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IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
APRIL, 1960

75662

Compiled By
IPD Personnel

[redacted]
[redacted]
[redacted]

May 19, 1960

RICHLAND, WASHINGTON

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

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SUMMARY

RESEARCH AND ENGINEERING OPERATION

Four monitor columns of dingot uranium fuel were discharged at 400 MWD/T exposure for special measurements. Examination revealed no significant difference in either warp or diameter change between these elements and the control ingot uranium elements.

Fifty feet of NPR inner fuel element tubes have been received from NMI. The material is being inspected prior to irradiation testing in the 1706-KER facility.

The 18-inch enriched tube-and-tube elements being irradiated in KER-2 have reached an exposure of 1900 MWD/T and natural uranium seven-rod clusters loaded in KER-3 have reached an exposure of 1840 MWD/T. A failure occurred in enriched tube-and-tube elements in KER-4 at 1070 MWD/T. Examination to date has revealed nothing regarding the nature of the failure.

A method for calculating the shutdown flux in a Hanford reactor has been reduced to a handbook method to allow rapid approximations.

Sufficient 305 pile tests have been completed to permit determining the concentrations of rare earth poisons required in a ceramic ball to provide the same control strength as the boron-carbon steel mixture presently used at the K Reactors.

The Power Level Monitoring Standard has been revised for B and F Reactors to permit the use of the subcritical monitors installed in these reactors for startup period determination. The subcritical monitors provide neutron flux information at lower levels than the proportional counters.

Startup efficiency continues to be 50-70% higher at C and K Reactors through the use of splines. The use of splines at other reactors will be limited to equilibrium adjustment until the spline disposal systems have been replaced.

At the end of the report period the primary limit to all reactor power levels was based on fuel element failure control.

The 105-C Metal Examination Facility storage addition was completed. The addition permitted moving the profilometer pump and oil reservoir from the work area as a noise control measure as well as providing additional work and storage space.

MANUFACTURING OPERATION

Reactor input production was 7.0 percent above forecast; 3.1 percent above at the six old reactors and 13.2 per cent above at the K Reactors. Forecast was exceeded due to improved average power levels and nonequilibrium losses.

Overall time operated efficiency was 81.6 percent (82 percent forecast); 80.8 percent for the six old reactors and 84.1 percent for the K Reactors.

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The combined reactor instantaneous power level was not increased. The individual reactor power levels were increased 5 megawatts at B (1725 to 1730) and 5 megawatts at DR (1830 to 1835). New input production records were achieved at D and DR Reactors exceeding previous records by 5.4 and 3.7 percent, respectively.

Ten ruptures, seven I&E regular and three I&E enriched were removed from the reactors. Three of the I&E regular ruptures were at F, 2 at C and one each at B and KW. The three enriched ruptures were at C, DR and KW.

Processing and Power Statistics for individual reactor areas are shown on pages C-5 through C-9.

FACILITIES ENGINEERING OPERATION

Organization of a scope design and testing program in support of a project proposal for the modification of the 105-C Reactor for self-supported fuel elements was initiated.

Scope drawings for Project CG-775 are 100 percent complete. A portion of these drawings which define the total expansion of the 100-K Area water plants will become part of Project CGI-883.

Overall design for Project CGI-791 is 93 percent complete. Phase III scope is 96 percent complete while detail design is 84 percent complete. Twelve comment and 33 approved drawings were issued during the month. The overall test and development program is approximately 97 percent complete. An additional test was initiated during the month to evaluate the feasibility of fabricating aluminum filter frame assemblies using epoxy adhesive bonded joints rather than the conventional welded joints.

Detail design for Project CGI-839 is 98 percent complete. All instrument and mechanical piping drawings have been completed and approved. Acceptance Test Procedures for the electrical switchgear, loop pumps, loop heat exchangers, and loop instrument modifications have been issued for comment.

A revised project proposal for Project CGI-844 requesting scope revision and total project funds of \$2,100,000 has been forwarded to the Atomic Energy Commission for approval. The revision represents an increase of \$600,000 over the original estimate and includes a last ditch pump station between the KE and KW reactor building to supply coolant to either reactor upon demand.

Project CGI 883 progressed with issuance of construction drawings for the modification of the pumping unit at the 190-KW pump house. Scope design for the total project is approximately 97 percent complete.

The self-supported fuel element charging machine modification was delivered to the 105-C Reactor Operation; solid state analog-to-digital converter was installed at the 105-B Reactor; partial shipment of in-core chambers has been received from one vendor; and the last necessary information for specifying ceramic balls was obtained in work related to existing reactors.

In NPR work, a new flow monitoring limit circuit is being assembled and test operation of the NPR-PCE loop for cycling fittings and RDT's continue.

The maximum authorized dollar value of spare parts items added to the inventory was approximately \$28,150. The maximum authorized dollar value of items deleted from the inventory amounted to approximately \$14,450.

The annual two-year and five-year power forecasts are in the process of review; because of reasonable assurance that interruptible class power will be available, it is proposed that firm power commitments for IPD remain at the current level for the next two fiscal years.

A successful test of Northern Pacific coal was conducted in order to determine its suitability for service.

The Project CGI-791 construction contractor is approximately 33 percent complete on Phase IIB compared to 46 percent scheduled as of April 29.

A Project proposal is in preparation for "Modifications for Use of Self-Supported Fuel Elements - C Reactor" which includes installation of zircaloy process tubes and new tube hardware.

A project proposal also is in preparation to modify a lead reactor to permit use of bumper fuel elements.

RELATIONS PRACTICES OPERATION

Twenty-four BS/MS and one PhD candidates were interviewed with four offers extended. Eleven exempt employees transferred into the Department from other HAPO and GE Components. Four exempt employees transferred out of the Department. Two employees retired during the month. Six security violations occurred during April.

FINANCIAL OPERATION

The quarterly equipment expenditure pattern was transmitted to Contract Accounting on April 28, 1960.

The biennial physical inventory of IPD Movable Equipment was started on April 26.

Two changes in operating report forms were made. Effective with the July 1960 report, charges from AEC contractors will be booked as direct cost rather than as services. Assessment pool billings will be recorded separately from other assessments.

Procedures for taking the annual coal physical inventory were distributed.

Year-to-date absenteeism amounted to 2.7% of total available hours for a total of 39,786 hours comprising 30,047 for sickness, 9,739 other causes. 3,415 hours of this amount were absent without pay.

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Absence and injury records pertinent to the second consecutive HAPC General Manager's safety award were reviewed. Nothing which would disqualify the department from achieving the award on April 14, 1960 was found.

Guidance was given to members of the new 100-N Area Operation in their study of the maintenance information system requirements being designed for the new reactor area.

NPR PROJECT OPERATION

The construction area at the 181 Building River Pump House was flooded on April 17, 1960. The site was completely pumped out on April 28 but work had been resumed on April 25. All seven walls were poured to 24 feet above the base slab.

Excavation for the 105-109 Building was 80 percent complete and a few concrete walls and footings were poured.

The septic tank and tile field were completed and put in use.

Graphite production, using "K" stock, was started April 7, 1960. The first shipment of reflector material was received April 22. Bids on the core graphite were received April 25.

Recommendation for award of contract for furnishing the production order of zirconium alloy process tubes was made to the Commission April 1, 1960.

Preparation of facilities for on-site tube processing continued on schedule.

Design output and comments on drawings, specifications, requisitions, and criteria continued at a high level, slightly over the preceding month.

Planning for budgeting of essential materials for N-Plant construction, startup and operation was initiated. Needs for development of special tooling for plant operation and maintenance were predicted. An over-all study of two-company operation of an N-Plant converted to power production was completed.

Work continued on the integration of the 105 and 109 confiner vent provisions. Attention was also given to the feasibility of discharging the effluent from the primary loop dump valves directly into the 109 pipe gallery and using the steam vents and drain system for disposal. Although operating problems would be introduced, environmental protection could be improved and capital costs reduced by this method.

Design work in support of engineered equipment procurement continued during the month. Initial process elevator bids were rejected because of high cost and a program was initiated to develop revised elevator specifications which will provide acceptable facilities at minimum capital cost.

In addition, study was given to a number of design modifications of possible benefit in reducing project capital cost. On inlet and diversion valve

procurement, evaluation of proposals was completed in preparation for initiation of a prototype development program with selected vendors. On irradiated fuel handling equipment, addendum proposals were evaluated with the conclusion reached that functional requirements can be met but that capital costs would have to be reduced to a more appropriate level.

In the general cost reduction activities action was taken because of increasing cost to defer any further work on the 1704-N Administration Building. Direction from Kaiser Engineers to the subcontractor has been initiated. A decision will be made at a later date whether or not to continue the building or to cancel it and use the T-C Administration Building.

GENERAL

ORGANIZATION AND PERSONNEL

ORGANIZATION

There were no significant organization changes.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non- Exempt</u>	<u>Total</u>	<u>Changes This Month</u>
General	1	2	3	0
Research & Engineering Operation	103	63	166	+1
Manufacturing Operation	351	1370	1721	-1
Facilities Engineering Operation	139	44	183	+1
Relations Practices Operation	7	18	25	0
Financial Operation	17	16	33	+1
NPR Project Operation	<u>71</u>	<u>24</u>	<u>95</u>	<u>+5</u>
Total	689	1537	2226	+7

D. C. Boyd transferred from Manufacturing Operation to PRTR; R. H. Kopel transferred from Manufacturing Operation to APED; C. E. Lorenzen and M. A. Hall transferred from the Chemical Processing Dept. to Manufacturing Operation in IPD; P. J. Hollifield transferred from the Technical Graduate Program to the Facilities Engineering Operation; G. M. Baker, Engineer and N. E. Dean, Engineering Assistant, transferred from HLO to NPR Project Operation.

PERSONNEL ACTIVITIES

Meetings were held with W. H. Coleman, G. E. Manufacturing Services, in further discussion of IPD participation in the Manufacturing Training Program. R. S. Bell and R. J. Bursey interviewed technical personnel at Evandale, Ohio for placement in the Department.

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SAFETY, SECURITY AND RADIATION EXPERIENCES

Six security violations occurred during April. There were no disabling injuries or radiation exposures exceeding operational control. Ninety-five medical treatment injury cases were reported. Safety awards were ordered as the Department completed 410 days operation without a disabling injury.

INVENTIONS

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

Name	Title
R. L. Richardson	Electrical Connectors, Eight Pins
R. L. Richardson	Electrical Connectors, Eleven Pins
W. Dalos	Electrical Circuitry
M. L. Faught	Industrial Non-sequential Event Counting Bridge Circuit

[Signature]
General Manager
IRRADIATION PROCESSING DEPARTMENT

PROCESS AND REACTOR DEVELOPMENT OPERATION

REACTOR FUELS

Present Reactor Technology

Projection Fuel Testing

The first two columns of self-supported fuel irradiated in C reactor ribless Zirconium process tubes were discharged during the outage of March 10, 1960. Exposure at discharge was approximately 775 MWD/T; goal exposure for these columns was specified at approximately 200 MWD/T above the normal variable goal. Both tubes were recharged with self-supported fuel for further testing.

A replacement charge of 20 tubes of bumper elements to be charged under PT-IP-262-A-FP is under preparation in FPD.

Dingot Uranium Testing

Four monitor columns of dingot uranium were discharged at about 400 MWD/T for special measurements. The examination of these monitor columns revealed no significant difference between the dingot and the control ingot material with respect to either warp or diameter change. Twelve columns of dingot material remaining in the reactor are currently at about 85% of goal exposure and will be discharged during May.

Advanced Reactor Fuels

Fuel Development at NMI

Fabrication of 50 feet of NPR inner fuel element tubes was completed by NMI. This material has been received at Hanford, is being inspected, and will be used in the preparation of single tube irradiation tests in the KER facility. Work on the brazed bonded closure development continues at NMI under DDR-75, Modification I.

KER Testing

The KER-1 process tube was replaced. Leak problems were solved and the loop is currently charged with dummies on a shakedown cycle prior to charging fuel elements.

The 18 inch enriched tube-and-tube elements being irradiated in KER -2 at a coolant outlet temperature of 270 C have attained an exposure of 1900 MWD/T.

Natural Uranium seven-rod clusters with hot headed end closures being irradiated in KER-3 have reached an exposure of 1840 MWD/T.

On April 23, a failure occurred in the enriched tube-and-tube elements being irradiated in KER-4 at a coolant outlet temperature of 280 C. Exposure at the time of failure was 1070 MWD/T. Discharge of the elements was accomplished without difficulty and observation revealed no failure on the outer surfaces of any of the elements. Accordingly KER-4 was recharged on April 25 with

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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-56-A	Low Hydrogen Dingot U Elements	14	D, KE	Variable		Semi-production scale testing of low hydrogen dingot uranium fuel, solid. Test is discontinued but will not be terminated until material discharged.
IP-84-A	Projection Self-Supported fuel in ribless aluminum tubes	12	B	900 MWD/T		Preliminary evaluation of self-supported fuel elements. Routine charging to continue until tubes are replaced. Ultrasonically attached supports currently being used.
IP-171-A a)	Solid X-8001 & C64-F	1	B	Variable 500 MWD/T	664 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 OIN		6	D	Variable	140 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 now under irradiation.
IP-216-A	Normal Prod. Nat. OII, KII and KIII fuel elements	86	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 except for 3 columns scheduled for special extrac- tion at approxi- mately 3 Mo.	6 Mo.	Provides for long term irradiation of solid black mint for conversion ratio, and fuel performance determination. Control columns discharged.

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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-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-288-A	Seven Zr-2 Jack-eted Nat. U 7-rod cluster elements with hot-headed end closures	1	KE	2000 MWD/T	1840 MWD/T	Charged in KER Loop 3 on October 29, 1959.
IP-280-A	OIIN alloyed Dingot	7	D	800 MWD/T	660 MWD/T	Provides for evaluation of the stability and performance of cores having 100-200 ppm Si and Fe additives as grain refiners. Low exposure columns discharged.
IP-292-A	Four Zr-2 jack-eted 18-inch. enriched tube-and-tube elements	1	KE	3500 MWD/T	1900 MWD/T	Charged in KER Loop 2 on January 11, 1960.
IP-250-A Supp. C IP-292-A	Enriched tube-and-tube elements	1	KE	2000 MWD/T	1070 MWD/T	Charged February 21, 1960, in KER Loop 4; discharged April 24, 1960, with failure.
IP-300-A	8 Nat. U hot-headed tube-and-tube elements	1	KE	2000 MWD/T		Charged April 25, 1960, in KER Loop 4.

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natural uranium tube-and-tube elements under PT-IP-300-A. The inner tubes of these elements were fabricated with hot headed closures while the outer tubes had single gas welded closures. Examination of the charge has to date revealed nothing regarding the nature of the failure. Radiometallurgy examination will be carried out as early as possible.

IBM Design Analysis

The Multiple Option Fuel Design and Analysis program (MOFDA) was used to generate a variety of reactivity transient data for the NPR with recently computed graphite temperatures. The same code was also used to analyze the effects on fuel channel pressure drop and fuel dimensions of approximately 14 different combinations of fuel support designs which could possibly be used for NPR fuel. Calculations were also carried out on the same program for uranium oxide fuel elements if used in NPR. Machine generated data include flows, pressure drops, fuel temperatures, feed enrichment, xenon shutdown transients, flattening efficiencies, jacket temperatures, etc. Application of the same code to KER fuel design was also made.

REACTOR PHYSICS

Present Reactor Technology

Panellit Modifications

The use of DPST panellit switches in various applications was reviewed. Static switching trip identification is acceptable based on prototype tests in 105-DR utilizing either the DPST switches or the present switches. Use of the DPST switches in a coincident safety trip system will require further testing and evaluation of performance.

E-N Loading

Irradiation in the 305 pile of the striped E-N loading to obtain axial values traverses both wet and dry have been completed. Enriched pins used in these irradiations must be calibrated before the data obtained can be analyzed.

Planning work has continued on the E-N demonstration loading to be installed in H reactor. To date no specific authorization has been received to proceed with the E-N loading although authorization has been received to proceed with the procurement of canning components.

Shutdown Flux Calculations

A method of calculating the shutdown flux in a Hanford reactor has been reduced to a handbook method. This will be issued in document form and will allow a rapid approximation of the shutdown flux in a reactor.

SS Accountability

The program devised to predict isotopic concentrations as a function of exposure has been modified slightly. The expression for the effective resonance integral is now:

$$R. I. = \left[1 + \alpha(t-20) \right] A + \left[1 + \beta(t-20) \right] B \sqrt{S/M}$$

where

A = 2.81 barns

$$\alpha = 1.6 \times 10^{-4}/^{\circ}\text{C}$$

B = 24.7 barns

$$\beta = 3.18 \times 10^{-4}/^{\circ}\text{C} \times \sqrt{S/M}$$

Other minor corrections have been made including the use of slightly different graphite densities for the older reactors.

The concentration of Pu^{242} in natural and 0.946 percent enriched uranium was calculated for various exposures. Calculation was based on data from the SSA 100 program and no correction was made for Pu^{242} absorption. Concentrations appearing below are for K reactor with a 38 piece natural I & E charge and a 46 piece enriched I & E charge. A Pu^{241} capture cross section of 500 barns was used.

MWD/Ton of U

Pu^{242} in Grams/Ton of U

For Natural Uranium

100	0.001	
200	0.001	
300	0.004	+ 0.001
400	0.015	+ 0.004
500	0.030	+ 0.008
600	0.056	+ 0.014
700	0.100	+ 0.025
800	0.166	+ 0.042
900	0.253	+ 0.063
1000	0.371	+ 0.093
1100	0.512	+ 0.128

For Enriched Uranium

700	0.040	+ 0.010
800	0.068	+ 0.017
900	0.103	+ 0.026
1000	0.150	+ 0.038
1100	0.217	+ 0.054

Advanced Reactor Physics

Ceramic Ball Strength

Sufficient 305 pile tests have been completed to permit determining the concentrations of samarium and gadolinium required in a ceramic ball to provide the same control strength as the boron steel-carbon steel mixture presently used at the K reactors. The 305 testing in a "tight" lattice approximated the expected NFR flux spectrum. The following concentrations of rare earth poisons have each been demonstrated to be

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equal in control strength to the boron-carbon steel.

.532 grams/cc of ball, gadolinium oxide

.445 grams/cc of ball, samarium oxide

Ceramic Ball Activity

The activities of the Ball 3X candidate material irradiated in the 305 reactor last month were re-measured after an 11 day decay period. Relative data based on 1.2 percent boron steel as a standard appears below.

Relative Ball Activities - 11 Day Decay

<u>Sample</u>	<u>Related Activity</u>
1.2% Boron-Steel	1.0
1.5% Boron-470 Stainless Steel	5.8
.200 gms/cc Eu_2O_3 - Ceramic	100.3
.74% Gd_2O_3 - Ceramic	.41
.105 g/cc samarium - Ceramic	.54
Pyrocera - no poison	.20

REACTOR ENGINEERING

Present Reactor Technology

Zircaloy Tubes

As reported last month, Bridgeport Brass Co. has completed the initial 50 smooth-bore C reactor Zircaloy-2 process tubes. Harvey Aluminum Co. has packaged for shipment 32 additional tubes. With the receipt of the Harvey tubes a total of 95 smooth-bore C reactor tubes will have been received.

Flow Protection

Instability limits have been provided for all reactors for tubes operating with rear crossheader pressure as high as 80 psig.

Graphite

Prior to installing a graphite thermocouple stringer in channel 2285 in C reactor the channel was borescoped to look for burnout pitting similar to that in channel 1960 in January. No pitting was detected. This indicates that the exaggerated pitting in 1960-C may be largely limited to that one fuel channel. Water leakage through the flange on the end closure of 1960-C could account for the metallic contamination of the burnout monitoring samples. Borecoping of other channels in various zones of the reactor will be conducted as tubes are removed for replacement. Graphite burnout monitors inserted in 1960-C in January will be removed at an early date to obtain further information on burnout rate in that specific location.

Three two-foot long bars of graphite, one unpurified and one gas purified, which had been in C reactor since startup were removed April 24. Dih measurements will be made on these long-term irradiated bars to obtain data on the rate of burnout of nuclear impurities. Dimensional measurements will also be made to obtain data on contraction.

Earthquake Studies

Authorization has been received to continue the earthquake vulnerability studies with Lockheed Aircraft Corporation and the Holmes and Narver Company to a total level of \$92,600, and the completion date has been extended to June 15, 1960.

Advanced Reactor Technology

A pressurized water loop in the GETR at Vallecitos was decontaminated during the week of April 10. Representatives from Hanford were present during the operation. The work done which most nearly simulated conditions and methods expected to be used with NPR was the cleaning of the in-reactor part of the loop. Available evidence indicates that the operation was successful, in that considerable activity was removed from the piping without any apparent corrosion or other damage.

Graphite

The first 18 dih purity sample bars from top and bottom reflector graphite were received from National Carbon Co. in April. The dih purity values ranged from +0.46 to +0.53 compared to specification minimum requirements of +0.25. Bulk density of the sample bars averaged 1.68 as compared to a specification requirement of 1.71, $\pm .03$.

The first 6 dih purity sample bars from top and bottom reflector graphite were received from Great Lakes in mid-April. The dih purity values ranged from +0.38 to +0.46.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience of critical IPD classifications for the first 16 weeks of the 1960 badge year:

<u>Classification</u>	<u>Total Dose</u>	<u>No. of Employees</u>	<u>Average Dose/Employee</u>	<u>Extrapolated Year End Average</u>	<u>No. of Employees over 3r Extrapolated Exposure</u>
Radiation Monitors	76370 mr	79	967 mr	3143 mr	54
Processing Operators	193967 mr	254	764 mr	2483 mr	51
Pipefitters	65762 mr	93	707 mr	2298 mr	23
Millwrights	50665 mr	76	667 mr	2168 mr	20

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Lapse of Radiation Control

Lapse of Radiation Control
Distribution by Reactor and Component

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>IPD TOTAL</u>
Processing	0	0	2	0	4	2	1	3	12
Maintenance	1	1	1	1	1	1	0	1	7
Supplemental Crews	0	0	0	0	0	0	0	0	0
Research and Engineering	0	0	0	0	0	1	0	0	1
Facilities Engineering	0	0	0	0	0	0	0	0	0
Central Maintenance	0	0	0	0	0	0	0	0	0
Reactor Areas	0	0	0	1	0	0	0	1	2
Assigned Totals	1	1	3	2	4	4	1	5	21
IPD General									0
Outside IPD									1

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

Average Reactor Effluent Activity Output

	<u>April, 1960</u>	<u>March, 1960</u>	<u>April, 1959</u>
107-B	47,000 uc/sec	26,000 uc/sec	32,000 uc/sec
107-C	45,000 "	38,000 "	31,000 "
107-KW	90,000 "	66,000 "	58,000 "
107-KE	62,000 "	33,000 "	46,000 "
107-D	28,000 "	31,000 "	38,000 "
107-DR	59,000 "	18,000 "	43,000 "
107-H	42,000 "	22,000 "	43,000 "
107-F	60,000 "	28,000 "	45,000 "
Total	433,000 uc/sec.	262,000 uc/sec.	336,000 uc/sec.

High turbidity in river water and the consequent high effluent water activity which normally accompany the spring run-off have not occurred this year. This may be due too either the presence of the pool behind Priest Rapids Dam having a beneficial effect on river water purity, or the period of high river water turbidity has not yet arrived. Measurements of radioactivity in the river and hexavalent chromium concentrations during the low flow period in March revealed no abnormalities except reduced dilution.

Radiation Control Standards and Procedures

Radiation Control Standard 1.1, "Personnel External Exposure Limits" has been revised to reflect recent changes made in the HAPD external exposure standard.

Remote Area Monitoring

Fabrication of the remote area monitoring aid prototype was completed and the instrument is now under test in the field. The name "Sentinel" has been tentatively chosen for this instrument.

Multi-isotope Analyzer

Evaluation of the multi-isotope analyzer for monitoring effluent water continued. The monitoring equipment is installed in the 146-FR building. Its electronic system, including the programmer, has operated satisfactorily. The mechanical sampling system is the weakest part of the equipment and will require design revisions to make it operable with any degree of reliability.

Reactor Effluent Treatment

Design of a small scale test facility at 100-K Area in which the development study of effluent water treatment will be carried out was begun. The tank will be about 3 x 6 x 20 feet with facilities for sampling the bed media and water at intervals along its length. Water from the 107-KW tank will be passed through the tank and dumped back into the KW effluent line.

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PROCESS TECHNOLOGY OPERATIONREACTOR POWER LEVEL LIMITATIONS

The primary limit to all reactor power levels at the end of the report period was based on fuel element failure control at the goal exposure permitted by the available metal supply.

PROCESS STANDARDSHW-46000 B, Process Standards - Reactor

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

Process Standard C-020 - "Power Level Monitoring"

The Power Level Monitoring Standard was re-written to permit use of sub-critical neutron monitoring equipment to replace the normally used proportional counter for startup period determination.

Safe startups are dependent upon early knowledge of the neutron flux and period. The sub-critical monitor provides this information earlier and at lower flux levels, thus presenting a significant gain in reactor safety.

Another stipulation in this revision requires that on cold startups, the power rise be halted, as soon as temperature response, and/or flux response is noted, and a calibration check be made by comparing indicated and calculated power levels.

Process Standard E-020 - "Handling of Irradiated Enriched Slugs"

The Standard was revised to save outage time during the discharge of .96 per cent enriched E slugs. This was accomplished by specifying bucket limits for the random arrangement of slugs which are permitted to fall directly into buckets from the discharge chutes. This was accomplished at no compromise to reactor or personnel safety.

HW-46000 D, Process Standards - Reactor

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

Process Standard A-021 - "Bulk Outlet Temperature Limit"

The revision to this Standard permitted an increase of 1-1/2°C to the former maximum bulk outlet water temperature limit. This relaxation was contingent upon the following:

1. Limitations were placed upon the number of process pumps supplying water to the reactor. This requirement limits the bulk water temperature surge to an acceptable value, should a process water pump shaft fail.

2. A deadman switch is required on all horizontal control rods whenever operating above the former maximum bulk temperature limit. Inadvertent horizontal rod withdrawal will be thus limited to increments which will limit bulk water temperature surges to 5°C.
3. Poison column length is either limited or rear ball valve controls must be automatically de-activated, whenever operating above the former maximum bulk outlet water temperature. Unacceptable temperature surges are thus prevented by the reduced length of the poison column or the disarmed ball valve controls.

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 if the 3X system was needed at the time of evacuation to meet the "Total Control Criterion."

Process Standard H-020 - "Handling of Irradiated Enriched U²³⁵ Slugs"

The revisions made to this Standard were identical to those made for HW-46000 B, above.

HW-46000 F and HW-46000 H, Process Standards - Reactor

Four revised Standards were issued during the month: These were:

Process Standard A-021 - "Bulk Outlet Temperature Limit"

Process Standard D-060 - "Emergency Evacuation of Personnel"

The revisions made to these Standards were identical to those made for HW-46000 D, above.

Process Standard C-020 - "Power Level Monitoring"

Process Standard H-020 - "Handling of Irradiated Enriched Slugs"

The revisions made to these Standards were identical to those made for HW-46000 B, above.

HW-46000 K, Process Standards - Reactor

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

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

Process water pump maintenance necessitated the removal of one pump from service causing a reduction in process water pressure to the reactor. A

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new series of outlet water temperature limit curves TAI) were supplied since these limits are pressure dependent.

Process Standard A-021 - "TOA Boiling Limit"

The change to K-III fuel elements obsoleted the present TOA boiling limit curves. The change of the outside diameter size of a fuel element affects the eccentricity of the slug with respect to the process tube. Therefore, the ratio of the top of the annulus temperature rise to the bulk temperature rise of the tube is altered. New curves were accordingly supplied

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

The revision to this Standard are identical to those made in parts 1 and 2 of Standard A-021, for HW-46000 D, above.

Process Standard A-050 - "Panellit System Control"

Lower reactor water pressure as a result of the process water pump maintenance previously mentioned required additional curves showing revised high and low Panellit trip pressure settings.

Process Standard B-010 - "Gas Composition, Pressure and Flow"

The method of administering the oxygen concentration limit of the reactor gas atmosphere was revised to facilitate meeting the intent of the Standard. The revision did not represent a change in the permissible oxygen concentration.

The frequency of analysis of the nitrogen content of the reactor gas atmosphere was reduced to once every 24 hours, provided that the previous two samples taken at four-hour intervals, showed a decreasing nitrogen content.

HW-27155 Rev1, Process Standards - Water Plant

Process Standard 183-A-010 - "Aluminum Sulfate Coagulant Addition"

Reference in the Standard to activated silica was deleted since this reagent is no longer used. Replacing this, two new chemicals were added to those specified in the Standard.

The "Advice" limit on turbidity in process water was relaxed based on unpublished results of a high turbidity test performed at F Water Plant. The mandatory limit remains unchanged.

PROCESS CHANGE AUTHORIZATIONS

Eleven 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 Process Equipment Standards - HW-41000. These were:

FCA #0-29 - "Graphite Thermocouple Stringers, KE and KW Reactors"

Process Standard C-040 requires replacements of faulty graphite thermocouple stringers within three months whenever the stringer is no longer serviceable.

Due to graphite stack misalignment, removal of faulty stringers has been exceedingly difficult and unattainable in the specified time.

In addition to the serviceable stringer thermocouples, both K Reactors have about 200 thermocouples that were originally installed in the moderator. Although the number of thermocouples presently available for graphite temperature monitoring is less than desired, sufficient numbers of measuring points are available to indicate if any gross damage is occurring to the moderator.

The FCA permits operation with less than the specified number of serviceable graphite stringers for a six month period provided graphite temperatures in unmonitored locations are calculated and continued effort is made to replace the failed stringers.

FCA #0-30 - "Rear Header Pressure Requirement - F Reactor"

Trip-After-Instability limits are based, in part, on a maximum rear cross-header pressure of 40 psig. The major parameter affected by rear header pressure is the Panellit gauge low trip pressure setting. The present minimum low trip setting of 55 psig is based on a 40 psig maximum rear crossheader pressure. If the rear crossheader pressure is greater than 40 psig, the Panellit low trip pressure must be increased to maintain adequate low flow protection for individual tubes.

Five crossheaders at F Reactor have a pressure slightly higher than 40 psig which is attributed to increased water flow to the reactor.

Authorization was given until July 1, 1960, or upon revision of the Process Standard, whichever is sooner, to operate with a maximum rear crossheader pressure of 45 psig and the present TAI limits, provided minimum low trip Panellit pressure on the affected headers is 100 psig or greater.

FCA #0-31 - "Bulk Outlet Water Temperature Limit During Five Pump Operation - K Reactors"

During the period of operation with five process pumps, severe cavitation of pump impellers would occur upon failure of one pump if pump speed were unrestricted.

This Process Change establishes 1600 RPM as the maximum operating speed for old process high lift pumps during periods of five pump operation at KE and KW.

FCA #0-32 - "Rear Header Pressure Requirements - DR Reactor"

The problem and requirements are identical to those presented in FCA #0-30

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above, except that the maximum permissible rear crossheader pressure is specified at 50 psig for DR Reactor.

PCA #O-33 - "Rear Header Pressure Requirement - B, D, and H Reactors"

The problem is identical to that stated above in PCA #O-30. However, in this case, higher rear crossheader pressures necessitated special TAI limits and Panellit low trip pressures.

Authorization was given to the Process Engineer to supply these data to permit continued operation. This Authorization will expire June 30, 1960, or upon revision of the Process Standard, whichever is sooner.

PCA #O-34 - Rear Header Pressure Requirement - DR and F Reactors"

The problem and requirements are identical to those stated above in PCA #O-33. This PCA voided PCA #O-30, F Reactor, and PCA #O-32, DR Reactor.

PCA #O-35 - "Ball 3X LP Trip Setting, D Reactor"

Process Standard C-110 specifies the maximum pressure differential between the LP trip setting and the riser pressure. The LP-VLP trip settings are designed to cause a ball drop on a process water decay significantly greater than normal pressure decay caused by a BPA outage. On this basis the LP trip is set as close to operating pressure as practical and the VLP is set far enough below the LP trip so that water pressure decay from a BPA outage will not cause a ball drop.

Authorization was given to operate the LP trip setting 35 psi lower than specified in Process Standard C-110 until the next minimum outage, at which time the LP-VLP trip settings will be adjusted to comply with the Standard.

PCA #O-36 - "C-Elevator Photocell Interlock - D-DR Reactors"

Process Standard D-050 specifies that the C Elevator travel be automatically stopped by a photocell interlock, should an object interrupt the beam.

Due to the unreliability of the photocell equipment, authorization was given to continue operation with C-Elevator travel interlocked with specific pieces of equipment. Efforts are also being directed towards development of a more reliable system to replace the photocell equipment.

This Authorization will expire on December 28, 1960, at which time effective replacement equipment should be available.

PCA #O-37 - "Rear Header Pressure Requirement - K Reactors"

The problem and requirements are identical to those stated above in PCA #O-33, D Reactor. This PCA will expire July 20, 1960, or upon revision to the Process Standard, whichever is sooner.

PROCESS ASSISTANCE

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

Graphics services prepared 56 charts, graphs, and visual aids for various IPD and HLO components.

RUPTURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Metal</u>	<u>Exposure/</u>	<u>Type of Failure</u>
4/1/60	2588-C	KJ-197-C ⁽⁵⁾	I&E Natural	466	Side Hot Spot
4/3/60	1169-F	KL-375-C	I&E Natural	546	Unknown
4/6/60	2548-KW	KS-133-F	I&E Enriched ⁽²⁾	222	Side Hot Spot
4/8/60	1569-F	KL-378-C	I&E Natural	392	Side-Other
4/9/60	1275-C	KJ-188-C	I&E Natural	400	Side Hot Spot
4/19/60	1380-C	KG-848-E	I&E Enriched ⁽²⁾	422	Side Hot Spot
4/23/60	4268-KE ⁽¹⁾	(4)	"tube in tube" ⁽³⁾	1070	Unknown
4/26/60	0668-B	KL-352-D ⁽⁵⁾	I&E Natural	607	Unclassified
4/26/60	3683-F	KL-410-C	I&E Natural	521	Side-Other
4/28/60	1385-KW	KR-164-D	I&E Natural	514	Unknown
4/30/60	0774-DR	KH-133-C	I&E Enriched ⁽²⁾	774	Side-Other

- (1) KER Loop #4
- (2) 0.94% U-235
- (3) 1.6% U-235
- (4) PT IP-250-A SUP C
- (5) 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.

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

Unclassified - Failure did not logically fall into any of the usual types.

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OPERATIONAL PHYSICS OPERATIONPILE PHYSICS ASSISTANCE

Startup efficiency at the K Reactors continued to show a 50-70 per cent improvement through use of splines. D Reactor spline usage for startups was restricted pending installation of the more trouble-free reel removal system. Both C and H Reactors realized a 50-60 per cent decrease in losses per startup, C Reactor with initial spline application and H Reactor with more aggressive procedures utilizing the PCCF system. Additional PCCF columns have reduced startup losses significantly at DR Reactor also. Indicative of the progress in supplemental control development is the fact that there were no temporary poison discharge outages during the report period.

Transition to the new "square pile" calculational basis for total control requirements has necessitated only moderate supplementary control adjustments to permit operation of the four 9-rod reactors with 34-piece fuel element charges; this calculational method is more sensitive to changes in charge length than the previous front-to-rear weighting approximations.

The new geminol graphite thermocouple stringers, presently installed in B and F Reactors, permit continuous observation of the front-to-rear flux distribution in good detail. Procedures have been initiated to obtain and to make greater use of this information, particularly as these stringers are installed in other reactors.

Average flattening efficiency as measured by total ECT was maintained above 77 per cent for the third consecutive month; previously, 77 per cent efficiency had been exceeded only once. Flattening efficiency has been especially high at the DR Reactor with its central zone operating at nearly uniform exposure under the unit discharge production test.

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

Reactor	B	C	D	DR	F	H	KE	KW
ECT in April (1)	1460	1670	1490	1590	1455	1640	2445	2480
12-Month Avg. ECT	1435	1645	1480	1525	1445	1600	2470	2470
Equil. Scram Time (2)	13-17	30-35	14-18	25-35	14-20	30-35	19-22*	19-22*
No. of Scrams and Recoveries (3)	1/1	0/0	0/0	0/0	0/0	2/2	0/0	0/0
No of Non-Scram Outages (4)	0/0	4/2	1/0	0/0	0/0	2/1	0/0	0/0
Recording Period -								
From:	3-25	3-24	3-25	3-25	3-26	3-25	3-25	3-25
To:	4-25	4-25	4-25	4-24	4-25	4-25	4-25	4-22

* 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.

(Footnotes continued on following page)

Footnotes (Continued)

- (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

An ECT of 1500 was achieved near the end of the report period, the maximum flattening efficiency of B pile to date; a long operating period, the return to service of 22 channels which had contained dummies or had been air channels pending retubing, and placement of spike enrichment columns contributed to this performance. Correlation between graphite thermocouple data and solid aluminum traverse information indicated that basic graphite temperatures can be normalized to represent adequately the longitudinal flux profile. This data is readily available continuously with the seven new geminol stringers consisting of eleven TC's per stringer. The maximum flux continues to be slightly upstream with little change in degree of peaking. Enrichment adjustments to maintain a flat radial flux distribution have proven to be quite successful when the adjustments were based upon variations in zone reactivity resulting from the discharge in that zone. Operating continuity was very good with only one unscheduled outage during the reporting period.

C Reactor - R. A. Chitwood

Spline usage during the last three C Reactor startups resulted in a non-equilibrium loss reduction of about 60 per cent. Spline usage increased each startup; 51 splines were used for an extended outage at the end of the report period. Attempts to remove 3X balls lodged in the graphite by the use of a magnet have been effective only on the layer of balls nearest the VSR channel, thus resulting in a relatively small recovery of balls and reactivity. Average flattening efficiency remained above average despite relatively short operating periods.

D Reactor - W. L. Stiede and J. F. Jaklevick

A "slave" power rate meter was installed over the control console to aid power level control during spline and PCCF operation; over-controlling was markedly reduced. Spline usage was lower than normal this report period due to spline removal difficulties and associated manpower exposure. Operating continuity was reasonably good; only two outages occurred, one for a rupture, and the other for a water leak.

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DR Reactor - D. G. Montague

Flattening efficiency continued to be about four per cent higher than average as a result of the block discharge program. Increased PCCF coverage permitted a record turnaround level of 1475 MW. Operation was interrupted three times during the month, once each for an enriched metal rupture, a water leak, and a power failure to one process pump.

Flux traverse data following a downstream fuel element rupture in tube 0859 indicated seven per cent peaking above a cosine distribution with the maximum slightly upstream of center. The metal coefficient was re-evaluated from the downcomer surge test (PT-IP-278-A) results. However, the value was considerably larger than obtained from full shutdown reactivity transients; the uncertainty in the discharged poison column reactivity and the limited sensitivity of the recording instruments introduced a large error probability.

F Reactor - G. F. Bailey and C. D. Wilkinson

Use of a predominately upstream rod configuration to control radial flux distribution problems following a startup March 11 resulted in downstream peaking for one operating period; subsequently three ruptures occurred near the point of maximum flux. New procedures for startup rod control will insure maintenance of a downstream equilibrium rod configuration. Since the last of these ruptures, April 8, operation has been continuous.

H Reactor - A. R. Kcsmata

Non-equilibrium losses of only 0.18 and 0.15 effective day, respectively, were achieved during the last two startups of the report period. This new record performance, about 50 per cent improvement over previous experience, resulted from increased emphasis on improving startup efficiency. A startup level of 1600 MW was achieved. The average equilibrium ECT reached nearly 1640, a record high for H Reactor. A temporary surge in power of 30 MW occurred when a flow interruption in the H-1 loop caused the coolant to flash to steam; no significant reactivity transient effects followed the return to normal level. Three shutdown periods occurred this report period, one because of a rupture and two more due to water leaks.

An irradiated aluminum dummy piece was backflushed out of a PCCF tube during a shutdown because the rear valve was closed. The front valve was open, and the reactor was on high flow. Difficulty in washing poison downstream was experienced in one PCCF tube; following what was thought to be flush discharge of the tube, the poison moved downstream after the rear ball valve was closed and the Panellit gauge was unbypassed; a Panellit trip scrambled the reactor.

The zone temperature monitor was adjusted to monitor tube powers for a short period of time, but inaccuracy in temperature agreement between the resistance thermal detectors and the thermocouples made the readjustment difficult and of questionable value; the system was returned to a less rigorous temperature monitoring status at least until the temperature discrepancies are resolved.

KE Reactor - F. C. Franklin

The average ECT was about 50 tubes lower during the report period than it had been recently. Flattening adjustments during operation were held to a minimum because of high residual exposure and thus more inherent cycling potential; questionable flow values on some tubes following the return from five to six pump operation also detracted from flattening efficiency. About 180 splines were used for equilibrium and non-equilibrium control; resulting losses for the report period's three startups averaged only 0.30 effective day, and a record low of 0.22 effective day was achieved on one startup. Insufficient spline insertion rates following one startup restricted turnaround level, but continued addition of splines permitted the level to be raised simultaneously, thereby resulting in little decrease in startup efficiency.

A malfunction of the withdrawal mechanisms for both subcritical monitoring chambers occurred during the April 25 startup; both systems are now back in service.

KW Reactor - A. D. Vaughn

Loss from service of No. 2 HCR, a primary long rod for equilibrium control, was compensated successfully by substitution of No. 1 rod plus splines for far side control. However, loss of this rod did delay plans for a higher level spline startup. A 115 MW power reduction occurred when a flow monitor failure caused the power meter to read high; a minor flux distributional cycle resulted. To prevent recurrences, alarms have been placed on the bulk outlet temperature recorder to indicate changes in the effluent temperature. Malfunctions of both subcritical monitoring systems, the drive mechanism in one case and the period recorder in the other, were corrected before the end of the report period. Only one outage, for an enriched metal rupture, interrupted operating continuity.

PROCESS PHYSICS STUDIESSafety Control Studies

Experience tests with the new subcritical monitoring installations were completed at C, H, and KW piles during the month. Following completion of the D test, scheduled early in May, seven of the eight tests will have been completed.

There has not been an opportunity yet to re-run the scheduled power rate meter test at the D pile due to RTD's out of service.

Pile Reactivity Studies

The E-N loading for H pile is being planned in two parts - a fringe blanket of outer N columns compensated by adjacent E columns, and a central E-N stripe loading. It will be feasible to authorize the loading in two steps starting with the fringe blanket loading while the central core still contains natural uranium. The production test for this first phase is nearly completed in rough draft form and will be circulated for comment in this form in the near future.

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Operation of the DR loading at approximately two-thirds goal exposure under the Unit Flattened Zone production test has been stable and uniform with an ECT of approximately 1600 and presently limited by bulk outlet conditions.

Control Efficiency Studies

Losses per spline startup at the C and K piles have consistently averaged half of what they would have been otherwise. The excellent mechanical performance of the spline system at these reactors has demonstrated the incentives for use of splines at all reactors. However, the chopper and eductor disposal methods do not permit full advantage, and use of splines in the other reactors will be limited to equilibrium adjustment until the spline coiler removal system is available. HW-64753 was issued during the month to aid in obtaining project authorization for the spline coilers.

The DR and H piles have also shown marked improvements lately in startup efficiency from additional PCCF columns and greater attention to attaining their full potential. Planning has been completed with F Processing for use of splines during equilibrium and for relocation of PCCF columns to improve startup control efficiency.

Shielding Studies

A special thermal shield temperature measurement in the H pile indicates that fringe tube powers at present levels would be allowable with two adjacent thermal shield cooling tubes out of service. This measurement was made in bottom cooling tube No. 70 at the H pile which has run dry for some time because of a leak, and with flow temporarily blocked off in an adjacent tube.

Masonite heating tests in an air atmosphere performed at IPD's request indicated that ignition did not occur at temperatures below 245°C. Ignition did occur after two hours time at 250°C and after ten minutes time at 260°C. Deterioration rates at lower temperatures were in good agreement with test data from helium atmosphere oven tests carried out several years ago.

Black mint, lithium-aluminum slugs enriched in the lithium⁶ isotope, have been charged into some of the top fringe poison locations at the H pile and are now available for other shield protection requirements.

Reactor Fundamentals Training

The series of talks for reactor specialists by guest speakers on supplementary control techniques and control efficiency, and on Panellit functions and trip requirements were completed during April. Except for one scheduled make-up session the Utility Operator training program, which was made available during the past year to all Utility Operators, has also been completed. No formal training classes are scheduled during the summer months.

TESTING OPERATION

IRRADIATION TESTING OPERATION

DR-1 Loop

The DR-1 Loop was not operated with a test loading during the month. It was operated intermittently to test the emergency system response to total flow loss events and to better establish compressor operating characteristics with the compressor by-pass system in service.

The rate of helium leakage from the loop has been reduced to about 2-1/2 per cent of the loop volume per day. This represents a five- to six-fold reduction in leak rate, and was accomplished primarily by cleaning valve seats and increasing the seating force on the loop purge valve and the over-pressure relief valve.

All attempts to reduce the excessive vibration in the motor-generator sets have been unsuccessful. The situation has been referred to the vendor for correction.

Leads from eight of the 10 thermocouples of the MGCR-II A fuel element, scheduled for the next loop irradiation, were found to be broken from their connectors during a pre-loading check of the fuel element. Repairs and identification of the leads is underway.

One Hanford Test Reactor irradiation, of a series of four, of a nuclear mock-up of the heterogeneous fuel element has been completed. The results of these four irradiations, representing four levels of U-235 enrichment, will be used to determine the enrichment to be used in the test heterogeneous fuel element.

Mr. B. T. Resnick of the AEC Division of Reactor Development, Maritime Reactors in Washington, D.C., visited HAPC April 18, to discuss the facility's testing capability.

H-1 Loop

The empty in-reactor loop was on recirculation cooling for 64 per cent of the report period and on process water cooling for the remainder of the time.

On April 13 an accident occurred, in which a portion of an instrument line was blown from a high pressure fitting. The loop was recirculating cooling water at a pressure of 2000 psig and 500 F at the time. Although two men were working at that location at the time, no injuries or personnel over-exposure occurred. The in-reactor tube was switched to process water cooling. The area in the vicinity of the failure and the operating cubicle were contaminated with steam and water-borne radioactive materials. To date, all zones, with the exception of a small area in the vicinity of the break, have been decontaminated.

On April 18 it was discovered that the line heaters and the three-inch pipe enclosed by the line heaters had been damaged as a result of the rapid

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loop depressurization following the fitting failure and the subsequent failure of the automatic system designed to turn off the power to the heaters. Repairs and replacement of damaged equipment is essentially complete.

The NRM fuel assemblies and flow tubes for the BAPL-120-8B test have been returned to HAPO for insertion into the loop.

Sample Irradiations

The following samples were irradiated or undergoing irradiation during the report period:

<u>Reactor</u>	<u>Test Hole</u>	<u>Facility</u>	<u>Request Number</u>	<u>No. of Samples</u>	<u>Material - Purpose</u>
C	G	Bare channel	HAPO-117	3	Graphite (damage studies)
KW	4C	Snout	F&WS-105	11	Alnico (isotope production)
KE	2D	Quickie	HAPO-223	6	Flux monitors (facility calibration)
KE	2D	Quickie	HAPO-184	2	Washington-Designated Program
KW	2C	Hot Graphite	HAPO-177	1	Graphite (damage studies)
KE	2C	Hot Graphite	HAPO-177	2	Graphite (damage studies)
DR-H		PCCF	HAPO-184	12	Washington-Designated Program
DR		PCCF	HAPO-218	1	Natural uranium (fission product release studies)
F	E	Quickie	HAPO-219	1	Strontium (isotope production)
F	E	Quickie	HAPO-223	1	Lutecium (isotope production)
F	E	Quickie	HAPO-227	2	UO ₃ (isotope production)
F	E	Quickie	HAPO-229	8	UO ₂ (thin films for damage studies)
C	D	Bare Channel	HAPO-237	2	Inconel (PRTR Gas Loop Components)
KE		Gamma	HAPO-148	10	Plastics and rubber (damage studies)
KW	4B	Snout	NAA-110	3	GdO ₂ , SmO ₂ (control rod material study)
KW	3A	General Purpose	HAPO-236	1	Zirconium (creep test)

Borescoping Activities

Process Tube 2278, 105-H - Borescope assistance was provided to assist in removal of a stuck charge from tube 2278-H.

Process Channel 3666, 105-DR - This channel was inspected front and rear in an effort to remove a stuck drill.

Process Channel 0668, 105-B - Channel inspected to determine its condition.

Vertical Safety Rod Channel 19, 105-C - Inspected to assist in the removal of a 3X ball magnet.

Vertical Safety Rod Channel 17, 105-C - Inspected before and after an attempt to remove 3X balls from the horizontal cracks between tube and filler blocks.

Vertical Safety Rod Channel 60, 105-C - Inspected before and after 3X balls were "trickled" into the channel and after attempts to remove 3X balls lodged in horizontal cracks.

Horizontal Control Rod 2, 105-KW - Channel inspected to determine its 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>
4-20-60	105-H	4674-H	36'	Up .01" at 7'4" since 1-10-60 Down .15" at 23' since 1-10-60
4-11-60	105-D	4674-D	36'	Up .03" at 9'4" since 1-7-60 Down .05" at 22' since 1-7-60
4-8-60	105-B	4391-B	34'	Up .13" at 9'4" since 8-25-59 Up .03" at 21' since 8-25-59

COOLANT TESTING OPERATION

During April, 1960, activities of the Coolant Testing Operation included operation of the 1706-KE in-reactor and out-of-reactor equipment; operation of the 1706-KER in-reactor loops, and start-up of new and revised facilities.

A summary record of activities involving each facility follows, including significant items of performance, changes and improvements:

1706-KE Single-Pass Tubes (PT IP-197-A)

The six central zone tubes in KE Reactor which are supplied by 1706-KE pumps, were operated until the April 23 outage under the following specified production test 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
4557) Control	7.0	Process	2 ppm
4863) Tubes	7.0	Process	2 ppm
4963	6.5	Process	2 ppm
5063	6.5	Process	2 ppm

During the April 23 outage, all material was discharged from these tubes. Tubes 4355, 4456, 4963, and 5063 were recharged with weighed, numbered

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metal and continued testing under previous conditions. Tubes 4557 and 4863 were recharged with normal production metal and returned to normal reactor process water supply.

1706-KE Mock-up Tubes

The mock-up tubes were shut down during the month for maintenance on steam valves and for detailed measurement of pipe wall thicknesses on the steam distribution station.

Out-of-Reactor Loops

ELMO-1 - The loop continued operation during the month on a raw water corrosion test of A-212 carbon steel and aluminum samples. The primary side of the heat exchanger was operated at 200 F and the secondary (raw water) side at 180 F.

ELMO-4 - The loop has remained shut down during the month awaiting delivery of pump parts.

ELMO-5 - The loop continued operation at 290 C and pH 10.0 for uniform corrosion tests of coupons of:

Zircaloy-2	Nickel
Zircaloy-4	D-979 Nickel Alloy
Stellite-6	J&L Steel #313472
Stellite-12	Hasteloy-X
Hasteloy-C	Inconel
Monel	
Graphite, Zircaloy-2 galvanic couple	

ELMO-6 - ELMO-6 operated on a clean-up and decontamination run until April 12 when the loop was shut down due to failure of the recirculating pump. The loop remained shut down during the rest of the month, awaiting delivery of a replacement pump.

ELMO-7 - Following shakedown and conditioning operation, testing at 300 C and pH 10.0 was begun on April 27. Tests are being run on: (1) six short sections of the outer tube of a KER-size NPR candidate fuel element for testing experimental brazed end closures on Zircaloy-2, and (2) single rod PRTR element with a broken spacer wire for checking fretting corrosion.

ELMO-8 - The loop was operated at 355 C until April 14, when it was shut down for repair of a weld leak. Further examination of welds revealed the necessity for complete radiographing of all high pressure, high temperature welds to determine suitability of the loop for further operation. Radiographing was completed during the month.

ELMO-10 - The loop remained shut down during the month awaiting installation of a new pump.

CEP-1 - The second set of cyclic decontamination tests was completed on April 5. This test consisted of repeated decontaminations using alkaline

permanganate and Turco-4518, followed by high temperature loop operation.

Cyclic decontamination test No. 3 was started on April 5, also using alkaline permanganate followed by Turco-4518. During this test, special care is being taken to keep oxygen out of the system during decontamination and flushing. Two cycles of decontamination and flushing were completed during the month.

CEP-2 - The loop has operated at 300 C and pH 10.0 during the month for cyclic fretting corrosion tests on Zircaloy-2 components.

CEP-3 - The loop is being installed in the 1706-KE Building.

CEP-4 - Shakedown testing of the loop following new piping installation was completed during the month. Shakedown operating conditions were 300 C and pH 10.0.

REP - One decontamination test was performed during the month in which the loop was grossly contaminated with irradiated uranium and decontaminated with an alkaline permanganate solution (20 per cent caustic, 5 per cent carbonate, 5 per cent permanganate) followed by Turco-4518. Results were good on stainless steel components and fair on carbon steel components. The loop is presently shut down for the installation of an improved make-up pump.

In-Reactor Loops

KER-1 - A new in-reactor Zircaloy-2 tube was installed during the April 1 reactor outage. Shakedown tests and leak repairs of the new tube installation have continued during the month.

KER-2 - The loop continued operation during the month at 269 C and pH 10.0 with NPR candidate fuel element shapes authorized by PT IP-292-A.

KER-3 - The loop operated at 275 C and pH 10.0 during the month with fuel elements authorized by PT IP-288-A. On April 28, the reactor was scrammed from a heat exchanger exit temperature trip. Detailed investigation of the heat exchanger measuring and control system revealed improperly wired grounding circuits which caused instrument oscillations from outside electrical disturbances. This condition had existed since original equipment installation.

KER-4 - The loop continued operation at 285 C and pH 10.0 until April 23 when a fuel element rupture caused a reactor shutdown. The fuel elements were discharged and the loop recharged with fuel elements authorized by PT IP-300-A. cursory examination of the elements which were discharged revealed a severely warped component on one of the elements.

On returning KER-4 to recirculation status immediately before reactor start-up on April 29, it was observed that neither pump was putting out normal head and flow. The loop was put on single-pass operation with metal charged to permit pump repair.

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On April 26 the reactor was scrammed from a high heat exchanger exit temperature trip (KER-4). Since the reactor had not yet reached equilibrium power level, it was possible to perform a successful scram recovery. Detailed investigation to determine the cause of the scram is continuing.

Effect on Reactor Outages

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

- April 23, 1960 - KER-4 rupture
- April 26, 1960 - KER-4 heat exchanger exit temperature scram
- April 27, 1960 - KER-3 heat exchanger exit temperature scram

Total outage time charged to Coolant Testing Operation activities for these outages was 44.4 hours. This is itemized as follows:

<u>Production Test</u>	<u>Description</u>	<u>Hours</u>
IP-250 A and IP-292-A	Lost production time from KER-4 rupture and rupture discharge	14.0
IP-300-A	Charge KER-4	0.4
	Repair leak on KER-1	3.1
IP-197-A	Charge-discharge single-pass tubes	0.9
	Traverse KER-1	4.7
IP-288-A	Lost production time from KER-3 scram	21.3
	TOTAL	44.4

COMPONENT TESTING OPERATION

Irradiated Material Examination

Examinations were completed on fuel elements from the following 29 tubes at the 105-C Metal Examination Facility during the month of April:

<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>
197A	4456-KE	216A	3772-DR	219A	1377-DR
	4557-KE		3771-DR		1381-DR
	4863-KE		2363-DR		1380-DR
216A	2379-DR		4049-KW		1376-DR
	3180-DR		3989-KW		1282-DR
	3670-DR		3383-KW		1276-DR
	2770-DR		3073-KW	Reg. I&E - 27 pieces	unknown
	3772-DR		2566-KW		
	2176-D	219A	1382-DR	Rupt.	3563-D
	1359-D		1374-DR		3877-DR

105-C MEF - New Storage Addition

The 10' x 20' storage addition to the existing 105-C Metal Examination Facility has been completed. The profilometer pump and oil reservoir were moved into the storage room to lower the noise level in the working area and to provide more working space. Three new storage cabinets were installed and three existing cabinets were moved to the new location to provide systematic storage of miscellaneous items. The over-all job consisted of re-routing waste piping, relocating a transformer and instrument panel, installing lighting fixtures and wall outlets, providing two unit heaters and service piping, and painting floors, ceiling and roof in accordance with existing building specifications.

Special Testing

A test was performed to determine if similarities in breaking force existed between irradiated and cooled non-irradiated fuel elements. The test pieces were selected from PT IP-226-A, "Enriched 7-Rod Clusters with 20 and 30 mil Zr-2 Jackets". The test samples were cut into five-inch sections for easy handling. The four non-irradiated pieces were cooled to -150 C in liquid nitrogen, and broken in the 105-C MEF fuel element fracturer. The force applied to break these pieces was 8500 pounds. The breaking force required to break the irradiated pieces was 3000 pounds.

New Equipment

The stereomicroscope attachment has been completed and received from an off-site vendor. Fabrication of an eddy-current probe is in progress to complete the project.

Bond Testing

Twenty-eight tubes of metal from PT IP-216-A, "Normal Production Test I&E's", were tested to determine bond integrity. Results of this test are recorded on the new data sheets, which were placed in use during the month.

Four tubes of fuel elements from PT IP-280-A, "Alloyed Dingt Uranium Fuel Elements", were bond tested.

Testing of fuel elements from two tubes, PT IP-308-A, "Water Soluble Protective Coatings", was completed.

One tube of normal production fuel elements metal was tested.

Process Tube Corrosion Monitoring Program

In-reactor probolog measurements of 204 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.

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<u>Reactor</u>	<u>No. of Tubes Probologged</u>	<u>Report No.</u>	<u>HW Number</u>
F	53	16	64616
B	140	17	64700
F	11	18	64748

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

<u>Reactor</u>	<u>B</u>	<u>D</u>	<u>DR</u>	<u>F</u>
<u>Number of Tubes</u>	8	1	3	1

Four of the eight tubes from B Reactor were removed to investigate the rate of corrosion and to verify the accuracy of the probolog interpretation on second generation tubes. Actual wall thickness measurements of three tubes showed the probolog interpretation to be accurate within 0-3 mils. On one of the four tubes no comparison could be made of actual thickness and probolog measurements; the portion of the tube where the probolog interpretation was made was not received for examination. The remaining four tubes, examined from B Reactor, were removed because two each contained a ruptured slug and two were removed for rib height measurements.

A leaker tube from D Reactor was examined. The leak was not found--not all portions of the tube were received for examination. The tube examined from F Reactor contained a ruptured slug.

Three tubes were removed from DR Reactor because one contained a ruptured slug and two sustained rear van stone leaks. Visual examination revealed that each of the van stones had a crack in the curvature, on the bottom portion of the flange.

Flexible Connector Examination

Thirty-six front face flexible connectors from different reactors were examined this month. Four connectors were found to be leakers. The leaks were all due to a small flaw in the teflon liner. Fifty per cent of the 36 connectors had one to three broken wires on the outside braid. The ends of broken wires had sharp straight edges, indicating that wires were broken due to mechanical damage. Of the 36 connectors, there were no broken or flattened wires noticed on the inner braids, indicating that no cavitation or vibrational damage occurred.

Panellit Programs

Gauges processed in instrument maintenance shops during the month totaled 370. Inspection of these gauges resulted in detection of 72 gauges which did not meet inspection standards, for a rejection rate of 19.5 per cent.

In-board reliability examinations were performed on 784 gauges. Of the 784 gauges examined, 135 were determined to be defective and were removed from service. This is a percentage defective of 17.3, which is approximately 5 per cent greater than for the average month during the past year.

This increase is attributed to the relatively large number of examinations at C Reactor during the month (230 gauges) of which 26 per cent were removed for a single defect--worn drive plates.

In-board bourdon coil leak examination of 1366 gauges resulted in detection of 12 leaking coils, for a leak rate of 0.88 per cent. This is approximately double the normal leak detection rate and is attributed to the involved gauges' not having received leak examinations during the past five months, a period approximately three times longer than the normal span between examinations.

Response times were determined on a total of 784 gauges during the month. Of this number 4.9 per cent, 38 gauges, showed slow response and received corrective action. Percentage-wise, slow response during the past six months is as follows:

November, 1959	12.0
December, 1959	9.5
January, 1960	12.5
February, 1960	7.4
March, 1960	4.8
This month	4.9

The reduction and apparent leveling off of slow response incidence rate, indicated above, is attributed to increased sensing line flushing and re-oiling activities.

During the month, 129 gauges received failure analysis examination.

The routine "Panellit Gauge Failure Analysis Report", covering a 60-day period beginning February 1, 1960, was published during the month as document number HW-64773.

"Critical components" inspection of Panellit components to be warehoused by the Spare Parts Records Operation, Warehousing Operation, was as follows:

<u>DT-100-T</u>	<u>Bourdon Coils</u>
Inspected ----- 152	Inspected ----- 275
Rejected ----- 36	Rejected ----- 0
Accepted ----- 116	Accepted ----- 275
Per cent Rejection - 23.7	Per cent Rejection - 0

Panellit System Improvement Program accomplishments during the month were:

1. "Panellit Gauge Procurement Specification for New K and C Area Gauges", HWS-7803, was issued.
2. HWS-7823, "Form 2B Switch Specification", was issued.

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Special testing equipment was fabricated to determine functional compatibility of form 2B mercury switches (switches with mercury wetted contacts) when used in DC circuitry. The equipment was used during the month to complete a series of such tests requested by the Instrument Development Operation. Results of the tests indicate that switches will perform equally well with either DC or AC circuitry.

O.A. Greager

MANUFACTURING OPERATIONPRODUCTION OPERATIONPRODUCTION PLANNING & SCHEDULING OPERATIONPlanning

An IPD production forecast for the next eighteen-month period, beginning April 1, 1960, was completed and issued as Document No. HW-64518. This information was transmitted to CPD for inclusion in the overall HAPO production forecast.

Studies concerning the use of projection fuel elements, self-support and bumper, were completed. The results were issued in Document No. HW-64968, Revision to Production Forecast - Projection Fuel Elements.

Storage basin bucket requirements for CY 1961 were determined and final figures issued in Document No. HW-64914.

Production SchedulingDischarge Concentration

There were no discharge exposure plan adjustments effected during April. The trend toward higher discharge exposures continued with a marked improvement over recent months. The values reported in the table below represent the highest overall discharge exposure levels attained this calendar year.

Discharge Exposure Comparisons (MWD/Ton)

	<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>
February	693	542	615	642	844	679
March	694	637	618	659	787	694
April	727	746	644	701	826	731

A resume of discharging outside the established goal exposure plan is provided in the table below.

<u>Reactor</u>	<u>Tons Disch.</u>	<u>Tons Excess Usage</u>	<u>Material Type</u>	<u>Reason</u>
B	0.6	0.3	Reg.	Process tube replacement
	1.1	0.5	Enr.	To adjust enrichment
	1.5	0.5	Reg.	Rupture prone lot KL352D

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<u>Reactor</u>	<u>Tons Disch.</u>	<u>Tons Excess Usage</u>	<u>Material Type</u>	<u>Reason</u>
C	10.3	7.1	Reg.	Discharge of ball valve tubes where maintenance work required removing water flow.
	1.5	1.0	Enr.	Same as item above.
	3.7	1.1	Reg.	Rupture prone lot KJ197C.
F	4.9	1.8	Reg.	Rupture prone lot KL378C.
	0.7	0.3	Reg.	Charging of fringe poison and compensating enrichment.
H	4.4	1.6	Reg.	Discharge of lot KL393D which showed evidence of excessive warp.
KW	0.4	0.2	Reg.	To adjust enrichment.
	26.5	12.9	Totals for Regular	
	2.6	1.5	Totals for Enriched	

Operations Analysis

Work continued on the E-H Optimization Study. The five-year process tube replacement forecast was completed and issued. Study of cracked tube failures was requested of metallurgy and further requests were made for probolog information to furnish a basis for tube replacement forecasting.

PRODUCTION COMPUTING OPERATION

Tube-by-tube source data were processed to establish the current production and corrosion status for each tube in all reactors. Routine and emergency reports were issued to implement the scheduling, forecasting, and accountability functions of the Production Operation. Charge-discharge and tube replacement information for each reactor operation was provided in accordance with production schedules. Production data were supplied to each Pile Physicist for reactivity evaluations, and to Process technology for EDM processing.

Individual tube source data were supplied to the Nuclear Materials Operation for calculating weights of SS material in discharges and month's end inreactor inventories.

Over the past year there has been a steady growth in the demand for services from our production computing facilities. The IBM machines at 100-H are now loaded to the point where routine work can not be completed during regular five-day work week. As an expedient the machines have been operated six days per week to the extent necessary to maintain normal standards of service.

ESSENTIAL MATERIALS

Rail and truck shipments received in April were as follows:

Carload shipments for IPD	134
Carload shipments for other Depts.	124
Truck shipments for IPD	<u>144</u>
Total	402

Helium gas consumption during the month of April in all reactors was as follows:

100-B	421,600 cu. ft.
100-C	515,300
100-D	329,900
100-DR	288,200
100-F	470,500
100-H	327,500
100-KE	318,700
100-KW	<u>260,900</u>

Total 2,932,600 cu. ft.

In addition to the routine duties involved in the procurement and delivery of essential materials, the following items were included in the group's activities during April:

1. Prepared requisitions to cover the purchase of 200 aluminum boron splines each from Reactor Materials Inc. at Peekskill, N.Y. and from the Technical Research Group Inc. at Yonkers, N.Y. These splines will be evaluated on arrival and if satisfactory the two suppliers will be invited to bid on future requirements of this item.
2. Attended a meeting on April 21 with NPR personnel for a preliminary discussion of the essential material requirements at the new reactor.

PRODUCTION REPORTS AND STATISTICS

Routine processing of the Daily Production and Daily Operations Reports and the Monthly Manufacturing Operation Record Report was continued. The April IPD monthly record report which will subsequently be compiled and issued by Production Operation was prepared.

Data involving reactor operation and associated equipment were collected and tabulated in historical record books. Chart Books were maintained for the HAPO and IPD General Managers and the Manufacturing Operation Manager. 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

Security classification matters continued to be handled for the department. New guidance from the AEC-HOO and the Hanford Laboratories Operation was given appropriate distribution and interpretation within IPD.

IPD's first class in "Fundamentals of Mfg." training continued its sessions on schedule, and feedback from participants and instructors shows this new course to be progressing very well. Other integrative staff work

on Mfg. personnel training continued in connection with union relations, radiation protection, reactor fundamentals, and on programs having HAPO-wide implications.

On April 8 and 9 meetings were held with visitor W. H. Coleman (Field Representative for GE's Mfg. Training Program) in further discussion of IPD participation. Potential work assignments for MTP Trainees were considered, and administrative procedures were reviewed. Departmental liaison with the Relations Operation was continued in connection with the central consideration being given to HAPO participation in this Company-wide program.

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MONTH April, 1960		REACTOR OPERATIONS STATISTICS - PROCESSING														TOTAL	
		B		C		D		DR		F		H		KE		KW	
		NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.
INPUT PROD. - Pu (% OF FORECAST)		1	159.6	0	170.3	0	44.1	0	32.6	0	46.8	0	52.4	0	69.0	0	64.0
TIME OPER. EFF. (% OVERALL)		-	-	2	17.4	-	-	1	3.9	-	-	2	1.0	5	68.1	-	-
NO. OF REACTOR OUTAGES & HOURS		2	42.7	3	24.5	1	17.1	2	39.4	3	65.9	2	111.2	0	0.4	2	27.3
SCHEDULED		3	202.3	5	212.2	1	61.2	3	75.9	3	112.7	4	164.6	5	137.5	2	91.3
UNSCHEDULED - SCRAMS		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- OTHER		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL		3	202.3	5	212.2	1	61.2	3	75.9	3	112.7	4	164.6	5	137.5	2	91.3
BREAKDOWN OF REACTOR OTGE HRS.																	
PLANNED																	
CHARGE-DISCHARGE		46.6	-	14.1	-	12.2	-	9.8	-	26.9	-	29.9	-	35.8	-	53.1	-
TUBE REPLACEMENT		79.7	-	-	-	6.4	-	-	-	7.0	-	2.0	-	-	-	-	-
PROJECT WORK		-	-	106.3	-	-	-	-	-	-	-	-	-	-	-	-	-
PRODUCTION TEST		-	-	1.2	-	-	-	-	-	-	-	-	-	24.9	-	1.0	-
MAINTENANCE		33.3	-	48.7	-	25.5	-	22.8	-	12.9	-	20.5	-	7.7	-	8.9	-
MISCELLANEOUS		-	-	-	-	-	-	-	-	-	-	-	-	0.6	-	1.0	-
SUB - TOTAL		159.6	-	170.3	-	44.1	-	32.6	-	46.8	-	52.4	-	69.0	-	64.0	-
UNPLANNED																	
CHARGE - DISCHARGE		-	-	2.3	-	0.1	-	-	-	3.3	-	57.9	-	-	-	2.2	-
PRODUCTION TEST		-	-	-	-	-	-	-	-	-	-	-	-	36.3	-	-	-
RUPTURE REMOVAL		34.5	-	22.2	-	-	-	15.6	-	61.6	-	3.8	-	-	-	22.7	-
WATER LEAK		1.8	-	-	-	15.6	-	23.8	-	-	-	34.6	-	-	-	-	-
MAINTENANCE		6.4	-	17.4	-	1.4	-	-	-	1.0	-	14.9	-	-	-	2.4	-
INSTRUMENTATION		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PANELLIT		-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-
MISCELLANEOUS		-	-	-	-	-	-	3.9	-	-	-	-	-	32.2	-	-	-
SUB - TOTAL		42.7	-	41.9	-	17.1	-	43.3	-	65.9	-	112.2	-	68.5	-	27.3	-
TOTAL		202.3	-	212.2	-	61.2	-	75.9	-	112.7	-	164.6	-	137.5	-	91.3	-
NO. SLUG RUPT. (ALL TYPES)		1	-	3	-	-	-	1	-	3	-	-	-	-	-	2	-
NO. NEW TUBES INSTALLED		48	-	0	-	3	-	4	-	2	-	5	-	1	-	0	-
TYPE OF WATER LEAK - TUBE		-	-	-	-	1	-	-	-	-	-	2	-	-	-	0	-
VAN STONE		1	-	-	-	-	-	2	-	-	-	0	-	-	-	0	-
REMARKS:																	

MONTH	REACTOR OPERATION STATISTICS -- SLUG RUPTURES
April, 1960	

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MONTH		REACTOR OPERATIONS STATISTICS — POWER										SHEET 1	
April, 1960		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL			
RIVER WATER (BLDG. 181)													
TO RESERVOIR (BLDG. 182)		11604		4375		2381	2547			20907			
TO FILTER PLANT (BLDG. 183)		56704		93810		75026	72200	162700	167300	627776			
TO FILTER PLANT (CADR)		92066		66786						158852			
TO R & E (KER) FEO				203				576		779			
TOTAL		160410		165174		77407	74747	163276	167300	808314			
TOTAL		6929.7		7135.5		3344.0	3229.1	7053.5	7227.4	34919.2			
RESERVOIR WATER (BLDG. 182)													
TO POWER HOUSE (BLDG. 184)		27		55		402	51			535			
TO COND. SYSTEM (BLDG. 190)				1620		1941	2496			6057			
TO COND. SYSTEM (180DR & 183F)				2700		38				2738			
TO EXPORT SYSTEM		11577								11577			
TOTAL		501.3		189.0		102.9	110.0			903.2			
FILTER WATER (BLDG. 183)													
TO POWER HOUSE (BLDG. 184)		163		164		119	148			594			
TO PROCESS (BLDG. 190)		61300	77616	77380	75750	72430	69400	157091	161757	752724			
TO 108		2500	4500	1894		1102	1270			11266			
TO 108DR				1893						1893			
TO FILTER PLANT (BLDG. 183DR) B			8538	10213						(18751)			
TO F & S SYSTEM		217		237						805			
TO R & E (KER) FEO				153		206	145			153			
BACKWASH		1098	1412	1876	1249	1169	1237	5609	5543	19193			
TOTAL		2820.0	3977.2	4052.5	3326.3	3241.1	3119.0	7028.6	7227.4	34792.1			
PROCESS WATER (BLDG. 190)													
TO REACTOR		60900	77216	76980	75350	72030	68900	153700	159600	744676			
TO REACTOR		80700	95500	82000	82500	82000	84000	182900	179400	869000			
POWER HOUSE (K AREA)								24	15	39			
108 (KE - KW)								2795	1742	4537			
TO R & E (KER)								172		172			
BUILDING USAGE		400	400	400	400	400	500	400	400	3300			
TOTAL		2648.2	3353.0	3342.8	3272.4	3129.0	2998.1	6786.3	6987.9	32517.6			
RIVER DATA													
ELEVATION (MSL, FT.)		397.2		387.7		374.5	379.6		392.0				
		390.2		381.0		368.4	374.5		383.2				
		394.7		385.5		371.7	377.7		388.9				
TEMPERATURE		44.5		45.0		46.0	45.3		45.0				

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MONTH		REACTOR OPERATIONS STATISTICS — POWER											SHEET 2	
April, 1960														
WATER TREATMENT DATA		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL				
AT BLDG. 182	MM GALS	2451.2	3977.2	4052.6	2885.1	102.9	3119.0	7028.6	7227.4	102.9				
	MM GALS					3241.1				33982.3				
CHEMICAL CONSUMPTION														
CHLORINE (BLDG. 182)	LBS.	12349	25066	20930	14750	17913	18326	38800	44000	192134				
	LBS	0.6	0.8	0.6	0.6	0.7	0.7	0.7	0.7	0.7				
	AVG PPM													
*Alumina	LBS	4906	187600	189088	151150	170134	194660	385000	349100	4906				
	AVG PPM	121257	5.7	5.6	6.3	6.3	7.5	6.6	5.8	1747989				
		6.9								6.2				
SEPARAN	LBS	500	400	468	340	729	300	1050	900	4687				
	AVG PPM	.024	.012	.014	.014	.027	.012	.018	.015	.017				
SULPHURIC ACID	LBS	175269	262904	296489	157782	262211	244215	474200	560000	2433070				
	(AS 100%)	8.6	7.9	8.7	6.6	9.7	9.4	8.1	9.3	8.5				
DICHROMATE	LBS	39277	50115	48727	47701	46935	41985	99800	103600	478140				
PURGE MATERIAL CONSUMPTION														

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

REACTOR OPERATIONS STATISTICS — POWER											SHEET 3	
MONTH												
April, 1960												
<u>ANALYTICAL DATA</u>												
<u>RAW WATER</u>												
PH TURBIDITY	PH AVG	8.1	7.7	8.1	8.1	8.1	8.0	7.5	7.5	7.5		
	PPM AVG	14	15	22	24	20	17	23	23	23		
<u>FINISHED WATER</u>												
PH TURBIDITY CL ₂ RESIDUAL DICHROMATE	PH AVG	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1	7.1
	PPM AVG	.007	.006	.009	.008	.011	.009	.006	.006	.006	.006	.006
	PPM AVG	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
	PPM AVG	1.79	1.80	1.80	1.80	1.80	1.84	1.80	1.80	1.80	1.80	1.80
<u>STEAM DATA</u>												
GENERATED (MAX) (NOR) (AVG) TOTAL TO PLANT COAL RECEIVED CONSUMED IN STORAGE GEN. STEAM/LB. OF COAL	100-B	100-D	100-F	100-H	B-D-F-H TOTAL		KE	KW		KE-KW TOTAL		
	93000	128000	88000	67000	376000	54000	67000	121000				
	81000	84000	56000	56000	277000	-	-	-				
	83000	82747	57621	53000	276368	33500	33250	66750				
	60303	59578	41489	38455	199825	24120	23940	48060				
	51136	50522	36510	32610	170778	21708	21546	43254				
	1407	2747	1658	1637	7449							
	3522	3747	2344	2190	11803							
	23409	27263	17691	19589	87952							
	8.56	7.95	8.85	8.78	8.47							
OIL RECEIVED CONSUMED IN STORAGE GEN. STEAM/GAL. OF OIL	GALLONS											
	GALLONS											
	GALLONS											
	GALLONS											
<u>ELECTRICAL DATA</u>												
TOTAL GENERATED KW HRS.												
1596000 1685600 3281600												
156000 - 245600 401600												
Excess Kilowatt Hours												

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B-C REACTOR OPERATIONGENERAL

Administrative Activities - Review and comments on N Reactor criteria, prints, and specification revisions continued. Activities were continued to obtain pocket dosimeters for on-the-job monitoring of radiation doses and to eliminate unloading and reloading of buses at Main Gates.

Personnel Development - EXEMPT - Four B-C Managers continued the "Business Operation In Our Changing Environment" course. 36 first line supervisors participated in the "B-C Supervisory Training in Basic Principles". Three first line supervisors enrolled in the "Fundamentals of Manufacturing" course. Also, 26 people participated in six other on-the-job courses related to their work. NONEXEMPT - 64 people participated in 10 different on-the-job training activities.

Cost Control Activities - Routine.

Landlord Activities - Routine.

Suggestions - On hand at the beginning of the month - 55; received - 12; completed - 16; end of month - 51.

B PROCESSING

Production - Input production was 93.1 percent of forecast. Limiting factors were tube powers and graphite temperatures. TOE for the month was 71.9 percent. There were two unscheduled outages and one scheduled outage:

<u>Day</u>	<u>Hours</u>	<u>Cause</u>
4	125.3	Scheduled - Replacement of 47 tubes and Ball 3X Electrical Modifications (MJA-8).
9	3.5	Unscheduled - To replace defective outlet thermocouple lead (2180).
26	73.5	Stuck rupture - 0668. Forces up to 16,000 pounds required to remove tube and charge.

Equipment Experience - 3 DuPont-type rear pigtails failed and were replaced. The rear VanStone flange of Tube 2089 was leaking and the gasket was replaced. Approximately 760 Panellit surge suppressors were installed. The drive mechanisms of both sub-critical monitor assemblies failed and were repaired. The sphincter gas seal on VSR No. 25 was replaced.

Improvement Experience

Production Test IP-84-A, "Evaluation of Slugs Having Projections for Use In Ribless Tubes" - A supplement was approved to increase the exposure from 900 to 1,200 MWD/T.

Production Test IP-287-E, "Installation of Prototype Analog-to-Digital Converter (Flexowriter)" - The installation was completed; it cut in half the time to type a temperature map, to about 9 minutes. Project CG-817, "Crossheader Differential Indicators" - Completed and tested. AR-59-IP-63, "Crossheader Valve Operators" - Installation completed, front and rear.

Radiation Monitoring Experience - Rupture removal in the discharge area required working with dose rates up to 2.5 r/hour and contamination levels up to 2 rads/hour; while undressing afterwards, two Maintenance employees received skin contamination up to 25,000 c/m.

Events Influencing Costs - Overtime usage was reduced to about one-third the March usage, and helium consumption was reduced almost 3 percent. 12,500 dummies were reclaimed for reuse.

C PROCESSING OPERATION

Production - Input production was 87.4 percent of forecast, limited by a rupture control index. TOE was 70.5 percent. There were five unscheduled outages; recovery was made on two:

<u>Day</u>	<u>Hours</u>	<u>Cause</u>
1	0.6	Rupture - "Quickie" on tube 2588 (Reg I&E).
9	32.6	Rupture - tube 1275 (reg I&E).
11	0.3	Scram - Panellit system grounded.
11	31.1	Scram - Panellit system grounded.
19	147.6	Rupture - tube 1380 (enriched I&E). Discharged with charging machine after hydraulic jacking at 3,500 pounds. Decontaminated discharge area external piping, removed OCD ball valves and completed installation of T/C bundles.

Equipment Experience - 368 new tube outlet thermocouples were installed on vertical columns 68 through 75, completing the installation. The panellit system was inspected for causes of grounding; 12 corroded gauges and 14 leaking gauges were replaced. The G hole assembly positioning motor (for the Low Level Neutron Flux Monitor) burned out and was replaced.

Improvement Experience - The internal surfaces of the rear piping were decontaminated, reducing the radiation level by a factor of 3.2 (PT-316-E). All remaining OCD discharge area ball valves were removed and replaced with regular nozzles. The outlet expansion joints were repacked and foundation repairs were completed on both 107 tanks.

Radiation Monitoring Experience - A tugger accidentally turned over contaminating the floor to 40,000 c/m and an employee's shoe to 20,000 c/m.

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Maximum dose rates were : 4 r/hour for rupture removal, 3 r/hour for spline removal, and 1 r/hour for removal of neutron monitor and G samples. There were 5 cases of skin contamination (up to 6,000 c/m) and two cases of clothing contamination up to 20,000 c/m; all were decontaminated.

POWER OPERATION

Operating Experience - B-C Power continued to pump export water to the 200 Areas. A Turco purge was made of the 105-C Reactor on April 20. The raw water turbidity remained low (9 to 20 P.P.M.). A diver inspected the suction well floors 1-C through 10-C at 181; the area was generally clear. A continuous critical power condition existed from March 28 to April 15 for inter-change of breakers between the 251 and 151-B Sub-Stations.

Equipment Experience - Inspected 1,2, and 9 Process Pump Impellers at 190-C; No. 1 had a broken vane, No. 2 had three cracked vanes and No. 9 was suspected of having a cracked vane. The inspection and rewedging of the 4500 HP motors in 190-B was completed except for No 2A. The four original process motors in 183-B were completely overhauled. No. 2 and No. 4 clearwell tanks at 190-C were inspected.

Improvement Experience - Two new impellers were installed in the CG-600 pumps at 190-C and one failed after five days with a broken wear ring. The CG-558 pump impeller in No. 3A at 190-B was replaced due to a fault in the casting.

CGI-845 - Increased Pumping Capacity 181-C - The toggle valves were installed for the two new pump discharge lines and transformer exchanges were made. Conversion to liquid dichromate was completed 4-8.

Events Influencing Cost - Maintenance costs were high due to extensive work required on 190-C pumps and 190-B motors.

MAINTENANCE OPERATION

Of the 414.5 outage hours at B-C Reactors, 54 percent was for reactor maintenance. Major work was: At 105-B - 47 process tubes were replaced; major revisions were completed in the 3X electrical components; one ruptured fuel element was removed with unusual difficulty. At 105-C - The remaining 106 Operation Charge Discharge rear ball valves were removed; 368 tube outlet thermocouples were installed; three ruptured fuel elements were removed.

Equipment Experience - At 190-BA, a new impeller assembly was installed in the No. 3 process pump; the assembly had a vendor-modified casing head and casing, new shaft, new bearings, and new impeller. The No. 1, No. 2 and No. 9 process pump impellers were inspected at 190-C; No. 1 had about 6 square inches missing and was replaced; No. 2 had three visible vane-to-ring cracks, and was kept on standby awaiting a replacement; No. 9 was suspected of sub-surface cracks.

Improvement Experience

At 105-B, 789 pressure monitor surge suppressors were installed, making a total of 835 installed to date. The drilling of access holes to the B discharge area was continued for replacement of gamma monitor sensing lines. At 105-C, a spray header manifold, nozzles, and trail hose were installed on D elevator for better contamination control. Also, at 105-C, the remaining 368 outlet thermocouples were replaced.

Maintenance Engineering - At 105-C, a graphite thermocouple stringer utilizing geminol wire was installed and the multipoint temperature indicator to read out both iron constantan and geminol thermocouples was placed in service. The new prototype Analog-to-Digital Converter was installed at B and is operating satisfactorily. A study has been made of the VSR channel obstruction problems at C and a report was issued recommending an interim procedure and tooling to correct the problem. Further study is in progress for exerting high forces and boring out the obstruction if necessary. The Turco installation at C was completed, tested and operated satisfactorily for decontamination of rear face piping. The removal of the process water pressure trips from the No. 1 Safety Circuit (Design Change 246-B at B) was completed and tested. Preparation of a Design Change was started to permit the two electrically driven HSR's at B to scram with the other HSR's. A Design Change (311-C) was completed at C to permit the withdrawal of the HCR's in calibrated pairs for reactor startup.

Productive Maintenance - Of the scheduled 9379 manhours, 80 percent was completed.

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D-DR REACTOR OPERATIONGENERALAdministration Activities

The D-DR Reactor Operation managers and administration specialists met with R. L. Dickeman, Manufacturing Section Manager, on April 4 to review and discuss current performance and future plans. A plan was established for Professional and Trade Society Meeting trips by D-DR Reactor people during the balance of FY-1960. Coordination was provided for development of the D-DR Reactor Operation Personnel Inventory and a listing of individuals qualified for promotion to exempt positions.

Personnel Development

The Manager, D-DR Reactor Operation, began a series of information meetings with bargaining unit personnel, scheduled each Wednesday for approximately twenty-five people.

Cost Control

The final draft of the IPD budget of Equipment not Included in Construction Projects was reviewed with D-DR Reactor Operation managers. Priorities in the Equipment Projects portion were established with four projects taking top priority. The third fiscal quarter report of Representative Economy Measures was submitted to Financial Operation.

Landlord Activities

The Electrical Equipment Development Operation moved to new quarters in Buildings 1709-D and 185-D. A replacement tile floor was installed in the 105-D lunchroom.

D PROCESSING OPERATIONProduction

Input production was 119.5 percent of official forecast. Operating levels were limited by a rupture control tube power limit. Time operated efficiency for April was 110.2 percent of forecast.

Operating Experience

There was one unscheduled shutdown during the month. Total downtime was 61.2 hours.

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
4-10-60	61.2	Water leak - 4261-D

Equipment Experience

Three new tubes were installed, one a leaker, one damaged in removing a stuck charge and one left as an air channel in the previous outage. Ninety

Equipment Experience (Con't.)

four front face flow indicators were disassembled and the rotors modified to correct a binding problem. Forty six rear face pigtaills were replaced because of corrosion cracks. Charge seaters were installed on the C elevator, to be placed in service in May.

Improvement Experience

CG-791 - "Confinement Project" - Installation of reinforcing steel was continued in preparation for concrete pour of 117-D Building. CG-707 - "Sub-Critical Flux Monitor" - One chamber motor was replaced during the month. Work is in progress to replace portions of the wiring from the control room to X level to avoid repeated motor failures. Spline Coiler Money has been appropriated and design work is in progress for a spline coiler on the reactor.

Radiation Monitoring Experience

Two lapses of radiation control occurred in April. The first, assigned a severity of 7, involved contamination to the shoe of a maintenance employee who had worked in the discharge area. The second lapse was air-borne contamination in the discharge area when a splitter was pulled through a tube. Nasal smears on two men read 500 c/m and on a third 70,000 c/m. The men had been wearing only face shields. Decontamination was performed and bioassays taken. A severity of 12 was assigned. The highly contaminated laundry cart incident, described in last month's report, was classified as a lapse of control and assigned a severity of 6.

Events Influencing Costs

A total of 37.3 hours of overtime was used during the month.

Nonexempt Shift Overlap	15.5 hours
Shutdown Coverage	21.8
Exempt Overtime	<u>0</u>
Total	37.3 hours

DR PROCESSING OPERATION

Production

Input production was 120.8 percent of the official forecast. Time operated efficiency was 111.6 percent of forecast. Production was significantly higher than forecast due to the higher than predicted TOE and ECT.

The Maximum power level at DR during the month exceeded the previous high by 5 MW. Rising river temperature resulted in a reduction of up to 25 MW by the end of the month.

Operating Experience

Operation was interrupted by three unscheduled outages during the month.

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Operating Experience (Con't.)

The reactor was down at the end of the month on the third outage. A breakdown of the shutdown time follows:

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
4-1-60	37.1	Shut reactor down due to water leaks in tubes 2274-DR and 2277-DR
4-12-60	37.9	Reactor scram due to loss of #8 process pump (Faulty transformer at 190 DR).
4-30-60	<u>0.9</u>	Shut reactor down to discharge rupture in tube 0774-DR
	75.9	

Equipment Experience

Four channels were retubed, two because of rear Van Stone leaks and one that contained a rupture last month. The fourth replacement was one of the two Van Stone leakers, damaged during charging. The rupture in 0774-DR was classified as a "side-other" failure. All horizontal control rods were pressure tested for water leaks and found in good condition. Other shutdown work included foaming of seven rear bellows leaks and repair of 12 rear thermocouples. Over 800 Panellit gauges were adjusted during reactor operation in preparation for eight pump operation which took effect on April 6.

Improvement Experience

CGI-865 - "Continuous Air Monitoring - All Reactors" - Lines were run to the C elevator and pickup chutes for the continuous air monitor during the month. CGI-791 - "Reactor Confinement" - Work continued on the construction of the filter building. Several comment prints on the ventilation improvements were reviewed and commented on. Crossheader Valve Turners - New suspension systems were installed on the C elevator for the front crossheader valve turners. The prototype valve turners were compatible with the new suspension system and are therefore in service. Charge Seaters - Installation of the charge seater carriages was completed during the month. Two charge seaters were installed and are ready for use.

Radiation Monitoring Experience

Two lapses of radiation control with severity numbers of 15 and 7 occurred in April. The first was the ventilation imbalance and corridor contamination incident reported last month but not classified as a lapse. The second was contamination of 80,000 c/m to the shoe of a processing employee. The source is unknown. Maximum dose rate received was 3 r/hr while unhooking a vacuum box on the top of the reactor. An underwater survey in the transfer area loading pit was made for possible future repair work by a diver. Readings ranges from 10 to 200 mr/hr when the probe was within 2" of basin or equipment surfaces.

Events Influencing Costs

The overtime usage rate was:

Shift Overlap	13 hours
Shutdown Coverage	107
Exempt	<u>24</u>

Total 144 hours

D-DR POWER OPERATION

Operating Experience

On April 12 one of the three normal 13.8/44 KV transformers at 190-DR developed a short to ground fault, catching fire about 10 minutes later. A series of events in the 10 minutes were relay-out of a circuit breaker in the 151-D substation, resultant loss of 440 voltage and lighting in the south end of 190-DR and scram shutdown of 105-DR by control board manipulations of the 190-DR Chief Operator, unaware of the overall situation. Following, the No. 3-D, No. 3-DR, and No. 13-161-D pump units relayed out due to low voltage on the 151-D bus. The 105-D reactor was in an outage at the time. Emergency equipment was put in operation until the three normal 13.8/44 KV transformers were replaced, about 24 hours after the beginning of the incident. A formal report is forthcoming.

Equipment Experience

183-D - The south clearwell was drained for inspection of the expansion joint in the distribution flume on the west wall where packing has washed out. No work on it appears urgent at this time. 183-DR - Installation of a liquid alum facility was started April 12. 184-D - The emergency generator was removed from standby service on April 12 to overhaul the turbine governor. 190-D - The DC generator on the motor-driven battery charger failed April 12. The spare Phano-charger was installed for temporary use. 190-DR - Impeller replacement and realignment of No. 1 pump unit was completed April 6. Eight-pump operation was started on that date.

Events Influencing Cost

The liquid alum facility at 183-D is virtually paid for by savings to date. Savings on the system now being installed at 183-DR will appear in May and June to cancel this month's expenditure on installation.

D-DR MAINTENANCE OPERATION

Equipment Experience

Fabrication of graphite stringers using Geminol wire and new read-out instruments was started in both 105 buildings. Work will continue for two months. Slip rings of the No. 7 motor in 190-D were machined with the motor running with a special lathe-like tool, secured to floor plates and motor housing. Removal of the D elevator cab was completed in April. Problem channel 3666-DR was opened to allow a 1 1/4" pipe to be pushed through. However the potato drill in the channel appears to be lodged in a void in the graphite. Plans are started to remove misaligned guide rails in the DR No. 1 transfer pit, using a contract diver to remove lower bolts.

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Maintenance Engineering

Design Teflon Lined Impulse Lines for Steam Flow Meters, 184-D - One unit has been installed, the remaining four units will be installed as scheduling permits. Charge Seater - Rear Face Door Charging Machine Interlock - Design Change #371 has been prepared to include the new charge seating device in the existing rear face door interlock circuits at both D and DR. Deadman Switch on HSR's - Drawings are complete and material is on hand and installation planned at 105-DR during the next outage. Safety Circuit Trip Identification System - Operating experience during the first five months of use has shown the equipment to be completely reliable. PCCF Scram Delay Instrumentation - Prefabrication of components is in progress - installation at both D and DR awaits sufficient outage time. 4500 HP Motor Connection - Prototype open bus bar was completed at 190-DR during the month and operation has been satisfactory. Other units will be converted as operation conditions permit. Quench Spray to Rod Water Downcomer, 105-D - Sketches of piping to supply water to spray heads in rod water downcomer are complete. Spray water is intended to prevent effluent vapors from coming back into the outer rod room. Gamma Monitor Heat Exchangers - Design and drawings of the heat exchangers are complete. One heat exchanger will be installed for testing and evaluation. Spline Coiler Installation, 105-D - An Appropriation Request has been approved for fabrication and installation of one spline coiler for 105-D. Target completion date is July 1, 1960. Process Gas Loss Reduction - Efforts to seal the leaking rear boots on the rear face at 105-D were continued. Five boots were repaired by adding foam to the bellows base plate. Explosimeter survey of these boots before and after foaming indicated a reduction in leak rate. New foaming equipment was received during the month and is ready for use.

Events Influencing Costs

The overtime usage for the month is as follows:

Nonexempt	- 271 manhours
Exempt	- 86 manhours in 100-D Area
	140 manhours in other areas

F REACTOR OPERATION

GENERAL

Administration Activities

Suggestion plan statistics for the month were as follows: start of month-26, received-14, completed-11, end of month-29.

Personnel Development

Exempt: Two supervisors visited the Puget Sound Naval Shipyard in Bremerton, Washington, on April 11 to study operational and maintenance planning and scheduling practices.

Participation in other development activities was as shown below:

<u>Meeting</u>	<u>Number</u>
Beckman Leak Detectors	1
4500 HP Motors	2

Nonexempt: Participation was as follows:

<u>Training</u>	<u>Number</u>
Ball Valve Removal	2
Skookum Blocks	4
Tube Replacement and Rupture Removal	2
Air Tool Maintenance	7
Review of DC Electricity	1

Cost Control Activities

A routine cost review meeting was held on April 27, during which cost reduction programs were reviewed.

Landlord Activities

A work order was issued to provide needed improvements to personnel and lunch room facilities in the 105-F Building. Efforts are in process to obtain necessary funds to start the work this fiscal year. Funds to complete the work will come from the FY-1961 capital budget.

F PROCESSING OPERATION

Production

Input production was 102.0 percent of forecast, with a TOE of 84.3 percent. Equilibrium operation was limited by rupture control tube power limits.

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Operating Experience

Reactor outages totaled 112.7 hours for this month. Operating continuity was affected by the following:

<u>Outage Date</u>	<u>Hours</u>	<u>Reason</u>
4-1-60.	0.1	Continuation of outage of March 28.
4-3-60	33.8	Rupture 1169-F.
4-8-60	38.0	Rupture 1569-F and charge-discharge.
4-26-60	40.8	Rupture 3683-F and charge-discharge.

Equipment Experience

Sixty-seven tubes were probologged. Two tubes which had medium severe corrosion were leak tested and charged solid aluminum for future replacement. Two tubes were installed - one had contained a rupture and one was an air channel.

We experienced three ruptured fuel elements. One tube was removed and replaced and two tubes were removed and channels blanked. A force of 12,500 pounds was required to discharge the rupture in 1569-F.

We experienced two stuck charges on April 26 - one was recharged and one leak tested and recharged.

Seven tubes were probed, using 10, 11, 12 and 13 inch probes. Probing ran from 9' to 10'10".

The lower section of VSR 27 was replaced and returned to service.

A Geminol-type stringer was installed in 3466-F.

Improvement Experience

OGI-706 gas instrumentation installation continued throughout the month.

Radiation Monitoring Experience

F Processing Operation incurred four lapses of control. Two involved high level clothing contamination of up to 150 rads/hour received during discharge of ruptured fuel elements. Prompt clothing removal and shielding of clothing served to limit exposure to within less than 10 percent of permissible weekly work limits. One lapse involving inadequate control of highly contaminated rupture removal equipment was formally investigated and reported separately in HW-64871. Extra care and effort were required to control contamination in the wash pad and storage basin area following recent discharges of ruptured fuel elements.

F POWER OPERATION

Power disturbances on the BPA system were experienced at 12:33 p.m. on April 12 and at 2:38 p.m. on April 25. No equipment was affected.

Process water flows during reactor outages are now being maintained by the electric-driven pumps in the 190-A Building and with the steam turbine-driven pumps on automatic backup.

The No. 4 boiler acceleration test on April 29 was satisfactory and the boiler was placed in service. The No. 3 boiler was removed from service at this time for repairs to stokers.

Equipment Experience

The replacement of motor stators for Nos. 6A and 3A process water pump motors was completed on April 2 and 8.

The pump impeller for the No. 3A process water pump was inspected on April 6 by E. Buddy of the DeLaval Company and C. Quackenbush of Facilities Engineering. Cavitation indications were excessive as compared to similar equipment inspected recently. Surfaces were polished and the impeller was reinstalled.

The Class A inspection and repair work performed on the No. 9 steam turbine in the 190 Building was completed on April 3.

A new Barnstead water still was installed in the 190 Building on April 20 as replacement for the worn out unit.

Improvement Experience

Installation work on Design Change No. 351-F, "Low Pressure Steam Annunciation in the 184 Building," was completed on April 27.

The stainless steel tank for the liquid alum feed at the 183 Building was installed. Installation of piping is in progress.

Events Influencing Costs

Class A inspection and repair work on No. 9 steam turbine in the 190 Building.

Class A inspection and repair work on the No. 5 boiler feed pump and replacement of 1-1/2 inch angle valves in the 184 Building.

Removal of the No. 3 boiler and placing the No. 4 boiler in service.

F MAINTENANCE OPERATION

Equipment Experience

Eight temperature monitor system rear face thermocouples were repaired. Approximately 2442 gages were adjusted on the pressure monitor system panels. A total of 110 Panellit gages were undamped.

Fabrication of new stainless steel decontamination tanks for the reactor wash pad was started.

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Three, four-inch gate valves were replaced at the filters on the No. 11 influent valve at the 183 Building.

A 1-3/16" drive shaft on a fan in the heating unit in the 185 Building was replaced.

A Class A overhaul of the No. 9 turbine and pump in the 190 Building was completed.

Maintenance Engineering

The approved scope report for a project on the 105-F gamma monitoring improvement was forwarded to the Project Engineering Operation.

A revision to Design Change No. 254-F, authorizing changes to circuitry, was submitted for approval.

The mercury vapor rectifier tubes in one of the temperature monitor battery chargers have been replaced by silicon diode rectifiers to reduce maintenance costs of the temperature monitor power supplies.

Events Influencing Costs

Motor failure work at 190 annex; three reactor outages; additional painting within the area; overtime.

H REACTOR OPERATION

GENERAL

Administration Activities

A revised evacuation procedure for 100-H Area was submitted, in rough draft, for review.

A report on marginal employees was compiled as part of an over-all program concerning these people. Manpower forecasts and a listing of immediately promotable personnel were compiled.

The Quarterly Plant Standards Audit report was compiled and issued. Background work for the Work Stoppage Procedure was initiated. The H Operating and Improvement Program report for CY-1960 and 1961 was assembled, edited, and issued.

A meeting to discuss the non-unit, non-exempt salary plan was held by the H Reactor Operation on March 29. (This item was inadvertently omitted from the March report.

Personnel Development

Twelve employees attended the Manufacturing Section Manager's information meeting for H Area exempt personnel. N. H. Skarshaug attended the Company's Tenth Regional Plant Engineering and Maintenance Meeting at Schenectady.

Approximately 35 personnel attended training and educational sessions in Fundamentals of Manufacturing; Tube Replacement; Ball Valve and Rupture Removal; Leak Detection; Flow Measurements and Business in Our Changing Environment (BOCE).

Cost Control Activities

Preparatory work on a program to develop cost charts for the Reactor Operation was initiated. A business review meeting was held on April 18, for the Section Manager. Cost items where overruns are anticipated were examined. The FY-1961 Budget was also reviewed.

Landlord Activities

Studies of office space in the 1704, 1760, and 1761 Buildings continued. Proposals to permit the addition of more people to these buildings were submitted. Plans were drawn to modify existing space in the 1703 Building so the H Reactor Operation staff can consolidate in one building.

Damaged floor tile in the 1703 and 1704 Buildings was repaired by the flooring contractor. About 30 locations required repair consisting of sub-floor patching and tile replacement.

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H PROCESSING OPERATIONProduction

Input production was 2.2 percent below forecast. Equilibrium power levels reached 1860 MW. The tube power operating limit remained at 1135. The addition of the eighth pump at 190 during the month served to balance out the severity increase from higher river temperatures.

Operating Experience

The operating continuity of H Reactor was affected by the events listed below:

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
4-1-60	74.0	Continuation of outage caused by rupture in tube 1464.
4-4-60	0.8	Panellit trip, 0776.
4-4-60	0.2	Panellit trip, 2079 - PCCF tube.
4-18-60	54.6	Process tube leak, 0581.
4-23-60	35.0	Process tube leak, 2065.

Equipment Experience

Five new process tubes were installed. Two of the replaced tubes had been damaged by stuck fuel elements. One showed some rib rotation and two were replaced because they leaked. One of the leakers was attributed to abnormal corrosion of a second generation tube; the other has not yet been identified.

Seven stuck charges were encountered during regular charge-discharge of natural I & E metal at goal exposure. Four of the tubes with stuck charges contained the same lot material, KL-393-D. One of these required a maximum force of 18,000 lbs. to remove the charge. An additional 37 tubes of this material were discharged at an average goal exposure of 64 percent because of its stuck charge history.

Improvement Experience

Powered valve turners were installed on the front and rear elevators. Minor modifications are required for satisfactory performance.

PT-IP-188-C, "Test of Start-Up Procedures with Sub-Critical Monitoring," was successfully completed on the April 24 start-up.

PT-IP-216, "Evaluation of Performance of Normal Production I & E Fuel Elements," had nine charges in the reactor at month's end.

PT-IF-217, "Uranium Sample Irradiation (HAPO-218)", had one charge undergoing irradiation at month's end.

Radiation Experience

During removal work on a stuck charge, a Processing Operator was exposed to a dose rate of 35 r/hr to the hand and 8 r/hr to the body for an estimated 29 mr hand and 9 mr body exposure when he capped the rear nozzle. The Radiation Occurrence was formally investigated and reported in document HW-64792.

Contamination up to 4.5 rad/hr was spread to the floor area of X-1 level when a Swazelok fitting in the H-1 loop high pressure system parted after having been loosened and re-tightened. There was no detectable ingestion of contamination by personnel. A formal investigation was reported under Serious Accident No. 60-4.

Two Processing Operators were exposed to an estimated dose rate of 300 rad/hr to the hands when they attempted to re-insert an irradiated solid aluminum piece which had flushed from the front of a PCCF tube. The incident occurred when the wrong PCCF tube was opened and two solid aluminum pieces were flushed out. The hand dose was less than 5 rad and the body exposure, as seen by the health badge, was nominal. A report of the formal investigation is being reported as an Unusual Radiation Exposure and will be documented by P. C. Jerman, Radiological Engineering, R & E, IPD.

Events Influencing Costs

Overtime for the month amounted to 216 hours.

H POWER OPERATION

Operating Experience

The eighth 190-H Annex process water pump was placed in service on April 18, due to increased seasonal water demands.

Dump valves for the recirculating water for 190 Annex pump were placed in service during April. This will enable continuous operation of the annex motors and possibly reduce motor failures during start-up.

The average steam generating rate was 53,000 pounds per hour. An evaporation rate of 8.78 pounds of steam per pound of coal was attained.

Slight pressurization of the sulfuric acid storage tanks was experienced on April 26, due to a hard ferrous sulfate sludge blockage of the tank overflow vent lines. The plugged lines have been cleaned and remedial steps have been initiated to prevent recurrence.

Standard quality water was produced throughout the month with an average alum and Separan feed of 7.5 and 0.012 ppm, respectively. During the latter part of the month, it was necessary to increase alum feed on the east side in order to produce water of optical quality for 105 Basin "pick-up."

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Pressure on the export water system dipped to 190 psi on April 16, due to a Groves valve trip in 100-D Area. Operations were not affected since the surge was not of sufficient magnitude to trip the surge suppressors.

Equipment Experience

An inspection of the capstan car puller at the 184 Building revealed several damaged drive components. The unit was taken out of service awaiting replacement parts. Replacement of sub-standard steam supply piping to the boiler soot blowing elements was completed on all boilers. The semi-annual financial physical survey of the coal storage area was completed on April 29.

Improvement Experience

Data is being compiled on the temperatures of the export water system and elevated storage water tanks to evaluate back-up systems.

H MAINTENANCE OPERATION

Equipment Experience

In the 105-H Building, 46 rear face tube-to-crossheader connectors (J-2 pigtails) were replaced to correct water leaks. The vibration of the rear crossheaders loosened several pigtail brass adapters at the crossheaders which were tightened. Fifty-one Panellit gauges converted to the 10-90 trip range were installed to replace defective gauges and 39 to replace 25-75 range units. To date, 1,106 25-75 range gauges have been replaced with 10-90 range gauges.

A five-thermocouple graphite stringer was installed in No. 70 thermal loop tube; also, three flow recorders in front thermal loop tube pigtails to obtain temperatures and flow measurements.

A new duct was installed for the rear face communication wiring to waterproof the system. The timekeeping station is connected to the new wiring in the duct and the C-D system will be connected during a future outage.

An additional 61 regular venturis were converted to reamed venturis in order to obtain a more favorable pressure indication. Flow increases were made on four tubes by changing from the double orifices to the regular venturis.

In the H-1 loop in the 105-H Building, the recirculating line electric heaters did not shut off when the loop was drained due to malfunction of a heater thermo switch, causing the aluminum encasement around the heaters to melt. The heaters were replaced and circuit was revised for added protection.

The No. 11 pump assembly in the 181-H Building was removed from service following malfunction of motor during startup. The pump shafts were metalized, all rubber sleeve bearings in shaft spiders were replaced and impellers were repaired. The motor was sent off plant for repair. The pump assembly repair is completed except for installation of the electric motor.

The No. 4 unit motor (4500-hp) in the 190-H Annex was removed from service for inspection and replacement of stator coil wedges and spray painted with Glyptal. The coil and turns showed outside corona damage, which was treated with a mica compound. The stator was subjected to an a-c high-potential test and polarity index measurement. The motor is back in service and this completes scheduled 4500-hp motor repairs for eight-pump operation.

The material for installation of the new liquid alum feed system at the 183-H Building has been ordered and some material has arrived. The storage tank has been set in place and some of the piping brackets and troughs are completed.

Maintenance Engineering

Installation of the twelve-tube average temperature indicator instrument was completed during the month except for the permanent amplifier mounting. At a later date, the necessary mounting will be provided. All engineering work is completed.

Material which will permit modification of one five-fold hand and foot counter to reduce maintenance cost has been received. When completed, maintenance cost for this instrument will be monitored to determine the feasibility of modifying additional instruments.

During a reactor outage, CO₂ lines were connected to Horizontal Control Rod Seals Nos. 6, 8, 9, and 12. All that remains to complete this work is to install modified seals and gas lines in rods Nos. 10, 11, 13, 14, and 15.

Fabrication of Geminol graphite stringers was commenced during the month and should be essentially completed during May.

Following completion of the D elevator geared limit switches, it is planned to rehabilitate the tool dolly. Preliminary inspection and plans have been made concerning control cable problems. The 105-H nozzle remover tool will be reinstalled and the broken limit switches on the bottom of the tool dolly will be replaced.

A study has been made to determine the best method of providing 13.8-kv volt meters in the 190-H Control Room. It is expected that engineering will be completed during May.

Several problems concerning the Turco mixing facilities at 190-H were studied and resolved during the month. Recommendations and sketches to effect necessary changes were issued. All engineering work has been completed.

A design has been developed to provide a diversion facility in the 1904 outfall structure. The facility will provide a relatively water-free area so that the outfall structure repair may be made under optimum conditions. Sketches and design detail are available for the guidance of the personnel making the installation.

Activities of the Instrument Manual Writer during the month include the following:

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Developed block diagram on the temperature monitoring system. Completed a systematic listing of pressure gauges for buildings 181, 182, 183, 184, and 190. Completed modifications for 8-point Brown deviation temperature recorder. Devised location diagram of schematic diagram of the Neutron Monitoring Control instruments. Developed check sheet for keeping records on the individual temperature monitoring controller units. Assisted with modification of the zone temperature controllers and prepared check sheet for the individual units. Developed check sheet for calibration and servicing of the Barton differential pressure gauges.

CENTRAL MAINTENANCE OPERATION

Engineering and Planning

The engineering required for detailing the information for the installation of the bauxite and Turco piping systems for C Area was furnished. Detailed engineering service for design, fabrication and installation of a test frame and design for channel straightening broach was furnished for FEO Mechanical Development. The design of a ball valve adaptor sleeve remover for 105-C was improved. A pigtail crimper and a push pole adaptor were designed for 105-H. A gunbarrel flange to use with the Scott pushing machine was designed from an idea furnished by others. The design of 190 motor wedge drivers was improved. Specifications for a quick coupling device originally designed by Central Maintenance personnel were written for D Area. Tooling data for tools required to size venturis were prepared. Information required for the preparation and filing of seven work reviews was procured.

Shops

Shop work included the following:

Routine repair of tools used in reactor maintenance work. Machining sixty shaft couplings. Metallizing, straightening, and zincing river pump shafts. Reconditioning a monorake trunion assembly. Fabricating emergency parts for spline coiler, a spline inserter and a gunbarrel adaptor remover. Completing 600 special dummies for 1706-KE. Modifying eight slug cartridges for the Metal Examination Facility. Fabricating thirty-four quick couplings for tube removal tools. Reconstructing a special ball 3X hopper. Fabricating a decontamination bucket, machine guards, and other minor types of items. Fabricating complete electrical panel assembly for FEO development and performing project fabrication for MJA-8, CG-839, CG-865, and CG-871.

Projects and Special Services

Project activity during the month included: CG-666, CG-706, CG-707, CG-785, CG-806, CG-817, CG-839, CG-865, and MJA-8. Painting program was concentrated in F, H and D Areas, plus painting transformers in H Area and signs for all areas. Sheetmetal installations and repairs were made to four buildings in D Area, three in K Area, and one each in F and H Areas. Field work was performed at a 105-C test facility and installation of piping for the Turco program was completed for C Area. Special installation of piping and equipment for conversion to raw bauxite was started at B Area. Routine work on scales, refrigeration and fire alarm systems and numerous miscellaneous small jobs were performed.

KE-KW REACTOR OPERATION

GENERAL

Administration Activities

Preliminary arrangements were made with representatives of Transportation Operation to coordinate bus service with changes in security clearance and health badge procedures. A listing of deferred vacation requests (15 days in 1961) was submitted and approved. A review of exempt personnel participation in Professional and Trade Society Meeting activities was submitted.

Suggestion Plan Statistics for the month were as follows: Start of Month-35, Received-21, Completed-21, End of Month-35.

Personnel Development

Exempt

<u>Meeting</u>	<u>Attendance</u>
Fundamentals of Manufacturing	3 (6 sessions)
Value Analysis Seminar	1 (7 sessions)
Reactor Fundamentals (Reactor Specialists)	9 (3 sessions)

Non-Exempt

Thirty-eight Maintenance craftsmen attended on-the-job training sessions. Twenty Processing utility operators participated in Reactor Fundamentals training sessions. Seven Power operators attended training sessions on Nuclear Energy & Power Plant Application. One secretary attended the Secretarial Communications Seminar.

Cost Control Activities

A summary of customer overtime usage was made showing effects of major pump overhaul work and increased reactor outages. Preparation was initiated on budgets for maintenance fifth level supervisors as a means of improving cost control. The fiscal year-to-date cost picture in relation to the budget was reviewed with the area management through routine and special contacts, with emphasis on reducing selected overruns during the current quarter.

Landlord Activities

Arrangements were made to include the K Plant roof repair program in the centralized activity sponsored by F.E.O.

KE PROCESSING OPERATION

Production

Input production was 105.8 per cent of forecast. Power levels were limited by the rupture control point.

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Operating Experience

Reactor outages totaled 137.5 hours. Operating continuity was effected by the following events:

<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
1	32.1	Scram from the loss of Number 6 hi-lift pump. Exact cause of pump failure undetermined.
8	31.5	Scram by Number 2 safety circuit trip believed to be due to an over-sensitive manual scram control button.
23	43.5	Scram due to a fuel element failure in KER-4.
26	0.6	Scram due to a high heat exchanger exit temperature trip. (KER-4) Recovery was successful.
27	29.8	Scram due to a high heat exchanger exit temperature trip on KER Loop Number 3 caused by an induced transient on signal leads.

Components that were involved in the two KER trips were completely checked and replaced.

Equipment Experience

The tube of KER-1 was replaced during the month. A force of 13,000 psi was required for the initial movement during tube removal.

The effluent line developed a leak in the vicinity of the transfer area. Excavation in preparation for repairs was in progress at month end.

Improvement Experience

Installation of rear crossheader pressure gages (CG-817) in conjunction with the differential pressure system was completed during the month.

A new scintillation portable instrument called the "watch dog" was tried. Developed by Radiological Engineering, its purpose is to give a warning of a radiation level change and thereby reduce the need for close monitoring in radiation zones.

Radiation Monitoring Experience

One Lapse of Radiation Control occurred for an assigned severity of seven. Personnel were exposed to dose rates in excess of 3 r/hr on two occasions during spline removal work.

KW PROCESSING OPERATION

Production

Input production was 120.6 per cent of forecast. A new production record for a 30-day month was achieved. Maximum tube powers were maintained at the administratively imposed level due to rupture experience.

Operating Experience

Reactor outages totaled 91.3 hours. Operating continuity was affected by the following events:

<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
6	34.4	Reactor shut down to discharge ruptured fuel element in tube 2548. (K-III-E)
28	56.9	Reactor shut down to discharge ruptured fuel element in tube 1385. (K-III-N)

Following the second outage, startup was made with five of the six pump sets in operation to permit class A overhauls on Numbers 5 and 6 high-lift pumps and installation of a larger capacity impeller in the Number 1 high-lift pump unit. The change to five pumps reduced coolant water flow by 14 per cent for the overhaul period.

Equipment Experience

Removal of the tube and ruptured charge from channel 1385 required special permission from Process Technology to use pressures up to 10,000 psi.

Following an unsuccessful attempt to remove HCR 2 on April 6, it was successfully removed during the latter outage. The rod was returned to service with a new tip section and step plug. Boroscope examination of the original step plug revealed damage to the graphite bearings. Visual examination of the old tip section indicated severe galling on the rod. HCR 4 was removed from service when operating difficulties indicated that a similar problem may exist.

The first functional use of the ram type charge seaters was made. A need for further training in the use of this equipment was indicated.

Improvement Experience

A variable low trip indicator was installed on the bulk outlet water temperature recorder. This trip, together with the present high trip system, provides the console operator with an indication of power level variation that might go otherwise undetected should the power calculating instrumentation fail.

Design Change 338, "Fog Spray Modification," was completed. This revision permits control of the fog spray equipment from either the 18 or 38 foot viewing windows to facilitate contamination control.

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Radiation Monitoring Experience

Three Lapses of Radiation Control with a total severity of 23 were incurred. Dose rates up to 3 r/hr were required for inspection of Ball 3X room equipment. A buildup of smearable contamination to 16 rads/hr in the transfer area required intermittent decontamination for control.

KE-KW POWER OPERATION

Operating Experience

The electrical peak control point for April was first set at 325 megawatts and subsequently raised to 330 on April 26 when a sharp increase in plant load made this change economical.

Following considerable difficulty from floating trash in the river water, negotiations conducted by F.E.O. resulted in the Priest Rapids Dam contractor cleaning the major portion of the reservoir-created trash from the river. The rise in the river enabling water to go over the jetty just below 181-KE, also aided by sweeping the remaining trash downstream.

On April 1, the Number 6 high-lift pump unit at 190-KE tripped off during normal operation, causing a scram of the reactor. No relay targets were actuated and the motor was restarted shortly afterward without difficulty. Despite exhaustive tests of the control circuits and relays, no cause for this trip-out was determined.

Equipment Experience

A new upper shaft was installed in Number 3 low-lift pump at 190-KE to replace a shaft showing a longitudinal crack. Cross sectioning of the old shaft revealed this crack to be straight and radial, extending from the surface to the exact center of the shaft.

The sodium hydroxide heat exchangers, transfer pumps and piping were removed from 183-KW for installation in the 105 buildings for foundation block cooling.

Improvement Experience

Design Change Number 362, which removed Number 3 and Number 4 river pumps from the 4160 volt buses in case of B.P.A. failure or separation from the local buses, was completed and tested. The change alleviated overloading of the emergency generators in case of B.P.A. failure.

Preparation of the casing of Number 1 high-lift pump, 190-KW, was begun for installation of a CG-775 type prototype impeller. The modified impeller and shaft unit, originally from the Number 1 high-lift pump at 190-KE, was received from Byron-Jackson Company for installation.

KE-KW MAINTENANCE OPERATION

Equipment Experience

Range changes or checks were made to 5350 gages with 4582 being completed during outages. A large portion of these were made to accommodate the change to five-pump operation at 190-KW. The change out of the 25-75 pound trip range gages to 10-90 pound type was completed in 105-KW.

The following Design Changes were completed:

- Number 363 - Removal of V-72 Guard Valve Maletron Pressure Switch, (105-KE).
- Number 271 - Voltage Regulator and Relay Test Circuit, (165-KE).
- Number 362 - Raw Water Pump Number 3 and 4 Trip Circuit Revision, (165-KE-KW).
- Number 338 - Fog Spray Modifications.

Class "A" overhauls were completed on 183 items of equipment, class "B" on 247 items, inspections on 81 and lubrication checks on 41 items. The class "A" overhauls included Number 5 high-lift pump, 190-KW, and associated equipment and Number 2 safety circuit in 105-KE. The class "B" overhauls included Number 3 low lift pump in 190-KE, the motor of Number 5 highlift, 190-KW, the cranes in both 190 buildings and the thirty ton crane in the 105 buildings.

Maintenance Engineering

Satisfactory calibration of three overcurrent units on one ITE 500 amp 480 volt breaker was achieved at KW with the newly acquired multi-amp high current testing unit.

A resistance-to-ground check was made on the bridge networks of the temperature monitor system with the system voltage supplies shut down in 105-KE, thereby providing a check on all RTD's, connectors and lead wire in parallel. Two points having low resistance were corrected. A letter was issued to Processing Operations recommending that an RTD lead wire connector tightness re-check be made to reduce the number of failures when the fog spray system is used.

SUPPLEMENTAL CREWS OPERATION

Methods and Procedures

The following procedures, developed by Industrial Engineering, were approved by the Manager, Supplemental Crews:

- Rear Face Pre-Marking (all areas)
- Rear Face Set-up (105-KE-KW)
- Rear Face Button-up Conveyer, Carts and Trays Method, (105-KE-KW)

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SUPPLEMENTAL CREWS OPERATION (Cont'd)

The time distribution from April 4 through May 1 was as follows:

<u>Area</u>	<u>Percent</u>	<u>Hours</u>	<u>Area</u>	<u>Percent</u>	<u>Hours</u>
100-B	20.8	1639	100-F	6.6	512
100-C	23.2	1823	100-H	9.4	737
100-D	11.3	884	100-KE	8.7	683
100-DR	7.9	622	100-KW	12.1	952

R L Dickman

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

FACILITIES ENGINEERING OPERATION

REACTOR MODIFICATION DESIGN

RESEARCH AND DEVELOPMENT

Organization of a scope design and testing program in support of a project proposal for the modification of the 105-C Reactor for self-supported fuel elements was initiated. This proposal will encompass the execution of design for the nozzle, process tube, and charging machine, as well as other modifications necessary for the installation of new zirconium process tubes and operation with new self-supported fuel elements.

A new order for ceramic (alumina oxide) sleeves for the 105-K Reactor horizontal control rods has been placed with the Coors Porcelain Company. A trip was made to the Goulton Industries, Metuchen, New Jersey to discuss problems in the fabrication of the ceramic sleeves with this vendor who was delinquent on the original order. This vendor was unable to control distortion in the ceramic sleeves and as an alternate method proposed fabricating the sleeves from zirconium silicate. His proposal is being studied to determine its effect upon reactor operation.

DESIGN PROJECTS

CG-775 - 100-K Water Plant Expansion

The No. 1 pumping unit in the 190-KE Main Pump House has been modified by installation of a second revised design impeller which will receive three months in-service testing prior to inspection for cavitation damage. The completion date for this project has been extended to June 30, 1960 to permit inspection of the impeller.

Scope drawings for this project are 100 percent complete. A portion of these drawings define the total expansion of the 100-K Area water plants and will become part of Project CGI-883.

CGI-791 - Reactor Confinement

Overall design completion for this project is 93 percent. As part of an interim authorization, an additional \$800,000 was received for Phase III of this project. As part of this authorization the design and testing funds were increased from \$526,000 to \$595,000. This supplemented funds authorization represents the total design funding for the project.

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The scope for Phase III of this project remains at 96 percent complete. To date all major scope items have been approved and detail design is 84 percent complete. Twelve comment and 33 approved detail design drawings were issued during the report period. A study of the proposed filter handling system for removing and installing filters in the 117 Filter Building was issued for comment preparatory to initiating detailed design.

A trip was made to the San Francisco Bay area to inspect building surfaces coated with Tri-Flex which has been proposed as an alternate coating for Ply-On. Visual inspection of the two coatings indicate that Tri-Flex is not an approved equal; therefore it will not be recommended as an alternate coating.

Considerable effort has been spent in preparing and processing purchase requisitions for equipment required for Phase III. Essentially all requisitions for this phase of the project have been issued and bid reviews completed in most cases.

The overall completion of the testing program is approximately 97 percent complete. Progress of the tests not completed are summarized below:

DT-1050- Environmental Component Testing

The filter test units in the exhaust air tunnels in 105-B and F reactor buildings did not experience any abnormal increase in pressure drop across the filter units during the report period. Approximately 0.35 inches of water pressure drop increase has accumulated across the absolute filter bank in 105-F over the past six months and 0.20 inches of water pressure at 105-B during seven months.

A dust sample removed from the filters in 105-F is being analyzed to determine particle size and contaminant.

Development Program - Adhesive Metal Bonding

A design test program has been initiated to evaluate the feasibility of fabricating aluminum filter frame assemblies using epoxy adhesive bonded joints rather than the conventional welded joints. Aluminum shapes necessary for fabrication of a number of joints typical of the filter frame have been received.

Preliminary tests have been made with a typical filter frame section assembled with "Permagile" epoxy adhesive. The adhesive joints were stressed to approximately 2.5 times the calculated load without failure.

Additional tests are in progress using various adhesives to joint steel as well as aluminum shapes.

CGI-839 - Modification of Fuel Element Test Facilities

Design completion for this project is 98 percent complete. Revision is complete for ten drawings relocating the KER 4160 volt power supply from the C-F bus to the B-E bus system in the 165-K Control Building. All instrument and mechanical piping drawings have been completed and approved.

The design drawings for the KER-3 and KER-4 process tube assemblies have been approved. Stress analysis design tests are in progress.

The Acceptance Test Procedures for the electrical switchgear, loop pumps, loop heat exchangers and loop instrument modifications have been issued for comment. Comments have also been requested on the general construction specification.

A visit was made to the vendor's plant during the month to discuss material specifications and design requirements for construction of the loop heat exchangers.

The drawings and specifications for the 1706-KER Building addition, being prepared by an architect-engineer, were revised and returned to the General Electric Company for approval.

CGI-844 - 100-K Coolant Backup System

The revised project proposal requesting scope revision and total project funds of \$2,100,000 has been forwarded to the Atomic Energy Commission for approval. The revised proposal is an increase of \$600,000 over the original proposal and includes a last ditch pump station between the KE and KW Reactor Buildings to supply coolant to either reactor upon demand.

Scope design is approximately 95 percent complete. All six scope drawings have been completed, three have been approved by the Project Representatives and the Design Council, one is ready for approval, and the remaining two drawings have been issued for comment. The Design Criteria are being prepared.

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

Purchase orders have been placed for all engineered items required for the pump modification at the 190-KW Main Pump House. Approved drawings for the modification of this pumping unit have been issued.

Scope design for the total project is approximately 97 percent complete. The Project Representatives have approved all scope drawings which are planned. A rough draft of the design criteria has been completed and routed for comment.

A network analyzer study of the K Area electrical system was performed at Schenectady during February 1960. Preliminary results of the study indicated that minor relaying changes from the present design would be appropriate. These changes include modification of the relaying scheme for the submersible pump motors to be installed at the 181-K river pump house.

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EQUIPMENT DEVELOPMENT OPERATION

EXISTING REACTOR WORK

The machine for charging self supported fuel elements was delivered to 105-C Reactor; and modifications to the machine mounting on the elevator are in progress to facilitate a quick exchange between this and the standard machine.

The analog-to-digital converter, with solid state circuitry, was installed in 105-B Area and is operating satisfactorily except for one minor function. The latter was found to have resulted from a design error by the vendor which he is correcting.

Two out of five in-core chambers ordered from Anton Electronics have been received after long delay. This represents partial completion of a vendor development of this item.

Drawings and specifications for Van Stone sealing inserts, an interim solution to the problem of rear face Van Stone leaks, were turned over to Plant and Industrial Engineering for reactor application.

Review of a long standing development effort to improve the service life of K Reactor vertical safety rod gas seals indicates that this can be successfully concluded. New seals have survived fourteen months and give every indication of providing adequate service for another year, as compared to previous experience where seals became badly worn within a few months.

Prototype samples of aluminum oxide ceramic balls, containing varying concentrations of poisons, were received and turned over to Research and Engineering for 305 Reactor tests. These show that satisfactory balls for existing reactors can be obtained within the range of concentration to which the aluminum oxide can be loaded.

A machine has been built for marking the ends of 100 selected charges of fuel elements with serial numbers at 105-C to facilitate flux distribution studies. This device uses a serial marking head which was obtained with the possibility in view of a common serial marking system for all reactor fuel elements.

Work is continuing on study, shop and vendor fabrication, laboratory testing, and planning on elements of the following programs:

- (a) Process tube channel overboring.
- (b) Remote operation of rear face tube closures.
- (c) Inexpensive machinery for charging during operation.
- (d) Tube removal and replacement.
- (e) High speed scanning for temperature and other parameter modeling.
- (f) Panellit system modification.

NEW REACTOR WORK

First phase of a design test on the proposed shield expansion joint gas seal for NPR was completed. The data indicate large stresses which suggest a re-examination of the joint design.

The NPR-PCE loop operated routinely in thermal and bend cycle testing of NPR connector-nozzle fittings. Operation was delayed four days when the loop line heater failed and had to be repaired.

Magnetic amplifier components were received and are being assembled into a model NPR flow monitor limit circuit on which performance testing can begin early in May. This is a locally conceived approach to the problem which makes use of solid state and magnetic components of the same type and manufacture that have given exemplary performance in the existing reactors' zone temperature monitoring system.

Testing of immersion and ~~strap~~-on resistance temperature detectors continued making use of the NPR-PCE loop for response time testing. One immersion unit blew out during pressure testing at about 1800 psi, but the failure appears to be associated either with improper assembly of the fitting or with a warped Weldolet fitting.

A design of a horizontal control rod gas seal has been found which seals effectively at both 1/2 and 5 psi test pressures. Material specifications and design of the restraining systems are being prepared.

Feasibility of a system for containment coating of the Zone 1 confinement area of NPR, using proprietary compounds have been established. A comment specification is being prepared, based on physical characteristics of the specimen test to date.

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PLANT AND INDUSTRIAL ENGINEERING OPERATIONDRAFTING OPERATION

The summary of services provided by the Drafting Operation is as follows:

New Engineering Drawings	163
Revisions, Layouts and Sketches	116
Microfilm drawings added or retired	4247
Microfilm prints reproduced	297
Ozalid check prints reproduced	715
Customers serviced - Microfilm files	221
Vendor catalogs added to file	95
Customers serviced - catalog file	41

INDUSTRIAL ENGINEERINGProgram of Tube Replacement Improvement

Recently, a symposium and film review was conducted on tube replacement activities for members of Facilities Engineering and Manufacturing Operations. The purpose of this meeting was to assist individuals in their planning and scheduling of large volume tube replacement activities at C reactor.

Reactor Building Work Area Metal Handling, All Old Areas

The design-development of a suitable magazine container for storage and shipping of fuel elements is in progress. Front face material handling study continued with tests to demonstrate flow of fuel elements through the fuel clip. Application of a small amount of water-soluble oil to the sides of the clip allows regular as well as self-supported fuel (even of extra large diameter) to be discharged.

Service to D-DR Reactor Operation

Scheduling boards for DR reactor were ordered and have been received. These are used to increase the ease and flexibility in scheduling and in maintaining an up-to-date schedule throughout an outage.

Simplification of Maintenance Administrative Control System

Revised forms and procedures, previously developed in a cooperative effort between 100-H Maintenance Operation and engineering personnel were installed at 100-H Area on April 1, 1960; and the anticipated improvements are being realized.

Program of Charge-Discharge Improvements

The procedures for rear face setup and buttonup for the GI can method and the carts and trays method for the six old reactors have been updated and rewritten as approved procedures.

Four thousand front face special marking tags have been ordered from the low bidder, Kirkhill Rubber Company of Brea, California. Delivery is expected in late May, 1960.

Metal Unloading Ramp

An engineered system of unloading fuel elements and other material from delivery trucks at the Reactor Buildings is being provided at B, D, DR, and F reactors. One ramp unit, purchased from Magline Inc. of Pinconning, Michigan, has been delivered to F reactor.

Standard operating procedures and maintenance instructions have been prepared by Industrial Engineering and approved by the Manager, F Processing. Copies of these standard operating procedures have been delivered to the other reactor buildings for use as their ramps are received.

Assistance to Supplemental Crew Activity

At the request of the Manager, Supplemental Crews Operation, assistance has been provided to the supervisors with work simplification suggestions to eliminate or minimize unnecessary work elements or delays during charging activities in all reactors. A letter to the Manager, Supplemental Crews, dated April 14, 1960, outlines some of the observations and recommendations to date.

Overboring Feasibility Task Force Study

Mathematical formulas were developed for computing elapsed outage time when performing reactor work under four different types of work schedules. A report, "Calculation of Reactor Outage Time Required by Various Work Schedules," was issued April 18, 1960. The analytical and methods formulation work associated with the Task Force Study on the feasibility of overboring reactor graphite channels was completed. A draft of the task force report (HW-64519) was issued.

REACTOR, PLANT ENGINEERING

Closed Circuit Television

Technical assistance was given to several television applications at Hanford. Consultation was rendered to develop specifications for television equipment. A review was made of proposals from six vendors to supply an optical scanner for use in IPD. Assistance was given to Equipment Development Operation for preparation of specifications for television to be used with a remote manipulator.

K Area Material Handling

The charge seater phase of K Area Material Handling Improvements Program has added to the difficulty of magazine movement. To relieve this problem a Rail King Tractor has been ordered to motorize the bridge crane. After success has been demonstrated, the remainder of the troublesome bridge cranes will be so equipped.

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Ventilation Improvement - C Reactor Building

Scope for ventilation improvements at C Reactor has been accepted by C Reactor Operation. Design is now in progress for the ventilation provisions at gamma monitor rooms, gas instrument room, and new offices.

Poison Spline Application

Considerable progress has been made in the qualification of additional spline vendors. Reactor Materials, Incorporated has delivered spline samples which have satisfactorily passed evaluation tests of physical, mechanical and reactivity properties. Samples from Technical Research Group are currently being evaluated.

Scope was prepared for a project to provide two spline coilers for each reactor.

Water Studies Semi-Works - Safety Circuit Improvements

Comments have been received from Manufacturing and Research and Engineering on the scope report for improvement of KER safety circuits. Appropriate revisions have been made, drawings have been completed and the final package is currently being routed for approval.

Safety Circuit Trip Identification

The scope report, Safety Circuit Trip Identification, HW-64404, was approved and issued for Project Proposal preparation. The system will provide a means for identification of the first safety circuit component to trip.

STANDARDS ENGINEERINGSpare Parts

New Line Items Added to Spare Parts and Items		
Increasing Stock Levels	151	\$ 28,172
Line Items Deleted from Spare Parts and Items		
Decreasing Stock Levels	32	14,450
Line Items Changed, i.e., Description, Etc.	25	
Spare Parts Items Authorized by Letter to		
Project Engineering	2	500
Spare Equipment Items Authorized by Letter to		
Project Engineering	0	0
Spare Part Items for Projects by Stock Adjustment Requests (SARs)	25	15,380
Spare Equipment Items for Projects by SARs	1	1,754
Spare Part Items for 100-K	80	2,150
Engineered Items Reviewed	40	
Drawings Ordered Revised	0	
Stock Adjustment Requests (SARs) Processed	50	
Stores Stock Requests Processed	3	

A total of 223 uniform wall process tubes procured from the Reynolds Aluminum Company have been installed in the five old reactors.

Craft Training and Testing

Activities during the month follow:

Seven instrument trainees completed the ten session training course on the Fundamentals of Flow Measurement. The trainees participating were tested on their knowledge of Flow Theory. A servicing clinic on the Beckman Leak Detector was conducted by Mr. Stanley Baldwin of Beckman Instruments. Preparation of a training program on the Reactor Confinement instrumentation is in progress. Two eight-hour classes and practice sessions on Tube Replacement and Rupture-Removal were attended by 11 millwrights and pipefitters. Four two-hour classes on Tubing and Swagelock Tubing Fittings were attended by 52 pipefitters, supervisors, and engineers. Instruction was presented by R. E. Shanks, Automation Products, Spokane, Wash. Three two-hour classes on Hoisting Blocks (Skookum Bearing), presented by K. L. Wernsing and Paul Davis, Skookum Block Company, Portland, were attended by 42 riggers, supervisors, engineers and safety specialists. Seven two-hour classes on C Reactor Building Ball Valve Removal were attended by 85 millwrights, pipefitters, and supervisors.

WATER PLANT AND UTILITIES ENGINEERING

Engineering in Support of Power Forecasting

Draft copies of the annual two-year and five-year power forecasts for IPD were completed and copies were routed to area management for comments and concurrence. The forecast data reviewed with Utilities Operation, Construction Engineering and Utilities Operation, in an informal meeting to discuss the qualifications placed on increase in demand associated with projects which are not yet approved. It is intended that the firm power commitment for IPD not be increased for the next two fiscal years. The present firm power schedule is adequate for operation without spare pumping equipment. There is reasonable assurance that interruptible class power will be available in sufficient quantity to cover all projected operation of the spare pumping equipment.

4500 HP Motors - 100-F Area

Engineering assistance was provided to F Area personnel during the replacement and repair activities resulting from failure of the No. 3 and No 6, 4500 HP motor. As part of our continuing efforts to evaluate the reliability of the insulation system of the subject units, several meetings were held with vendor's representatives. Also reviewed was the vendor's report on motor No. 6999803. This information was officially transmitted to the Atomic Energy Commission on April 22, 1960.

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Undervoltage Relays - Safety Circuits

Recommendations were made to eliminate the undervoltage relays in the Main Pump House - B, D, DR, F, and H Buildings from the safety circuit. This recommendation was based on studies of maintenance troubles with the relays and on recorded data taken during the several flow decay tests performed during the past eight months. These relays caused several scrams which are considered to be unnecessary.

Suitability for Service Tests - Northern Pacific Coal

At the request of Production Operation and with the assistance of Power Operations at 100-D Area, a test that would permit evaluation of the reliability of Northern Pacific Railroad coal for use in all Power House Buildings was conducted. Data was taken by motion pictures, personal observations during the progress of the test, and screen analysis of the coal both as received and as fired. Tabulation and analysis of the data have been completed and a report of the results has been issued. During this test, burning characteristics and pickup were satisfactory; however, some control adjustments are necessary to reduce hunting.

Columbia River Studies

Average river turbidities have ranged from 103 PPM to 15 PPM. The highest readings were due, we believe, to construction activity at Priest Rapids Dam. Most (80 to 95 percent) of our present turbidity seems to stem from Rocky Reach Dam or above. Daily river flow and temperature forecasts have been provided to the Power Areas.

Short Term Effects of Priest Rapids Dam

Following our complaints, the five acres of debris above Priest Rapids Dam was collected by a tug boat and disposed of on shore.

The Public Utility District is conducting load rejection tests on their turbines causing load swings of 20 to 50 m.c.f.s. These tests will continue for some time. A failed main power transformer caused severe swings at H.A.P.O., but no power failure despite loss of No. 2 BPA line.

Surface water temperatures of the pool behind the dam have been from 8° C to 11° C. Turbine discharge temperatures are 5 to 6-1/2° C.

PROJECT ENGINEERING OPERATIONPROJECTSCG-600 - 100-C Alterations

During this period pumps Nos. 1, 2, 8, and 9 were interiorly examined. Pump No. 1 required immediate rotating element replacement due to severe erosion damage on one inboard blade. Pumps Nos. 2, 9, and 8, in that order, will have rotating element replacement as fast as assemblies are received from Byron Jackson. These replacement assemblies are being received for prompt installation. One of the latest type 18-8 integrally cast stainless steel impellers recently received had to be removed from operation due to a broken impeller ring on April 17, 1960. The failed element was immediately returned to the vendor for repair. The program of inspection and replacement will continue until acceptable impeller units have finally been received from Byron Jackson Pump Company.

CGI-791 - Reactor ConfinementPhase I - Fog Spray

Work has been started on the fabrication of thermocouple duct shields by plant forces.

No conclusive results have been obtained as yet from the tests of the modified sampling system in the 105-B Reactor Building. These tests are continuing.

Phase II-A - Site Preparation

This work is complete.

Phase II-B - Filter Buildings

The R. B. Miles Company is approximately 33 percent complete with their contract compared with 46 percent scheduled as of April 29, 1960.

Six concrete pours have been made since the 30th of March. The status of the concrete pours is as follows: F, H, C, and B Areas have three complete pours, DR Area has two pours, D, KE, and KW have one pour.

The contractor has started excavation for the air ducts in 100-F Area and has started driving sheet piling for the protection of the building and stack foundations in 100-H Area. He has been experiencing considerable difficulty in the installation and alignment of the seal frame inserts in 100-F and H Areas.

Phase III - Ventilation Modifications and Tie-ins

An interim authorization for \$800,000 has been received from the Commission. A work release, CGI-791, No. 11, was issued to the J. A. Jones Company on April 19, authorizing them to incur costs in the amount of \$200,000 for

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labor and materials for the modification of the ventilation system in the 105 Reactor Buildings. The total funds released to J. A. Jones to date are \$808,400. They have started work in F, H, and DR Areas on the installation of conduit and tubing.

The procurement status for engineered material for this phase of the project as of April 22, was \$310,626 worth of material on order, and 18 requisitions out for bid, with an estimated value of \$210,470.

Commercial Steel Fabricators, Inc., Seattle, Washington, was visited on April 7, 8, and again on April 25, to observe their progress on fabrication of filter frames. On the latter visit, one frame was ordered for preliminary inspection for our determination as to its acceptability. Both parties agree that this frame is not within specified tolerances. Our observation of the welding on the frame showed that there were still some welding problems to be corrected. These involved pin holes and cold laps.

Their progress on the fabrication of frames in the last two weeks has improved remarkably. It was agreed that the frame would be completed and offered for final inspection on Monday or Tuesday, May 2 or 3. General Electric Company Inspectors will be at the plant on either of these days to begin final inspection.

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

The purpose of this project is to provide crossheader pressure differential indicators and an alarm system on the front face of each reactor. This will assist in correctly valving down during outage work and will provide visual and audible alarm in the event of low pressure to eliminate hot header incidents.

Previously reported acceptance tests were conducted at 105-KE on December 7, 1959, and at 105-D on January 4, 1960. Beneficial use was attained at 105-H on January 25, 1960, and at 105-F on February 2, 1960. During this period beneficial use was attained at 105-B on April 8, 1960, and acceptance tests conducted at 105-B during week ending April 10, 1960. The total project scheduled to be 90 percent complete is actually 93 percent complete. The work on the reactors is being accomplished by Central Maintenance.

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

The purpose of this project is to modify and move a dormitory from the 1100 Area to 100-D Area and convert it into office space complete with fire protection, new electrical circuits, ventilation, heating, water, sewer and telephone facilities. Design was accomplished by Doudna, Williams and Phipps, Yakima Architect/Engineer firm, and construction bids were opened on April 26, 1960. The Commission is now appraising the bids.

CGI-845 - Increased Pumping Capacity - 181-C

Upon completion of this project two additional pumps will have been installed in the 181-C River Pump House and will include structural and electrical modifications in the building. Approximately 12,000 to 15,000 gpm of increased flow should be realized and the reliability of the electrical source for the 181-C building will be increased. The work which is scheduled to be 61 percent complete is now 60 percent actual. The work is progressing satisfactorily and it is expected that all building modification work will have been completed prior to the delivery of the two new pumps and motors. Scheduled delivery date on the pumps is May 1, 1960, but the motors from Louis Allis Company are not scheduled for shipment prior to May 13, 1960.

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

One of the phases of this project includes the rewinding and upgrading of ten low lift pump motors from 900 hp to 1500 hp service. An option had been obtained from Westinghouse which had to be exercised by April 11. The Commission notified Westinghouse of their intent to exercise this option. Westinghouse still has the request under consideration and no purchase order has been accepted, as yet.

PROJECT PROPOSALSProject Proposals Approved by AEC

CGI-791
Rev. 4

Reactor Confinement

Local authorization of \$800,000 additional funds for Phase III. To Washington-AEC for balance of requested funds (\$1,380,000) on April 20, 1960.

CGI-883
Rev. 1

Increased Process Water Flow - 100-K Area

Redistribution of funds to rewind ten 190-K low-lift pump motors.

CGI-884

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

CGI-889

Effluent System Modifications, 100-B/C

Interim design funds of \$39,000.

CGI-890

1704-K Ventilation Improvements

Directive issued for alternate system (evaporative cooling).

Project Proposals Submitted to AEC

CGI-844
Rev. 1

100-K Area Coolant Backup

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CGI-892 Ventilation Improvements, 181 Buildings

CGI-899 Cask Handling Facility - 105-KW

Other Projects Awaiting AEC Approval

CGI-824 Remotely Operated Cap Remover, KE Reactor
Rev. 1

CGI-868 Columbia River Scale Model
Rev. 1

CGI-869 Operational Charge-Discharge C Reactor

CGI-887 Critical Mass Monitoring, All Hanford 105 Buildings

Requests Received for Project Preparation

R-20932 Modification for Use of Self-Supported Fuel Elements -
C Reactor

R-20933 Safety Circuit Trip Identification System

R-20934 Poison Spline Coilers - All Reactors

R-20935 Modifications for Use of Bumper Fuel Elements - Two Reactors

PLANT FORCE WORK REVIEW

The HOO-AEC Labor Standards Board approved ten jobs for assignment to plant forces which are estimated to cost \$124,145.

MANAGER
FACILITIES ENGINEERING

RT Jessen:msw

RELATIONS PRACTICES OPERATION

PERSONNEL PLACEMENT

Twenty-four experienced BS/MS candidates were interviewed with four offers extended. One PhD candidate was interviewed with no offer extended. Eleven exempt people transferred into the Department from other HAPO and GE Components. There were four transfers out of the Department.

OFFICE SERVICE & PROGRAM ADMINISTRATION

A total of \$350 in awards was paid to 30 suggesters. The highest award was \$80.

COMMUNICATION

Mass communication activities included the publication of seven Management News Bulletins, two Round Table Guides, two IPD Headliners, and four priority messages. One IPD-OPG and ten HAPO-OPGs were issued during April. GE NEWS coverage included 15 items about IPD activities totaling 222 column inches.

SALARY ADMINISTRATION

Salary administration work was completed on the establishment of Applied Reactor Engineering Operation in Manufacturing. Information was developed for further HAPO-wide study of first-line supervisor pay differentials.

WAGE & BENEFITS

Two employees retired during April. One death occurred in IPD during this report period. The new wage plan, affecting 249 IPD non-unit, nonexempt employees, became effective April 11, 1960.

HEALTH & SAFETY

Six security violations occurred during April. No disabling injuries were reported but 95 medical treatment injury cases were treated. Safety awards were ordered as the Department completed 410 days without a disabling injury.

Wm. A. Shanks

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FINANCIAL OPERATION

GENERAL ACCOUNTING OPERATION

The quarterly equipment expenditure pattern was transmitted to Contract Accounting on April 28, 1960. FY 1960 expenditures and commitments were estimated as \$1,573,000 and \$1,919,000 respectively.

The biennial physical inventory of IPD Movable Equipment was started on April 26.

A Work Simplification Seminar held in Schenectady was attended by one IPD employee. This trip represents our April attendance at Off-Site Courses. Costs incurred totaled \$439.

Attendance at meetings of Professional and Trade Societies consisted of participation by two IPD employees in a Nuclear Congress held in New York City, sponsored by several Professional Societies. Costs incurred totaled \$425.

PRODUCT COST & BUDGET OPERATION

S. H. Small, C. E. Reed, O. H. Greager and J. H. Brown attended a meeting with representatives of Contract Accounting and various AEC components to discuss Research and Development requirements and program documents in connection with the FY 1962 and revision of FY 1961 budgets. Minor changes in the wording of the program document were agreed upon.

S. R. Johnson and C. E. Reed met with Dennis Keck and Dave Wheeler to discuss the practicability of equipment piece maintenance reporting for the N Reactor.

The Essential Material Inventory in D-DR Power was observed.

Two changes in operating report forms were made. Effective with the July, 1960 report, charges from AEC contractors will be booked as direct cost rather than as services. Assessment pool billings will be recorded separately from other assessments.

A statement of steam production costs for FY 1959 was furnished to FPD Cost for comparison purposes.

Procedures for taking the annual coal physical inventory were distributed.

PERSONNEL ACCOUNTING

During the month of April, 10,813 overtime hours were worked by department personnel compared to 15,072 hours worked during March.

Year-to-date absenteeism amounted to 2.7% of total available hours for a total of 39,786 hours comprising 30,047 for sickness, 9,739 other causes. 3,415 of these hours absent were without pay.

AUDITING

Absence and injury records pertinent to the second consecutive HAPO General Manager's safety award were reviewed. Nothing which would disqualify the department from achieving the award on April 14, 1960 was found.

A report covering the observation and review of results of the physical inventory of Property of Others in the custody of the department was issued.

Revisions to thirty-five AEC Manual Chapters were reviewed for their effect on IPD operations.

PROCEDURES

As a follow up of a previously completed procedures review, a detailed work sampling study of two clerical jobs in Central Maintenance was completed and a final report summarizing the procedural analysis was issued.

A systems study was completed of the clerical work activities associated with personnel records in the Financial and Relations Practices Operations. Some of the difficulties of the present methods were enumerated and recommendations were made to substantially improve the procedures used. In addition, personnel changes and rearrangements in office space occupancy were recommended to implement the suggested revisions.

Guidance was given to members of the new 100-N Area Operation in their study of the maintenance information system requirements being designed for the new reactor area. For this study integration of manufacturing needs are being made with cost and property accounting system requirements.

SH Small

Manager-Finance
IRRADIATION PROCESSING DEPARTMENT

SH Small:kd

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NPR PROJECT OPERATION

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PROCESS DESIGN

Research and Development

During this fiscal year, \$265,000 in R&D funds have been available to Process Design, \$215,000 from the normal Category II 2000 program and \$50,000 from supplementary NPR R&D sources. These funds have been used to finance general design studies having broader interest and application than just NPR. Main activity has been, (a) development of analytical methods for solution of reactor heat transfer, physics, and stress analysis problems, (b) test work yielding fundamental design information such as simulated process tube rupture tests, two-phase flow tests, etc., and (c) purchase of pre-prototype equipment for evaluation of applicability to general reactor design use as well as specifically to NPR design. The supplementary NPR funds assigned to Process Design have been used almost exclusively in this last category. It is also in this area that greatest difficulty is being encountered in keeping pace with program requirements within the limitations of available funds. Currently, it appears that this category may exceed original estimates by about 40 percent. An intensive effort is being made to keep these expenditures to a practical minimum as well as to review the assignment of funds to assure the correct balance of charges to project and R&D funds.

Project CAI-816

Work has proceeded on the integrated confinement venting system design for the 105 and 109-N buildings. The addendum to the confinement system criteria which calls for reduction in the number of 105-N steam vents from ten to two, provision of a cross vent in the common wall between 105 and 109 buildings, and provision for a back-up closure device on all Zone I confinement valves was approved by Project Representatives and Design Council.

Detailed attention was also given to the feasibility of routing the effluent from the primary loop dump valves directly to the 109 pipe gallery. This would achieve the required separation of potentially contaminated water from the flashed steam, which must be released to atmosphere, at minimum capital cost. However, it introduces certain operating problems, the solution of which must be studied in some detail before a final decision can be made.

Evaluation of vendor proposals for underwater irradiated fuel handling equipment was concluded. Addendum proposals submitted by the two most qualified vendors were reviewed and an engineering recommendation submitted to Kaiser Engineers. It appears, at this point, that functional requirements can be met; however, a concerted effort will have to be made to reduce capital cost to a more appropriate level.

Project CAI-816 (Continued)

The twenty-four engineering proposals which were received for the manufacture of diversion and inlet valves and drive mechanisms have been reviewed and evaluated. This included visits to certain vendors, as well as discussions with vendor representatives at this site. These conferences and the functional specifications which they supplement have served to completely describe our problem to the valve industry. Information has been obtained regarding feasibility of meeting functional requirements, general vendor qualifications, and cost of a prototype development program as well as the full production order. At this point it appears that there are a number of qualified vendors interested in developing functionally adequate designs at competitive prices. Our next step will be to initiate a prototype development program with selected vendors.

Initial bids for the "W", "C", "D", "F", "R", and "S" elevators were rejected as too high and a program was instituted to reduce cost to conform more closely to project objectives. Discussions were held with the three potential vendors who submitted the most acceptable proposals to develop information regarding methods of reducing costs. Discussions also were held among using interests to identify modifications in equipment capability which would be acceptable to operations. At month's end, revised specifications were being prepared which should provide minimum acceptable facilities at a substantial reduction in initial capital cost.

Another review of potential capital cost reductions was made by Operations' representatives during the month with a number of items being brought to light. An example is the deletion of the outer rod racks. Design study is now being given to these items with Project Representative consideration scheduled for those affecting project scope.

Reactor Plant Design over-all progress is currently reported as about 57.8 percent complete. Discussions were held with AEC and Kaiser Engineers to clarify responsibilities on bid package preparation and sub-contractor design information.

The latest A-E design progress schedule, dated April 16, 1960, indicates Title II work to be 47 percent complete. Scope progress is calculated to be 84 percent complete at month's end.

Representatives of R&E, Operations, and Process Design were again at the A-E offices during the month to facilitate scope progress as well as General Electric acceptance of detail design.

DEVELOPMENT AND TESTING

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

Progress, problems, direction of new work, and required dates for equipment development were reviewed in a meeting between Process Design and Equipment Development on April 1, 1960. General conclusions which could be reached at

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the end of the meeting include: (1) not many developments are currently in progress that are critical to early design decisions; (2) the expected first peak in development to support early design decisions has been passed and the second peaking has not started which is forecast for the evaluation of vendor prototypes and for support of ATP and startup problems; and (3) increased emphasis must be placed on encouraging process engineers to issue scheduled new design tests to Equipment Development.

Progress in instrument development during the last two years was reviewed and can be summarized as follows: Two years ago, development engineers knew the New Production Reactor requirements for critical instrumentation to measure flow, temperature, and flux and to pinpoint ruptures and had reservations as to whether materials and technology had advanced to the stage that components and systems could be obtained that had adequate life, were reliable, and could be procured and at reasonable cost. Today, these development engineers believe that components and systems for flow, temperature, flux, and rupture detection can be obtained that are suitable, reliable, and of reasonable cost and they have various components and systems in various stages of testing and evaluation. The ideas, concepts, and data of the development engineer currently are being transferred to specifications suitable for procurement.

Procurement of more than a thousand inlet butterfly valves and more than a thousand exit diversion valves in a prototype demonstration program progressed through (a) visits by a Kaiser Engineers - General Electric engineering-procurement team to four vendor plants during the week of April 3-9, 1960 and (b) interviews with seven other vendors at Hanford. Significant conclusions reached to date include: (1) acceptable inlet and outlet valves probably can be obtained in the required time within budgeted costs; (2) the prototype approach to procurement of critical items appears to be justified based on the quality of the proposals, the unique ideas suggested, and the elimination of numerous unqualified-but-interested vendors; (3) it has been necessary to emphasize to vendors that commercial valves in the high quality range are desired, not the high-cost, high-quality nuclear valves used at other installations; the cost impact was such that the review team immediately instituted a request for a vendor and a vendor-buyer cost reduction program; (4) verbal estimates for the prototype and production program varied widely (five to one for prototypes and for the production order) emphasizing the need for careful selection of participants; (5) to date only one vendor has estimated the prototype inlet and exit valve programs near the prototype budget; as a result, the number of vendors who may be authorized to participate in the prototype phase may have to be reduced; and (6) the various proposals contain various engineering risk factors that must be considered before awarding prototype contracts. Letters requesting written prices for the prototype and production orders are being drafted to those companies that have passed the engineering proposal-capability screening.

Five connector-to-nozzle joints were subjected to one month of thermal, bend, torsion cycling to qualify them for procurement action. The Marman and Futurecraft joints leaked during the cycling. Of the remaining three, Grayloc, Tube-Turns, and Gamah, the Grayloc joint is considered the best possessing plus features of added strength, ruggedness, ease of assembly, and minimized cavities for potential deposition of contamination.

Two years' development of process tube flow monitors was summarized in HW-64325, "Interim Status and Recommendation Report - Flow Monitor", by A. J. Lindsay, dated March 11, 1960. This report summarizes results of the testing and performance of a solid-state, electronic Daystrom-Barton-Luther prototype and recommends use of a solid-state, electronic flow monitor system for the New Production Reactor. Magnetic amplifier components were received and are being assembled into a Model NPR flow monitor limit circuit where performance can be evaluated. This is a locally conceived approach to the problem which makes use of solid-state and magnetic components of the same type and manufacture that have performed so well in existing zone temperature monitoring systems.

Samples of ceramic materials with various concentrations of samarium and gadolinium for potential use in the ball safety system have been received and their nuclear properties evaluated. Ceramic balls poisoned with samarium appear to be feasible for use in the New Production Reactor and can be obtained cheaper than boron-stainless steel balls, but specifications must await an evaluation of the total ball system control requirements.

A suitable system for containment coating of the Zone I confinement area of the New Production Reactor has been found which employs a 30-50 mil thick Thiokol caulk of an F2 or F3 concrete surface and which is topped with a 4-5 mil Hypalon coating.

A design of a horizontal control rod gas seal has been found which seals effectively at both 1/2 and 5 psi test pressures. Material specifications and design of the restraining systems are being prepared.

Development and testing were completed of an electrical solenoid suitable to actuate the trip mechanism for the New Production Reactor ball safety system. A non-standard solenoid with multiple windings and rated for continuous operation at 150 F was found in Model L-1920 of the GW Lisk Company.

Testing of the hydraulic drive for horizontal control rods continued. Minor modifications to the system have been made to improve operation which requires smooth slow action for control and rapid motion during scrams.

Recent observations include:

1. The drive system has capacity to insert the rod in the required time if energy is not lost in the control devices;
2. An accumulator in the inlet line at the cylinder did not change the acceleration appreciably;
3. Air pockets in the hydraulic system appear to be the major source of control problems for both slow and high speed operation;
4. The present high speed flow control valve can be made to work but it appears desirable to test other valves; and
5. A strong spring may be required in the upstream dump valve to aid in closing the valve after a high speed run.

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FIELD AND OPERATIONS ENGINEERINGConstruction

All seven walls in the 181-N pump house, east of the stop logs, were poured to a point 24 feet above the top of the base slab, that is, to elevation 384'-0".

The excavation for the 181 Building was inadvertently flooded with water on April 17. The water was approximately 21 feet deep on the morning of April 18, at which time work was started on pumping it out. This pumping was completed on April 28, 1960. However, backfill and new road construction activities permitted work to be resumed on the building April 25, 1960.

The George A. Grant Construction Company completed the septic tank and tile field for the area sanitary sewer system, and this facility has been placed in operation serving the temporary construction office buildings. This company also completed the sub-grade for the floor slab of the 1704 Building, and part of the slab was poured.

The excavation for 105-N and 109-N was approximately 80 per cent complete, and a few of the wall and column footings for the 105 Building were poured.

The casing for one of the hydraulic cylinders for the D elevator was driven to full depth but is too far out of plumb to meet the specification.

Graphite

Production machining of NPR graphite was initiated on April 7. Work has been confined to surfacing and end-milling of top and bottom reflector filler bars from the existing "K" inventory. In surfacing of this material, some difficulty was experienced due to badly warped raw blocks resulting in unmachined surfaces. However, it appears that enough material is on hand to complete the NPR requirements by the scheduled date of June 1.

The first shipment of 1206 4 x 5 reflector bars was received on April 22. Machining of this material is scheduled to start June 1, 1960, based on anticipated delivery and acceptance of the new notching machine by that time. Latest reports from Kaiser Engineers are that this schedule can be maintained.

Bids for the core graphite were received on April 25. These bids were reviewed from the technical and project standpoint and comments were returned to Purchasing. Placement of this order by early May is required to meet project schedules.

The 2101 mock-up pad was ground to acceptable tolerances with the exception of three or four isolated spots. However, these few spots are not significant and it is planned to tailor the bottom of the master graphite layer to eliminate any sharp discontinuities.

Design is 100 percent complete on pre-shop inspection stations and approximately 60 per cent complete on fabrication shop stations.

Zirconium

The bids for the production order of NPR process tubes and recommendation for award were submitted to the Atomic Energy Commission for approval April 1, 1960.

Vendors of pilot orders for the process tubes were contacted to firm up scheduled delivery of these orders. It appears that Allegheny-Ludlum and Harvey Aluminum should complete their pilot orders by September 1, 1960. Chase Brass believes they should not need to complete their order until November 15, which is the contract end date. Discussions are underway with Chase Brass to improve this schedule.

Tubes from Harvey Aluminum have been received and are now being ultrasonic tested. Ultrasonic and dye penetrant testing will be performed on these tubes as building modification work will permit.

Tube Shop building modification is continuing. Two autoclaves were received and are being installed. The building trusses to replace support columns in one end of the building were installed. The sprinkling system was approximately 90 per cent completed. The hot air dryer for the dye penetrant was completed.

Due to an emergency situation in an operating plant, two transformers, which are to be installed at the Tube Shop, were temporarily moved to 100-D Area.

Procurement

Following is the present status of procurement:

Reactor Plant

General Electric Originated - Kaiser Engineers Purchase (74 Requisitions - 41 Alterations)

53	Open Requisitions - Estimated Cost	\$7,053,145.00
13	Open Purchase Orders - Actual Cost	254,276.00
7	Completed Purchase Orders - Actual Cost	11,437.00
3	Cancelled Requisitions	--

(Includes \$6,620 Spare Parts)	\$7,318,858.00
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General Electric Originated - General Electric Purchase (5 Requisitions - Zirconium and Graphite)

3	Open Requisitions - Estimated Cost	\$9,795,000.00
5	Open Purchase Orders - Actual Cost	3,487,040.00

\$13,282,040.00

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Heat Dissipation Plant

Burns & Roe, Inc. Originated - Kaiser Engineers Purchase
(73 Requisitions - 99 Alterations)

48	Open Requisitions - Estimated Cost	\$18,614,100.00
15	Open Purchase Orders - Actual Cost	9,677,744.00
6	Cancelled Requisitions	--
4	Requisitions being held (lock sets)	--
		<u>\$28,291,844.00</u>

NPR Related

General Electric Originated - Kaiser Engineers Purchase
(5 Requisitions)

1	Open Requisition - Estimated Cost	\$17,500.00
1	Open Purchase Order - Actual Cost	33,160.00
3	Complete Purchase Orders - Actual Cost	55,475.00
		<u>\$106,135.00</u>

(Grand Total All Orders \$48,998,877.00
(Includes 21,911 Spare Parts)

Administration

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

Routine work processed this month: (April 3 through April 24, 196)

Drawings	503
Criteria	16
Specifications	47
Requisitions	74
ATP	1
Other	<u>73</u>
TOTAL:	714

Reviews were completed and formal comments were offered as follows on Engineering material during the month:

On Detail Drawings	194
On Scope Drawings	1
On Specifications	<u>30</u>
TOTAL:	225

Operational Planning .

A study was made of predicted essential material usage at 100-N during period from June 1, 1961, to January 1, 1964, to form a basis for agreements with Kaiser Engineers on amounts to be furnished and charged to the Project while under construction, and also to supply reasonable estimates for operational budgeting.

A summary of tool development; requirements for operation and maintenance was prepared and forwarded to Facilities Engineering for development planning and scheduling.

The "K" reactor reliability study is programmed and in calculation. Results have been promised by May 15. A report covering both the "N" and "K" studies will be prepared after this date.

The "K" reactor reliability study is programmed and in calculation. Results have been promised by May 15. A report covering both the "N" and "K" studies will be prepared after this date.

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	<u>2-11-60</u> <u>Estimate</u>	<u>4-15-60</u> <u>Estimate</u>	<u>Increase</u> <u>or</u> <u>Decrease</u>
Temporary Construction	1,573,700	1,573,700	0
General Area Facilities	9,465,400	9,562,100	+ 96,700
Administration Building	456,500	456,500	0
Attendant's Building & Gas Pump	5,500	5,500	0
105 Building	53,781,900	44,629,500	- 9,152,400 ⁽¹⁾
Water Treatment Plant	3,730,300	3,128,100	- 602,200
River Water Pump House	3,295,400	2,946,400	- 349,000
153 Switchgear Building	779,700	596,600	- 183,100
Standby Power House	4,852,900	4,272,500	- 580,400
109 Heat Exchanger Building	33,919,900	33,388,200	- 531,700
182 High-Lift Pump House	1,746,900	1,833,000	+ 86,100
Final Functional Testing	300,000	300,000	0
Misc. Equipment for Heat Dis. Plant	200,000	150,000	- 50,000
Spare Equipment	0	75,000	+ 75,000 ⁽²⁾
Zirconium Tubes	0	10,370,000	+10,370,000 ⁽¹⁾
Subtotal	114,108,100*	113,287,100**	- 821,000
Indirect Costs	23,142,000	23,142,000	0
GE (Engr. & Indirects)	8,830,000	8,830,000	0
B&R (Engr. & Indirects)	4,665,000	4,665,000	0
Kaiser Engineers Indirects	8,597,000	8,597,000	0
Kaiser Engineers Fee	1,050,000	1,050,000	0
Escalation	6,711,700	5,289,500	- 1,422,200
Contingency and Startup	5,708,000	3,281,400	- 2,426,600 ⁽³⁾
Total	149,669,800	145,000,000	- 4,669,800

* Includes \$9,177,600 for subcontractor's overhead, profit and bond.

** Includes \$9,523,300 for subcontractor's overhead, profit and bond, which is an increase of \$345,700 over the 2-11-60 estimate.

- (1) Removed purchase cost of zirconium process tubes (\$10,450,000) and entered as separate account at \$10,200,000. Removed purchase cost of zirconium graphite cooling tubes (\$170,000) and entered as separate account. Kaiser Engineers is showing this separately since zirconium is being purchased by GE and will not be transferred to Kaiser Engineers.
- (2) It has now been established that certain spare parts are to be classified as spare equipment and as such are to be capitalized. This has been estimated to cost \$75,000 for the 100-N plant.
- (3) Contingency and startup continues to be shown as a lump figure. (GE has submitted an estimate of \$800,000 for project startup.) Contingency was reduced this time to comply with AEC's direction that the over-all estimate total \$145,000,000.

Design Status

Reactor Plant as of 4-30-60

Title I

100 99.7

Scope

Title II

Drawings
Specifications
Requisitions*
ATP's
Development and Testing

70
8
8
4
10
100

57
68
12
7
69
51

59.2
43.0
13.1
.9
6.2
52.17

Total

*Requisition percentage completion
is now based on 400 engineering
requisitions.

Heat Dissipation Plant as of 4-30-60

Title I

100 84

Scope Criteria

Title II as of 4-16-60

47 47

Detail Design

Criteria
Preliminary Drawings (bid)
Detail Drawings (for const.)
Specifications (bid)
Requisitions
ATP's (no. being developed)

No.
Req'd
24
750
762
161
171
-

No. Issued to 4-16-60
Scheduled Actual
16
165
80
60
66
0
16
204
90
60
66
0

Certified
Schedule % Complete
55.6 55.2

Composite Design Completion
(Reactor and Heat Dissipation Combined)

Total

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Schedules

Kaiser Engineers issued a revised subcontractor schedule on April 22. No revisions have been made on over-all project schedule during this reporting period.

MANAGER
NPR PROJECT

JS McMahon:mf

SIGNIFICANT REPORTS ISSUED

HW-64676 HAPO Power Failure - H Reactor Plant, April 20, 1960, E. J. Filip and G. W. Wells, Secret.

HW-64564 Project CGI-791 - Reactor Confinement Filter Handling System, April 6, 1960, E. L. Shockey and C. E. Jones, Unclassified.

HW-64825 Partial Modification of 190-KW Pump No. 1, Project CGI-883, Increased Process Water Flow-100-K, April 18, 1960, M. H. Schack, Unclassified.

HW-63351 Increased Production Study B, D, DR, F, H, and C Reactors, April 18, 1960, N. F. Fifer and F. J. Kempf, Secret.

HW-64603 FY 1962 Plant Acquisition and Construction Budget Continuity of Operation - Reactors, April 25, 1960, L. B. Brinkman, N. F. Fifer, W. W. Porter, Secret.

HW-64158 Project CGI-791 Reactor Confinement Progress Review, March 3, 1960, H. W. Heacock, Unclassified.

Unclassified Operating Procedures for Zirconium Tube Trimmer and for Zirconium Tube Van Stone Spinning Tool, April 1, 1960, E. A. Wegener, Unclassified.

Unclassified Status Report - NPR Fitting Development Activity, April 7, 1960, J. H. Fastabend, Unclassified.

HWS-7541 - Specification for Portable Dose Integrator, February 26, 1960, A. N. Iverson.

HW-62892 Supplemental Authorization Production Test Authorization IP-279-AE, Sup. 2 Reactor Test of Van Stone Seal Insert for F Reactor, April 5, 1960, H. F. Jensen, Unclassified.

HW-64358 Zirconium Tube Van Stone Seal Test, March 17, 1960, E. A. Wegener, Unclassified.

HW-64422 Replacement of Presently Installed Flexowriter Equipment, R. Sherrard, March 31, 1960, Unclassified.

HW-64455 Interim Report No. 6 - Design Test 1024 - NPR Fuel Handling, Mattress Pad Development, C. W. Higby, March 25, 1960, Unclassified.

HW-64570 Interim Report - DT-1057, Moderator Coolant Flow Monitor, J. P. Thomas, March 31, 1960, Unclassified.

HAPO Plumber-Steamfitter Training Requirements, T. M. Clement, April 8, 1960.

HW-54558 184-F Low Pressure Steam Incident, April 4, 1960, M. P. Johnson, Unclassified.

IPD Five-Year Electric Power Forecast - Fiscal Years 1961 thru 1965, April 11, 1960, V. G. Blanchette.

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HW-64458 Water Plant Modifications for Increased Production at B, C, D, DR, F, and H Reactors, April 15, 1960, L. B. Brinkman and J. P. Corley, Secret.

HW-57016 REV1 105-N Design Criteria - Rod and Shield Cooling Water Supply Systems, March 31, 1960, G. E. Wade.

HW-57030 REV1 105-N Design Criteria - Moderator Cooling System, April 18, 1960, G. E. Wade.

HW-57036 ADDL RD2 105-N Design Criteria - Fission Product Confinement System, April 14, 1960, G. E. Wade.

HW-62150 RD2 NPR System Parameters, April 21, 1960, D. L. Condotta and D. E. Simpson.

HW-64388 Isotopic Concentrations vs. Power Level in the NPR, April 15, 1960, C. A. Mansius.

HW-64707 Orificing of NPR Process Tubes and Associated Flow Monitoring Criteria, April 12, 1960, D. L. Condotta.

HW-64801 Project CAI-816 - Reactor Plant Project Representatives - Minutes, Meeting No. 51, April 22, 1960, J. R. Carrell.

HW-64811 Proposal to Discharge Primary Loop Emergency Dump Effluent into the 109-N Piping Gallery, April 15, 1960, N. O. Strand.

HW-64838 NPR Project Section - Monthly Design Test & Development Program Status Report - CAI-816, March 31, 1960, W. J. Morris.

HW-64879 Operating Temperatures of NPR Fuel Element, April 27, 1960, D. D. Stepnewski.

HW-64930 A Discussion of NPR Graphite Overbore and Process Tube Temperature, April 28, 1960, F. J. Mollerus, Jr.

Unclassified Carbon Steel Primary Piping System for the New Hanford Reactor, H. R. Kosmata.

HW-64478 NPR Process Design Monthly Report - March, 1960, April 11, 1960, A. B. Carson.

HW-62858 REV1 Equations of State for Steam-Water Mixtures and Some Representative Applications Analysis, April 21, 1960, W. J. Love.

HW-64946 Two-Organization Operation of a Converted NPR Plant, April 29, 1960, W. J. Dows.

TRIPS

R. Nilson visited the University of Washington, Seattle, Wn., for the purpose of PhD recruiting, 4/6-10/60.

M. E. Jackson, E. J. Nesselson and W. A. Oldham visited the Atomic Power equipment Dept., San Jose, Calif., and the Vallecitos Atomic Laboratory, Pleasanton, Calif., to observe and participate in decontamination experiments, 4/10-15/60.

D. H. Curtiss visited Allegheny-Ludlum Steel, Watervliet, N.Y., Chase Brass & Copper, Waterbury, Conn., and Harvey Aluminum, Torrance, Calif., for consultation on NPR process tubes, 4/17-22/60.

O. H. Greager attended a meeting of the General Electric Reactor Safeguards Council in Chicago, Ill., 4/22-27/60.

R. Nilson visited Washington, D.C., to participate in PhD recruiting at the American Physical Society Meeting, 4/22-28/60.

R. E. Trumble attended meetings in Germantown, Md., to discuss fission product confinement technology with AEC and DuPont personnel, 4/25-27/60.

R. S. Bell and R. J. Bursey visited Evandale, Ohio, to interview technical personnel for possible placement in the Department. R. S. Bell also attended the SAM-ASME Cost Reduction Conference in New York City.

T. W. Hauff gave a talk on "Production Reactor Operations at Hanford" to the Portland, Oregon, Chapter of the National Association of Power Engineers.

E. R. Rudock visited Hartford, Connecticut on April 3 through April 7 to discuss the design of heat exchangers for Project CGI-839 with W. C. Beekley of the Whitlock Manufacturing Company.

E. R. Rudock visited Metuchen, New Jersey, to discuss the problems associated with the manufacture of ceramic sleeves with G. Howett of Goulton Industries, Inc.

E. L. Etheridge visited the University of California Radiation Laboratory, Livermore, California; Mare Island Naval Shipyard, Vallejo, California; Bell Telephone Company Office, San Mateo, California; and Sullivan's Warehouse, South San Francisco, California on April 21 and 22 to inspect the recent applications of the protective coating Tri-Flex which has been proposed as a substitute for Ply-On.

E. L. Etheridge and H. W. Heacock visited the Atomic Energy Commission headquarters, Germantown, Maryland on April 26 to discuss reactor confinement with representatives of the duPont Company and the Atomic Energy Commission.

M. H. Schack visited Phillipsburg, New Jersey on April 5 to inspect the facilities at the Ingersoll Rand Company for testing the experimental replacement pumps for Project CG-558.

C. E. Frantz visited Sunset Foundaries, Kent, Washington, April 12, 1960, to view and inspect the first castings of the body and parts for the Mark IV rear closure flap valve.

C. A. Munro attended "Design Short Course", April 3, 1960 through April 8, 1960, at Washington State University, Pullman, Washington. This course was conducted as a refresher in basic engineering subjects for engineers who had been working in industry for up to ten years from graduation.

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D. L. Hovorka visited Byron-Jackson Division of Borg-Warner Corporation in Los Angeles, California, on April 6 through April 8, 1960 to discuss delivery of spare pump for the NPR Prototype Concept Evaluation Loop in 189-D Building.

C. W. Higby traveled to Schenectady, New York, April 2 through April 10, 1960, in connection with his transfer to KAPL.

J. H. Fastabend traveled to Peterborough, Ontario, Canada on April 18 through April 21, 1960 to discuss the NPR fitting development program with AECL and view tube rolling techniques.

H. F. Jensen accompanied E. L. Etheridge of the Reactor Modification Design Sub-section on a trip in the San Francisco-Oakland area to observe applications of two candidate polyvinyl chloride coatings for use in CGI-791 on April 21 and 22, 1960.

W. R. Moon and R. S. Hammond visited Westinghouse, U. S. Army Signal Research and Development Laboratory, General Electric's Industrial Control plant and Lundell Corporation during the week of April 11 through 16, 1960.

G. A. Fox visited Phoenix, Arizona, April 10 through 14, 1960 to discuss methods and time standards with other G.E. personnel. Mr. Fox also attended the Company's Annual West Coast Department Methods and Time Standards Meeting.

R. D. Gilbert and B. C. Benedictson visited Puget Sound Naval Shipyard in Bremerton on April 11 through 13, to study operational and maintenance planning and scheduling practices for application of IPD planning and scheduling practices.

W. W. Walker attended the Joint ASME National Board Annual Meeting on Pressure Vessels in Denver, Colorado.

L. C. Cole and P. H. Hutton went to Seattle for the purpose of visiting departments utilizing magnetic tape recordings at Boeing Aircraft Company. Magnetic Tape Equipment vendors were also contacted concerning recording problems.

A. McDonald reviewed operating problems with the Chief Engineer at the Terry Turbine plant in Hartford, Connecticut. Mr. McDonald also visited the Atwood Morrill plant in Philadelphia, Pennsylvania, to discuss the feasibility of installing a solenoid trip mechanism on the 184 and 284 Power House Turbines.

H. A. Kramer visited Priest Rapids Dam four times during the month regarding debris problems and the installation of our river temperature reporting system.

R. T. Jaske and H. A. Kramer conducted A. R. Maguire and C. E. Harkins on a tour of Priest Rapids Dam.

A. McDonald visited the General Electric Company Service Shop in Seattle to conduct engineering technical tests and develop a course of action appropriate to restoration of the failed 4500 HP stator.

H. A. Kramer visited Portland, Oregon to attend a meeting of the Columbia Basin Forecast Committee and participate in the program.

J. P. Corley attended a special meeting and demonstration of corrosion measurements and cathodic protection in Portland, Oregon.

D. A. Hoover and D. E. Newby visited Commercial Steel Fabricators, Inc., of Seattle, Washington on April 7 and 8 to observe their progress on fabrication of filter frames..

W. Seeburger and D. A. Hoover visited Commercial Steel Fabricators, Inc., of Seattle, Washington on April 25 to perform a preliminary inspection of frames being manufactured by this company. Welding problems are still being encountered and the frame did not meet specified tolerances.

D. M. Diediker traveled to Hartford, Connecticut to consult with Whitlock Manufacturing Company regarding the final design of heat exchangers on order with that firm for Project CGI-839. While in the east he attended the International Nuclear Congress at New York City. Travel began on April 3, 1960.

F. J. Mollerus visited the General Electric Apparatus Sales office in Seattle, Washington, April 14 and 15, to discuss with J. R. Eliason the findings of the network analyzer study of K Plant 4160 volt bus made in Schenectady last February.

C. F. Quackenbush attended, as a member, a regular meeting of the Materials Task Force of the American Standards Association B31 Advisory Committee on Nuclear Piping, in New York, New York, J. A. Klapper, Chairman.

C. F. Quackenbush visited the U. S. New York Naval Shipyard Materials Annex Laboratory to discuss with J. Z. Lichtman the progress of cavitation research work for our job, Code 949 for Laboratory Project 4759-14, Part 1.

C. F. Quackenbush conferred with S. H. Weaver and Shelton Childs at the Cameron Pump Plant of the Ingersoll-Rand Company at Phillipsburg, New Jersey in connection with the testing of a 4500 HP, two stage, process water pump purchased on Order No. H9C-67796.

J. S. McMahon and A. B. Carson visited APED, San Jose, California, on April 18 - 20, 1960, to discuss the NPR engineering audit.

E. M. Kratz visited Beck and Associates, Seattle, Washington, to discuss their report on the feasibility of converting NPR on April 28 - 29, 1960.

M. H. Russ is presently visiting Burns and Roe, Inc., Hempstead, New York, to expedite design progress. Mr. Russ departed from HAPO on April 24 and is scheduled to return May 9, 1960.

D. Marinos visited the Acheson Plant of National Carbon Company on April 12-13, 1960, to observe the initial surfacing operation of the first shipment of reflector grade material.

H. S. Davis spent April 6 - 8, 1960, at Holmes and Narver, Inc., Los Angeles, California, to discuss structural audit of the 105-N confinement walls.

W. M. Harty and W. J. Morris visited the following companies on April 2 - 10, 1960 to discuss inlet and diversion valve proposals:

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Crane Company	-	Chicago, Illinois
Atwood-Morrill	-	Salem, Massachusetts
Mason-Neilan	-	Norwood, Massachusetts
WKM	-	Houston, Texas

R. C. Walker visited National Carbon Company, Niagara Falls, New York, April 12, 13, and 14, 1960 to inspect machining of NPR reflector graphite.

F. D. Collins visited Mount Rainier Ordnance Depot April 18 and 19, 1960 to obtain, on loan, a borescope for NPR process tube examination.

C. E. Love visited between the dates of April 11 and 22, 1960, Great Lakes Carbon Company, Allegheny-Ludlum Steel Corporation, Chase Brass and Copper Company, Harvey Aluminum Company, and Arrowsmith Tool Company in Connection with NPR graphite and zirconium program.

F. D. Collins visited the Arrowsmith Tool Company, Los Angeles, California, April 26 through 28, 1960 to witness run-in of the graphite notching machine being procured by Kaiser Engineers.

G. R. Hosack attended the American Welding Society Conference and Exhibit in Los Angeles, California, April 25, through April 28, 1960. He also visited Consolidated Western Division of U. S. Steel Company, Los Angeles, California, April 28, 1960.

F. C. Fisher visited the United Products Company in Tacoma, Washington, April 24 through April 26, 1960 and the Hughes Tool Company in Culver City, California, April 10 through April 12, 1960, to examine their capacity for fabrication of primary shield crates.

E. W. Wilson and A. C. Whiteside spent the period from April 25 through April 30, 1960 at Burns and Roe, Inc., in Hempstead, New York, as Heat Dissipation Plant Project Representatives engaged in design consultation and scope review and approval.

W. J. Dowis visited Washington, D. C., April 7 through 11, 1960, to assist W. E. Johnson in testimony before the Joint Committee on Atomic Energy, which was subsequently cancelled.

VISITORS

B. Wells, H. Chestnut and D. W. Leiby of General Electric, General Engineering Laboratory, Schenectady, N. Y., visited HAPO to discuss optimization methods, tour 105-DR and discuss NPR problems, 4/11-14/60.

P. Loewenstein of Nuclear Metals, Inc., Concord, Mass., visited HAPO to discuss the NPR fuel development program, 4/14-15/60.

B. O. Grable of Westinghouse Electric Corp., MTR Site Operation, Idaho Falls, Idaho, visited HAPO to discuss H-1 Loop equipment, 4/28-29/60.

W. H. Coleman, G. E. Manufacturing Services, visited HAPO April 8 and 9 to further discuss IPD participation in the Manufacturing Training Program.

Messrs. L. I. Kennedy and Charles Stewart of Gardner-Denver Company, Denver, Colorado, visited E. Hollister on March 22, 1960, in 108-D Building to examine the air motors on the prototype tube chopper which failed due to internal scoring and damage.

Messrs. Hugh C. Neal and William Barton of American Machine and Foundry Company, Greenwich, Connecticut, visited R. B. Willson in 108-D Building, April 8, 1960, to witness a demonstration of the cap remover mechanism prototype for which AMF is low bid vendor for the system.

Messrs. Watts and Gassius of the Gray Tool Company, Houston, Texas, visited the 189-D Mechanical Development Laboratory March 18, 1960, to witness and discuss testing of the "Graylock" joint for NPR evaluation.

Mr. E. F. Reiber, representing the Gamah Corporation, Los Angeles, California, visited the 189-D Mechanical Development Laboratory March 29, 1960, to witness and discuss testing of the Gamah joint for NPR evaluation.

Mr. W. A. Kates, president of W. A. Kates Company, visited J. W. Green on March 17, 1960, to discuss flow regulator prototypes for fuel rupture monitoring.

Messrs. C. Claridge and Dan Liddy of Stromberg-Carlson, Rochester, New York, visited R. Sherrard, A. J. Lindsay, and A. N. Iverson on April 11, 1960, to discuss flow and temperature monitoring for NPR.

M. R. Wood and R. R. Cone met with the Stromberg-Carlson representatives on April 13 and 14 to discuss the sub-critical, the intermediate level and period meter systems being proposed for NPR and CGI-806 projects respectively.

Mr. Ted Valentine, Sales Representative of the 3M Company of Seattle, Washington visited the 100 and 212-N Areas for an application of a test coating at 212-N Area.

On April 20, Mr. Frank Morris of Turco Products, Spokane, Washington, visited in the 100 Areas to become acquainted with the processes and procedures in decontaminating the reactor.

Dr. E. R. Tinney, Pullman, Washington, visited the plant on April 21 to consult on miscellaneous hydraulic and hydrological problems.

A. Pletanik and R. W. Stevens, from the Large Motor and Generator Department, inspected 4500 HP motor installations.

Mr. R. C. Nyberg and Mr. C. C. Sollitt of Addressograph, Yakima and Spokane, Washington, visited HAPO on March 24 to discuss possible application of Addressograph equipment for scheduling Productive Maintenance work.

R. E. Shanks, Automation Products, Spokane, Washington, visited HAPO March 24, 1960 to conduct classes on tubing and swagelock tubing fittings.

K. L. Wernsing and Paul Davis, Skookum Block Company, Portland, Oregon, visited HAPO on April 5 to conduct classes on hoisting blocks.

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Members of the NPR audit team from Atomic Power Equipment Department, San Jose, California, visited HAPO on the following dates. The purpose of these visits was to discuss initial plans for the NPR design audit.

G. D. Collins	April 13-15, 1960
P. E. Novak	April 13-15, 1960
J. F. Cage, Jr.	April 14-15, 1960
W. W. Kendall	April 14-15, 1960
A. E. Galson	April 14-15, 1960
R. A. Huggins	April 20-21, 1960

D. W. Leiby of the General Engineering Laboratory visited NPR Process Design on April 13 and 14 to present a review of the progress so far on the NPR Primary Loop System Analysis.

W. Kendall of Atomic Power Equipment Department, San Jose, California, visited W. D. Bainard on April 8, 1960, to discuss decontamination and water purity.

Representatives of the following companies visited Reactor Plant Design to discuss inlet and diversion valve proposals:

Security Valve
Chander Evans
Teleflex

Manning, Maxwell, & Moore
Garrett
Consolidated Controls

T. Way, Vice President, J. Hackett, Production Costs Manager, and M. Redmont, Technical Engineer of Speer Carbon Company visited the plant March 31 and April 1, 1960 to discuss NPR graphite.

R. J. O'Donnell and B. R. Tarraut of Ingersoll-Rand visited on April 22, 1960 and April 26, 1960 to discuss NPR primary process pump design.

J. Rainer of Bingham Pump Company visited on April 22, 1960 to discuss graphite coolant pumps.

Eustace Vynn, Cascade Distributors, Seattle, Washington, visited HAPO on April 14, 1960 to train an instructor in the use of gun-powder actuated hand tools.

Victor McCormick and Carl C. Irwin, Ingersoll-Rand Company, Portland, Oregon and Seattle, Washington, visited HAPO April 20 to conduct classes on air tool maintenance.

Ray Loesby, Vanton Pump, Seattle, Washington, visited HAPO April 22 to discuss Vanton pumps.

END

**DATE
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12 / 18 / 92