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IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
JUNE, 1960

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Compiled By
IPD Personnel

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Date *5/15/73*
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By Authority of *CG-PR-2*

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RICHLAND, WASHINGTON

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SUMMARY

RESEARCH AND ENGINEERING OPERATION

Preliminary visual inspection of the first columns of self-supported fuel elements irradiated to 1200 MWD/T revealed no unusual corrosion patterns. Four eighteen inch enriched tube-and-tube elements being irradiated in KER-2 to a goal exposure of 3500 MWD/T have attained an exposure of 3085 MWD/T.

Twenty-six pieces of N material from the small-scale E-N test at 105-H were shipped to SRO. CPD has dissolved and sampled the three batches of metal from the E-N test which are to be used in establishing a tentative conversion ratio for an E-N loading.

The graphite temperature limit at DR Reactor was increased to 650 C under a Production Test to gain reactivity during the initial phase of operation subsequent to central zone discharge.

Testing of overbored nozzles prepared for use with the Zircaloy tube facility in C Reactor has indicated an unsuspected porosity. While this problem is being evaluated, self-supported slugs will be hand charged and standard nozzles replaced.

Process Standards have been revised for all reactors to allow continued operation if a vertical safety rod inadvertently drops into the reactor provided that graphite temperatures are below 800 C.

Film readings indicate that front face neutron leakage, which has reached an operating dose rate as high as 30 mrem per hour in some cases, passes through the iron rings and donuts around the gun barrels. No neutron moderating materials interrupt the travel of neutrons through this region.

The primary power level limit was based on fuel element failure control at all reactors except H, which was restricted by bulk outlet water temperature limits.

Naval Reactors cancelled the BAFL-120-8B test and all further testing in the H-1 Loop. Determination of ultimate disposition of the loop is in progress.

MANUFACTURING OPERATION

Reactor input production was 12.9 percent above forecast; 4.1 percent above at the six old reactors and 25.7 percent above at the K's. Forecast was exceeded, particularly at the K's, due to high time operated efficiency and average power levels. June production was essentially equal to the May record when adjusted for one less day.

Over-all time operated efficiency was 84.4 percent (81 percent forecast); 81.5 at the six old reactors and 93.2 at the K's. The high efficiency at the K's is attributed to exceedingly good operating continuity. KE was down once during the month, on schedule, and KW once, continuing an outage which started late in May.

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There was no increase in the combined reactor instantaneous power level or the individual reactor record power levels. Record production was achieved at KW exceeding their previous record by 5.9 percent.

Nine ruptures, five I&E regular, two I&E enriched and two solid regular metal, were removed from the reactors. Two of the I&E regular metal ruptures were at H and one each at B, C, and F. The two solid regular metal ruptures were at DR and H and the two I&E enriched ruptures were at C and D.

FACILITIES ENGINEERING OPERATION

The downcomer model testing program being conducted at Washington State University continued. Additional tests were performed to verify the similarity of the downcomer model with the prototype downcomer in service at 105-DR Reactor Building.

Preliminary engineering studies regarding the correction of deficiencies in the last ditch coolant supplies for the 105-B, D, F, and H Reactors continued. Existing last ditch coolant supplies are considered adequate for DR and C Reactors.

Project CG-775 was closed on June 30, 1960 as scheduled. Funds are accrued for inspection of the test impeller and continuation of the filter plant tests during the summer. The project was completed with a financial under-run of approximately two percent.

Over-all design completion for Project CGI-791 is 95 percent. All material with the exception of the nozzle assembly detail drawings has been transmitted for construction approval.

A rough draft copy of the design criteria for Project CGI-844 has been completed and issued for comment. A study of the various 4610 volt system switching arrangements was completed. Preliminary results indicate present method of operation is equal to proposed methods.

Several basic concepts to be used in development of project scope were discussed at the initial meeting of the Project Representatives for CGI-884.

Two prototype Mark V flapper valves were installed in the rear face of 105-KE to be observed for the effects of reactor operation. Work continues in the development of tools and procedures for overboring reactor process channels. First shipment of equipment designed and built for us under DDR-93 has been received and initial tests run. Orders have now been placed for prototype nozzle assemblies for both front and rear faces of C Reactor. Possibility of assembling filter frames with structural adhesive was demonstrated successfully.

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Burst tests confirm the recommendation already made for the selection of the Grayloc joint for the NPR connector-to-nozzle joint. A breadboard magnetic amplifier-magnetic logic flow monitor system has operated continuously since April 25 without malfunction.

A test of boiler and control performance under various firing and coal conditions has been developed and is scheduled for use in 184-D Building.

Scope work has been completed for the Gamma Monitor Improvement Project Proposal.

Sample testing of Hycar O-rings for H Reactor rear connectors has been completed with approval of the material for use.

Physical completion acceptance leading to the closing of Project CG-558 with exceptions was achieved.

A physical completion notice was issued for Project CG-600 with the exception of the Byron-Jackson 190 pumps.

The total CGI-791 project is estimated at 42 percent actual completion compared to 42 percent scheduled on the recently submitted certified progress schedule.

NPR PROJECT OPERATION

Concrete placement at the 181-N Building River Pump House was completed to the 405 foot elevation.

Work on the 184-N Building Standby Boiler House was being slowed by lack of turbine foundation information.

Excavation for the 153-N Electrical Building was near completion and construction was started on the 151-N Substation.

Concrete placement continued on the 105-N Building.

Graphite and zirconium production and delivery by vendors continued to be satisfactory.

Design activity on the reactor and reactor building portion of the plant remains at a high level. While scope is essentially complete, technical modification such as the increase in graphite cooling tubes and cost savings items such as simplified dump of the primary loop and reduced instrumentation requirements continue to be formally processed. Design drawings preparation continue on schedule under considerable pressure from the construction planning and scheduling. Special procurement aimed at lower cost and improved reliability of which elevator rebid, butterfly and diversion valve development and flow monitor prototype program continues to absorb engineering effort. The initial ATP has been forwarded to AEC for approval.

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Design activities for the remainder of the plant are concentrated on completion of scope and supporting work related to engineered equipment procurement. Scheduled items of scope are essentially complete and only recent changes such as dumping of the primary loop remain. Detail drawings for 109 sub-structure contract have been released.

FINANCIAL OPERATION

The quarterly custodial inventory of Reactor and Other Special Materials was taken June 30, 1960, and a ten-year depreciation forecast was prepared on assets to be added by the Plant Improvement Program.

The annual physical inventory of coal was completed and a report issued. No adjustment of values was considered necessary.

The monthly essential material inventories in D and DR Processing and F and H Power were observed. All essential materials and coal were covered during the fiscal year.

Total number of personnel assigned to the Department at month end totaled 2,260, an increase of 29 from the number on hand at May 30, 1960. Included in the increase of 29 are 16 temporary employees.

A report was issued covering the results of the Department's cash funds. It was determined that the fund established for security reasons was not needed, and it will be liquidated.

Planning and implementation were completed for the Department's participation in the plant-wide employee status change procedures. New payroll status change forms were prepared and distributed this month. The form incorporates the features of several other payroll forms and will help alleviate the flow of paper work at HAPO. Communications were prepared for section management and detailed procedural instructions were prepared for use by field supervisors.

RELATIONS PRACTICES OPERATION

Four experienced BS/MS and five PhD candidates were interviewed with three offers extended. Two exempt employees transferred into the Department from Hanford Laboratories. Five exempt employees resigned from the Company. Three employees retired during the month. One security violation occurred during June.

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GENERAL

ORGANIZATION

A. B. Carson requested and was granted relief from his responsibilities as Manager, Process Design, NER Project Operation. He is now assigned as a Principal Engineer in NER Project Operation. J. R. Carrell is serving as Acting Manager, Process Design.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non Exempt</u>	<u>Total</u>
General	1	2	3
Research & Engineering Operation	111	67	178
Manufacturing Operation	373	1374	1747
Facilities Engineering Operation	126	46	172
NER Project Operation	72	26	98
Financial Operation	18	14	32
Relations Practices Operation	<u>7</u>	<u>23</u>	<u>30</u>
TOTAL	708	1552	2260

Two exempt employees transferred into the Department from Hanford Laboratories Operation and five exempt employees resigned. Sixteen temporary employees and five first-year Manufacturing Training Program men were placed in the Department.

SAFETY, SECURITY, AND RADIATION EXPERIENCE

One security violation occurred. There were no disabling injuries or radiation exposures exceeding operational control. Seventy-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.

GENERAL MANAGER
IRRADIATION PROCESSING DEPARTMENT

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RESEARCH AND ENGINEERING OPERATION

PROCESS AND REACTOR DEVELOPMENT OPERATION

REACTOR FUELS

Present Reactor Technology

Projection Fuel Testing

The first three of the initial ten columns of end-spider supported fuel elements were charged into B reactor. Higher than normal charging forces were experienced and an investigation of the two columns remaining in storage from the same shipment revealed oversized fuel elements; therefore, it was concluded the first three columns were also oversized and could have caused the higher charging forces.

Preliminary visual inspection of the first columns of self-supported fuel elements irradiated to 1200 MWD/T revealed no unusual corrosion patterns.

Dingot Uranium Testing

Analysis of the seven tubes of alloyed Dingot material discharged from D reactor at an average exposure of 795 MWD/T revealed: (a) Dingot is not significantly higher in average warp than Ingot. (b) Tube filling capacity (TFC) for Dingot was not statistically different from Ingot.

A final report will be issued discussing the results of Pt-IP-280, "Irradiation of Alloyed Dingot Uranium Fuel Elements".

Nickel Plated Fuel Testing

Ten columns of nickel plated fuel elements under PT-IP-263-A-FP were satisfactorily charged into DR reactor on 5-28-60.

Advanced Reactor Technology

KER Testing

The Zircaloy-2 jacketed natural uranium thermocouple element being irradiated in KER 1 under PT-IP-314-A to measure the temperature effect of crud film deposition in pH 10 coolant has shown negligible filming at coolant temperatures up to 288 C with a surface heat flux of about 0.38×10^6 B/hr ft². No filming resulted from several temperature cycles. The loop is currently on low pressure - low temperature operation as the result of leaky check valves. If these valves can be repaired next outage, decontamination studies described in HW-65586 will be performed.

The four eighteen-inch enriched tube-and-tube elements being irradiated in KER-2 under PT-IP-292-A to a goal of 3500 MWD/T have attained an exposure of 3085 MWD/T in 270 C coolant at an average specific power of 123 KW/ft.

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<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-84-A	a. Projection Self-Supported fuel in ribless aluminum tubes	19	B	1200 MWD/T		Preliminary evaluation of self-supported fuel elements. Routine charging to continue until tubes are replaced. Ultrasonically attached supports currently being used. Goal exposure increased from 900 MWD/T to 1200 MWD/T.
	b. End Spider	3	B	1200 MWD/T		Initial charging of end-spider supports.
IP-171-A	a. Solid X-8001 & C64-F	1	B	Variable 500 MWD/T	752 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 OILIN	6	D	Variable	560 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.
IP-216-A	Normal Prod. Nat. Oil, KII & KIII fuel elements	127	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	8 Mo.	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	Bumper Supported fuel in Ribbed process tubes	20	D	1200 MWD/T 1 pr at 400 MWD/T 2 pr at 800 MWD/T	220 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.

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<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-263-A	Nickle Plate Demonstration Loading	10	DR	800	100	Provides for testing if the spalling affects in nickle plate has been eliminated.
IP-272-A	CIVN Geometry I&E Self-Supported Fuel	9	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 18-inch enriched tube-and-tube elements	1	KE	3500 MWD/T	3085 MWD/T	Charged in KER Loop 2 on January 11, 1960.
IP-300-A	8 Nat. U Hot-headed tube-and-tube elements	1	KE	2500 MWD/T	805 MWD/T	Charged April 25, 1960, in KER Loop 4.
IP-314-A	One Thermocouple 1 element; two thirty-six inch tubular heater elements	1	KE	Not over 2000 MWD/T	860 MWD/T	Charged in KER-1 on May 14, 1960.

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KER-3 is empty.

The eight natural uranium Zircaloy-2 jacketed tube-and-tube elements being irradiated in KER-4 under PT-IP-300-A to evaluate hot-headed closures have attained an exposure of 805 MWD/T in 288 C coolant. The elements are scheduled to a goal of 2500 MWD/T.

REACTOR PHYSICS

Present Reactor Technology

Ceramic Ball Tests

HW-65547, "Development Test IP-330-A, Pile Testing of Ball 3X Candidate Materials", was issued on June 13. This DT will permit irradiating (for 30 operating days) samples of ball 3X candidates in the KW Reactor and determining (1) rate of poison burnout under irradiation, and (2) post-irradiation activity of the samples. All arrangements have been completed with the Irradiation Testing Unit for charging this test about July 1, 1960.

E-N Conversion Ratio

Twenty-six pieces of N material from the small-scale E-N test at 105-H were shipped to SRO about June 17.

CFD has dissolved and sampled the three batches of metal from the preliminary E-N test which are to be used in establishing a tentative conversion ratio for an E-N loading. Results of the analyses of these samples will be available before August 1.

Metal Coefficient - Correction

The results reported last month for the average metal coefficient determined from tests were incorrect. The value -0.75 ih/MW should be corrected to -0.075 ih/MW.

Analytical Physics

Time has been spent in reviewing literature on the current methods of calculating lattice parameters for tube-and-tube elements. The IDIOT program has been utilized to compare calculated values with those measured in laboratory experiments. First indications show good agreement between the measured and calculated values of k infinity, but the values of p and η show compensating errors. This may reflect difficulties in laboratory measurement of p .

The method which was being used in the study of neutron thermalization to select the source neutrons in the graphite was found to be in error. This has been corrected and the program is presently being de-bugged. There is a question about the method of using recording surfaces to determine flux. Once this has been settled the program should be nearly complete.

Critical Mass Studies

A method has been devised which will permit the calculation of safe spacings for bundles of fuel elements. The answers should be conservative and will be used to replace the previous calculations.

Hazards Review

The analysis of the NPR cold water startup and flooding accidents was completed and issued. The latest revised values of control strength for both the horizontal rods and ball 3X systems were included in HW-64755, "N Reactor Hazards Review of Cold Water, Flooding, and Startup Accidents", by C. W. Allen.

NPR Transient Response

A preliminary analysis of the NPR has developed to the point that an analytical estimate of the transient response has been obtained. For a small step in reactivity the maximum power is reached in less than one second and quickly settles to within one percent of final power. A 50 percent over-shoot is obtained. Since the peak is reached so quickly and also due to good damping characteristics, the power response to reactivity changes is expected to be excellent. This result will be checked later against analog models of the reactor.

REACTOR ENGINEERING

Present Reactor Technology

Zirconium Tube Procurement

Bridgeport Brass Company has prepared 111 C Reactor process tubes which are within specifications in all respects except possible corrosion resistance. The corrosion test results have not yet been received. One additional tube has been prepared which is within specifications except that the wall is one mil below minimum specifications for 23 inches at one end of the process tube. This tube has been offered to us for \$550. This tube will be shipped with the remainder and will be purchased. It is technically acceptable for use in-reactor.

Harvey Aluminum Company has shipped 18 - 20 C Reactor process tubes which are scheduled for delivery onsite on June 30. The schedule for shipment of the remaining tubes is not now known.

Increased Graphite Temperature Limits at DR

The startup of DR Reactor on June 1 and operation to the shutdown on June 17 was conducted under the provisions of Production Test IP-325-AC (HW-65311) allowing a time-weighted increase of the graphite temperature limit to a maximum of 650 C even with a helium concentration in the reactor atmosphere as low as 20 percent. The higher temperature was allowed under test to gain reactivity through higher moderator temperature in place of a good number of tubes of enriched fuel. The temperature provisions of the test were found

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adequate. The highest graphite temperature measured was 649 C. The burnout of the graphite under startups of this sort is being monitored with inserted test pieces of graphite. The weight loss of these pieces will be measured after two startups.

Low Flow Pressure Drop Characteristics - DR Reactor

Hydraulic equations developed for the total DR Reactor flow system have been checked against experimental data at 80,000 gpm. Calculations of pressure drop for a total flow of 40,000 gpm have been completed for a range of inlet and outlet temperatures. Work is proceeding on the calculations for 20,000 and 10,000 gpm total flow.

Review of TAI Limits

A rough draft of a technical review of TAI limits has been prepared and is undergoing review. A document will be issued soon.

Overbored Nozzles - C Reactor

~~Fluorescent-penetrant~~ testing (Zyglo) of the first of the overbored nozzles prepared for use with the 300 Zircaloy tube facility in C Reactor has indicated an unsuspected porosity. It has been concluded that the first ten tubes currently being installed in C Reactor should be hand-charged with self-supported fuel elements and standard nozzles replaced. This will provide perhaps two months time for more complete evaluation of the suitability of the reamed nozzles for reactor use and for the evaluation of potential alternates.

Advanced Reactor Technology

Zr Thermal Fatigue Tests

An equipment failure in the testing equipment has resulted in a two-week delay in the steady-load thermal cycling program. Test results to date indicate no fatigue failures in more than 3000 thermal cycles between 200 and 800 F at stresses up to 35,000 psi.

Zr Sponge Specifications

Harvey Aluminum Company has been granted permission to increase the maximum limits of silicon in the sponge used for NPR process tubing from 100 parts per million to "190 + 60 parts per million". The initial limits were established empirically and were designed to maintain Zircaloy quality approximately the same as the quality of the Zircaloy materials whose properties have been studied. The additional silicon was authorized on the basis of data which indicate that:

1. The short term corrosion characteristics of the fabricated tubing would be improved somewhat,
2. Metallographic examination of the fabricated material indicates that the additional silicon would result in more uniform distribution of alloying materials in the zirconium matrix, which should be generally beneficial, and
3. No data indicate unfavorable results from such silicon addition.

Decontamination Test

A production test authorizing the decontamination of the KER-1 Loop has been approved and issued.

NPR Graphite

The inquiry for bids for supplying about 300 tons of graphite for the front and rear reflectors and trunnion sleeves for the NPR has been sent out. The bid reply date is July 18. This is the last lot of graphite for the NPR for which an order is to be placed.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience of critical IPD classifications for the first 24 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	121621 mr	85	1430 mr	3097 mr	61
Processing Operators	301389 mr	250	1205 mr	2610 mr	61
Pipefitters	93205 mr	93	1002 mr	2170 mr	19
Millwrights	74627 mr	76	981 mr	2124 mr	14

Lapse of Control

Lapse of Radiation Control Distribution by Reactor and Component

	B	C	D	DR	F	H	KE	KW	IPD Total
Processing	0	1	1	0	0	2	1	1	6
Maintenance	0	0	0	1	0	1	0	0	2
Supplemental Crews	0	0	0	0	0	0	0	0	0
Research and Engineering	0	0	0	0	0	0	1	0	1
Facilities Engineering	0	0	0	1	0	0	0	0	1
Central Maintenance	0	0	0	0	0	0	0	0	0
Reactor Areas	0	0	0	0	0	0	0	0	0
Assigned Totals	0	1	1	2	0	2	1	1	8
IPD General									0

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>June 1960</u>	<u>May, 1960</u>	<u>June 1959</u>
107-B	37,000 uc/sec.	46,000 uc/sec.	26,000 uc/sec
107-C	47,000 "	33,000 "	34,000 "
107-KW	61,000 "	74,000 "	49,000 "
107-KE	44,000 "	49,000 "	43,000 "
107-D	24,000 "	40,000 "	16,000 "
107-DH	18,000 "	34,000 "	15,000 "
107-H	26,000 "	37,000 "	20,000 "
107-F	22,000 "	40,000 "	21,000 "
Total	<u>279,000 uc/sec.</u>	<u>353,000 uc/sec.</u>	<u>224,000 uc/sec.</u>

Remote Area Monitoring

The prototype space monitor for NPR is in the field for testing. The instrument is set up in the outer rod room at D reactor. The stability of the instrument to date has been excellent.

Effluent Water

The reactor effluent decontamination test facility at 100-D Area is virtually complete. Testing should begin on schedule the first week in July.

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PROCESS TECHNOLOGY OPERATION

REACTOR POWER LEVEL LIMITATIONS

The primary power level limit at all reactors except H was based on fuel element failure control at the goal exposure permitted by the available metal supply. H Reactor power level was restricted by bulk outlet temperature limitations.

WATER TREATMENT

Typical June conditions exist so far as the air binding in filters was concerned. Raw water was easier to treat than is normal for June. Alum feeds were high in relation to turbidity. Particles in filtered water were not of the film forming type unless the concentration was several times normal operating level.

PROCESS STANDARDS

HW-46000 B, Process Standards - Reactor

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

Process Standard A-022 - "Bulk Outlet Water Temperature Limit"

Three revisions were made to the Standard.

Bulk temperature dependence upon the number of operating process water pumps was specified to limit bulk temperature surges in the event of a process pump shaft failure. The bulk water temperature limit was raised 1-1/2°C above the former maximum temperature. This was accomplished by requiring the use of a Deadman Switch on all control rods to restrict the amount of inadvertent rod withdrawal.

Restrictions were also imposed upon the length of poison columns in ball valve equipped process tubes. An alternate requirement was specified where full poison columns are permitted, provided the rear ball valve controls are interlocked with the bulk outlet water temperature. Bulk temperature surges from inadvertent poison column discharge are thus limited to safe values.

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

Recent evaluation of the expected temperature rise of a vertical safety rod inadvertently dropped into an operating reactor has shown that reactor life or safety will not be compromised.

The former requirement for reactor shutdown under the above conditions was deleted from the Standard with the qualifying restriction that graphite temperatures are below a specified maximum.

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

The changes made to this Standard consisted of conversion from inhour units of reactivity to c-mk units.

HW-46000 D, Process Standards - Reactor

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

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

The revisions made are identical to those made for HW-46000 B, above.

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

Ball 3X system requirements from three other Standards were compiled and added to Standard C-110 for clarification purposes.

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

The revisions made are identical to those made for HW-46000 B, above.

HW-46000 F, Process Standards - Reactor

Four revised and one new Standard were issued during the month. These were:

Process Standard A-010 - "Process Piping"

Reactor startups were authorized following scrams resulting from rear pigtail failures. This action is permitted provided Panellit low pressure trip requirements can be met as specified in Process Standard A-050 and the affected tube will operate above a specified minimum tube power.

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

The revisions made are identical to those made for HW-46000 B, above.

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

The revisions made are identical to those made for HW-46000 D, above.

Process Standard C-130 - "Total Control Criterion"

A new Standard was issued which specifies the Total Control Criterion within which the reactor shall be operated. Methods of calculating the reactivity control necessary for operation within the criterion are specified in the Standard.

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

The revisions made are identical to those made for HW-46000 B, above.

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HW-46000 H, Process Standards - Reactor

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

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

The revisions made are identical to those made for HW-46000 B, above.

HW-46000 K, Process Standards - Reactor

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

Process Standard C-020 - "Power Level Monitoring"

The sub-critical neutron monitor was included in the revised Standard as a primary startup instrument. Since safe startups are dependent upon early knowledge of the neutron flux and period, the development and use of the sub-critical monitor presents a significant gain in safe reactor startup methods.

Power level checking requirements during cold startups have also been added to the Standard. Initially, power level is to be monitored with the #1 galvanometer until an increase in outlet water temperature is measurable. At this point, it is required that the startup instrumentation be calibrated.

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

The revisions made are identical to those made for HW-46000 B, above.

Process Standard D-060 - Emergency Evacuation of Personnel"

Ball 3X system requirements just prior to an area evacuation were stipulated in the revision. Un-bypassing of an automatic ball 3X insertion system which is actuated by loss of process water pressure to the reactor or a manual trip of the ball 3X system is now required.

HW-41000, Process Equipment Standards

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

Process Standard D-040 - "Period Instrumentation"

Equipment maintenance, response, and functional testing requirements for the sub-critical monitor are specified in this Standard. These requirements are designed to ensure an accurate period indication for reactor startups.

HW-27155 Rev1 - "Process Standards - Water Plant"

Six revised Process Standards were issued during the month. These were:

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Process Standards 183-A-020, 183-A-070, 183-A-090 - "Separan or Hagan Coagulant Aid"

References to lime, activated silica, and caustic soda were deleted since these chemicals are no longer used in the water treatment process.

A purified form of Separan, designated as Separan NP 10, was added as an acceptable chemical for water treatment.

Process Standard 183-A-050 - "Chlorine Addition"

The limit on total chlorides was deleted. Long-term increase of chlorides is easily monitored by required weekly analyses and the short duration chloride trends have proven to be no problem.

Process Standards 183-A-060 - "pH Control"

References to lime, activated silica, and caustic soda were deleted since these chemicals are no longer used in the water treatment process.

Other changes to the Standard are as follows:

1. Maintenance requirements of pH instrumentation were revised.
2. Water sampling location requirements were revised to include the clear-wells and their inlet and outlet flumes.
3. Monitoring of treated water pH values was upgraded from Advice to a mandatory requirement.

Process Standard 183-B-030 - "Composition of Filter Beds"

Filter bed specifications for the top layer were revised to require a coarser filter media which will improve the filter plant capacity.

PROCESS CHANGE AUTHORIZATIONS

Eight 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 #0-48 - "Boiler Testing, F Reactor"

Water Plant Standard 184-D-010 requires that the 184 Building boilers, which supply steam to the emergency process pumps, be tested at least once per year to demonstrate their ability to pick up the emergency steam load in event of a BPA power failure.

On April 28, F Water Plant could not meet this requirement due to maintenance work needed on one of the boilers and an unscheduled outage which precluded testing of the standby boiler (#4).

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Authorization was given to use the untested boiler in the reactor's emergency backup system provided:

1. Number 4 boiler would be placed in service and observed for proper control response while number 3 boiler (needing maintenance) was still in service.
2. Number 4 boiler would be performance tested as required in Standard 184-D-010 within 24 hours following completion of the reactor outage.

PCA #0-49 - "Spline Insertion Monitoring - KE Reactor"

Process Standard C-120 requires continuous monitoring of the outlet water temperature of a process tube receiving a spline. It further requires that if an increase or no change in outlet water temperature is observed when at least eight feet of spline have been inserted under the active zone charge, the splining operation shall be discontinued. A reduction in non-equilibrium production losses can be obtained during reactor startups from a minimum outage, if splines can be inserted during a period before significant tube temperature response is noted, or during conditions where rod movement could make temperature response to the spline insertion.

Authorization was given to insert splines under conditions where temperature response to the insertion may not be detected, provided the following restrictions were met:

1. Continuously monitor the outlet water temperature on the process tube receiving the spline.
2. Maintain outlet water temperature on the tube receiving the spline at least 10°C below TAI limits during the spline insertion.
3. Continuously monitor the Panellit pressure on the process tube receiving the spline. If the pressure falls outside a stated band, the spline operation shall be discontinued.

This authorization expired on April 29.

PCA #0-50 - "Panellit Base Checks - B Reactor"

Process Standard A-050 requires that a base check be completed on the first minimum outage for any gauge on which a range change was made during operation. Base checks are made during the outages to avoid potential Panellit scrams.

Due to an over-sight during a recent outage, reactor operation was resumed without completing all the necessary base checks.

Authorization was given to continue operation since:

1. Panellit gauge bases for all tubes charged during the outage had been checked as required.
2. The ranges of the unchecked gauges had not been changed during the shut-

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down and data were available for range changes made during operation.

As an additional precaution, a requirement was specified in the PCA that any of the subject tubes operating closer than 5°C to their TAI limit shall be base checked.

The PCA expired June 1, 1960.

PCA #0-51 - "L.P. Annunciator Trip - B Reactor"

Process Standard C-110 requires that during reactor operation the process water pressure be monitored by a time delay by-passing relay, which will permit a drop of the 3X balls if the water pressure falls faster than a specified decay rate.

A low pressure annunciator trip recently occurred which indicated that the timing relay has been actuated and that it had automatically by-passed the ball 3X rapid water pressure decay safety feature.

Permission was granted to by-pass the ball 3X system during equipment repairs, provided the 3X balls be manually tripped upon rapid water loss to the reactor. Constant supervisory coverage of the Control Room was specified during the by-passed condition and manual scrams required if any situation arose which paralleled the safety function of a by-passed component.

PCA #0-52 - "Ball 3X Automatic Trip Settings, KW Reactor"

Process Standard C-110 specifies the riser pressure settings that actuate the time delay by-passing relay which in turn will permit a 3X ball drop upon too rapid a water pressure loss to the reactor.

In order to place a sixth process pump in service during operation, it was necessary to reset the ball 3X riser pressure trips. By-passing of the automatic ball drop feature which functions upon too rapid a water pressure loss, or upon water pressure decay below a certain value, was necessary to avoid tripping all of the ball 3X hoppers. Authorization was given to by-pass the automatic ball drop features provided the following precautions were taken:

1. The riser pressure ball 3X switch settings shall be maintained within the requirement of the Process Standards.
2. The riser pressure shall be continually monitored and the #1 safety circuit tripped upon top-of-riser pressure reduction of 60 psi.
3. If #2 above is accompanied by a low sensitivity alarm on the seismoscope, the inner ball 3X system shall be manually tripped.

PCA #0-53 - "Ball 3X Testing - KE Reactor"

Process Standard C-110 requires that the operability of the ball 3X system be tested annually.

The last full test was made during May 1959, at which time all components of

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the system functioned properly.

During a recent unscheduled outage, insufficient manpower was available to perform the required facility testing.

The Process Change authorized delay in testing of the system until July 1, 1960.

PCA #0-54 - "Vertical Bowing Traverse Delay - F Reactor"

Process Standard G-010 requires measurement of the vertical bowing of a process tube in the top center of the reactor at three month intervals and bowing measurements in the top near and far corners of the reactor at six month intervals.

Scheduling difficulties precluded the accomplishment of the required measurements during a recent outage.

Authorization was given to delay these measurements until June 30, 1960.

PCA #0-55 - "Thermal Shield Cooling - K Reactors"

Process Standard A-070 specifies the temperature limitations on the bottom reactor shield cooling water and the steel membrane located below the base pad of the reactor. The specified temperature limits are met during the winter months but difficulties arises in meeting these requirements during the summer.

Operating experience has shown that the thermal gradient in the pad is well below the value which might damage it.

Authorization was given to increase the maximum outlet water temperature limit for the bottom thermal shield by 25 per cent and reduce the lower limit of the membrane temperature 20 per cent. This authorization will expire on August 30, 1960, or on revision to the referenced Standard, whichever is sooner.

PCA #0-56 - "Ball 3X Trip Setting - B Reactor"

Process Standard C-110 specifies the riser pressure trip settings that actuate the time delay by-passing relay which in turn permits a 3X ball drop upon too rapid a water pressure loss to the reactor.

Through an error, the higher of the two specified trip settings was established 35 psi lower than specified in the referenced Standard.

Authorization was given to by-pass, for three hours, the rapid water loss time delay relay function, to enable proper setting of the riser pressure trips without scrambling the reactor.

Alternate monitoring procedures, to provide protection during the by-pass period, were specified in the PCA.

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PROCESS ASSISTANCE

Auditing

One engineer audited the conformance to Process Standards by making 17 inspections at each reactor during the report period.

Graphics

Graphic services prepared 34 charts, graphs, and visual aids for various IPD and HLC 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>
6/1/60	1583-H	KL-458-C	I&E Natural	424	Side-Other
6/2/60	2471-F	KL-441-D	I&E Natural	466	End -Male
6/3/60	3553-H	MA-282-A	Solid Natural	588	Split-Long.
6/9/60	3964-D	KH-150-C	I&E Enriched ⁽¹⁾	807	Side-Hot Spot
6/16/60	2178-H	KL-458-C ⁽²⁾	I&E Natural	468	Side-Hot Spot
6/17/60	2155-DR	MA-285-A	Solid Natural	554	Side-Hot Spot
6/18/60	2456-C	KG-256-E	I&E Enriched ⁽¹⁾	697	Side-Hot Spot
6/20/60	1889-C	KJ-222-D	I&E Natural	488	Side-Hot Spot
6/26/60	3277-B	KL-433-D	I&E Natural	683	Unknown

(1) 0.94 per cent U-235

(2) Multiple failure lot

Legend:

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

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

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.

End - Failure on the end of an I & E piece, probably caused by water penetration through a weld.

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OPERATIONAL PHYSICS OPERATION

PILE PHYSICS ASSISTANCE

Use of supplementary control systems reduced startup losses at C, DR, H, KE, and KW Reactors to about 0.2 equilibrium days equivalent production, representing an improvement of about 0.4 days from the average 1959 startup efficiency for these reactors. Scheduled supplementary control additions at B, D, and F Reactors are aimed toward achieving similar efficiencies.

Reactivity shortages, caused by a relatively large number of inactive tubes at H and F Reactors and a low central zone exposure at KW Reactor, limited the average all-pile flattening efficiency to slightly below the record level achieved in May. However, the total ECT was the third highest monthly average - nearly 77.5 per cent of all reactor tubes.

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

Reactor	B	C	D	DR	F	H	KE	KW
ECT in June (1)	1475	1700	1500	1560	1430	1620	2505	2465
12-Month Avg. ECT	1430	1660	1485	1540	1445	1615	2490	2470
Equil. Scram Time (2)	14-16	25-35	14-20	25-35	14-20	14-20	20-24*	20-24*
No. of Scrams and Recoveries (3)	1/1	3/3	3/3	0/0	0/0	0/0	0/0	0/0
No. of Non-Scram Outages (4)	2/1	1/1	1/1	2/2	0/0	0/0	0/0	0/0
Reporting Period -								
From:	5-24	5-24	5-25	5-25	5-24	5-21	5-25	5-23
To:	6-24	6-24	6-23	6-24	6-24	6-24	6-24	6-24

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

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

B Reactor - S. L. Stewart

Startup efficiency was increased by about 0.1 of a day's production by charging smaller increments of poison in certain PCCF tubes. A slight

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sacrifice in turnaround power level was more than compensated by the faster rate of power increase following discharge of the full poison columns; the shorter poison columns could be discharged at a higher level because of their less pronounced effect on flux distribution during discharge. The first I & E enriched fuel element rupture at B Reactor and an unexplained Panellit scram caused the only two outages of the report period.

C Reactor - R. A. Chitwood

Increased poison spline usage resulted in a record low non-equilibrium loss of 0.16 days and a continued record high radial flattening efficiency which was about three per cent above the pre-spline average. Because of a large number of outages the high average flattening efficiency was particularly significant.

In preparation for a production test to permit "quickie" rupture discharges at low power level, a level of one MW was maintained following one shutdown to evaluate the operating problem of maintaining this low level and to establish appropriate flux monitor safety trip levels.

Four scrams were followed by successful recoveries during the report period. Continuity was further interrupted by two ruptures and one scheduled outage.

D Reactor - J. F. Jaklevick

The limitation of 20 splines per startup, necessitated by the mechanical and radiation exposure problems with the interim spline removal equipment, reduced startup efficiency only about 0.2 of a day's production per startup. Charging temporary poison was delayed an hour to repair the PCCF charge machine following one startup; about 0.2 of a day's production loss resulted. After one spline cap insert came unscrewed and floated downstream, causing a Panellit scram, all other spline cap inserts were welded to the caps. A record high flattening efficiency of nearly 1530 effective central tubes resulted from effective spline usage; the average effective central tubes of 1500 tied the previous record for a report period.

The newly installed geminol graphite thermocouple stringers were being calibrated by solid aluminum flux traverses to provide front-to-rear flux distribution monitoring.

Operating continuity was interrupted by un-scheduled outages due to a front pigtail leak, a rupture, and the loose spline cap insert.

DR Reactor - D. G. Montague

The second block discharge (976 central zone tubes) was completed early in the report period. Initial flattening efficiency following the startup with the new load was slightly lower than that following the first block discharge, primarily because of a lower average residual exposure of the fringe columns. The replacement of the natural mint with enriched "black" mint in the top fringe tubes for shield protection also contributed to the slight reduction in flattening efficiency. Higher graphite temperatures permitted by a production test to increase reactivity during the low exposure portion

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of the metal cycle, reduced the enrichment requirements by about 30 tubes; results indicated that even further enrichment reductions may be made with the next block loading.

Conservative operating procedures because of the reactivity uncertainties associated with the block discharge, and the reactivity loss caused by a water leak resulted in a startup reactivity about 800 c-mk lower than predicted and in a non-equilibrium loss equivalent to 1.65 days of production.

Transition to a 32-piece fuel element column from the 34-piece column reduced the dry pile reactivity to the extent that temporary poison and the VSR's are sufficient without the 3X system to meet total control requirements during any length outage.

F Pile - C. D. Wilkinson

Operation has been relatively steady, being interrupted by only two minimum downtime outages. Difficulties in maintaining a constant gas composition for several days caused reactivity cycling which reduced startup and flattening efficiency. Nearly 20 tubes were out of service in preparation for tube replacement scheduled for early July; a lower than average number of effective central tubes has resulted. Number four HCR remained out of service during the report period to prepare for replacement with a half-rod; efficiency was not affected.

H Reactor - A. R. Kosmata

A record low startup loss of 0.14 days was attained. To improve startup efficiency further, movement of several PCCF columns is scheduled for one of the next few outages. Several outages and up to 17 inactive tubes caused the equilibrium ECT to fall below 1600 for the first time in about six months. Five water leaks, three ruptures, and four shutdowns caused by pigtail leaks and loose caps interrupted continuity.

KE Reactor - F. C. Franklin

Low non-equilibrium losses and high flattening efficiency, both made possible through efficiency spline usage, plus steady operation, resulted in the attainment of a new production record in May. A "sliding" tube power limit has been adopted which permits higher tube powers during the first low exposure days of an operating period and a gradual decrease as the rising uranium exposure increases flux distribution cycling tendencies and rupture potential. Use of 120 splines following the one outage in the report period reduced non-equilibrium losses by about 0.8 day's equivalent production.

KW Reactor - A. D. Vaughn

Operating continuity has been continuous since June 2. A reactivity shortage caused by the large centralized fuel discharge reduced flattening efficiency by about two per cent during the first part of this operating period. Long term reactivity gains permitted the flattening efficiency to

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return to normal after a week's operation. Further long-term gains would have forced a shutdown to charge poison after about 20 days operation; however, splines were used to compensate for the reactivity gains, thus permitting continued operation.

PROCESS PHYSICS STUDIES

Safety Control Studies

With the transition to the "square pile" method of total control evaluation at F Reactor this procedure is now being applied at all eight reactors.

Control Efficiency Studies

Preliminary analysis of the operation with the first central zone block loading, discharged late in May, indicated that as a direct result of the uniform exposure distribution the radial flattening efficiency was improved about four per cent over that achieved with a random exposure distribution. The average exposure deviation from the standard variable goal did not appear to be any greater than has been experienced with normal scattered discharging.

A survey of the enrichment requirements and the total control aspects of front-to-rear flattening was completed for the older reactors. About 120 split enrichment columns would reduce the average to maximum specific power by 18 per cent. Because of their more extensive vertical control systems C and H Reactors would have no problems meeting total control requirements with this alteration in pile loading; however, large amounts of supplementary control would be required during outages and startups at the other older reactors.

Shielding Studies

Film readings indicate that front face neutron leakage, which has reached an operating dose rate as high as 30 mrem per hour in some cases, passes through the iron rings and donuts around the gun barrels; no neutron moderating materials interrupt the travel of the neutrons through this region. Square polyethylene plates, which would moderate and scatter the escaping epithermal neutrons, are being considered as a short range relief; these plates would clip onto nozzle caps thus forming a transparent "wall" which should provide only negligible interference with normal front face personnel operations. The feasibility of changing the materials and/or design of the rings and donuts in conjunction with possible overboring of the process channels in the future is being investigated.

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TESTING OPERATION

IRRADIATION TESTING OPERATION

DR-1 Loop

The DR-1 Loop was operated a total of 664 hours during the report period. The primary loop was in operation for 287 hours of the total time, with 147 hours at test reference conditions. The loop was on the auxiliary system for 377 hours, due to a bearing failure on the #2 motor-generator set. The bearing failure caused a reactor scram, with 23 minutes lost production charged to DR-1 Loop. The bearing was replaced and the motor-generator set is back in service.

One of the motor-generator sets continues to vibrate excessively when exciter current is applied to the generator. It was sent to the General Electric Company Apparatus Service in Spokane, Washington, for investigation. The investigation is still in progress at month end.

Identification of the test element thermocouples was confirmed by the temperature distribution in the test element at reference conditions.

Fission product Xe-133 was detected in the coolant gas after raising the test element temperature to reference conditions, indicating a possible break in the element cladding. No iodine isotopes have been detected.

H-1 Loop

The H-1 Loop was on recirculation cooling for 62 per cent of this report period, and on process water cooling for the remainder of the time.

Naval Reactors cancelled the BAPL-120-8B test and all further testing in the H-1 Loop. Determination of the ultimate disposition of the loop is in progress.

Special Irradiations

Ceramic Fuels Development Operation has proposed the simultaneous irradiation of several defected UO₂ fuel elements. A draft of a production test to permit the irradiation of one defected assembly in a KE front-to-rear test hole was routed for comments.

A second UO₂ swelling capsule, to be irradiated in 3865 KW, is ready for charging. A supplemental production test which will permit the loading of enrichment to compensate for the expected reactivity loss, has been approved.

Sample Irradiations

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

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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>
F	E	Quickie	HAPO-172	10	Effluent water (radioisotopes in effluent water study)
D-DH		PCCF	HAPO-184	11	Washington-Designated Program
D		PCCF	HAPO-218	2	Natural uranium (fission product release studies)
F	E	Quickie	HAPO-119	4	Graphite (damage studies)
F	E	Quickie	HAPO-229	4	UO ₂ (thin films)
KW	4C	Snout	FWS-105	1760	Cobalt (fish tags)
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-171	5	Plastics and rubber (damage studies)
KE		Gamma	HAPO-141	1	Plastics and rubber (damage studies)
KE		Gamma		2	Plastics and rubber (damage studies)

Borescope Activities

Process Tube

Remarks

2248-KW	Tube in good condition
4250-KW	Deep chatter marks approximately 12 inches from front Van Stone.
4488-KW	Tube in good condition

Vertical Bowing Measurements

A summary of the results of vertical bowing measurements follows. All distances are measured from the front Van Stone.

<u>Date</u>	<u>Area</u>	<u>Number</u>	<u>Distance</u>	<u>Results</u>
6-5-60	105-B	4454-B	36'	Up .15" at 9'6" since 11-29-59 Up .01" at 20' since 11-29-59
5-31-60	105-H	A Test Hole H-1 Loop	32'	No previous data

COOLANT TESTING OPERATION

KER Loop Operations

KER-1 - Testing of crud film build-up on zirconium-clad fuel elements in pH 10.0, 288 C loop water continued until June 11, 1960, when leakage through the process water back-up check valves forced reduction of loop

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temperature to approximately 100 C. The above testing is being done with a thermocouple train charge, consisting of one, one-inch diameter natural uranium rod 10.78 inches long, with five imbedded thermocouples and two enriched 36-inch tubular heater elements. This test is described and authorized by PT IP-314-A.

KER-2 - Testing of scaled-down NPR prototype fuel elements at 273 C and pH 10.0 continued during the month, as authorized by PT IP-292-A. Testing is for determination of dimensional change, radiation damage, and corrosion attack.

KER-3 The loop remained on stand-by status during the month due to unavailability of fuel element test charges. Test elements are now on hand and are awaiting a reactor outage for charging.

KER-4 - Testing of scaled-down NPR prototype fuel elements at 288 C and pH 10.0 continued during the month, as authorized by PT IP-292-A and PT IP-250-A, Supplement C. Testing is for determination of dimensional change, radiation damage, and corrosion attack.

1706-KE Single-Pass Tube Operation

Four central zone process tubes were supplied with water by 1706-KE high head pumps for corrosion and effluent activity testing, as authorized by PT IP-197-A and PT IP-197-A, Supplement C. These 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
4963	6.5	Process	2 ppm
5063	6.5	Process	2 ppm

Outage Performance

No unscheduled outages were charged to Coolant Testing Operation activities during the month. 1.4 outage hours were used for repacking a front face valve on KER-4.

Ex-Reactor Facility Operations

1706-KE Mock-Up Tubes - The mock-up tubes were operated during the month for testing of:

1. Decontaminating processes for the present reactors.
2. Corrosion characteristics of improved nickel-plated fuel elements at 120 C and 165 C.
3. Effect of concentrated aluminum corrosion product on aluminum corrosion rates.

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ELMO-5 - Tests for determining uniform corrosion of various materials at approximate NPR conditions (290 C and pH 10.0) were continued during the month. The following materials were tested:

Zircaloy-2	Nickel
Stellite-6	D-979 Nickel Alloy
Stellite-12	J&L Steel #313472
Hasteloy-C	Hasteloy-X
Monel	Inconel
Carbon steel, Zircaloy-2 galvanic couple	
Cold-rolled, normalized carbon steel	

Testing of the carbon steel, Zircaloy-2 galvanic couple was completed during the month.

ELMO-7 - The loop resumed operation at 300 C and pH 10.0 on June 20, for fretting corrosion testing of full-length PRTR element and testing of brazed end closures on NPR candidate fuel element shapes.

ELMO-10 - The loop continued operation during the month on low temperature decontaminant-scanning tests. Tests were completed on 53 processes.

CEP-1 - Four cyclic decontamination tests were completed during the month, using Turco-4502, followed by Turco-4518 with a nitrogen purge for excluding all oxygen during decontamination runs. Loop conditioning between decontamination runs was performed at 300 C and pH 10.0.

CEP-2 - The loop continued operation at 300 C and pH 10.0 during the month for cyclic fretting corrosion tests of Zircaloy-2 PRTR components. The fretting corrosion elements are being mechanically vibrated for accelerated fretting corrosion attack.

CEP-4 - Three cyclic decontamination tests were completed during the month, using Wyandotte 1113, followed by Turco-4512. Intermediate loop conditioning runs were performed at 300 C and pH 10.0.

REP - One gross decontamination test was completed during the month. The loop was grossly contaminated with 10 grams of irradiated uranium and decontaminated with Turco-4502, followed by Turco-4512. General background exposure in the loop enclosure was reduced to approximately 50 mr/hr.

COMPONENT TESTING OPERATION

Irradiated Material Examination

Examinations were completed on the fuel elements from the following 27 tubes in the Metal Examination Facility (105-C) and the Technical View Pit (105-C) during the month of June.

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<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>
216A	2768-H	255A	1987-H	255A	4473-H
	3482-H		2086-H		4474-H
	1281-F		4272-H		4572-H
	3056-F		4273-H		4573-H
	0877-F		4274-H		4574-H
	2357-C		4372-H	272A	3869-C
	2064-C		4373-H		3479-C
	4965-KE		4374-H	308-F	3668-C
255A	0568-H		4472-H		3677-C

Process Tube Corrosion Monitoring Program

In-reactor measurements of 590 process tubes were completed during the month. Listed below are the number of tubes measured per reactor and the document numbers of the reports issued:

<u>Reactor</u>	<u>No. of Tubes Probologged</u>	<u>Report No.</u>	<u>HW Number</u>
DR	98	26	65487
B	156	27	65546
F	35	28	65589
H	8	29	65590
B	40	30	65626
H	46	31	65746
F	55	32	65758
B	45	33	65861
H	107	34	65918

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

Tube 1072-DR was removed from the reactor for further investigation of the rate of corrosion and to verify the accuracy of the Probolog on second generation tubes. Actual wall thickness of this tube showed the Probolog interpretation to be accurate within 4 mils.

Tubes 0887-H, 4162-H and 4372-H were removed because they were leakers. Tube 4162 had a longitudinal crack about 1/2 inch upstream from the rear van stone flange. Tube 4372 was a rear Van Stone leak. In tube 0887-H a transverse crack was found on the top wall, located approximately 23 feet from the rear Van Stone flange. A sample containing the crack and a portion of the tube that was located in the front gun barrel was taken to Radiometallurgy Laboratory, HLO, for further studies to determine the cause of the crack.

Visual examination was made on tube 0161-B to verify the fact that it was a leaker. From the Probolog trace it was interpreted to be a leaker; however, it was pressure tested and was said to hold pressure. The tube was removed from the reactor on the basis of the Probolog interpretation. After removal from the reactor, visual examination revealed nine holes located between 7-1/2 and 8-1/2 feet from the rear Van Stone flange.

Front Face Flexible Connector Examination

Inspection was made on 117 connectors at 105-B Reactor, upon which Reactor personnel had found broken wires. The wires were examined to determine whether they were broken as a result of cavitational damage or mechanical damage. No broken wires resulting from cavitational damage were found.

Four connectors from H Reactor that were touching the nozzle were removed for examination. Inspection revealed that the area in question was damaged.

Panellit Programs

Gauges processed by Maintenance personnel during the month totaled 234. Component Testing Operation inspection of these gauges resulted in detection of 51 gauges which did not meet inspection criteria, for a rejection rate of 21.8 per cent.

In-board reliability examinations were performed on 1333 gauges during the month. Of these, 125 were found to be substandard or defective in some way, and were removed from service. This is a percentage defective of 9.4, slightly under the rate predicted with program inception, and approximately 4 per cent less than the average per month for the past year.

In-board Bourdon coil leak examinations of 1366 gauges resulted in detection of 13 leakers for a leak incidence rate of 0.95 per cent, approximately double the normal monthly average. This increase is accounted for by the fact that gauge-Bourdon coils examined have been in service approximately 12 months longer than the average Bourdon coil examined.

Response times were determined on a total of 1333 gauges during the month. Of this number, 46 showed slow response and received corrective action. Percentagewise, 3.6 of gauges examined showed slow response. Comparative percentages, since the response detection program began, are listed and show a desirable reduction and leveling off:

November, 1959	12.0
December, 1959	9.5
January, 1960	12.5
February, 1960	7.5
March, 1960	4.8
April, 1960	4.85
May, 1960	2.7
June, 1960	3.6

"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	106	None
Rejected	40	
Per cent Rejected	37.7	

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Dial shaft-bearing examination during the month was performed on 96 Panellit gauges which had failed for various reasons. Twenty-eight, or 29 per cent of dial shafts examined contained light to heavy deposits of corrosion.

During the month, 96 gauges received failure analysis examination. The "Failure Analysis Report", for the 60-day period ending June 1, 1960, was published as document number HW-65614.

A test series, providing for accelerated corrosion of dial shafts and bushings to determine effectiveness of several possible corrective measures, was initiated during the month.

R. W. Beil 7/8/60

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MANUFACTURING OPERATION

PRODUCTION OPERATION

PRODUCTION PLANNING & SCHEDULING OPERATION

Assumptions for the next five year forecast were completed and reviewed with Manufacturing Operation management. Production input and output figures were being computed at month-end. Forecast revision of usage of self-supported and bumper fuel elements was completed and figures transmitted to FPD for planning purposes.

There were no discharge exposure plan adjustments effected during June. The overall exposure level of material discharged in June was near goal but was below that recorded in May due largely to early discharge of the central zone of DR Reactor.

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>
April	727	746	644	701	826	731
May	724	749	691	677	795	730
June	667	754	669	675	767	776

Ten casks containing half the HAPO inventory of four-inch unenriched Li-Al slugs and one cask containing 26 enriched Li-Al slugs (for tritium Yield determination) were sent to the Savannah River Plant. Six casks of polonium were shipped to Mound Laboratory to complete FY 1960 requirement for this product.

PRODUCTION COMPUTING OPERATION

Production and operating data for each reactor tube were processed on the IPD Computing and punched card equipment. Scheduling, forecasting, and accountability reports were issued to fulfill the corresponding function 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 June were as follows:

Carload shipments for IPD	-	52
Carload shipments for other Depts.	-	187
Truck shipments for IPD	-	167
Total		406

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Purchasing was requested to extend the term and increase the quantities on the FY 1960 coal contracts to insure coal deliveries during the months of July and August and allow more time for new contract negotiations.

PRODUCTION REPORTS & STATISTICS

Routine processing of Daily & 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 & HLO.

MISCELLANEOUS ACTIVITIES

Five first-year MTP men reported-in during the month and were placed in pre-selected productive work assignments (one in R&E, one in FE, and three in Manufacturing). Liaison with the Relations Operation was maintained relative to arrangements for "Manufacturing Studies" classes scheduled for starting in September.

Employment consideration of MTP graduates becoming available this summer was continued, in liaison with Relations Practices and other IPD Sections.

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REACTOR OPERATIONS STATISTICS - PROCESSING

MONTH		REACTOR OPERATIONS STATISTICS - PROCESSING																	
June, 1960																			
INPUT PROD.-PU (% OF FORECAST)		106.2	99.4	120.1	118.7	101.5	80.9	127.7	123.9	TOTAL									
TIME OPER. EFF. (% OVERALL)		82.3	78.8	88.8	92.6	83.1	63.4	91.9	94.5										
NO. OF REACTOR OUTAGES & HOURS																			
SCHEDULED		0	98.6	1	97.0	0	49.9	0	33.7	1	92.2	1	172.0	1	56.1	0	34.5	4	634.0
UNSCHEDULED - SCRAMS		4	15.6	5	20.6	0	-	3	3.1	0	-	0	-	0	-	0	3.9	12	43.2
- OTHER		0	13.6	3	35.3	2	30.4	1	16.8	2	29.7	6	91.7	0	2.4	0	0.9	14	220.8
TOTAL		4	127.8	9	152.9	2	80.3	4	53.6	3	121.9	7	263.7	1	58.5	0	39.3	30	898.0
BREAK'DN OF REACTOR OTGE HRS.																			
PLANNED																			
CHARGE-DISCHARGE		45.1	61.2	17.6	11.8	30.2	34.6	47.3	30.6								278.4	4.8	
TUBE REPLACEMENT		7.5	-	-	-	6.8	91.8								106.1	1.9			
PROJECT WORK		-	11.5	-	-	-	-	-	0.5								12.0	0.2	
PRODUCTION TEST		5.0	21.4	-	1.3	9.1	3.0								39.8	0.7			
MAINTENANCE		41.0	2.9	32.3	20.6	55.2	36.5	5.8	2.6								196.9	3.4	
MISCELLANEOUS		-	-	-	-	-	-	-	0.8								0.8	0	
SUB - TOTAL		98.6	97.0	49.9	33.7	92.2	172.0	56.1	34.5								634.0	11.0	
UNPLANNED																			
CHARGE - DISCHARGE		-	-	0.6	3.9	1.0	4.8								10.7	0.2			
PRODUCTION TEST		-	-	-	0.4	-	-	-	0.4								0.4	0	
RUPTURE REMOVAL		3.3	26.0	14.6	10.9	2.8	35.7								93.3	1.6			
WATER LEAK		0.8	-	-	-	22.1	40.7								63.6	1.1			
MAINTENANCE		9.5	1.7	15.2	2.0	3.8	10.5	2.4	0.5								45.6	0.8	
INSTRUMENTATION																			
PANELLIT		15.6	20.3	-	2.7												42.5	0.8	
MISCELLANEOUS		-	7.9												7.9	0.1			
SUB - TOTAL		29.2	55.9	30.4	19.9	29.7	91.7	2.4	4.8								264.0	4.6	
TOTAL		127.8	152.9	80.3	53.6	121.9	263.7	58.5	39.3								898.0	15.6	
NO. SLUG RUPT. (ALL TYPES)		1	2	1	1	1	3	0	0								9		
NO. NEW TUBES INSTALLED		4	10	2	0	0	67	0	1								84		
TYPE OF WATER LEAK - TUBE		1	1	-	-	-	2	-	-								4		
VAN STONE		-	-	-	-	-	1	-	-								1		
Helium Used - m cu. ft.		395.7	662.8	389.1	233.4	719.4	254.1	286.4	428.4								(3)3369.3		

- (1) Continuation of a May outage.
- (2) Installation of zirconium tube.
- (3) Helium consumption during the month of June represents a 35 day consumption period extending from the regular cutoff date of May 25 through the end of the year on June 30.

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MONTH	REACTOR OPERATIONS STATISTICS — POWER										SHEET 1	
	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL			
RIVER WATER (BLDG. 181)												
TO RESERVOIR (BLDG. 182)	14509		4383		1479	2462			22833			
TO FILTER PLANT (BLDG. 183)	64950		96010		77846	67000	178700	177000	661506			
TO FILTER PLANT (C&DR)	104263		68096						172359			
TO R & E (KER) & FEO			203				325		528			
TOTAL	183772		168692		79325	69462	179025	177000	857226			
TOTAL	7936.8		7287.5		3426.9	3000.8	7733.9	7646.4	37032.2			
RESERVOIR WATER (BLDG. 182)												
TO POWER HOUSE (BLDG. 184)	34		63		378	45			520			
TO COND. SYSTEM (BLDG. 190)			1620		1076	2417			5113			
TO COND. SYSTEM (190DR & 182F)			2700		25				2725			
TO EXPORT SYSTEM	14025								14025			
TOTAL	607.3		189.3		63.9	106.4			966.9			
FILTER WATER (BLDG. 183)												
TO POWER HOUSE (BLDG. 184)	152		157		103	140			552			
TO PROCESS (BLDG. 190)	75210	81570	78513	79430	75113	59500	171202	171757	792295			
TO 108	2500	4500	326		1100	1020			9446			
TO 105DR			327						327			
TO FILTER PLANT (BLDG. 182) & 183	126	14703	13141						(26842)			
TO F & S SYSTEM			361						976			
TO R & E (KER) FEO			153		343	146			551			
BACKWASH	1665	3490	3032	(1806)	1187	6194	7100	5243	29717			
TOTAL	3441.0	4504.1	4147.6	3509.4	3362.9	2894.4	7719.8	7646.4	37225.6			
PROCESS WATER (BLDG. 190)												
TO REACTOR	74810	81170	78113	79030	74713	59000	169600	170900	787336			
TO REACTOR	84290	95200	83800	84200	85000	85500	182000	180000	879900			
POWER HOUSE (K AREA)							43	12	55			
108 (KE ~ KW)							1053	445	1498			
TO R & E (KER)							106		106			
BUILDING USAGE	400	400	400	400	400	500	400	400	3300			
TOTAL	3249.0	3523.8	3391.7	3431.3	3244.9	2570.4	7395.9	7419.9	34226.9			
RIVER DATA												
ELEVATION (MSL, FT.)	402.5		391.7		380.2	383.7		397.3				
	399.3		388.5		375.5	381.1		393.2				
	401.3		390.4		376.2	382.6		395.5				
TEMPERATURE	56.5		56.0		57.0	56.3		56.6				

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REACTOR OPERATIONS STATISTICS - POWER

MONTH
June, 1960

SHEET 2

	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL
WATER TREATMENT DATA									
AT BLDG. 182					64				64
BLDG. 183	2805.8	4504.1	4147.6	2941.7	3362.9	2894.4	7719.8	7646.4	36022.7
CHEMICAL CONSUMPTION									
CHLDRINE (BLDG. 182)	17101	39190	29820	26270	24863	27626	68900	76600	31037.1
(BLDG. 183)	.7	1.0	0.9	1.1	0.9	1.2	1.1	1.2	1.0
AVG PPM									
*Alumina	23600								23600
ALUM	64951	212266	254563	153296	210195	161396	578800	573100	2208568
AVG PPM	6.8	5.7	7.3	6.3	7.5	6.7	9.0	9.0	7.4
SEPIRAN	250	150	450	325	215	100	240	420	2150
AVG PPM	.010	.004	.013	.013	.007	.004	.004	.007	.007
SULPHURIC ACID	216775	316423	243516	145820	207292	147787	349800	400200	2027613
(AG 100%)	9.3	8.4	7.0	6.0	7.4	6.1	5.4	6.3	6.8
AVG PPM									
DICHLOROMATE	48550	52475	45203	45713	48800	37470	99800	100700	478711
PURGE MATERIAL CONSUMPTION									
SOLIDS	-	200	-	-	-	-	-	-	200
LEB									

*Alumina and Alum combined for Avg. PPM in alum column.

REACTOR OPERATIONS STATISTICS - POWER

MILFORD

June 1960

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APPLIED REACTOR ENGINEERING OPERATIONINDUSTRIAL ENGINEERING OPERATIONPortable Powered Valve Operators

All reactors, with the exception of 105-DR, have been equipped with the air powered crossheader valve operators. The 105-DR installation was deleted because of conflicts with other equipment.

Metal Unloading Ramp

Metal unloading ramps are in use at 105-B, D, DR, and F Buildings for unloading fuel elements from vans.

Charge-Discharge Improvements

Methods and time standards are developed and arrangements being made to test new methods of integrating charge-seating into the charge operation.

Rear Face Improvements

Improved handling system for rear face nozzle caps is in use at KE and KW Reactors. Purchase orders have been placed for handling equipment for the balance of the areas.

Reactor Work Area Material Handling

Development of a magazine container for storage and shipping of fuel elements is complete. Requests have been initiated for application engineering effort to provide a lead reactor installation.

Tube Replacement Improvements

Tube replacement engineering data obtained from front and rear face films is being evaluated to develop improved tube replacement techniques.

Program of Charge-Discharge Improvements in KE-KW Reactors

Tests are being conducted and charging machine modifications scheduled in an effort to utilize charge-seaters in the "K" Reactors.

Assistance to Supplemental Crews Activity

A program to present the theories, application, and benefits of work simplification, motion economy, and methods development application is being presented to Supplemental Crews supervisors and specialists. To date, eight supervisors have attended the 24-hour course.

Office Space Study - 100-H Area

Redistribution of office space at 100-H is being studied at the request of the Manager, H Reactor Operation.

1706-KE Freight Elevator

To determine justification for installing a freight elevator in 1706-KE Building, a study is being made of material handling and personnel movement in the building.

Reactor Production Planning and Scheduling

A work program, Improvement of Reactor Productivity, has been initiated to determine ways and means of effecting improvements by studying reactor outage time in all reactors. This will include analyzing and recording procedures for reactor scrams and outage work breakdowns.

MAINTENANCE PRACTICES OPERATIONSpare Parts Inventory

The IPD portion of the spare parts inventory, as of June 30, 1960, was \$1,764,557.00. Obsolete items valued at \$55,000.00 were deleted from the spare parts inventory during the month of June.

IPD O.P.G. No. 33.46

A revision to O.P.G. 33.46 has been initiated to reflect recent organizational responsibility changes, incorporate provisions to supplement HAPO O.P.G. 4.2, and provide provisions for auditing of pressure vessel requirements.

Maintenance Manpower Study

A broad maintenance manpower study is in progress with the intent of obtaining improvements in maintenance effectiveness, cost improvements, operating continuity, and measurement criteria.

Emergency Rescue Procedure

The Emergency Rescue Procedure has been revised to simplify procedures and define responsibilities. Final procedure is awaiting management approval.

Third Party Inspection

The Third Party Inspection contract with Travelers Insurance Company expired on May 31, 1960, and work is continuing with the contract group to achieve a new contract.

Craft Training

In-plant training is being provided in setting up and servicing the gamma spectrometer.

Twelve instrument trainees received sixteen hours each of training on fundamentals of A.C. electrical theory. On June 28 an electronics training course was initiated for the same group.

Charge-seater maintenance training classes were held for sixty-three millwrights and supervisors.

IPD Communications, Construction Engineering and Utilities, and Technical Library groups are assisting in developing format and layouts for maintenance service manuals, and are also developing an instruction course for manual writers.

Engineering Assistance

A meeting was held on June 13 with Reactor Design, Instrument Design, Project Engineering, Radiological Engineering, and Maintenance Practices Operation personnel to evaluate fog spray instrumentation tests conducted at 100-B Area. The need for additional equipment for this instrumentation system was resolved.

EQUIPMENT ENGINEERING OPERATION

Pressure Monitor System Revisions

The Task Force from Research and Engineering Operation, Facilities Engineering Operation, and Manufacturing Section submitted a preliminary letter-report recommending that the Maintenance Job Authorizations for K, C, and H Reactors' panellit system revisions should proceed immediately on the basis of including alternate switch models.

Rear Face Crossunder Lines

As project representative, Plant Equipment Engineering has participated in formal scope meetings.

GENERAL

NPR Tool Development

Agreement was reached on responsibility for development of NPR special tooling. Equipment Development Operation has assumed the responsibility.

B-C REACTOR OPERATIONOPERATING EXPERIENCE

B Plant - One slug rupture occurred (I&E Regular metal) and was discharged with a charging machine. Power levels were limited primarily by tube power considerations. At 190-B, the eighth process water pump was activated on 6-2-60; subsequent operation has been on a "no spare" basis which will continue through the seasonal warm water period.

C Plant - Two slug ruptures occurred. Four of five scrams experienced were due to Panellit trips. The remaining scram resulted 6-28-60 from an operator's failure to by-pass a power loss relay during the removal from service of No. 11-C process water pump at 190-C; a related outage was necessitated 6-29-60 from lack of sufficient excess reactivity to provide control of graphite and tube outlet temperatures within process standard limits. During the month, power levels were limited by an Operating Severity Index for rupture control.

EQUIPMENT EXPERIENCE

B Reactor - Two leaking process tubes and two thin-wall process tubes were removed; three were replaced and one channel blanked off. Numerous leaks in the hydraulic lines prevented full utilization of the PCCF system; this problem has become acute and replacement of the lines is scheduled. Seven leaking neoprene bellows boots were replaced. A re-examination of all flexible connectors (at tube inlets) revealed no indication of cavitation induced damage.

B Power Facility - At 190-B, the No. 6-A process water pumping unit was temporarily removed from service for replacement of a leaking tube in the flywheel cooling coil assembly.

C Reactor - Replacement of a burned out positioning motor was required to reactivate the G hole neutron flux monitor; replacement of the H hole monitor positioning motor is required and scheduled.

C Power Facility - At 190-C repetitive failure of the outboard wear ring in the impeller assembly of No. 12-C process water pumping unit incapacitated the unit on 6-13-60, and again on 6-26-60; no replacement impeller assembly was immediately available for correction of the second failure. A similar failure occurred 6-28-60 in the No. 11-C pump; on-site repair work was performed to permit temporary use of this unit until replacement assemblies are received July 1 and 2 from the vendor, Byron Jackson Company, San Francisco. All 3 of the above failures occurred to assemblies of the vendor's latest and most highly recommended design.

IMPROVEMENT EXPERIENCE

B Reactor - Installation of Panellit surge suppressors continued, 529 being added in June. Installation of 228 additional reamed venturi-meters during June leaves only 98 yet to be installed. The electrical power source to the evacuation signal was revised to eliminate undesirable effects on the power deviation recorder. A new pressure controller was added to the reactor

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atmosphere gas system. Work continued on Project CGI-791, Reactor Confinement. A safety inter-lock system was completed on the metal loading elevator.

C Reactor - Ten additional zirconium tubes were installed in June (19 to date). A second graphite thermocouple stringer was installed.

C Power Facility - Progress on Project CG-845, Increased Pumping Capacity at 181-C, has been delayed by failure of the vendor, Byron Jackson Company, to deliver the new pumps on schedule.

RADIATION MONITORING EXPERIENCE

No significant contamination or exposure control problems were experienced. Personnel dose rates of 3 r/hr were encountered during removal of graphite samples from the Y hole at C Reactor. Radioactivity control limits have been established for all routinely frequented work and material storage locations within the area and these locations have been incorporated into the schedule of routine surveying for control of radiation and contamination.

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D-DR REACTOR OPERATION

OPERATING EXPERIENCE

Operating levels at D Reactor were limited chiefly by tube power and at DR by bulk outlet temperature. A rupture at D Reactor, a hot spot type, was removed with 7,000 lb. pressure and the tube replaced. A second D outage resulted from a spline cap failure where a cap insert separated, contacted the metal and caused pressure and temperature rise. Other spline cap assemblies were revised to prevent recurrence. Two scrams at DR Reactor were the result of manipulations at the Pannelit board and one from low flow on the gas loop. A hot spot side rupture was discharged with the charging machine. There was a moderate increase in raw water turbidity, causing reduced filter runs. An outage at D Reactor afforded the opportunity to complete repairs on a section of the export line near 115-D building. A surge on the export system occurred when a pump cut out at 182-B building.

EQUIPMENT EXPERIENCE

Reorificing of 241 fringe tubes at D Reactor for charging with I & E metal increased flow by 1600 gpm. D Reactor replaced 48 rear pigtails with the J-2 type. Both reactors are now equipped with 7 graphite Geminol stringers and the associated read-out equipment. A weld failure caused a 3" crack in the rear riser at DR where it connects with the crossover line. The crack was repaired. The No. 5 pump in 190-D developed a water leak on the inboard carbon ring seal, making replacement necessary. Shortly after the pump was put back on the line an oil leak developed in the gear box but all oil seals were found in good condition upon inspection. The No. 8 pump in 181-D was 100 percent rewedged this month.

IMPROVEMENT EXPERIENCE

CG 791, "Reactor Confinement" Concrete pours on buildings at D and DR and excavation for tie-in ducts is in progress. CG 706, "Improved Gas Instrumentation" A gas panel was installed at 105-D control room. Spline Coiler Installation The unit is complete except for wiring of electrical controls. Elevator modifications are complete. Interim Gamma Monitor Heat Exchangers Design is complete and fabrication of the first heat exchanger is 50 percent complete. The exchanger consists of copper tubing sample lines in an open steel exchanger shell as temporary equipment until project action takes place. PT-IP-325-AC - Increased Graphite Limits During DR Reactivity Minimum This production test was initiated and the first part of it terminated during the month. The purpose of the production test is to increase reactivity by increasing graphite temperatures following a block discharge. Some difficulty was noted in maintaining sufficiently low shield temperatures.

RADIATION MONITORING EXPERIENCE

A lapse of radiation control, with a severity of 8, occurred at D Reactor when an operator's face was sprayed with water from a tube cap during spline removal. A second lapse, with a severity of 8, occurred at DR Reactor when a Maintenance employee working in the discharge area, received a dose rate of 700 mrad/hr for 15 minutes from a particle on his scalp. Low level skin contamination was received in the D work area and at DR while two operators were preparing plastic shielding equipment for burial.

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F REACTOR OPERATION

OPERATING EXPERIENCE

Equilibrium operation was limited by rupture control tube power limits and an exceptionally low ECT. The low ECT resulted from 15 process tubes being charged with solid aluminum dummies and 5 others being removed and the channels blanked off. This was done to reduce corrosion on the specific tubes and to reserve tubes for a larger and presumably more efficient tube outage.

Process water flow rates were satisfactorily maintained with the use of the newly installed liquid alum feeding system.

EQUIPMENT EXPERIENCE

Processing activities included the probologging of ninety process tubes for evidence of external corrosion and, as a result, 16 with excessive corrosion will be replaced. Twelve fringe tubes were probed to determine the feasibility of continuing regular 8" metal charging in designated reactor regions; the results were favorable since the tubes will still pass regular fuel elements. An inspection of the horizontal control rods showed a needed brake adjustment on rod #9. The heavy scratches previously noted on rod #6 are still being investigated.

Instrument maintenance activities included repairs to 24 rear face thermocouples and replacement of 8 pressure monitor Panellit gages. A Zone Temperature Monitor System Study revealed that 15 RTD circuits were out of service due to various types of failures; two zone temperature monitor thermocouples were repaired.

Electrical maintenance activities included further evaluation and testing of the new Ball 3X time delay relays, transfer of the "C" elevator electric eye power source to an emergency panel, and installation of a new-type leveling switch for the metal loading elevator.

Power activities included an inspection under the direction of Facilities Engineering Operation of the stator winding for the No. 7A process water pump motor; the winding condition was satisfactory except for the #6 RTD which was disconnected from the circuit. The motor was returned to service on June 4. The #27 voltage relays for the 190 Annex pump motors were by-passed on June 3 so they would not function during the reactor operation and cause a scram; permanent removal of the relays is scheduled for a future shutdown.

Mechanical maintenance activities included the replacement of six rear boots; testing of all vertical safety rod sphincter seals, including the replacement of one seal on VSR #35; repair of a 4" split in the rear face far-side neoprene seal; and the replacement of 450 central zone venturis with the .320 size. Three damaged front face and nine rear face pigtails were replaced and a program was started to replace the "O" rings in the pressure monitor toggle valves with 16 percent replaced to date.

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EQUIPMENT EXPERIENCE (continued)

The 182 surge suppressors were overhauled and the timing needle valves and blow-out gaskets on the oil pump sight glass were replaced; installed a new cup leather in the power cylinder of the #6E backwash valve at the 183 Building and a new base under the #2 acid pump at the 183 Building; replaced the clutch and shaft on the 1A stoker of the #4 boiler and continued the class "A" overhaul on the #3 boiler. An inspection of the #7 pump gears at the 190 Annex showed they were in good condition.

Maintenance Engineering activities included an investigation of a water leak in the rear far 36" riser; the leak resulted from a break at the weld where the vent line attaches to the top of the riser. The break was caused by movement of the riser and repairs will require the installation of an expansion joint.

A check print showing location of rear face wall access holes was completed; Design Change #384-F, to remove and relocate PCCF tubes, was completed; drawings and an estimate were completed for providing high pressure flush water directly from 190-F to 105-F; Design Change #348-F, to fuse each cone valve individually in the 190 Annex, was issued;

A report on Accident #60-10, concerning the damage to the 1608-F Building steam turbine driven pump unit, was issued on June 27, 1960. During modifications to the 105 lunchroom and personnel facilities, the air supply to the 1608 Building was removed from service and the manually operated turbine valve was inadvertently allowed to remain open causing continuous turbine operation. This, in turn, permitted the turbine to run without an adequate load which caused excessive vibration and damage amounting to less than \$2,000. A revised design to provide a fail-safe control is being prepared.

IMPROVEMENT EXPERIENCE

Installation of bulk chlorine feed facilities by Minor Construction forces started on June 13, 1960; work is in progress on installation of an 8" raw water line in the 182 Building pump room in conjunction with the 182-FA pump test facility.

Installation of the Gas Instrumentation System (CGI-706) was completed and acceptance evaluation is in progress.

RADIATION MONITORING EXPERIENCE

F Reactor Operation sustained no radiation lapses of control or personal contamination cases during June. No personal radiation exposure in excess of 3 r/hour rates was required.

H REACTOR OPERATIONOPERATING EXPERIENCE

Bulk outlet temperature of the reactor cooling water limited the power level to an equilibrium level of 1765 MW. Reactor outages caused by slug ruptures and process tube leaks plus a scheduled outage during the last week of the month resulted in input production 19.1 percent below forecast. Standard quality water was produced with average alum and separan feed held higher than normal in order to produce clear storage basin water at the 105-H Building for metal pick up.

EQUIPMENT EXPERIENCE

Sixty-five process tubes were removed and all but four replaced. Of these latter, three were converted to graphite thermocouple stringers and the fourth left as an air channel. A broken graphite block obstructing the channel prevented retubing at this time. Modification of the near downcomer was completed, including perforation of the downcomer trays. The 184-H boiler coal stokers required almost continuous maintenance, due to the use of pit coal containing foreign material, for about 65 percent of the month. This material caused extensive damage to the stoker feed mechanism. An inspection of rear face hardware revealed evidence of wear on several crossheaders at points of contact with their supports. Adjustment and realignment of the supports will be made.

IMPROVEMENT EXPERIENCE

The prototype installation of the Panellit By-Pass Interlocking System (PT-IP-180-E) was placed in service. A study of electric power and lighting facilities in the 105-H Building was completed by Reactor Plant Engineering and recommendations are being evaluated for consolidation into a final report in July. The flushing console design for the "C" elevator (M-11-40-H) is 40 percent complete and should be finished in July. Stainless steel RTD wells for backup of bulk outlet temperature monitoring have been fabricated. They will be installed in the downcomers for functional testing in the near future. Building 181 raw water pump motor heat rise and air flow tests were run to secure data for a project proposal to improve building ventilation at 181-B, D, F, and H.

RADIATION MONITORING EXPERIENCE

There were four lapses of Radiation Control during the month. In three cases, localized doses of 33 mrad, 437 mrad and 10 rad were received. Cause ranged from contact with contaminated equipment to exposure to a small speck lodged in a glove seam. In the fourth case, swabs reading 100 mrad/hr were found in a non-radioactive waste container. In no case, however, were personnel exposed to radiation in excess of established limits.

CENTRAL MAINTENANCE OPERATION

Major activities included modification of the Ball 3X system (MJA-8) at the 105-H Building. Improved design and detail sketches for CG-785 were accomplished and, in addition, work on projects CG-707, 839, and 865.

Other shop, engineering and special service duties were routine

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KE-KW REACTOR OPERATION

OPERATING EXPERIENCE

The K Reactors achieved a new combined production record. A new production high for a 30-day month was also achieved by KW Reactor. Power levels were limited by rupture control tube power limits.

EQUIPMENT EXPERIENCE

Repairs to the 72" effluent water line Dresser coupling outside the KE Reactor building were completed. The leak was through the gasket in the retaining band flange. The flange was removed and the band was welded to form a solid ring around the line. The neoprene "O" ring seals and stud bolts were replaced.

The Number 1 turbine at 165-KW failed to operate due to freezing of the governor operated cam shaft in its outboard bearing. The bearing was replaced and packed with high temperature silicone grease. Inspection frequency was increased to include an inspection whenever the unit is removed from service.

Severe metal corrosion of the 105-KW gamma monitor flow regulators required a replacement of 50 per cent of the serviced units.

IMPROVEMENT EXPERIENCE

The emergency scram limit switches were adjusted to prevent insertion of half-rods past the 30 per cent position. The revision places the rods in their most effective poisoning position in the event of a scram.

A program to improve reliability of the 480 V bus transfers at 165 - 105 KE & KW load centers employing automatic transfer features was completed by installation of dual instantaneous over voltage (PJV) relays.

The development test authorizing use of a spline coiler to remove irradiated splines from the reactor thereby reducing radiation exposure to operating personnel was completed at KW Reactor following successful demonstration of the equipment. A similar coiler was installed at KE Reactor.

RADIATION MONITORING EXPERIENCE

Personnel dose rates up to 3r/hr were required during poison spline removal difficulties. Dose rates averaged 25 mr/hr during normal operation of the spline coiler equipment.

Smearable contamination to 270 mrad was spread in 105-KW to the process monitor room, and lesser amounts to the -9 foot landing, gas instrument room, ball 3X room, and -17 foot levels as a result of the storage basin water overflow. Following decontamination, the locations were returned to normal status.

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SUPPLEMENTAL CREWS OPERATION

A new charging rate record was established at the K Reactors, 377 tubes per eight-hour shift.

A second Electronic Secretary was installed in the Supplemental Crew office to facilitate daily communications with the shift crews. This equipment enables the supervisors to dial an unlisted number at the beginning of each shift to receive pertinent information that is taped daily.

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HW-65924

GENERAL

RESPONSIBILITY

The responsibility for Safety and Fire Prevention was transferred to Applied Reactor Engineering Operation June 1, 1960.

FORCE SUMMARY

	June 30			Change This Month
	<u>Exempt</u>	<u>Non Exempt</u>	<u>Total</u>	
General	*7	2	9	+5
Production Operation	15	12	27	+1
Reactor Engineering Operation	22	7	29	+3
B-C Reactor Operation	73	279	352	-6
D-DR Reactor Operation	73	306	379	-7
F Reactor Operation	41	163	204	0
H Reactor Operation	57	261	318	-4
KE-KW Reactor Operation	86	344	430	+14
Total	374	1374	1748	+6

*Includes 5 MTP trainees

The above force includes NPR trainees.

R. E. Buntain, R. W. Indermuhle and E. K. Loop terminated. E. L. VanKirk retired. Paul Conrad was transferred from the ANP Dept. to D-DR Maintenance Engineering. K. B. Sowa transferred from Central Maintenance Operation to Research and Engineering Operation.

Sixteen Radiation Monitors and seven Extra Coverage Specialists were transferred to Supplemental Crews Operation to centralize these activities for Manufacturing Operation.

Five first-year MTP men reported during the month and were placed in pre-selected work assignments.

SAFETY, SECURITY & RADIATION EXPERIENCE

There were 69 medical treatment injuries, no security violations, disabling injuries or radiation overexposures.

SIGNIFICANT REPORTS ISSUED

HW-64459 100-C Reactor Central Tube Status, June 6, J. R. Young, Confidential-Undocumented.

HW-65760 Current Status Second Generation Process Tube Internal Corrosion, June 22, J. R. Young, Confidential-Undocumented.

HW-65766 Synopsis - Plant Improvement Program - IPD - FY 1961 through 1966, June 15, Secret.

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HW 65924

HW-62862 A IPD Plant Improvement Program, June 8, Secret.

TRIPS & VISITORS

M. M. Cox visited the Savannah River Plant June 27 and attended the Health Physics Society Meeting in Boston June 29.

J. W. Green visited the National Reactor Testing Station, Idaho Falls, Idaho, June 2 & 3 and 14 through 18 to furnish assistance during NPR fuel element tests in the ETR.

S. L. Nelson attended the American Nuclear Society Conference in Chicago and visited the Panellit Corporation.

J. J. Cummings, Allegheny-Ludlum Steel, Pittsburg, Pennsylvania, visited C Reactor June 30.

W. J. Deitrich, AEC Radiological Physics Fellowship student visited C Reactor for training June 21-24.

R L Dickeman

R. L. Dickeman, Manager
Manufacturing Operation
IRRADIATION PROCESSING DEPARTMENT

FACILITIES ENGINEERING OPERATIONREACTOR MODIFICATION DESIGNRESEARCH AND DEVELOPMENT

The downcomer model testing program being conducted at Washington State University continued during the month. Additional tests were performed to verify the similarity of the downcomer model with the prototype model in service at 105-DR Reactor Building. Also basic studies to determine the similitude relations for two phase flow conditions were undertaken.

Two design development studies relating to the use of smoothbore Zr-2 process tubes in 105 C have been initiated, 1) an optimization study to determine the amount of graphite overboring desired in the event that machining techniques and economics are favorable and 2) a study to establish the adequacy of rear face piping and effluent system for a proposed flow increase to 115,000 gpm.

Preliminary engineering studies to correct deficiencies in the last ditch coolant supplies for the 105-B, D, F, and H Reactors continued. During the interim period until planned budgeted action is initiated, deficiencies in the system will be corrected, 1) by installation of additional supply lines from the high tanks to the front risers, 2) by reduction of the temperature of the water stored in the high tanks, and 3) by modification of the export system to increase its capacity and decrease the time required to bring it into service. Existing last ditch coolant supplies are adequate for the DR and C Reactors for current operating levels. The following additional study programs are planned.

- 1) Cleaning the high tanks and tank discharge piping.
- 2) Inhibiting the formation of corrosion products in the cleared tanks and piping.
- 3) Providing an analysis of the export system by an outside consultant.

The Goulton Industries Corporation, which recently suggested that sleeves for the K Reactor control rods be fabricated from zirconium silicate rather than aluminum oxide ceramic, has requested cancellation of the order since they have been unable to hold the dimensional tolerances specified on their own drawings. Since the original order with this manufacturer is several months overdue, a new order will be placed with Norton, Inc., who was the next low bidder on the original order. This does not affect the order with the Coors Porcelain Company which was placed in May to provide an alternate supplier for these sleeves.

DESIGN PROJECTS

CG-775 - 100-K Water Plant Expansion

This project was closed out June 30, 1960 with funds accrued to provide for inspection of the test impeller in the No. 1 pumping unit at the 190-KE Main Pump House, and continuation of the filter plant tests during the summer months. The project was completed with a financial underrun of approximately two percent.

The high flow filter test, authorized to demonstrate the capability of the CGI-883 proposed flow rates, progressed satisfactorily. During the period of difficult water treatment, in late May and early June, the filter runs were as short as five hours on the test filter and eight hours on the control filter. The test filter is base loaded to produce a constant flow of 20,000 gpm while the control filter follows the clearwell demand and has averaged 16,000 - 17,000 gpm. The automatic backwash cycle equipment has been modified to sustain plant wide filter runs for periods as short as six hours.

CGI-791 - Reactor Confinement

Overall design completion for the project is 95 percent. Progress of design continues to be delayed due to the slowness in receiving certified drawings from the vendors. The Project Representatives have approved the proposed filter handling system and detail design for this equipment is underway.

Operation of the rear face fog spray systems with automatic actuation has been delayed due to the interference of secondary radiation in the Iodine 131 channel from Argon 41 in the exhaust air stream. Test data from a modified gamma monitor scintillation detection system indicates that a reliable signal for activating the fog spray system will be produced by a difference meter which subtracts the Compton effect of the Argon 41 from the Iodine 131 channel. Requisitions have been issued for instrumentation to affect this change.

Detail design for Phase III is 90 percent complete. Seventeen drawings have been approved during the report period. A design for foundations for the new exhaust fan electric motors in 105-B, D, and F Reactor Buildings has been issued since the adaptor plate furnished with the motors by the vendor would not fit the existing foundations or new motor base. Although the new motors have been on site for two weeks certified drawings have not been received.

The overall completion of the test program is 98 percent. Tests to evaluate the practicability of fabricating the aluminum filter frame assemblies using epoxy structural adhesives rather than conventional welding were completed during the month. A typical filter frame cross section and one of the frame side plates was fabricated with structural adhesives. Load tests on the frame exceeding twice the maximum filter loading and five times the maximum seal loading failed to rupture any bonded joint. As a result of these tests, reinforcing of the second stage filter frames will be accomplished by installing structural members with epoxy adhesives.

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CGI-839 - Modification of Fuel Element Test Facilities

Design completion for this project is 100 percent. All scheduled drawings, specifications, acceptance test procedures, and purchase requisitions are complete. All material has been transmitted for construction approval with the exception of the nozzle assembly detail drawings which are being held pending completion of the high pressure temperature strain tests.

Test results indicate that the solid wire "O" ring seal currently in service on KER nozzles is extremely sensitive to seal surface conditions and bolt torque loads. A design test to evaluate other high temperature metal seals has been initiated to provide design data in the event the present seal design requires revision.

CGI-844 - 100-K Coolant Backup System

A rough draft of the design criteria has been completed and issued for comment. The installation of a steam driven secondary coolant pump in each K Area and diesel driven pumps in a "midway" pump station supplying last ditch coolant to either reactor are proposed by this project to correct inadequacies which currently exist in the last ditch coolant supply. A study was initiated to evaluate various methods of operation to provide for a safe reactor emergency shutdown that would minimize the dependence upon the present last ditch coolant system. Preliminary results of the study indicate that the present method of operation, generators approximately 40 percent loaded and paralleled at the 4160 volt level, was as reliable as the other methods; therefore, there was no justification for changing.

The Atomic Energy Commission has placed a hold request on three diesel engines located at Clearfield, Utah that are satisfactory for service in the "midway" pump station. When procurement funds are available, arrangements will be made to recondition and modify the engines for automatic quick start service.

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

Scope design for the total project is 99 percent complete while detail design is approximately 11 percent complete. Detail design effort has been directed towards the preparation of drawings and specifications required for the procurement of engineered materials.

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

Several basic concepts to be used in the development of the project scope were discussed at the initial Project Representatives meeting.

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EQUIPMENT DEVELOPMENT OPERATION

EXISTING REACTOR WORK

Remote Rear Face

Two prototype Mark V flapper valves were installed in the rear face of 105-KE to be observed for the effects of reactor operation. Bids for ten and 100 ball valves, which are competitive for this application, were received at slightly under \$70 each. Bids for procurement of 100 Mark V flapper valves are to be opened June 30. A valve actuator prototype at 108-D has been disassembled for modifications - indicated as desirable in the laboratory testing - prior to installation on the KE Reactor, which is scheduled for next month.

Overboring

Work continues in the development of tools and procedures for overboring reactor process channels. First shipment of equipment designed and built for us under DDR-93 has been received and initial tests run. These consisted of machining for boring out the cast iron thermal shield block and last donut and a machine to open up the centering flange.

Expansion Hardware

Orders have now been placed for prototype nozzle assemblies for both front and rear faces of C Reactor. Study of alternate concepts is continuing.

Nuclear Instrumentation

In comparing the response of the stop-gap power rate installation on DR Reactor with that of a prototype ion-chamber drive power rate instrument, agreement was found after manual changes of reactivity, also an unexplained one-half to two cycle/second variation in both instruments which appears to correlate with variation in process tube flow was discovered.

Four in-core chambers have now been received from the vendor after very long delay.

Survey was completed and a method selected for drilling shield holes for the B, D, and F octant monitoring chambers.

Analog-to-Digital Converter

A replacement for the malfunctioning part of this equipment was received and installed. The system is now operating satisfactorily in all respects.

Project CG-707 - Subcritical Monitor

Trouble with the chamber positioner for this equipment has prompted a review of the mechanical design. Difficulty with the current positioner arises from the sticking of the lubricant on the screw assembly.

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CG-791 - Filter Frames

The possibility of assembling these frames with structural adhesive was demonstrated successfully.

NEW PRODUCTION REACTOR WORK

Fitting Development

Burst tests were conducted on the several candidate connector-to-nozzle joint assemblies which serve to confirm very strongly the recommendation already made for the selection of the Grayloc joint.

Some inconsistencies in the strength produced in rolled joints by varying the degree of reduction have been detected and experimental efforts are continuing to define the problem.

Instrumentation

A one-hundred-point gross gamma fuel rupture monitor at 105-C continued to operate properly without component failure. The more critical current problem in this instrumentation area is the selection of a suitable flow regulator and modified prototype units are under test.

A breadboard magnetic amplifier-magnetic logic flow monitor system has operated continuously since April 25 without malfunction. Testing of other types of flow monitors is in progress.

PLANT AND INDUSTRIAL ENGINEERING OPERATION

DRAFTING OPERATION

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

New Engineering Drawings	115
Revisions, Layouts and Sketches	51
Microfilm prints reproduced	341
Drawings added or retired	3963
Ozalid checkprints reproduced	1140
Customers serviced - microfilm files	296
Customers serviced - catalog files	41
Catalogs added	112

A program is underway to review about 5,000 drawings which have been in the "check print" and "comment print" status for a number of years. It is the plan to either void or complete such drawings.

REACTOR, PLANT ENGINEERING

Gamma Monitor Improvement - Six Older Reactors

The gamma monitor improvement scope report for six older reactors has been completed. Additional electronic improvements were provided in the final draft. Introductory information was presented to the AEC on June 2, 1960.

Rear Face Piping Problems at Older Reactors

Study and testing have been continued to determine a means for vibration reduction of rear face piping. Dr. E. R. Tinney of Washington State University and other HAPO personnel were consulted on possible methods of reducing vibration by way of design changes confirmed with model tests. An additional study item involves an investigation of the flow disturbances in the downcomer approach section. Arrangements have been made to test this possibility at 105-H.

Poison Splines

Progress has been made to qualify additional vendors for splines with receipt of samples from a fourth possible supplier, Brooks and Perkins. In conjunction with this effort, specifications are being reviewed for cost reduction possibilities.

K Vertical Safety Rod Latch Improvements

The study to improve reliability of the 100-K vertical safety rod latch assemblies has been completed. It has been recommended to the 100-K Reactor Operation that existing plunger blocks be replaced with an improved design. Document HW-65645, "105-K Vertical Safety Rod Latching System", by J. L. Deichman summarizes the engineering study and testing which provides the basis for the recommendation.

Hycar O-Rings, 105-H Reactor

An order of 10,000 Hycar O-rings has been received for use with 105-H Reactor rear face connectors. Sample lots of these O-rings were locally tested for conformance to specifications on durometer and tensile strength. Other samples were returned to the Goodrich Company for verification of product and recipe identification. Within the limitations of normal production requirements, these tests confirmed the agreement of the new O-rings with the prescribed specifications.

WATER PLANT AND UTILITIES ENGINEERINGArea Trip Out Tests

A comprehensive discussion of the inter-relation of boiler performance and load characteristics among the D, F, and H, 184 Power Houses is being prepared for publication. A review of the data obtained during the subject tests indicates the need of obtaining more information on the effect of furnace-uptake pressure drop and its potential in stalling a boiler. To obtain this information a thoroughly instrumented test will be conducted in 184-D in July.

Upgrading the D Area Raw Water Back Up System

Various methods of improving the reliability of raw water back up system at D Area are being studied. This study showed that installing Style 60 Dresser couplings at each of the bell and spigot joints of the cast iron raw water back up line is the most economical and expedient method of upgrading the D back up system.

The work is estimated to cost \$50,000 and should normally not require any reactor outage time for installation. A rough draft of the scope has been prepared.

Columbia River Scale Model

Invitations to submit proposals for construction and operation of the Columbia River Scale Model were sent out by Contract Administration to the University of Washington, Washington State University, and Oregon State College.

Columbia River Studies

River temperatures have been comparatively low due to the slow melting of high level snow and the continuing storage of surface water at the various dams during the present reservoir filling period. This storing of flood water has kept turbidities low. The Grant County Public Utility District has installed the slide wire on the Priest Rapids telemetering gage in preparation for final calibration of the gage.

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PROJECT ENGINEERING OPERATION

PROJECTS

CG-558 - Reactor Plant Modifications for Increased Production

Physical completion acceptance leading to the closing of this project with exceptions was achieved.

CG-600 - 100-C Alterations

On June 28 at approximately 9:45 p.m. process pump #11 had to be shut down at 190-C due to failure of the impeller wear rings. Ordinarily this would not have been too serious, but in this case process pump #12 was inoperative due to identical trouble. No spare rotating assembly was available and the reactor was shut down because of low water pressure. Continuous expediting efforts have been in process between General Electric, Atomic Energy Commission, and the Byron Jackson Pump Company in an effort to obtain replacement rotating assemblies from Byron Jackson.

In the past we have been fortunate in obtaining replacement assemblies in time to prevent an incident such as this one. On June 29, the Commission was requested to put forth all the effort required to obtain the necessary replacement rotating units and eliminate the chance of a similar incident happening again. Steps were taken on June 29 to locally repair the assembly in pump #11. An attempt to have this pump unit ready for operation by 9:00AM, June 30, was successful. Work was accomplished in the J. A. Jones shop at White Bluffs.

A physical completion notice with the exception of the 190-C pumps was issued.

CGI-791 - Reactor Confinement

Phase I - Fog Spray

The sampling system has been modified to improve sensitivity. This was accomplished by replacing existing crystals with larger ones and modifying the sample beaker to improve its geometry. Since the system sensitivity has been improved and the testing of the system continued, it has been demonstrated that there are isotopes of gases other than iodine 131 in the reactor exhaust air stream which overlap the iodine 131 channel. The dual countrate meter test in 105-B on the fog spray instrumentation has been completed and results analyzed. It has been concluded that the existing log countrate meters (CRM) cannot be used in this application, but they will be used on the charcoal sampler to be installed on Phase III. Two linear countrate meters and a difference meter have been recommended to replace the log CRM. With this system the fog spray would be actuated on the difference reading. This system is now on test at 105-B.

Angle and hardware for the thermocouple duct shields have been received; however, no installation work has been started. Certain material has been ordered and is scheduled for delivery in three weeks.

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 53 per cent complete with their contract, which is the scheduled completion on the revised Construction Status Chart.

As of June 29, 1960, approximately 4350 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. Work progressed on the installation of filter frame inserts at 100-H and 100-C.

Phase III - Ventilation Modifications and Tie-ins

The J. A. Jones Company is installing the tubing for the pressure sensing stations in 105-B, C, DR, and D Areas. Installation of the stack bases in 105-C is complete. The running of conduit is progressing in all areas.

The first filter frame has been checked dimensionally and found to be satisfactory. The weld quality is being reviewed with the vendor, Commercial Steel Fabricators, Incorporated. The second filter frame has been dimensionally checked and found to be satisfactory. However, the welding will have to be corrected before shipment. The vendor has promised plant site delivery of the first six frames by July 5, 1960.

The exhaust fan drive motors for B, D, F, C, and H have been received. However, the adaptor plates, which were supplied by the vendor, to mount on our slide rails, cannot be used in B, D, and F Areas. The switchgear base has been poured in 105-F. The steam isolating valve for the exhaust fan turbines has been installed, and also the solenoid rack for the ventilation system controls has been installed in 105-F. The temporary downcomer vents have been installed in all areas where required. The atmospheric sampling tip and surge tank have been installed in all but the 100-K Areas ready for tie-in.

Installation of new steam coils has been completed on one vent supply inlet at 105-F. Piping cannot be started until material is received.

Procurement status for engineered material for this phase of the work as of June 21, 1960 is \$495,507 worth of material on 42 purchase orders, and four requisitions out for bid with a total estimated value of \$273,000.

General

A revised Construction Status Chart has been prepared and forwarded to the Commission for their approval.

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CAI-835 - Additional Office Space - 100-D Area

This project work consists of moving a dormitory from the 1100 Area to the 100-D Area and converting it to office space. As previously reported a contract was awarded to Ray Britton, Kennewick contractor, and actual work started on May 5. Concrete was placed for the building footings in 100-D Area on June 3. On June 14, contractor completed interior work on the dormitory to a point where he could start moving the building to 100-D. Although progress on this phase of the work was much slower than planned, the building was delivered to 100-D Area on June 22. At the present time the building has been placed over the concrete footings and the foundation work is being completed.

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

Fabrication of all components and subassemblies for the rupture detection system has been completed in readiness for final installation. It is planned that the installation will be made and acceptance tests performed during the next scheduled outage at 105-KE. The next outage is presently scheduled for July 5, 1960.

It is estimated that the approximate three shifts will be required to perform the installation and run the ATP. For this reason it is necessary that the work be programed for a "scheduled" outage.

CGI-845 - Increased Pumping Capacity - 181-C

This project work includes installation of two new pumping units in the 181-B/C building and various structural and electrical modifications to provide approximately 15,000 gpm increased flow. All preparation work required prior to receiving the new pumps and motors has been completed. A new 13.8 KV power line has been constructed by the Wilson Construction Company, a lump-sum contractor from Portland. This work, which was started on June 6, was completed on June 29. J. A. Jones performed all of the other work involved and will set the new pumps and complete their tie-ins upon receipt.

MJA-8 - Ball 3X Electrical Modifications, 105-B, D, DR, F, and H

The purpose of this maintenance job authorization is to completely renew the electrical portion of the ball 3X systems at 105-B, D, DR, F, and H reactors. Previously reported were the modification and completion of the systems at 105-F and B. The ball 3X outage at 105-H was planned to commence on June 26, and work actually started on that date. All work is being accomplished by Central Maintenance who have planned and executed the physical work. The work at 105-H was completed Friday, July 1.

PROJECT PROPOSALS

Project Proposals Submitted to AEC

CGI-883 Increased Process Water Flow, 100-K Area
Rev. 2

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HW-65924

CGI-900 Self-Supported Fuel Elements - Lead Reactor

Proposals Awaiting AEC Approval

CGI-839 Modification of Fuel Element Test Facilities, 1706-KER
Rev. 2

CGI-884 100-K Area Coolant Backup
Rev. 1 (Previous interim authorization \$235,000)

CGI-868 Columbia River Scale Model
Rev. 1

CGI-869 Operational Charge-Discharge - C Reactor

CGI-887 Critical Mass Monitoring, All Hanford Reactors

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

CGI-892 Ventilation Improvements, 181 Buildings

Requests Received for Project Preparation

CGI-824 Remotely Operated Cap Removers, KE and KW Reactor Discharge
Rev. 2 Areas

R-20937 Process Tube Examination Facility, 105-C Building

R-20938 Increased Pumping Capacity, 181-D Building

CPFF CONSTRUCTION SERVICE CONTRACTOR - LIAISON

Issued seven new work orders and supplemented seven project releases for a total of \$113,688 to J. A. Jones in the month of June.

PLANT FORCE WORK REVIEW

The Labor Standards Board approved three jobs for assignment to plant forces, which are estimated to cost \$141,754.

MANAGER
FACILITIES ENGINEERING

RT Jessen:msw

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HW-65924

NPR PROJECT OPERATION

PROCESS DESIGN

Research and Development

General equations have been derived for component reliability, equipment reliability, and system reliability as a function of component failure rate. Electrical-mechanical, magnetic-amplifier, and solid state flow monitor systems were originally proposed as models for the initial studies; a semi-redundant solid state monitor has been added to the study. Mercury switch reliability has been calculated based on Hanford experience and statistically adequate transistor and crystal-diode failure rate information is available from off-site sources.

A study has been completed (HW-65735) investigating the blackness and gas evolution as a function of burnout for lithium-aluminum alloy target slugs in the range of .75 percent to 2.00 percent lithium-6.

Criticality calculations have been initiated to determine the applicability of variational technique to critical buckling for an assembly of multiple regions immersed in water. Although no conclusive results have yet been obtained, development of this approach would be applicable to criticality studies for underwater storage of enriched fuel elements.

Project CAI-816

The temperature and pressure parameters for the primary loop were established on the basis of the limits of the ASA 900 pound valve rating. Different interpretations of scope by Burns and Roe and General Electric resulted in the two design groups proceeding on a slightly different valve rating basis. Scope was clarified during the month and the differences have now been resolved. The ASA 900 pound rating will be applied throughout the primary loop and should result in reduced costs for valves, particularly in the smaller valve sizes.

Additional graphite cooling tubes have been reconsidered and approved during the month. This modification will permit greater pile flattening and will reduce the temperature of the graphite process tube supports. No significant effects on the exterior graphite cooling loop are anticipated so that current procurement interferences in this area should not result. Changes in the graphite, thermal shield, and biological shield are being accomplished without significant schedule adjustments.

An acceptance test covering an outline of the responsibility for testing within the 105-N Building has been submitted to the AEC for approval. This procedure outlines the procedure format and general responsibilities within the acceptance testing program and represents the first of 80 ATP's to be prepared.

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Project CAI-816 (Continued)

The Phase 1 initial design work on the underwater conveyor and fuel sorter has been initiated by AMF Atomics. Mutual discussions between General Electric and AMF were held during the month and in addition, a joint tour of the Savannah River installation was made to observe underwater equipment designed by AMF.

Extensive testing on various high pressure couplings has resulted in the recommendation that the Grayloc coupling be utilized in the connector-to-nozzle and connector-to-header joints. Negotiations are now proceeding on the procurement of this critical portion of the primary loop.

A functional flow monitor specification has been issued permitting alternate approaches to the NPR flow monitoring problem. This approach requests proposals from industry and will progress through a prototype testing program before final product order placement.

Representatives of R&EO and Process Design were again residents at the Burns and Roe offices in Hempstead, New York. The processing of all originally scheduled scope is now complete. Updating and incorporation of pending revisions will be accomplished by the Representatives on an occasional trip basis in the future.

The award of the 1997-1998 competition prize in 1998, however, was not without controversy. Although the jury had been asked to select the best of the 1997-1998 competition, the jury members had not been informed of the prize's existence until the day of the award ceremony. The jury members had been asked to select the best of the 1997-1998 competition, but the jury members had not been informed of the prize's existence until the day of the award ceremony.

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FIELD AND OPERATIONS ENGINEERING

Construction

As of June 28, there had been a total of 1,737 cubic yards of concrete placed in the 105-N Building.

A concrete pour schedule has been received from Sound Construction and Engineering. This schedule is being continually revised and kept up-to-date by Kaiser Engineers.

Two well casings for "D" elevator hydraulic plungers have been accepted as being within tolerance. One casing for "C" elevator has been placed and is now being plumbed to within tolerance. Difficulty is still being experienced with the "F" elevator casing due principally to an inability to cope with ground water at the lower level of the casing.

The elimination of coatings on the Zone I confinement structure has required the selection of a suitable joint seal. We are now proceeding on the basis of calking the joints.

Sound Construction and Engineering is forming for wall pours in Areas 3, 4, and 5. Placing of piping, conduits, and reinforcing steel is in progress for the process unit foundation pour from elevation (-) 22'-0" to elevation (-) 16'-0".

The hydraulic fuel element transfer pipe under the reactor block was accepted after hydrostatic testing and after successful passage of the plunger. Slight modifications were necessary to the design to facilitate installation. This resulted in sloping the pipe toward the drain point instead of running it flat.

All concrete pours have been made to elevation 405'-0", and forming has been continued for walls to elevation 421'-0" on the 181 river pump house. No difficulty has been encountered with the diking at this building due primarily to the abnormally low water experienced this year. A peak river elevation was experienced June 21 with a second peak about June 30 or July 1 no higher than the earlier peak. The double peaking this year was created by manipulation of river flow by filling the Grand Coulee reservoir.

George A. Grant has stopped work on the 184-N Building due to lack of information on turbine foundation pedestals. All concrete on the boiler foundation and building footings has been completed.

Excavation for the 153-N Building is essentially complete.

Construction has started on the 151-N Building, and the subcontractor has completed the underground duct bank beneath the railroad adjacent to the building.

The electrical line and substation feeding the C-25 tube shop was energized and turned over to Operations at 3:00 pm June 2, 1960.

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Preliminary design of TC facilities to be occupied by General Electric field forces at the 100-N job site was prepared.

Erection procedures, inspection guides, and design and procurement of inspection tools for the reactor unit continued.

Graphite

Machining of 4 x 4 reflector filler material is now essentially complete. Surfacing of master layer stock is also near completion and fabrication of finished details is being started. Production machining of 4 x 5 reflector stock has been delayed nearly one month because the supplier of necessary inspection components failed to deliver as scheduled.

A carload of graphite was received from each of the two reflector suppliers (Great Lakes and National) the first of June.

The bid due date for the front and rear graphite reflector blocks and the graphite tube sleeves was extended to July 18, 1960, due to changes in the technical requirements.

Zirconium

Chase Brass and Copper Company shipped ten NPR process tubes during the month of June, 1960, making a total of twenty-one tubes accepted from this company. Allegheny-Iudlum has completed eight tubes which will be shipped at a later date, making a total of thirty-five tubes completed by A-L. Harvey Aluminum has extruded twenty-four billets and is preparing to draw these tubes to finish size. Billets for all remaining pilot order tubes are completed or being fabricated by Harvey Aluminum.

The forty-eight tubes previously received from the above companies have been dye-penetrant tested. All but eleven have been ultrasonically tested and three X-rayed. Hand conditioning for dye-penetrant defect removal is in progress with twelve tubes being conditioned acceptable.

Installation of inspection and tube handling equipment at the C-25 facility continued through the month.

Major items completed were:

1. Installation of modified rollers in Immerscope tank.
2. Extension of Immerscope coverage track.
3. Installation of ball transfer conveyors and overhead monorail.
4. X-ray unit repaired and put into service.

Work in progress at month end:

1. Installation of crane over dye-penetrant tanks.
2. Equipment modification in acid mixing room.
3. Fabrication and installation of autoclave tube carrier.
4. Modification of acid pickling facility.
5. Installation of ball transfer on X-ray conveyor.

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Procurement

Following is the status of procurement as of June 28, 1960:

Reactor Plant

General Electric Originated - Kaiser Engineers Purchase
(95 Requisitions - 79 Alterations)

47	Open Requisitions - Estimated Cost	\$6,760,259
33	Open Purchase Orders - Actual Cost	823,413
11	Complete Purchase Orders - Actual Cost	36,892
3	Cancelled Requisitions	
TOTAL:		<u>\$7,620,564</u>

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:		<u>\$13,074,681</u>

Heat Dissipation Plant

Burns and Roe, Inc., Originated - Kaiser Engineers Purchase

(92 Requisitions - 227 Alterations)

42	Open Requisitions - Estimated Cost	\$15,903,800
27	Open Purchase Orders - Actual Cost	9,718,537
11	Subcontracts	7,526,918
7	Cancelled Requisitions	--
5	Requisitions being held (lock sets)	--
TOTAL:		<u>\$33,149,255</u>

NPR Related

General Electric Originated - Kaiser Purchase
(13 Requisitions - 2 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>
TOTAL:		\$ <u>122,259</u>

TOTAL ALL ORDERS: \$53,966,759

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Administration

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

Routine Work Processed May 22 through June 26, 1960

Drawings	682
Criteria	33
Specifications	67
Requisitions	110
ATP	--
Others	<u>79</u>
TOTAL:	<u><u>971</u></u>

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

On Detail Drawings	449
On Scope Drawings	2
On Specifications	38
On Criteria	<u>4</u>
TOTAL:	<u><u>493</u></u>

Operational Planning

Evaluation of the effect on operating capital cost reduction actions has continued. Preliminary results are now available. The finished analysis is scheduled for July 15, 1960.

The results of the N Reliability Study and a comparison study of the K Reactors is in rough draft form and should be available in the next few days.

With Financial Operation, budget estimates were prepared for "N" essential material for FY-1962, 1963, and 1964.

To date a total of 37 bid proposals for spare parts have been reviewed, 13 spare parts orders have been placed, and 2 orders have been placed for construction spares.

A preliminary list of tools to be developed for maintenance was submitted to Equipment Development Operation.

Assistance in the organization of the 100-N Operation training program was given Manufacturing as requested.

A program for evaluation of anticipated N-Reactor non-exempt operating positions was initiated.

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PROGRAM EVALUATION

Design Status

	<u>Wt'd Total</u>	<u>Certified Schedule</u>	<u>Actual % Complete</u>
<u>Reactor Plant as of 7-1-60</u>			
<u>Title I</u>			
Scope		100	99.7
<u>Title II</u>			
Drawings	70	60.5*	71.1
Specifications	8	80.0*	56.6
Requisitions	8	21.5*	17.8
ATP's	4	11.0*	.9
Development and Testing	<u>10</u>	<u>69.0*</u>	<u>65.0</u>
Total	100	59.0	62.3

Heat Dissipation Plant as of 7-1-60

<u>Title I</u>			
Scope Criteria		100	90.0
<u>Title II</u>			
Detail Design		54.5	54.5
	<u>No. Req'd</u>	<u>No. Issued to Scheduled</u>	<u>5-28-60 Actual</u>
Criteria	23	22	22
Preliminary Drawings (bid)	722	253	312
Detail Drawings (for const.)	732	175	188
Specifications (bid)	162	73	83
Requisitions	173	79	89
ATP's (No. being developed)	-	0	0

<u>Composite Design Completion (Reactor and Heat Dissipation Combined)</u>	<u>Certified Schedule</u>	<u>Actual % Complete</u>
Total	62.1	63.00

*Percentages based on AEC certified schedule.

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Cost Estimate

A new cost estimate was issued on June 30 as follows:

	<u>4-15-60</u> <u>Estimate</u>	<u>6-30-60</u> <u>Estimate</u>	<u>Increase or</u> <u>Decrease</u>
Temporary Construction	1,573,700	1,724,000	+ 150,300
General Area Facilities	9,562,100	9,282,200	- 279,900
Administration Building	456,500	175,000	- 281,500
Attendant's Building & Gas Pump	5,500	0	- 5,500
105 Building	44,629,500	43,309,400	-1,320,100
Water Treatment Plant	3,128,100	3,297,400	+ 169,300
River Water Pump House	2,946,400	2,970,800	+ 24,400
Decontamination Facility	0	1,170,800	+1,170,800
153 Switchgear Building	596,600	543,100	- 53,500
Standby Power House	4,272,500	4,199,800	- 72,700
109 Heat Exchanger Building	33,388,200	31,705,100	-1,683,100
182 High-Lift Pump House	1,833,000	2,318,400	+ 485,400
Final Functional Testing	300,000	500,000	+ 200,000
Misc. Equip. for Heat Dis. Plant	150,000	150,000	0
Spare Equipment	75,000	75,000	0
Zirconium Tubes	10,370,000	10,561,500	+ 191,500
Emergency Boiler Plant	0	340,800	+ 340,800
Sub-total	113,287,100*	112,323,300**	- 963,800
Indirect Costs	23,142,000		
GE (Engr. & Indirects)	8,830,000	8,830,000	0
B&R (Engr. & Indirects)	4,665,000	5,060,000	+ 395,000
B&R Loaned Labor for 105 Insp.	0	370,000	+ 370,000
Kaiser Engineers Indirects	8,597,000	8,697,000	+ 100,000
Kaiser Engineers Fee	1,050,000	1,050,000	0
Escalation	5,298,500	4,485,600	- 803,900
Startup	800,000	800,000)	
Contingency	2,481,400	3,384,100)	+ 902,700
Total	145,000,000	145,000,000	0

* Includes \$9,523,300 for subcontractor's overhead, profit and bond.

**Includes \$8,464,800 for subcontractor's overhead, profit and bond which is a decrease of \$345,700 over the 2-11-60 estimate.

Schedules

Kaiser Engineers issued the new construction schedule on July 1 for AEC review and approval. This schedule is based on advertised bids for the 105 and 109 superstructure on August 15 rather than the current schedule of going out for bids early in October; therefore, there is a two-month discrepancy for the 105 and 109 Buildings.

JS McMahon:mrf

MANAGER
NPR PROJECT

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FINANCIAL OPERATION

GENERAL ACCOUNTING OPERATION

The quarterly custodial inventory of Reactor and Other Special Materials was taken June 30, 1960, and a ten-year depreciation forecast was prepared on assets to be added by the Plant Improvement Program.

During June, 22 IPD employees attended meetings of Professional and Trade Societies and one employee participated in an off-site Technical Course. Expenditures incurred totaled \$4,138 and \$558, respectively.

PRODUCT COST & BUDGET OPERATION

Meetings were attended with Contract and Accounting and other department Product Cost managers at which agreement was reached on operating costs which are considered to be controllable.

The annual physical inventory of coal was completed and a report issued. No adjustment of values was considered necessary.

The monthly essential material inventories in D and DR Processing and F and H Power were observed. All essential materials and coal were covered during the fiscal year.

PERSONNEL ACCOUNTING

Total number of personnel assigned to the Department at month end totaled 2,260, an increase of 29 from the number on hand at May 30, 1960. Included in the increase of 29 are 16 temporary employees.

AUDITING

Revisions to sixteen AEC Manual Chapters were reviewed for their effect on IPD Operations.

A report was issued covering the results of the Department's cash funds. It was determined that the fund established for security reasons was not needed, and it will be liquidated.

A report was issued covering audit work relative to timekeeping and resulting payments performed during the current fiscal year.

PROCEDURES

Planning and implementation were completed for the Department's participation in the plant-wide employee status change procedures. New payroll status

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change forms were prepared and distributed this month. The form incorporates the features of several other payroll forms and will help alleviate the flow of paper work at HAPC. Communications were prepared for section management and detailed procedural instructions were prepared for use by field supervisors.

In conjunction with Electronic Data Processing and our own operating people, work was completed to develop a system for producing reactor temperature limit maps on transparencies by our field Flexowriters direct from computer output.

Financial Operation relinquished its functional responsibility within the Department for records management. HAPC OPG 1.9 on this subject delegated the administration of the Records Management Program to Contract and Accounting Operation in conjunction with the initiators of the records.

SH Small

Manager-Finance
IRRADIATION PROCESSING DEPARTMENT

SH Small:kd

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RELATIONS PRACTICES OPERATION

Four experienced BS/MS candidates were interviewed during June with two offers extended. Seven Manufacturing Training Program graduates were interviewed and extended offers; four accepted and two rejected the offers leaving one offer open at month end. Five PhD candidates were interviewed with one offer extended. Nine summer program employees were placed in IPD during the month. Two exempt people transferred into the Department from Hanford Laboratories Operation. There were five exempt resignations to accept outside employment.

A total of \$340 was paid to 17 suggesters for 16 suggestions in June. The largest award was \$125.

Mass communication activities included the publication of ten Management News Bulletins, one Round Table Guide, two IPD Headliners, two priority messages, six Relations Background Information Letters and one IPD-OPG. GE NEWS coverage included sixteen items about IPD activities totaling 305 column inches. Two Management Information Meetings were held during the month.

Participation in the Personal Accident Insurance Plan introduced this month is 58.3%. Three IPD employees retired during June.

One security violation occurred during the month. No disabling injuries were reported and 76 medical treatment injury cases were treated compared to 102 for May. The Department has accumulated 5,819,000 hours in 472 calendar days since the last disabling injury.

W. J. Shankes

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SIGNIFICANT REPORTS ISSUED

HW-65398 CGI-791 Reactor Confinement Project Representatives Meeting No. 19, May 31, 1960, E. L. Etheridge, Unclassified.

HW-65749 Project CGI-900 Representatives Meeting No. 1, E. R. Rudock, June 20, 1960, Unclassified.

HW-65603 Project CGI-884 Representatives Meeting No. 1, June 8, 1960, F. J. Kempf, Unclassified.

HW-65541 Last Ditch Cooling Supply, June 6, 1960, H. W. Heacock, Confidential-Unclassified.

HW-65726 Production Test Authorization IP-337-P, Chemical Descaling of 105 High Tank Piping, June 17, 1960, H. F. Jensen, Unclassified.

HW-62449 Portable Dose-Rate Integrator Mark I, May 27, 1960, A. N. Iverson, Unclassified.

HW-65345 Development Test IP-327-K Flapper Valve Reactor Discharge Nozzle, May 24, 1960, C. E. Frantz, Unclassified.

HW-65549 Installation and Operation Study Remote Rear Face Equipment, June 7, 1960, C. E. Frantz and C. A. Fick, Unclassified.

Status Report - NPR Fitting Development Activity, June 13, 1960, J. H. Fastabend, Unclassified.

HW-65569 Vibration Studies, Reactor Rear Face Piping 105-H and F, June 9, 1960, P. H. Hutton, Secret.

HW-65645 105-K Vertical Safety Rod Latching System, June 13, 1960, J. L. Deichman, Unclassified.

HW-65324 Increased Pumping Capacity at 181-D - Scope and Justification, June 1, 1960, L. B. Brinkman and V. G. Blanchette, Secret.

Design Change 374-Modification to the B, D, and H Downcomers, June 13, 1960, L. B. Brinkman.

Design Change 381-4500 HP Motors-Automatic Synchronization - 100-F Building, June 27, 1960, V. G. Blanchette.

Test Procedure, Test of Boiler and Control Performance Under Various Firing and Coal Conditions, June 24, 1960, M.P. Johnson.

Trip Report - Test of Pit Model for Main Circulating Water Pumps, Project CAI-816, June 13, 1960, W. J. Love.

HW-57014 REV1 105-N Design Criteria Ball Safety System, June 1, 1960, J. F. Nesbitt.

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HW-57017 REV1 105-N Design Criteria Reactor Single Pass Decontamination System, May 24, 1960, G. E. Wade.

HW-57030 REV2 105-N Design Criteria Moderator Cooling System, June 13, 1960, RD G. E. Wade.

HW-57043 ADD3 100-N Design Bases - Part I - Addendum 3, Primary Coolant System, June 14, 1960, E. R. Kosmata.

HW-57044 ADD2 100-N Design Bases - Part II - Addendum 2, Primary Loop Pressure Relief System, May 31, 1960, D. L. Condotta.

HW-65484 Calculations Supporting the Revised 105-109 Building Confinement Venting System, June 4, 1960, W. A. Massena.

HW-65517 The Linear Extrapolation Distance and Effective Radius of Cylindrical Control Rods, June 6, 1960, D. E. Simpson.

HW-65543 Confinement System Valves Backup Closure Provisions, June 1, 1960, G. E. Wade.

HW-65591 Incentives for Modification for Use of Self-Supported Fuel Elements and Zirconium Tubes in C Reactor, June 13, 1960, C. A. Mansius and D. D. Stepnewski.

HW-65648 NPR Project Section - Monthly Design Test and Development Program Status Report - CAI-816, May 31, 1960, W. J. Morris.

HW-65706 Steam-Water Pressure Drop and Critical Discharge Flow - A Digital Computer Program, June 17, 1960, W. A. Massena.

HW-65735 Blackness and Burnout of Li-Al Alloys, June 17, 1960, E. R. Hill, Jr.

HW-65739 Steam-Water Critical Flow Using the "Separated Flow" Model, June 20, 1960, W. A. Massena.

HW-65753 Reactivity Capacity of NPR Control Systems, June 30, 1960, D. E. Simpson.

HW-65840 NPR Primary Loop Pressure Relief System Capacity, June 24, 1960, W. A. Massena.

105-N Design Communication No. 6 - Rupture Monitor Heat Exchangers, June 6, 1960.

105-N Design Communication No. 8 - Graphite Cooling System, June 9, 1960.

HW-64459 100-C Reactor Central Tube Status, June 6, 1960, J. R. Young, Confidential-Undocumented.

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HW-65760 Current Status Second Generation Process Tube Internal Corrosion, June 22, 1960, J. R. Young, Confidential-Undocumented.

HW-65766 Synopsis - Plant Improvement Program - IPD - FY-1961 through 1966, June 15, 1960, Secret.

HW-62862 A IPD Plant Improvement Program, June 8, 1960, Secret.

TRIPS

C. W. Allen attended the ANS meeting at Chicago, Ill., and visited the Dresden Nuclear Power Station, Morris, Ill., and Goodyear Aircraft Co., Akron, Ohio, for technical discussions, 6/11-18/60.

O. H. Greager attended the ANS meeting in Chicago, Ill., 6/12-16/60.

R. W. Reid attended the ANS meeting in Chicago, Ill., and visited the Dresden Nuclear Power Station, Morris, Ill., to discuss startup activities and GERL, Schenectady, N.Y., to discuss optimization study, 6/12-19/60.

R. W. Benoliel visited Westinghouse Electric, Waltz Mills, Pa., National Carbon Co., Clarksburg, W. Va., Great Lakes Carbon Corp., Niagara Falls, N.Y., and GERL, Schenectady, N.Y., for graphite discussions, 6/12-20/60.

R. V. Dulin visited Byron-Jackson Co., Los Angeles, Calif., for pump contract discussions, 6/12-20/60.

C. G. Lewis visited the MTR-ETR Site, Idaho Falls, Idaho, for discussions on in-reactor loops, 6/15-17/60.

J. D. Agar attended the AIChE International Conference in Mexico City, Mexico, and visited Vallecitos Atomic Laboratory, Pleasanton, Calif., to discuss instrumentation, 6/17-25/60.

D. H. Curtiss visited Westinghouse, Bettis Plant, Pittsburgh, Pa., Bridgeport Brass Co., Bridgeport, Conn., and Tube Reducing Corp., Wallington, N.J., for tubing contract discussions, 6/20-30/60.

L. A. Carter visited the Savannah River Operations, Aiken, S.C., for discussions on radiation problems, and attended the Health Physics Society meeting in Boston, Mass., 6/25-7/3/60.

F. W. Van Wormer attended the ASTM meeting in Atlantic City, N.J., and visited the Knolls Atomic Power Laboratory, Schenectady, N.Y., to discuss testing equipment and procedures, 6/25-7/3/60.

H. A. Kramer visited Priest Rapids Dam in connection with the installation of the new river gage station.

R. T. Jaske visited San Francisco, California, on two occasions for consultations on power house designs.

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J. W. Green and R. W. Gilmore visited the ETR facility at Arco, Idaho on June 2-3 to conduct fuel rupture test to determine sensitivity and adequacy of fuel rupture monitor prototypes; the same trip was made on June 14-18 for the same purpose.

P. B. McCarthy contacted Mr. J. Ellis of the Sintercast Corporation, New York, New York, on May 26 to discuss fabrication and specifications of splines. He also contacted Mr. Solomon of the Worcester Wire Works, Worcester, Mass., on May 27 to discuss wire handling methods.

E. Hollister contacted Mr. Art Kamstadius of the Isaacson Iron Works, Seattle, Wash., on June 9 to discuss and inspect trepanning type boring operation.

H. F. Jensen attended the ANS meeting in Chicago, Ill., on June 11-15 and presented a speech on "Chemical Decontamination of the Hanford Production Reactors".

E. C. Wood attended the ANS meeting in Chicago, Ill., on June 13-14 and Argonne National Laboratory, Lemont, Ill., on June 15 to discuss organization, technology, and methods of operation.

D. M. Diediker visited Byron-Jackson Pump Company, Los Angeles, Calif., June 8-10, to review the progress during design of the canned rotor process pumps being supplied by Byron-Jackson for Project CGI-839.

F. J. Mollerus contacted Dr. Gene Greenfield of the Washington Institute of Technology, Pullman, Wash., May 18, to discuss the 4500 HP coil insulation problem; A. McDonald was also present.

L. M. Keene visited the Byron-Jackson Company, Los Angeles, Calif., June 1-2, to discuss the installation of submersible pumps for project CGI-883.

E. R. Rudcock visited the Byron-Jackson Company, Los Angeles, Calif., June 8-10, to discuss service dolly specifications for the new pumps for Project CGI-839.

W. J. Love traveled to Los Angeles, Calif. to witness the Byron-Jackson pump test on June 7, 1960.

W. J. Love, E. M. Kratz, and D. E. Simpson visited Atomic Power Equipment Department in San Jose, Calif., June 29 and 30, 1960, to discuss the NPR audit.

C. E. Love visited Harvey Aluminum, Los Angeles, Calif., June 14, 1960, to review progress on zirconium process tube fabrication.

C. E. Love visited Great Lakes Carbon Corporation, Morgantown, N.C., National Carbon Company, Clarksburg, West Virginia, Chase Brass and Copper Company, Waterbury, Conn., and Tube Reducing Corporation, Wallington, New Jersey, during the week of June 20, 1960, to review progress on NPR graphite and zirconium fabrication.

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M. H. Russ and E. W. Wilson spent the period from June 1 through June 10, 1960 at Burns and Roe, Inc. Headquarters in Hempstead, New York, for the purpose of expediting design progress.

D. L. Condotta traveled to Akron, Ohio and New York City during the period of June 15-22, 1960, to review the Goodyear NPR analog program and discuss control of heat dissipation system with Burns and Roe, Inc.

H. S. Davis visited Stanford, Montana on June 2 and 3, 1960 to inspect hydrous-iron deposits and to obtain samples at mining operation.

J. F. Nesbitt and H. D. Lenkersdorfer visited Savannah River June 14 and 15, 1960 for technical discussions regarding irradiated metal handling. They also visited AMF Atomics in Greenwich, Conn., June 16 and 17, 1960, for discussions regarding design of fuel element handling system.

M. M. Cox visited the Savannah River Plant June 27 and attended the Health Physics Society Meeting in Boston, June 29.

S. L. Nelson attended the ANS conference in Chicago, Ill., and visited the Panellit Corporation.

VISITORS

J. G. Carver, GE, ANPD, Evandale, O., visited HAPO for reactor physics consultations, 6/7-10/60.

P. Loewenstein, Nuclear Metals, Inc., Concord, Mass., visited HAPO to discuss the NPR Fuel Development Program, 6/16-17/60.

B. Kotts, General Dynamics, General Atomic Div., San Diego, Calif., visited HAPO to discuss removal of the H-1 Loop facility, 6/21-24/60.

G. B. Warren, GE, Turbine Division, Schenectady, N.Y., and R. B. Richards and W. R. Kanne, GE, APED, San Jose, Calif., visited HAPO to attend the GERSC Subcouncil meeting, 6/22-23/60.

W. K. McBean, R. A. Williamson, and H. F. Stevenson, Holmes & Narver, Los Angeles, Calif., visited HAPO for engineering discussions regarding earthquake analysis contract, 6/22-23/60.

T. Redding of North American Aviation, Inc., Atomics International, Canoga Park, Calif., visited HAPO to discuss tests at 105-KW, 6/27-29/60.

C. W. Bascom and V. H. Neubert, General Dynamics, Electric Boat Division, Groton, Conn., visited HAPO for discussions on earthquake stress analysis, 6/28-29/60.

W. B. Bible, E. I. duPont Co., Savannah River Operations, Aiken, S.C., visited HAPO to discuss mechanical engineering problems, 6/29-30/60.

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Dr. E. R. Tinney of Washington State University visited at HAPO as consultant at a meeting on Reactor Rear Crossheader Vibration for B, D, DR, F, and H.

J. Jolly of Power Sources, Inc., Burlington, Mass. visited HAPO on June 8 to discuss static power inverters.

P. Quinn of Paramount Agencies, Seattle, Wash., visited HAPO on June 8 to discuss static power inverters.

W. F. Ferguson and S. H. Hanover of Oak Ridge National Laboratory, Oak Ridge, Tennessee and C. D. Stout of Oak Ridge "E&M", visited HAPO on June 22 to discuss the reliability of reactor power supplies and systems.

J. L. Barns and E. G. Messa of Nuclear Products & Teleflex Corp., Los Angeles, Calif., and North Wales, Pa., visited HAPO June 6-7 to discuss charge seating mechanism.

J. Ellis, Sintercast Corp., New York, N.Y., visited June 9 to discuss a new order of splines.

J. Powers of Longyear Co., Salt Lake City, Utah visited May 17 to discuss core drilling.

J. L. Havlick of J. L. Havlick, Spokane, Wash., visited HAPO May 25 for drilling consultations.

G. L. Collins, APED, San Jose, Calif., visited HAPO May 19 to review test work on NFR items in 189-D laboratory.

A. Selz, Westinghouse Commercial Atomic Power Department, Pittsburgh, Pa., visited May 27 to discuss development and evaluation of high pressure-high temperature zircaloy tubing fittings.

W. Brown, Canadian G.E. Co., Ltd., Peterborough, Ontario, Canada; C. W. Beynon, AECL, Toronto, Ontario, Canada; A. O. Kroehenbuehl, duPont, Toronto, Ontario, Canada, and J. H. Rubin, US-AEC, Toronto, Ontario, Canada visited HAPO on June 10 to discuss testing high pressure-high temperature loop capability and high pressure seal development.

P. B. Robinson, G. E., West Lynn, Mass., visited June 1-2 to inspect GE 16 point recorder, made minor corrections, and suggested instrument be shipped to factory for correction.

Aladar Hollander, Hydraulics Consultant, Los Angeles, Calif., visited HAPO to discuss pump impeller, pump shaft seal, vibration and cavitation problems.

James Kavanaugh and Harry Walters of Gibbs and Hill Co., New York, N.Y. visited on June 2 to discuss reactor confinement relevant to the Jamestown Reactors.

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I. R. Compton, Comptronics Company, Seattle, Wash., visited HAPO on June 28 to discuss Donner analog equipment recently received.

W. I. Gilliam and S. Gottila, Burns and Roe, Inc., visited HAPO on June 14-17 for the purpose of discussing 105, 109-N instrumentation.

H. J. Cooper, Administrative Engineer, Burns and Roe, Inc., visited HAPO on June 28-30, to review administrative procedures.

C. W. Bascom and V. H. Neubert, Electric Boat Division, General Dynamics Corporation, visited HAPO on June 28 and 29 to discuss NER stress analysis contract.

G. L. Locke, Consultant to Process Design, visited HAPO on June 16 and 27 to discuss the final report and conclusions on the Process Tube Rupture Tests.

J. J. Cummings, J. Presenton, and A. H. Smith, Allegheny-Ludlum Steel Corporation, visited HAPO June 30 to discuss zirconium tube procurement.

W. J. Deitrick, AEC Radiological Physics Fellowship student, visited C Reactor for training June 21-24.

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