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IRRADIATION PROCESSING DEPARTMENT
MONTHLY RECORD REPORT

HW--62599

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OCTOBER, 1959

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RICHLAND, WASHINGTON

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IRRADIATION PROCESSING DEPARTMENT
MONTHLY RECORD REPORT
OCTOBER, 1959

SUMMARY

RESEARCH AND ENGINEERING OPERATION

Measurement of the eight columns of depleted uranium fuel elements which were discharged in September at about 1150 MWD per ton indicated there was greater distortion of the fuel than is normal in standard production.

Results have indicated that there is no significant difference in the relative dimensional stability during irradiation between fuel cores heat treated in carbonate salt and chloride salt.

Two failures of Zircaloy-2 jacketed fuel elements occurred during irradiation testing in the KER Loops. One apparently resulted from pitting corrosion on the inside of the inner tube of an enriched tube-and-tube element at an exposure of 310 MWD per ton; the other appeared as a longitudinal split in the jacket of an outside rod of an enriched seven-rod cluster element at an exposure of 2240 MWD per ton.

The IBM program for obtaining statistical analysis of the effects of fuel manufacturing tolerances on fuel design has been debugged and is in use.

A review of the technology of zirconium and design bases for NFR process tubes was completed and reported. Calculations indicate stresses for various positions in the process tube are within the design criteria.

Technical specifications for the NFR reflector graphite have been issued. Test samples irradiated in the MFR have been discharged and sent to HAPD; data obtained from examination and analysis of these samples will determine the schedule for discharge of those being irradiated in the GETR.

The bulk outlet temperature limit continued to be the most restrictive limit to power level at D Reactor; the power level limits at all other reactors were based on fuel element failure control.

A new method was devised for calculating total control requirements for the existing reactors which promises to resolve some of the problems which require a three dimensional approach.

MANUFACTURING OPERATION

Record reactor input production (0.7 per cent above the August, 1959 maximum) was 9.2 per cent above forecast; 8.1 per cent above at the six old reactors and 11.0 per cent above at the K Reactors. Forecast was exceeded due to high time operated efficiency and average power level. A new production record was achieved at C Reactor, exceeding their July, 1959 maximum by 14.3 per cent.

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The maximum established power level (combined total for all reactors) was increased 580 megawatts. Record power levels were increased 95 megawatts at H, 85 at KW, 80 at F, 60 at KE, and 20 at D Reactor.

Over-all time operated efficiency was 84.3 per cent (81 per cent forecast); 85.4 per cent at the six old reactors and 80.9 per cent at the K Reactors. Efficiency was high due to less time for maintenance and the correction of water leaks.

Six ruptures, five I and E regular metal and one I and E enriched, were removed from the reactors. The I and E regular metal ruptures were at C, D, DR, H and KW Reactors. The I and E enriched was at DR Reactor.

Significant items of equipment experience were:

1. Ninety-two process tubes were installed; 38 at B, 31 at F, 13 at DR, 5 at KW, 4 at H and 1 at KE Reactor.
2. Four process tube leaks and one Van Stone leak were corrected. Two tube leaks occurred at H, one at DR and one at KE. The Van Stone leak was at H.
3. At 190-C, No. 11-C process pump impeller was inspected; a piece of one vane was broken off and all vanes were cracked. No. 5-C impeller was also inspected and three vanes were found cracked.
4. At KW the No. 4 river pump at 181 Building was found to have a broken thrust nut shaft coupling allowing the impeller to ride the pump bowl. The No. 2 pump was found to be in the same condition. Both pumps were repaired and returned to service.
5. The fuel element was charged and the "Recirculating Gas Loop" at DR was placed in the No. 1 Safety Circuit on October 12.

FACILITIES ENGINEERING OPERATION

The downcomer model test program at Washington State University on the modifications proposed for 105-DR downcomer was completed.

A proposal for a model study program in support of the bulk water increased temperature studies was submitted by Washington State University.

Project CG-775 design scope was revised to propose the use of submersible river pumps.

Phase IIB design of Project CGI-791 is 100 per cent complete. Phase III exhaust fan modification requirements have been established.

A study has concluded that flywheels on the new KER pumps would not be justified at this time. The contract for the Architect-Engineer services on the detail design of the decontamination room addition to 1706-KER was awarded to Carson, Kesterson, and Moe.

First round of bids for 105-D Cap Remover were rejected; specifications were revised and submitted for rebid in an attempt to bring the project cost within available funds.

Stop-gap power rate-of-rise meters (CGI-806) were installed on D and DR Reactors and a partial installation of RTD cable was made on B Reactor.

In NPR work, the originally scheduled complement of Two Phase Critical Flow tests was completed.

Three competing prototypic fuel element shipping containers are being prepared for performance testing.

A proposed criteria for rear face pigtails has been formulated and circulated for comment.

Inspection of the 1904-H outfall structure indicated damage from uncontrolled expansion; recommendations for repair are being prepared.

The scope study for the B-C Effluent System Modifications was issued on October 20, 1959.

Examination of three CG-558 process water pumps which have operated approximately six months with FW-1417-2 impellers in modified cases, shows that cavitation damage is in excess of that acceptable on the outboard (thrust bearing) side of the impeller. The vendor has been contacted for consultation on further steps. Meanwhile, straightening vanes will be installed in the suction lines on all new installations.

A Byron-Jackson metallurgist inspected two of their 190-C pump impellers both of which had cracked at a fabrication weld connecting the vane with the shroud of the impeller. They are currently evaluating the situation. Final recommendations and report of findings have not been made. Steps are being taken to replace fabricated impellers at the earliest possible date.

RELATIONS PRACTICES OPERATION

Four PhD and three other candidates were interviewed and two offers made. Four acceptances were received this month. Six exempt people left the Department and ten transferred in. Two employees died during October. Forty-two new participants joined the Good Neighbor Fund. An AEC Security "Shield of Achievement" was presented to 100-K Area. Five security violations were investigated.

FINANCIAL OPERATION

The mid-year review of FY 1960 Equipment Not Included in Construction Projects was submitted to Contract Accounting. Estimated expenditures for the year are the same as the July forecast (\$1,693,000).

Contract Accounting was assisted in preparing a paper on Irradiation Processing Department Power Operation and HAPO electricity requirements for presentation at a meeting in Savannah River.

Two increases in base salary rates were effective during October. On October 1, 1959, bargaining unit base salaries were increased by 3.46 per cent. On October 26, the base salaries of all non-exempt employees except Business Training Recruits were increased by .59 per cent, due to an increase in the Bureau of Labor

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Allegheny-Ludlum's production of zirconium alloy process tubes has been halted by the steel strike. Harvey Aluminum and Chase Brass are proceeding with their pilot orders for this material.

A large volume of design review was accomplished, approximately 70 per cent over the rate of the previous month.

Operations organization and staffing planning continued with special attention to those items which bear on the union negotiations scheduled for 1960.

IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT OF INVENTIONS OR DISCOVERIES

OCTOBER, 1959

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, notebooks, records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

Name

Title

None

None


General Manager
IRRADIATION PROCESSING DEPARTMENT

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RESEARCH AND ENGINEERING OPERATION

OCTOBER 1959

VISITORS AND BUSINESS TRIPS

P. Loewenstein and H. F. Sawyer of Nuclear Metals, Inc., Cambridge, Mass., visited HAPO to discuss NPR fuel development contracts, 10/6-7/59.

R. C. Howard of General Atomic Division of General Dynamics Corp., San Diego, Calif., visited HAPO to observe the DR Gas Loop operation, 10/12/59. Mr. Howard accompanied by H. Hopkins of the same Company again observed the Loop on 10/20/59.

K. W. Newman of Turco Products, Inc., Los Angeles, Calif., discussed reactor decontamination, 10/14/59.

D. H. Curtiss visited Wolverine Tube Co., Detroit, Mich., Mallory-Sharon Metals Corp., Niles, O., Chase Brass & Copper Co., Waterbury, Conn., Bridgeport Brass Co., Bridgeport, Conn., and Superior Tube Co., Norristown, Pa., for zirconium tube consultations, 9/27-10/5/59.

S. S. Jones visited the Albrook Hydraulic Laboratory at the University of Washington, Pullman, Wn., to discuss the Downcomer Model Program, 10/1-2/59.

G. E. Zima visited International Nickel Co., New York, N.Y., Knolls Atomic Power Laboratory, Schenectady, N.Y., Westinghouse Electric Corp., Bettis Plant, Pittsburgh, Pa., and Battelle Memorial Institute, Columbus, O., for consultations regarding Inconel, 10/4-10/59.

W. R. Conley visited Burns & Roe Co., New York, N.Y., to review design material for the NPR project, 10/4-17/59.

J. F. Music recruited for PhD's in Austin and Houston, Texas, 10/5-13/59.

T. W. Evans attended the Company Symposium at General Electric, APED, San Jose, Calif., and discussed fuel and material programs at Vallecitos Atomic Laboratory, Pleasanton, Calif., 10/11-14/59.

D. H. Curtiss visited Seattle, Wn., to consult with Allegheny Ludlum Steel Corp. representatives about zirconium tube fabrication, 10/13-14/59.

W. R. Conley attended the Trustees' Meeting of the American Water Works Association, Portland, Ore., 10/23-24/59.

M. L. Smith visited Oak Ridge National Laboratory, Oak Ridge, Tenn., E. I. du Pont Co., Savannah River Plant, Aiken, S.C. and Westinghouse Electric Corp., Bettis Plant, Pittsburgh, Pa., to observe and discuss radiation protection problems, 10/24-11/1/59.

J. F. Music attended the Technical Symposium on Optimization and Process Control, General Electric Research Laboratory, Schenectady, N.Y., 10/27-31/59.

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VISITORS AND BUSINESS TRIPS - (Continued)

K. W. Norwood attended the Hydraulic Conference, Washington State University, Pullman, Wn., 10/29-30/59.

ORGANIZATION AND PERSONNEL

	<u>Permanent</u>		<u>Rotational</u>	
	<u>Sept.</u>	<u>Oct.</u>	<u>Sept.</u>	<u>Oct.</u>
Management & Administration	5	4	-	-
Process & Reactor Development	44	43	3	3
Process Technology	34	35	4	2
Operational Physics	19	18	7	7
Testing	69	69	2	5
	<u>171</u>	<u>169</u>	<u>16</u>	<u>17</u>

Management & Administration: W. C. McGee, Specialist, Reactor Data Analysis, resigned, 10/14/59.

Process & Reactor Development: R. E. Tiller, Technical Graduate, assigned from Rotational Training Program, 10/1/59. G. D. Joanou, Engineer I, resigned, 10/2/59. Colleen Neilan, Secretary, resigned, 10/2/59.

Process Technology: B. C. Cremer, Engineer II, assigned from Rotational Training Program, 10/1/59.

Operational Physics: A. R. Kosmata, Engineer II, assigned from Rotational Training Program, 10/1/59. R. L. Ferguson, Engineer II, transferred to Manufacturing, B-C Reactor, IPD, 10/1/59. G. R. Gallagher, Engineer II, resigned, 10/2/59.

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PROCESS AND REACTOR DEVELOPMENT SUBSECTION

Reactor Fuels

Present Reactor Technology

Depleted Uranium Fuel

Post-irradiation measurement of depleted uranium fuel elements from the eight columns discharged September 18 at about 1150 MWD/T (PT-IP-231-A) indicated greater fuel distortion than normally encountered in standard production. The mean warp value for the depleted pieces was 20 mils with a standard deviation of 12.6 mils; whereas normal ingot fuel irradiation to about 800 MWD/T has a mean warp of approximately 8 mils with a standard deviation of approximately 6 mils.

E-N Fuel Testing

The "striped" portion of PT-IP-255-A, "E-N Demonstration Test", HW-60340, was charged into H Reactor on 10-19-59. (The "blanket" portion was charged 9-13-59 as reported last month.) Initial data indicates that these columns are operating at very close to predicted tube powers relative to adjacent natural uranium. The striped portion is a 9:1, E (6") to N (4") piece ratio which was based on dry HTP measurements. Three columns will probably be discharged during January, 1960.

Top shield temperature data from 105-H indicates that a simple substitution of enriched mint for natural mint in the fringe blanket loading would reduce the shield temperature by about 15 ± 5 degrees.

Chloride Heat Treatment

Comparison of the relative dimensional stability during irradiation of fuel elements heat treated in rod form in carbonate salt and fuel heat treated in slug blank form in chloride salt indicates that the mean warp values are not significantly different. Analysis of end and center diameter changes is still being performed.

Advanced Reactor Fuels

Irradiation Testing

On September 30, 1959, a failure occurred in the charge of three enriched Zircaloy-2 jacketed tube-and-tube elements being irradiated in the KER Loop 3 under PT-IP-250-A. The elements had been irradiated for nineteen operating days and had reached an exposure of about 310 MWD/T. Examination of the elements showed that the failure occurred on the inside of an inner tube apparently as the result of pitting corrosion of the Zircaloy-2 jackets. Cause of the corrosion has not been definitely established.

A failure occurred in the enriched Zircaloy-2 jacketed seven-rod cluster elements being irradiated in the KER Loops under PT-IP-226-A on October 15, 1959. The elements had been in the reactor for 150 days and had reached an

exposure of 2240 MWD/T. The failed area appeared as a three-quarter inch long longitudinal split in the Zircaloy-2 jacket of an outside rod. Cause of the failure has not been determined.

The two enriched cluster elements irradiated in the 3674-KW front-to-rear test hole under PT-IP-237-A for subsequent controlled failure testing in the ETR were discharged September 20, 1959, at an exposure of 3600 MWD/T.

Off-site Efforts

The material produced at NMI is being formed into tube-tube elements for KER irradiations. The hot headed closure will be used. Nuclear Metals is assisting in this effort by doing the upset forming of the outer tubes and by supplying 20 to 30 short, headed sections for use in Hanford Laboratories in producing practice closures.

Investigation of the feasibility of brazed closures continues at NMI.

IBM Fuel Design Analysis

The IBM program for obtaining statistical analysis of the effects of fuel manufacturing tolerances on fuel design has been debugged and is in use. Each sample set of manufacturing tolerances results in a series of drag coefficients which are used in the fuel design program.

Reactor Physics

Present Reactor Technology

Conversion Ratio Test PT-IP-177-A

The 800 MWD/T metal from this test to determine in-pile conversion ratios of K III and O II fuel elements has been discharged from KW and H reactors; the 400 MWD/T discharge at H has been obtained and the 400 MWD/T material at KW is due for discharge on October 30.

Nuclear Safety and Control

A report reviewing the Hanford reactors' flux cycling problems has been completed. The conclusions reached were substantially: (a) flux cycling is not considered a nuclear safety problem and (b) flux cycling is not expected to be a major limiting factor at projected high reactor power levels.

The analog calculations of the speed of control requirements were completed this month. Results will be combined with those obtained previously and issued in a report now under preparation.

A document, HW-62226, "System Analysis of Proposed Dual Trip Panellit Pressure Monitor", was prepared and issued during this report period. The analysis indicates that there is an acceptable method of obtaining a dual trip panellit electrical safety circuit system. Modifications and additions to the existing K reactor panellit system are now under study.

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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	49	D	Variable		Semi-production scale testing of low hydrogen dingot uranium fuel, solid.
IP-84-A	Projection-Self-supported fuel in ribless aluminum tubes	13	B	900 MWD/T		Preliminary evaluation of self-supported fuel elements. Routine charging to continue until tubes are replaced.
IP-95-A	OIIN	5	D	Normal Goal		Provides for preliminary testing of I&E elements in D Reactor and for long term corrosion monitoring.
IP-168-A	CIIN	5	C	Variable 800		Long term corrosion monitoring and refinement of operating limits.
IP-171-A	Solid M388 & C64-F	4	B, DR, F	Variable 500	650	Provide for evaluation of alternate aluminum component vendors. Control columns are only ones carried special. Rest are lot charged.
	I&E M388 & C-64-F	6	D&H	Variable 800		
IP-178-A	KIIN & KIIN	6	KE, KW	Variable Normal Goal		Provides for irradiation testing of KIII elements, water mixers & long term tube corrosion monitoring.
IP-216-A	Normal Prod. Nat. OII, KII & KIII fuel elements	38	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-226-A	Zr-2 Jacketed 1.6% enriched 7-rod cluster elements	1	KE	5000	1000 MWD/T	Charged in KER Loop 1 on August 24, 1959. Elements in KER Loop 2 failed on Oct. 15, 1959, at an exposure of 2240 MWD/T.

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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-277-A	Enriched Uranium samples in aluminum capsules	6 3-test	D	1500	840,940 & 1100 MWD/T on three test columns	Test charged in 105-D on September 18, 1959.
IP-237-A	1.6% Enr. Zr-2 jacketed 7-rod cluster elements	1	KW	Elements discharged at 3600 MWD/T.		Charged April 24, 1959 to obtain exposure before failure testing in the ETR. Elements discharged September 30, 1959.
IP-243-A	Fuel elements clad in components extruded from cost blanks	0	H	Variable OIIE goal		Authorizes charging of six monitor columns and five tons per quarter of OIIE fuel clad in components impacted from cost rather than wrought blanks for rupture comparison with the normal production OIIE. Columns discharged at goal, awaiting examination.
IP-250-A	Three enriched Zr-2 jacketed tube-and-tube elements	1	KE	5000	Discharged at 310 MWD/T with failure	Elements charged in 3565 KE, KER Loop 3 on Sept. 7, 1959, and discharged Sept. 30, 1959 with failure.
IP-255-A	Solid Block Mint	10	H	2 years except for 3 columns scheduled for special Extrac-tion at approximately 3 mo.	1 month	Provides for long term irradiation of solid block mint for conversion ratio, and fuel performance determination.

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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-255-A (cont'd)	OIE	12	H	To be irradiated until first column reaches normal goal	165 MMD/T	Provides for E metal support of the above described Mint. Columns to be specially extracted to monitor conversion ratio.
	OIN	10	H	To be discharged with above E columns.		Provides for natural uranium columns as control for above E-N material.
	OII & I&E Black Mint	26	H	Six columns to negligible be irradiated to 800 MMD/T, rest rest till one rupture is sustained		Provides for irradiation of the "striped" portion of the load to determine conversion ratio data, physics parameters, and fuel performance.
IP-259-A	CIN	4	C	Variable CIN	100 MMD/T	Authorizes temperature distribution measurement in badly corroded C process tubes.

Advanced Reactor Physics

Results of experimental efforts to determine bucklings of tube in tube fuel geometries have been reported over the past few months. These data were assembled and three calculational methods were utilized to provide theoretical checks. All three are programmed for the IBM 709 and differ from each other only in minor details. The theoretical and experimental results were in good agreement at the lower lattice spacings of interest in NPR design. Deviations between theory and experiment appear at larger lattice spacings along with some divergences among the theoretical methods.

Reactor Engineering

Existing Reactor Technology

Bulk Outlet Temperature Investigations

Tests I and III of Production Test TP-278-A, "Verification of Transient Bulk Temperature Surges at D & DR Reactor", have been completed. Preliminary observations include:

- (a) No excessive strains or pressures were observed in the rear face piping or in downcomer.
- (b) The bulk outlet temperature surge when BPA power was tripped out with the reactor at half power was less than had been previously calculated on the basis of conservative assumptions.
- (c) The reactor safety system functioned properly following the BPA power trip-out.

Nuclear Safety

A document, HW-62471, "Preliminary Hazards Review Operational Charge-Discharge" was issued. It is concluded that the proposed operational charge-discharge can be designed and constructed so that its operational use will not increase the potential for the release of fission products from fuel elements in any significant way.

Graphite Measurements

Preliminary results from the measurements of graphite contraction in the older reactors have been obtained. These results indicate that the initial expansion damages suffered during the low temperature operation of past years has been annealed out almost completely. Since the beginning of 1958 the top center of the reactors (B, D, F) has been dropping at essentially a constant rate as a function of exposure. At present power levels the contraction rate is about 0.3 in./yr. At present the center tops of all three reactors are approximately $1\frac{1}{2}$ inches below the original layup level. Similar analysis is underway on data from C, DR and H reactors.

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Advanced Reactor Technology

NPR Process Tubes

A review of the technology of zirconium and the design bases for the process tubes for NPR has been carried out. Results are contained in HW-62435, "A Review of NPR Process Tube Design" (Secret), dated October 19, 1959, by O. E. Adams and D. H. Curtiss. Calculations of stresses for various positions in the process tube indicate that in all cases the stresses are within the design criteria.

Decontamination Procedures

Recommendations have been made in HW-62463 pertaining to decontamination procedures for the NPR. Decontamination methods have been developed which appear to be feasible now, although they are subject to change as development efforts continue. The procedure recommended is a three step process e.g., a solution of hydrogen peroxide - sodium bicarbonate - sodium carbonate as the first step, an alkaline permanganate solution as the second step, and an inhibited acid as the third step. The acids considered include dibasic ammonium citrate and ethylene-diamine-tetraacetic acid, or sodium bisulfate.

Graphite Irradiations

MTR: The irradiated graphite samples from the second L-48 modified shim rod have been shipped to Hanford for measurement. These samples are of Great Lakes graphite made of a proprietary needle coke. Samples of CSF graphite are included as reference material.

The twenty-one non-instrumented, hot capsules which were discharged from the MTR on September 21, have been shipped to Hanford. Direct comparison of the amount of contraction of samples of graphite made of three different needle cokes and of CSF and KC graphites as reference materials are being made. The quality of the data from these graphite samples will determine the schedule for discharge of the two test irradiation capsules in the GETR.

GETR: The two test capsules installed in GETR on September 2 are still under irradiation. Discharge schedules for these capsules are dependent upon the quality of the data obtained from the samples currently being examined from the MTR irradiations described above.

Graphite Specifications

Technical specifications for the top and bottom reflector graphite for NPR have been issued. Contraction properties of the graphite to be used in these locations are less important than for the core and side reflector material. Specifications have been written which are, however, approximately those expected for the core material including:

- (a) Needle coke as raw material.
- (b) Finer particle size of the coke than is used in most graphites.
- (c) Minimum graphitization temperature of 2800 C.

Radiological EngineeringRadiation Control Experience

The following table summarizes the first 40 weeks 1959 radiation exposure experienced for the critical IPD classifications:

<u>Classification</u>	<u>Total Dose</u>	<u>No. of Employ- ees</u>	<u>Average Dose/ Employee</u>	<u>Extrapo- lated Year End Average</u>	<u>No. of Employ- ees Over 3r Extrapolated Exposure</u>
Radiation Monitors	123673 mr	80	1546 mr	2008 mr	1
Processing Operators	317012 mr	252	1258 mr	1634 mr	0
Pipefitters	140632 mr	97	1450 mr	1883 mr	1
Millwrights	102156 mr	78	1310 mr	1701 mr	0

A localized technical overexposure which could have involved a dose as high as 18 rads to the chin of a DR Processing Operator, occurred during the month. A spot of contamination giving a corrected dose rate of 5 rads/hr was found on the chin of the operator after a 3- $\frac{1}{2}$ hour stay in the DR discharge area. It was not known when the contamination occurred.

Lapse of Radiation Control are summarized below:

Lapse of Radiation Control
Distributed by Reactor and Component

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>IPD Totals</u>
Processing	6	0	0	1	0	1	0	0	8
Maintenance	0	1	0	1	1	4	0	1	8
Supplemental Crews	0	0	0	0	0	0	0	0	0
Research & Engineering	0	0	0	1	0	0	0	1	2
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	0	0	0	0	0	0
Assigned Totals	6	1	0	3	1	5	0	2	18
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 charged to more than one component.

Average Reactor Effluent Activity Output

	<u>October, 1959</u>	<u>September, 1959</u>	<u>October, 1958</u>
107-B	24,000 uc/sec.	28,000 uc/sec.	21,000 uc/sec.
107-C	32,000 "	22,000 "	29,000 "
107-KW	41,000 "	51,000 "	76,000 "
107-KE	27,000 "	36,000 "	52,000 "
107-D	35,000 "	21,000 "	29,000 "
107-DR	18,000 "	15,000 "	10,000 "
107-H	17,000 "	20,000 "	21,000 "
107-F	27,000 "	18,000 "	24,000 "
Total	221,000 uc/sec.	211,000 uc/sec.	262,000 uc/sec.

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Effluent Water Monitoring

A scintillation detector with a 10mm sodium iodide crystal appears to be a good candidate for a device to monitor the effluent stream for control of fission product entering the river. The instrument measures the increase of neptunium²³⁹ resulting from fission product release from ruptured slugs. It should be possible to calibrate the instrument so that a signal is given when the fission product concentration approaches the limit for direct release to the river, upon which signal the stream may be diverted to a crib.

Rupture Detection

The use of Dow X50 cation resin for processing effluent water header samples for positive verification of slug ruptures looks promising. The resin removes the common metal isotopes from effluent samples, leaving iodine and bromine in the filtrate. The filtrate can be counted with a channel analyzer and the iodine isotope identified and compared to a control sample.

Liquid Waste Disposal

Examination of the data obtained from the experimental additions of arsenic to two 105-KE process tubes last month was started in an attempt to learn something concerning the mechanisms of As⁷⁵ absorption and As⁷⁶ release. The data examined so far indicates that at least three mechanisms are operating which appear to be first order reactions with half times of about 40 minutes, 40 hours and two weeks.

Reactor Gas Analysis

An energy spectrum analysis of the gamma radiation emitting from reactor gas was performed. Based on simple channel pulse height analysis, it appears that approximately nine-tenths of the gamma emitted is below an energy of 0.3 MEV. A more complete analysis will be made when lower purity gas is available.

PROCESS TECHNOLOGY OPERATIONREACTOR POWER LEVEL LIMITATIONS

The limits to all reactor power levels at the end of the report period except at D Reactor were based on fuel element failure control at the goal exposure currently in effect. At D Reactor the bulk outlet temperature limit was the most restricting limit.

PROCESS STANDARDSHW-46000 B, Process Standards - Reactor

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

Process Standard A-050 - "Panellit System Control"

A considerable decrease in Panellit pressure is experienced on tubes containing non-fissionable slugs when a solids purge is performed. Frequently the pressure change is sufficient to cause a scram. The revision authorized temporary by-pass of gauges on these tubes for the purge, provided substitute monitoring requirements were met.

HW-46000 D, Process Standards - Reactor

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

Process Standard F-011 - "Process Material"

The revision specifies a new water mixing spool for use with "O" size slugs. Use of a water mixing spool reduces slug and tube corrosion, and enhances the I & E slug potential.

Process Standard C-130 - "Total Control Criterion"

The new Standard prescribes the Total Control Criterion within which the reactor shall be operated. Methods of calculating the necessary reactivity control are specified. Recent plant modification, and major loading changes have changed operating conditions to the extent that constant attention to the Total Control Criterion has become necessary.

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

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

Process Standard F-011 - "Process Material"

The revision is identical to that issued for HW-46000 D, above.

HW-46000 K, Process Standards - Reactor

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

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Process Standard C-130 - "Total Control Criterion"

The Standard is identical to that issued for HW-46000 D, above.

HW-41000, Process Equipment Standards

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

Process Equipment Standard A-010 - "Modification of Critical Reactor Components"

The Standard was re-written to provide more explicit provisions and to outline accepted methods of modifying critical reactor components.

For purposes of administering the Standard, a "Critical Reactor Component" was defined.

PROCESS CHANGE AUTHORIZATIONS

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

PCA #9-121 - "KER Loops 2, 3, and 4, KE Reactor"

Some relaxation of operating conditions were permitted by the PCA for KER Loops 2, 3, and 4, following installation of stronger tubes.

PCA #9-122 - "Hot Startup With Failed Rear Pigtail, B, D, DR, F, and H Reactors"

The Process Change Authorization allows hot startup from a scram caused by a failed rear pigtail provided Panellit gauge minimum low trip pressure and minimum tube power requirements of Process Standards can be met following recovery from a scram.

PCA #9-123 - "TOA Corrosion Limits - KE Reactor"

The TOA corrosion limit was established to reduce the potential for sustaining large numbers of corrosion induced ruptured slugs. Recent studies have indicated that the limit can be made less restrictive. A conservative increase in the TOA corrosion limit of 5°C on a maximum of 25 tubes was authorized for KE Reactor.

PCA #9-124 - "Horizontal Bowing Measurements - D Reactor"

An extension of the time for making horizontal bowing measurements at D Reactor was authorized. The data were not obtained within the schedule prescribed by Standards because of equipment malfunction.

PCA #9-125 - "Trip-Out Tests Required by Process Standards - All Reactors"

A trip-out test is required by Process Standards when a major change is made

to the pumping system or in the reactor's flow characteristics. The PCA defined "major change," established a method for determining when the tests are required, and authorized an extension of time for scheduling and performing the test at the reactor areas where necessary.

PCA #9-126 - "Panellit Coordinate Trip Identification System - K Reactors"

The Panellit Coordinate Trip Identification system at the K Reactors was deactivated in February when it was discovered that because of this circuitry, sections of the Panellit system could be inadvertently by-passed by a particular sequence of operation. Since many unnecessary scrams have been caused by faulty Panellit gauges, it was desired to utilize the coordinate system for identifying the offending gauge. A temporary procedural method for avoiding inadvertent by-pass was authorized by the PCA to permit use of the coordinate system until a permanent revision could be designed and installed.

PCA #9-127 - "Graphite Thermocouple Stringers - C Reactor"

The Process Change Authorization allowed a delay in the installation of the two graphite thermocouple stringers at C Reactor required by Process Standards, to permit procurement of Geminol wire for the thermocouples. Geminol wire couples are reported to have a longer useful life under current reactor conditions.

PCA #9-128 - "Gas Composition - D Reactor"

The September 21 gas analysis for D Reactor indicated 11.3 per cent nitrogen and 0.17 per cent oxygen. Subsequent analyses revealed an oxygen content less than 0.01 per cent, and a nitrogen content that was steadily decreasing. A decrease in the sampling frequency was authorized provided a continuous analysis for oxygen showed no increase.

PCA #9-129 - "TOA Corrosion Limit - KW Reactor"

The TOA corrosion limit was established to reduce the potential for sustaining large numbers of corrosion induced ruptured slugs. Recent studies have indicated that the limit can be made less restrictive. A conservative increase in the TOA corrosion limit of 5°C on a maximum of 25 tubes was authorized for KW Reactor.

PCA #9-130 - "Temperature Monitor Failure - KE Reactor"

The bottom half of the temperature monitoring equipment went out of service at KE Reactor. An extension of the one-hour period the Process Standards allows the monitor to be out of service for repairs was permitted by the PCA, provided the outlet water temperature of representative tubes was monitored on a continuing basis with other equipment.

PCA #9-131 - "Graphite Temperature - C Reactor"

A slight over-run of graphite temperature limits was experienced at C Reactor. Authorization for continued operation with a maximum deviation from the limit

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of 20°C was given, provided a program for reducing graphite temperature within limits was followed.

PCA #9-132 - "Critical Pressure, No. 5 Double Orifice Zone - D Reactor"

During a re-orificing program at D Reactor, the No. 5 double orifice zone was re-orificed. The secondary orifice was inadvertently installed in a reversed position. The resulting low trip Panellit pressures on 16 of the gauges associated with the No. 5 zone were found to be lower than specified by Process Standards. The PCA authorized operation with the off-Standard orifices provided certain requirements necessary to meet the low trip specifications were met.

PCA #9-133 - "Automatic Scram Feature of the Temperature Monitor - K Reactors"

Because of the number of spurious scrams caused by this equipment, the PCA permitted removal of the temperature monitor scram feature from the #1 safety circuit, provided specified alternate conditions were observed.

PCA #9-134 - "Thermal Shield Cooling, K Reactors"

The PCA authorized a decrease in the lower temperature limit for the bottom steel membrane at the K Reactors and a minor increase in the thermal shield temperature limit. The range of temperatures defined by these limits controls the thermal gradient through the concrete pad. Modification of the limits by the PCA will not significantly affect the thermal gradient through the pad, but will compensate for inlet temperature variations of the cooling water.

PCA #9-135 - "Water Leak - DR Reactor"

Continued operation was authorized at DR Reactor, under specified conditions, when condensate collection exceeded the rate permitted by Standards. This permitted efficient scheduling of manpower to locate and repair the apparent leak.

PCA #9-136 - "By-Pass of Panellit Gauge on Tubes Containing Non-Fissionable Material During a Solids Purge - C Reactor"

During a solids purge, the drop in Panellit pressure on tubes charged with non-fissionable material may be larger than the trip range of the gauge. Because the magnitude of the change is not predictable, the potential for an unnecessary scram is great. The PCA permitted by-passing the Panellit gauge on tubes containing non-fissionable material during a solids purge, provided the gauges were continuously monitored and the reactor manually scrambled immediately upon indication of flow loss to the tube.

PROCESS ASSISTANCE

Auditing

One engineer audited conformance to Process Standards on all Processing Operation's shifts making about 12 inspections at each reactor during the report period.

Graphics

Graphics services prepared 25 charts, graphs, and visual aids for various IPD and HLO components.

RUPTURE EXPERIENCE

<u>Failure Date</u>	<u>Tube No.</u>	<u>Lot No.</u>	<u>Type of Metal</u>	<u>Exposure</u>	<u>Type of Failure</u>
10/5/59	4078-KW	KR-067-D	8" I&E Natural	395	Unknown
10/10/59	3678-D	KL-214-D	8" I&E Natural	736	Unclassified
10/12/59	2166-C	KJ-147-D	8" I&E Natural	430	Side Hot Spot
10/12/59	1371-DR	KL-198-D	8" I&E Natural	870	Side-Other
10/15/59	2864-KF(1)	PT-226-A	13" Cluster Enriched(2)	2084	Uncl.(4)
10/18/59	1581-H	KL-217-D	8" I&E Natural	465	Side-Other
10/27/59	4080-DR	KH-092-C	6" I&E Enriched(3)	100	Uncl.(5)

- (1) KER Loop #2
 (2) Seven rod cluster, zircaloy 2 clad, 1.6 per cent U-235
 (3) 0.94 per cent U-235
 (4) Probably due to splitting of the cladding.
 (5) Failed piece probably damaged during charging.

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.

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

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

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OPERATIONAL PHYSICS OPERATION

PILE PHYSICS ASSISTANCE

Flattening efficiency as measured by average equilibrium ECT's was maintained at 76.5 per cent of all reactor tubes, equal to that attained in September. The continued trend of higher power levels, longer operating periods, and larger discharges increases the reactivity range to be compensated through use of rods, flexible poison, and enrichment. Improved analytical techniques for determining total and local hot reactivity dependence and continued efficient use of POCF during operation have aided at the older reactors, and efficient operational use of splines has been the primary contributing factor at the K Reactors in maintaining high flattening efficiency.

Subcritical monitoring was installed at DR Reactor during the month by project forces; B, F, and H have already been equipped with the Subcritical Monitor.

SUMMARY OF OPERATING DATA OF PHYSICS INTEREST
FOR THE MONTH OF OCTOBER, 1959

	B	C	D	DR	F	H	KE	KW
ECT in Oct. (1)	1410	1630	1470	1520	1470	1615	2475	2500
12 Mo. Avg. ECT	1440	1630	1470	1490	1438	1585	2410	2470
Equil. Scram Time (2)	16-19	12-14	18-20	24-43	16-20	15-20	18-24*	18-24*
No. of Scrams and Recoveries (3)	4/4	0/0	1/1	0/0	0/0	0/0	1/1	1/1**
No. of Non-Scram Outages (4)	3/0	1/0	1/1	1/0	2/0	3/0	2/1	2/1
Report Period--From:	9/25	9/24	9/26	9/25	9/25	9/26	9/24	9/23
To:	10/23	10/23	10/26	10/23	10/26	10/26	10/26	10/24

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

** Rupture indications forced a shutdown immediately following startup.

- (1) Effective Central Tubes; this value is defined as the pile power divided by the average of the ten most productive non-enrichment tubes in the pile.
- (2) This is defined as the maximum time available in minutes between scram and the 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 - W. R. SMIT

The second subcritical monitor channel was installed; both channels were in use for all startups. The zone temperature monitor was repaired and in serviceable condition; training and encouragement will be required to alert operators to its potential usefulness.

Operating continuity was interrupted by one scheduled outage, one unscheduled outage, and six short outages (about one hour or less down of which three were due to Panellit trips during a cold startup). The lower than normal ECT efficiency was the result of a large central zone discharge which reduced the reactivity available for flattening.

C REACTOR - R. A. CHITWOOD

Except for one outage caused by an I & E fuel element rupture, operation was continuous during the report period. Despite reactivity uncertainties flattening efficiency was maintained at the normal level following the final discharge of the E-D load.

The #1 Galvanometer failed during the startup of 10-14-59, but cautious observance of other instrumentation permitted safe operation; the instrument has since been repaired.

D REACTOR - W. L. STIEDE

Added enrichment to offset the reactivity losses accompanying a large fringe discharge was the primary factor in maintaining the flattening efficiency up to normal. Flattening efficiency was 3.5 per cent lower following a similar discharge during the summer when the enrichment density was not increased. Operating continuity was interrupted by only one unscheduled outage caused by a rupture. Low reactivity following a P-push startup was sufficiently compensated by discharge of four ball-valve columns to permit recovery.

Spline usage was below normal due to the reactivity shortage which followed the last shutdown. However, the lower reactivity and improved techniques effectively reduced non-equilibrium losses following startups.

Instrument sensitivities remained good, the subcritical monitor giving excellent service.

DR REACTOR - D. I. MONNIE

DR Reactor was shut down for a scheduled outage only during the report period.

A large fuel discharge resulted in the lowest residual exposure and reactivity condition since the I & E metal was initially loaded. As a result the inventory of enriched material reached a new high of 92 tubes for radial enrichment and eleven for central spike.

Front-to-rear flux traverses showed about an eight per cent flux peak near the enrichment ring. Possible methods for reducing the peak include changing equilibrium rod configuration and altering the relative positions in the charge of enriched and natural uranium fuel elements.

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DR REACTOR (Continued)

Since mixer slugs were to be charged soon plans for operating with them were initiated; a reactivity reduction of about 30 inhours will result.

F REACTOR - G. F. BAILEY

Operating continuity at F Reactor was interrupted by only two outages: one each at the beginning and end of the report period.

Large fuel discharges reduced residual exposure to the lowest since the charging of I & E metal. Enrichment was added and B metal was charged in PCCF tubes during an outage near the end of the report period to maintain flattening efficiency during the low reactivity period and in support of F Reactor's power increases as the lead reactor for following the "optimization" schedule. Inadvertent flooding of the lower near corner of the reactor lattice with water during this outage delayed attaining equilibrium operation. The water was being slowly removed by low level operation at month's end.

H REACTOR - A. R. KOSMATA

Four shutdowns (one scheduled and three unscheduled) plus one scram, limited operating continuity during the report period. The frequent shutdowns and subsequent discharges lowered residual exposures; a reduced amount of control rod available at equilibrium resulted. However, the flattening efficiency was maintained about two per cent over the previous 12-month average.

One of the subcritical monitors was installed and was used successfully on two startups.

KE REACTOR - F. C. FRANKLIN

Operation was continuous except for two outages caused by high process activity in KER loops. One Panellit scram interrupted operation at startup.

Use of only ten splines for startup control reduced non-equilibrium losses about twenty per cent. Sliding splines in and out of the pile in five to ten foot increments proved effective in damping front-to-rear cycles.

Flattening efficiency continued to be high both due to increased use of poison splines and minimum cycling potential (resulting from low plutonium residual). However, the efficiency decreased slightly at the higher exposures near the end of the report period.

KW REACTOR - A. D. VAUGHN

Operation was continuous except for one scheduled outage and a one-hour shutdown just following a startup to remove a suspected fuel element rupture.

A new high power level was attained, partly because of increased limits and partly because ECT remained high through spline usage and low residual exposure.

KW REACTOR (Continued)

The newly installed traveling wire flux monitor data showed central flux in the longitudinal direction about 18 per cent above a "chopped" cosine curve. This peaking magnitude is due to the use of the outboard rods for flux distributional stability combined with the effects of enrichment columns, and had been observed from previous flux traverses.

PROCESS PHYSICS STUDIES

Safety Control Studies

A new method has been devised for calculating total control requirements for the existing reactors which promises to resolve some of the problems which require a three-dimensional approach. The method actually involves a unique manner of viewing the pile geometry. By eliminating a central region whose buckling is negative with control inserted and placing the two outside positive buckled regions together, the controls which remain and the remaining pile itself may be treated as a vertical cylinder; the top and bottom enrichment effects may be realistically approximated by assuming the cylinder is infinite in the vertical direction. The remaining two dimensions may be calculated by Bessel functions with the simplicity of a one-dimension calculation. The method should give conservative results, yet initial calculations indicate that some relaxation of total control requirements may be permitted by this method.

A preliminary investigation indicates that it should be possible to provide limit switches at a partial insertion point for half-rods without hampering their normal operability. Half-rods will contribute more to total control capacity in the dry xenon-free pile if their "black" section covers the more highly enriched near side.

A survey study for Process and Reactor Development indicates that control system geometry is a much more important factor in total control than ball blackness in the present reactor loadings and in the existing range of boron content.

Calculations were performed for Process and Reactor Development on effects of overboring on local control strength. The different migration areas due to larger fuel channel geometry would cause a decrease in local control strength; this effect may be balanced, in part at least, by reduced control requirements in the overbored loadings.

Control Efficiency Studies

Spline performance was quite successful for flattening at the K's and for partial startup use at D and KE during the month. Removal experience was also good but there was some insertion trouble at D. KW Reactor had another long operating period in October which was aided considerably by splines. The plant order of splines began to arrive just in time to augment the dwindling prototype supply of solid splines.

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Control Efficiency Studies (Continued)

Beneficial use of the displacement column prototype system has been delayed because of winch binding troubles in out-of-pile tests.

HW-61934, "Semi-Annual Summary Report of Pile Potential Gains and Operating Efficiencies Through June, 1959," was issued during the month. Routine data processing factor evaluations have been initiated for equilibrium potential gains in place of the semi-empirical temperature map comparisons previously used.

A rough draft production test on the "unit discharge" scheme was circulated for comment at DR, H, and KE. DR Processing has indicated the intent to try this method at their next heavy phase of the discharge cycle.

Calculations in support of supplementary control studies indicate that absolute startup losses at the levels experienced three years from now will be more than double those at the present time, assuming present initial recovery levels and rates of ascension to equilibrium.

Shielding Studies

One of the two plugged tubes in the H pile bottom thermal shield has been returned to service after it was cleared by drilling and had been pressure tested. The other tube, in line with column 70, will have a thermocouple train installed for dry readings before it is placed back in service.

Residue removed from the thermal shield cooling tubes has been chemically analyzed and found to consist largely of calcium carbonate. It is hoped that chemical flushing methods may be devised which will prevent the blocking of other thermal shield tubes.

The regular mint charges in the ten central tubes of Row 46 in H reactor have been replaced by "black mint." At the same time natural uranium in layer 45 was replaced by E metal. The resultant observation of no change in top shield temperatures from this double changeover would indicate that the blacker mint would by itself lower maximum shield temperatures 10 to 15 degrees C.

TESTING OPERATION

IRRADIATION TESTING

KAPL-120 Loop

The empty in-pile loop was on recirculation cooling for 15 days and on process water cooling for the remainder of this report period.

The clean-up of the magnesium oxide in the loop was completed. The final water analysis showed a magnesium concentration of less than 0.05 ppm. WAPD had requested that the final concentration be less than 0.1 ppm.

Repair of the three-inch check valves has been completed. The drawings on the circular flow tubes, rectangular flow tube, and tee section have been revised and up-to-date copies sent to WAPD. Review of the remaining mechanical drawings is 25 per cent complete. A review of the electrical drawings is underway.

A series of Hanford test reactor irradiations is in progress to determine the probable heat generation rates of the PWR plates which are to be charged into the KAPL loop as part of the 120-8 B experiment.

Flow decay tests on the KAPL loop were performed, the data analyzed and graphs prepared and distributed to interested HAPD and WAPD personnel. The data show that the time for the flow to decay to zero when power to the canned-rotor pumps is interrupted, is approximately one second.

DR Gas Loop

Construction work on the loop was completed with the acceptance of the emergency gas storage tanks. Project completion papers are being processed.

Repairs were completed to the standby helium compressor and it is now ready for test runs.

The first test element was charged into the loop on October 13, 1959, under the provisions of Production Test IP-265-D, "Irradiation of MGCR-II Test Fuel Element, Supplement A," HW-61122, September 28, 1959 (Secret), by R. E. Baars. Irradiations of the element began on October 16 under low temperature conditions and without preheating of the coolant gas. Operation was satisfactory, with the exception of several inconsistencies in the element thermocouple temperatures. The test element power generation averages about 8.5 KW, or about 75 per cent of the expected power operation rate. On October 20, gas preheat was added and coolant flow reduced to raise the element surface temperature to 1500 F. Due to excessive O₂ in the coolant, the temperature was reduced after about one hour and the element is being held at 1250 F surface temperature until O₂-CO₂ reaction rates can be evaluated. One test element thermocouple failed on October 24, leaving a total of nine operable thermocouples.

Two equipment failures have occurred since the start of the test. The drive couplings on No. 2 loop Pulsafeeder failed as a result of excessive wear on

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the drive shaft key and keyway. The couplings were repaired temporarily with oversize keys, pending the arrival of new shafts. The coolant gas heater failed because of two shorted rectifier diodes. The diodes were replaced and the heater returned to service. No reason for the diode failure has been determined.

Mr. R. C. Howard and Mr. Harvey Hopkins of General Atomic Division of General Dynamics Corporation, San Diego, California, visited the loop on October 20, to observe the initial operation of the loop and fuel element at full test conditions.

Other Irradiation Tests and Services

1. Gamma Facility

The dose rate in the gamma irradiation facility utilizing well-aged, spent fuel elements as gamma sources was determined to be 5240 r/hr. Ceric-sulfate chemical dosimeters were used in this determination.

2. Zircaloy Activity

A Zircaloy-2 sample has been discharged from the F Quickie Facility after a one-month irradiation. The initial decay half-life (25 hours) was approximately that of Zr 97 (17 hours). Attenuation data through lead plates indicated the gamma energy to be 1 Mev which also corresponds to Zr 97. Two more samples are undergoing longer irradiations and more detailed data will be obtained.

3. Discharge Area Neutron Flux

A lucite dosage integrator was irradiated in an access port of the discharge area wall of the F Reactor to determine the neutron flux. The radioactivity of the foils is being determined.

4. Test Hole Flux

The radioactive decay of the gold and sulfur foils irradiated in the KW snout facility is being determined. These samples were irradiated to determine the flux spectrum in this facility.

Borescoping Activities

HCR channel No. 2 in DR Reactor was inspected to determine whether or not an obstruction in the channel was causing No. 2 HCR to stick. The channel was in good condition, and the malfunction of the rod resulted from misalignment in the step-plug.

Several process channels in B and F Reactors were inspected to determine the condition of the thrust bearing washer located near the inner ends of the gun barrels. The washers and tube entry blocks appears to be in good condition and located as shown on the "as-built" drawings.

Vertical Bowing Measurements

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

<u>Area</u>	<u>Date</u>	<u>Tube Number</u>	<u>Distance</u>	<u>Results</u>
105-B	10-8-59	4574-B	37'2"	Up .08" at 9'8" since 5-14-59 No change at 20' since 5-14-59
105-F	10-26-59	4676-F	10'8"	Up .02" at 9'4" since 9-11-59
105-F	10-26-59	4276-F	10'8"	No previous data

COOLANT TESTING

During October, 1959, 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, installation of new equipment, and revisions to existing equipment.

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 were operated during the month under specified production test conditions, namely:

<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	--
4863)Tubes	7.0	Process	--
4963	6.5	Filtered	2.0 ppm
5063	6.5	Filtered	2.0 ppm

On start-up following the October 15 outage, it was not possible to establish satisfactory flow to tubes 4963 and 5063 from the 1706-KE system. As a result, these were switched to reactor process water supply for the ensuing reactor operating period.

All single-pass tubes were returned to normal operation during the October 30 outage. It was determined that the previous flow difficulties on tubes 4963 and 5063 were due to the lower pressure drop of K-III-N fuel elements. This lower pressure drop had reduced the back pressure in the 105 valve pit to the point where there was not enough available 1706-KE pump pressure to close the process water check valves with process water pressure up. Corrective action will be the raising of 1706-KE pump pressure before process water pressure is raised.

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Phosphate addition tests to tubes 4557 and 4863 were initiated during the month as authorized by PT IP-197-A, Supplement A. This test increases the P32 effluent activity by a factor of 20 on these tubes for effluent activity build-up studies.

1706-KE Mock-up Tubes

The steam supply was restored to the mock-up tube system on October 23. Testing was resumed on:

1. Corrosion evaluation of electro-nickel plated slugs in process water at 120 C.
2. Raw water corrosion of carbon steel at 140 C raw water temperature.
3. Hydriding effect of 110 C process water on etched and unetched Zircaloy-2 coupons.

The test was completed for evaluation of special coupon holders for use in normal tubes, using process water at 130 C. All holders performed acceptably.

Out-of-Reactor Loops

1. ELMO-4 - This heated-slug rupture loop was moved from 100-H Area and is presently being installed in the recently completed hot loop room.
2. ELMO-5 - The loop operated at 290 C and pH 10.0 for continued testing on:
 - a. Samples of carbon steel and stainless steel which have previously been exposed to various decontamination processes.
 - b. Surface treatments of carbon steel and stainless steel coupons for decontamination studies.
 - c. A stress corrosion heat exchanger for determining stress corrosion in a simulated NPR heat exchanger.
3. ELMO-6 - The loop has operated during the month at 300 C and pH 4.5 with nitric acid used as the pH control medium. Testing was begun on samples of 304 stainless steel, sensitized 304 stainless steel, and X-8001 aluminum at varying flow velocities to determine the protective properties of the low pH film produced by nitric acid addition.
4. ELMO-7 - The loop continued operation during the month for tests on:
 - a. A modified KER nozzle cap for use with thermocouple trains. A total of 2200 temperature cycles has been completed with no leakage.
 - b. A "Graylok" flanged joint. This is a high pressure piping connection designed for occupying a minimum of space. This joint has completed 1100 cycles with no leakage.

- c. Screwed NPR nozzle-to-tube joint with a bell-ring cap seal. This assembly has completed 200 cycles with no leakage.
- d. Flexitallic-gasketed NPR cap. Leakage was noted after 80 cycles using the manufacturer's recommendations on gasket loading pressure.
- e. Corrosion testing of nickel-plated, aluminum-clad solid dummies at 572 F and neutral pH.

All thermal cycling has been between 250-550 F at 1800 psi.

- 5. EIMO-8 - The loop has remained shut down during the month, awaiting completion of project revisions.
- 6. EIMO-10 - Six short-term tests have been completed. These have been corrosion and film removal tests of various decontaminants.
- 7. CEP-1 - The eleventh cycle in an extended series of Turco decontamination tests was completed during the month. Long-range effects of Turco on loop components and samples of stainless steel, stellite, Zircaloy-2, stressed samples of stainless steel, graphitar, and Zircaloy-2 NPR tube sections, are being examined.
- 8. CEP-2 and CEP-4 - Installation of these loops is continuing. Final completion of CEP-4 is awaiting Chempump replacement parts.
- 9. ORA-1 - This loop was dismantled and removed during the month. Some parts were salvaged for use on other facilities.

KER Loops

- 1. Loop 1 - The loop operated at 225 C and pH 10.0 during the month. The charge consists of six 1.6 per cent enriched 20 and 30 mil wall, Zircaloy-2 clad, seven-rod cluster elements and a Pu-Al Zircaloy-2 clad, seven-rod cluster element as authorized by Supplement B to PT IP-226-A.
- 2. Loop 2 - The loop continued operation at 255 C and pH 10.0 until October 15, when a rupture occurred in the loop, causing a reactor shutdown. The fuel elements were successfully discharged, using a special tray to prevent damage from the elements' dropping into the basin. The rupture was a one-inch long longitudinal split on the outside surface of a rod located in the outer ring of the cluster. The loop was flushed and the tube recharged with dummies and left on single-pass operation. During the October 30 outage, loop 2 dummies were discharged and the tube borescoped. Borecoping revealed no visual damage caused by the October 15 fuel element rupture. The tube was recharged with dummies, pressure tested, and put on recirculation.
- 3. Loop 3 - Loop 3 remained on recirculation with dummies during the month. During a test of raising temperature with dummies charged, a 10-15 fold increase in neutron activity was observed. After considerable temperature and flow cycling, feed and bleed, and clean-up operation, the activity returned to essentially normal by the end of the month. During the October 30 outage loop 3 was charged with seven unenriched seven-rod clusters, as

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authorized by PT IP-288-A.

4. Loop 4 - Loop 4 remained shut down during the month, awaiting fuel elements for charging.

Coolant Testing Operation Outage Performance

During the month a total of 20.6 hours of reactor outage time was charged to production tests being conducted in KER loops and 1706-KB single-pass tubes.

October 1 - 2	- Production time lost at reactor start-up and special discharge of loop 3. PT IP-250-A, Supplement B.	7.7
October 1 - 2	- Change loop 1 nozzle. Supplement B, IP-226-A	1.2
October 1 - 2	- Start-up delay on single-pass tubes due to faulty flow control valve, Supplement B, IP-197-A	0.6
October 15	- Loop 2 rupture - lost production time and special discharge, Supplement A, IP-226-A	10.3
October 15	- Start-up delay due to pumping difficulties, single-pass tubes, Supplement B, IP-197-A	0.8
October 30	- Loop 2 borescoping, PT IP-226-A	3.0
October 30	- Loop 3 charging, PT IP-228-A	<u>2.1</u>
Total		25.7 hrs.

One unscheduled reactor shutdown was caused by the fuel element rupture in loop 2 on October 15.

COMPONENT TESTING

Irradiated Fuel Element Examination

Examinations were completed on fuel elements from the following 40 tubes at the Metal Examination Facility during October:

<u>P.T. No.</u>	<u>Tube No.</u>	<u>P.T. No.</u>	<u>Tube No.</u>
39A	2392-F	95A	3376-D
	3065-F	168A	2464-C
	3754-F		2564-C
	3785-F		0973-C
	4387-F		2775-C
	4358-F	178A	1863-KW
95A	0481-D		2275-KW
	3386-D		2566-KW
	3474-D	Reg. I&E and Solid	19 tubes
	3284-D	Ruptures	3 tubes

The fuel elements from rupture tubes 1689-DR, and 3678-D, and rupture suspect tube 1371-DR, were examined. It was found that in positions 1 through 10, from the downstream end of the charge, four to six fuel elements had severe groove-type pitting. On three of the fuel elements the groove pits were deep enough to go through the jacket and the AlSi layer. The 19 tubes were examined to compare hot spot patterns.

Ultrasonic Bond Testing

One-hundred-four rejects from PT IP-210-A, "Bond Quality vs. Reactor Performance of Enriched I&E Fuel Elements," were measured to determine the longitudinal and circumferential length of the unbonded areas. The majority of the pieces were found to contain unbond areas approximately 1/2 inch long circumferentially and 1/2 to 3/4 inch longitudinally. Twenty-one of the rejects contained hot spots. Three of these contained unbond areas 3/4 of an inch long circumferentially and 3/4 to 1 inch longitudinally.

Process Tube Corrosion Monitoring Program

In-reactor measurements of 189 process tubes were made during the month. Listed below are the number of tubes measured per reactor and the document numbers of the reports issued.

<u>Reactor</u>	<u>No. of Tubes Probologged</u>	<u>Report No.</u>	<u>HW Number</u>
F	11	45	62130
B	60	46	62215
B	18	47	62479
F	100	48	62495

Visual examination, wall thickness and rib height measurements were completed on four tubes from DR Reactor, four tubes from F Reactor and six tubes from KE Reactor.

Tubes were removed from DR Reactor for the following reasons: Two were suspected leakers and two contained one rupture each. A leak was located in one of the two suspected leakers.

A crack approximately 23-1/2 feet from the rear van stone flange was found in tube 0759-DR. It appeared that the crack was caused by a flaw in the tube.

Tubes 0187-F and 0393-F were removed as leakers. Tube 2073 was removed because the Probolog trace indicated that external corrosion was present. Tube 2866-F was removed to check corrosion on a second generation tube. The leaks in tubes 0187 and 0393 were identical in appearance, and were located 9-1/2 feet from the rear van stone flange. They were caused by external corrosion. Both tubes had indented areas nine feet from the rear van stone flange, caused by the large amount of corrosion product build-up on the outside surface. When the slugs were discharged, they hit these indented areas, causing a plateau in the inside of the tube.

Four tubes from KE Reactor were removed for the Corrosion Monitoring Program, and two tubes were removed as leakers. In tube 0749-KE, a hole was found between the ribs, 6-1/2 feet from the rear van stone flange. In tube 1941-KE,

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the hole was found between the ribs, between 36 and 37 feet from the rear van stone flange. It could not be determined what punctured the tubes from the inside out to cause these leaks. The measurements from the four tubes for the Corrosion Monitoring Program revealed that the top half of the tube was corroding faster than the bottom half.

Panellit Programs

During the month, 310 gages were processed by Maintenance personnel. Inspection of these gages resulted in detection of 109 gages which did not meet acceptance criteria for a rejection rate of 35 per cent.

In-board reliability examinations were performed on 510 gages. Sixty-six of this number were found to be defective and were removed from service. This is a percentage defective of 12.9, 2.9 per cent in excess of predicted-gage service ability, and is accounted for by detection of some 30 gages during this period which were slightly out of calibration limits.

A total of 875 gages received in-board Bourdon coil leak examination (all gages were in F Reactor Panellit board). No coils were found to be leaking. Previously, average leak detection has been approximately 0.50 per cent. Exceptional results this month is attributed to two factors: (1) All gages examined had been examined thoroughly during the preceding 30 days, and (2) approximately 50 per cent of the 875 gages contained the newly designed Bourdon coils.

Five-hundred-ten gage and gage sensing line response times were determined. Of this total, 35 showed slow response and received corrective action. This amounts to a slow response condition percentage of 6.9, compared to 4.9 per cent for September.

During the month, 27 gages failed to perform satisfactorily and were subjected to a thorough failure analysis.

Production Test IP-266-B, "on-reactor" testing of 2B-X1 and 2B-X2 magnetically operated mercury switches, continued during the month. An additional 58 gages were placed in service and 3480 additional exposure days accumulated. Exposure day total is now 5220. The Production Test requires a minimum of 6000 exposure days. No defects have been noted to date.

In addition to inspections of gages in-board and in Maintenance shops, 501 Bourdon coils were received and inspected, 150 switches were inspected, and 165 gages were inspected. Sixty-one of the 165 gages were processed for installation on PT IP-266-B, and the balance had been processed by Panellit Inc.

INVENTIONS

All Research and Engineering Operation personnel 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 October 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.

Inventor

None

Title

None

O. A. Greager
 Manager, Research and Engineering
 IRRADIATION PROCESSING DEPARTMENT

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B-C REACTOR OPERATION
OCTOBER, 1959

I. ORGANIZATION AND FUNCTIONS - No change.

II. <u>PERSONNEL</u>	<u>September 30</u>			<u>October 31</u>			<u>Change</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	
B-C General	5	3	8	5	3	8	0
B Processing	16	38	54	17	37	54	0
C Processing	16	34	50	17	35	52	/2
B-C Power	15	96	111	14	99	113	/2
B-C Maintenance	23	106	129	22	106	128	-1
TOTALS	75	277	352	75	280	355	/3

The above totals include NPR trainees.

Movement of People - Exempt: R. H. Steach, Assignment Supervisor into B Processing from Purex Operation, CPD; R. L. Ferguson, Assignment Supervisor into C Processing from Research and Engineering, IPD: two temporary assignments (exempt) were completed and the incumbents reclassified to their former B-C nonexempt status. Nonexempt: 6 transfers out, 2 deactivations (personal illness), 1 termination(death), 10 transfers in and 2 reclassifications from temporary exempt status.

- III. PERSONNEL ACTIVITIES - A management information dinner meeting held October 29 by the Manager, B-C Reactor Operation was attended by 33 exempt B-C employees and 5 guests from other HAPO components. H. A. Laybourn, Supervisor-100 Operations, B Processing, was assigned October 14 (on loan basis) to the Reactor Plant Engineering Operation to participate in development of irradiated material (slug) handling equipment. F. F. Vlacil, Manager, B-C Maintenance visited G.E. plants at Schenectady, N. Y. and the Savannah River Plant at Aiken, S. C. October 19-28. L. H. Rice, Safety and Fire Prevention Specialist, attended the Annual Safety Congress in Chicago, October 19-23.
- IV. SAFETY AND SECURITY - There were 16 medical treatment injuries and no serious accidents, disabling injuries or security violations. There was one fire when one wire of 13.8 KV line C2L1 broke; the electrical fire damage was \$20.00.
- V. NON-ROUTINE REPORTS - HW-62355, IPD Radiation Occurrence Investigation, October 6, 1959, by J. H. Soehnlein.
- VI. COMPONENT ACTIVITIES

General

- A. Administrative Activities - Review and comments on N Reactor design criteria and approved prints for construction was continued. The studies started in September to simplify the bus transportation procedures in B-C Area were continued; however, the study was centralized and expanded to include all 100 Areas. Two revised OPG's were reviewed and commented upon: OPG 55.14 "Authorization and Performance of work" and OPG 11.5 "Delegation of Routine Authorities." A suggested new HAPO-wide procedure for "Control of Access to Documents in the Classified Files" was reviewed and commented upon.

- B. Personnel Development - Technical Graduate John P. Hawley started a 3-month rotational training assignment October 1 with B-C Maintenance Engineering.
- C. Cost Control - Review and revision of FY 1960-1961 budgets (PA&C, Equipment and planned Maintenance) and compilation of reason sheets for proposed FY 1962 budget items were completed.
- D. Landlord - Crosswalks were repainted and some additional traffic signs were installed.
- E. Suggestions - Start of Month - 39, received - 9; completed - 14; end of month - 34.

B PROCESSING OPERATION

- A. Production - Input production was 97.0 percent of forecast and was limited by tube powers and graphite temperatures. After the October 20 outage, tube power limits were lowered slightly as a result of reducing to seven-pump operation at 190-B. TOE for the month was 79.6 percent.
- B. Operating Experience - There were eight outages during the month, seven of which were unscheduled (recovery was made on six).

<u>Day</u>	<u>Hours</u>	<u>Cause</u>
3	0.3	Momentary line fault in BPA system.
4	113.7	Scheduled outage for charge-discharge, tube replacement, and project work.
9	1.3	Shutdown to discharge Tube 0160 because of abnormal panellit pressure.
20	35.0	Unexplained panellit trip on row 36. During recovery attempt, a second panellit trip (row 14) occurred. Charge-discharge and project work was done.
	0.3	
22	0.4	Three panellit scrams occurred during startup. One occurred when removing a jumper from a gauge, 1592. The cause of the other two was not definitely determined, but probably oscillating gauges were responsible.
	0.4	
	0.3	
- C. Equipment Experience - 38 process tubes were replaced; another which showed severe external corrosion on the probolog was removed for later replacement. One leaking front flexible connector was replaced. The No. 9 HCR gas seal was replaced, and 4 rear gas bellows were repaired. Seven faulty panellit gauges were replaced. The downcomer was inspected and found to be in good condition. The 3-X system battery cells were renovated with the assistance of a representative from the manufacturer. A new brake assembly was installed on the No. 6 HCR, and a leak in the rod cooling water supply line was repaired.
- D. Improvement Experience - Production Test IP-84 A, "Evaluation of Slugs Having Projections for use in Ribless Process Tubes" - Four tubes were discharged and recharged. Project CG-666, "Zone Temperature Monitoring" - Discharge area work was completed and the system was put into use on a limited basis. CG-707, "Improved Reactor Nuclear Instrumentation". The installation of the second of two sub-critical monitoring channels was completed. CG-806, "Nuclear Instrumentation for Reactor Safety and Control" - Three special rear connectors were installed for use with the stop-gate rate-of-rise meter.

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CG-791, "Reactor Confinement" - Preparatory work was started for relocation of the B-C scram annunciator inter-tie line, the evacuation signal line to 105-C and the B-C telephone line. A filter test unit was installed in the 105-B exhaust air tunnel under Design Test No. 1050.

- E. Radiation Monitoring Experience - During removal of an assembly from an experimental hole, two Maintenance men were exposed to dose rates of 200 r/hr and 45 r/hr respectively. The maximum dose received was 150 mr (investigation reported in HW-62355). Two cases of low-level contamination on shoes and one case of skin contamination were reported. The average activity of the effluent water at the retention basin outlet was 1,035 mrad per operating day, with the maximum being 1,665 mrad.
- F. Events Influencing Costs - 177 hours of overtime were used, which is less than half that used in September. Helium consumption was 464,200 cubic feet as compared to 237,000 cubic feet in September. This increase was due to an increase in the concentration of helium in the reactor gas, one helium startup to reduce non-equilibrium losses, and the upset of the building ventilating system and the gas control instrumentation resulting from the failure of a 13.8 KV power line. Work was continued in repairing gas leaks and in improving ventilation air balance to reduce gas leakage.

C PROCESSING OPERATION

- A. Production - Input production was 130.1 percent of forecast, and TOE was 94.4 percent. A new high input production record was achieved. Power level was controlled by a tube power rupture control limit.
- B. Operating Experience - Only one (unscheduled) outage occurred (October 12, 41.4 hours); it was for removal of a rupture in tube 2166. The charge was stuck and required 8000 pounds force for discharge. The tube was removed for later replacement. The rupture was an I&E regular metal slug, lot KJ-147-D, charged August 4, 1959. Examination of the slug revealed the rupture was a "hot spot" type failure.
- C. Equipment Experience - Octant monitor chamber 3-L was removed and repaired, but was not re-installed due to a binding condition in the thimble. Thirteen rear face thermocouples required repair before startup from the October 12 outage. The Beckman controllers for flux monitors 2, 3, and 4 required replacement as a result of malfunction of the mercury cells in the units.
- D. Improvement Experience - Nothing significant to report.
- E. Radiation Monitoring Experience - Two maintenance employees performed work on the wash pad prior to having a dose rate established; total estimated exposure was 5 mrem. Significant personnel exposures were: Tube removal in the discharge Area - 1,000 mr/hr.; Push pole removal on the charge face - 1500 mr/hr.; Octant monitor repair on the experimental level - 2000 mr/hr. There were two instances of personal clothing contamination; both items were decontaminated and released. There were five reported cases of skin contamination and all were easily decontaminated.
- F. Events Influencing Costs - 202.6 manhours overtime were required.

POWER OPERATION

- A. Operating Experience - Part of the export water pumping load was temporarily transferred to 100-D Area while the 15 million gallon reservoir was cleaned and alterations were made to the suction flumes according to recommendations from the Plant Emergency Task Force. 100-B Power reduced to 7-pump operation October 22.
- B. Equipment Experience - The 190-B storage tanks were re-inspected for rubber debris and the seven near screens in 105-B valve pit were re-inspected for proper seating; all were found to be satisfactory. The 700 kW emergency generator turbine in 184-B was inspected by a factory representative on October 7, and found to be satisfactory. The 4500 HP motor stator was removed from No. 4A process unit October 27 and returned to the manufacturer for experimental study; installation of a new stator (No. 42) was started. No. 4A process pump impeller was removed and installation of a new-design impeller was started. Straightening vanes were installed in the pump suction.

190-C - No. 11-C process pump impeller was inspected October 7, and all vanes were found to be cracked and a piece of one vane had broken off; the impeller was replaced with a new-design spare. No. 5-C impeller was inspected on October 12 and three vanes were found to be cracked; since no new type impeller was available, the vendor returned an old type which was installed on October 23.

On October 22, one wire of 13.8 KV Line C-2-L 1 broke causing a temporary loss of normal power to buildings 190-B and 105-B. There was no interruption of production.

- C. Improvement Experience - 58-IP Aluminum Oxide Sulfuric Acid Feeders 183-B - A new prototype reaction chamber was installed in No. 3 line feeder and was placed in operation. CGI-845 Increased Pumping Capacity - 181-C - Design work was approximately 75% completed.

A Telautograph transcriber system was installed in 190-B and 105-B control rooms, providing an instantaneous method of written communications between these two buildings.

- D. Events Influencing Costs - Coal consumption increased due to increased steam requirements. Chemical costs of treating water remained low due to the seasonal high-quality of raw water.

MAINTENANCE OPERATION

- A. Outage Experience - Of the 193.1 total outage hours experienced at 105-B and 105-C, 44 percent was devoted to reactor maintenance. The major work accomplished was: a) 105-B - replacement of 38 process tubes and effluent water basin facility repair; b) 105-C - removal of one ruptured fuel element.
- B. Equipment Experience - An unexplained reduction of process water flow prompted inspection of the No. 11 Process Pump at 190-C Building. The impeller had an approximate six-square-inch area of one vane broken out and all other vanes had visible cracks. The impeller was replaced. Subsequent inspection of the No. 5 Process Pump at 190-C revealed three visible cracks, vane to hub. The impeller was replaced on this pump also. Representatives from Byron-Jackson Company inspected both impellers and began a study of the problem and corrective action.

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As a result of questionable value of the existing coil insulation on the 4500 HP 190-BA Process Pump motors, the stator from the No. 4 motor was removed for shipment to the General Electric factory for study and repair. A new stator was in the process of installation at month-end.

At 183-B Building, the No. 3 Ball Valve (36-inch ball) and operating linkage was systematically dismantled to determine the cause of valve inoperability; a small, but exacting, adjustment to the operating crosshead linkage was made and apparently corrected the problem.

- C. Improvement Experience - A three point suspension trolley was installed on the 105-C overhead charging machine to facilitate use of less manual force in moving the machine across the elevator. The continuous monitor for checking air conditions in the discharge area at 105-C was completed. To further the safety of operating personnel, oil drain troughs were installed on all turbine bases at 190-C, thus eliminating a floor slippage hazard. An estimated 53,300 cubic yards of silt and sludge were removed from the 182-B storage basin.
- D. Maintenance Engineering - The reactivation of the closed loop television system in the 105-B discharge area was completed; changes included newly designed camera mounts and removal of the existing vertical and horizontal traversing mechanism. The flush-discharge system at 105-B was completed and 86 tubes were discharged using the new facility. To facilitate training, a manual on reactor instrumentation has been prepared and distributed. Design Change No. 153-C, which will permit the installation of a new annunciator system at C Reactor, was prepared and routed for approval; the equipment has been received from the vendor.
- E. Productive Maintenance - Of the 9,090 man-hours scheduled for productive maintenance, 93 percent was completed.

A. R. Maguire

Manager
B-C REACTOR OPERATION

AR Maguire:ILH:dip

D-DR REACTOR OPERATIONOCTOBER, 1959I. ORGANIZATION AND FUNCTIONS - No Change.II. PERSONNEL

A. <u>Force Summary</u>	<u>September 30, 1959</u>			<u>October 31, 1959</u>			<u>Net Change</u>
	<u>NE</u>	<u>E</u>	<u>Total</u>	<u>NE</u>	<u>E</u>	<u>Total</u>	
General	3	5	8	3	5	8	
D Processing	39	16	55	39	15	54	-1
DR Processing	33	15	48	33	16	49	+1
Power	102	14	116	102	14	116	
Maintenance	131	20	151	131	21	152	+1
	308	70	378	308	71	379	+1

The above totals include NPR trainees.

- B. Movement of People - The following changes involving D-DR Reactor Operation were effective October 1, 1959: J. W. Hedges, Engineer, Equipment Development Operation, Facilities Engineering Section, was transferred to Supervisor, Maintenance Engineering, D-DR Maintenance Operation replacing H. G. DeVoss. A. R. Sutton, Supervisor, 100 Operations, D Processing Operation was transferred to Assignment Supervisor, D-DR Power Operation, for development purposes. R. C. Haynes, Specialist, Reactor Operations, D Processing Operation, was promoted to Supervisor, 100 Operations, replacing A. R. Sutton. V. L. Kerstetter, Supervisor, 100 Power, D-DR Power Operation was transferred to Assignment Supervisor, DR Processing Operation, for development purposes. Nonexempt personnel movement during October included six transfers in, five transfers out (including one to a non-HAPO component), and one termination.

III. PERSONNEL ACTIVITIES - Routine

- IV. SAFETY AND SECURITY - There were 19 medical treatment injuries, including a fractured toe when a piece of steel was dropped on it. Details are reported in Serious Accident Report No. 59-15. There were no security violations.

- V. NON-ROUTINE REPORTS - None were issued.

VI. COMPONENT ACTIVITIESGENERAL

- A. Administration - The CY-1959 pre-retirement interview program involving twenty three D-DR Reactor Operation employees was completed during the month. Coordination was provided in making arrangements for the 100-D Area tour of IPD Central Health Safety and Security Council members following the monthly meeting on October 13.
- B. Suggestions - In process at beginning of month 28, submitted 12, reopened 1, completed 8, in process at month end 33.

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- C. Personnel Development - On October 1, the initial moves were made in the exempt employee training plan aimed at meeting D-DR Reactor Operation's obligation toward NPR manpower requirements and the broadening of functional experience. Three rotational Technical Graduates began assignments within D-DR Reactor Operation during the month, making a total of four technical graduates on assignment to the operation at month end.
- D. Cost Control - A listing of certain Plant Acquisition and Construction budget items, submitted in previous years, was sent to Facilities Engineering for consideration in the FY-1961 and FY-1962 budgets. Preparation of the Planned Maintenance and Equipment budgets for FY-1962 and revision to those of FY-1961 was begun. The quarterly report of Representative Economy Measures was prepared and forwarded to the Financial Operation.
- E. Landlord - AEC Directive No. 166, relative to Project No. CAL-835, Additional Office Space - 100 D Area, was issued on October 1. Estimated cost of this project is \$111,000 with a physical completion date of October 15, 1960.

D PROCESSING OPERATION

A. Production

Input production was 119.1 percent of official forecast. Operating levels were limited by the bulk outlet temperature limit and a rupture control limit. Time operated efficiency for October was 89.9 percent, which was 111.7 percent of forecast.

B. Operating Experience

1. Operating Continuity - There was one shutdown during the month:

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
10-10-59	75.3	Rupture - Tube 3678-D.

The rupture piece, an I&E piece from Lot Number KL-214-D, had an exposure of 736 MWD/Ton. The rupture charge was displaced with a force of 11,000 psi, using the pushing machine. The charge machine was used to complete the discharge. During regular charge-discharge, 21 tubes were discharged as rupture prone material. Rupture removal, rear face decontamination, venturi replacement, charge-discharge and miscellaneous shutdown items resulted in an outage of 75.3 hours, including time spent discharging temporary poison.

2. Equipment Experience - The spline system operated satisfactorily during October. Nine splines were removed, eight installed and eight remain in the reactor at the month end. O-ring gasket failures on two J-type pig-tails were found and repaired. The re-orifice program was continued with 284 venturis remaining to be replaced.

- C. Improvement Experience - CG-780 "Improved Ventilation - Buildings 105 and 115-B, D, and F" - Installation of equipment and acceptance tests were completed during October. CG-817 - "Crossheader Differential and Alarm System"

Work on installation of the C Elevator annunciator alarm system continued throughout the month. More work remains.

D. Radiation Monitoring Experience - One lapse of radiation control occurred when broaches were unloaded at 108-D building. The broaches, presumed contamination-free, were smearable up to 10,000 c/m on the outside of the containers. Contamination was spread to the truck and an employee's gloves. Discharge of a ruptured element increased working dose rates on the rear face during the October 10 outage. Spline removal dose rates received were up to 2 r/hr. Contamination equivalent to 1 rad/hr corrected, was found on a routine survey of an office in 108-D.

E. Events Influencing Cost - A total of 127.5 hours of overtime was used during the month.

Nonexempt Shift Overlap	15.5 hours
Shutdown Coverage	104.0
Exempt Overtime	8.0
Total	127.5 hours

Helium consumption increased 20 percent over the September figure. This was caused by adherence to the more restrictive limit on Nitrogen concentration which has been recently added to the Process Standards.

DR PROCESSING

A. Production

Input production was 97.6 percent of the official forecast. Time operated efficiency, 80.8 percent, was 97.1 percent of forecast.

B. Operating Experience

1. Operating Continuity

Operation was interrupted by one scheduled and three uncheduled outages. A breakdown of the shutdown time follows:

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
10-12-59	102.2	Scheduled outage
10-16-59	1.7	Shut reactor down to change venturi in tube 3072
10-27-59	38.4	Shut reactor down to remove ruptured slug from tube 4080
10-29-59	0.8	Scram required by Phase III, of Bulk Outlet Temperature Tests
	143.1 Total	

2. Equipment Experience - Thirteen tubes were replaced during the October 12 outage, one of the lot because of high pressure to discharge and one a leaking tube. HCR #2 was found slightly deformed and is scheduled for replacement. Two thermocouple well plugs blew out of Y-type pigtails on the rear face during reactor operation, making three such failures in the past

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two months. Reactor operation was not interrupted. Charging machines continued to present difficulties. A task force has been organized to improve the mechanical state of the DR charging machines. Measurements of the Ball 3X vacuum were obtained through an empty channel in connection with tests for graphite overboring feasibility.

- C. Improvement Experience - PT-IP-278-A "Verification of Transfer Bulk Temperature Surges at the DR Reactor" - Phases I and III of this production test were performed on 10-29-59. Approximately one hour base data for the test.* Readings were obtained during startup and at equilibrium. Phase II is scheduled for the beginning of the next scheduled outage. CG-791 "Reactor Confinement" - A minor amount of work was performed this month, chiefly restricted to installing Control Room instrumentation and checking out the instrumentation in the #10 Exhaust Fan Cell. CG-706 "Improved Gas Instrumentation" - Connections were made in the gas lines in the vicinity of the drip legs. Part of the tubing was installed for the top of the unit outlet vent valve. CG-707 "Improvements to Reactor Nuclear Instrumentation - Sub Critical Instrumentation" - The chambers were installed in A and X test holes during the 10-12-59 outage; the instrumentation was installed in the Control Room; and the system has been used during the past four start-ups. Initial indications are that this system will be a great asset toward safe startup of the reactor. CG-806 "Nuclear Instrumentation for Reactor Safety and Control - Stop Gap Rate of Rise Meter" - The 15 thermohms were installed on the rear during the 10-12-59 outage. The Control Room equipment has been installed on a temporary basis. During the past four startups, the rate of rise meter has performed as expected. AEC-160 "Recirculating Gas Loop" - The fuel element was installed in the gas loop and the gas loop was placed in the #1 Safety Circuit during the 10-12-59 outage. The gas loop is now in full service. Storage Basin Cleaner - The 3" line has been run from the back of the Wash Pad to the burial pit. Installation of the basin cleaner system is now complete and it will be placed in service in the near future.

*Five thermocouple trains were installed in the rear of tubes to obtain temperature data for this test.

- D. Radiation Monitoring Experience - Three lapses of radiation control occurred during the month. The first was low level contamination to the wrist and shoe of an employee during protective clothing removal. The second lapse was skin contamination of 5 rads/hr received in the discharge area. The third was brought about by a 900 mr/hr beam in the water tank shield on the X-1 level, where personnel traffic passed. High dose rates were received while installing a funnel on a rupture tube nozzle (2 rads/hr), pulling #2 HCR (1 r/hr), and installation of a sub-critical monitoring assembly at the X-hole (40 r/hr for 15 seconds).
* Technical overexposure.

- E. Events Influencing Cost - The overtime usage rate was 3.48 percent. Unit cost should be slightly higher than last month due chiefly to the uncheduled ruptured outage at the end of the month.

D-DR POWER OPERATION

- A. Operating Experience - It was necessary for 100-D Area to assist 100-B Area to maintain pressure on the export pumping system during October. Boiler

operation was satisfactory during the month. The steam generating load was 114,861 pounds per hour average, and 146,000 pounds per hour maximum. The evaporation rate was 9.01. The base steam load on each boiler in service was decreased from 40,000 pounds per hour to 32,000 pounds per hour on October 28.

- B. Equipment Experience - The #1 filter in 183-D was removed from service to replace the effluent valve and stem nut. Seven pump operation was resumed in both 190 buildings early in the month. The #5 pump unit in 190-D was removed from service for an impeller replacement and motor inspection. The #8 pump in 190-DR was removed from service due to a water leak in the motor air cooler. Repairs were completed. No. 5 process pump in 190-DR was released to Facilities Engineering for grinding of the pump case under direction of the DeLaval representative. New wear rings, impellers, and an enlarged shaft were installed. Similar work was performed on #2 process pump and straightening vanes installed in the suction header.
- C. Improvement Experience - "Work Order - A-53879 -- Install 3-inch Blending Valve at the Dichromate Pumping Station" - Work was completed by J. A. Jones Company on October 23.
- D. Events Influencing Cost - No unusual cost variations.

D-DR MAINTENANCE OPERATION

- A. Equipment Experience - During the October 12 outage one of the back seating crossheader valves on the front face of 105-DR was repacked while under pressure. It is indicated that repacking can henceforth be done while the unit is in operation, releasing the C elevator for outage work. Of some 500 "J-I" pigtails presently installed in DR reactor 13 were replaced with "J-2" type due to leakage around the "O" rings. No. 2-N backwash valve in 183-DR was replaced with a spare. The leaking valve was missing a seat ring and the gate ring was severely damaged. Overtravel of the gate is the suspected cause of the trouble.
- B. Maintenance Engineering - Reactor Safety Circuit Trip Identification - Two hundred vertical jumpers have been received. Installation of these jumpers will proceed when the remaining jumpers have been received on site and when Design Change #328 has been approved. Design For High Tank Low Level Alarm - An alarm system accurately assuring that operating personnel are aware that high tank water level has dropped 3' below the full level has been developed. This system will utilize mercury manometers with electrical probes which will in turn actuate an annunciator. Improved Panellit Ground Detector - Design Change #318 has been approved and fabrication of the component parts of this system is now in progress. Modification of Control Room VSR Switch Panels - Design Change #325 is now being routed for approval. The materials required to complete this modification are now on order. Revision to 110 Gas Piping - Installation of the low pressure CO₂ piping and new pressure reducing valve at the He unloading station was completed during the month. Completion of the 110 - 115-D piping revision awaits delivery of the He make-up pressure reducing valves. Lead Cab Removal 105-D Discharge Elevator - Field measurements of existing step plug openings have been taken. Based upon these limiting dimensions a print denoting cutting lines and a procedure for removal of the cab have been prepared. This work will be done as outage time is made available. Spot Decontamination Facilities - Design of the spot decontamination facilities

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is complete. This design proposes that a wash and rinse tank be located on the catwalk outside the "D" machinery room, and that piping and trail hoses be carried from these tanks into the rear face. Drive Replacement #4 and #5 Dryer Blowers - Excessive maintenance cost required to keep the present "Varidrive" units to #4 and #5 blowers in operation has led to a redesign of this system. The new design will utilize the same steam turbine that has been relatively maintenance free for the other blowers.

- C. Planning and Scheduling - During the month 12 Class A, 31 Class B, and 20 Class C inspections and overhauls were made. Generally all crafts are current in their P. M. work except Electrical, which is somewhat behind due to the extra work on 190 annex pump motors during the month. There was a decrease in the manhour backlog for carpenters and pipefitters. The backlog for the electricians and painters showed an increase. There was no significant change for the balance of the crafts.

- D. Events Influencing Costs - Overtime usage for the month is as follows:

Nonexempt - 853 hours
Exempt - 176 hours

WD Richmond
Manager
D-DR Reactor Operation

WD Richmond:JDR:jf

F REACTOR OPERATION
OCTOBER, 1959

I. ORGANIZATION AND FUNCTIONS

No change.

II. PERSONNEL

A. Force Report

	<u>September 30</u>			<u>October 31</u>			<u>Net Change</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>of Total</u>
General	3	2	5	2	2	4	-1
Processing	15	38	53	15	38	53	0
Power	7	50	57	7	51	58	+1
Maintenance	14	69	83	14	70	84	+1
Total	39	159	198	38	161	199	+1

B. Movement of People

M. W. Dickerson, Supervisor, 100 Operations I, was promoted to Analyst, Reactor Operations, effective October 1, 1959.

G. B. Jex, Specialist, Administrative Programs, was removed from payroll - deceased.

Nonexempt personnel changes included one deactivate, one reactivate, six transfers in and six transfers out.

III. PERSONNEL ACTIVITIES

Two Conference Table meetings were conducted by C. N. Gross, Manager, F Reactor Operation, with 17 nonexempt employees attending.

Two exempt employees attended a talk given by O. S. Hulley, Consultant, Manufacturing Training and Education, in relation to the Manufacturing Training Program.

R. J. Schier, Manager, Relations Operation, conducted a Union Relations meeting with six first-line exempt employees from 100-F, and nine from 100-H attending.

IV. SAFETY AND SECURITY

Two medical treatment injuries were reported. No disabling injuries or security violations were reported.

V. NONROUTINE REPORTS ISSUED

HW-62633 (unclassified), "IPD Radiation Occurrence Investigation Report - F Area," by W. G. Westover, dated October 25, 1959.

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VI. COMPONENT ACTIVITIESGENERALA. Administration

Procedures were completed for the new Badge House facility and will be placed in effect during November.

B. Personnel Development

G. L. Givan, P. J. Crowder, and W. DeGooyer enrolled in "Effective Communications" training.

S. A. Krieg, Technical Graduate, was reassigned from F Processing Operation to F Maintenance Operation, effective October 26.

C. Costs

Reviewed FY-62 and revised FY-61 Plant Acquisition & Construction, Equipment, & Planned Maintenance Budgets, and submitted them to the Manager, Manufacturing.

D. Landlord

Work started on the renovation of the new Patrol Headquarters in the 1707 Building.

E. Suggestion Evaluation

Suggestions on hand at start of month: 40; received: 12; evaluated and returned: 21; on hand at end of month: 31.

F PROCESSING OPERATIONA. Production

Input production was 102.4 percent of forecast, with a TOE of 83.5 percent. Maximum operating limits were limited by rupture control tube power limits.

B. Operating Experience1. Operating Continuity

<u>Outage Date</u>	<u>Hours</u>	
10-23-59	122.9	Panellit Trip - Completed Tube Replacement and Charge-Discharge.

C. Equipment Experience

1. Tube Replacement - A total of 100 tubes was probologged and 26 were replaced due to external corrosion. Three air channels and one

problem tube were retubed. One tube was removed for inspection of top of annulus corrosion and one was removed and left as an air channel as the result of a stuck charge. A total of 31 tubes was installed.

2. Stuck Charge 4570 - Charge stuck when attempting to discharge; removal made by backseating at 3500 pounds and using a Blackhawk jack from the front at a force of 5000 pounds. The tube was removed and the channel blanked.
3. Rear Pigtails - Four leaky rear pigtails were replaced.
4. Gas Conservation - One leaking rear face boot was replaced.
5. G Stringers - Two Geminol T/C graphite stringers were installed. Connections to the control room instruments will be made when lead-in wires are received.
6. Channel 2662 - During the tube outage, a rear nozzle was connected to the graphite stringer channel 2662 and resulted in water being discharged into the reactor.
7. Graphite Distortion - A horizontal traverse was completed on 4453 and 4494. A vertical traverse was completed on 4276 and 4676. Twenty-two tubes in the top section of the reactor passed a nine-inch probe.
8. Panellit Sensing Lines - A scram was caused when the Panellit sensing line on 3478 was inadvertently pierced during installation of flashing over an exhaust air duct; subsequent inspection revealed that ten sections required repair. The work was being conducted under the approved "Improved Ventilation" Project by Construction forces.

D. Improvement Experience

1. Start-Up Instrumentation - CG-707 - The second sub-critical monitor was installed and functioned properly during start-up.
2. VanStone Seal Inserts PT-279-E - Eighteen inserts were removed for inspection and evaluation.
3. Development Test 1050 - Test filters to determine the effectiveness of the proposed CG-791 exhaust air decontamination were installed at the junction of the 105-115 exhaust tunnels.

E. Radiation Monitoring Activities

Two radiation occurrences (both within permissible limits) were formally investigated and will be reported separately. The first involved an irradiated metal fuel piece that was caught in the chute rake reinforcing bars and raised near the surface of the storage basin. Personal exposure was limited to less than 5 mr when the operator visually detected the

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fuel element before the rake had been fully raised. The H. M. alarm system in the pick-up chute area has been improved and the rake design has been modified with metal gusset plates to prevent repetition of the incident. The second occurrence involved contamination of nine employees to levels up to 5000 c/m and contamination of building corridors to levels up to 100,000 c/m, following work on the "A" and "D" hole subcritical monitoring project. Decontamination of personnel and building facilities was successfully accomplished. Bioassay samples were scheduled for all affected employees.

Personal radiation exposure rates were limited to less than 3 r/hour with the exception of a momentary exposure of 5 r/hour during replacement of the "A" hole subcritical monitoring assembly into the reactor after addition of improved shielding.

F POWER OPERATION

A. Operating Activities

On October 15, the far high tank water level impulse line was cut while excavation for repairs to pipe joint in the raw water export line near the 105 Building and caused the 105 Groves valve to trip but caused no damage. The valve remained in a tripped position during reactor operation from 11:02 a.m. to 3:15 p.m. on October 15 when repairs were completed.

The power steam generation rates for the two boilers in service were reduced in accordance with letter from R. L. Dickeman, dated October 27.

B. Equipment Experience

Four spare cells of storage battery set with damaged negative plates were replaced with spares in the 190 Building.

A surge voltage recorder was installed in conjunction with motor-winding studies on C phase motor lead for No. 5A motor in 190-A.

A quick examination of the raw water cone valve on the east side of filter plant did not disclose the cause of the operating problems which have been experienced; a complete examination is scheduled. Repair of 24-inch gate valve at the downstream side of this cone valve was completed.

C. Improvement Experience

Project CG-558-190 Building Annex - Pump modification work on No. 3A process water pump started. Installation of latest design rotating assembly with PW-1417-2 impellers on both first and second stages has been completed; realignment work and pump discharge piping modification work continues.

Inspection of pump impellers for Nos. 5A and 8A pumps revealed varying degrees of erosion on first-stage impeller vanes. These units have operated for 3489 and 3842 hours respectively since installation of latest design rotating assemblies. Straightening vanes were installed in suction piping for Nos. 3A, 5A, and 8A pumps.

D. Events Influencing Costs

Protective painting, installation of coupling clamps on bell joints of export raw water line, inspection and minor repairs to No. 3A motor, and repairs to the raw water inlet valves in 183 Building will increase maintenance costs.

F MAINTENANCE OPERATION

A. Equipment Experience

1. Instruments - The No. 10 row relay lighting coil circuits shorted and caused the No. 10 Panellit trip light to burn bright. The pressure monitor system was bypassed for 15 seconds to replace the faulty relay.

Fifteen rear face reactor thermocouples were repaired without using any spare leadwire.

Nine Panellit gages were replaced and 700 were adjusted.

2. Electrical - Noise and interference filters were installed across the Beckman relays connected in the reactor safety circuit.
3. Mechanical - A Class "A" overhaul of the No. 12 process pump at the 181 Building was completed. New size shaft and pump bushings restored the unit to good operating condition.

Fourteen orifices were changed to .283 venturies and twelve .283 venturies were changed to .310 venturies.

The chute vibrator in the 105 storage basin was mounted on a permanent holder to increase its effectiveness.

B. Maintenance Engineering

1. Instrument Engineering

105-F Pressure Monitor System - Examination of the failed row relay showed that a conducting film had built up across the glass insulator in the base of the relay container.

2. Electrical Engineering

184-F Emergency Generator Safety Devices - Design Change 322-F, Emergency Generator Safety Devices, providing a remote emergency turbine stop push button and an oil pressure interlock for bearing protection was completed.

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3. Mechanical Engineering

Effluent Line Repairs - Exploratory excavations were undertaken at the 1904 junction box and the lines from the junction box to the river. Repairs will be necessary at the junction box to prevent excessive leakage.

C. Property Control

The inventory of Fixed Plant and Equipment was completed with all but seven items located or disposition verified.

Planning and Scheduling

Approximately 25 percent of available manpower was assigned to productive maintenance work. The activity included the completion of nine Class "A" overhauls and 347 Class "B" overhauls.

D. Events Influencing Costs

Costs are expected to increase due to painting and excavations of the outfall line at 1904.

In maintaining the F Reactor facilities, a total of 341 nonexempt overtime hours and 82 exempt overtime hours were required.

MANAGER
F REACTOR OPERATION



CN Gross:REA:det

H REACTOR OPERATION

OCTOBER, 1959

I. ORGANIZATION AND FUNCTION

No change.

II. PERSONNEL

A. Force Summary

	<u>September 30</u>			<u>October 31</u>			<u>Net Change</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>Of Total</u>
General	3	1	4	3	1	4	0
Processing	16	36	52	16	35	51	-1
Power	8	52	60	7	52	59	-1
Maintenance	15	61	76	15	60	76	0
Central Maintenance	18	111	129	18	114	131	+2
Total	60	261	321	59	262	321	0

The above totals include NPR trainees.

B. Movement of People

Exempt personnel movements consisted of the transfer of K. W. McKay, Supervisor, Power Operation to the KE-KW Reactor Operation.

Non-Exempt personnel movements consisted of five transfers into and six transfers out of the Operation.

III. PERSONNEL ACTIVITIES

Nothing significant to report.

IV. SAFETY AND SECURITY

There were no disabling injuries or security violations. Twenty-two medical treatment injuries were reported.

V. NON-ROUTINE REPORTS

A. HW-62493 - "Erroneous Power Indication During 105-H Reactor Startup of October 20, 1959," by E. T. Hubbard.

B. HW-62395 - "Radiation Occurrence Investigation Report," by F. E. Owen.

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VI. COMPONENT ACTIVITIESGeneralA. Administrative Activities

Routine during the month.

B. Personnel Development

Nothing significant to report.

C. Cost Control Activities

Routine during the month.

D. Landlord Activities

Industrial Engineering was requested to undertake an office space utilization study and recommend needed action to alleviate the current acute need for additional office space.

E. Suggestions Evaluation

On hand at beginning of month	36
Received	6
Processed	12
On hand at end of month	30

Processing OperationA. Production

Input production was 2.0 percent above forecast.

Equilibrium power levels reached 1700 MW which represented a new high for H Reactor. The tube power limit was increased from 1020 KW to 1035 KW to compensate for the Operational Severity Index decrease brought about by the seasonal drop in water temperature. The plan to return to seven-pump operation with the coming of cooler weather to enable pump maintenance was carried out this month.

B. Operating Experience1. Operating Continuity

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

<u>Date</u>	<u>Hours</u>	<u>Reason</u>
10-2-59	48.1	Excessive water collection - tube leaks.
10-11-59	36.7	Unexplained Panellit trip with insufficient reactivity for recover.
10-18-59	32.1	I & E natural rupture with associated tube leak.

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2. Equipment Experience

Four process tubes were replaced. Two were leakers, one was damaged by a ruptured fuel element and the other replaced because of normal tube corrosion.

Thirty-three additional 10-90 Panellit gauges were installed; 44.7 percent of the Panellit board now contains these gauges.

Sixty-six serious pigtail or adaptor leaks were corrected and 17 thermocouple wells were replaced because leaks had developed. Three of the wells with end holes are undergoing metalographic examination.

Seven worn mattress plates in the discharge chutes were replaced.

In the continued attempt to reduce gas loss, 17 rear bellows were foam sealed.

Split sections in five separate stainless steel header sample lines located on the far side of the rear face were repaired. No leaks were located on the near side lines.

Two plugged bottom thermal loop tubes, #60 and #70, were cleared by drilling through the plug material which analysis showed was primarily carbonates.

A start-up delay of 50 minutes was caused by the failure of the upper limit switches on vertical safety rods #20 and #40 to make up. Adjustments corrected the trouble.

The power level recorder indicated about 25 percent low on the last startup because of mechanical binding in the flow transmitter feeding to the power level calculator. No limits were exceeded. The incident was formally investigated and reported in document HW-62493.

C. Improvement Experience

With a few exceptions, the Zone Temperature Monitoring, Project CG-666, has been completed and is in operational use.

Continued study by Facilities Engineering Operation on the rear pigtail failure problem included the installation of three J-2 style pigtails and strain gauge instrumentation on two pigtails. Additional vibration data has also been taken.

The demonstration EN striped loading, PT-IP-225-A-9-FP, was charged during the month.

D. Radiation Experience

A Ra-Be source bug discovered missing from its shielding cask was found laying on the X-1 level Delay Neutron Monitor instrument. The bug had remained in this location for a period of five months. No excessive

amount of radiation exposure to personnel occurred as a result of the incident. The occurrence was formally investigated and reported in document HW-62395.

The unplugging of thermal loop tube #70 resulted in a case of hand contamination which could not be reduced below half of the original 7,000 c/m. The fixed contamination required two days to decay and/or wear off. All other cases of skin and personal clothing contamination were decontaminated and released.

At present, the radiation exposure status of all individuals in H Reactor is below the prorated 3 r/yr curve. The highest group average exposure is the H Maintenance pipefitters who are at 80 percent of the prorated curve.

E. Events Influencing Costs

Overtime for the month consisted of 46.0 hours.

Power Operation

A. Operating Experience

The process water pumping configuration was reduced from eight to seven annex pump units on October 4.

The average steam generating rate was 70,200 pounds per hour. An evaporation rate of 8.26 pounds of steam per pound of coal was attained. The minimum steam generating rate was reduced from 40,000 to 32,000 pounds per hour per boiler on October 27, as recommended by Facilities Engineering Operation.

A leak developed in the six-inch fire and sanitary water line servicing buildings 182 and 183 Head House on October 31. Repairs are currently in progress.

Standard quality water was produced throughout the month with an average alum feed of 3.7 ppm.

B. Equipment Experience

Repairs were completed to the top drive wheel of No. 2 traveling screen at the 181-H Building and the unit returned to normal service on October 21.

Anthrafil will be placed in the 183-H filter beds during the first week in November. It is estimated that approximately 170 tons will be required to bring the beds to normal level. "B" inspections were completed to process pump motors Nos. 4, 5, and 6. Filter backwash valve leak tests were conducted on October 2, with the backwash pump in service. Several valves are leaking excessively and will require repairs. During the month, rebuilt valves were installed in positions 8 east and 9 west. The new style teflon O-ring hydraulic control valves were installed on No. 8 filter panel for a test.

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No. 2 boiler at the 184-H Building was placed in service on October 12. The boiler load was alternated between Nos. 1, 2, and 3 units for the remainder of the month in order to respace grates in Nos. 2 and 3 units. No. 1 boiler was removed from service on October 31. Rearrangement of the coal storage pile has been in progress the greater part of the month. All salvable coal will be piled in one section of the pit and a comprehensive physical survey will be made. The new arrangement will provide a more realistic inventory value and reduce distance to transfer coal.

An inspection of No. 1 air compressor at the 190-H Building was completed on October 5, and the unit was returned to service. Impeller modifications were completed to No. 1 annex pump unit, and modifications to No. 3 pump unit are in progress. Straightening vanes were installed in the No. 3 pump suction line to improve cavitation characteristics. Straightening vanes will be installed in the remaining six units as schedules permit. A comprehensive inspection of No. 3 annex motor has been started and a representative of the General Electric Engineering Laboratory has conducted insulation tests of the unit. Approximately 60 percent of the stator coil wedges are loose. Complete rewedging is in progress. The brace ring will be reinsulated with Mylar.

C. Improvement Experience

Plant and Industrial Engineering continued studies of the steam generating facilities. During the month, combustion characteristics and acceleration tests were conducted with Washington coal. Test results will be documented by them.

Maintenance Operation

A. Field Maintenance

The left dewcel segmental recorder is not performing correctly due to a faulty microswitch. Replacement has been on order but not received.

The helium leak detector was out of service twice during the month to install a new mass spectrometer tube and preamplifier, and to remove oil from the spectrometer tube caused by a faulty shutdown sequence.

The Class "A" overhaul of two of four Foxboro flow transmitters was completed.

The monorail curved section of the Ball 3X Monorail System installation was completed. This completes the modification except for a performance check.

Five leaking gamma monitor sample lines on the far side were repaired. The sections of tubing removed had an exterior scale build-up with cracks under and in proximity to the scale.

A Class "A" inspection of No. 1 intake bay No. 7 at 181 Building was completed. The drum had shifted on the top shaft. Efforts to

reposition without removal of the drum were not successful and removal to accomplish repositioning was not warranted. A bushing was added to one end and the bearing surface dressed on the opposite end to compensate for shift.

B. Engineering

Bids were reviewed and rejected for the gamma monitor heat exchangers because of excessive cost. It was apparent after reviewing the bids that more flexible specifications would be desirable in order to take advantage of vendors' experience in heat exchanger design. Revised specifications have been prepared by Instrument Design and are awaiting approval by the Plant Engineering Operation prior to placement of the order. Additional gamma monitor system difficulties were experienced recently due to failure of rear face stainless steel sample lines. Plant Engineering has been contacted and requested to include replacement of these lines in the Gamma Monitor Improvement Project Proposal.

Estimates have been prepared for two graphite temperature monitoring systems. These are:

1. A complete system intended to replace the existing graphite temperature monitoring equipment.
2. An alternate system providing only the necessary monitoring required by operating standards.

Further work on graphite stringers will be delayed until a policy is established.

Lock nut assemblies to correct loose thermocouples on the rear face have been ordered and are expected to be delivered by the middle of November.

Sketches and cost estimates have been prepared for new moisture resistant rear elevator controls. Interim rear face communication improvements have also been designed. Installation will permit easier maintenance and greater flexibility.

Central Maintenance Operation

A. Engineering and Planning

The preventative maintenance system was completely reviewed and revised to make it more practical as regards shop equipment.

A torque clamp for mandrel tightening was demonstrated and proven to be practical and a slug gripper was demonstrated for Mechanical Development.

B. Shops

Hot shop work involved routine repairs to contaminated equipment.

Fabrication work was performed for projects CG-707, 806, 817, and the MJA-8 program.

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In addition, repairs were made to the KE-KW charging machine magazines; 6 bearing spiders were bushed and rebored for river pumps at F Area; bell ring seals were fabricated for NPR; components for 12 thermocouple stringers were fabricated and two river pump shafts were metalized for D and F Areas.

C. Projects and Special Services

Process scales were checked and those out of tolerance were corrected. Design Test 1050 was installed in B and F Areas. Fans and ducts were repaired in 183-KE. A spill-over damper was installed in the DR main air supply. The flashover protection for the 10,000 hp motor and the trail cable access platform was completed in KW. Repairs to the Fire Alarm systems included a ground at 720-K, test panel headquarters at White Bluffs, and a ground in 190-B and 100-D loop.


E. J. Philip
Manager
H REACTOR OPERATION

EJF:JGM:ore

KE-KW REACTOR OPERATION
MONTHLY REPORT
OCTOBER, 1959

I. ORGANIZATION AND FUNCTIONS

Responsibility for obtaining Labor Standards Board approval for applicable work within the Irradiation Processing Department was assumed by the Facilities Engineering Operation.

II. PERSONNEL

A. Force Summary

	<u>September 30</u>			<u>October 31</u>			<u>Net Change</u>
	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>E</u>	<u>NE</u>	<u>Total</u>	<u>of</u> <u>Total</u>
General	4	2	6	3	2	5	- 1
KE Processing Oper.	15	43	58	14	43	57	- 1
KW Processing Oper.	15	39	54	15	38	53	- 1
Power Oper.	11	72	83	13	73	86	+ 3
Maintenance Oper.	24	123	147	23	123	146	- 1
Supp. Crews Oper.	10	56	66	10	56	66	0
SUB-TOTALS	79	335	414	77	333	413	- 1

The above total includes NPR trainees.

B. Movement of People

Within KE-KW Reactor Operation, D. M. Maxson, Specialist, Reactor Operations, assumed the duties of Supervisor, 100 Operations, KE Processing Operation and V. V. Johnson, Assignment Engineer, was transferred from Maintenance to the Power Operation. C. E. Jones, Supervisor, 100 Operations, KE Processing, was transferred to Project Engineering, FEO. R. B. Shoen, Specialist, Manufacturing Administration, was transferred to the Production Operation as Specialist, Operations Analysis. K. W. McKay, Supervisor, H Power Operation, was transferred to KE-KW Power Operation as Power Engineer.

Changes for the month included three transfers in and four transfers out.

There were five Technical Graduates assigned to the Operation at month end.

III. PERSONNEL ACTIVITIES

F. M. Stratton visited the plant of Monitor Systems, Inc., at Fort Washington Industrial Park, Pennsylvania, to discuss equipment for Project CG-802, Passive Scanning.

J. C. McLaughlin attended the National Convention of the American Society for Testing Materials at San Francisco and delivered a discussion paper in conjunction with R. B. Richman's (HAPO) presentation, "Improvements in Water Treatment for Once-Through Reactor Cooling."

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PERSONNEL ACTIVITIES (Cont'd)

Seventy-six exempt employees and guests attended an information meeting and dinner. O. S. Hulley, Consultant, Manufacturing Services was guest speaker.

IV. SAFETY AND SECURITY

Twenty-one medical treatment injuries were experienced.

Representatives of the AEC presented R. S. Bell with a plaque in recognition of a fifteen-month period of security violation-free performance by K Plant personnel.

V. NON-ROUTINE REPORTS

None

VI. COMPONENT ACTIVITIES

GENERAL

A. Administration

The second session of the 1959 K Plant Nuclear Safety Review was held. Topics related to Nuclear Safety were presented by A. P. Vinther, G. C. Fullmer, L. P. Reinig and S. S. Jones.

Information relating to personnel on partial work restriction was compiled and forwarded to the Section Manager.

A campaign to obtain additional Good Neighbor Fund participants was conducted.

Suggestion Plan Statistics for the month were as follows:

Suggestions at start of month --	61
Received for evaluation -----	18
Replies submitted -----	22
On hand at end of month -----	57

B. Cost Activities

Reason sheets for Planned Maintenance jobs for the FY-61 and 62 budgets were submitted to the Financial Operation along with recommended priority listings for Equipment and PA&C items formerly approved.

Work was initiated on a PA&C Safety Improvement and Production Increase package for FY-63.

An MJA for modification of the Panellit systems was submitted covering revision of the coordinate light system and extensive gage modifications.

A review of personnel and servicing overtime requirements for the remainder of FY-60 was made.

C. Landlord Activities

Arrangements were made with Central Maintenance to chamfer and tar the 166 building oil storage bunker roofs to eliminate water seepage.

Six excavation and core drilling permits were processed.

KE PROCESSING OPERATION

A. Production

Input production was 115.3 per cent of the forecast. Power level was limited by the rupture control tube power. The maximum level was 60 units above the previous high.

B. Operating Experience

1. Operating Continuity

Reactor outages totaled 127.8 hours. Operating continuity was affected by the following events:

<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
1	54.3	Extension of scheduled September 29 outage (includes poison outage).
3	0.5	Panellit scram during startup.
15	32.2	Scram caused by rupture in KER Loop Number 2. Additional outage time used for metal processing.
30	40.8	Panellit trip caused by KE-KW crosstie pressure surge. Outage time used for metal processing.
(to month end)		

2. Equipment Experience

- a. Instrument and Circuitry - A graphite thermocouple stringer was installed in channel RS-1. All the thermocouples have failed on stringer RS-7 and the leads have been disconnected. At month end, stringers RS-1, 3, 5, 6, 8, and 9 were active although some points have failed on several stringers; RS-2, 4, and 7 are out of service.
- b. Process Water System - Process tube 1941 developed a leak during charge-discharge operations. The tube was replaced. A total of 353 gallons of water was removed from the gas system following the tube replacement. Rear crossheader expansion joint Number 22 (near side) failed and was replaced. An inspection of all the front nozzles revealed a number of lugs loose in the lug rings. Thirty-six lug rings were replaced. Six rear pigtails were removed for corrosion studies.

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B. Operating Experience (Cont'd)

- c. KER Facilities - The reactor was down at the first of the month due to a rupture in KER Loop Number 3. The charge was removed, recharged with dummies and operated on recirculation until the month end outage when it was recharged with PT-IP-288-A. Loop Number 2 was operated with dummies following a rupture removal on the October 15 outage. The tube was borescoped and pressure tested prior to returning the system to high pressure recirculation operation for loop cleanup. A new expansion joint was installed on the front of this loop.

C. Improvement Experience

1. Production and Process Tests

- a. IP-130-A, K Reactor Trip-Out Test Down To Crosstie Back-Up - The trip-out test was performed on October 2 to obtain pressure-flow decay data from a simulated power loss occurrence and to test the back-up capacity of the crosstie line. It was found that the V-72 valves closed when crosstie back-up conditions existed. Correction was made by reducing the trip point at which the V-72 valves operate.
- b. PT Summary - At month end, fourteen tubes were charged with production test materials.

D. Radiation Experience

1. Radiation Occurrences

There were no Lapses of Radiation Control.

2. External Exposure

Dose rates up to 2 r/hr were required for personnel removing poison splines. A vacuum filter box with a surface dose rate of 10 r/hr required dose rates of 2 r/hr for removal.

A 1706-KE rupture in Loop #2 with initial dose rates of 1.5 r/hr decayed to 25 mr/hr in 24 hours.

KW PROCESSING OPERATION

A. Production

Input production was 107.0 per cent of forecast. A record maximum power level 85 units above the previous high was achieved under the planned power increase program.

B. Operating Experience

1. Operating Continuity

Reactor outages totaled 156.7 hours. Operating continuity was affected by the following events:

1. Operating Continuity (Cont'd)

<u>Day</u>	<u>Hours</u>	<u>Remarks</u>
1	107.2	Completion of outage initiated September 30. Startup was delayed due to river pump shaft coupling failures.
5	1.9	Rupture in tube 4078.
30	47.6	Scheduled metal processing outage. Outage extended into November. (to month end)

2. Equipment Experience

- a. Instruments and Circuitry - A Panellit ground alarm was experienced when a water leak developed in the Bourdon tube of gage 4660. The gage was replaced eliminating the condition without incurring a ground trip. A second gage fitting (1444) could not be corrected and a trough was installed to carry water away to prevent a Panellit ground condition. A total of 14 inoperative RTD circuits was repaired and returned to service. A new graphite stringer, RS-7, was installed.
- b. Ruptures - A ruptured slug in tube 4078, KW Reactor's first KIII N rupture, was discharged October 5. The column was removed using normal charging machine pressures. The charge had attained an exposure of 395 MWD/ton. Type of rupture remained unknown since the metal could not be segregated from other material in the pick-up chutes.
- c. Crosstie Scram - During the routine monthly check of the "A" Riser Mercoid trip settings which required the tripping of the Mercoid pressure switch and the automatic opening of the KW V-73 emergency valve, a scram of KE Reactor occurred. As required by procedure, the V-72 guard valve was closed prior to checking the trip. When the V-73 valve opened, 165-KE experienced a pressure drop of about six psi followed by a surge. KE Reactor experienced a Panellit trip which caused the reactor to scram. Duplication of the test conditions was attempted shortly after the scram, but no pressure variations occurred. Actual cause of scram was not determined by month end.

C. Improvement Experience

1. Production and Process Tests

- a. PITA-IP-8-I, "Charging KIII Fuel Element Into K Reactors" - The planned conversion to KIII metal loading was completed.

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- b. PT-IP-130-A, "K Reactor Trip-Out Test Down to Crosstie Back-Up" - The trip-out test of a K Reactor with KIII metal loading down to crosstie back-up was successfully conducted on October 2 during an outage. The KW V-72 guard valve closed for approximately 30 seconds when the Mercoid, designed for protection against a crosstie failure, tripped. The unnecessary valve operation resulted from a trip setting which was too high. Water was restored to KW Reactor well ahead of the time when slug damage might begin. The Merciod trip setting was corrected prior to reactor start-up.

2. Projects

- a. CG-791, "Reactor Containment" - The ATP for Phase I, Fog Spray, was conducted on October 30. Adjustments to the Grove valve operation were made. The waterproofing of rear face electrical system leads proved satisfactory during the test, and no significant discharge elevator problems was encountered. Water seeped through rear face access holes and doors. Containment and prompt clean-up kept this contamination problem to a minimum.

D. Radiation Experience

1. Radiation Occurrences

There were two Lapses of Radiation Control. One lapse involved the movement of an over-limits contaminated tool to the Blue Tool Room; the other involved uncontrolled exposure to personnel.

2. External Exposure

Rear face dose rates of 250 mr/hr were encountered on initial entry. Average rates for metal processing were 120 mr/hr. One rupture was discharged with an average dose rate of 1 r/hr. A section of balled up thermocouple wire was removed from RS-2 on X-1 level at dose rates to 2.5 r/hr.

Several casks of irradiated 3X balls and shield plugs were moved to the burial ground at dose rates of 2.8 r/hr. The trench was subsequently backfilled to reduce the radiation level.

3. Contamination Control

Smearable contamination up to 100,000 c/m was deposited in the Blue Tool Room from a contaminated mandrel. More rigid control over contaminated tool movement was initiated. One well car was received on October 16 with smearable contamination up to 60,000 c/m.

KE-KW POWER OPERATION

A. Operating Experience

1. Electrical Peak Control

A peak of 325.8 megawatts was established on October 10 in excess of the previously set control point of 323 megawatts. The peak

resulted from malfunction of the megawatt meter in 165-KW, which indicated 28 megawatts below true level. A control point of 325 megawatts was retained for the remainder of the month.

2. Start-Up Delay - 181-KW River Pumps

A start-up delay of 55.5 hours occurred due to failure of Number 2 and 4 181-KW river pumps on October 2. Details of these failures are discussed under Equipment Experience.

B. Equipment Experience

1. River Pumps - 181-KW

On October 2, during Production Test IP-130-A, Number 4 pump at 181-KW tripped off from overload. Shortly thereafter attempts to start Number 2 pump were unsuccessful. Number 4 pump was pulled and found to have a broken thrust nut shaft coupling, allowing the impeller and shaft to drop and cause the impeller to ride the pump bowl. The pump was repaired, and a new larger impeller was installed. The Number 2 pump shaft was found in the same condition. Repairs were completed on October 6, and the pumps were returned to service.

2. Number 1 Turbo-Generator Governor - 165-KW

On October 28, the Number 1 generator at 165-KW would not pick up load when the governor speed control was actuated. Number 3 generator was put on the line. While attempting to reduce the load on Number 1 and back it off the line, the generator suddenly dropped its load causing a slight power surge but affecting no other equipment. The oil relay shaft of the governor was found to be bent. Necessary repairs were completed.

KE-KW MAINTENANCE OPERATION

A. Equipment Experience

1. Instruments

- a. Panellits - Range changes were made to 1,512 gages. Fifty-eight dual trip switch Panellits were installed in 105-KW under PT-IP-266-B. Guard rails were installed on the Panellit manifold in 105-KE to prevent inadvertent switching of a toggle valve.
- b. Thermal Shield Thermocouples - Number R-15 thermocouple was repaired. Failure of the insulation on the leads, particularly near the connectors, was evident. Long range plans were made for lead wire replacement during FY-61.
- c. Total Cooling Water Flow Indicator - A calibrated gage was installed in 105-KE to read the water flow from 190-KE to 105-KE. Plans were made for similar installation in KW Reactor.

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2. Electrical

- a. Radiation Alarms - 105-KW - A modification to the pick-up chute alarm system to include red indicator lights, bell muting and automatic resetting was designed, approved and installed.
- b. Design Changes - 105-KW - The following changes were completed:
 - (1) Number 198 - Retention Basin Inlet Valve Control.
 - (2) Number 177 - Safe to Unbypass Indicating Lights.
 - (3) Number 258 - Temperature Monitor Resistor Bypass Switch.
- c. Fog Spray System - 105-KW - Waterproofing of "D" elevator electrical equipment was completed.

3. Mechanical

- a. Charging Machines - 105-KE-KW - All machines were overhauled and modified in accordance with recommendations of D. Lenkersdorfer of Reactor Plant Engineering.
- b. Effluent Lines - 105-KE - Permanent repairs were made to the leaking Dresser coupling.
- c. 1706-KE-KER - Repairs were made to the anchors and a new expansion joint installed in the steam line located in the pipe tunnel between 1706-KE and 165-KE.

4. Engineering

- a. Filter Plant Backwash Valves - Examination reveals that corrosion of valve bodies occurs where the brass seat rings screw into the bodies. Recommendations for use of oversize monel seat rings in valve bodies with threads machined to take the new size were received from the vendor.
- b. Design Change 326 - Riser Pressure Annunciator Modification - The design change covering removal of relays not essential to circuit operation was prepared and circulated for approval.
- c. Panellit Concidence Scram System - 105-KE-KW - Assistance was given to Component Testing for preparing a design change which will modify the present panellit system (single trip) to a dual trip system.
- d. The following procedures and check sheets were prepared and circulated for comments:
 - 1. Horizontal control rod, functional electrical inspection procedure and check sheets.
 - 2. Electrical inspection of the 10,000 H.P. hi-lift pump motors.
 - 3. Electrical inspection of the hi-lift pump pressure lube oil system.

B. Planning and Scheduling

1. Class "A" overhauls were completed on 162 items of equipment, class "B" on 275 items and lubrication or inspection on 82 items. The class "A" overhauls included the two river pumps at 181-KW, chemical feed pumps in both 183 buildings, and a glycol pump in 165-KE. The "B" overhauls included Number 3 boiler in 165-KE and Number 1 boiler in 165-KW.

SUPPLEMENTAL CREWS OPERATION

A. Events Influencing Costs

1. Supplemental Crews Time Distribution

The non-exempt time distribution from September 28 through November 1, was as follows:

<u>Area</u>	<u>Percent</u>	<u>Hours</u>	<u>Area</u>	<u>Percent</u>	<u>Hours</u>
100-B	19.5	1894	100-F	20.1	1961
100-C	4.8	465	100-H	10.7	1042
100-D	9.5	920	100-KE	7.4	716
100-DR	12.2	1189	100-KW	15.8	1540



Manager
KE-KW REACTOR OPERATION

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PRODUCTION OPERATION
OCTOBER, 1959

I. ORGANIZATION AND FUNCTIONS

No change.

II. PERSONNELA. Force Summary

	<u>September 30</u>			<u>October 31</u>			<u>Net</u>
	<u>Ex.</u>	<u>N.E.</u>	<u>Total</u>	<u>Ex.</u>	<u>N.E.</u>	<u>Total</u>	<u>Change</u>
General	2	1	3	3	1	4	/1
Prod'n Rpts. & Statistics	1	2	3	1	2	3	0
Prod'n Planning and Sched'g	5	4	9	5	4	9	0
Prod'n Computing	3	3	6	3	3	6	0
Essential Materials	1	1	2	1	1	2	0
	12	11	23	13	11	24	/1

R. B. Shoen, Specialist, Manufacturing Administration, KE-KW was transferred to Production Operation as Specialist, Operations Analysis.

III. PERSONNEL ACTIVITIES

On October 27 the Production Operations of IPD and CPD held their third annual joint dinner and information meeting at the Desert Inn. All Personnel of both Operations were invited, and participation was excellent. A few close working associates from FPD and Contract & Accounting were included as guests.

IV. SAFETY AND SECURITY

There were no injuries or security violations. Safety and security meetings were attended as scheduled.

V. NON-ROUTINE REPORTS

<u>Doc. No.</u>	<u>Title</u>	<u>Author</u>	<u>Date</u>	<u>Class.</u>
HW-62392 RD	Production Forecast - N Reactor	W. G. Albert	10/14/59	Secret
HW-62396	Forecast Process Tube Re- placements Fiscal Years 1960 to 1964	E. F. Fairweather W. S. Slippern J. R. Young	10/15/59	Confid- Undoc.

VI. FUNCTIONAL ACTIVITIESA. Production Planning and Scheduling Operation

1. Forecasting

A reactor production forecast covering the period October 1, 1959 through June 30, 1961, was completed and issued as Document No. HW-62172 RD.

2. Production Scheduling

a. Discharge Concentrations

There were no discharge goal exposure changes during October. A correction to the values previously reported concerns I and E enriched slugs at F Reactor which are being discharged at 850 MWD/ton rather than 950. The goal plan in effect is the result of administrative decision based largely on fuel supply limitations and the pilot concept of probing higher power operation at certain reactors.

Material discharged outside the discharge goal plan is listed below:

Below Goal Discharging - October 1959

<u>Reactor</u>	<u>Tons Dischg.</u>	<u>Tons Excess Usage</u>	<u>Material Type</u>	<u>Reason</u>
B	1.5	0.9	Regular	Process tube replacement.
D	1.9	0.9	Regular	Rupture prone lot KL-214-D.
DR	0.7	0.2	Regular	Tube replacement and enrichment pattern adjustment.
F	28.3	4.6	Regular	Represents the additional uranium used as a result of the across-the-board goal reduction versus a goal based on the integrated power and temperature.
H	6.3	2.3	Regular	PT-IP-177-A, Conversion ratio test.
	3.3	2.2	Regular	Charging of E-N striped load under PT-IP-255-A.
KW	0.8	0.2	Regular	Tube replacement and temporary poison.
KE	0.5	0.4	Regular	PT-IP-216-A tubes discharged in error.
	<u>0.6</u>	<u>0.2</u>	Regular	Temporary poison
	43.9	11.9	Totals for regular metal	

A comparison of October discharge exposures for each metal type with data from previous months is as follows:

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Comparison of October Discharge Exposures (MWD/T)

	<u>Regular U</u>		<u>Enriched U</u>	
	<u>Solid</u>	<u>I & E</u>	<u>Solid</u>	<u>I & E</u>
August	757	743	953	824
September	741	745	904	772
October	739	700	928	739

b. Process Tube Replacement

Tube replacement activity for October is given below:

B - 38
 DR - 13
 F - 31
 H - 4
 KE - 1
 KW - 5
92 total tubes replaced

c. Off-Plant Shipments

Six casks of polonium were sent to Mound Laboratory as part of the large October request for this product. However, just before the material for the remainder of the October requirement was to be discharged, the AEC requested that it be held in abeyance pending a revaluation of the program.

3. Operations Analysis

Work continued on assembling data, both current and historical, for management use. The five-year tube replacement forecast was reviewed, up-dated and issued as Document No. HW-62396, Forecast Process Tube Replacements - Fiscal Years 1960 through 1964. Outage Time Accounting system changes were reviewed from the standpoint of developing a more effective reporting system.

B. 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 EDPM processing.

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

The Production Computing Function Study group continued with the evaluation of a proposal to perform some PCO work on the large 709 EDPM. Research and Engineering does not now have a representative in the group due to the resignation of the Specialist, Reactor Data Analysis. Currently a cost and procedural analysis is being made of a specific tube corrosion data processing application.

C. Production Reports and Statistics

Routine processing of the Daily Production and Daily Operations Reports and the monthly Manufacturing Section Record Report was continued. Data involving reactor operation and associated equipment were collected and tabulated in historical record books. A Chart Book was maintained for the HAPO General Manager and preparation of Chart Books for the IPD General Manager and Manufacturing Section Manager was continued. A large volume of both routine and non-routine data were supplied to IPD personnel. Some routine data were also supplied to the FPD, CPD, and HLO. Attended a Planning Meeting, representing IPD, for the preparation of the 1959 Annual Report.

D. Essential Materials

Rail and truck shipments received in October were as follows:

Carload shipments for IPD	347
Carload shipments for other Depts.	173
Turck shipments for IPD	<u>131</u>
Total	651

Helium consumptions during the month of October in all reactors were as follows:

100-B	464,200
100-C	464,200
100-D	241,400
100-DR	278,400
100-F	248,300
100-H	147,100

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DECLASSIFIED100-KE
100-KW252,700
248,900

Total 2,345,200

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 October:

1. Increased the quantities of coal, aluminum sulphate and sulphuric acid shipped during the month to adjust these inventory levels upward in the event transportation delays should develop during the coming months.
2. Inspected and sampled a barge loaded with liquid sodium dichromate that arrived at the Snake River Terminal on November 2. This barge represents one-half of a 700 ton order shipped from Painesville, Ohio via Baltimore, Maryland and Portland, Oregon. The analysis and color of this material was satisfactory and unloading was authorized to begin on November 3.

E. 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. Special liaison was maintained with Relations Practices relative to unclassified employee communications involving production and technology information.


O. S. Hulley, Consultant - Mfg. Education and Training in G. E.'s New York Office, spent October 6-8 at Hanford for orientation in manufacturing operations here, and for discussions of associated personnel training in IPD, CPD, and FPD. His visit was administered by the IPD Production Operation, with full integration of the interests of the other HAPO departments. Consideration was given to participation in G.E.'s Manufacturing Training Program and the associated Manufacturing Studies course.

For more immediate application, the course in "Fundamentals of Manufacturing" designed by G.E.'s Mfg. Personnel Development Services for local adaptation was seen to meet many of the training needs of IPD Manufacturing's first-line supervisors and equivalent specialists. Preliminary arrangements were made for a Services briefing in this course, together with CPD and FPD, and for requesting AEC-HOO approval of the instructional expense in utilizing this course.

Initial scoping of the training needs of Manufacturing Section exempt personnel was completed. In addition to the Fundamentals course approach noted above, agreement was reached on proceeding with the

development of a 6-8 week course in Radiation Protection for reactor supervision and specialists.

Liaison with the reactor plants continued in connection with arrangements for tours of facilities by authorized offsite visitors.


C. A. Priode, Manager
Production Operation

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REACTOR OPERATIONS STATISTICS - PROCESSING																			
MONTH October, 1959																			
		B		C		D		DR		F		H		KE		KW		TOTAL	
		NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.
INPUT PROD.-Pu (% OF FORECAST)		1	139.9	0	16.4	0	41.7	1	90.1	0	77.4	0	55.4	0	89.4	1	83.9	3	594.2
TIME OPER. EFF. (S OVERALL)		6	9.5	0	-	0	--(1)	1	0.8	1	23.4	1	6.0	3	20.2	0	--	12	59.9
		1	2.3	1	25.0	1	33.6	1	52.2	0	22.1	2	55.5	0	18.2	1	72.8	7	281.7
TOTAL		8	151.7	1	41.4	1	75.3	3	143.1	1	122.9	3	116.9	3	127.8	2	156.7	22	935.8
BREAKD'N OF REACTOR OTGE HRS.																			
PLANNED																			
CHARGE-DISCHARGE		36.3		9.5		27.2		48.9		31.2		21.1		60.2		57.2		291.6	4.9
TUBE REPLACEMENT		51.6						13.8		26.2		1.0						92.6	1.6
PROJECT WORK		12.1						5.5		1.0		1.2				6.3		26.1	0.4
PRODUCTION TEST		2.7				2.3		2.6				2.5		12.1		8.6		30.8	0.5
MAINTENANCE		37.2		6.9		12.2		19.3		19.0		29.6		12.6		9.5		146.3	2.5
MISCELLANEOUS														4.5		2.3		6.8	0.1
SUB - TOTAL		139.9		16.4		41.7		90.1		77.4		55.4		89.4		83.9		594.2	10.0
UNPLANNED																			
CHARGE - DISCHARGE		1.3						16.8		(3) 9.7								27.8	0.5
PRODUCTION TEST														18.4				18.4	0.3
RUPTURE REMOVAL				25.0		28.7		17.7				11.5				1.0		83.9	1.4
WATER LEAK								5.7				33.3		4.5				43.5	0.7
MAINTENANCE		1.0				4.9		(2)12.5		12.4		10.7		4.6		(5)71.8		117.9	2.0
INSTRUMENTATION										(4)23.4		6.0		0.5				39.1	0.7
PANELLIT		9.2						0.3						10.4				11.0	0.1
MISCELLANEOUS		0.3																	
SUB - TOTAL		11.8		25.0		33.6		53.0		45.5		61.5		38.4		72.8		341.6	5.7
TOTAL		151.7		41.4		75.3		143.1		122.9		116.9		127.8		156.7		935.8	15.7
NO.SLUG RUPT. (ALL TYPES)		0		1		1		2		0		1		0		1		6	
NO. NEW TUBES INSTALLED		38		0		0		13		31		4		1		5		92	
TYPE OF WATER LEAK - TUBE		0						1		0		2		1		0		4	
VAN STONE		0								0		1				0		1	

REMARKS:

- (1) Trip out test IP-278-A.
- (2) Repair bellows and charge venturi.
- (3) 9.7 stuck charge.
- (4) Panellit trip due to damaged sensing line.
- (5) 55.5 hrs. for repairs of #4 river pump.

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MONTH	REACTOR OPERATION STATISTICS -- SLUG RUPTURES
1	1050

October, 1959

[illegible]

BM-5000-051 (12-58) ABC-DE RICHLAND, WASH.

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MONTH	REACTOR OPERATIONS STATISTICS - POWER										SHEET 1	
	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL			
October, 1959												
RIVER WATER (BLDG. 181)												
TO RESERVOIR (BLDG. 182)	14,387		5,908		2,386	3,603						26,284
TO FILTER PLANT (BLDG. 183)	60,354		88,500		73,249	77,000						609,103
TO FILTER PLANT (C&DR)	110,490		55,264									153,700
TO R & E (KER) & FEO			203									153,700
TOTAL	185,231		149,875		75,635	80,603	503					801,847
TOTAL	8,268.7		6,690.4		3,376.3	3,598.1	6,999.7					35,794.4
RESERVOIR WATER (BLDG. 182)												
TO POWER HOUSE (BLDG. 184)	41		64		365	42						512
TO COND. SYSTEM (BLDG. 180)	3,000		1,620		1,796	3,561						9,977
TO COND. SYSTEM (180DR & 183F)			2,700		225							2,925
TO EXPORT SYSTEM	11,346		1,524		0	0						12,870
TOTAL	642.2		263.7		106.5	160.8						1,173.2
FILTER WATER (BLDG. 183)												
TO POWER HOUSE (BLDG. 184)	223		230		156	182						791
TO PROCESS (BLDG. 180)	68,354	92,903	74,680	66,164	71,089	71,400	152,976	150,861				748,427
TQ 108	2,100	5,000	200		1,159	1,240						9,699
TO 108DR			200									200
TO FILTER PLANT (BLDG. 182DR)		11,406	11,530									22,936
TO F & S SYSTEM	212		257		160	158						837
TO R & E (KER) & FEO			153									155
BACKWASH	871	1,181	1,250	630	685	4,020	3,322	2,789				14,748
TOTAL	3,203.4	4,932.3	3,950.6	2,981.7	3,269.8	3,437.3	6,977.2	6,861.2				35,613.5
PROCESS WATER (BLDG. 180)												
TO REACTOR	67,954	92,503	74,280	65,764	70,689	70,900	149,400	146,300				737,790
TO REACTOR	80,500	95,500	79,000	80,000	82,500	82,700	174,700	178,200				835,100
POWER HOUSE (K AREA)												
108 (KE - KW)							25	13				38
TO R & E (KER)							3,039	4,148				7,187
BUILDING USAGE							112					112
TOTAL	400	400	400	400	400	500	400	400				3,300
RIVER DATA												
ELEVATION (MSL, FT.)	3,051.3	4,147.2	3,333.7	2,953.6	3,173.4	3,187.3	6,828.8	6,734.4				33,409.7
(MAX.)												
(MIN.)	393.1		384.3		370.7	376.4		387.6				
(AVG.)	390.6		381.9		368.3	374.2		384.7				
TEMPERATURE	391.8		383.0		369.5	375.3		386.1				
AVG. °F	59.1		59.0		61.7	59.5		58.1				

MONTH October, 1959		REACTOR OPERATIONS STATISTICS — POWER										SHEET 2
WATER TREATMENT DATA		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL		
AT BLDG. 182 BLDG. 183	MM GALS	-	-	-	-	-	-	-	-	-		
	MM GALS	2,694.2	4,932.3	3,950.6	2,467.0	3,269.8	3,437.3	6,977.2	6,861.2	34,589.6		
CHEMICAL CONSUMPTION												
CHLORINE (BLDG. 182) (BLDG. 183)	LBS.	-	-	-	-	417	-	-	-	417		
	LBS	10,463	22,700	19,720	13,070	13,329	16,410	32,100	39,700	167,492		
	AVG PPM	0.5	0.6	0.6	0.6	0.5	0.6	0.6	0.7	0.6		
		3,745	-	-	-	-	-	-	-	3,745		
Alumina		*	-	-	-	-	-	-	-	*		
ALUM	LBS	65,421	126,231	138,990	80,740	109,209	106,025	201,700	275,500	1,103,816		
	AVG PPM	* 3.6	3.1	4.2	3.9	4.0	3.7	3.5	4.8	3.9		
SEPARAN	LBS	0	0	0	0	0	0	0	0	0		
	AVG PPM	0	0	0	0	0	0	0	0	0		
SULPHURIC ACID (48 100%)	LBS	162,435	301,665	248,920	146,373	225,263	228,424	499,800	434,400	2,247,280		
	AVG PPM	7.2	7.3	7.6	7.1	8.3	8.0	8.6	7.6	7.7		
DICHROMATE	LBS	46,000	55,074	44,341	40,000	47,345	52,998	100,300	98,200	484,258		
PURGE MATERIAL CONSUMPTION												
SOLIDS	LBS	0	300	0	0	0	0	0	0	300		

* Alumina and alum combined for average PPM.

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REACTOR OPERATIONS STATISTICS — POWER											SHEET 3
MONTH		October, 1959									
ANALYTICAL DATA		100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW		
RAW WATER											
PH											
PH AVG											
TURBIDITY		8.00	7.90	8.30	8.30	8.21	8.17	7.57	7.54		
PPM AVG		4.0	4.0	4.0	3.0	5.3	4.0	5.5	4.5		
FINISHED WATER											
PH		7.10	7.10	7.06	7.04	7.02	7.06	7.06	7.08		
TURBIDITY		.004	.004	.005	.003	.006	.005	.005	.003		
Cl ₂ RESIDUAL		.05	.05	.08	.08	.05	.09	.07	.06		
DICHROMATE		1.82	1.60	1.80	1.80	1.79	1.87	1.80	1.80		
STEAM DATA		100-B	100-D	100-F	100-H	B-D-F-H TOTAL	KE	KW	KE-KW TOTAL		
GENERATED (MAX)		140,000	146,000	94,000	82,000	462,000	45,000	45,000	90,000		
(INCR)		113,800	120,000	78,000	72,900	384,700	- - -	- - -	- - -		
(AVG)		114,200	114,861	75,000	70,200	374,261	34,366	32,228	66,594		
TOTAL		85,020	85,457	55,803	51,948	278,228	25,568	23,978	49,546		
TO PLANT		72,096	72,467	49,107	44,052	237,722	23,011	21,580	44,591		
COAL RECEIVED		5,527	5,283	5,375	5,157	21,342	- - -	- - -	- - -		
CONSUMED		4,672	4,742	3,265	3,146	15,825	- - -	- - -	- - -		
IN STORAGE		27,602	31,084	17,922	20,089	96,697	- - -	- - -	- - -		
GEN STEAM/LB. OF COAL		9.10	9.01	8.54	8.26	8.79	- - -	- - -	- - -		
OIL RECEIVED							0	458,475	458,475		
CONSUMED							231,672	206,139	437,811		
IN STORAGE							1,050,168	1,007,622	2,057,790		
GEN STEAM/GAL. OF OIL							110.4	116.3	113.2		
ELECTRICAL DATA											
TOTAL GENERATED KW HRS.											
							1,551,200	1,596,000	3,147,200		

FACILITIES ENGINEERING OPERATION
MONTHLY RECORD REPORT

OCTOBER, 1959

I. ORGANIZATION AND PERSONNEL

A. Responsibility

Effective October 1, 1959 responsibilities for liaison work with J. A. Jones & Company - CPFF Construction Service Contractor - and work review determinations were added. Other responsibilities remain unchanged.

B. Personnel Statistics

	<u>Sept. 30,</u> <u>1959</u>	<u>Oct. 31,</u> <u>1959</u>	<u>Net</u> <u>Change</u>
Employees on Permanent Roll	175	180	+ 5
Technical Graduates (Rot.)	10	6	- 4
Technician Trainees	2	2	0

	<u>FEO</u>	<u>Technical Graduates</u> <u>Rotational</u>
Transferred into Operation	8	2
Transferred out of Operation	1	6
Payroll Removals	2	0

C. Personnel Changes

C. T. Hayner, Engineer, transferred from Fuels Preparation Department to Plant & Industrial Engineering on October 1, 1959.

C. E. Lange, Engineer, transferred from Construction Engineering to Project Engineering on October 1, 1959.

J. W. Hedges, Engineer, transferred from Equipment Development to D-DR Reactor Operation on October 1, 1959.

Bernadine Fleiss, Clerk, transferred from Construction Engineering to Plant & Industrial Engineering on October 12, 1959.

Bonnie Richards, Clerk, Plant & Industrial Engineering terminated on October 16, 1959.

Jo Ann Milliman, Clerk, transferred from Fuels Preparation Department to Equipment Development on October 19, 1959.

C. E. Jones, Engineer, transferred from K Reactor Operations to Reactor Modification Design on October 15, 1959.

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F. L. Bramer, Engineering Assistant, transferred from Fuels Preparation Department to Equipment Development on October 1, 1959.

G. L. Erickson, Engineer, was placed on the rolls with Equipment Development on October 26, 1959.

F. H. Myers, Design Draftsman, Plant & Industrial Engineering, was removed from rolls due to illness on September 24, 1959.

D. Personnel Development

No courses were offered.

E. Safety and Security Experience

Seven medical treatment injuries were reported.

One security violation was reported.

II. MONTHLY REPORT OF INVENTIONS OR DISCOVERIES

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.

None

III. ACHIEVEMENT

A. Reactor Modification Design

1. Research and Development

Downcomer model tests were conducted this month at the Albrook Hydraulic Laboratory, Washington State University. The results of the model studies indicate that holes should be cut in all downcomer baffles and that notching of the I-beam supports was beneficial at high flow rates.

A proposal was received from the Washington State University for model studies planned for the increased bulk temperature program. This proposal is now being reviewed.

Holmes and Narver, Inc., are performing seismic vulnerability studies of HAPO installations in conjunction with a general study of coolant backup for existing reactors. Holmes and Narver was requested to:

- (a) Provide by November 9, 1959 a summary evaluation of the water plant and piping systems based on cursory and preliminary calculations.
- (b) Complete by March 1, 1960 detailed calculations of these portions of the system established as most vulnerable to seismic disturbances.

2. Design Projects

(a) CG-775 100-K Area Water Plant Expansion

The design scope for the project was revised to propose the use of submersible pumps in the existing pump houses rather than a new third river pump house as previously proposed. A study is now in progress of offsite installations of similar service to evaluate design and operational considerations.

The filter plant capacity test at 183-KE is progressing satisfactorily. No operating problems have arisen in maintaining water quality at the high flow rate. A major reduction in the automatic cycle time has been accomplished by overlapping consecutive cycles. This allows one filter to close its influent valve and drain while another filter is finishing its backwash cycle. This has reduced the overall cycle time to about thirty minutes.

An air injection line will be installed in the number 2, 24" butterfly control valve in 183-KW shortly, to

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test the principal of using air injection to suppress the cavitation. This change is based on consultation with the vendor.

(b) CGI-791 Reactor Confinement

Overall design progress is now 96 percent complete. The revised Phase III Design Criteria not affected by the 105 Building dust loading was approved by Project Representatives. Phase III Design Criteria will be issued in its entirety following resolution of the dust content problem.

Scope drawings are being prepared to show the extent of fan, electrical, and building modifications necessary for Phase III. Title II design is proceeding in conjunction with Title I design with these modifications.

Phase I - Comment drawings have been issued of the rear face instrumentation duct moisture protection shields for all areas except DR. Field measurements are required for DR before completion of the drawing.

Phase IIA - Steam line relocation drawings for D, DR, and F have been approved. Phase IIA detail design is now 100 percent complete.

Phase IIB detail design is 100 percent complete. The purchase requisition for the second filter bank filter frame assemblies has been issued. Purchase requisitions for the first stage equipment are withheld pending resolution of the 105 Building dust content.

Phase III design is now 91 percent complete. Pressure-flow relationship has been established for fan modifications for the new exhaust system. By-pass arrangements, whereby approximately 25 percent of the exhaust flow is recirculating will be utilized for the exhaust fans in all areas except DR and K which will require new fans. Following approval of Phase III revised design criteria, a new schedule for completion of Phase III detail design will be prepared.

The overall completion of the test program is approximately 85 percent. Actual testing is underway on all tests.

Additional irradiated uranium burning tests have been made at ORNL with carbon dioxide and air atmospheres. It was found that irradiated uranium oxidation rates in CO₂ is approximately one half of those for air and iodine release is one quarter. It was also found when the

temperature was raised to 1600C, UO_2 is given off as a vapor and is plated out on the cold surfaces downstream. Analysis of this film indicates the particles to be in the sub micron range 0.001 micron or less. High radiation activity of this film was noted.

To date, vendors have not been able to fabricate an inflatable seal made of Hypalon to our specifications. Test seals fabricated from an improved ozone resistant neoprene have been ordered from Huntington Rubber Mills for test evaluation as a substitute for Hypalon.

Both air filter environmental test facilities have been installed in the exhaust tunnels at 105B and F. The test unit at 105B has been in operation since October 9 and the unit at 105 F since October 26. Insufficient operating time has been accumulated to date to establish a trend in estimating air filter life in the 105 Building exhaust air.

The Halogen Collector Test Facility at the A. D. Little Company has been completed and shakedown tests have been underway since October 12. The analytical caustic scrubbers for the sampling points have been calibrated and correction factors determined. During the month, nine absolute filters were procured from Cambridge Filter Corporation for delivery at A. D. Little, Inc. Five filters were damaged on arrival. A 12" drop of the filter in the packing box will split the filter paper at the creases and prevent their use.

(c) CGI-839 Modification of Fuel Element Test Facilities
1706-KER

A review was made of the safety incentives of installing flywheels on the KER pumps in the event there occurred a simultaneous Bonneville power outage and a failure of the 100-KE and 100-KW emergency generator systems which provide KER pumping power. The proposed pump motor size, without flywheels, is 200 horsepower. The existing motor control centers can be used up to 200 horsepower. Any increase in horsepower, which would be necessary with flywheels, will require new and larger starting switch-gear. This equipment could not be installed in the present control center locations and would require additional building modifications.

It was concluded that flywheels should not be included in project scope at this time, however, if the necessity for last ditch protection is made mandatory for the KER loops, then flywheel protection could be added to the facility under later project action without incurring excessive delays in critical long term KER pump procurement.

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With regards to the pump and motor sets to be procured under Project CGI-839, the problem of fitting a flywheel unit, if required, into a cell will be better defined after receipt of the vendors drawings with pump set base dimensions.

Mechanical and civil detail design on the loop cell arrangements are being held back until receipt of vendors drawings on the primary pumps and heat exchangers.

Purchase requisitions for the primary pumps and heat exchangers are now out for vendor quotations.

The contract for the Architect-Engineer services on the detail design of the Decontamination and Hot Maintenance shop was awarded to Carson, Kesterson, and Moe of Kennewick, Washington. The Architect-Engineer has visited the building site to firm up design questions and is now preparing detail design drawings. Approximately ten drawings will be prepared by the Architect-Engineer.

(d) CGI-844 100-K Area Backup System

Seven different systems for providing coolant backup for the K reactor complex have been considered and compared with the existing coolant system. The recommended system consists of a steam-turbine driven pump in each area plus three gas-turbine driven pumps in a "midway" pump station providing water to a modified high pressure cross-tie line. This system eliminates robbing one reactor of coolant to supply the other and consequently eliminates the necessity for one reactor scrambling the other. The other systems all fail to meet the safety criteria on one count, either of inadequate flow from the last ditch system, or lack of independence between systems.

A meeting has been scheduled to submit the results of the above study to the Design Council for their consideration.

(e) MJA-18 100-K Graphite Restriction

Progress on this problem is being delayed until receipt of special HCR ceramic sleeves that are being procured for on-pile testing.

3. Visitors

Mr. D. M. Hopkins, Chief Consultant, Valve Department of Allis Chalmers Manufacturing Company visited 183-KW on October 9, 1959 to inspect the #2, 24" butterfly control valve which failed in service.

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Mr. A. B. Carson of Carson, Kesterson, and Moe visited the 700 Area on October 6 to discuss schedules and reports that would be required as the Architect-Engineer for the design of the Hot Maintenance Room addition to the 1706-KER Building.

Mr. Kesterson of Carson, Kesterson, and Moe with Mr. Lyle Marquie of Lyle Marquie and Associates visited the 1706-KER Building site to obtain information on existing equipment and service tie-in locations.

4. Trips

M. H. Schack visited the Byron Jackson Plant at Los Angeles on October 16 and 17 to inspect impellers that were to be returned to HAP0 for operation.

M. H. Schack visited the Albrook Hydraulic Laboratory, Washington State University on October 2 to discuss downcomer model studies and he visited the University on October 29 and 30 to give a technical paper at the Second WSU Hydraulics Conference on pump test stand acceptance tests.

N. F. Fifer visited the Washington State University on October 30 to attend the Hydraulics Conference.

5. Significant Reports Issued

HW-59071	"Alternate Methods of Removing Radio-Halogens from Air Stream", E. L. Etheridge, October 28, 1959, Confidential
HW-62079	"DDR-41 Test Conditions and Requirements", N. F. Fifer, October 2, 1959, Confidential-Undocumented
HW-62211	"Field and Test Stand Acceptance Testing on Pumps", M. H. Schack, October 6, 1959, Unclassified
HW-62341	"Project CGI-844 100-K Coolant Backup System Analysis", R. E. Trumble and D. F. Watson, October 22, 1959, Secret
HW-62385 RD	"Project CGI-791 Project Representatives Meeting No. 12", E. L. Etheridge, October 14, 1959, Uncl.
HW-62403	"CG-775 Representatives Meeting No. 6", H. W. Heacock, October 15, 1959, Unclassified
HW-62405	"Project CGI-791 Project Representatives Meeting No. 13", E. L. Etheridge, October 16, 1959, Uncl.
HW-62414	"Project CGI-839 Project Representatives Meeting No. 7", E. R. Rudock, October 16, 1959, Uncl.

B. Equipment Development

1. Existing Reactor Work

Bids for the 105-K Cap Remover were rejected and a specification revision on a four option basis prepared for rebid action to obtain a system and bid price compatible with available funds.

Design was completed and a work order issued to Central Maintenance for the fabrication of poison spline coilers - a new equipment concept directed toward solving one of the major problems (disposal) which is limiting complete application and optimum economic return from the poison spline system. The vendor supplied poison column displacement winches being laboratory tested (108-D) preparatory to on pile production test were found to require alterations to prevent cable foul up in normal use.

Ionization chamber current measurements (for the log ion period meter development) made in an under reactor channel at 105-DR indicates that sufficient neutron flux exists at this location at DR to operate a gamma compensated ion chamber over the chamber's useful range. Other reactors will also be checked for this.

To illustrate to the AEC the type of messages that would be passed over portable transceivers, about 20 hours of tape recordings were made of messages passed over the C-D Elevator to 105 Building communications system during a recent outage at 105-DR. A review of the tape indicates, in our opinion, that there are no items of a classified nature.

The surge suppressor for pressure monitors at B and C Areas purchased from Instrument Labs by B-C Maintenance Engineering were tested and examined and it was concluded that the vendor's latest effort was satisfactory for use.

Stop gap power rate of rise meters (CGI-806) were installed on D and DR Reactors. A partial installation of RTD cables was made on 105-B. The 105-DR unit will be tested during the start-up of October 16-17.

A development test was completed on an improved amplifier for use with the seismoscope system for earthquake protection. Silicon controlled rectifiers are used in the amplifier to trigger and lock-in the control action. The amplifier circuitry was installed on the DC power bus at C Reactor and isolated by a resistance-capacitance filter. Voltage transients which occur during operation of major electrical equipment were photographed and the attenuated effects on the seismoscope amplifier found to be negligible.

A circuit for reactor safety trip identification and Panellit gauge trip identification has been developed and a prototype

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has been assembled for reactor use, as requested by S-DR Reactor personnel. The first device to cause scram is indicated on ground glass optical readout panels.

During a routine outage at DR Reactor the connections were completed between the Trip Identification System and the pressure monitor's row indicator lights. Connections to the pressure monitor column gauges will be completed when the remainder of the special jumpers are received. Also, most of the connections were completed to the safety circuit relays which operate when scrams occur.

The environmental component test fixture was installed in the 115-105- Building exhaust air tunnel on October 8, 1959. The installation was completed and placed in service on October 9, 1959. This fixture is intended to determine the effectiveness of a molecular sieve halogen collector filter and air filters after being exposed to normal reactor exhaust air for an extended period of time.

2. New Reactor Work

New Production Reactor design testing was continued with the Tube Rupture test and the Two Phase Critical Flow test having top priority for craft assistance and NPR-PCE loop operation. A total of three Tube Rupture tests and twenty-two Two Phase Critical Flow tests were performed during the month.

Work continued in the development of a process tube to nozzle connection. A threaded tube joint, a rolled tube joint, and a 37 degree flange tube joint are being evaluated in that order of priority.

Testing continued on threaded tube fittings using two types of seals. The No. 1 Canadian rolled joint was removed from test and returned to Canada.

Two sample 37 degree flared joints were submitted to tensile pull-out tests. The flared fittings appear to have somewhat less axial strength than the threaded fittings.

Stability and drift tests of the Daystrom two channel monitor prototype continued during this activity period. The monitor was operated for two weeks with the high trip points set one percent above and the low trip points set one percent below the input signal without any malfunctions or a trip.

Further testing of the Luther rotary differential transformers, proposed as flow to electrical transducer components, indicated nothing is gained by the use of a split winding. A split winding can be used, but more is gained when the two windings are used in series for maximum voltage to a monitor system and logging system.

Two pressure welded specimens of NPR Zircaloy-2 tubing were pressure tested. The annealed tubing broke in the weld at a pressure of 6500 psi at 345°C. Its appearance suggested an incomplete weld. The 20 percent cold worked tubing broke longitudinally at 9500 psi at 345°C, indicating a completely successful weld.

3. Security Experience

A security file violation was incurred by Materials Development on October 6, 1959.

4. Visitors

Dr. K. Newman of Turco Products Company visited R. R. Henderson on October 14, 1959, to discuss reactor decontamination.

On September 30, 1959, Yates Hickey, Robert Lynch, and E. J. Messa visited 1707-B and 189-D with C. A. Munro to observe tests and obtain information for required design modifications to the charge seater. E. J. Messa visited work area of 105-KW to observe the operational environment for this equipment.

On October 8, 1959, Yates Hickey and M. C. C. Chisholm, President of Teleflex Corporation, visited the 700 Area with C. A. Munro to discuss purchasing procedures related to procurement of charge seater mechanisms.

On October 9, 1959, A. J. Kaye and L. R. Sedgeley of Manufacturing Services Equipment Development Laboratory visited R. M. Smithers and C. A. Munro in 1707-B to obtain basis for scope study of means to handle irradiated fuel elements. Kaye was shown the transfer area at 105-C.

Don Melton and G. O. Haglund of General Mills visited R. M. Smithers, R. B. Willson, E. C. Wood, and V. R. Saarela October 13, 1959, in the 703 Purchasing conference room for discussion regarding the revised specification and bid options for the Cap Remover.

On October 15, 1959, Tom Leonard, D. E. Platt, and R. P. Migra of Thompson-Ramo-Wooldridge met with R. M. Smithers and R. B. Willson in Purchasing Section conference room, 703 Building, and 1707-B for discussions regarding the revised specification and bid options for the Cap Remover.

Nat Paris, Sales Manager of Anton Electronics visited J. W. Green and others on October 8, 1959, to discuss radiation detector requirements.

Bill Waddell, Daystrom Systems Division of the Daystrom, Inc., visited with J. D. McCullough on October 13, 14, and 15 to discuss Process Tube Flow Monitoring.

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5. Trips

On September 21 through 25, R. M. Smithers visited General Mills Company, Minneapolis, Minnesota, to reevaluate the remote manipulator concept and Manufacturing Services Equipment Development Laboratory and General Engineering Laboratory, Schenectady, to explore the feasibility of engineering service for conceptual development of irradiated fuel element handling system.

J. W. Green visited the Ohmart Corporation in Cincinnati, Battelle Memorial Institute in Columbus, Ohio, Victoreen Instrument Company and Reuter-Stokes in Cleveland; the General Engineering Labs in Schenectady, and APED in San Jose in conjunction with prototype fabrication and development programs on In-Core Flux Monitoring and Fuel Rupture Monitoring. The trip covered the period September 12, 1959, through September 26, 1959.

R. Sherrard and D. F. Arnold visited Monitor Systems, Inc., Fort Washington, Pennsylvania on September 28, 29, and 30 for audit of CGI-802, Phase I high speed scanner equipment. On October 1, 1959, R. Sherrard visited Thomas A. Edison Company, Orange, New Jersey, to discuss Temperature Transducers and Temperature and Flow monitoring. Contact was Mr. J. J. Dietz. On October 2, 1959, he visited A. C. Rugge, Associates, Hudson, N.H., to discuss temperature detectors. Contact was W. E. Jackson, Chief Engineer. On October 5, 1959, Mr. Sherrard visited Sigma Instrument Company, South Braintree, Massachusetts, with Virginia Hudson, Development Engineer to discuss magnetic amplifiers for flow and temperature monitoring and visited Epsco, Inc., Cambridge, Massachusetts, on October 6 to discuss high speed scanning with B. Cordon, President and L. Larence, U.P. Manufacturing. On October 7 and 8 he visited Panellit, Inc., to discuss flow and temperature monitoring. Contacts were A. F. Sperry, President and engineers, Jack Sargent, Shep Winters and J. Srock. On October 8 and 9 Mr. Sherrard visited Lumen, Inc., to discuss magnetic amplifier repeaters.

On September 18 to 27, 1959, J. E. Kaveckis attended the ISA Conference in Chicago, Illinois and conferred with vendors who have prototype orders from Instrument Development relative to progress and to exchange information with these and potentially new vendors on instrument development problems relative to flow, temperature, nuclear and scanner developments for HAPO. Some vendors contacted were T. A. Edison Company, Panellit Corporation, Daystrom, Epsco, Hays and Ohmart Corporation, Charles Englehard, Beckman Systems, Ascop, etc.

R. W. Gilmore visited Phillips Company, ETR-MTR, Idaho Falls, Idaho on September 20 to 25, 1959, to check over and test instrumentation of ETR rupture test facility and certify its readiness for first test run to be made first week in October 1959.

D. B. Lovett attended the high temperature thermometry conference at ORNL, Oak Ridge, Tennessee on September 29 to October 3, 1959.

J. D. Maguire visited Vickers, Inc., in El Segundo, California, on October 21 to 25, 1959, for consultation on acceptance test of hydraulic system.

R. S. Hammond and R. L. Richardson consulted on equipment evaluation at the Boeing Airplane Company in Seattle, Washington on September 23 to 24, 1959.

R. R. Henderson and R. K. Smith, on August 30 thru September 4, 1959, visited for consultation with A. O. Smith Company in Milwaukee, Wisconsin on DDR-67; Metallurgical Products-GE, Detroit, Michigan, and Wolverine Tube, Detroit, Michigan, on metal splines.

R. K. Smith visited Wolverine Tube Company, Detroit, Michigan, on October 7 to 9, 1959, to observe extrusion of boron stainless steel for prototype horizontal rod.

R. R. Henderson visited the A. O. Smith Company in Milwaukee, Wisconsin, on October 17 to 20, 1959, to discuss DDR-67 and engineering questions on pressure welding for NPR connectors.

6. Significant Reports Issued

Undocumented - "Status Report - NPR Fitting Development Activities," J. H. Fastabend, 10-12-59.

Undocumented - "Fuel Element Charging Force," G. F. Howden, 10-2-59.

Undocumented - "Preliminary Report on D. T. 1063, Evaluation of Dynamic Visual Monitor," A. J. Lindsay, 10-5-59

Undocumented - "Interim Report on Proposed Solid State Seismoscope Amplifier," J. H. Greer, 10-26-59.

HW-59324 - "Improved Charging Equipment - A Budget Study Re-evaluation," C. A. Munro, 2-20-59.

HW-61240-A "Flux Monitor By-Pass Annunciator Circuit," W. E. Eberhardt, 10-21-59.

HW-62053 - "Interim Report No. 4 - Part "A", DT-1024 - NPR Fuel Handling," K. G. Hawkins, 9-25-59.

HW-62055 - "Components System Approach for Instrument Systems of NPR," R. Sherrard, 9-24-59.

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HW-62206 - "Rear-Face Connector Stress Analysis," F. D. Frisch,
10-5-59.

HW-62223 - "Final Report - Building Containment Tests - CG-791
Structural Strengths, Reinforcement, and Sealant
Materials," H. F. Jensen, 10-20-59

C. Plant and Industrial Engineering

1. Drafting Operation

Summary of Drafting Operation services provided is:

New, revised, as-built drawings	173
Sketches, layouts and charts	92
Microfilm drawings added or retired	1437
Film prints produced	147
Check prints produced	811
Catalogs added	82
Customers serviced print files	236
Customers serviced catalog files	57

2. Industrial Engineering

Rear Face Improvements

Improved material handling equipment for rear face nozzle caps at KE-KW incorporates use of a gravity roll conveyor, nozzle cap trucks and cap trays used in conjunction with engineered methods of removing, servicing, and replacing nozzle caps for charge-discharge activities.

To improve charge-discharge activity in the older reactors, rear face nozzle cap material handling equipment similar to that described for 105-KE-KW has been programed for the remaining reactors.

Metal Handling, 300-100

As a part of the three-phase program for charge-discharge improvement which has been formulated by IEO, the matter of fuel element shipment from FPD to IPD was studied. It is believed to be desirable to ship premade tube charges of fuel elements from FPD instead of shipping pallets, each containing a large number of slugs. This is because during a charge-discharge operation, a peak manpower load is required to achieve acceptably rapid charging rates. When each tube charge of fuel elements can be assembled prior to the charge discharge activity, extra manpower becomes available to relieve metal-handling personnel on the front face. It has been decided that the design-development of a suitable magazine shipping container will be undertaken by the IEO. Fabrication of three competing designs is underway.

Audit of Outage Activity, 105-B

As requested by B Processing management, assistance was provided to introduce to all shifts the engineered methods for preinsertion of downstream dummies and for rear face setup with associated premarking of the front and rear.

Program of Charge-Discharge Improvement

In accordance with the proposed Phase I of charge-discharge improvements, standard methods are being developed for charge-discharge operations.

A procedure for premarking the front and rear face has been developed in order to standardize techniques in all areas. Procurement of rear face tags and front face tags from Stores stock has been initiated. Delivery is expected before November 30.

Assistance was given to supplemental crews by familiarizing K. W. Greager with the engineered procedures and the techniques used to develop the procedures.

Metal Unloading Ramp

An engineered system of unloading fuel elements and other material from delivery trucks at the 105 buildings was presented to and accepted by the Processing Operations managers at their meeting on October 8. The program involves:

1. Purchase one ramp.
2. Test and evaluate one ramp in cooperation with 100-F, observing the tests for safety and compatibility with present equipment.
3. If test proves out equipment, proceed with purchase of other ramps.

Equipment specifications are being prepared for purchase action.

3. Reactor, Plant Engineering

Panellit Surge Suppressor, 105-KW

The surge suppressor drawing has been approved and issued to Central Maintenance for the fabrication of 12 prototype surge suppressors. Material has been ordered, and the shop work has been scheduled.

Gamma Monitor - Six Older Areas

Bids were received on the 105-H heat exchangers for sample cooling, but none were satisfactory. The drawing is being revised and clarified in preparation for obtaining new quotations. The scope report for gamma monitor improvements in the six older areas is being prepared.

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Moisture Monitor

Incomplete test data has indicated that improved dewcell performance has resulted through the use of an outer covering over the cell. Additional data has been analyzed along with dewcell materials, and orders for new materials have been placed.

Rear Face Connectors

A proposed criteria for rear face connectors for B, D, DR, F and H reactors has been prepared and circulated for comment. A program was initiated to obtain vibration data in support of the development work to replace the failing connectors.

4. Standards Engineering

Spare Parts

Stores Stock Requests processed		7
Stock Adjustment Requests processed		40
Maximum Authorized dollar value of new items added by SARs	\$42,000	
Maximum Authorized dollar value of spare equipment requested by letter to Project Engineering	39,531	
Maximum Authorized dollar value of spare parts requested for Projects by SARs	9,000	
Number of engineered spare parts items reviewed		68
Number of Drawings ordered revised		5
Maximum Authorized dollar value of items deleted from Spare Parts stock	1,562	

Engineering Standards

The Guide for Maintenance Work on Code Piping was issued on October 5, 1959, and distributed in accordance with the requests of the Maintenance Managers.

The Standard for Limits of Acceptable Workmanship EWS-7507-S has been issued and distributed. This standard is an IPD requested standard and should have wide application.

Craft Training and Manual Writing

J. V. Lawler, Plant Lubrication Engineer, was the principal speaker at the Lubrication Training Meeting arranged by the Standards Engineering Operation. Meetings were conducted in each reactor area and additional meetings are being held in White Bluffs for the benefit of shift personnel. The films used in this training program have also been loaned to some of the Power Operations for showing on shifts and weekends.

Craft Training and Manual Writing (continued)

A detailed review of the background of the Instrument Trainees now on roll has indicated that it will be necessary to separate the group into three separate categories for training purposes. The outline of the program for these Trainees is progressing. The preparation of a manual covering the use of tools and approved shop practices is the initial part of the program.

5. Water Plant and Utilities EngineeringPower Studies Supporting Reactor Safety

Screens for reclaimed coal were discussed with Power Managers at their October 15 meeting. A suggestion for relocating the screens to the transfer house between Number 2 and 3 belts will be investigated before discussing the subject at a future meeting. Assistance was provided in planning a trip-out test in 100-H. A design of instrumentation for recording critical data in a boiler loading test to be made at 184-H on November 5 has been firmed up and is being installed.

Differences in 184 control systems are under study to determine possible causes of lag in steam load pickup or unsatisfactory operation with various coals.

Effluent Systems Modifications

The scope study report was issued for the B-C Effluent System Modifications, providing for routine use of 107-C west tank for B effluent and remotely controlled diversion of effluents from both reactors. The final scope estimate was \$495,000, including \$75,000 contingency. This does not include a ring spray system for the 107-C west tank, an item already needed for contamination control during certain maintenance work.

Outfall Line Repair

In order to determine the condition of the concrete pipe, the 1904-F outfall lines were uncovered from a point approximately 60 feet from the outfall structure to the junction of the concrete pipe and steel pipe. The excavation revealed that the concrete pipes were completely encased in concrete. Sections of the encasement were badly cracked allowing effluent water to run out of the top and sides of the concrete encasement. Excavation to uncover the lines at the outfall structure was then started but had to be abandoned due to excessive leakage from the structure.

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Outfall Line Repair (continued)

Since the primary problem is one of structural stability it is planned to minimize the leakage from the box by sealing the open joints around the concrete outfall lines at the 1904 structure and sealing the deep cracks in the concrete walls of the structure.

At the request of H Area Reactor Operations, an inspection of the 1904-H outfall structure to determine the condition of the concrete wall around the outfall pipes was made. The concrete around the two 60 inch steel outfall pipes has spawled off from the steel anchor ring to the inside face of the wall. A program to remove the steel anchor ring, provide a leak free expansion joint at the structure, and pressure grout the areas is being formulated.

Electric Storage Batteries

Arrangements were made for the Electric Storage Battery Company service engineer to re-separate the 2 Ball-3X Batteries in 105-B, 2 Ball-3X Batteries in 105-DR, and the station service batteries in 181-D, with the assistance of the area maintenance personnel. The Electric Storage Battery Company did this work which involved six to eight man days time on a no-charge basis as a warranty item.

4500 HP Stator Investigations

Mr. E. C. Schrom, Engineer from General Engineering Laboratory, conducted surge tests on the spare stator stored in 189-F, and on No. 5 in 190-D, and No. 3 in 190-H. The tests did not indicate that any of the 36 coils tested are defective.

6. Visitors

Dr. E. Roy Tinney, Director, Albrook Hydraulics Laboratory, Division of Industrial Research, Washington State University, visited 100-F Area on October 16, to discuss river model planning and inspect several plant facilities.

E. P. Dahlhausen, Service Engineer for the Electric Storage Battery Company, was at HAP0 on October 5 through 15, regarding storage batteries in B, D, and DR Areas.

E. C. Schrom, Engineer from General Engineering Laboratory at Schenectady, visited HAP0 from October 20 thru 23, to conduct tests on stators.

7. Trips

J. H. Hoage visited the Union Machine Works, Seattle, Washington, and Parts Engineering Company, Inc., El Cajon, California, to discuss procedures for fabrication of the "J" type connectors for the rear face.

H. A. Kramer made a trip to Priest Rapids Dam during the month.

L. B. Brinkman made a trip to Washington State University on October 2, to witness the downcomer model tests.

R. T. Jaske and J. P. Corley visited Pullman, Washington, on October 30, to confer with Dr. R. E. Tinney, Washington State University, H. Rouse, Iowa State University and Professor L. Hooper, Wooster Poly Tech., regarding their serving as consultants to General Electric Company on the scope of the Columbia River Model.

8. Significant Reports Issued

HW-61206 (Secret), "Effluent System Modifications - 100-B, C", JP Corley, dated October 7, 1959.

"Preliminary Preparation Procedure for 100-H Electric Trip-Off Test", VG Blanchette, dated October 20, 1959.

"Trip-Out Test - 100-H Area, Power Preparation and Procedure for First Trip-Outs", MP Johnson, dated October 26, 1959.

HW-62456 (Uncl.) Critical Mass Monitoring Instrumentation CD Wilkinson, JL Deichman, dated October 29, 1959.

HW-62473, CG-775, Water Plant Capacity Expansion, 100-K Area, Scope Report - Noise Abatement, 190-165-K, PH Hutton, dated October 23, 1959.

Maintenance Guide for Code Piping, WW Walker, dated October 5, 1959.

Low Level Neutron Monitor (Instrument Service Manual) prepared by N. V. Hobbs.

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D. Project Engineering**1. Projects**

<u>Number of Assignments</u>	<u>Description</u>	<u>Balance</u>
17	Active Construction Projects	\$5 554 200
5	Active Expense Jobs	548 200
8	Completed Projects - Accrued	2 067 100
	Plant Assistance	50 100
	Customer Work Orders	47 800
	Total	\$8 267 400

CG-558 - Reactor Plant Modifications for Increased Production**Pump Test Stand**

Contract work is complete except for minor punch list items.

Process Water Pumps

Mr. Budde arrived, as DeLaval's Field Engineer, on October 5 and a total of 25 pumps have been modified. Examination of three pumps, B-2, F-5 and F-8, which have operated approximately six months with PW-1417-2 impellers in modified cases, shows that cavitation damage is in excess of that acceptable on the outboard (thrust bearing) side of the impeller. Mr. Gartmann of DeLaval has been contacted and tentative plans are for him to arrive approximately November 2 for consultation on further steps. Meanwhile, straightening vanes will be installed in the suction lines on all new installations.

CG-600 - 100-C Alterations

Mr. Drahos, Byron-Jackson Metallurgist, inspected two Byron-Jackson impellers on October 16, 1959 which had cracked at a fabrication weld connecting the vane with the shroud of the impeller. Byron-Jackson is currently evaluating the situation. Final recommendations and report of findings has not been made. Steps are being taken to replace fabricated impellers at the earliest possible date.

CG-666 - Zone Temperature Monitoring, 100-B, C, D, DR F & H

During this reporting period beneficial use has been obtained at 105-B on 10-16-59. Final acceptance of the system was obtained at 105-DR on 10-15-59, and at 105-H on 10-26-59. Work remaining on this project consists of final installation of RTD's and leadwire at 105-C.

CG-707 - Improvements to Reactor Nuclear Instrumentation -
All Reactors

Two channels of equipment were completely installed at 105-DR on 10-15-59. The second, or remaining channel at 105-B was completed on 10-8-59.

Five channels of electronic equipment have been bench tested and received final testing at the 305 reactor on 10-22-59, which provides a backlog of equipment available as other reactors provide outage time for installation. At 105-F step plugs and shield pieces were replaced in the positioner equipment to eliminate a radiation leakage problem on the "X" level. This work was completed on 10-27-59.

CGI-791 - Reactor Confinement

Phase I - Fog Spray

Installation of automatic instrumentation is in process. Work is approximately 90 percent complete as compared with a scheduled 96 percent.

Phase II-A - Site Preparation

Phase II-A is 53 percent complete as compared to a scheduled 37 percent. Concrete pouring has begun in KE Area by J. A. Jones. The dividing wall between ducts was poured Friday, October 23.

Bids were opened October 28 for Phase II-B. The apparent low bidder was the R. B. Miles Construction Company of Mercer Island, Washington for \$1,698,866. This bid is being evaluated for final award determination. The second from the low bid was by Hoffman Construction Company of Richland for \$1,738,800. Fair cost estimate was \$1,780,000. There were a total of eight bids, the highest of which was \$2,373,000.

CGI-817 - Crossheader Pressure Differential Indicators,
Hanford Reactors

Installation of differential pressure indicators and associated piping has been completed at 105-B, D, H and at 105-KE. Installation of the electrical component, which will provide a low pressure alarm and signal light, is 50 percent complete at 105-D, and 99 percent at 105-KE.

CAI-831 - Fence and Badge House Relocation - 100-F

The contractor has asked the AEC for a 21 day extension of time, since the steel strike has delayed delivery of the badge house doors.

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The fence is 98 percent complete, the fence and security lights are 90 percent complete, and the badge house is 95 percent complete.

CGI-871 - Improved Dummy Decontamination - B, C, D, DR, F and H Reactors

Design was started on this project on 10-21-59.

2. Project Proposals

Project Proposals Approved

CG-674 Rev. 4	Water Plant Component Test Loop, Building 1706-KE
CAI-835	Additional Office Space
CGI-839 Rev. 1	Modification of Fuel Element Test Facilities, 1706-KER

Projects Awaiting AEC Approval

CGI-844	Coolant Backup, 100-K Area (Interim authorization of \$30,000 received July 20, 1959)
CGI-861	Expansion of Electrical Distribution System, 105-B, D, and F
CGI-869	Operational Charge-Discharge, C Reactor

Requests Received for Project Preparation

R-20926	Effluent System Modification, 100-B-C
CG-707 Rev. 2	Improvements to Reactor Nuclear Instrumentation, All Reactors

3. CPFF Service Contract - Liaison

We have issued twenty-three work orders, and supplemented five work orders and one project, for a total of \$162,551.90 to J. A. Jones in the month of October.

4. Plant Forces Work Review

The HOO-AEC Labor Standards Board approved six jobs for assignment to Plant Forces which are estimated to cost \$337,753. Since the procedure of obtaining LSB approval was assigned to IPD, 183 jobs have been approved representing a total cost of \$8,182,289.49.


MANAGER
FACILITIES ENGINEERING

RELATIONS PRACTICES OPERATION
OCTOBER 1959

PERSONNEL PLACEMENT

Three experienced BS/MS candidates were interviewed during the month resulting in two offers. There were three acceptances from previous offers. Four PhD candidates were interviewed, with one offer anticipated. One acceptance was received from a previous offer, leaving one offer open at month's end.

There were nine transfers into the department from other HAPO components and one transfer into the department from the Aircraft Nuclear Propulsion Department. There was one transfer out of the department to the Relations Operation and one Educational Leave of Absence. There were three resignations, one of which was to the HOO-AEC.

OFFICE SERVICE

Xerography equipment for reproducing copies from opaque originals and duplicating half-tone photographs was installed in the 1713-B duplicating facility this month.

An audit of IPD mail and duplicating functions was prepared by traveling auditors during October. Results of the audit are not yet available.

A procedure for expediting priority mail between 100 Areas locations and the IPD General Manager's or HAPO General Manager's offices was formalized and announced to IPD components November⁴.

Testing activities during October included five Pile Operator Selection tests given to Utility operators. In addition, five nominees for the Supervisor Selection Program were tested.

COMMUNICATION

Publication included seven Management News Bulletins, one Employee Newsletter, one Round Table Guide, two IPD Employee Headliners and three priority messages. Three IPD-OPGs and eight HAPO-OPGs were issued during October. GE NEWS coverage included 19 items about IPD activities totaling 300 column inches, or 34% of all available space. Three Management Information Meetings were held during the month.

SALARY ADMINISTRATION

"Exempt Employee Compensation and Promotion and Transfer Procedure" booklets and instructions for use of the revised appraisal form were distributed to all IPD supervisors of exempt employees.

WAGE & BENEFITS

Two IPD employees died during October. James S. Hogan, Sr., age 62, Power Operator Journeyman in B Area died of a heart ailment. George B. Jex, age 52, Specialist Administrative Programs in 100-F Area also died of a heart ailment.

The Good Neighbor Fund Campaign added forty-two (42) new participants increasing

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IPD's donations by an amount of \$676.30. The approximate total of monies pledged in IPD for the Good Neighbor Fund during 1960 is \$21,500.

A .59 percent increase on base rates was made effective October 26, for all IPD employees whose pay is affected by cost-of-living salary adjustment.

During October, IPD paid a total of \$210 in suggestion awards to 18 suggesters for a total of 17 new suggestions. The highest award was \$40.

HEALTH, SAFETY AND SECURITY

Five security violations were investigated. An AEC Security "Shield of Achievement" was presented this month to 100-K Area by AEC Security Division. This award represents 15 consecutive months without an infraction of security regulations.

There were no disabling injuries reported in October. Medical treatment injuries were normal for the month with 88 cases reported. Research and Engineering completed 1125 consecutive days without a disabling injury for a total of 1,000,000 hours of exposure accumulated.

A comprehensive review of the new Reactor Maintenance Safety Handbook was made. A joint study of the high temperature working zones of the K-loop is presently being conducted by engineering, operations, medical, and health and safety personnel. Improved types of wearing apparel, fresh air supply and careful medical selection of assigned personnel may be necessary.

W. J. Shanks

**FINANCIAL OPERATION
MONTHLY RECORD REPORT
OCTOBER, 1959**

General Accounting

The midyear review of FY-1960 Equipment Not Included in Construction Projects was submitted to Contract Accounting. Estimated expenditures for the year are the same as the July forecast (\$1,693,000).

The following Assistance to Hanford program authorizations were approved in October, 1959:

ATH-IP-4 (Rev. 1)	Condensation Nuclei Detector	\$ 8 275
ATH-IP-5	NPR Primary Loop System Study	14 000
ATH-IP-6	Repeated Surge Tests	540
ATH-IP-7	Irradiated Material Handling	5 000
ATH-IP-8.	100-K Water Plant Design Review	8 045

Product Cost & Budgets

All Plant Managers and Administrative Analysts were furnished with the proper procedure for coding of N Startup charges.

Contract Accounting was assisted in preparing a paper on Irradiation Processing Department Power Operation and HAPO electricity requirements for presentation at a meeting in Savannah River.

B-C Power Essential Material inventory was observed.

The quarterly report on personnel work assignments as of September 30, was issued to Contract Accounting.

Personnel Accounting

Two increases in base salary rates were effective during October. On October 1, bargaining unit base salaries were increased by 3.46%. On October 26, the base salaries of all nonexempt employees except Business Training Recruits were increased by .59%, due to an increase in the BLS cost-of-living index. Both of these increases were accompanied by increases in isolation pay applicable to the same groups of employees except that the isolation pay increase of October 26 included Business Training Recruits and all exempt employees.

Auditing

Revisions to eleven AEC Manual Chapters were reviewed to determine and resolve possible problems arising from AEC requests for compliance.

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Nine Irradiation Processing Department OPG's were revised and submitted for reissu. Five of these covered instructions for the reporting and obtaining reimbursement of travel, living and moving expenses.

Revisions to Article VI of Appendix "B" covering travel and moving expenses were reviewed and suggested changes were submitted to Contract Accounting.

Comments on the proposed list of approved Professional and Trade Societies were obtained from IPD Level 3 Managers and sent to Prime Contract Administration.

Procedures

A complete review was made of all phases of the overtime report system used by the department. Written procedures have been prepared describing the current system.

A review was made of the department's needs in the HAPO vital records protection program. A summary of our requirements was submitted to Contract and Accounting Operation, the administrators of this program.

Studies were completed for the submission of salary distribution input data on an exception basis throughout the department. Procedures were agreed upon with Cost Accounting and Data Processing Operations, C&AO; the revised system was adopted and placed in use.

General

No inventions or discoveries were reported during the month by Financial personnel.

DR. MacNaughton
Manager-Finance
IRRADIATION PROCESSING DEPARTMENT

DR MacNaughton:kd

MONTHLY RECORD REPORT
NPR PROJECT OPERATION
OCTOBER, 1959

I. ORGANIZATION AND PERSONNEL

A. Responsibility

J. S. McMahon returned from Crotonville on October 12, 1959 and resumed his duties as Manager, NPR Project; W. W. McIntosh returned to his position as Manager, Field and Operations Engineering.

B. Personnel Statistics

	<u>Sept. 30,</u> <u>1959</u>	<u>Oct. 31,</u> <u>1959</u>	<u>Net</u> <u>Change</u>
Employees on Permanent Roll	72	77	+5
Technical Graduates (Rotational)	3	3	0
Technical Trainees	0	0	0

	<u>NPR</u>	<u>Technical Graduates</u> <u>(Rotational)</u>
Transfers Into Operation	5	0
Transfers Out of Operation	0	0
Payroll Removals	0	0

C. The following personnel were added to NPR Project during the month:

To Field and Operations Engineering:

W. L. Goss, structural field engineer, from ANP;
F. C. Fisher, optical field engineer, from CE & UO;
James T. Bobo, clerk, from CE & UO;
Charlotte Glass, steno-typist, new hire;
Janie Lambert, steno-typist, from Steno Pool;
G. R. Hosack transferred from Process Design into Field and Operations Engineering but is temporarily acting as Supervisor, System Design, in Process Design.

D. Safety and Security

Fire wardens were appointed for the building and all employees advised of their duties in the event of a fire. One fire drill was successfully conducted.

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No medical treatment injuries were reported during the month.

One security violation was reported during the month.

II. MONTHLY REPORT OF INVENTIONS AND DISCOVERIES

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. 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.

III. ACHIEVEMENT

A. Process Design

1. Research and Development

The graphite stack design employed initially in the process tube rupture test facility utilized spacer blocks in each layer to maintain spacing between primary blocks as well as to allow cross-venting into higher layers in the event of a process tube rupture. Test results showed that the spacing function was adequately performed although it was also noted that the spacer blocks were being shifted extensively by the venting steam. Recent studies indicated that spacer block shifting might, in some instances, be blocking the vent channels resulting in erratic functioning of the venting system and in "lifting" of the stack in order to relieve the pressure. Such stack lifting, if excessive, could conceivably induce failure in the process tube above the point of rupture and, therefore, was of major concern in the NPR stack design. The three most recent rupture tests were performed with a modified stack design from which free moving spacer blocks were eliminated. Stack lifting was reduced by a factor of two or more, relative to similar tests with the previous stack design.

Simulated process piping failure tests to obtain basic hydraulic data regarding two-phase flow from a break in a high pressure, high temperature water line were completed and detailed analysis of the results was begun. A small computer program is being written to assist in the calculation of pressure drop in the test piping. Test conditions did not duplicate actual reactor designs, but results will permit the validity of available methods of calculation to be checked.

2. Project CAI-816

Four reactor plant criteria were approved during the month by the project representatives leaving only one criteria, that for the NPR fuel element, not yet considered out of a total of forty-two. However, the confinement criteria is scheduled for reconsideration due to failure to attain general agreement and understanding regarding the basic requirements of the system.

Project representatives also processed a number of changes to previously approved scope material where justified by subsequent detail design or testing activity. An example is the change in graphite stack design indicated by the process tube rupture test results. The revised design has all primary blocks interlocked by top and bottom notching. This results in a six inch square basic block, with three-quarter inch deep notches. Additional advantages include,

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2. Project CAI-816 (Continued)

(1) elimination of on-site surfacing operation, (2) increased tube block wall thickness, (3) elimination of separate vertical keying, and (4) added venting downward. The main disadvantage is elimination of the potential for withdrawing an entire tube bearing stringer.

Scope design on the reactor plant is now estimated to be 95 percent complete compared to 90 percent at the end of last month. Weighted progress in the preparation of construction drawings kept pace with schedule, although not as many have received final design approval as was originally scheduled for this time. Ten specifications for reactor plant components have been approved to date and fourteen others are out for comment out of a predicted total of 125.

Of the 95 anticipated development and testing program items, 18 have been completed, 57 are in progress, and 20 are in the planning stage. The program is estimated to be 44 percent complete, compared to about 55 percent schedule. It is of great concern that although the rate of expenditure on this program has continued unabated, the rate of progress has fallen to about half that scheduled. Close attention is being given to identification of most critical items and an effort will be made to clarify relative priorities so that the greatest benefit to the project can be obtained from the limited money, facilities, and manpower.

On the heat dissipation system design, a revised schedule was received from the A-E which indicated scope design to be 54.5 percent complete. Progress was accelerated by completing the approval of scope material processed by the project representatives during their September sojourn at the A-E's offices. Early in October, they undertook a second period of residence there to process additional items of scope which were delaying detail design progress. Specific examples are, (a) the electrical one-line diagrams that define the 230/13.8 KV and the 13.8 KV/4160 V transmission and distribution systems, (b) limitation in the provisions for cooling system expansion to a total of seven operating loops, (c) definition of the water treatment facilities, and (d) area plot plan.

On Title II design, General Electric acceptance was given to the following bid drawings and specifications;

- (a) Attendant's Building.
- (b) Administration Building.
- (c) River Pump House Superstructure.
- (d) Turbine-Generator Set for Stand-by Power House.
- (e) Circulating Water Pumps.
- (f) Travelling Water Screens and Guides.
- (g) Graphite Cooling Heat Exchangers.
- (h) Main Power Transformer.

2. Project CAI-816 (Continued)

Acceptance was withheld on specifications for the primary coolant pumps and the stand-by power house steam-generator pending certain corrections.

Discussions during the month have indicated that increases in the primary pump drive horsepower recently recommended by the A-E are the result of a misinterpretation of the design bases regarding primary loop flow requirements. Efforts are underway to eliminate any misunderstanding and to come to a final decision on the pump drive horsepower.

3. Visitors

Mr. J. V. Neely, American Car & Foundry, visited HAP0 on October 21, 1959, to discuss problems of moderated design of gas cooled graphite moderated power reactor being done by American Car & Foundry.

Mr. Bill Waddell of Daystrom Inc., visited HAP0 on October 14, 1959, to discuss flow monitoring and data acquisition systems.

Mr. J. W. Langhaar of the E. I. duPont Company, visited Reactor Plant Design to discuss common problems associated with underwater equipment design on October 22, 1959. Mr. Langhaar also spoke at the AEC Symposium.

4. Trips

M. H. Russ spent October 5-16, 1959, at the Burns and Roe office in Hempstead, New York, to expedite design progress. On October 12, 1959, visited Sheppard T. Powell & Associates in Baltimore, Maryland, to discuss scope of Powell & Associates' work.

E. M. Kratz and H. R. Kosmata visited Burns and Roe, Inc., and the Atomic Energy Commission in New York on October 13-16, 1959, for discussion regarding NPR design criteria.

H. G. Johnson and E. R. Astley visited Oregon State College, Corvallis, Oregon, on October 7-9, 1959, to discuss numerical methods of analysis with Dr. A. T. Lonseth.

C. A. Mansius visited Burns and Roe, Inc., in New York and attended the ANS Winter Meeting in Washington D.C. on October 29 - November 11, 1959. Mr. Mansius will discuss shielding problems with Burns and Roe, Inc.

W. A. Massena visited the University of Washington on October 16-17, 1959, to discuss critical flow tests being performed at Hanford with Dr. R. W. Moulton of the University.

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4. Trips (Continued)

H. S. Davis visited the NPD Laboratory, Troutdale, Oregon on October 8, 1959, to observe fabrication of attenuation slabs with iron-serpentine concrete.

W. J. Morris visited the following companies on October 10-17, 1959, to discuss diversion and butterfly valve requirements; (a) Lunkenheimer Valve, Cincinnati, Ohio, (b) Atwood and Morrill Valve, Salem, Mass., (c) Leslie Valve, Lyndhurst, N. J., (d) Aloyco Valve, Linden, N. J., and (e) Teleflex Inc., North Wales, Penn.

J. D. McCullough went to Chicago, Illinois, on September 23-25, 1959, to discuss NPR instrumentation with factory engineers attending the 14th Annual ISA Conference and Exhibit and to investigate new instruments being exhibited for application to NPR design requirements. On September 28-29, 1959, Mr. McCullough visited Burns and Roe, Inc. in Hempstead, New York, to discuss the coordination of instrumentation between the reactor and heat conversion plants.

5. Significant Reports Issued

HW-57017 - "Design Criteria - Process Tube Injection System," October 9, 1959, G. E. Wade.

HW-57038 RD3 - "Design Criteria - Miscellaneous Building Mechanical," October 15, 1959, J. F. Nesbitt.

HW-57041 ADD1 RD - "100-N Design Bases - Part V - Addendum 1, Reactor Emergency Cooling System - Instrumentation and Control," D. L. Condotta, October 21, 1959.

HW-57975 - "Project Representatives Minutes No. 28," October 16, 1959.

HW-57976 - "Project Representatives Minutes No. 29," October 16, 1959.

HW-57977 - "Project Representatives Minutes No. 30," October 30, 1959.

HW-61753 RD2 - "Reactor Capital Cost Reduction Study," October 28, 1959, G. E. Wade.

HW-62118 - "Design Philosophy of NPR Primary Loop Pressure Relief System," October 9, 1959, D. L. Condotta.

HW-62150 RD - "NPR System Parameters," October 1, 1959, D. L. Condotta and D. E. Simpson.

HW-62150 RD SUP1 - "NPR System Parameters - Supplement 1, Reactivity Transient Data," October 22, 1959, D. E. Simpson.

5. Significant Reports Issued (Continued)

- HW-62237 - "NPR Project Section - Monthly Design Test and Development Program Status Report - CAI-816," September, 1959, W. J. Morris.
- HW-62283 - "Preliminary Study of Feasibility of Pre-Nuclear High Temperature Acceptance Tests for 100-N," October 9, 1959, N. O. Strand.
- HW-62397 RD - "Design Test - NPR Dump System Evaluation," October 15, 1959, N. O. Strand.
- HW-62485 - "Feasibility of Providing Test Facilities in the NPR," October 28, 1959, A. B. Carson.
- HW-62489 - "Optimum Capacity - NPR Heat Dissipation System," H. R. Kosmata, October 29, 1959.
- HW-62501 - "Neutron Age in Graphite-Water Lattices," D. E. Simpson, October 28, 1959.
- HWS-6504 RD - "Purchase Specification - Confinement System Butterfly Valves," October 21, 1959, G. E. Wade.
- HWS-6555 - "Specification for Graphite Cooling Tubes," October 27, 1959, G. E. Wade.
- HWS-6953 RD - "Specification for Confinement System Rupture Discs, Flanges and Weather Heads," October 2, 1959, G. E. Wade.
- "Trip Report, Discussions of Specifications for Process Tube Inlet and Diversion Valves." W. J. Morris.
- Confidential, Undocumented, "NPR Operation Study Group, Minutes of Meeting of October 26, 1959," October 28, 1959, D. E. Simpson.

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B. Development and Testing

The Component Test Loop was operated up to 168 hours per week performing tube rupture tests, two-phase flow tests, and thermal-cycling test fittings. Five tube rupture tests were performed at 800 psi, three with the graphite cold and two with the graphite at 750°C, to evaluate venting characteristics, graphite spacer-block design, and effects of slug geometry at the point of rupture. Thirty-one two-phase flow tests were completed on 1-inch, 2-inch, and 4-inch pipes at 50, 250, 500, 750, 1000, 1250, 1500 and 2000 psi. Thermal-cycling of test fittings increased beyond 2200 cycles.

- Three flared zirconium tubing joints were subjected to tensile pull-out tests at 580°F and failed at 44,000, 54,800 and 58,000 pounds. These compare unfavorably with similar pull-out tests with threaded tubes that failed above 140,000 pounds and rolled tube joints that failed above 70,000 pounds.

The facility for flexing test fittings concurrent with thermal-cycling was placed in operation. Two Marman Conoseal joints were cycled 117 times from 480 to 600°F at 1625 psi concurrent with a bending moment of 13,000 in.-lbs. Upon disassembly some evidence of leakage was detected at the points of maximum movement.

Hanford Laboratories was authorized \$40,000 to develop a rupture detection system for recirculating water reactors which will consist of a fast-scanning gross-gamma monitor to detect rapid burst-type failures and a slow-scanning gamma-energy monitor to confirm threshold signals from the gross-gamma monitor. Both monitors will employ rotating turrets operating inside a circular array of one hundred shielded sample chambers each fed from an individual reactor process channel. The above development is parallel to one which employs a GM tube in a pulse-counting rate meter circuit.

A Daystrom two-channel flow monitor was subjected to stability and drift checks over a two-week period. No malfunctions or trips were encountered when the high trip point was set one per cent above and the low trip point was set one per cent below the input signal.

A. C. Ruge Associates and T. A. Edison Company report significant progress in the development of resistance temperature detectors for the New Production Reactor. Both indicate that a cast housing for the clamp-on design of a resistance temperature detector is feasible and more economical than one fabricated from sheet metal.

Two sections of zirconium tubing, pressure-welded by A. O. Smith Corporation, were subjected to burst testing. Specimen #1, annealed, fractured circumferentially in the pressure weld (1/32" wide x 2 1/4" long) at 6800 psi and 343°C. Specimen #2, 20% cold-worked and autoclaved, failed at 9500 psi and 344°C, the opening being 8" long and 7 1/2" wide and including the weld.

C. FIELD AND OPERATIONS ENGINEERING

1. Activities

Construction

The access road was completed by the subcontractor, L. W. Vail Company, on October 16, 1959.

The installation and testing of the 12" water line from the existing export water line to 100-N Area was completed, including the chlorinator and pressure regulating station. The subcontractor, J. P. Head, continued to work on temporary lines in the N Area site.

The Tullar Electric Company started stringing wire on the 13.8 kv line from 100-D Area. It was necessary to request a change order to reduce the tension in the conductors on the first thirteen poles on this line and also to replace three crossarms and install additional down guys in order to alleviate an overstress condition in two structures.

Procurement

A survey was made of the coast facilities to determine those plants willing and capable of fabricating reactor shielding crates. Special emphasis was placed on their use of optical alignment control, precision boring equipment and temperature control. Aircraft manufacturing companies were included in the survey with the knowledge that their jig fabrication practices presented problems similar to those encountered in crate fabrication. From this investigation at least seven plants appeared to be capable of doing this work.

Graphite

Procurement specifications for the top and bottom reflector were issued October 26, 1959. This order is for approximately 375 tons of reflector grade material which is combined with approximately 325 tons of the existing graphite inventory for top and bottom reflector use.

As a result of the process tube rupture tests, an alternate moderator design was developed which provides for greater structural stability of the pile since it allows for more efficient venting of the steam released during a simulated process tube rupture. In addition, the design of the top and bottom reflectors was further modified to allow for more efficient graphite utilization with a significant project cost savings (approximately \$300,000). Further savings will be realized during fabrication since the primary surfacing operation will now be essentially eliminated.

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Zirconium

Allegheny-Ludlum Steel Corporation is being affected by the steel strike. A meeting was held in Seattle, October 13, 1959, with Dr. T. T. Magel, AISI Technical Director, to discuss proposed back-to-work schedules, and progress during the steel strike. Both sub-contractors, Budd Company and Tube Reducing Corporation, were contacted. The three tubes at Budd Company have been welded and were inspected the week of October 26, 1959. Tube Reducing Corporation is also on strike but is arranging to modify their reducing machine when the strike ends and will reduce tubes as they are received instead of waiting for the twenty tube lot as originally planned.

Chase Brass and Copper Company has extruded all billets (87) for their first lot of tubes and all appear excellent. Extrusions are now being stripped of the copper jackets in the new pickling facility. The first twenty-five extrusions were stretcher straightened with good results and are now being conditioned on the centerless grinder. The new draw bench and other equipment are being installed.

Harvey Aluminum, Inc., made the final draw on the first two tubes of their order. These tubes are now being conditioned prior to inspection scheduled for October 30, 1959. The additional metal, 18,000 pounds, has been ordered for the remainder of the first lot.

Planning is continuing on the on-site preparation shop. A scope design of the new autoclave has been prepared. Kaiser is preparing a contract for the building and preliminary mechanical modifications needed in the facility.

Administration

Field office files were set up in 100-N construction site.

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

Drawings	292
Criteria	25
Specifications	48
Requisitions	16
Others	<u>31</u>
Total:	494

A Construction Personnel Forecast was prepared for industrial Medical, to enable them to anticipate field First Aid office needs.

Design Review and Consultation

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

Comments on Detail Drawings	278
Comments on Specifications	105
Comments on Scope Drawings	43
Comments on Criteria	<u>15</u>
Total Formal Comments:	441

Operations Planning

A study of estimated Phase II and III N-Plant unscheduled outage performance was completed. A further preliminary study of the estimated capital expenditures to attain goal unscheduled outage performance was also made.

Steps were taken to initiate an N-Plant reliability study by the Operations Research and Synthesis group of HLO.

Personnel in this operation participated in meetings with Utilities Operation, CE&UO, to reach an understanding regarding cognizance of 13.8 kv equipment in the 151-N facility.

Meetings were held with representatives of Union Relations, IPD Facilities Engineering, and IPD Manufacturing toward establishing bases for the 1960 GE-HAMTC contract negotiations.

Spare parts needs of 100-N are being integrated with existing spare parts stocks.

Position Guides for the N-Reactor Processing Operation management positions (6) have been commented on by the Specialist, IPD Salary Administration, and are in process of revision for recommendation to Manufacturing.

First drafts of the Job Descriptions for the proposed combined Reactor Processing and Power Operator non-exempt positions for N-Processing are out for comment and study.

2. Trips

C. E. Love visited Allegheny-Ludlum Steel Corporation representatives in Seattle, Washington, October 13, 1959, to make plans for resumption of zirconium alloy process tubes on resumption of production.

J. E. Stice visited Boeing Aircraft in Seattle, Washington, with Kaiser personnel October 16, 1959, and J. E. Stice and F. C. Fisher visited other prospective fabricators of biological shield crates in San Francisco, Los Angeles, and San Diego, California on October 20, 1959 through October 26, 1959, to determine interest and ability to perform this work.

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E. W. Wilson was stationed at the Burns and Roe office in Hempstead, New York, from October 7, 1959, through October 17, 1959, as a Heat Conversion Plant Project Representative and Operations Requirement Consultant.

D. Consulting Engineers

1. Visitors

On October 27, 1959, Dr. S. Barron, Burns and Roe, visited the Consulting Engineer, Electrical, to discuss the basis for fuel costs in the Federal Power Commission Study.

2. Trips

Meetings were held in San Francisco on October 7 to 9, 1959, with AEC, FPC, Burns and Roe, and BPA representatives to discuss outline and procedure for NPR conversion feasibility report, to select cases for use in the report, and to make trial run on selected cases.

Meetings were held in New York October 13 to 17, 1959, with Burns and Roe and AEC-Washington representatives to discuss NPR design, chiefly with respect to application of heat exchangers and setting of design steam pressures.

3. Significant Reports Issued

HW-61857 RD, "Flow and Energy Equations for NPR Thermal-Hydraulic Circuits," W. J. Love, September 29, 1959.

HW-62017 RD, "Estimated Fuel Costs for Use in FPC Study," W. J. Dowis, September 22, 1959.

HW-62448 RD, "Continuity of NPR Power During a Primary Loop Outage," W. J. Love, October 21, 1959.

HW-62488, "Federal Power Commission Study of NPR Power Conversion - Outages," W. J. Dowis, October 26, 1959.

"Federal Power Commission Study - Status Report," W. J. Dowis, October 29, 1959.

E. Program Evaluation

1. Activities

Schedules

The 9-15-59 Kaiser issue of the preliminary working schedule is still the most recent issue. The AEC has submitted a one-time construction status report to Washington. The schedule is dated 9-21-59; however, it was just released to Washington and shows total project construction complete as being .03 percent complete on 9-1-59. A preliminary schedule of Kaiser Engineers' subcontracts has been issued for discussion purposes.

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Design Status

	<u>Wt'd Total</u>	<u>Certified Schedule</u>	<u>Actual % Complete</u>
<u>Reactor Plant as of 10-31-59</u>			
<u>Title I</u>			
Scope		97	96
<u>Title II</u>			
Drawings	70	26	27.7
Specifications	8	18	17.6
Requisitions	8	0	0.9
ATP's	4	0	0.0
Development and Testing	10	54.5	46.0
Total	100	24	25.47

Heat Dissipation Plant as of 10-31-59

<u>Title I</u>		
Scope Criteria	70	54.5
<u>Title II as of 10-31-59</u>		
Detail Design*	29	29

	<u>No. Req'd</u>	<u>No. Issued to 10-17-59</u>	<u>Scheduled</u>	<u>Actual</u>
Criteria	30	9		9
Preliminary Drawings (Bid)	585	80		77
Detail Drawings (Bid)	730	63		63
Specifications	165	9		10
Requisitions	150	10		11
ATP's (No. being developed)	-	0		0

*Based on revised A-E schedule submitted 10-23-59.

Composite Design Completion (Reactor and Heat Conversion Combined)

	<u>Certified Schedule</u>	<u>Actual % Complete</u>
Total	33.6	33.4

Cost and Estimates

A new project cost estimate is being prepared by the cost evaluation team and will be issued during the second week of November.

Currently the AEC is preparing a new Work Authority to General Electric Company. It will increase our total authorization to somewhere in the neighborhood of \$10.5 million. This will permit us to start procurement of graphite (approximately \$2 million of the \$10.5 million will be for graphite procurement) and will allocate funds for Title III services.

On 10-21-59 a new estimate of costs and funds participation by General Electric was submitted to the AEC. This covered estimated costs for graphite and zirconium procurement, engineering, GE vendor inspection, GE construction indirects and HAPO-related services.


MANAGER
NPR PROJECT

JS McMahon:mf

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IRRADIATION PROCESSING DEPARTMENT
MONTHLY RECORD REPORT
OCTOBER, 1959

SUMMARY

RESEARCH AND ENGINEERING OPERATION

Measurement of the eight columns of depleted uranium fuel elements which were discharged in September at about 1150 MWD per ton indicated there was greater distortion of the fuel than is normal in standard production.

Results have indicated that there is no significant difference in the relative dimensional stability during irradiation between fuel cores heat treated in carbonate salt and chloride salt.

Two failures of Zircaloy-2 jacketed fuel elements occurred during irradiation testing in the KER Loops. One apparently resulted from pitting corrosion on the inside of the inner tube of an enriched tube-and-tube element at an exposure of 310 MWD per ton; the other appeared as a longitudinal split in the jacket of an outside rod of an enriched seven-rod cluster element at an exposure of 2240 MWD per ton.

The IBM program for obtaining statistical analysis of the effects of fuel manufacturing tolerances on fuel design has been debugged and is in use.

A review of the technology of zirconium and design bases for NPR process tubes was completed and reported. Calculations indicate stresses for various positions in the process tube are within the design criteria.

Technical specifications for the NPR reflector graphite have been issued. Test samples irradiated in the MTR have been discharged and sent to HAPG; data obtained from examination and analysis of these samples will determine the schedule for discharge of those being irradiated in the GEIR.

The bulk outlet temperature limit continued to be the most restrictive limit to power level at D Reactor; the power level limits at all other reactors were based on fuel element failure control.

A new method was devised for calculating total control requirements for the existing reactors which promises to resolve some of the problems which require a three dimensional approach.

MANUFACTURING OPERATION

Record reactor input production (0.7 per cent above the August, 1959 maximum) was 9.2 per cent above forecast; 8.1 per cent above at the six old reactors and 11.0 per cent above at the K Reactors. Forecast was exceeded due to high time operated efficiency and average power level. A new production record was achieved at C Reactor, exceeding their July, 1959 maximum by 14.3 per cent.

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The IBM program for obtaining statistical analysis of the effects of fuel manufacturing tolerances on fuel design has been debugged and is in use.

A review of the technology of zirconium and design bases for NFR process tubes was completed and reported. Calculations indicate stresses for various positions in the process tube are within the design criteria.

Technical specifications for the NFR reflector graphite have been issued. Test samples irradiated in the MIR have been discharged and sent to HAF0; data obtained from examination and analysis of these samples will determine the schedule for discharge of those being irradiated in the GEFR.

The bulk outlet temperature limit continued to be the most restrictive limit to power level at D Reactor; the power level limits at all other reactors were based on fuel element failure control.

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