 "	48,000 "
107-KE	23,000 "	44,000 "	40,000 "
107-D	26,000 "	24,000 "	19,000 "
107-DR	18,000 "	18,000 "	19,000 "
107-H	13,000 "	26,000 "	20,000 "
107-F	24,000 "	22,000 "	24,000 "
Total	<u>220,000 uc/sec.</u>	<u>279,000 uc/sec</u>	<u>250,000 uc/sec</u>

Effluent Water

A series of delays has prevented the start of test in the effluent decontamination test facility at 100-D Area. Water is expected to be turned into the bed of aluminum shavings immediately.

A test was begun this month in KER to determine the effects of sulfate ion concentration on the concentration of isotopes, particularly phosphorus-32 in effluent water.

Consideration is being given to the use of aluminum nitrate in the place of aluminum sulfate in cooling water as a means for controlling P³² in the effluent. Small scale laboratory tests indicate that high feed rates of aluminum nitrate can reduce ionic arsenic and phosphorus by appreciable amounts.

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PROCESS TECHNOLOGY OPERATION

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REACTOR POWER LEVEL LIMITATIONS

The primary power level limit at C, F, KE, and KW Reactors was based on fuel element failure control at the goal exposure permitted by the available metal supply. Power levels at B, D, DR, and H Reactors were restricted by bulk outlet temperature restrictions.

WATER TREATMENT

The demand for polyelectrolyte addition has diminished for raw water treatment as is typical for July.

Model filter plant tests have been conducted using aluminum nitrate in place of alum. No significant difference in the filter characteristics or water quality produced were observed.

Tests are being conducted at the City of Pasco filter plant to determine the effect of water quality on radioactive isotope retention. In addition, the use of the microphotometer to monitor water quality is being demonstrated.

PROCESS STANDARDS

HW-46000 B, Process Standards - Reactor

Five revised Standards were issued during the month. These were:

Process Standard A-010 - "Process Piping"

Conditions for reactor operation with a failed rear pigtail were added to this Standard. Previously only the conditions for continued operation were specified and recovery from a scram due to a failed rear pigtail was not permitted.

Hazards associated with hot startups from scrams caused by failure of a rear pigtail have been analyzed and it was concluded that reactor protection is not reduced provided certain limits, specified in the Standard, are met following recover

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

Process tube outlet coolant temperature monitoring requirements were re-grouped into shutdown, pre-startup, and equilibrium operation. Maintenance requirements were added for zone temperature monitoring sensors.

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

Ball 3X system requirements from three other Standards were compiled and added to this Standard for clarification purposes.

DECLASSIFIEDProcess Standard D-020 - "Ruptured Slug Detection"

This Standard was completely rewritten. Rupture indications requiring immediate reactor scrams were re-stated. Each of the scram conditions listed are a combination of an increase in effluent water activity and another significant rupture indication.

Gamma monitoring operating conditions previously included as "Advice" were re-stated and upgraded to "Mandatory" requirements.

Process Standard F-011 - "Process Material"

Authorization to use identical spool pieces for six inch natural and enriched slugs was removed from the Standard.

Information concerning slug types and end cap data were changed to that currently used.

HW-46000 D, Process Standard - Reactor

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

Process Standard A-010 - "Process Piping"Process Standard D-020 - "Ruptured Slug Detection"

Revisions to these Standards are identical to those for HW-46000 B, above.

HW-46000 F, Process Standards - Reactor

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

Process Standard D-020 - "Ruptured Slug Detection"Process Standard F-011 - "Process Material"

Revisions to these Standards are identical to those for HW-46000 B, above.

HW-46000 H, Process Standards - Reactor

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

Process Standard A-010 - "Process Piping"Process Standard F-011 - "Process Material"

Revisions to these Standards are identical to those for HW-46000 B, above.

HW-46000 K, Process Standards - Reactor

Five revised Standards were issued during the month. These were:

DECLASSIFIEDProcess Standard A-010 - "Process Piping"Process Standard D-020 - "Ruptured Slug Detection"Process Standard F-011 - "Process Material"

Revisions to these Standards are identical to those issued for HW-46000 B, above.

Process Standard A-050 - "Panellit System Control"

Special requirements for by-passing Panellit gauges when vertical column coordinate jumpers are in service have been added. These requirements are necessary to ensure a by-passed gauge does not inadvertently remove other gauges from service.

Process Standard K-030 - "Single Pass Operation - Fissionable Material Charged"

During single pass operations the dump valve is required to be locked in the "dump" position. In addition, the air supply line to the dump valve was required to be disconnected. These requirements ensure against flow interruptions due to operation of the dump valve.

This revision permits single pass operation with the air supply to the dump valve locked out instead of physically disconnected.

HW-41000, Process Equipment Standards

One Equipment Standard was issued during the month. This was:

Process Equipment Standard A-010 - "Process Water System"

The precaution prohibiting the use of valve pigtailed on tubes charged with fissionable slugs has been transferred to this Standard from the Process Standards - Reactor manual. Also, drawing numbers of the process water system were up-dated.

PROCESS CHANGE AUTHORIZATIONS

Ten Process Change Authorizations were issued during the month to permit temporary deviation from Process Standards - Reactor, HW-46000, and one was issued to permit temporary deviation from Water Plant Standards, HW-27155 Rev1. These were:

PCA #O-57 - "Maximum Pressure Settings for Safety Valves and Rupture Discs for KER Loops 1, 2, 3, and 4"

Safety valve and rupture disc settings are specified in Process Standard K-010, "General Requirements," at 1500 psig for Loop 1 and 1825 psig for Loops 2, 3, and 4. Recent studies indicate these values should be changed to 1720 psig for all loops. This PCA specified the change and a required completion date.

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PCA #0-58 - "Use of Cast Uncanned Tubular Al-Si-Cd Dummies - B Reactor"

This process change authorized use of Al-Si-Cd poison pieces remaining from Production Test IP-147-IE. This poison material was tested and is an acceptable substitute for the canned lead-cadmium poison slugs, but due to manufacturing difficulties, further procurement of this material has been discontinued.

PCA #0-59 - "Graphite Thermocouple Stringers - C Reactor"

Process Standard C-040 for C Reactor specifies the number of graphite stringers that must be in operation for correlation of filler block graphite temperature with thermocouple stringer temperature. Two stringers were required at C Reactor to meet this requirement.

This process change authorized postponing stringer installation to permit procurement of Geminol temperature monitoring equipment.

PCA #0-60 - "Vertical Bowing Traverse Delay - D Reactor"

Vertical bowing measurements are required to monitor the extent and rate of process tube channel and moderator distortion. Some measurements are required at six month intervals and others at three month intervals.

Approximately two hours of outage time per year could be saved by arranging the traverse schedule such that the six month measurement coincides with alternate three month measurements.

Authorization was given to delay measurements so that the traverse schedule could be adjusted.

PCA #0-61 - "Raw Water Screens - H Reactor"

The size of the raw water screens at H Reactor do not conform to Standards. Authorization was given to operate with these screens until the process pump trip-out test, authorized by Production Test IP-289-I, has been completed.

PCA #0-62 - "Removal of Automatic Emergency Process Water Backup to the KER Loops After Four Hours of KE Reactor Shutdown"

Emergency coolant backup requirements for KER loops are specified in Standards. It was necessary to remove coolant from all four loops to repair a leaky check valve on Loop #1. Authorization to use a specified procedure for removal of emergency water backup to all four loops was given.

PCA #0-63 - "Reduction of Free Vent Size Between Rupture Disc and Safety Valves on KER Loop Pressurizers"

Planned modification to the KER loop pressurizers required a reduction in the free vent area between rupture disc and safety valves to comply with accepted code practice. This PCA specified the new requirement and set the

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date for meeting the requirement.

PCA #0-64 - "Rear Header Pressure Requirements - B, C, D, DR, F, and H Reactors"

Rear crossheader pressures currently being experienced exceed the maximum specified by Standards. A method for calculating TAI limits and Panellit low trip settings which take into account rear header pressure, in addition to other parameters, was specified by this PCA.

PCA #0-65 - "Automatic Scram Feature of the Temperature Monitor, KE and KW Reactors"

Startups without having the temperature monitor actuating the #1 safety circuit were authorized. In its place a 50 point alarm system which provided an early warning of poor temperature distribution was required.

PCA #0-66 - "Storage of 0.96% U-235 Enriched Slugs - D Reactor"

Recently a larger size pallet for handling and shipping E-slugs has been placed in service. To maintain criticality control, storage restrictions were specified by this PCA until the appropriate Standard could be revised.

PCA #0-67 - "Removal of High Pressure Crosstie Flow Limiting Orifice - K Reactors"

Removal of the flow limiting orifice from the high pressure crosstie was planned. Concurrently, safety circuit changes were to be made which would delay opening of the V-73 valve until the aiding reactor has been shut down.

This PCA presented a valving procedure to be used at a shutdown K Reactor to minimize the amount of coolant that could be diverted to it from the other K Reactor.

PROCESS ASSISTANCE

Auditing

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

Graphics

Graphic services prepared 27 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 Metal</u>	<u>Exposure</u>	<u>Type of Failure</u>
7/3/60	2864-KE ⁽¹⁾	IP-292-A	"Tube in Tube"	3320	Jacket-Split

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<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Metal</u>	<u>Exposure</u>	<u>Type of Failure</u>
7/4/60	2974-KW	KR-223-D	I&E Natural	377	Side Hot-Spot
7/7/60	2160-KE (2)	IP-314-A	I&E Natural (9")	856	Unknown
7/9/60	2072-C	KG-270-E	I&E Enriched (3)	387	Side Hot-Spot
7/10/60	1265-B	KL-484-D	I&E Natural	305	Side Hot-Spot
7/12/60	0677-DR	KH-155-D	I&E Enriched (3)	426	Side Hot-Spot
7/14/60	2352-H	MA-282-A	Solid Natural	686	Split-Long
7/23/60	1383-B	KL-471-D	I&E Natural	532	Unknown
7/28/60	2252-C	MA-289-B	Solid Natural	616	Split-Long
7/29/60	3660-D	KH-186-D	I&E Enriched (3)	461	Side Hot-Spot
7/31/60	2665-DR	KL-485-D	I&E Natural	473	Side-Other

- (1) KER Loop #2
- (2) KER Loop #1
- (3) 0.94 per cent U-235

Legend:

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

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

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

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

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OPERATIONAL PHYSICS OPERATION

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PILE PHYSICS ASSISTANCE

The monthly average ECT exceeded 77.5 per cent of all reactor tubes for the second time; this high ECT was especially significant in view of the tendency toward decreases at some piles due to operation on bulk limits or to operational limitations.

Central spline caps were installed at F reactor and a single spline operational test was carried out at B reactor; all reactors except DR and H are now making at least partial use of the poison spline system for operating control flexibility.

Five reactors, B, D, DR, F, and H now have working geminol graphite thermocouple stringers; a program was initiated to obtain longitudinal flux traverses from the graphite temperature readings from these stringers.

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

Reactor	B	C	D	DR	F	H	KE	KW
ECT in July (1)	1470	1715	1520	1565	1435	1630	2490	2500
12-Month Avg. ECT	1430	1665	1485	1550	1445	1620	2490	2470
Equil. Scram Time (2)	14-16	26-34	15-17	30-40	14-20	20-30	*20-22	*18-20
No. of Scrams and Recoveries (3)	1/0	0/0	1/1	0/0	0/0	2/2	1/1	0/0
	0/0	2/1	1/1	1/0	0/0	0/0	2/0	0/0
No. of Non-Scram Outages (4)	3/0	1/0	2/0	1/0	3/0	3/0	4/0	2/0
Reporting Period -								
From:	6-24	6-24	6-24	6-25	6-24	6-25	6-25	6-25
To:	7-25	7-24	7-24	7-25	7-25	7-25	7-25	7-25

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

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

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B Reactor - S. L. Stewart

Startup efficiency was slightly further improved over June's performance by refinement of the modified charge length technique for charging turn-around poison.

A spline was inserted for the first time during reactor operation; the insertion and subsequent operation proceeded with no problems.

Operation on bulk effluent temperature limits reduced the incentive for fine flattening; a slight drop in ECT resulted. Three outages occurred during the report period, all the result of fuel element ruptures.

C Reactor - D. E. Newbrough

Fifty ribless zirconium tubes were installed in the C pile. To assure adequate spline coverage some aluminum tubes were retained in the otherwise solid block of zirconium tubes.

A record high average flattening efficiency was achieved during the report period - 86 percent of all reactor tubes. During one operating period #35 vertical safety rod was stuck 12 feet into the active zone; compensating control adjustments with splines and rods prevented efficiency losses. Operation was interrupted by four outages during the report period.

In order to correct the upstream flux depression which is caused by 3X balls lodged in the graphite lattice (see February's report), an initial loading of twelve special columns, authorized by PT IP-324-C, was charged; these columns each contain four normal enrichment pieces in the upstream portion of an otherwise standard charge.

The zone temperature monitor and power rate meter were installed.

D Reactor - J. F. Jaklevick

A modified startup technique was adopted to reduce startup losses following extended outages; successive power level raises, spaced about three hours apart following the initial low level turnaround, were made to force a faster rise to equilibrium power level. The eight columns of 1.47 per cent U-235 enriched uranium metal which were authorized by PT IP-262-A-FP, Supplement B, resulted in the anticipated reactivity gain of about 150 mk.

Preceding the one scheduled outage PT IP-249-C, "Scram Transient Tests," was performed; present reactivity coefficient numbers were verified within reasonable accuracy. Following recovery from a Panellit scram insufficient control flexibility was available to correct a heat unbalance; reactor outage resulted.

DR Reactor - D. G. Montague

The withdrawal mechanism of one channel of the low level neutron monitor and failure of the other fission chamber resulted in both instruments being out of service temporarily. Instrumentation of the geminol graphite system was completed.

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A study was initiated to determine the validity of using graphite temperature data for determining front-to-rear flux distribution. A reactivity prediction error during an unsuccessful scram recovery prompted a revision of scram recovery curves; preparations were made to perform a scram transient test during the next scheduled outage.

Two outages, one from a Panellit scram and the other for a rupture, were the only shutdowns during the reporting period.

F Reactor - C. D. Wilkinson

Several reactor modifications made during the extended outage of July 12 were of significant importance to operating efficiency:

1. #4 HCR was converted to a half rod.
2. Fourteen ball valves were moved from the center of the reactor; four were removed and ten were relocated near the edge of the flat zone.
3. The enrichment inventory was increased in the radial pattern and decreased in the center.
4. 73 spline caps were installed in the central portion of the reactor.

These changes were designed to increase equilibrium flattening efficiency, to decrease startup losses, to improve enrichment utilization and to more easily satisfy total control requirements. With such extensive changes one or two months of slight readjustments may be required before the potential efficiency improvements are realized.

Two additional shutdowns were necessary for water leak repairs.

H Reactor - A. R. Kosmata

The first three (of seven) geminol graphite thermocouple stringers were installed. Because the couples recorded a higher graphite temperature than had been indicated previously by relatively inadequate monitoring, the helium concentration in the pile gas atmosphere was increased about thirteen per cent to reduce the maximum graphite temperatures.

To reduce metal costs of converting to a full central zone block discharge technique of operation (scheduled for September) approximately 200 process columns were charged with slightly shorter columns to increase the average rate of exposure build-up per piece in these charges.

Flux traverses taken in conjunction with the split enrichment charge production test, PT IP-281-C, indicate that the first twelve charges, adjacent to the bottom portion of the enrichment ring, resulted in a 2-3 per cent reduction in the flux peak and a shift of the peak from the center to four fuel element lengths upstream.

KE Reactor - G. F. Bailey and D. E. Clark

With the inability to insert HCR's 16 and 19 beyond the last five per cent

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of their travel four rods were not completely operable during the first portion of the report period (12, 16, 17 and 19); subsequently, HCR's 12 and 16 were repaired. Seven additional splines were used per startup to substitute for HCR 17 which could be inserted to only 72%.

300 splines were used during this report period for startup control. A record low non-equilibrium loss of 0.155 equivalent days was achieved following a secondary cold startup. Operation was interrupted by five outages; three resulted from two KER ruptures and one spurious KER temperature trip. The first outage terminated a 25-day operating period.

KW Reactor - R. A. Chitwood

#2 HCR, which failed in April, was repaired and returned to service; subsequently all HCR's were operable.

Spline insertion rate restrictions limited startup gains slightly during the minimum time startup on 7-19. A rupture on 7-4 ended a 32-day operating period. One other outage resulted from a Panellit scram.

PROCESS PHYSICS STUDIES

Safety Control Studies

An addendum to the "square pile" total control document, HW-64027, has been prepared to include total control requirements at the K piles with the Ball 3X system in various stages of operability.

Calculations based on flux matching methods confirm the present basis for determining the total control limitations of fringe poison loadings. As long as the calculated flux in the supporting equipment columns does not exceed that in the natural load being replaced, the total control of the fringe loading is slightly conservative relative to natural uranium.

Operational Physics Sub-Section continued to participate during the month in the PRTR startup and operational audit being carried out by IPD.

Pile Reactivity Studies

HW-66236 has been forwarded to the accountability operation giving tritium yields in fringe poison columns, normalized to consistent separations results at Savannah River. Test batches are currently being run in the 200 Areas on the plutonium yield test for IPD.

Control Efficiency Studies

The semi-annual summary of potential gains shows a 3-fold improvement in startup efficiency at the K's during the second quarter of 1960. Correspondingly, the production efficiency at the K's was also the highest ever by approximately 6%. These improvements have resulted largely from the use of splines.

The single prototype displacement column installed at KW has worked well mechanically. Attempts at simultaneous flux traverses failed because of TWFM jamming.

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The first block discharge cycle at the DR reactor showed production roughly equivalent to that of the staggered discharge method. It would appear at this time that any disadvantages of the block method must be compensated for by improved maintenance utilization rather than increased production itself.

The fringe poison portion of the E-N production test for the H pile is completed and will be circulated for signature during the next month. Final approval by the AEC for going ahead with the H pile E-N load awaits results of separations data from the previous small scale test at H; these data are expected during the next few weeks.

The document summarizing the proposed program for automatic control development during the next two years has been completed and will be issued as HW-66125.

Shielding Studies

The front face neutron and gamma leakage and attenuation observations mentioned in last month's report have been documented in HW-66117. Recommendations to the reactor plants are included for the use of high density concrete bayonets as dry column shields and for consideration of supplementary detachable cap shields for cutting down the background level in the older reactors.

Reactor Fundamentals Training

E. H. Lockwood, Training Specialist, has been carrying out re-orientation assignments consisting of two weeks at each of three "typical" reactor plants - KE, C and F.

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TESTING OPERATION**DECLASSIFIED**IRRADIATION TESTING OPERATIONDR-1 Loop

The DR-1 Loop was operated continuously during the report period with the exception of four hours during a reactor shutdown. The test element was maintained at reference conditions for 412 hours, bringing the total to 559 hours.

The vibration of the #1 motor-generator was corrected at the General Electric Apparatus Service, Spokane, Washington, by eliminating electrical short-circuits in the rotor windings, correcting the run-out of the rotor, and realigning the mechanical centers of the rotor and stator. The unit has not yet been tested under full load conditions for final acceptance of the repairs.

The in-reactor tube wall temperature thermocouple failed due to an open couple. A spare thermocouple will be inserted in the flux monitor tube to provide an indication of the tube wall temperature.

Fission product concentration in the loop coolant remains at approximately the same level as last month, with no indication of iodine isotopes. Total Xe_{133} in the loop is less than one curie.

H-1 Loop

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

Special Irradiations

A nuclear mock-up of the Atomics International organic reactor fuel plate experiment (NAA-111) was tested in the Hanford Test Reactor. The assembly consisted of 16, 0.3 x 0.4 x 0.075 inch uranium plates enriched to 10 per cent U-235 alloyed with molybdenum and aluminum. The alloy compositions were 3.5, 7.5 and 10 per cent molybdenum and 3.5 per cent molybdenum plus 2 per cent aluminum. Data from the test will be used to predict the heat generation and reactivity effects of the test assembly.

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 Number</u>	<u>No. of Samples</u>	<u>Material - Purpose</u>
DR-H		PCCF	HAPO-184	11	Washington-Designated Program
DR		PCCF	HAPO-172	2	Effluent water (radioisotopes in effluent water study)
C	Y	Hot Graphite	HAPO-177	2	Graphite (damage studies)

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<u>Reactor</u>	<u>Test Hole</u>	<u>Facility</u>	<u>Request Number</u>	<u>No. of Samples</u>	<u>Material - Purpose</u>
KW	2C	Hot Graphite	HAPO-177	7	Graphite (damage studies)
KW	2C	Hot Graphite	HAPO-177	1	Graphite (damage studies)
D-DR-H		PCCF	HAPO-218	4	Natural uranium (fission product release)
KW	2C	Hot Graphite	HAPO-223	1	Ceramic balls (poison burnup study)
KW	4C	Snout	FWWS 105	2740	Cobalt (fish tags)
KW	2D	Magazine	ORNL-179	3	Silver (isotope production)
			ORNL-195	3	Tantalum (isotope production)
			ORNL-196	1	Tin (isotope production)
			ORNL-197	1	Mercury (isotope production)
C	D	Bare Channel	HAPO-237	2	Inconel (PRTR Gas Loop material)
KW	4B	Snout	NAA-110	3	GdO ₂ , SmO ₂ (control rod material study)
KW	3A	General Purpose	HAPO-236	1	Zirconium (creep test)
KE		Gamma	HAPO-177	3	Plastics and rubber (damage studies)
KE		Gamma	HAPO-141	2	Plastics and rubber (damage studies)
KE		Gamma		3	Transducers, transformer (damage studies)

Borescope Activities

Process Tube Channel 4163, 105-H - A broken trunion block was obstructing the channel at 10 feet 10 inches in from the front van stone. The end of a split tube began at 12 feet in from the front. Further inspection of the channel was impossible due to graphite chips and dust in the channel.

Process Tube 0771, 105-B - A stuck perf had torn the tube at 4 feet in from the front van stone.

Process Tube 4269, 105-D - The ribs and top of the tube were severely damaged at 12 feet in from the front van stone. This new tube was damaged during charging operations.

Process Channel 3373, 105-D - There was a stuck drill at 29 feet in from the front van stone.

Process Channel 1078, 105-D - The channel was obstructed with aluminum chips and graphite dust and chips beginning at 15 feet in from the front van stone.

Horizontal Control Rod Channel #12, 105-KE - The channel had 3X balls on the rod track, between the track junctions and two balls were found at the upper corners of the channel between tube blocks. The top of the channel had been scratched by the rod or the ball retriever auger.

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Vertical Bowing Measurements

A summary of the results of vertical bowing measurements follows. All front to rear distances are measured from the front van stone or from the reactor skin on side-to-side test holes.

<u>Date</u>	<u>Area</u>	<u>Number</u>	<u>Distance</u>	<u>Results</u>
7-12-60	D	4453	36'	Up .08" at 10'4" since 11-5-59 Down .17" at 22' since 11-5-59
7-12-60	D	4494	36'	Up .01" at 9'4" since 11-5-59 Down .14" at 22' since 11-5-59
7-12-60	D	4674	36'	Up .02" at 9'4" since 4-11-60 Down .09" at 22' since 4-11-60
7-17-60	F	4453	36'	Up .23" at 10' since 9-17-59 Up .14" at 21' since 9-17-59
7-17-60	F	4676	36'	Up .21" at 9'4" since 2-2-60 Up .11" at 20' since 2-2-60
7-17-60	F	3776	36'	Up .11" at 9'4" since 1-25-60 Up .03" at 20' since 1-25-60
7-17-60	F	0175	36'	No previous data
7-16-60	KE	Z-3	40'	Down approximately .78" at 22' since 8-25-59
7-16-60	KE	Z-5	42'	Up approximately .10" at 22' since 7-31-59

COOLANT TESTING OPERATION

KER Loop Operations

KER-1 - Testing, as described and authorized by PT IP-314-A, of crud film build-up on zirconium-clad fuel elements at 288 C and pH 10.0 continued until July 7, 1960. On that date, the radiation monitor activity increased to trip, causing a reactor scram and loop depressurization. The loop was discharged, and an attempt to recharge the loop was unsuccessful due to a slight bow in a 36-inch heater element. The loop was subsequently charged with dummies.

KER-2 - The loop operated at 273 C and pH 10.0 with scaled-down NPR prototype fuel elements, as authorized by PT IP-292-A. On July 3, a fuel element failure caused an unscheduled reactor outage. The fuel elements were discharged, and the loop was charged with dummies. A visual examination of the fuel elements revealed a break on the exterior surface of the inner rod of one of the elements. Test elements are available for charging when a reactor outage occurs.

KER-3 - The loop was on standby status until July 3. During the July 3 outage, the loop was charged with four 16-inch heavy-walled Zircaloy-2 clad tubular fuel elements in Zircaloy-2 sleeves, as authorized by

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PT IP-309-A. In addition, two defected 14-inch heavy-walled Zircaloy-2 clad tubular fuel elements in 16-inch Zircaloy-2 sleeves were charged under PT IP-309-A, Supplement A. Testing the integrity of the heavy-walled Zircaloy-2 jackets in 278 C, pH 10.0 water continued for the remainder of the month.

KER-4 - Testing of tube-and-tube fuel elements, authorized by PT IP-300-A, at 288 C and pH 10.0 continued during the month. On July 15 the reactor was scrammed due to a high trip on the heat exchanger exit temperature. Following the scram, an investigation was conducted to determine the cause of the trip. Efforts to duplicate the conditions leading up to the scram were unsuccessful, as all equipment operated satisfactorily. All of the improved annunciator relays on hand were installed, and the program to separate the signal and annunciator leads was completed in an effort to avert spurious scrams caused by this system.

1706-KE Single-Pass Tube Operation

Testing for corrosion and effluent activity, as authorized by PT IP-197-A and PT IP-197-A, Supplement C, was continued in two of four central zone process tubes supplied water by the 1706-KE high head pumps. Two tubes were discharged on July 15 and returned to 105-KE control. The remaining two tubes operated under the following conditions:

<u>Tube</u>	<u>pH</u>	<u>Water</u>	<u>Dichromate</u>
4355	7.0	Filtered	1 ppm
4456	7.0	Filtered	1 ppm

Outage Performance

There were three unscheduled outages caused by Coolant Testing activities during the month:

1. July 3, 1960	KER-2 rupture
2. July 7, 1960	KER-1 rupture
3. July 15, 1960	KER-4 heat exchanger exit temperature trip

A total of 62.3 outage hours was charged to the Coolant Testing Operation. This is itemized below:

<u>Production Test</u>	<u>Description</u>	<u>Time</u>
IP-197-A	Charge-discharge of single-pass tubes 4355 and 4456	0.4
IP-314-A	Install and remove stinger from KER-1 for check valve work	0.1
IP-314-A	Fuel element failure, KER-1 - lost production time for discharge	24.2
IP-292-A	Lost production time due to KER-2 fuel element rupture and discharge	9.9
IP-309-A and IP-309-A, Supl.C	Charging KER-3	2.1
IP-300-A	Lost production time due to heat exchanger exit temperature trip on KER-4	<u>25.6</u>
	Total	62.3 hours

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Ex-Reactor Facility Operations

1706-KE Mock-Up Tubes - The following tests were conducted in the mock-up tubes during the month:

1. Corrosion characteristics of aluminum cermets.
2. Corrosion characteristics of nickel-plated fuel elements.
3. Corrosion during decontamination.

ELMO-4 - Pump repairs were completed during the month and shakedown runs were started.

ELMO-5 - Tests of various materials for the determination of uniform corrosion in 290 C and pH 10.0 water were continued during the month. Tests were completed on:

Stellite-6	D-979 Nickel Alloy
Stellite-12	Nickel
Hasteloy-C	J&L Steel No. 313472
Monel	Hasteloy-X
	Inconel

Other materials were: Zircaloy-2, cold-rolled, normalized carbon steel and stress relieved and annealed carbon steel.

ELMO-7 - Testing continued on brazed end closures on NPR type fuel elements and on fretting corrosion of single-rod PRTR type fuel. Cycling tests on a Flodar tubing fitting were started.

ELMO-10 - Ten tests on low temperature decontaminant-scanning were completed during the month.

CEP-1 - The cyclic decontamination tests using Turco-4502 followed by Turco-4518 were completed on July 11. Loop conditioning was done at 300 C and pH 10.0.

CEP-2 - Fretting corrosion tests of Zircaloy-2 PRTR components were continued at 300 C and pH 10.0. The test specimens are being mechanically vibrated to accelerate the fretting corrosion attack.

CEP-3 - Shakedown operation at 250 C and pH 7.0 was started. The loop was shut down on July 27 for piping changes and installation of additional equipment.

CEP-4 - The eighth and final cyclic decontamination test of this series was completed on July 14. The decontaminants were Wyandotte-1113, followed by Turco-4512. The loop conditioning runs were made at 300 C and pH 10.0.

REP - Two gross decontamination tests were completed during the month. The contaminant was approximately 10 grams of irradiated uranium. The first decontaminants used were Turco-4502, followed by Oakite-88. A modified APACE process was used for the second test.

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Dowtherm - The shakedown run on the Dowtherm loop was started. The desired heat fluxes across the heat exchanger cannot be attained until the raw water pump repairs are complete.

COMPONENT TESTING OPERATION

Irradiated Material Examination

Examinations were completed on the fuel elements from the following 27 tubes at the Metal Examination Facility during July:

<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>
171A	3374-D	216A	4858-KE	262A	3574-D
	3371-D		4582-KE		3874-D
	0772-D		2393-KE	272A	1076-C
197A	5063-KE		2380-KE		2289-C
	4456-KE		5474-KE		3467-C
	4355-KE	255A	2088-H		3874-C
	4863-KE		1986-H	308F	3874-C
	4557-KE		2087-H		3576-C
	4963-KE		1988-H	Reg.	3167-KE

New equipment, to be used to measure residual can wall thickness of irradiated fuel elements, was installed.

Process Tube Corrosion Monitoring Program

In-reactor measurements of 340 process tubes were completed during the month. Listed below are the number of tubes measured per 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	68	35	66157
B	19	36	66158
F	98	37	66163
H	123	38	66164
H	31	39	66186

One tube from KE was probologged to determine whether or not perf chattering had damaged the tube. No damage was found.

Visual examination, wall thickness and rib height measurements were completed on one tube from B Reactor and five tubes from H Reactor.

The tube from B Reactor and four tubes from H Reactor were removed to investigate the rate of corrosion and to verify the accuracy of the Probolog interpretation on second generation tubes. Actual wall thickness measurements of four of the tubes showed the Probolog interpretation to be accurate to within ± 3 mils. No comparison could be made of actual thickness and Probolog measurement of one of the H Reactor tubes because the portion of the tube where the Probolog interpretation was made was not received for examination. The remaining tube from H Reactor was removed as a leaker; however, the leak was not found.

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Panellit Programs

During the month, 366 gauges were repaired and recalibrated. Of this number, 86 failed to meet inspection criteria, for a rejection rate of 23.5 per cent.

In-board reliability examinations were performed on 1087 gauges during the month. A total of 166 gauges were found to be defective or sub-standard, and were removed from service. This is a percentage defective of 15.3, approximately 2 per cent higher than the yearly average and 5 per cent higher than for the month of June, 1960.

In-board Bourdon coil leak examination of 2050 gauges at H Reactor during the month resulted in detection of one leaking coil, for a leak incidence rate of 0.05 per cent. This is a percentage reduction--compared to the average rate--of 0.42 per cent and is attributed to the fact that all of these coils had received examination within approximately 90 days of this examination.

Response times were determined on a total of 1087 gauges during the month. Of this number, 41 did not respond within specified limits, and received corrective action. This amounts to a 3.8 per cent slow response, a slight increase over last month but well below initial averages of approximately 12 per cent.

"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	100	None
Rejected	8	
Per cent Rejection	8	

A trip failure incident in 100-KE, caused by "C" washer displacement motivated a Processing Operation request for in-board examination to eliminate possible future occurrences. Results of the examination are as follows:

Examined	928 gauges
Detected	53 malfunctioning
Per cent Defective	5.7

During the month, 111 gauges received failure analysis examination.

Dial shaft-shaft bearing examination was performed on 101 gauges which had failed during the month for various reasons. Twenty-five gauges, 25 per cent of those gauges examined, contained dial shafts and bearings with light to medium deposits of corrosion. This is slightly less than previous percentages.

Ad. Swager

PRODUCTION, ENGINEERING & REACTOR OPERATIONS

PRODUCTION OPERATION

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PRODUCTION PLANNING & SCHEDULING OPERATION

An IPD production forecast for a five-year period beginning July 1, 1960 was completed and issued as Document No. HW-65997.

There were no discharge exposure plan adjustments effected during July. The overall exposure level of July discharges was the second highest attained during CY-1960 (May was 2% higher).

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>
May	724	749	691	677	795	730
June	667	754	669	675	767	776
July	671	766	659	691	778	762

Conversion from unenriched to enriched lithium-aluminum slugs in fringe poison tubes was completed during July. In the future, enriched lithium-aluminum will be used for all appropriate applications except for the reactor operational poison displacement development work.

Ten casks containing the bulk of the remaining HAPO inventory of four-inch unenriched Li-Al slugs were shipped to Savannah River. Two casks, one of short-cooled uranium slugs and one of isotope production, were sent to ORNL.

PRODUCTION COMPUTING OPERATION

Production and operating data for each reactor tube were processed on the IBM computing and punched card equipment. Scheduling, forecasting, and accountability reports were issued to fulfill the corresponding functions of the Production Operation. Basic data were supplied to other components for reactivity evaluations and transmutation calculations.

ESSENTIAL MATERIALS

Rail and truck shipments received in July were as follows:

Carload shipments for IPD	160
Carload shipments for other Depts.	152
Truck shipments for IPD	185
Total	497

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PRODUCTION REPORTS & STATISTICS

Routine processing of Daily and Monthly Reports continued. A large volume of both routine and non-routine data were supplied to IPD personnel. Some routine data were also supplied to FPD, CPD and HLO.

MISCELLANEOUS ACTIVITIES

Three more first-year Manufacturing Training Program men reported-in during the month and were placed in pre-selected production work assignments (one in Research & Engineering and two in Manufacturing). Liaison with the Relations Operation was maintained relative to arrangements for "Manufacturing Studies" classes scheduled for starting in September.

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HW-66296

REACTOR OPERATIONS STATISTICS - PROCESSING

MONTH	REACTOR OPERATIONS STATISTICS - PROCESSING													
July 196														
INPUT PROD.-PU (% OF FORECAST)	B		C		D		DR		F		H		KE	
TIME OPER. EFF. (% OVERALL)	101.3		107.7		90.5		112.3		85.9		95.1		98.8	
	81.5		78.5		72.8		89.8		69.9		77.3		78.6	
NO. OF REACTOR OUTAGES & HOURS														
SCHEDULED	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.
	0	108.9	1	146.6	1	152.8	-	38.5	1	169.7	0	99.3	0	62.8
UNSCHEDULED - SCRAMS	1	2.2	0	-	4	1.1	-	3.5	0	-	1	0.3	5	90.7
- OTHER	2	26.2	2	13.4	2	48.6	2	33.9	1	54.0	4	69.2	0	5.6
TOTAL	3	137.3	3	160.0	7	202.5	2	75.9	2	223.7	5	168.8	5	159.1
BREAKDOWN OF REACTOR OTGE HRS.														
PLANNED														
CHARGE-DISCHARGE	37.2		30.4		28.2		20.5		28.7		47.6		52.5	
TUBE REPLACEMENT	11.1				41.3				85.3		29.0			
PROJECT WORK							18.0							
PRODUCTION TEST	1.0		(1)25.7		9.3				5.0		0.4		3.7	
MAINTENANCE	59.6		(2)66.5		74.0				50.7		22.3		3.6	
MISCELLANEOUS			24.0										3.0	
SUB - TOTAL	108.9		146.6		152.8		38.5		169.7		99.3		62.8	
UNPLANNED														
CHARGE - DISCHARGE					0.6				2.3		7.0		0.5	
PRODUCTION TEST					25.5						0.3		(3)59.7	
RUPTURE REMOVAL	24.8		10.0		17.3		31.8				14.4		18.6	
WATER LEAK									45.7		28.1			
MAINTENANCE	3.6		3.4		5.2		2.1		6.0		19.7		7.0	
INSTRUMENTATION														
PANELLET					0.6		3.5						11.6	
MISCELLANEOUS					0.5								26.6	
SUB - TOTAL	28.4		13.4		49.7		37.4		54.0		69.5		96.3	
TOTAL	137.3		160.0		202.5		75.9		223.7		168.8		159.1	
NO. SLUG RUPT. (ALL TYPES)	2		2		1		2		0		1		0	
NO. NEW TUBES INSTALLED	5		50		30		1		76		0		0	
TYPE OF WATER LEAK - TUBE	0		0		0		0		0		1		0	
VAN STONE	0		0		0		0		2		0		0	
Helium Used - MCU. Ft.	253.0		379.5		272.3		211.8		490.4		364.4		284.0	
													377.6	
														2633.0

(1) Includes 22.7 hrs. for export water tie-in (NPR & new fire station)

(2) Includes 64.0 hrs. for installation of zirconium tubes.

(3) Trips caused by KER test facilities.

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REACTOR OPERATIONS STATISTICS — POWER											SHEET 1
MONTH July 1960	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL		
RIVER WATER (BLDG. 181)											
TO RESERVOIR (BLDG. 182)	16279		4382		1512	2746				24919	
TO FILTER PLANT (BLDG. 183)	64125		89622		68905	75600	160100	165200		623552	
TO FILTER PLANT (C&DR)	104222		67961							172183	
TO R & E (KER) & FEO			203				432			635	
TOTAL	184626		162168		70417	78346	160532	165200		821289	
TOTAL	8241.7		7239.2		3143.4	3497.4	7166.1	7374.5		36662.3	
RESERVOIR WATER (BLDG. 182)											
TO POWER HOUSE (BLDG. 184)	34		62		401	41				538	
TO COND. SYSTEM (BLDG. 190)	-		1620		1020	2705				5345	
TO COND. SYSTEM (190DR & 183F)			2700		91					2791	
TO EXPORT SYSTEM (Incl. NPR)	16245		-		-					16245	
TOTAL	726.7		195.6		67.5	122.6				1112.4	
FILTER WATER (BLDG. 183)											
TO POWER HOUSE (BLDG. 184)	159		156		106	143				564	
TO PROCESS (BLDG. 190)	72722	83466	73719	77935	66027	69100	153443	159515		755927	
TO 108	2500	4500	533		858	1170				9561	
TO 108DR			533							533	
TO FILTER PLANT (BLDG. 183DR & 183F)		12914	11726							(24640)	
TO F & S SYSTEM	114		377		401	177	156	50		1119	
TO R & E (KER) & FEO			153				6501			309	
BACKWASH	1544	3342	2425	1752	1513	5010	5635			27722	
TOTAL	3439.0	4652.5	4000.7	3557.2	3075.9	3374.8	7146.9	7374.5		36621.5	
PROCESS WATER (BLDG. 190)											
TO REACTOR	72322	83066	73319	77535	65627	68600	151800	158400		750669	
TO REACTOR	84500	95500	84800	83900	85000	85800	182200	179400		881100	
POWER HOUSE (K AREA)							46	11		57	
108 (KE - KW)							1017	704		1721	
TO R & E (KER)							180			180	
BUILDING USAGE	400	400	400	400	400	500	400	400		3300	
TOTAL	3246.3	3725.9	3290.8	3479.0	2947.5	3084.6	6849.7	7120.8		33744.6	
RIVER DATA											
ELEVATION (MSL. FT.)	403.1		392.2		380.2	384.0				397.7	
	394.8		385.4		371.7	377.6				389.2	
	399.9		389.4		376.1	381.6				394.3	
TEMPERATURE	62.8		62.0		63.3	62.6				62.7	

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REACTOR OPERATIONS STATISTICS - POWER											
	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL		
<u>WATER TREATMENT DATA</u>											
AT BLDG. 182											
MM GALS											
BLDG. 183	2862.5	4652.5	4000.7	3033.8	3075.9	3374.8	7146.9	7374.5			35521.6
<u>CHEMICAL CONSUMPTION</u>											
CHLORINE (BLDG. 182)											
LBS.											
BLDG. 183	13723	38439	32940	24440	21800	27590	70500	80300			308732
AVG PPM	0.6	1.0	1.0	1.0	0.9	1.0	1.2	1.3			1.0
<u>*Alumina</u>											
ALUM											
LBS											
BLDG. 183	23126	193837	204366	135819	166803	168258	393500	441400			23126
AVG PPM	5.7	5.0	6.1	5.4	6.5	6.0	6.6	7.2			1747389
<u>SEPARAN</u>											
LBS											
BLDG. 183	50	50	200	135	125	0	90	130			780
AVG PPM	.002	.001	.006	.005	.005	-	.002	.002			.003
<u>SULPHURIC ACID</u>											
LBS											
BLDG. 183	232840	349259	216000	136590	178082	153582	426000	452300			2144653
AVG PPM	9.8	9.0	6.5	5.4	7.0	5.5	7.2	7.4			7.2
<u>DICHROMATE</u>											
LBS											
BLDG. 183	48335	55500	43800	46300	44211	44699	91600	96000			470445
<u>PURGE MATERIAL CONSUMPTION</u>											
LBS											
BLDG. 183	0	800	0	0	0	0	0	0			800

*Alumina and alum combined for PPM avg. in alum column.

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REACTOR OPERATIONS STATISTICS - POWER

MONTH
July 1960

ANALYTICAL DATA	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW
	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW
RAW WATER								
PH	8.10	7.90	8.38	8.38	8.32	8.19	7.52	7.47
TURBIDITY	3.0	3.0	8.0	8.0	10.0	8.0	9.1	9.4
FINISHED WATER								
PH	7.10	7.10	7.09	7.07	7.04	7.07	7.07	7.07
TURBIDITY	.008	.011	.011	.011	.013	.006	.007	.007
Cl ₂ RESIDUAL	.05	.05	.08	.08	.06	.11	.06	.09
DICHROMATE	1.80	1.80	1.80	1.80	1.80	1.91	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)	105000	215000	75000	66000	461000	58000	71000	129000
(NOR)	81000	81000	53000	53913	268913	-	-	-
(AVG)	79700	83064	52748	51187	266699	40298	32726	73024
TOTAL	59325	61800	39245	38083	198453	29982	24348	54330
TO PLANT	50307	52406	34536	32294	169543	26984	21913	48897
COAL RECEIVED	3079	3060	1728	1731	9598	-	-	-
CONSUMED	3648	3962	2407	2355	12372	-	-	-
IN STORAGE	16101	19134	15156	17203	67594	-	-	-
GENJTEAM/LB.OF COAL	8.13	7.80	8.15	8.09	8.02	-	-	-
OIL RECEIVED						431185	0	431185
CONSUMED						294097	22264	516361
IN STORAGE						553350	475188	1028538
GENJTEAM/GAL.OF OIL						101.9	109.5	105.2
ELECTRICAL DATA								
TOTAL GENERATED KW HRS.						1556800	1640800	3197600
Peak Demand Control						68800	152800	221600

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APPLIED REACTOR ENGINEERING OPERATIONINDUSTRIAL ENGINEERING OPERATIONRear Face Improvements - All 105-Reactor Buildings

Improved handling system for rear face nozzle caps incorporates use of a gravity roll conveyor, nozzle cap trucks and cap trays. System is in routine use in DR, KE and KW reactors. Installation in the rest of the reactors is being programmed. Purchase orders have been issued for all equipment necessary for the system. Successful bidders include Thompson Metal Fab. of Portland, Oregon, Ram Plastics, Inc. of Seattle, Washington and Fryer Knowles, Inc. of Seattle, Washington.

Program of Tube Replacement Improvement

The July 1960 tube outage at 105-F was studied by teams of industrial engineers on each shift, using time study and memo-motion or time lapse motion pictures of the entire 90-hour outage. A three-phase improvement program, including direct work maintenance standards on each specific task and a relationship of allowances for indirect work and delay, is being prepared for use in establishment of a tube replacement standard. A critique of the February and July tube replacement outages was held for the managers and supervisors of F processing and maintenance operations.

Metal Handling, 300-100 Areas

The development of a magazine container for storage and shipping of fuel elements for older reactors is considered complete. Key items are the fuel clip and overhead monorail.

Reactor Plant Engineering Operation of FEO is doing the application engineering necessary to equip F reactor as a lead reactor.

Water Leak Study

An industrial engineer has been assigned a study to assemble and correlate all the problems and sub-problems identified with water leaks associated with the reactors.

New Nozzle Cap Gasket

The new "captive O ring" gasket assures a leak-proof seal for caps tightened to less than 20 foot-pounds torque. These new gaskets plus the 20 foot-pound Skidsore torque wrench reduces the time necessary to remove and install caps and reduces damage to caps, lug rings and nozzles caused by overtightening of caps.

Valving Techniques

Motion pictures have been taken of the technique now used to valve cross-headers, and these have been analyzed. Improvement in the methods used for valving crossheaders will have as its prime goal, standardization among the six old reactors to help prevent valving errors.

Portable Powered Operators for Valve Turning

Fabrication of new light-weight drivers for all portable valve operators is complete. Lever type handles for the front face inboard tools at KE, KW, and C and all the front face tools for the other areas are on order to replace the roll type handles now in use on the air motors.

Metal Unloading Ramp

An engineered system of unloading fuel elements and other material from delivery trucks at the 105 reactor buildings has been provided at B, D, DR, and F reactors.

Training Films

A library of motion picture films illustrating various manufacturing activities is available to Department personnel for training, educational and analytical purposes. A catalog is being prepared listing each reel of film by title and with a brief description of content.

Study of Duplicating Needs

A study has been started to establish the feasibility of placing a duplicating service in 100-F Area similar to those in the other reactor areas. A questionnaire has been prepared for use in determining the amount of work that would be performed in an F Area Duplicating Service Operation.

Assistance to Supplemental Crew Activity

A program of Work Simplification, Motion Economy and Methods Development Appreciation has been devised for presentation to supervisors and specialists of Supplemental Crews.

1706-KE Building Freight Elevator

Personnel movement and material handling is being studied in this building to determine if there is adequate justification for installing a freight elevator.

Poison Spline Procedure

A study to develop an engineered method for poison spline manipulation has been started.

Reactor Outage Reporting Procedure

An investigation is being made to determine a standard procedure for reporting outage time in all eight reactors. Contacts are still being made with selected Department personnel to determine types of information which should be included in an outage report.

Determination of Base Painting Load in IPD

Upon a request by the Manager, H Reactor Operation, a five year cyclic painting schedule is being prepared for the entire department. Plans are being made to determine the man-hour requirements and the total costs of the painting load in the 100 Areas. This cost estimate is established on a historical basis from labor and material standards currently used in IPD Central Maintenance.

MAINTENANCE PRACTICES OPERATIONSpare Parts Inventory

The IPD portion of the spare parts inventory as of July 31 was \$1,768,309. This is versus \$1,764,557 as of June 30. During the month revisions to spare parts inventory were as follows:

Decrease		\$31,994
Increase		
Plants	\$ 2,368	
Projects	\$17,771	20,139
Over-All Decrease		\$11,855

Maintenance Studies

Additional information has been secured on past outages time data plus production breakdowns. Discussion meetings were held with maintenance personnel, and area planning meetings were attended.

Third Party Inspections

The CH&U contract administrator and the Contract Operation are working toward a new Third Party Inspection contract. We will review a rough draft for Manufacturing interest.

Craft Training

Craft Training was provided on the following items:

105 Charge-Seaters - Six 2-hour training classes attended by six supervisors and thirty-one craftsmen.

Mechanical - One informational meeting presented by a Field Engineer for U. S. Motors. Five supervisors and eight craftsmen attended the 2-hour session.

Instrument - Eight 4-hour training classes were attended by six trainees. Specific items covered were electronic fundamentals and rectifier circuits.

Service Manuals

The mechanical service manual on charge seaters was issued to the plants. The instrument trainee's instruction manual, "Introduction to Instrument Electronics and Rectifier Circuits," was completed and distributed to the instrument trainees.

Instrument Programs

The program to provide the materials needed by the plant instrument groups has been initiated in several fields; a) priorities are being developed on manual requirements, and b) a compilation of all plant instrumentation for the purpose of grouping systems and instruments. In conjunction with this effort, a meeting was held at White Bluffs with the Manufacturing Instrument Supervisors to discuss the above and other related topics.

NPR Autoclaves

A letter was forwarded to the NPR projects confirming recommendations on Safety and Code consideration of the NPR autoclaves.

NPR Code Compliance Criteria - HW-64508-RDZ

The criteria were reviewed and comments were combined with those of Process and Reactor Development and forwarded to NPR design.

100-K Helium Receivers

Participated in a meeting on July 13 to resolve the start operating pressure of the 100-K high pressure helium receivers. Agreement was reached to raise the pressure to 1410 pounds maximum allowable working pressure.

4500 HP Motors

Participated in a program to establish overhauling programs; also, have expedited delivery of four additional sets of spare coils to protect operating continuity.

PLANT EQUIPMENT ENGINEERING OPERATIONTemperature Monitor System

Study of the temperature monitor systems in B, C, D, DR, F and H Reactors was completed, and issued as HW-66063. Recommendations were made for installation of the Epsco analog-to-digital converter and other longer range improvements to the system. Justification for the ADC installation has been completed in support of a project proposal.

NPR Fuel Element Rupture Monitor

A recommendation was issued on the rupture monitor system for 105-N which combined the best features of systems developed by instrument development groups in HLO and IPD. NPR Project Section is proceeding with design in accordance with the recommended course of action.

B-C REACTOR OPERATION**DECLASSIFIED****OPERATING EXPERIENCE**

Power levels were limited during the month by tube power and bulk outlet temperature at B Reactor and by rupture control limitations at C Reactor. A C Reactor outage was extended to provide concurrent B and C outages necessary, during interruption of emergency raw water (export) back up service, for tie-in of the export water system to the N Reactor site and to the 100 Areas Central Fire Station. Failure of the 4500 HP motor of No. 8 process water pumping unit at 190-B Annex caused a temporary reduction in water flow to B Reactor.

EQUIPMENT EXPERIENCE

At B Reactor, 4 thin-wall tubes and 1 damaged tube were replaced; numerous, severe cracks in the near, rear-face neoprene seal were repaired by patching; 2 large cracks in the rear-face omega seal were repaired and 1 faulty gun-barrel bellows was replaced; 5 rear-face PCCF ball valves were replaced.

At C Reactor, the inoperable No. 35 VSR was removed for burial and 55 leaking, rear-face gunbarrel bellows were filled with liquid silicone.

At 190-B Annex, a damaged stator coil was removed from the No. 8 4500 HP motor and the unit returned to service.

At 190-C, the inboard wear ring failed in No. 11 process pump; the impeller was replaced with a third generation assembly, one of 4 replacement impellers received in July from Byron Jackson Pump Company.

IMPROVEMENT EXPERIENCE

At B Reactor, 422 pannellit surge suppressors were installed to bring the total-to-date to 1860; Design Change No. 367-B, "HCR Deadman Switch Control and PCCF Bulk Outlet Temperature Lockout," was completed; new gas make-up control valves and a helium analyzer were placed in service; work continued on the new filter building and equipment changes associated with reactor confinement (Project CG-791).

At C Reactor, 50 ribless zirconium tubes were installed to bring the total-to-date to 69.

At 181-C, two new pumps were received and installed in connection with Project CGI-845, "Increased Pumping Capacity." Installation of a new electrical feeder line from the 184-B transformer was completed.

Work was started on installation of noise suppression materials at 190-C and on replacement of faulty cables in the auxiliary electrical supply system to the 183-B water pumping facility.

D-DR REACTOR OPERATION**DECLASSIFIED**OPERATING EXPERIENCE

In July D Reactor production was limited mainly by rupture control tube power and by non-equilibrium conditions. DR operated predominantly on bulk outlet temperature limits. D Reactor was shut down three times by Panellit difficulties and once by faulty relay panel operation at 190-D Building during start-up of a pump. One outage at D was the result of reactivity problems when the control of graphite temperature with supplementary poison, in connection with a process test, caused reactivity loss.

EQUIPMENT EXPERIENCE

D Reactor replaced 19 mattress plates in rear face chutes. The reorificing of 171 fringe tubes for I & E slug charging permitted flow increase of 1000 gpm. Sixty-eight rear face connectors were replaced. A complete Panellit inspection revealed 65 leaking gauges, which were replaced. At DR Reactor a vertical safety rod was jacked out of its channel where graphite shifting had caused a bind. A stator coil failed in a 190-DR pump motor, was replaced and the failed unit shipped to a Seattle shop for repair. Weather shields were removed from 181-D motors, with the concurrence of the motor manufacturer, dropping coil temperatures 30°F and bearing temperatures 20°F. The shields had been recycling 140°F air over the lower half of stator coils and lower shaft bearings.

IMPROVEMENT EXPERIENCE

CG 706 "Gas Instrumentation" Control room operated purge valves were installed. Project is 95 percent complete at D Reactor. CG 791 "Confinement" Work continued at D on building pours and preparations for temporary stack installation. Work continued at DR on filter building tie-in and intake fan modification. Deadman Switch HSR's & PCCF Interlock Work on this equipment continued at DR and is 70 percent complete. Spline Coiler All shop fabrication is complete.

RADIATION MONITORING EXPERIENCE

Three lapses of radiation control occurred at DR Reactor. The first resulted when two operators received 30,000 c/m to the hands, hair and clothing while boxing contaminated waste for burial. The second lapse occurred when contamination up to 1850 mrad/hour was transferred to the leg of an operator's plastic suit while installing a special cap on a rupture tube. The third lapse resulted when a box with an 800 mr/hr reading was placed near the radiation zone boundary in the work area. Severity rates for the three lapses were assigned at 7, 7 and 9 respectively. Maximum dose rate received at D was 2.5 r/hour pulling poison splines and 3.5 r/hour at DR burying tube sections.

DECLASSIFIEDRADIATION MONITORING EXPERIENCE

At B Reactor, one employee received hand dosage at rates to 91 r/hr during removal of shielding pieces from the "D" hole Subcritical Neutron Monitor Facility; resultant total hand dosage was 86.5 mrem. details are documented in HW-66263, IPD Radiation Occurrence Investigation Report, by J. H. Soehnlein, dated 7-29-60.

At C Reactor, an operator's hands were contaminated to 30,000 c/m during spline insertion and personnel dose rates of 5 r/hr were encountered during spline removal; no overexposure problem was involved.

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F REACTOR OPERATION

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OPERATING EXPERIENCE

Equilibrium operation was limited by rupture control tube power limits.

Maximum process water flow capability was reached on July 27 following the scheduled outage. Since that date, we have experienced difficulty in maintaining maximum levels in clearwells at the 183 Building and in storage tanks located in the 190 Building.

Power disturbances on the BPA System were noted at 4:48 p.m. on July 25 and at 8:36 a.m. on July 26. A 4 psi variation in process water pressure was observed on the first disturbance and a 12 psi drop was recorded on the second disturbance.

EQUIPMENT EXPERIENCE

Ninety-nine process tubes were probologged and 70 were replaced due to external corrosion. One tube was replaced due to a sheared rear Vanstone. A PCCF tube was replaced due to a history of stuck temporary poison charges. Two air channels were made. One tube was left as a problem tube during tube removal and one tube was removed which had a cracked rear Vanstone. Four air channels were retubed. The connector on one tube was replaced due to broken strands. The charge in one tube was reluctant to discharge and was loosened at 2500 psi, discharged, and the tube recharged. Four tubes were traversed. Henderson Vanstone seal inserts were installed in the rear of 257 process tubes. Twenty-two venturis were replaced with 0.320 throat size venturis. The No. 4 HCR was replaced with a half-rod. Sixteen leaking rear pigtails were replaced, 73 spline caps installed, 4 former PCCF tubes returned to normal, of which 10 were relocated, and outlet thermocouples replaced on 16 process tubes.

A modified impeller was installed in the No. 4 process water pump in the 183 Building on July 13 with the expectation of gaining additional flow. The complete overhaul of the No. 4 condenser pump was completed on July 27.

Instrumentation experience included the repair of 23 rear face thermocouples, replacement of 8 pressure monitor Panellit gages and calibration of cross-header gages. Inspection of rear face thermocouple terminal boards revealed considerable corrosion on both the terminals and lead wire drops to the individual tubes. We have experienced difficulty in maintaining calibration of drip leg level transmitters and unit level transmitters installed in the new gas makeup system (CG-706).

Electrical experience included installation of Design Change No. 384, "Revision of Control Circuitry, PCCF Tubes," installation of four waterproof EM chambers on the rear face and completion of electrical control stations on the "C" elevator and in the control room for the spline choppers. Necessary wiring revisions were completed for automatic synchronization of the No. 2 motor, 190 Annex (Design Change No. 381).

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With regard to mechanical experience, two problem areas encountered during the outage of July 12, 1960, included the removal of five stuck splitters and difficulty in obtaining craftsmen for overtime exposure work due to simultaneous reactor outages.

IMPROVEMENT EXPERIENCE

Completed installation of improved gas instrumentation (CGI-706). Channel 1192-F was overbored, as authorized by PT-IP-291-AE, Supplement A, "Graphite Channel Overboring Demonstration," and retubed with a standard size process tube. The rear crossheader and nozzle Parker fittings on tube 2167-F and the nozzle Parker fitting on tube 2168-F were reamed as permitted by PT-IP-318-E, "Reaming of Rear Face Parker Fittings."

Construction work is in progress on the 182-FA pump test stand.

RADIATION MONITORING EXPERIENCE

One lapse of radiation control occurred. Three cases of low-level skin contamination were readily reduced. An analysis of the sanitary water supply revealed no detectable increase of radioactivity or hexavalent chromium contamination resulting from upstream discharge of reactor effluent during an outage.

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H REACTOR OPERATION

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OPERATING EXPERIENCE

Equilibrium power levels reached 1725 MW during the month. The bulk outlet effluent water temperature prevented further increases.

Of the six reactor outages during the month, there were two that were mainly responsible for failure to achieve forecast production. These were the rupture outage of 7-14-60, and the tube leak outage of 7-20-60. These outages resulted in a combined production loss of 125 hours out of a total of 168.8 hours.

EQUIPMENT EXPERIENCE

Considerable difficulty was experienced with damaged stokers in the 184-H Building due to rocks in the pit coal. At one period, a third boiler was maintained on live bank in readiness for service should a stoker be completely lost on one of the operating boilers. Resumption of the use of car coal has alleviated the problem, providing sufficient coal can be received to meet requirements. Economic feasibility of screening the coal to remove rocks, including the use of portable equipment, is being investigated.

Geminol graphite thermocouple stringers, installed in three reactor process channels during June and connected to temporary readout instruments, have been performing satisfactorily. Indicated graphite temperatures were up to a maximum of 40° C higher than comparable temperatures indicated by the present iron constantan thermocouples. The difference in temperature readings appears to be the result of breakdown in the iron constantan thermocouples. Investigation is underway to verify the cause.

A total of 151 process tubes were probologged to verify wall thickness. This is being done as rapidly as possible to all second-generation tubes, particularly those installed in 1955 and 1956, in order to isolate those with abnormally thin walls of 26 mils or less.

A borescope inspection of problem channel 4163 revealed that a broken trunnion block, in addition to a section of split tubing, was obstructing the channel. The obstructions were removed with the exception of a short piece of tubing. There was no evidence of the tube being melted.

A momentary loss of water supply on horizontal control rod #1 required removal of the rod from service for a short period of time. Subsequent investigation revealed the tension on a water hose had relaxed, permitting it to kink. There was no rod damage. It was placed back in service after corrective maintenance work.

During reactor shutdown on 7-22-60, the failure of a differential pressure gauge permitted cooling water to be shut off to horizontal row 08 for an indeterminate time. Corrective measures were taken as soon as the condition was found. There was no evidence of tube damage.

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To facilitate block central zone charge-discharge planned to commence about the middle of September, approximately 400 central zone I and E natural, scheduled for discharge through the middle of August, will be short charged; i.e., 28 rather than 32 pieces. Two-hundred and 26 tubes had been charged by month's end.

On July 11, one of the reactor rear face side viewing glasses disintegrated, permitting all the water to drain from the viewer. There was no injury to personnel or other equipment damage. The remaining glass was removed pending replacement with an improved viewing device.

IMPROVEMENT EXPERIENCE

Following the recent turbine failure at 1608-F Building, a study was made of similar conditions at 1608-H which might contribute to the same type failure. A design was developed to provide for operation of the annunciator at the 105 Building main control panel whenever (1) extremely low water levels exist in the turbine suction wall, and (2) whenever an abnormal high water level exists. This will permit operating personnel to take appropriate action immediately.

Modifications to the flushing console for application on the 105 Building charge elevator have been completed. Instructions for installation of the facilities will be issued in August.

RADIATION MONITORING EXPERIENCE

Dose rates at the rear face viewing window during reactor operation after one of the rear panes disintegrated and water drained from the viewer were 400 mr/hr and 16.5 mrem/hr - neutrons.

Dose rates in the discharge area averaged 80 mr/hr and 40 mr/hr 24 hours after shutdown on two successive outages. This is about 75 percent of what is normally expected and is attributed to the rear face decontamination in June.

There were two Lapses of Radiation Control during the month, making a year to date total of 37.

CENTRAL MAINTENANCE

Operations were routine during the month.

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KE-KW REACTOR OPERATION**DECLASSIFIED**OPERATING EXPERIENCE

Power levels of the reactors were limited by the planned rupture control program. Due to rising seasonal river temperatures, maximum levels were 220 units below the previous high level achieved in January.

EQUIPMENT EXPERIENCE

A rupture in tube 2974 at KW Reactor required pressures up to 10,000 psi to remove the tube containing the ruptured element. The fog spray system was turned on when contamination in the form of sludge was observed coming out of the tube. Subsequently, the ruptured element was observed to be on fire as it fell from the tube into the storage basin. The fog spray system prevented the release of any significant amount of contamination from the rear face area. A survey of ground areas outside the building revealed no contamination spread from the incident.

On July 17, the Number 1 low lift motor in 190-KE was tripped out by the motor winding temperature relay (trip setting at 125°C). This in turn tripped off the high lift pump causing a scram of KE Reactor. An outside air temperature of 112°F raised the 190 building ambient temperatures above normal and contributed to the motor temperature buildup. The motor, which had been rewound in 1959 and uprated from 900 to 1500 HP showed no damage and was returned to normal service. As a temporary measure, four openings were made in the south wall of the building to improve cross ventilation and three temporary blowers were set up pending installation of six additional air coolers under Project CG-883.

A severe power surge caused 12 - 14 psi pressure drop in process cooling water on July 26, but no equipment was lost. The power surge was caused by a trip-off of generators at The Dalles powerhouse.

IMPROVEMENT EXPERIENCE

The restricting orifices in the high pressure crosstie line between the K Reactors were removed to provide increased flow of water from the aiding reactor in case of coolant water loss at the opposite reactor. Coincidentally, Design Change Number 380, V-73 Crosstie Valve Safety Circuit Modification, was installed and tested in both reactors. In case of coolant water loss to one reactor, the circuit modification delays the opening of the V-73 crosstie valve to provide water from the aiding reactor until five seconds after its immediate shutdown. These changes were made as preliminary steps to operation of the reactors at 95°C bulk outlet temperatures.

A total of 492 tube nozzles in the reactor fringe zones was reamed to accommodate internally and externally cooled fuel elements. The use of solid type elements will be discontinued entirely.

DECLASSIFIEDSUPPLEMENTAL CREWS OPERATION

Eight tube charge seaters of novel design manufactured by Teleflex, Incorporated, arrived on plant. The Equipment Development Operation began initial testing of the equipment prior to its routine use by Supplemental Crews.

GENERALRESPONSIBILITY

There were no significant changes in responsibilities.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
General	*10	2	12
Production Operation	16	12	28
Reactor Engineering Operation	24	7	31
B-C Reactor Operation	65	275	340
D-DR Reactor Operation	70	296	366
F Reactor Operation	41	156	197
H Reactor Operation	55	256	311
KE-KW Reactor Operation	79	341	420
NPR Start-up	22	32	54
	382	1377	1759

*Includes 8 MTP trainees.

L. V. Barker transferred from B Processing Operation to Research and Engineering Operation. O. L. Olson transferred from Supplemental Crews Operation to Electronic Data Processing Operation. M. P. Johnson transferred from Facilities Engineering Operation to F Power Operation. M. W. Dickerson terminated.

SAFETY, SECURITY & RADIATION EXPERIENCE

There were 60 medical treatment injuries, no disabling injuries or radiation overexposures. One security violation occurred due to a faulty locking mechanism on a file cabinet drawer.

SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Class'n.</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-65944	Secret	G. J. Rogers	July 13	Scope Report - Modification of D Reactor for Bumper Fuel Elements.

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HW-66296

<u>Number</u>	<u>Class'n.</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-66063	Unclass.	J. W. Green	July 13	Temperature Monitoring Systems - B,C,D,DR,F and H Reactors
HW-65997	Secret	A. B. Greninger	July 7	Production Forecast IPD, July 1, 1960 through June 30, 1965.

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
R. D. Gilbert	General Electric Schenectady, N.Y.	July 14 - Aug. 5	Attend an Advanced Standards Instructor's Class
E. F. Fairweather	IBM Co. of San Jose, Calif.	July 25-29	Attended an IBM Customer Executive Course

VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
B. D. Olson	West Chemical Co. Seattle, Wash.	July 14	Presented methods of job simplification to area janitors

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O. C. Schroeder

O. C. Schroeder, Manager
Manufacturing Operation
IRRADIATION PROCESSING DEPARTMENT

FACILITIES ENGINEERING SECTIONREACTOR MODIFICATION DESIGN**DECLASSIFIED**RESEARCH AND DEVELOPMENT

Downcomer verification tests performed in the Albrook Hydraulic Laboratory at Washington State University, have established that the downcomer model is similar in performance to the prototype downcomer in use at DR Reactor. Additional tests are required to establish the similitude of the connected piping on the model and prototype installation. During initial boiling tests a pulsating release of water vapor was noted indicating that the capacity of the downcomer venting system has a primary effect on downcomer performance under boiling conditions.

Contract negotiations are in progress to obtain Mr. George R. Rich, Consulting Engineer, Boston, Massachusetts to evaluate the adequacy of the export water system. This evaluation will include recommendations for any necessary equipment and operational improvements to protect the export system from the effects of transient hydraulic pressure surges.

Twenty seven rear crossheader fittings from H Reactor were visually inspected for cavitational damage. The results of this examination failed to reveal any significant damage in the "Parker" fitting or in that portion of the crossheader fitting directly opposite the "Parker" fitting. Equipment used in the inspection did not permit other interior areas to be examined.

DESIGN PROJECTSCG-775 - 100-K Water Plant Expansion

This project was closed on June 30 with funds accrued to provide for inspection of the test impeller in the KE Main Pump House and completion of the filter plant tests. This impeller, the second to be tested, was inspected for cavitational damage following approximately four months in service testing. The damage appears to be more localized and severe than in the first test impeller and inspection indicated that the wheel was not concentric with the shaft. Critical dimensions will be obtained at the next scheduled reactor outage to determine if the impeller was built to specifications. Based on these findings, a third impeller will be designed and tested in the prototype pump.

The filter plant test, initiated to demonstrate the capability of the 100-K filter plants to treat the CGL-883 process flows, was completed. Preliminary results indicate that the proposed filtration rate of eight gpm per square foot are feasible. The increased flows were successfully obtained by modifying the backwash cycle time to increase the frequency of filter backwashing.

CGL-791 - Reactor Confinement

Overall design is 98 percent complete. All scope material except filter handling has been approved by the Design Council. All purchase requisitions except two affecting auxiliary equipment for the diesel engines have been issued.

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The estimated construction costs for increasing the polyvinyl coating on the concrete connecting ducts and 117 Filter Buildings was prohibitive; therefore, the decision was made to apply the 12 mil coating as originally specified. It was also recommended that the junction of the concrete surface and filter frame insert be caulked.

Sketches were issued to the field to revise drawings for the stack breaching ductwork. These revisions provide clearance for installing the duct blanks or spacers.

Detail design for Phase III is 96 percent complete. A total of 28 drawings were approved and 17 drawings were revised. A comment issue of the Phase III Design Criteria has been prepared. All acceptance test procedures have been issued for comment.

Investigation is proceeding on the availability and use of a portable DOP unit for testing the single bank of high efficiency filters following installation. A trip has been scheduled to the Naval Research Laboratory to determine the status of portable testing equipment.

The overall completion of the testing program is 98 percent. The remaining test, Environmental Component Tests, is scheduled for completion late this year.

CGI-839 - Modification of Fuel Element Test Facilities

Design Completion is 100 percent. Revisions to the KER electrical switch-gear drawings have been completed and the drawings transmitted for approval.

Drawings defining the revisions for increasing the monorail and dolly capacity from one to four tons have been issued for comment. This modification will permit service of the process water pumps in the Hot Maintenance Shop.

CGI-844 - 100-K Coolant Backup System

The remaining scope drawings have been approved by the Design Council and have been transmitted to the Atomic Energy Commission for approval. The Design Criteria has been revised and approved by the Project Representatives. Detail design has been initiated by issuance of a design work release.

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

Scope design for the total project is 100 percent. The remainder of the scope drawings received Design Council approval and have been transmitted to the Atomic Energy Commission for approval. Detailed design is approximately 18 percent complete. Specifications for 5 KV and 13.8 KV switch-gear, 181-K River Pump House motor control center addition, and 190-K Main Pump House evaporative coolers have been issued. The detailed design, acceptance test procedures, and procurement specifications required for the modification of one process water pump set in the 190-KW Main Pump House have been completed and the material is on plant.

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

Scope design is approximately 80 percent complete. Scope drawings defining the riser crossunder line for B, D, DR, and H Reactors have been approved by the Project Representatives. A design work release for detailed design has been issued.

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EQUIPMENT DEVELOPMENT OPERATION**DECLASSIFIED**EXISTING REACTOR WORKRemote Rear Face

The initial round of bids on flapper valves was received and rejected when it was felt that lower prices might be obtained from minor modifications in the design. New bids were solicited and opened July 29. The unit cost for 100 valves was about \$96 each, only slightly less than in the initial round. An order is being placed with the low bidder at this price. The valve roving actuator is being reassembled after modification; and, in anticipation of its installation in KE Reactor, the actuator drive chain was installed on the KE rear elevator during an unscheduled outage.

Supplementary Control

One column of the poison column displacement system was installed on KW Reactor for test purposes. In laboratory experiments it was found that splines could be installed in a ribless zirconium tube charged with self-supported slugs immediately after charging when the slugs had been charged with the indexing charging machine. Work is continuing on this problem.

Overboring

Channel 1192-F was overbored 200 mils during the July 9 reactor outage. The experience in the graphite boring was similar to that in an earlier successful boring in DR Reactor. The front of the graphite channel contains alternate hard and soft areas in an apparently random pattern and drills with considerable chattering of the drilling rig; downstream graphite is similar but less severe; that in the center of the pile cuts easily. The new equipment performed very well, but there are indications its power may be less than optimum. Most of the time used for this work was consumed in rectifying a mounting problem on the thrust washer boring tool. Once this has been done in a temporary way, the boring tool enlarged the I.D. of the gunbarrel thrust washer in about two minutes. This is a first time for this operation.

Zirconium Tubes

A method was successfully developed to anneal and Van Stone the forty "problem" zirconium tubes received in one lot from one vendor. When, on Zygl inspection of overbored C front nozzles, unexpected porosity was found, an alternate method of attaching cap lug rings was quickly developed and applied to fifty nozzles to permit their installation in the reactor.

Reactor Hardware

The rear Parker fitting of tube 2162-F was drilled out. A problem in Parker fitting overboring was identified during the work when it was found that the placement of the Parker fittings on the crossheader was widely variable, and that in many cases it will be difficult to get a properly aligned boring tool past the gunbarrel flange. Flow and temperature measurements are being taken.

DECLASSIFIEDNEW PRODUCTION REACTOR WORK

Design Test work for NPR continued with activity on the following titled design tests.

DT-1021 Hydraulically Driven Horizontal Rods
DT-1024 NPR Fuel Handling
DT-1026 NPR Header to Nozzle Connectors
DT-1043 Test of Horizontal Rod Gunbarrel Assembly
DT-1061 Gas Seal for Shield Expansion Joint
DT-1067 Dump System Evaluation
DT-1078 Grout Seal Assembly
DT-1054 Underwater Lighting
DT-1056 Evaluation of Power Range Safety Amplifiers
DT-1065 Pile Motion Transducer
DT-1068 High Temperature Cable
DT-1069 Process Tube Flow Monitor
DT-1072 Resistance Temperature Detectors

Status and accomplishment are reported through normal contact with the responsible NPR design engineers.

NPR Fitting Development

Six Grayloc connector-to-nozzle joints have been installed in the NPR-PCE loop for long term testing. Pull-apart tests were made on a range of rolled joints with various degrees of wall reduction in an effort to bracket the range of separation loads to be expected. Helium leak tests were performed on two sample joints, these exhibited good gas sealing qualities. A sample coextruded zirconium stainless steel joint has completed 524 thermal cycles without leakage.

Fuel Rupture Monitor

A slightly modified version of the gross gamma rupture monitor system now prototyped in C Reactor has been selected as the NPR primary system. A review was completed by Operations Research of reliability data accumulated in C Reactor testing, which except for one component, indicated a mean time to one point failure in a 1000 point system of about eight days. The function of the annunciator operating relay, which appears to be the weakest link, is being studied with a view to replacement of the relay with a static component.

Flow Monitor

As a candidate for flow monitor limit circuitry, a multiple point breadboard has been assembled and tested which employs magnetic amplifiers to compare the output of the flow transducer with a limit signal, which uses a saturable reactor as a static switch to open the safety circuit on demand. This breadboard has been in operation about two months.

PLANT AND INDUSTRIAL ENGINEERING OPERATION**DECLASSIFIED**DRAFTING OPERATION

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

New Engineering Drawings	137
Revisions, Layouts and Sketches	81
Microfilm prints reproduced	247
Microfilm drawings added or retired	3250
Ozolid check prints reproduced	700
Customers serviced - Microfilm files	196
Customers serviced - Catalog files	24
Catalogs added to files	174

The review of unapproved IPD drawings continued. Drawings of all areas have been reviewed except for 100-K Area.

WATER PLANT AND UTILITIES ENGINEERINGBoiler Tests in 184-D

Acceleration tests for the purpose of determining (1) the minimum load at which a boiler can be operated and still accelerate satisfactorily to meet emergency steam demands, and (2) the maximum attainable load with four and five grates were conducted on the No. 2 boiler in 184-D on July 19 and 20, 1960. Results are currently being evaluated.

100-H Area4500 HP Motors

Engineering assistance was provided to DR Area personnel during the replacement of the No. 5 - 190-DR motor. This motor is currently in the Seattle Service Shop being completely rewound with Class B coils.

H Area Fence Relocation

The H Area Fence relocation possibilities are being restudied. The new bus and badge procedure will make possible a project considerably less expensive than that in the original study. Moving the existing 105 Badge House about fifty feet would enable this badge house to serve both the 100-H Area and the 105-H exclusion area.

Columbia River Scale Model

A proposal for construction and operation of the Columbia River model was received from Washington State University. Negative replies were received from the University of Washington and Oregon State College.

A meeting of our Advisory Committee is being scheduled for inspection of the Washington State University facilities and further discussion of their proposal.

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Columbia River Studies

Solar radiation has been over 700 langlies daily for over a month causing river temperatures to range near the ten year daily maximums.

The river crested July 8, 1960, at 334,000 cfs. which was within the forecast limits.

REACTOR, PLANT ENGINEERING

Evaluation of Condition of Rear Face Piping - Older Reactors

The removal of a rear face crossheader at DR Reactor and the removal of sample patches from the rear face crossheaders at B, D, F, and H Reactors has been suggested to help confirm the integrity evaluation of the current systems for present and proposed interim conditions. The plans have been reviewed with Central Maintenance Operation. A Plant Forces Work Review has been initiated, construction estimates have been obtained and arrangements are being formulated to remove the piping samples from DR Reactor this fall. Removal and metallurgical testing of these components is proposed to provide information in our effort to:

1. Advance the current program for establishing the rate of deterioration of present piping.
2. Provide information for future engineering design.
3. Confirm the piping integrity for present and proposed interim power levels.
4. Develop maintenance techniques and determine necessary spare parts, tooling, etc.
5. Disclose problems which have not been evident in investigations to date.

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

Means of reducing reactor rear crossheader vibration by reducing excitation are being studied. It appears that flow disturbances in the downcomer approach piping may be a major source of excitation. A test was conducted at H Reactor Building wherein pressure and rear header vibration were monitored by oscillograph for single and dual downcomer operation at normal reactor power. This test provided information to help determine a method to reduce flow disturbances in the downcomer approach piping.

Poison Splines

The spline samples submitted by Brooks and Perkins, Inc., Detroit, Michigan, have been evaluated for physical, nuclear and chemical properties. The samples were the best tested to date. Recommendations were made that a test order of two-hundred (200) splines be made for in-reactor use and evaluation.

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A routine chemical analysis of poison spline samples was established to confirm adequacy of vendor quality control.

Remote Actuated Reactor Discharge Nozzle

The scope and justification for Remote Actuated Reactor Discharge Nozzle installation at KE Reactor was prepared to assist Project Engineering in a revision to Project CGI-824.

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PROJECT ENGINEERING OPERATION**DECLASSIFIED****PROJECTS****CG-600 - 100-C Alterations**

The previous report called attention to failure of pump No. 11 in 190-C due to broken impeller wearing rings. This created an emergency situation because process pump No. 12 was also down for repairs. The J. A. Jones shop fabricated new mild steel wearing rings and the 100-B and C maintenance forces installed a repaired rotating assembly in pump No. 11. A failure of this same pump, No. 11, occurred on July 18. The failure was due to damage within the case wearing ring seats. This condition was immediately reported to Byron Jackson and their Field Engineer arrived on plant July 21 and supervised the repair of this pump. While this unit was down, a new type 18-8 cast stainless steel impeller was installed.

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

The basic purpose of this project is 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 systems. Beneficial use of this equipment was obtained at 105-C on December 14, 1959, at 105-F on July 18, 1960, and 105-B on July 27, 1960. Installation is 95 percent complete at 105-D and DR, and a lesser degree at 105-H, KE, and KW.

CGI-791 - Reactor Confinement**Phase I - Fog Spray**

The test results, using two linear countrate meters and a difference meter were favorable. The difference system was developed because of the isotopes of gases other than iodine 131 in the reactor air stream which overlap the iodine 131 channel. This system actuates the fog spray on the difference reading. A requisition has been issued for the purchase of the difference system.

Shop fabrication is continuing on angle and hardware for the thermocouple duct shields. Curtain material still has not been received. The delivery promise is now August 8, 1960.

Phase II-A - Site Preparation

This phase of work as originally defined was completed on February 19, 1960.

Phase II-B - Filter Buildings

The R. B. Miles Company is approximately 64 percent complete with their contract, which is scheduled 60 percent on the revised construction status chart which shows the first area beneficial use date of October 1, 1960.

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The present contract completion date for F area is August 4, 1960 and for C area, August 14, 1960. These areas are estimated to be only 83 percent and 71 percent complete respectively.

As of June 29, 1960, approximately 5100 yards of concrete have been poured out of a total of 6293. Work progressed in all areas, but the 100-K's, on the installation of the underground concrete exhaust and intake ducts, which connect the new filter building to the stack. 100-H, C, and B Areas duct pours are nearing completion. The filter frame inserts have been installed in 100-F, H, and C. Piping work is progressing in 100-F, C, and B.

Phase III - Ventilation Modifications and Tie-ins.

Tubing runs for the pressure sensing stations has been completed in 105-F and C. Pressure transmitter stations in 105-F and C are also completed.

Installation of bases for the temporary stacks is complete in B, C, D, DR, F, and H.

Workmanship on the second stage filter frames has improved. A requisition has been issued for the third stage filter frames. Design has been modified and also bidders given the option of forming frame sections from plate or extrusions.

Slide rails have been received from the motor vendor as replacements for the adapter plates which could not be used.

The 8" steam isolation valve has been installed in 105-B, D, and F. Steam coils for the ventilation supply have been installed at 105-B, DR, and F. Supply piping to these coils is approximately 80 percent complete at 105-F, 30 percent at 105-B, and 5 percent at 105-DR.

Foundations for the supply inlet additions have been poured at 105-F, C, KE, and KW.

A mock-up of the new stack breaching was made at 105-F. Layout was completed for mounting the new breaching and chipping out an opening in the existing breaching.

Shielding grout has been poured in one exhaust fan room bay at 105-KE and installation of reinforcing steel is continuing in other bays.

CGI-817 - Crossheader Pressure Differential Indicators and Alarm Systems - Hanford Reactors

The purpose of this project was to provide differential pressure indicators and an associated alarm system on the front face of the reactors to give a direct differential pressure indication between front and rear cross-headers. The work which started March 1, 1959, has been completed and the equipment functioning correctly with the exception of some not yet installed at 105-C because of temporary interference with the charge-discharge demonstration unit equipment. This condition will be removed during the next

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available outage and all work completed at C. The physical completion notice dated July 25, 1960, has been issued.

CGI-845 - Increased Pumping Capacity - 181-C

This project work includes installation of two new pumping units in the 181-C Building to increase the flow by approximately 15,000 gpm. All basic construction work was completed on June 29, 1960. The project could not be fully completed due to the late delivery of the two pumps and motors from the Byron Jackson Pump Company. These units did arrive during July and have now been installed. Final electrical hook-up is now being performed.

PROJECT PROPOSALS

Projects Returned Unapproved

CGI-869 Operational Charge-Discharge, C Reactor
Returned per General Electric Company request because of
potentially higher priority projects.

Project Proposals Approved

CGI-839 Modification of Fuel Element Test Facilities - 1706-KER
Rev. 2 Except for safety and control circuit costs.

CGI-883 Increased Process Water Flow - 100-K Area
Rev. 2 Directive HW-506, Modification 2, added \$30,000 for interim
design funds to previously authorized \$297,000 for this project.

Project Proposals Submitted to AEC

CGI-904 Improvement of Gamma Monitor Systems for 105-B, C, D, DR, F, and H

CGI-905 Modifications to High Tank and Raw Water Systems for Improved
Coolant Backup - 100-B, D, F, and H Areas

CGI-906 Poison Spline Coilers - All Reactors

Other Projects Awaiting AEC Approval

CGI-844 100-K Area Coolant Backup
Rev. 1 Previous interim authorization \$235,000.

CGI-845 Increased Pumping Capacity - 181-C
Rev. 2 Extension of Physical Completion Date.

CAI-868 Columbia River Scale Model
Rev. 1

CGI-887 Critical Mass Monitoring, All Hanford Reactors

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CGI-889 Effluent System Modifications - 100-B/C
For remaining funds of \$451,000

CAI-892 Ventilation Improvements - 181 Buildings

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

Requests Received for Project Preparation

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

CGI-884 Rear Face Crossunder Lines - B, C, D, DR, F, and H Reactors
Rev. 1

R-29131 Modification of 4500 Horsepower Motors, 190-B, D, F, DR, and
H

CPFF CONSTRUCTION SERVICE CONTRACTOR - LIAISON

We have issued nine new work orders and supplemented four project releases for a total of \$437,027 to J. A. Jones in the month of July.

PLANT FORCES WORK REVIEW

The Labor Standards Board approved six jobs for assignment to plant forces, which are estimated to cost \$112,708.

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MANAGER
FACILITIES ENGINEERING

RT Jessen:msw

NPR PROJECT OPERATION

PROCESS DESIGN

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Research and Development

Initial heat transfer calculations are being made in a study of the feasibility of a nuclear superheater for a NPR type reactor. Specific power and fuel element temperature computations are presently on the way for a 19 rod cluster UO₂ fuel element in a 3 inch process tube.

Project CAI-816

Design work by AMF Atomics on fuel element handling equipment is now in progress. A meeting of AMF and GE engineers on July 11, 1960 in Richland reviewed the work to date and established space relationships with the 105-N Building and other equipment. To be consistent with construction schedules, anchor bolt information has been developed at this time for most of the equipment. The first progress report has been released by AMF which outlines primary progress made to date on a cost reduction program on the system.

During the week of July 22, 1960, the Project Representatives met with Burns and Roe, Inc., in Hempstead, New York, for the purpose of arriving at a conclusion as to which of three proposed methods should be utilized for dissipating the thermal energy that would be released by an emergency once-through cooling dump. It was resolved that the design of the Emergency Dump System proceed on the bases that the reactor coolant be dumped into a large underground water filled concrete tank. The concrete tank would be located approximately 25 feet west of the 105-N and 109-N Buildings. The two alternate methods proposed were: (1) discharge the reactor coolant directly into the 109-N Building pipe gallery and, (2) discharge the reactor coolant into a high pressure flash tank.

Process tube rupture tests were run sometime ago and the graphite design was modified to provide increased keying and venting. The 189-D high temperature test loop was utilized for these tests and the demands of other tests on the loop facilities such as the connector coupling development permitted only a few points to be run. The conclusion at that time was that adequate ventilation and stability were demonstrated by the graphite block. Further interest has now been generated and it appears desirable to develop additional test points in order to increase our understanding of the tube rupture phenomena. Reactivation of testing is planned, however, first priority of the test loop must be given to the process tube to nozzle joint studies to be completed in mid September.

An order for hydrous iron aggregates for the biological shields has been placed with N. W. Whittaker and the Young-Montana Corporation, Stanford, Montana. Prior to the placing of the contract, inspection of the site indicated that suitable aggregates could be obtained by selective mining techniques. Stock piled selective mining material has been inspected and accepted by General Electric Design. Shipment of the ore is now proceeding.

DECLASSIFIEDProject CAI-816 (Continued)

The development of the fuel rupture monitor has proceeded on two alternate paths. The project schedule has required a decision on the final approach to be made at this time. An analysis of the problem and systems indicated that the ultimate system must be adequately flexible to function when the unknowns of rupture signal to background ratio is not fully understood in a recirculating carbon steel primary loop. The decision has been made to combine the best features of the two systems under development. The GM tube type detectors will be placed in a circular array so that a slow scan system can be utilized to calibrate and check the continuous monitoring system.

Agreements were reached during the month between Burns and Roe, Inc., and General Electric that a common set of architectural and structural specifications will be used for the super structure phase of the 109 and 105 Buildings. While Burns and Roe will be responsible for the architectural specifications and General Electric the structural specifications, comment issue procedures will be utilized to assure mutually satisfactory specifications.

DEVELOPMENT AND TESTING

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

Progress on procurement activities that invoke prototype requirements include: (a) recommendations of General Electric and Kaiser Engineers for award of orders for prototype process tube inlet and exit valves were forwarded to the Atomic Energy Commission, (b) engineering proposals for process tube flow monitors were requested from approximately forty potential vendors and a pre-proposal conference was scheduled for August 2, 1960, (c) engineering proposals have been received from ten vendors for process tube bellows, and (d) prototypic testing of connector couplings focused attention on the Grayloc coupling resulting in its specification and requisition as a required design.

In joint development, six Grayloc connector-to-nozzle couplings have been installed in the Component Test Loop for long-term testing; pull-apart tests were made on rolled zirconium tube joints with various degrees of wall reduction (5 - 20 percent) and initial cold working (15 - 45 percent) to bracket the range of separation forces that can be expected (34,000 - 109,400 pounds); tightness of rolled zirconium tube joints was determined with helium leak detectors; the sample zirconium-stainless steel coextruded joint has been thermal cycled more than 500 times without leakage; Nuclear Metals reports the ability to peak a carbon steel to zirconium coextruded joint if the force is concentrated at the interface (a condition hard to visualize in actual operation); and the Grayloc coupling principle is being tested as a potential zirconium tube-to-nozzle joint.

Development activities on fuel rupture monitoring centered on the delivery of equipment and performance data to permit a design selection by August 1, 1960.

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Information on the competing systems was presented in a meeting of July 12, 1960. The 100-point gross gamma fuel rupture monitor which employs GM tubes is working successfully at C Reactor; problems exist in flow regulation but this is common to both competitive systems. The prototypic fast-scanning gross gamma monitor and slow-scanning gamma-energy monitor turret is operating in the Hanford Laboratories. Hanford Laboratories was authorized \$10,000 to complete testing and write a terminal technical report on its rupture detection activities. Both competitive developments are operating satisfactorily and can be designed and procured as suitable instruments; the selection of one or parts of both will be based primarily on anticipated loop radiation backgrounds vs. time; anticipated mechanics of ruptures; anticipated signal-to-background ratios; and anticipated operator reaction observing signals, confirming signals, and diversion, set-back, shutdown, and cooling procedures.

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FIELD AND OPERATIONS ENGINEERING

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Construction

Forming and placing of concrete was continued in the 105-N Building throughout July with a total of 2,068 cubic yards of concrete being placed during the period June 29 through July 26. Total yardage as of July 26 thus became 3,805. This represents an average placement rate through July of approximately 109 yards per working day. Sound Construction and Engineering started working laborers and carpenters on swing shift July 18. A Fieldman has been assigned to cover this shift.

The foundation base slab for the reactor has been completed to elevation (-) 16'-0".

Installation of casings for the hydraulic cylinders for C and D elevators has been completed. The casing for the "F" elevator has been driven to depth. Considerable difficulty has been encountered, however, in dewatering the casing for installation of the bottom plate. A fourth attempt is currently under way utilizing a different procedure.

Pipefitters were off the Sound Construction job July 25 and 26 due to a jurisdictional dispute with the carpenters.

The subcontractor, George A. Grant, resumed work on the substructure for the 184-N Building during the month.

Footings have been poured for about one-half of the periphery of the 109-N Building.

Most of the walls of the 181-N Building are now at their finished elevation, and the work is progressing.

Concrete pouring for the substructures for the 183-N and 163-N Buildings is in progress. The walls on the clearwell have been completed.

Preparation of erection procedures, inspection guides and design and procurement of inspection tools for the reactor continued during the month.

Preparation of design of T-C facilities to be occupied by General Electric field forces at the 100-N job site continued.

Graphite

The final shipment of reflector grade graphite from National Carbon Company was received on July 26. A shipment of the same type material was also received from Great Lakes on this date; the remaining 2100 bars on the Great Lakes order are scheduled for shipment about mid-August. This delay in Great Lakes' delivery will not affect 2101 fabrication schedules.

Production machining of the 4 x 5 reflector material was not yet started on July 29, 1960; however, the delay will not seriously affect over-all

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schedules if machining rates fall within predicted ranges. Kaiser Engineers is now making minor adjustments to the Arrowsmith machine to start production runs of notched bars within the next week. All inspection equipment for this machining has been installed.

During the report period, the remainder of the moderator layer drawings were issued as approved. Following this, a final take-off of material requirements was made which is greater than the preliminary take-off for the original order of core graphite. As a result, a purchase order alteration was initiated to reflect this difference in quantity at an estimated increase in total cost of core graphite of approximately \$120,000. This increase will bring the total NPR graphite cost to approximately \$2,685,000 not including the "K" inventory.

Bids for the front and rear graphite reflector blocks and the graphite tube sleeves were reviewed. The apparent low bidder is Speer Carbon Company and final award of the purchase order is awaiting AEC-HOO approval.

Zirconium

Fifty-eight acceptable pilot-order process tubes and three rejects have been received. Of this quantity, 57 have been X-rayed, 55 have been dye penetrant tested, and 44 have been immerscoped. No tubes have been rejected by dye penetrant or immerscope testing; however, 16 tubes are held as of questionable acceptability because of weld quality. These tubes were closely examined and corrective action is being taken with the fabrications to assure future tubes will meet the weld standards.

Work has proceeded on installation of equipment in the tube shop, including a vidigage inspection station, an overhead crane for the dye penetrant station, and a new water deionizer. The autoclave assemblies are in the process of being tested. The X-ray tube planned for NPR tube radiography ruptured due to an unknown cause. Rather than replace this tube, the services of Radiographic Testing Operation, Field Unit, will be arranged for weld examination.

Progress at the zirconium tube fabricators is as follows:

Harvey Aluminum has three tubes accepted and one being final inspected on the pilot order. All billets were made for the remainder of the tubes, and all extruding was scheduled to be complete July 30, 1960. Five tubes were ready to draw and 22 are being pointed. Delay in drawing was due to breakdown of the pointer and burnout of the motor on the draw bench. Drawing is scheduled for the week of August 1, for 26 tubes. For the production order, 24 billets have been machined, 11 forged, 20 cast, and 29 were being melted as of July 25, 1960.

Allegheny-Ludlum's subcontractor, Tube Reducing Corporation, was on vacation the last two weeks of July. All except nine tubes were welded by Budd Company. Final tube reducing for the remainder of Allegheny-Ludlum's order (57 tubes) is scheduled to be performed in early August.

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Chase Brass Company is in the process of melting metal for the remainder of the pilot-order. Extruding of billets for 13 tubes is scheduled August 1, 1960.

Procurement

Following is the status of procurement as of July 22, 1960:

Reactor Plant

General Electric Originated-Kaiser Engineers Purchase (108 Requisitions - 96 Alterations)

51	Open Requisition - Estimated Cost	\$ 9,245,323
24	Open Purchase Orders - Actual Cost	1,139,344
12	Complete Purchase Orders - Actual Cost	37,160
3	Cancelled Requisitions	- - -

TOTAL: \$10,421,827

General Electric Originated - General Electric or AEC Purchase (6 Requisitions - Zirconium, Graphite, and Others)

3	Open Requisitions - Estimated Cost	\$ 204,500
8	Open Purchase Orders - Actual Cost	<u>12,870,181</u>

TOTAL: \$13,074,681

Heat Dissipation Plant

Burns and Roe, Inc. Originated - Kaiser Engineers Purchase (104 Requisitions - 268 Alterations)

42	Open Requisitions - Estimated Cost	\$ 6,258,400
33	Open Purchase Orders - Actual Cost	11,772,429
11	Subcontracts - Actual Cost	7,526,918
1	Purchase Order Complete - Actual Cost	59,000
7	Cancelled Requisitions	- - -
5	Requisitions being held (Lock Sets)	- - -

TOTAL: \$25,616,747

NPR Related

General Electric Originated - Kaiser Engineers Purchase (13 Requisitions - 3 Alterations)

5	Open Requisitions - Estimated Cost	\$ 25,300
6	Open Purchase Orders - Actual Cost	40,568
4	Purchase Orders Complete - Actual Cost	<u>56,391</u>

122,259

TOTAL ALL ORDERS:

DECLASSIFIED\$49,235,514Administration

The following material was issued by Drawing and Specification Control during the month:

Routine Work Processed from June 27 through July 21, 1960

Drawings	541
Criteria	29
Specifications	52
Requisitions	79
ATP's	1
Others	<u>72</u>
Total:	233

Reviews were completed and formal comments were offered on Engineering Material as follows:

On Detail Drawings	246
On Scope Drawings	1
On Specifications	56
On Criteria	<u>0</u>
Total:	303

Operational Planning

Non-exempt position descriptions anticipated for 100-N Reactor Operation were completed, evaluated, and compared with similar position descriptions and evaluations in the older Reactor Operations as a study to determine bases for possible new positions or position levels for N-Reactor.

Selection of individuals from Manufacturing for assignment to 100-N Training Specialist positions and to NPR Project Section and off-site inspection positions as part of their training for N-Operation was initiated with the first selectees reporting.

The report on affect on operational characteristics of N-Plant of capital cost reduction is complete.

The N-Plant reliability study, "NPR Safety and Reliability Study," HW-65932, dated July 1, 1960 by E. A. Grimm, was issued July 1, 1960.

Contacts have been made with the Hanford Laboratories Operation Computing Section regarding analog simulation usage for operational purposes. There are several groups currently using their services for study of parts of the N system. The Computing Section has assumed the role of a clearing-house on this and plans to keep all interested groups informed of the needs

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and progress of others involved. This communication line has been established to take advantage of work already done in filling needs for analog simulation in support of operational training and operational technique development.

The miscellaneous tools and furniture capital cost allotment of funds was reviewed for adequacy.

A tentative procedure has been set up for the transfer of spare parts to the General Electric warehouse.

Two Manual Writers have been assigned by Manufacturing Section to NPR. These people are being functionally guided by Field and Operations Engineering personnel.

CONSULTING ENGINEERS

A letter was received from Hanford Operations Office expressing the interest of the Division of Reactor Development in a study by Hanford of the potential of a graphite-moderated water-cooled reactor for electric power production, the study to cover particularly the application of steam cooling as exemplified by the Beloyarsk reactor now under construction in Russia. A proposal form has been completed and returned to the Commission, and further instructions have been forwarded from Washington, but not yet received.

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DECLASSIFIEDPROGRAM EVALUATIONDesign Status

	<u>Wt'd Total</u>	<u>Certified Schedule</u> ⁽¹⁾	<u>Actual % Complete</u>
<u>Reactor Plant as of 8-1-60</u>			
<u>Title I</u>			
Scope		100	99.7
<u>Title II</u>			
Drawings	70	65	74.1
Specifications	8	85	62.2
Requisitions	8	25	19.4
ATP's	4	13	1.3
Development and Testing	<u>10</u>	<u>71</u>	<u>67.0</u>
Total	100	63	65.25

Heat Dissipation Plant as of 7-23-60

<u>Title I</u>			
Scope Criteria		100	97.0
<u>Title II</u>			
Detail Design		57.0	57.0
	<u>No. Req'd</u>	<u>No. Issued to 7-23-60</u>	
		<u>Scheduled</u>	<u>Actual</u>
Criteria	23	23	20
Preliminary Drawings (bid)	717	318	333
Detail Drawings (for const.)	726	197	235
Specifications (bid)	165	83	90
Requisitions	176	89	97
ATP's (No. being developed)	-	0	0

<u>Composite Design Completion</u> (Reactor and Heat Dissipation Combined)	<u>Certified Schedule</u>	<u>Actual % Complete</u>
Total	65.4	66.3

(1) Percentages based on AEC certified schedule.

DECLASSIFIEDCost Estimate

The last cost estimate was issued on June 30. See previous report for summary.

Schedules

Kaiser Engineers issued a new construction schedule to the AEC for approval on July 1. The schedule was returned by the AEC with comments, but not approved, on July 29.

JS McMahon:mf

MANAGER
NPR PROJECT

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FINANCIAL OPERATION

GENERAL ACCOUNTING OPERATION

The results of the Physical Inventory of Irradiation Processing Department's Movable Equipment were issued during the month.

There were 3 311 items of record at the beginning of the physical inventory. Only 21 were not located. There were 32 items added to record. Unlocated items represent 0.3 per cent of the asset balance and unrecorded items amounted to 0.6 per cent of asset balance.

Equipment Not Included In Construction Projects Expenditure Pattern was provided for Contract and Accounting Operation July 29, 1960.

Engineering Construction Definitions were provided Contract and Accounting Operation July 9, 1960.

During July, there were no expenses incurred for attendance at professional and trade societies or offsite training courses.

PRODUCT COST AND BUDGET OPERATION

The IPD cost code system was revised to correct problems which had developed with the expanded organization. An Instruction letter with the revised codes attached was issued to all IPD Exempt.

An engineering job assignment cost procedure was devised for Industrial Engineering Sub-Section of Applied Reactor Engineering, to be effective July 1, 1960.

C & AO has been advised that accumulation of Space Occupancy (rent, light and heat) cost by building can be changed from monthly to yearly resulting in clerical savings of six to eight hours per month for C & AO.

Liquidation of IPD supplemental crew cost was mechanized. This will reduce C & AO month end clerical effort and provide analysis material through the work order "cost-to-date" report.

PERSONNEL ACCOUNTING

Total number of personnel in the Department at July 31, 1960 was 2 276, an increase of 16 from the number on hand at the end of June, 1960. Included in the number on hand at July 31, 1960 were 16 temporary employees hired as summer replacements.

During the calendar year-to-date, \$4 391 of suggestion awards have been paid to Department employees. Authorized allocation for the year is \$12 000.

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PERSONNEL ACCOUNTING (continued)

During the month of July a cost of living increase of 1.18% was given to all nonexempt employees. Cost of living increases since October 1955 have amounted to 11.80%.

AUDITING

Twenty-three revisions to AEC Manual Chapters were reviewed for their effect on IPD Operations.

The absence and injury records pertinent to the third consecutive HAPO General Manager's Safety Award were reviewed. Nothing which would disqualify the Department from achieving the award was found. In addition to the report for the latest period, a report summarizing the work done in connection with all safety awards during fiscal year 1960 was issued.

A summary report of audit work in connection with contracts, purchase requisitions and store orders performed during fiscal year 1960 was issued. Action has been taken to correct certain unsatisfactory conditions noted during the review.

The Director, Finance Division, HOO-AEC was requested to arrange for an audit of the billing made by Arthur D. Little, Inc., Cambridge, Massachusetts, on our Design, Development and Research Contract, DDR-68.

No inventions or discoveries were made during the month.

PROCEDURES

New Department procedures were established for Employee Status Change paperwork routines. Internal procedures within Finance and Relations Practices were developed and installed.

SH Small

Manager-Finance
IRRADIATION PROCESSING DEPARTMENT

SH Small:vjr

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RELATIONS PRACTICES OPERATION

Five technically trained graduates were interviewed and three offers extended. Two Manufacturing Training Program graduates were interviewed and one offer extended. One PhD candidate was interviewed but accepted another offer. Three offers were accepted during the month leaving thirteen offers open at month end including two to PhDs. Three exempt employees resigned from the Company.

A total of \$730 was paid to fourteen suggesters in July. The largest award was \$600.

Mass communications included ten Management News Bulletins, one Round Table Guide, two Headliners, and two Information Letters. G. E. News coverage included seventeen items about IPD activities totaling 292 column inches. Two Management Information Meetings were held.

Three security violations occurred during the month. The Department completed 500 consecutive days without a disabling injury. Sixty-six medical treatment injuries were reported.

W. A. Shanks

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SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Class'n.</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
	Unclass.	LB Brinkman	7-1-60	Upgrading the D Area Raw Water Back-Up System.
HW-65989	Sec.-Red Label	JP Corley	7-6-60	Reactor Effluent Outfall Structures-Status and Potential Problems.
HW-66070	Unclass.	DF Watson	7-14-60	Project CGI-844-100 K Coolant Backup System Project Representatives Meeting Minutes No. 4.
HW-66190	Unclass.	DF Watson	7-26-60	Project CGI-844-100 K Coolant Backup System Project Representatives Meeting Minutes No. 5.
HW-66137	Unclass.	ER Rudock	7-21-60	CGI-839 Modification of Fuel Element Test Facilities 1706-KER - KER Loops Safety Circuit Improvements, Project Representatives Meeting No. 1.
	Unclass.	JH Fastabend	7-11-60	Status Report - NPR Fittings Development Activity.
HW-66121	Unclass.	FB McCarthy	7-19-60	BDF Zirconium Tube Sliding Forces in Graphite Channels.
HW-65944	Secret	GJ Rogers	7-13-60	Scope Report - Modification of D Reactor for Bumper Fuel Elements.
HW-66063	Unclass.	JW Green	7-13-60	Temperature Monitoring Systems - B,C,D,DR,F, and H Reactors.
HW-65997	Secret	AB Greninger	7-7-60	Production Forecast IPD, July 1, 1960 through June 30, 1965.
HW-64508 RD2	Unclass.	NO Strand	7-1-60	Code Compliance - NPR Piping Systems and Pressure Vessels.

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<u>Number</u>	<u>Class'n.</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-65932	Unclass.	EA Grimm	7-1-60	NPR Safety Circuit Reliability Study.
HW-65968	Unclass.	FJ Mollerus	7-5-60	Moderator Cooling System Stress Analysis Part I.
HW-65814	Secret	DD Stepnewski	7-15-60	Technical Aspects of 105-C Conversion to Zircaloy-2 Process Tubes and Self Supported Fuel Elements.
HW-66188	Unclass.	HR Kosmata	7-25-60	Dual Level Enrichment Loading for the NPR.
HW-66185	Unclass.	HG Johnson CL Goss	7-60	Reliability Study - NPR Flow Monitor Equipment.
HW-66108	Confidential	Edited by WJ Love	7-25-60	Effect of Capital Cost Reduction on NPR Man-power Requirements and Time Operating Efficiency.
	Unclass.	WJ Love	7-11-60	Trip Report - Visit to APED to Discuss NPR Audit with F. Cage and RB Richards.
	Unclass.	WJ Love	7-22-60	Trip Report - Visit to Burns & Roe Offices - Emergency Dump of Primary Loop.
	Unclass.	HL Pringle	7-11-60	105-N Design Communication Letter No. 9, Process Tube Flow Monitor - Approach to Trip Alarm.
	Unclass.	HL Pringle	7-11-60	105-N Design Communication letter No. 10, Central Control Room Primary Water Graphite Panel Layout.

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
A. McDonald	G.E. Service Shop Seattle, Wash.	7-12 to 7-14-60	To inspect the DR 4500 HP motor.
HA Kramer	Priest Rapids Dam	(Five trips during month)	To examine the possibility of eliminating the wide fluctuation of discharge.
MH Schack	Wash. State Univ. Pullman, Wash.	7-18-60	Discuss downcomer model testing.
	Chas. T. Main, Co. Boston, Mass.	7-19-to 7-21-60	Discuss the proposed evaluation of the export water system.
WJ Tupper	Wash. State Univ. Pullman, Wash.	7-18-60	Discuss a study of proposed modifications to the export water system on a McIlroy Analyzer.
HW Heacock	Byron-Jackson Pump Co. Los Angeles, Calif.	7-20 to 7-22-60	Discuss pump impeller casting problems.
	Holmes & Narver Los Angeles, Calif.		Discuss results of seismic vulnerability studies.
PA Carlson	Massachusetts Institute of Technology Cambridge, Mass.	6-25 to 7-12-60	Attend Heat Transfer Summer Course.
	Columbia University New York, N.Y.		Discuss heat transfer problems.
JH Brown RE Trumble GE Zima	San Francisco, Calif.	7-5 to 7-7-60	Presentation to G.E. Safeguards Council.
OH Greager	San Francisco, Calif.	7-5 to 7-9-60	Attend G.E. Safeguards Council Meeting.
WE Vetter	Panellit Inc. Skokie, Illinois	7-5 to 7-10-60	Consult on gauge and monitor system components.
DL Hirschel	Pacific Steel Products Seattle, Wash.	7-12 to 7-13-60	Inspection and discussion of equipment being fabricated.
WR Conley	Burns & Roe New York, N.Y.	7-17 to 7-22-60	Discuss NFR design.

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
SS Jones	Albrook Hydraulic Lab. Pullman, Wash.	7-18-60	Discuss DR downcomer model.
NR Miller	ALW Project Idaho Falls, Idaho	7-18 to 7-20-60	Discuss operation of carbon steel piped reactor.
SS Jones	Charles T. Main Boston, Mass.	7-19 to 7-21-60	Discuss last ditch cooling system.
SS Jones FH Champagne	Albrook Hydraulic Lab. Pullman, Wash.	7-27-60	Discuss DR downcomer model.
RD Gilbert	General Electric Schenectady, N.Y.	7-14 to 8-5-60	Attend an Advanced Standards Instructor's Class.
EF Fairweather	IBM Co. of San Jose, Calif.	7-25 to 7-29-60	Attended an IBM Customer Executive Course.
JE Stice HS Davis	Yuba Manufacturing Div. Plant, Benecia, Calif.	7-18-60	Discuss progress of fabrication and methods of inspection of primary shield crates.
GR Klingler	Monitor Systems, Inc. Philadelphia, Pa.	7-25 to 7-26-60	Observe Test of a fast scan temperature monitor system.
EW Wilson ME Russ	Burns & Roe, Inc. Hempstead, New York	7-18 to 7-27-60	Expedite design problems.
DD Stepniewski	Los Alamos Scientific Lab., Group GMX-12, Los Alamos, N.M.	7-21 to 7-23-60	Discuss gas purification for NPR with JR Russel and RJ Daly.
GA Newell	Harvey Aluminum, Torrance, Calif. Reynolds Metal Co., Phoenix, Arizona Associated Piping & Engineering Co., Compton, Calif. Airline Welding & Engineering Co., Gardena, Calif. Arrowsmith Tools & Ice Cork, Los Angeles, Calif. Vinson Engineering & Sales Co., Van Nuys, Calif.	7-27 to 7-28-60	Discuss control tip tubing and extrusion dimensional tolerances with various vendors.

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<u>Name</u>	<u>Firm and Location</u>	<u>Date</u>	<u>Purpose</u>
HS Davis	Young-Montana, Corp. Stanford, Montana	7-11-60	Availability of hydrous-iron-ore.
WD Bainard	Arco, Idaho, ALW	7-19-60	Discuss primary coolant chemistry.
	Burns & Roe, Inc. Hempstead, New York	7-22 to 7-23-60	Discuss waste disposal and decontamination.
JR Carrell WJ Morris	Chandler-Evans Hartford, Conn.	7-27 to 7-30-60	Evaluation of vendor's production facilities and technical discussions of their valve engineering proposal.
WJ Love	Burns and Roe, Inc. Hempstead, New York	7-18 to 7-19-60	Proposed NPR dump system.

VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
Weller Reed	Weller Reed & Associates Los Angeles, Calif.	7-18 to 7-22-60	Acceleration tests conducted in 184-D.
George Kanen	Dage Television Div., Thompson Ramo Wooldridge Michigan City, Ind.	7-7-60	Describe and demonstrate two television systems.
Dr. Dunlop, B. Bedford, Dr. A. Bushey	G.E.L. Schenectady, New York	7-22-60	Discuss HAPO work to be done at GEL.
J. Polizzotto	Marman Div., Aeroquip Corp., Seattle, Wash.	7-7-60	Discussions on testing and evaluation of connector to nozzle joints for NPR.
JL Barns	Teleflex, Inc., Encino, Calif.	7-14-60	Discuss charge seaters.
J. Robeck	Monitor Systems, Inc. Ft. Washington, Pa.	7-11-60	Discuss NPR instrumentation requirements.
P. Loewenstein	Nuclear Metals, Inc. Concord, Mass.	7-12 to 7-13-60	Discuss NPR fuel development program.
R. Mack	Atomics International Canoga Park, Calif.	7-26-60	Discuss proposed irradiation test at Hanford.

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
ED Olson	West Chemical Co. Seattle, Wash.	7-14-60	Presented methods of job simplification to area janitors.
AH Smith	Allegheny-Ludlum Steel Corporation	7-25-60	Visited zirconium tube shop to review test work on zirconium tubes.
GA Moudry	Harvey Aluminum	7-28 to 7-29-60	Discuss contract for zirconium process tubes.
WE Roth	Electro-Mechanical Research, Inc.	7-14-60	Demonstrated a visual rod display in 712-A Building.
HL Hurst	Hogan Chemicals and Controls, Inc.	7-20-60	Discuss the Central Data Logging System.
RH Norris	GEL - Consulting Engineer	7-5 to 7-6-60	Discuss reliability concepts.
Dr. H. Poritsky	GEL	7-11 to 7-12-60	Discuss NPR flow transient problem.
EJ Zendey T. Russell M. Pannaman C. Pon	Burns & Roe, Inc.	7-13 to 7-15-60	Discuss architectural and structural specifications common to 105 and 109-N Buildings.
WW Barton	AMF Atomics Division, American Machine & Foundry	7-11-60	Discuss aspects of fuel element handling system.

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