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HW--70625

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IRRADIATION PROCESSING DEPARTMENT

MONTHLY REPORT

JULY 1961

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HANFORD ATOMIC PRODUCTS OPERATION

GENERAL ELECTRIC

RICHLAND, WASHINGTON

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This document consists of
76 pages.

IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
JULY, 1961

79502

Compiled by
IPD Personnel

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By Authority of CG PR-2

August 14, 1961

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OPERATING REPORT

*Confidential - Unrecorded - Manufacturing Section Consolidation**Page 15*

CODE:	CURRENT MONTH	PREVIOUS MONTH	FISCAL YEAR TO DATE	BUDGET FOR 1 MONTHS
PERIOD ENDED: 7-31-61				
PERSONNEL END OF PERIOD	1761	1768		
DIRECT AND APPLIED LABOR	632 706	600 167		
INDIRECT LABOR*	680 368	690 255		
TOTAL LABOR	1313 074	1290 422		1233 541
CONTINUITY OF SERVICE	151 001	723 23		148 026
ESSENTIAL MATERIALS- PROCESSING	125 616	98 794		184 825
- POWER	296 574	299 638		297 185
APPLIED MATERIALS	88520	129 961		119 690
SUPPLIES	42158	4623		24 939
TOTAL MATERIAL AND SUPPLIES	552 868	533 016		626 639
PURCHASED ELECTRICITY *	478 585	480 056		478 204
OTHER DIRECT CHARGES*	25 711	64381		65 396
SERVICES FROM WITHIN IPD				
PROGRAMMED MAINTENANCE	76			
PLANNED MAINTENANCE	6462	5763		23 651
LOANED LABOR	270			
POWER				
RENT, LIGHT AND HEAT				
ENGINEERING	8848	15466		11 000
SUPPLEMENTAL CREWS				
H WATER LABORATORY				
OTHER				
TOTAL SERVICES FROM WITHIN IPD	15656	21229		34651
SERVICES FROM OTHER HAPO				
PROGRAMMED MAINTENANCE	2563	7718		7155
PLANNED MAINTENANCE	709	302		
LOANED LABOR				
ENGINEERING AND LABORATORY	3186	13347		4523
ROTATIONAL TRAINEES	5780	3600		6663
PROCEDURAL & COMPUTING	1153	4235		5247
OTHER	290			
TOTAL SERVICES FROM OTHER HAPO	13681	29202		23588
LESS - SERV. TO OTHER IPD COMPONENTS*	108601	149196		144857
SERV. TO OTHER HAPO COMPONENTS*	30651	45339		34254
TOTAL DIRECT CHARGES AND SERVICES	2411324	2296094		2425934
INDIRECT SERVICES *	158859	125227		169274
TOTAL COST	2570183	2421321		2595208
DISTRIBUTION OF COST				
CONSTR. & EQUIP. WORK IN PROGRESS-IPD	16383	36273		32832
CONSTR. & EQUIP. WORK IN PROGRESS-OTHER	1713	7352		
SPECIAL IRRADIATIONS	11002	3339		4972
OTHER ACCOUNTS	5597	(2009)		
UNDISTRIBUTED	21440			
UNDER(OVER) LIQUIDATION OF COST	(2893)	21185		(718)
TOTAL OTHER ACCOUNTS	53242	65140		37086
<i>Irradiation Pn</i>	2431600	2269951		2558122
<i>Special Production</i>	25341	14102		
<i>Start-up</i>		72128		
TOTAL DISTRIBUTION OF COST	2570183	2421321		2595208
AS A MEMO				
MANUFACTURING COST	2416274	2189721		2448533
PRODUCTION & MANUFACTURING GENERAL	57732	56161		62289
APPLIED REACTOR ENGINEERING	42935	38171		47300
OTHER PRODUCT COST - IPD*	363129	497327		396833
GENERAL HAPO ASSESSMENTS	607056	635641		645910
TOTAL PRODUCT COST	3487126	3417021		3600865

CODE:	CURRENT MONTH	PREVIOUS MONTH	FISCAL YEAR TO DATE	BUDGET FOR 1 MONTHS
<i>Manufacturing Section Council</i>				
INDIRECT LABOR				
EXEMPT	304 680	323 615		
NON-EXEMPT	45 423	47 123		
OVERTIME PREMIUM	44 249	31 637		
VACATION AND HOLIDAY PAY	185 329	110 475		
ABSENCE PAYMENTS	18 566	26 380		
ISOLATION-SHIFT & OTHER	132 121	151 025		
TOTAL INDIRECT LABOR	680 568	690 255		
OTHER DIRECT CHARGES				
TRAVEL EXPENSES	242	5518		2240
COMPUTING EQUIPMENT RENTAL	2296	3845		3798
CHGS. FROM AEC CONTRS.-PROG. MAINT.	1840	8269		6430
- PLANNED MAINT.	6897	31 690		43 978
- OTHER	11 84	11 84		1179
<i>Outgoing Product Freight</i>		963		
SPARE PARTS ADJ. & OTHER	12 152	12 912		6771
TOTAL OTHER DIRECT CHARGES	25 711	64 381		65 346
INDIRECT SERVICES				
TRANSPORTATION	72 981	58 933		80010
ELECTRICAL DISTRIBUTION	60 865	41 715		62386
LAUNDRY	18 164	18 055		20 448
TELEPHONE	4197	4371		4265
OFFICE SERVICES	2467	1879		1982
OTHER				
? + <i>Light & Heat</i>	185	274		183
INDIRECT SERVICES	158 859	125 227		169 274
COMPONENTS				
SECTION-B&C REACTOR	623	3446		18324
-D&DR REACTOR				
-F REACTOR				
-H REACTOR				
-KE&KW REACTOR				
-N REACTOR STARTUP	2078			
-GENERAL				
-PRODUCTION				
-APPL. REACTOR ENG				
FACILITIES ENGINEERING SECTION	49 383	6 1180		48101
NPR PROJECT SECTION	7	385		
RESEARCH & ENGINEERING SECTION	54647	82060		76366
RELATIONS PRACTICES SECTION	932	1188		1091
FINANCIAL SECTION	850	843		883
DEPARTMENT - GENERAL	81	94		92
TOTAL OTHER IPD COMPONENTS	108 601	149 196		144 857
SERVICES TO OTHER HAPO COMPONENTS				
RELATIONS OPERATION	1194	1403		1356
FUELS PREPARATION DEPARTMENT		284		400
CHEMICAL PROCESSING DEPARTMENT	11248	12154		13227
HANFORD LABORATORIES OPERATION	12223	21 075		16 792
CONTRACT & ACCOUNTING OPERATION	91	100		108
CONSTRUCTION ENG. & UTILITIES OPER.	5895	10323		7371
TOTAL OTHER HAPO COMPONENTS	30651	45339		39254
OTHER PRODUCT COST - IPD				
FACILITIES ENGINEERING	140 103	239 766		119570
RESEARCH AND ENGINEERING	162 491	183 084		206226
FINANCIAL, REL. PRACTICES, DEPT. GENERAL	60535	74 477		71 037
TOTAL OTHER PRODUCT COST	363 129	497 327		396 833

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SUMMARY

RESEARCH AND ENGINEERING

The power levels at all reactors are currently limited by bulk outlet temperature restrictions with the exception of DR Reactor which is limited by reactivity considerations. The loss in reactivity experienced at DR Reactor followed an extended outage for recovering from a Ball 3X drop; the extent to which the loss should be attributable to balls and/or water is being investigated.

Following the complete ball drop at DR Reactor, recovery of the balls was facilitated by removing all of the vertical safety rods and clearing other obstructions from the work area at the top of the reactor. Total control requirements were maintained by special poison loadings.

There have been no loading changes in the overbore fuel loadings at C Reactor and all columns continue to operate satisfactorily.

Two additional 17-inch NIEL elements with capped jacket defects were added to KER-1 Loop on July 19; the initial charge of five NIEL, two of which have capped jacket defects, has reached an average exposure of 865 MWD/T. When the irradiation is completed, it will provide elements at approximately 1,000 and 2,000 MWD/T for PRTR rupture loop testing. KER-2 Loop now contains seven 23-inch N-size inner tubes; five are natural uranium at an exposure of 1915 MWD/T, one enriched element has reached 720 MWD/T and a second enriched piece was added to the charge on July 19. This procedure should provide elements at exposures of about 1,000, 2,000 and 3,000 MWD/T at discharge. KER-3 and KER-4 Loops remain shut down for CGI-839 revisions.

The high-alum water treatment had been instituted at all reactor areas by mid-July. A one-to two-week lag between changes in alum feed rate and consequent change in As-76 and P-32 isotope concentrations has been observed. This has prolonged optimization studies at 100-F and has changed monitoring criteria.

MANUFACTURING

Production

Reactor input production (MWD) was 0.8 per cent below forecast; 8.7 per cent below at the six old reactors and 10.1 per cent above at the K's.

Over-all time operated efficiency was 76.4 per cent (81.4 per cent forecast); 72.3 per cent at the six old reactors and 88.7 per cent at the K's. Efficiency was low at the old reactors due to water leaks, tube replacement and the dropping of 3X System balls at DR Reactor.

There was no increase in the combined reactor instantaneous power level or the individual reactor record power levels. A production record was achieved at C Reactor exceeding the previous maximum at one of the old reactors by 7.3 per cent.

One rupture, I&E regular metal at F, occurred during July. This represents the lowest number of ruptures in the history of eight reactor operation.

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Engineering

A Task Force, to study the process tube water leak problem, was established. Working with other IPD Operations, recommendations for reducing the number of tube leaks were developed and presented to IPD Management July 20. A request for revision of Project CGI-871, Dummy Decontamination Facilities, was submitted to Project Engineering.

FACILITIES ENGINEERING

Tools have been designed and fabricated for installation of the first prototype overbore process tube assembly of the 40 tube overbore test and for the removal of ruptured fuel elements. Procurement of process tube assembly components is complete for the first 20 tube installation except for the gas tube, adapter, and gunbarrels. Flow and calibration tests of the first five pinna flowmeters indicate them to be satisfactory. Results of the hydraulic flow testing of the process tube assembly utilizing various fuel loadings were also satisfactory.

Graphite distortion data collected from the No. 57 vertical safety rod channel at C Reactor revealed graphite blocks protruding into the channel from both the front and rear with the channel completely blocked about 38 feet down from the top of the reactor. At DR Reactor five vertical safety rod channels were inspected subsequent to the recent 3X Ball drop. Block breakage was noted in the upper portion of the graphite stack and in six to eleven per cent of the graphite layers in the pattern fringe. Block breakage was observed on only the front and rear channel walls.

Three KE Reactor tubes were discharged during operation using the prototype rear face actuator and ball caps. There were no significant incidents, nor was there any evidence of non-controllable cycling during the 11 days of operation following the discharge. In addition, one tube was discharged and successfully recharged with non-fissionable material during reactor start-up.

In the Elevator Modification Program, six of the eight charge elevators have been weighed. Haughton Elevator Company is presently determining basic car weights for net load determination.

Several employees were called by the Atomic Energy Commission and/or R. B. Miles Construction Company to testify at an Atomic Energy Commission hearing on claims submitted by the R. B. Miles Construction Company with respect to their performance on Project CGI-791.

Non-delivery of the recirculating pumps for Project CGI-839 has caused the construction to lag behind schedule. A revised construction schedule which will include the safety circuitry approved in Revision No. 3 is being submitted.

NPR PROJECT

General Electric has released documentation on plant safety, operability, and reactor performance for Burns and Roe, Inc. use on design of a power generating plant.

Bailey Meter Company has submitted cost information on the 109-N instrument package.

Prototype of horizontal rod drive has been received from Rucker Company for testing at HAPO.

American Machine and Foundry has started fabrication of underwater testing facilities for the fuel sorting machine.

General Electric and Kaiser Engineers have held a number of meetings on the routing of instrumentation lines in the front and rear pipe spaces.

General construction of the 105-N and 109-N Buildings is continuing at a satisfactory rate. Structural steel for the maintenance shop area has been installed and roofing is being placed in this area, the process area, storage basin, and transfer area. Installation of tubing runs in the pipe spaces has been initiated. The 116-N Ventilation Stack foundation has been completed and the first lift for the chimney poured.

The base "I" sections for the reactor have been machined level. The first tier side and corner crates for the biological shield have been set and poured. Delivery of boron steel plates for the bottom thermal shield has been delayed due to difficulty experienced by the fabricator, Baldwin-Lima-Hamilton.

Mock-up of the second layer group of graphite (27-46) was completed July 27, 1961, and this work is proceeding well ahead of field requirement dates.

Processing of zirconium process tubes proceeded at a reduced rate awaiting delivery of the remaining tubes and the Vacu-Blast equipment needed for conditioning tubes requiring processing.

GENERAL

RESPONSIBILITY

There was no significant change in responsibility.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
General	7	2	9
Research and Engineering	115	64	179
Manufacturing	414	1347	1761
Facilities Engineering	127	44	171
NPR Project	96	37	133
Financial	17	14	31
Relations Practices	6	17	23
TOTAL		1525	2307

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SAFETY, SECURITY AND RADIATION EXPERIENCE

There were 62 medical treatment injuries, one serious accident, one security violation, and no disabling injuries. One localized radiation exposure exceeded operational control.

INVENTIONS

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

<u>Name</u>	<u>Date</u>	<u>Title</u>
J. A. Dear	7-25-61	Reactor Bumper Fuel Charging Machine and Associated Equipment.

General Manager

AB Greninger:OCS:oh

RESEARCH AND ENGINEERING

PROCESS AND REACTOR DEVELOPMENT

REACTOR FUELS

Present Reactor Technology

Overbore Fuel Development

There have been no loading changes during this report period and all twenty overbore-size fuel columns in C Reactor are continuing to perform satisfactorily.

All required post-irradiation measurements have been completed for the four fuel columns which have been discharged to date.

A maximum weight loss of about 20 grams has been reported for downstream fuel elements from the two short-charged (18 piece) central zone tubes discharged on 6-5-61 at an average exposure of 662 MWD/T. Twenty grams is equivalent to about 7 mils of aluminum loss, assuming the loss is uniformly distributed over the fuel element surface.

Self-Supported Fuel Development

Production Test IP-409-A-FP which authorizes irradiation testing of KVNS fuel elements in smooth-bore Zircaloy-2 tubes has been approved. Two charges will be loaded during the next KW outage.

Bumpered Fuel Development

Ten columns of natural uranium, I&E, bumper fuel elements and ten columns of non-bumpered, control elements were charged into KW Reactor on 6-27-61, under supplement A of PT-IP-183-A-FP. The fuel elements are KIV size with three, 60 mil-high, collapsible, bridge-rail bumpers on each end of the fuel element, on 90° centers, and in line. Two of the bumper charges are equipped with downstream thermocouple probes.

To date, 700 tubes of bumper material have been successfully irradiated and discharged from D Reactor; 1411 tubes are currently under irradiation.

Coextruded I&E Fuel Development

The initial two tubes of coextruded I&E fuel elements which were charged into KW Reactor on 5-25-61 reached 420 MWD/T exposure on about 7-20-61. These two charges were goaled for 400 MWD/T and will be discharged at the next outage. Five additional columns will be added at that time.

Advanced Reactor Technology

N Reactor Fuel Development

Three 17-inch, NIEL elements and two 17-inch, NIEL elements with capped jacket

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STATUS REPORT OF PRODUCTION TESTS

Test No.	Type Metal	Tubes	Reactor	Goal		Current		Remarks
				Exposure		Exposure		
IP-183-A	K-size bumper fuel. KIVN-B	10	KW	1200 MWD/T		275 MWD/T		Repeat of an earlier inconclusive test to evaluate the reduction of hot-spot frequency associated with bumper fuel elements in a K ribbed process tube. Ten tubes of bumper and ten tubes of non-bumper control elements charged on 6-25-61.
IP-216-A	Normal prod. natural & enriched fuel elements	79	All	Normal variable goal				Provides for monitoring the performance of a sample of all normal production material to assist in development of a Quality Index for production use. Test is continuous.
IP-255-A	Solid black Li-Al	7	H	2 yrs.		21 mos.		Provides for long-term irradiation of solid black Li-Al for conversion ratio, and fuel performance determination.
IP-272-A	CIVN geometry I&E self-supported fuel	69	C	Variable				Provides for testing of CIVN geometry fuel in C Reactor ribless zirconium tubes.
IP-363-A	Four 18-inch KSE3 elements	1	KE	3500 MWD/T		3555 MWD/T		KER-3 charged December 15, 1960, and discharged May 27, 1961.
IP-377-A	Five 23-inch NINL elements	1	KE	3000 MWD/T		1915 MWD/T		KER-2 charged 2-23-61 with five NINL elements; one NIEL element added to the charge on 5-28-61; one NIEL element added 7-19-61.
	One 23-inch NIEL element					720 MWD/T		
	One 23-inch NIEL element					0 MWD/T		

<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-381-A	CVIN geometry I&E overbore size fuel	18 2	C	800 MWD/T		Provide preliminary qualitative data regarding irradiation behavior of larger fuel element designs.
	a) CVINS b) CVINB					
IP-377-A	Five 17-inch NIEL elements, two with capped jacket defects	1	KE	2000 MWD/T	865 MWD/T	KER-1 charged 5-28-61, with five NIEL elements; two additional NIEL elements added to charge 7-19-61.
	Two 17-inch NIEL elements with capped jacket defects				0 MWD/T	
IP-397-A	Zircaloy-clad enriched I&E fuel elements	2	KW	400 MWD/T	420 MWD/T	Provide irradiation experience for elements fabricated by NPR manufacturing process. Two tubes charged on 5-25-61.

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defects for failure testing in the PRTR rupture loop have been irradiated in KER-1 to an average exposure of 865 MWD/T. Two more 17-inch, NIEL elements with capped jacket defects were added to the charge on 7-19-61, thus providing failure-test elements at two different exposures (approximately 2000 and 1000 MWD/T) when the irradiation is completed.

Five 23-inch, NINL elements in KER-2 have reached an exposure of 1915 MWD/T as of 7-24-61. One 23-inch, NIEL element added to the charge on 5-28-61, has an exposure of 720 MWD/T. On 7-19-61, a second 23-inch, NIEL element was added to the loading. This procedure should provide elements at about 3000, 2000, and 1000 MWD/T when the column is discharged.

Nomenclature: (NIEL - NPR sized inner tubes - enriched uranium)
(NINL - NPR sized inner tubes - natural uranium)

REACTOR ENGINEERING

Present Reactor Technology

C Overbore Tubes

A total of 14 C overbore process tubes have been delivered by Reactive Metals Inc., Niles, Ohio, under contract AT(45-1)1560. Three additional tubes under this contract remain to be inspected at the vendor's plant. Fifteen extrusions under contract AT(45-1)1591 were shipped from Riverside to Niles, Ohio, for tube-reducing. After three tube-reducing attempts which resulted in mechanical failures of the tube-reducing machine, eight good tubes have been tube-reduced and inspection has begun.

Hydraulic Tests on Self-Supported Fuel Elements

Flow tests of KVNS fuel elements in smooth-bore zirconium tubes reveal the hydraulic behavior to be as predicted by design calculations. Pressure drop flow characteristics are identical to the KIIIN fuel element used as the design basis. The hole-flow-to-total-flow ratio was experimentally found to be 0.35 as compared to a predicted value of 0.33.

Advanced Reactor Technology

N Reactor Reject Process Tubes

Harvey Aluminum Company has to date accumulated 139 reject NPR tubes. A large percentage of the rejects contain metal tears or separations on the inner surface. The depth of these tears is sufficient to result in a thin wall and an oversized ID when the tear is removed by grinding. Harvey has proposed bringing the tubes back into specifications by placing the tube in longitudinal compression and heating the localized area. The resulting bulge area is squeezed with semi-circular dies which transfers the bulge to the ID where it may be ground off. Harvey has performed hardness and metallurgical tests that indicate no adverse effect from this procedure and are to supply test samples to HAPO for burst and metallurgical tests.

Zirconium Thermal Cycling Tests

Three Zr-2 specimens have each been tested for 20 cycles at the General Engineering Laboratory. One specimen was thermally cycled with a mean stress of 9000 psi and a stress range of 10,000 psi. Two specimens were cycled with a mean stress of 15,000 psi and a stress range of 10,000 psi. Plastic deformation in one inch after these cycle tests was too small to be detected by an optical measurement having an accuracy of 1/2 mil.

N Reactor Technical Bases for Standards

Twelve rough draft technical bases for Process Standards have been prepared since the last report period for a total of 22 bases. This compares with a scheduled number of 29 bases by this date. The initial analog simulation of the NPR to determine safe VSR withdrawal rates and safe instrument settings has been outlined. The temperatures will be computed from a one-node model. The simulation will contain the necessary "point storage circuits" so that many decades of power can be covered with relative ease.

N Reactor Hazards Review

A general outline of the N Reactor Hazards Review has been devised and contributions from the Process Design Sub-Section have been solicited.

A study is underway to determine theoretically the effect on the reactivity of the NPR when a central fuel rod and coolant is removed and a void remains, and when a central fuel rod and coolant is removed and water fills the void. Preliminary results of the analysis indicates that the NPR will gain reactivity (as expected) when a fuel column is discharged and replaced by air.

REACTOR PHYSICS

Present Reactor Technology

Helium Leak Detection

The work by HLO in using an infra-red detector to measure gas stream temperatures has progressed sufficiently so that an on-reactor test seems feasible.

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C Reactor Overbore Conversion Ratio

At the request of E. P. Wigner of the General Advisory Committee, the neutron physics pertinent to the overbore proposal were summarized in a document HW-70528.

The theoretical neutron balance for the cold clean pile indicates a 14.4 percent relative increase in the atom/atom conversion ratio for the proposed C overbore lattice. The relative increase in the hot pile is slightly lower - 13.9 percent, and the exposure dependence on the conversion ratio is not expected to be much different for the two cases. The relative gain in the grams plutonium per MWD will be somewhat less than that in atom/atom conversion ratio due to the larger fission rate in U^{238} in the overbore pile. The appropriate relative gain in the grams/MWD conversion ratio is 12 percent.

Recycle Program

Study of the effect on reactor operation of recycling enriched uranium continued during the month. A production test to authorize special pickup of irradiated recycled fuel has been signed and issued.

Analyses have been made on once-recycled fuel prior to its second irradiation. Preliminary results indicated the weight percent of uranium-236 for three samples is as follows: 0.0085 ± 0.0005 , 0.0081 ± 0.0005 , 0.0093 ± 0.0005 .

Advanced Reactor Technology

PRTR Fuel Element Rupture Test Facility

The scope document for the rupture detection instrumentation is nearly completed. The document provides information for the processing of an appropriation request to purchase the instrumentation for the facility.

Fast Neutron Energy Dissipation in N Reactor Process Tubes

The Monte-Carlo program used to determine fast neutron damage in NPR graphite has also enabled the determination of the energy dissipated in the process tubes. The energy dissipated per cubic centimeter of Zr-2 is 2.68×10^{15} Mev/cm³ per MWD/AT. This compares with a figure of $\sim 7.6 \times 10^{15}$ in the graphite.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience of critical IPD classifications for the first 28 weeks of the 1961 badge year:

HW-70625

<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	124940 mr	86	1453 mr	2699 mr	23
Processing Operators	338143	265	1276	2370	31
Pipefitters	109081	95	1148	2132	19
Millwrights	81716	74	1104	2051	10

Lapse of Control

Lapse of Radiation Control Distribution by Reactor and Component

	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>IPD Totals</u>
Processing	2	0	0	3	2	0	2	0	9
Maintenance	2	0	0	2	1	1	0	0	6
Supplemental Crews	0	0	0	0	1	0	0	0	1
Power	0	0	0	0	0	0	0	0	0
Research & Engineering	1	0	0	0	0	0	1	0	2
Facilities Engineering	0	0	0	0	0	0	0	0	0
Central Maintenance	0	0	1	0	0	0	0	0	1
Reactor Areas	0	0	0	0	1	0	0	0	1
Assigned Totals	3	0	1	5	4	1	2	0	16
IPD General				1					1

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

Average Concentration of Radioisotopes in Reactor Effluent Water

The table below shows the average concentrations of radioisotopes in reactor effluent water from samples taken during June 1961. Concentrations are in units of (10^{-12} curies per cc).

<u>Reactor</u>	<u>As⁷⁶</u>	<u>p³²</u>	<u>Zn⁶⁵</u>	<u>Np²³⁹</u>	<u>Cr⁵¹</u>
B	100	46	40	130	670
C	130	20	66	97	640
D	57	13	17	85	290
DR	67	21	15	85	250
F	44	7	39	130	390
H	64	8	12	69	310
KE	55	11	100	85	230
KW	56	11	30	91	290

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Reactor Effluent Activity Reduction

The high alum feed process was adopted at all areas according to the schedule shown below. A one-to-two week time lag between changes in alum feed rate and consequent change in As⁷⁶ and P³² concentrations has been observed. This has prolonged optimization studies at 100-F Area and has changed monitoring criteria.

High Alum Feed Adoption

100-B	July 1	100-F	May 1
100-C	July 1	100-H	July 14
100-D	July 15	100-KE	July 5
100-DR	July 15	100-KW	July 5

PROCESS TECHNOLOGY OPERATIONREACTOR POWER LEVEL LIMITATIONS

The power levels at all reactors except DR are currently limited by bulk outlet temperature restrictions. The power level at DR reactor is currently limited by reactivity considerations.

PROCESS STANDARDSHW-46000 B, Process Standards - Reactor

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

Process Standard A-070 - "Thermal and Biological Shield Cooling Water"

The following specific changes were made to the standard:

1. Minimum flow requirements were given for individual shield cooling tubes.
2. Mandatory shield temperature limits were provided.
3. Functional checks of the equipment were deleted since this information appears in the process equipment standards.
4. Fringe tube power limits were raised for continued operation following coolant loss to a single or two adjacent shield cooling tubes.

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

The standard was re-worded to permit use of any approved gas for maintaining a positive pressure to the reactor atmosphere during reactor outages. The previous standard specified the use of CO₂ gas during shutdown periods since it is cheaper than helium. Certain conditions of shutdown show that a helium makeup is periodically the most economical mode of operation.

A revision was also made to permit negative pressure in the reactor atmosphere with graphite temperatures in the C reactor reflector up to 400 C. Construction details at C reactor are such that the outer fringe graphite temperatures remain over 300 C for a number of hours following a reactor shutdown. Thus, certain maintenance work on the reactor has been unduly delayed in order to meet the former graphite temperature limits. Recent studies indicate this relaxation will not result in exceeding the specified graphite burnout rate criterion.

Process Standard C-120 - "Poison Splines"

Spline specifications were updated in this revision.

Splines used for reactivity control during outages must be of known poison strength. An acceptable testing method was included in this revision.

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Use of an upstream dummy charge to guide spline insertion is now mandatory. Perforated aluminum dummy pieces were required at each end of the upstream dummy charge.

Monitoring requirements were specified for each of the following situations:

1. Equilibrium operation
2. Non-equilibrium operation
3. For incomplete spline insertion due to component failure or malfunction.

Process Standard F-050 - "Charge-Discharge During Operation, PCCF"

Present metal coefficients of reactivity which are smaller than formerly used, required a re-evaluation of temperature margins that must exist between poison column control facility (PCCF) tubes and process tubes within five lattice units prior to discharge of the PCCF tube.

Curves showing necessary temperature margins that were based on the former criterion, that TAI limits would not be exceeded in the event of an inadvertent sudden flush of the entire column, were impractically restrictive. Therefore, curves were prepared on a new criterion which specifies sufficient temperature margins, prior to PCCF discharge, that process tube saturation temperatures will not be reached in event of an inadvertent full column flush.

HW-46000 D, Process Standards - Reactor

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

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

Revision to this standard is identical to that shown in the first paragraph of the revision for HW-46000 B, above.

Process Standard C-120 - "Poison Splines"

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

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

HW-46000 F, Process Standards - Reactor

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

Process Standard A-070 - "Thermal and Biological Shield Cooling Water"

Process Standard C-120 - "Poison Splines"

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

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

Process Standard C-140 - "Speed-of-Control Criterion"

This is a new standard resulting from present operating conditions of the B, D, and F reactors close to speed-of-control power level limits. Speed-of-control considerations require that enough VSR strength be available for automatic insertion at a rate sufficient to limit the power level excursion resulting from water loss at equilibrium levels from ever reaching the melting point of uranium.

The two major causative factors contributing to the necessity for a speed-of-control standard at this time are block charge-discharge techniques which tend to increase the reactor plutonium inventory, and faster rates of power level increase during reactor startups, which result in significantly higher power levels while graphite temperatures are relatively cool. Power level limits have been presented as a function of graphite temperatures for startups, and as a function of plutonium inventory (flux squared weighted exposure) for higher power level operation.

Process Standard G-010 - "Distortion of Graphite Moderator, Process Tubes, and Reactor Shields"

Unit motion reading points of measurement that are no longer significant have been dropped from the standard for B, D, and F reactors. The deleted measurements were shield motion check points that are adequately covered by other instrumentation. Description of several of the measurement locations was re-written for clarification.

HW-46000 K, Process Standards - Reactor

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

Process Standard C-120 - "Poison Splines"

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

Process Standard C-130 - "Total Control Criterion"

The ball 3X trip setting specified for this standard was changed from 30 to 25 psi for agreement with trip settings specified in Process Standards C-100 and C-110.

Process Standard F-011 - "Process Material"

Former length specifications for dummy material at the K reactors were deleted to provide greater flexibility in choice of desired lengths. A maximum length of 18 inches is now the only length requirement for aluminum dummies. This length was selected since it provides desirable positioning of the fuel elements and is conservatively below the maximum length that will pass the most distorted process tube channel.

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PROCESS CHANGE AUTHORIZATIONS

Eight process change authorizations were issued during the month to permit temporary deviation from Process Standards - Reactor, HW-46000. These were:

PCA #1-41 - "VSR Response Time, B, D, F Reactors"

A technical basis for speed of reactor shutdown has recently been issued. Basis Number C-3, HW-55500 RD, for B, D, F reactors.

Pending issuance of process standards, limits were specified in PCA #1-41 to ensure that adequate speed of control is always available.

PCA #1-42 - "Pressure Monitor-Flux Monitor Interlock, K Reactors"

Process standards required by June 1, 1961, a flux monitor-pressure monitor interlock which will open the pressure monitor by-pass switch circuit when flux monitors are ranged to permit operation in excess of two power units. Equipment will not be ready for installation until September or October of 1961. A stop-gap design has been approved to interlock the bulk outlet temperature with the pressure monitor by-pass switch circuit. With this temporary interlock, the pressure monitor by-pass switch circuit will be automatically opened when the bulk outlet temperature exceeds 5°C above the inlet water temperature.

PCA #1-43 - "Pressure Monitor-Flux Monitor Interlock, B, D, DR, and F Reactors"

The purpose of this PCA is to permit operation without a pressure monitor-flux monitor interlock utilizing similar temporary circuitry described above in PCA #1-42. The average outlet temperature of ten selected process tubes will replace the bulk outlet water temperature signal used in the K reactor interlock.

PCA #1-44 - "Flow During Reactor Shutdown - C Reactor"

Process Standard A-030 stipulates that crossheader valves may not be throttled except for poison outages, for at least two hours after shutdown. C reactor shut down on 6/8/61 after 1-1/2 hours of operation to repair a rear face pig-tail. The repairs necessitated flow reduction to crossheader 15.

Procedures have been established in the referenced standard whereby throttling of a crossheader prior to two hours is permitted during poison outages. Throttling at an earlier time can be justified during poison outages because they occur after short operating periods. In this specific instance, the reactor had operated for slightly less than 1-1/2 hours; therefore, throttling could be accomplished within the intent of the standard.

This process change authorized the throttling of crossheader 15 at C reactor, without waiting for two hours, following the shutdown of the reactor on June 8, 1961, provided no process tubes on this crossheader were opened or uncapped on the front of the reactor and the hottest tubes on crossheader 15 were constantly monitored.

PCA #1-45 - "Horizontal Bowing Measurements - D Reactor"

Process Standard G-010 specifies that horizontal bowing shall be measured annually in channels located on both the near and far sides of the reactor near the horizontal centerline. Channels 2451 and 2496 have been used at D reactor for taking of these measurements. The purpose of these data is to monitor trends in distortion of the moderator so that adequate forewarning of potential graphite distortion problems is available.

The extent of process tube channel distortion at D reactor has rendered inadequate the line of sight measuring equipment to the point where a traverse can only be obtained on 2451.

Investigation of equipment modifications is in progress to replace present measuring devices with instrumentation not requiring a line of sight through the process tube channel.

Authorization was given to delay taking horizontal bowing measurements on process tube 2496 until the first cutage after September 14, 1961, to allow time for improvement of procedures and equipment.

PROCESS ASSISTANCE

One engineer audited the conformance to process standards by making ten inspections at each reactor during the report period.

RUPTURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Material</u>	<u>Exposure</u>	<u>Type of Failure</u>
7/1/61	2485-F	UZ-015-H	I&E N	419	Split-Transverse

Legend:

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

Split-Transverse - Failure caused by uranium cleavage across or at an angle to the axis of the core.

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OPERATIONAL PHYSICS OPERATION

PILE PHYSICS ASSISTANCE

All eight production reactors operated during the month on bulk outlet temperature limits, reducing the incentive for flattening; Effective Central Tube values were slightly under the average for the previous twelve months. The average nonequilibrium loss for the month was approximately one-fourth effective day per startup.

During startup on July 21, DR Reactor showed a sharp loss in reactivity following an extended outage for recovering from a Ball 3X drop; the extent to which the loss should be attributable to water and/or balls is under investigation.

SUMMARY OF OPERATING DATA OF PHYSICS INTEREST
FOR THE MONTH OF JULY, 1961

Reactor	B	C	D	DR	F	H	KE	KW
ECT in July (1)	1510	1685	1495	1525	1470	1505	2540	2555
12-Month Average ECT	1500	1705	1495	1540	1455	1580	2520	2545
Equil. Scram Time (2)	14-16	30-35	14-15	30-40	14-20	50-70	20-25*	20-30*
No. of Scrams and Recoveries (3)	0/0	0/0	0/0	0/0	2/2	1/1	0/0	0/0
No. of Non-Scram Outages (4)	0/0	1/0	0/0	0/0	1/1	2/2	0/0	1/1
	2/0	3/0	3/0	2/0	5/0	2/0	2/0	3/0
Recording Period -								
From:	6-21	6-21	6-23	6-23	6-23	6-23	6-23	6-21
To:	7-20	7-20	7-21	7-20	7-21	7-21	7-21	7-21

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

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

B Reactor - J. H. Ferguson

Operating continuity was excellent during the report period; it was interrupted only once, by a high pressure Panellit trip. Average pile exposure was down to 200 MWD/T early in the report period, necessitating a higher than normal spike enrichment inventory.

C Reactor - D. E. Newbrough

Three outage periods all due to water leaks were experienced during this period. Power level was successfully raised and lowered with daily inlet temperature variations during much of the report period.

Number 13 HCR is presently being held out of the pile and is scheduled for replacement during the next outage; the scheduled replacement of remaining cadmium-containing shim rods has been discussed in preceding monthly reports.

VSR number 22 entered only half-way into its channel during the July 17 outage and is presently tied out of the safety system. A smaller B pile type VSR will be inserted in this channel during the next outage.

D Reactor - D. W. Constable

Four outage periods have resulted from one scheduled shutdown, two water leaks and one power failure. A total of 53 splines were used for startup on 6/30, the greatest number used to date for a startup at the D Reactor.

During the last unscheduled outage 33 thin wall tubes were left inactive until later replacement. Average nonequilibrium loss has been .232 equilibrium days per startup.

DR Reactor - J. F. Jaklevick/L. L. Grumme

Operating continuity was interrupted by two water leaks and one power failure. The power failure scram resulted in a Ball 3X trip. All VSR's were removed to facilitate the ball removal; total control requirements were maintained by charging 57 Pb-Cd columns and 127 effective splines; because all the splines would not go in full length, 178 splines were actually used. Backup procedures included partial withdrawal (availability) of HCR's and routine monitoring of low level neutron monitors.

The initial critical configuration on July 21 following the 10-day ball recovery outage indicated a loss of over one per cent ρ_k in reactivity; operation was initiated at reduced level and flux traverses taken in an attempt to determine the extent to which the loss was attributable to 3X balls and/or water.

F Reactor - R. B. Heiple

Operating continuity was poor with a total of five outage periods resulting from two ruptures, two water leaks and a scheduled tube replacement outage.

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F Reactor - R. B. Heiple (Cont'd.)

Additional conservatism in raising level after startups was required due to malfunctions in temperature and rate-of-rise monitoring instrumentation. The HCR "deadman" switch was installed during the July 10 outage.

H Reactor - S. L. Stewart

Two shutdown periods were necessary to repair water leaks. In addition a secondary cold and a hot startup resulted after shutdowns to repair front cap leaks; a rear pigtail failure resulted in a scram from which recovery was made. Equilibrium operation with the E-N load continues to be stable with the present load approximately midway through its exposure cycle. Eight additional tubes of Li-Al have been charged to absorb excess reactivity of the initial load.

KE Reactor - A. R. Kosmata/J. W. Hagan

Only one scheduled outage occurred during the report period. Three tubes of natural metal were discharged during equilibrium operation on July 5. The flapper-valve equipment functioned satisfactorily, and operating personnel had no difficulty in controlling the reactor. Equipment was installed on one tube during the July 17 outage for operational charge-discharge, presently with only aluminum pieces. The installation of the octant monitor safety circuit prototype equipment has been completed and some data was obtained from it during the July 20 startup.

KW Reactor - R. A. Chitwood

Three outages occurred during the month, one scheduled and two due to unexplained Panellit trips. Interim operation was steady. Nonequilibrium losses for the report period averaged .214 equilibrium days.

PROCESS PHYSICS STUDIES

Safety Control Studies

In order to clear the balls from the vertical channels more efficiently following the Ball 3X trip on July 11, DR Processing wished to cover the total control requirements entirely with poison columns and splines. Such a pattern was provided on the basis of locally compensating the enrichment, and then by adding sufficient poison uniformly over the central region of the reactor to cover total control requirements for an infinite outage.

Following the observation of a reactivity loss estimated at 1-1/2 per cent δk , it was possible to add 30 E-columns to the central zone of the reactor within total control limitations. Flux distribution during operation, however, has been so severely peaked to the lower far side that additional enrichment will be required to permit more normal operation. This additional enrichment will be compensated by splines during outages and startup until sufficient xenon and residual heat builds up to permit "uncovering" of the enrichment during operation. The splines may be withdrawn approximately 10 hours after startup and must be inserted within approximately 10 hours following a shutdown.

An evaluation was made of the local and total control effectiveness of the H pile with the E-N loading as charged. This calculation agrees with previous conclusions on the adequacy of the vertical safety system for carrying out this loading in the H Reactor.

Initial data were obtained on intermediate range and octant prototype safety circuitry during the KE startup of July 20; this equipment is being tested under PT IP-410-C.

Pile Reactivity Studies

Background physics information in support of the NPR stack purity test was published as HW-70194. Preparations are proceeding for testing of the applicable equipment and concepts in HLO facilities.

Control Efficiency Studies

Reactivity effects of 72 splines consisting of 36 combinations of width and thickness were determined at the Hanford Test Pile during the month in order to establish optimum specifications for a weaker spline for equilibrium control. The problem is that splines with reduced poison effect must be thinner and narrower to permit more coolant flow, yet must have reasonable strength and retention of poison effect.

Burnout calculations on normal splines indicate on the order of three months irradiation could be obtained before their poison effectiveness was reduced more than 10 per cent.

Subsequent to the samarium transient the hot long-term reactivity changes in the E-N loading have been essentially zero. Indications to date are that the next cycle of the E-N load should have an additional target piece in every fifth tube. Spline flux traverses in tubes 0779, 2684, and 3180 showed a flux peaking approximately three feet upstream of charge center slightly in excess of a cosine pattern maximum.

Shielding Studies

The maximum H Reactor top shield temperature rose during July to 148 C; this higher temperature can be attributed to the higher concentration of CO₂ permitted by the lower specific power during the summer months. During the operating run at low level following the DR ball drop, top shield temperatures reached 177 C with a 100 per cent CO₂ atmosphere but with maximum specific tube powers only about two-thirds normal. These observations confirm earlier conclusions on the effectiveness of helium in improving thermal and biological shield conductivity.

Reactor Fundamentals Training

In cooperation with Manufacturing and Radiological Engineering personnel demonstrations were made of the "teaching machine" to meetings of Process Analysts, Process Managers, and the Industrial Relations Council.

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TESTING OPERATION

IRRADIATION TESTING OPERATION

DR-1 Loop

The DR-1 Loop was operated continuously with the exception of 198 hours during reactor outages. Reference test conditions (1500 F cladding temperatures) were maintained for 236 hours bringing the total time at reference conditions to 2682 hours. The test element was cycled twice from 1500 F to ambient temperature, raising the accumulative total to 18 cycles.

Repairs to the primary loop circulator which failed in May were completed and the circulator was returned to DR-1 for operational testing.

C-1 Loop

The C-1 Loop recirculation pump which failed in June has been returned to the factory for repair.

H-1 Loop

The No. 1 and No. 2 H-1 Loop pumps were removed from the loop, decontaminated, and shipped to the Bettis Atomic Power Laboratory, as authorized by HOO-AEC. Installation of blank flanges will complete this pump work.

KE Quickie Neutron Calibration

Flux monitors were irradiated at the innermost position in each of the six pockets of the Quickie facility at KE Reactor. These monitors will be used to determine the thermal, resonance, and fast-neutron flux in the facility.

HAP0-241

The HAP0-241 defected UO₂ fuel element was discharged from test tube 3865 KE.

Borescoping Activities

Process Tube 4578, D Reactor - The tube was examined for possible damage resulting from a stuck bumper fuel element charge. The top of the tube was galled in four places with pieces of metal rolled up for approximately one foot, starting six inches downstream of the tube inlet flange.

Process Channel 3953, KW Reactor - The channel was examined for obstructions encountered during retubing. The first trunion block was raised approximately one-quarter inch above the first tube block. The remainder of the channel was in good condition except for separations between the tube blocks.

Process Channels 3065 and 2557, KW Reactor - These channels were examined to determine the condition of the graphite prior to insertion of zirconium process tubes. The channels were in good condition with the exception of tube block separations in both channels and some metal chips in channel 2557.

Process Channels 3982 and 4077, DR Reactor - These channels were examined to assist in tube replacement. Both channels had separations between tube blocks at various points along the channel. Both channels also had longitudinal cracks in the central zone tube blocks.

Process Channel 4367, F Reactor - The channel was examined to assist in tube replacement. The third, fourth, fifth, and sixth tube blocks had longitudinal cracks. There was also a transverse crack two feet in from the tube inlet sleeve.

Vertical Safety Rod Channels 34, 24, 14, 38, 28, 27, and 20, DR Reactor - These channels were inspected during ball removal operations to assist in ball removal and evaluation of the graphite stack. A complete report will be issued.

Vertical Safety Rod Channels 10 and 15, DR Reactor - These channels were inspected to determine the amount of 3X balls remaining in the channel and to evaluate the efficiency of the ball removal magnet.

Channel No. 15 had 144 balls visible in the vertical cracks in the corners of the channel. The balls were evenly distributed between 15 and 35 feet down from the bumper block.

Channel No. 10 had 348 balls visible in the same locations as in No. 15. There were 43 balls in one location, 20 feet down from the bumper block. After use of the ball removal magnet, 303 balls remained visible in channel No. 10.

Vertical Bowing Measurements

A summary of the results of vertical bowing measurements follows. All distances were measured from the process tube inlet flange.

<u>Date</u>	<u>Tube</u>	<u>Distance</u>	<u>Results</u>
6-26-61	4674-D	35 feet	Up .01" at 9'4" since 1-27-61 Down .08" at 22' since 1-27-61
7-13-61	4676-F	36 feet	Down .02" at 9'4" since 5-1-61 Down .01" at 21' since 5-1-61

Sample Irradiations

The following irradiation samples were handled:

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Reactor	Test Hole	Facility	Request No.	No. of Samples	Material-Purpose
KE	2D	Quickie	HAPO-184	9	Washington designated program
H		PCCF	HAPO-184	1	Washington designated program
KW	2D	Magazine	ORNL-187	5	KCl (isotope production)
KW	2D	Magazine	ORNL-195	1	Tantalum (isotope production)
KW	2D	Magazine	ORNL-196	1	Tin (isotope production)
KE	2D	Quickie	U of W-104	1	Yttrium (transnasal hypophysectomy)
F		Process Channel	HAPO-098	8	Graphite (burnout studies)
KE	2B	Magazine	HAPO-119	3	Graphite (damage studies)
KW	2B	Hot Graphite	HAPO-177	12	Graphite (damage studies)
KW	2B	Hot Graphite	HAPO-253	1	Al ₂ O ₃ -MgO ceramics (damage studies)
DR		Shield	HAPO-247	6	NPR RTD's (radiation damage study)
KE	2D	Quickie	HAPO-254	3	Phosphorus (tracer isotope production)
KE	2D	Quickie	HAPO-252	3	Arsenic (tracer isotope production)
D		Process Tube	HAPO-218	2	Uranium (fission product release studies)
KE	2A	General Purpose	HAPO-245	1	Zirconium (hydride test)
KE	2D	Quickie	HAPO-223	6	Gold, phosphorus (facility flux calibration)
KE	2D	Quickie	HAPO-260	3	Aluminum crystals (fission damage study)
KW	4B	Snout	HAPO-243	3	Reactor structural materials (fission damage study)
		Gamma*	HAPO-171	8	Plastics and rubber (damage studies)
		Gamma*		3	Concrete (damage studies)
		Gamma*		1	Solutions (damage studies)

*Gamma Irradiation Facility in Building 105-KE storage basin.

COOLANT TESTING OPERATION

KER Loop Operation

KER-1 - Operation of the loop with three 17-inch NIEL and two defected 17-inch NIEL elements as authorized by PT IP-377-A and PT IP-377-A, Supplement A continued. During the outage of July 17, two 17-inch NIEL fuel elements were charged as authorized by PT IP-377-A, and a 9-inch Zircaloy-2 coupon holder, containing a Zircaloy-2 wire-wound rod, was charged to evaluate the fretting corrosion between the rod and wire at reactor operating conditions. Loop operating conditions for the month were 230 C, 1600 psi, and pH 10.0.

KER-2 - Testing of five 23-inch NINL fuel elements with brazed end closures and one 23-inch NIEL element as authorized by PT IP-377-A continued. During the outage of July 17, one 23-inch NIEL fuel element was charged as authorized by PT IP-377-A. Also during the outage of July 17, a new mixing device was installed in the primary heat exchanger mixing-tee.

Prior to reactor startup on July 20 a quantity of ion exchange resin was discovered in the main loop piping, and the loop was placed on single-pass operation. Failure of the resin retaining screens in an ion exchange column is suspected. Clean-up of the loop is proceeding.

KER-3 and KER-4 - These loops remained shut down for Project CGI-839 revisions.

1706-KE Single-Pass Tube Operation - All eight tubes were supplied normal process water from 105-KE.

KE Reactor Outage Time Requirements - No unscheduled reactor outages were charged to production testing. A total of 1.8 hours was charged to production tests as listed below:

<u>Production Test</u>	<u>Description</u>	<u>Hours</u>
PT IP-377-A	Charge three elements in KER-1 and 2	1.8

During the outage of July 17 the test hole facility was removed from channel 3865 in preparation for installation of an NPR-sized tube as authorized by Project CGI-839. As a result, 6.7 hours of KE Reactor outage time were charged to Project CGI-839.

Out-Of-Reactor Facility Operation

TF-1 (CEP-1) - Testing stress crevice corrosion of AMS-5616 coupons and crevice attack on 410 and 420 stainless steel coupons began July 8 using service water (air saturated) at pH 9.5 and 10.0.

TF-2 (CEP-2) - The studies of the effect of contact area on the fretting corrosion between two Zircaloy-2 surfaces continued.

TF-3 (CEP-3) - Work continued on rebuilding of the loop.

TF-4 (CEP-4) - The cyclic decontamination test which began in June continued. Materials undergoing corrosion testing are: 304 stainless steel; A-212 carbon steel; carbon steel welded to stainless steel; Stellite 6 and 12; Haynes Alloy 41; AMS-5616 barstock and as cast; Zircaloy-2; 420 stainless steel; mechanically-bonded carbon steel, stainless steel, and Zircaloy-2 pre-stressed coupons.

TF-5 (ELMO-5) - Corrosion testing of 406 stainless steel, Hastelloy C, Zircaloy-2, 1031, 1051, and A-212 carbon steel, and sensitized and non-sensitized 304 stainless steel coupons continued. Corrosion testing of Monel and 420 stainless steel was completed.

TF-6 (ELMO-6) - Corrosion testing of aluminum X-8001, sensitized stainless steel and Zircaloy-2 at pH 4.5 using a slurry of molybdenum trioxide as the corrosion inhibitor continued.

TF-7 (ELMO-7) - The following test work was continued:

1. Corrosion testing of suit-case-handle supports on two Zircaloy-2 clad fuel elements.
2. Corrosion testing of one KSE3-~~XXXX~~.

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3. Fretting corrosion testing of a PRTR element.
4. Corrosion testing of Zircaloy-2, carbon steel, and 304 stainless steel coupons.

TF-8 (ELMO-8) - Conditioning of the loop was completed July 14. The loop is being readied for low temperature testing. Piping insulation has been completed and spring hangers were installed to support test sections and pump suction line, and a chemical feed system was added.

TF-9 (ELMO-4) - Rate and mechanism of rupture testing of coextruded uranium Zircaloy-2 fuel rods continued.

TF-10 (ELMO-10)- No test work was scheduled.

TF-11 (REP-1) - One gross fission product contamination-decontamination test was completed using stainless steel, carbon steel and Zircaloy-2 coupons.

TF-13 (Dowtherm) - Testing of the effect of raw water film buildup on the heat exchanger tubes and corrosion testing of carbon steel, 304 stainless steel and aluminum coupons continued until failure of the recirculating pump on July 21.

COMPONENT TESTING OPERATION

Irradiated Material Examination - Examinations were completed on the fuel elements from the following 31 tubes at the 105-C Metal Examination Facility:

<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>	<u>PT No.</u>	<u>Tube No.</u>
12I	3965-D	216A	3486-H	216A	3787-KE
	3978-D		3789-H		4355-KE
	4067-D		1553-KE		1352-KW
216A	0864-C		1687-KE		2145-KW
	1560-C		2553-KE		3469-KW
	2685-C		2943-KE		4156-KW
	3964-C				
	1695-D		2952-KE		4159-KW
	1487-F		3087-KE		5561-KW
	3464-F		3370-KE	Reg. "E" Metal	0677-DR
	3379-H		3566-KE		3859-DR

Process Tube Corrosion Monitoring Program - In-reactor measurements of 463 process tubes were completed. Listed below are the tubes measured for each 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>
KE	20	54	70100
KW	100	55	70168
DR	80	56	70188
F	54	57	70193
DR	46	58	70196
C	32	59	70214
H	2	60	70297
KE	80	61	70448
D	49	62	70508

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

<u>Reactor</u>	<u>Number of Tubes</u>	<u>HW Number of Unclassified Report</u>
KW	2	70422
H	9	70518
C	1	Not reported

Tubes 2557-KW and 3953-KW were probologged and removed to verify probolog accuracy. The probolog measurement of tube 2557 was within 1 mil of the out-of-reactor measurement of wall-thickness, and the probolog measurement of tube 3953 was approximately 3 mils lower than the out-of-reactor measurement.

Tubes 0581-H, 1479-H, 1578-H, 1973-H, 2079-H, 2389-H, 3184-H, 4276-H and 4571-H were removed as leakers. Tubes 2079 and 4276 had tube outlet flange leaks; 1578 and 0581 contained transverse cracks; 1973 and 2389 had pin hole leaks due to corrosion and no leaks were found in tubes 1479, 3184 and 4571.

Critical Reactor Component Examination - All of the Truarc snap rings on the tube inlet flanges of both KE and KW Reactors were examined during the month. In addition, the 416 stainless steel Truarc snap rings at both reactors were examined once a week.

All of the front-face flexible connectors at 105-KE Reactor were examined.

Panellit System Programs

Gages repaired, calibrated by Maintenance	-	128	
Gages meeting calibration criteria	-	121	(94%)
-previous month			(82%)
In-board gage reliability examinations	-	691	
Gages meeting examination criteria	-	650	(94%)
-previous month			(95%)
-average for past year			(90%)
Response time determination	-	691	
Meeting response criteria	-	689	(99.6%)
-last two months			(98.8%)

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In-board Bourdon coil leak examination	- 17828	
Non-leaking coils	- 17784	(99.8%)
-average rate for past two years		(99.7%)

During the month, 145 gages received failure analysis.

Critical component examination of Panellit gage components for warehousing and direct-to-user availability are:

	<u>Switches</u>	<u>Bourdon coils</u>
Inspected	85	332
Rejected	22	3
Rejection rate	26%	.9%

Manager, Research and Engineering

MANUFACTURINGPRODUCTION OPERATIONPRODUCTION PLANNING AND SCHEDULINGDischarge Concentrations

There were no discharge goal exposure adjustments effected in July. The overall discharge exposure is as expected from the current goal plan despite an increase in premature discharging to accommodate process tube replacement and probolog activities.

Discharge Exposure Comparison (MWD/T)

	<u>Regular Solid</u>		<u>Regular I&E</u>		<u>Enriched I&E</u>		<u>Overall Exposure</u>
	<u>6 Old</u>	<u>2 K's</u>	<u>6 Old</u>	<u>2 K's</u>	<u>6 Old</u>	<u>2 K's</u>	
May	762	719	647	669	805	687	669
June	691	704	675	678	785	704	692
July	808	739	642	682	841	753	682

Off-Plant Shipments

Two casks of isotope material were shipped to ORNL.

Two elements were returned to HAPO from Mound Laboratory for positive identification. Specific gravity and visual inspection of the crystal structure verified that they were bismuth confirming the earlier HAPO transfer.

ESSENTIAL MATERIALS

Rail and truck shipments received in July were as follows:

Carload shipments for IPD - 98

Carload shipments for other Depts. - 82

Truck shipments for IPD - 230

Total 410

MISCELLANEOUS ACTIVITIES

By month-end ten of the eleven Manufacturing Training Program (MTP) members scheduled into IPD this summer had arrived and been assigned to the using components (nine in Mfg. and one in Facilities Engineering). MTP transfers from IPD to other GE locations proceeded on schedule.

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The selection of six regular IPD employees for registration in the first-year courses of the Manufacturing Studies Program was essentially completed.

Planning for the one 1961-62 class in Fundamentals of Manufacturing was completed, and the course offering was distributed through supervision to first-line supervisors and associated specialists. This class, to begin its sessions on September 11, has been scheduled to accommodate "B" Shift and straight-day personnel. Applications were being received at month-end.

REACTOR OPERATION STATISTICS - PROCESSING

MONTH		REACTOR OPERATION STATISTICS - PROCESSING															
July 1961		B	C	D	DR	F	H	SIX OLD	KE	KW	K'S	TOTAL					
INPUT PU (% OF FORECAST)		108.4	120.6	94.1	34.6	69.2	117.3	91.3	110.6	109.7	110.1	99.2					
TIME OPER.EFF.(% OVERALL)		79.8	94.9	71.9	42.2	51.6	93.7	72.3	87.3	90.1	88.7	76.4					
NEW TUBES INSTALLED		63	3	58	50	51		225	1	1	2	227					
WATER LEAKS- TUBE		2	2	5	5	2	2	18				18					
- VAN STONE		1		3		3		7				7					
SLUG RUPTURES						1		1				1					
HELIUM CONSUMED- M CU.FT.		234.3	511.9	400.1	187.8	693.8	108.5		114.6	273.1		2524.1					
CAUSES OF REACTOR OUTAGES		NUMBER OF REACTOR OUTAGES AND HOURS															
REACTOR OUTAGES		NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.
OPERATIONAL CAUSES																	
FAULTY INST. OR CIR.																	
FAULTY PROC. EQUIP.																	
UNEXPLAINED																	
151 Sub-Station																	
Production Test																	
Water Leak																	
CHARGE-DISCHARGE																	
RUPTURE																	
WATER LEAK		1	150.2	1	38.3	2	126.6	2	102.7	2	123.9	1	45.4	9	587.1	9	587.1
TUBE REPLACEMENT																	
MAINTENANCE																	
Lack of Reactivity																	
Enrichment Adjustment																	
TOTAL		1	150.2	1	38.3	4	209.3	6	430.0	8	360.3	3	47.0	23	1235.1	2	94.4
		UTILIZATION OF REACTOR OUTAGE HOURS															
CHARGE - DISCHARGE		37.6		51.5	19.1	44.1		7.0	159.3	42.6	18.5	61.1	220.4	3.1			
RUPTURE REMOVAL						1.0			1.0				1.0	0.5			
WATER LEAK		19.0	18.3	54.1	37.3	142.9	32.4		304.0				304.0	5.1			
TUBE REPLACEMENT		76.3	15.2	64.1	66.0	69.0			290.6	9.6	2.0	11.6	302.2	5.1			
MAINTENANCE		9.2	4.1	31.9	9.0	101.6	7.6		163.4	14.4	17.9	32.3	195.7	3.3			
STANDARD CHECK				1.5	2.6	1.7			5.8	1.2	2.5	3.7	9.5	0.2			
PRODUCTION TEST		0.8		0.5	0.6				1.9	19.9	0.7	20.6	22.5	0.4			
PROJECT WORK		7.3							7.3	6.7		6.7	14.0	0.2			
OTHER			0.7	5.7	*295.4				301.8		31.7	31.7	333.5	5.6			
TOTAL		150.2	38.3	209.3	430.0	360.3	47.0	1235.1	94.4	73.3	167.7	1402.8	23.6				

*Recovery of 3X System balls and associated work.

**Continuation of June outage.

[REDACTED]

MONTH	REACTOR OPERATION STATISTICS - SLUG RUPTURES

*REMOVAL METHOD: Q, -QUICKIE; CM-CHARGE MACHINE; HJ-HYDRAULIC JACK; TP-TUBE & PIECE

MONTH	REACTOR OPERATIONS STATISTICS — POWER									SHEET 1
	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL	
RIVER WATER (BLDG. 181)										
TO RESERVOIR (BLDG. 182)	15653		2440		2388	2831			23312	
TO FILTER PLANT (BLDG. 183)	66219		87180		65909	88200	178069	183215	668792	
TO FILTER PLANT (C&DR)	120158		35903						156061	
TO R & E (KER) & FEO			203				50		253	
TOTAL	202030		125726		68297	91031	178119	183215	848418	
TOTAL	9018.6		5612.4		3048.8	4063.6	7951.2	8178.7	37873.4	
RESERVOIR WATER (BLDG. 182)					241				241	
TO POWER HOUSE (BLDG. 184)	25		65		23	41			154	
TO COND. SYSTEM (BLDG. 190)			1389		2076	2790			6255	
TO COND. SYSTEM (190DR & 183F)			986		48				1034	
TO EXPORT SYSTEM Incl NPR	15628								15628	
TOTAL	698.7		108.9		106.6	126.3			1040.6	
FILTER WATER (BLDG. 183)										
TO POWER HOUSE (BLDG. 184)	158		168		77	147			550	
TO PROCESS (BLDG. 190)	74751	97848	72654	45861	60697	82000	173505	178512	785828	
TO 108	2500	4500	518		1082	1240			9840	
TO 108DR and B			518						518	
TO FILTER PLANT (BLDG. 183DR)		13312	10721						(24033)	
TO F & S SYSTEM	144		314		475	174		50	1157	
TO R & E (KER) & FEO			153				397		550	
BACKWASH	1978	4498	2134	763	3578	4639	4167	4653	26410	
TOTAL	3550.3	5363.8	3891.7	2081.2	2942.2	3937.2	7949.0	8178.7	37894.1	
PROCESS WATER (BLDG. 190)										
TO REACTOR	74351	97448	72254	45461	60317	81500	161200	173700	766231	
TO REACTOR	88000	100000	87900	88000	88800	85800	183500	185000	907000	
POWER HOUSE (K AREA)							22	11	33	
108 (KE - KW)							11883	4401	16284	
TO R & E (KER)										
BUILDING USAGE	400	400	400	400	380	500	400	400	3280	
TOTAL	3336.8	4367.9	3243.2	2047.2	2709.5	3660.5	7745.3	7968.8	35079.2	
RIVER DATA										
ELEVATION (MSL, F.T.)	402.8		392.3		379.0	384.2			397.4	
	392.6		383.9		370.5	376.3			387.5	
	396.8		387.2		373.9	379.4			391.4	
TEMPERATURE	63.5		65.		66.	65.1			64.0	

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MONTH July 1961	REACTOR OPERATIONS STATISTICS - POWER										SHEET 2	
	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL			
WATER TREATMENT DATA												
MM GALS					106.6							106.6
AT BLDG. 182	2956.0	5363.8	3891.7	1602.7	2942.2	3937.2	7949.0	8178.7				36821.3
BLDG. 183												
CHEMICAL CONSUMPTION												
LBS.												
CHLORINE (BLDG. 182)			4000		600							4600
(BLDG. 183)			32600	13160	22519	31488	98994	93767				331533
AVG PPM	.7	.4	1.0	1.0	.9	.9	1.5	1.4				.9
Alumina												
LBS												
ALUM	80300	140349				57520						278169
AVG PPM												
SEPARAN												
LBS												
AVG PPM	450	650	750	210	916	735	1450	1890				7051
	.018	.015	.023	.016	.037	.022	.022	.027				.019
SULPHURIC ACID (AS 100%)												
LBS												
AVG PPM	233600	399880	60098	72775	136181	202502	194243	856999				2156278
	9.4	8.9	1.8	5.4	5.5	6.2	2.9	12.6				5.9
DICHROMATE												
LBS	33570	51260	45935	29000	25172	41745	25407	83368				335457
PURGE MATERIAL CONSUMPTION												
LBS	10000	13000		3500								26500

* Alumina and alum combined for ppm in alum column.

REACTOR OPERATIONS STATISTICS — POWER SHEET 3

FINOM

July 1961

SHEET 3

ANALYTICAL DATA									
RAW WATER									
	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	
PH	8.3	8.1	8.4	8.4	8.3	8.2	7.1	7.1	7.1
TURBIDITY	10	7	9	13	9	8	13	15	15
FINISHED WATER									
PH	7.1	7.1	7.2	7.1	6.9	7.1	6.9	6.6	6.6
TURBIDITY	.006	.007	.006	.009	.006	.005	.006	.007	.007
CL ₂ RESIDUAL	.05	.05	.05	.05	.05	.17	.21	.17	.17
DICHROMATE	1.21	1.41	1.80	1.80	1.10	1.26	.4	1.2	1.2
STEAM DATA									
	100-B	100-D	100-F	100-H	B-D-F-H TOTAL	KE	KW	KE-KW TOTAL	
GENERATED (MAX)	105000	180000	66000	65000	416000	50000	64000	114000	
(NOR)	81000	81000	40000	54428	256428				
(AVG)	79400	82856	37292	53952	253500	30400	32800	63200	
TOTAL	59119	61645	27747	40140	188651	21620	24367	45987	
TO PLANT	50133	52274	24417	34039	160363	19458	21930	41388	
COAL RECEIVED	465	1706	540	977	3683				
CONSUMED	3413	3350	1586	2528	10877				
IN STORAGE	15470	19520	15154	6853	56997				
GEN STEAM/LB. OF COAL	8.66	9.20	8.74	7.94	8.67				
OIL DATA									
OIL RECEIVED						0			
CONSUMED						201120	212138	413258	
IN STORAGE						1164290	1035802	2200092	
GEN STEAM/GAL. OF OIL						107.5	114.9	111.3	
ELECTRICAL DATA									
TOTAL GENERATED KW HRS.									
						1,497,000	1,623,800	3,120,800	
						9,000	135,800	144,800	

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TOTAL GENERATED KW HRS.

Peak Demand Control

BM- 8700--

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APPLIED REACTOR ENGINEERING

INDUSTRIAL ENGINEERING OPERATION

Planning

A movie entitled "Breakthrough" which describes the "Program Evaluation and Review Technique" for management of large scale Engineering - Scientific programs was obtained from the Navy and shown to several groups currently engaged in Engineering - Planning.

The N Reactor Resident Industrial Engineer attended training sessions on NPR equipment and facilities.

D-DR Perimeter Fence

An analysis of a proposal for the D-DR Perimeter Fence and Badge House relocation was completed.

MAINTENANCE PRACTICES OPERATION

Process Channel Straightening

Facilities Engineering Operation has agreed to investigate the difficulties experienced recently when inserting new process tubes. On-pile investigations have been conducted at DR and F Reactors, which include borescoping, probing, broaching, and boring, as an initial effort to scope the problem and determine corrective action required.

Charging Elevator Modifications

One phase of developing charging elevator modification design scope is the weighing of these elevators. Six of the eight elevators have been weighed and the data is now being analyzed. A program has been initiated to remove specific equipment from the charging elevators to improve the loading conditions pending analyses. Data are now being prepared to correlate interim elevator loading and the effect upon operating costs and production.

PLANT EQUIPMENT ENGINEERING OPERATION

Water Leak Task Force

The Water Leak Task Force was established on July 6 to investigate the current reactor water leak situation and to develop a program for reducing the number of leaks in the future. On July 20, the program was accepted by Irradiation Processing Department Management. A document describing the program currently is being issued.

Dummy Decontamination - Project CGI-871

A request for revision of this project to provide for installation of decontamination facilities at KE and KW Reactors, the replacement of the prototype equipment originally installed at DR Reactor, and the installation of a recently developed perf and poison reclaimer at B, C, D, DR, F and H Reactors has been forwarded to Project Engineering.

N Reactor Instrumentation

Engineering assistance was furnished to the NPR Project Section on evaluation of vendor proposals for the temperature monitor system, flow monitor transducer calibration errors, and specifications for Geiger-Müller tubes for the fuel rupture monitor system.

K Reactor Gunbarrel Flange Retaining Rings

Investigations to establish the cause of failure of existing rings continued, together with studies to aid in the inspection of installed rings to identify those which may not be fully seated. The effect of torque applied to the nozzle mounting nuts and the effect of the chamfer of the gunbarrel flange on ring deformation were established. Calculations were completed to establish the reduction in assembly strength resulting from varying amounts of ring unseating.

B-C REACTOR OPERATIONOPERATING EXPERIENCE

Power levels at both B and C Reactors were controlled during the month to limit bulk outlet water temperatures. One outage was required at each reactor for elimination of process tube water leaks.

July production by C Reactor exceeded by 7.3 per cent the previous high one-month record among the six old reactors. Sixty-four buckets (15,360 pieces) of natural metal were weaseled for the non-representative Pu program.

The feed rate for alum addition was increased, effective July 1, 1961, to 18 ppm at B and C process water treatment plants; this was in connection with efforts to reduce the contaminants content in reactor effluent water.

Effective July 6, the feed rate for addition of dichromate to process water for B Reactor was reduced to one ppm; feasibility of the reduced rate was established by Production Test IP-321-A (HW-65189), in process at C Reactor.

EQUIPMENT EXPERIENCE

New tubes were installed in 63 channels at B Reactor in replacement of tubes with thin walls or water leaks.

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The installation of 82 bumper fuel element nozzles during July brought the total of BFE nozzle-equipped tubes to 119 at B Reactor. Inconel pigtails installed in replacement of J-type outlet connectors now number 278, including 82 added during July.

Three new tubes were installed at C Reactor as replacements for two leaking tubes and one removed for corrosion studies.

Gas leakage from 11 gunbarrel bellows at C Reactor was stopped by filling the bellows with silicone rubber foam. External water leakage was reduced by repair of seven rear face fittings and replacement of two faulty thermo-couple housings. Gamma monitor sample lines were crimped at the rear face to prevent their conduction of water to the interior of the reactor.

A graphite obstruction in a vertical safety rod channel (No. 57) at C Reactor was located by borescoping. Available time was insufficient for complete correction of the condition and the rod was returned to service with only the last six inches of internal travel impaired by the obstruction.

Lightning struck a 2300V line supplying emergency power to Bldg. 183-C. Undesirable results included only minor damage to a circuit breaker. A substitute breaker was placed in service pending procurement of repair parts.

Two 600HP electric motors which failed during June were re-installed at Bldg. 181-B following repair by Westinghouse shops at Portland, Oregon.

A newly rewound stator and quick disconnect bus bars were installed in the 4500 HP motor of No. 7-A process pump unit at 190-B Annex. The pump impeller had developed cracks in two vanes and was replaced with an assembly repaired in the Central Maintenance shops.

IMPROVEMENT EXPERIENCE

At B Reactor, removal of the rear riser room floor and penetration to the downcomer wall was completed in preparation for crossunder line installation (Project CG-884). Modification of the B Sample Room was completed in connection with Project CGI-904. No. 2 Junction Box was installed and the 107-B outfall tie-in was completed under Project CG-889.

At C Reactor, the use of plastic spline stubs on spline caps was initiated to prevent external water leaks.

RADIATION MONITORING EXPERIENCE

Personnel dose rates up to 3 r/hr were encountered during tube burial, up to 350 mr/hr during draining of dryer room expansion joints, and up to 600 mr/hr during removal of front face nozzles. Decontamination was readily accomplished in five incidents of low level skin contamination. In two cases of contaminated personal clothing, all articles were cleaned and released with the exception of one pair of shoes.

No personnel overexposure occurred.

D-DR REACTOR OPERATION

OPERATING EXPERIENCE

Bulk outlet temperature was the principal power level limitation at D Reactor. At DR lack of reactivity after a ball drop shutdown limited power level due to residual balls and/or water in the reactor. Production was low at DR due to the extended shutdown to recover balls and the reactivity conditions following.

The four outages at D Reactor were from water leaks on two occasions, a scram caused by power failure in the water plants and a manual shutdown to reposition an improperly seated front face cap. DR was down six times, two from water leaks, ball recovery, reactivity investigation, inspection of vertical safety rod channels and a Panellit trip.

Actuation of the ball 3X system at DR was caused by incorrect calibration of very low pressure (VLP) switches at a previous undetermined time. During a routine meter check at the 151-D substation on July 11, a test cable plug, placed in the wrong position, caused a loss of power to 190 Bldg. pumps, scrambling both reactors. Balls were released to DR Reactor because of the VLP calibration. Details are contained in document HW-70454.

EQUIPMENT EXPERIENCE

Installation of nozzles for bumper fuel elements was completed at D Reactor with the total now 1790. The tube replacement program continued with 58 installed. Functional checks of the ball 3X Mercooid switches were made verifying that all are correctly installed and calibrated.

DR Reactor, in replacing 50 tubes experienced a repetition of last month's binding of tubes, this time when being pulled into the reactor. Two new tubes were replaced because of damage. Two new reaming methods were tried with some measure of success.

IMPROVEMENT EXPERIENCE

The extended outage at DR Reactor for ball recovery from VSR channels brought out some new techniques for clearing the channels. A plywood dust-proof chute 8" x 8" in cross section was used in place of pipe to transfer balls from the top of the unit through the wall to a cask outside the building. No jamming of balls occurred. Two tools were devised for removing graphite chunks, one a cluster of square-shank screwdrivers, the other of short center punches. They served to wedge the chunks for withdrawal, to spear them or to break up large chunks for removal by vacuum.

RADIATION MONITORING EXPERIENCE

Five lapses of radiation control occurred, all at DR Reactor. Four resulted from facial contamination and one from a radioactive particle in a laundry bag. The maximum dose rate received was 3 r/hr changing ball casks.

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F REACTOR OPERATION

OPERATING EXPERIENCE

Equilibrium reactor power level was essentially limited by bulk outlet temperature. At the month's end, it was controlled by reactivity and heat distortion problems associated with a severe process tube coolant leak in tube 3063-F on July 27, 1961.

Three of the eight outages experienced during the month were in connection with recovery attempts from the reactor coolant leak.

EQUIPMENT EXPERIENCE

During a scheduled outage, 50 tubes were replaced at a rate of 0.75 hours per tube. Three of the tubes removed were found to have bad rear Van Stone flanges.

In locating water leaks, a total of 572 tubes were stinger tested.

Ten Parker fittings were inspected during the July 14 outage. Mild cavitation damage was found in one of the fittings. Significant cavitation damage was found on two of the associated crossheaders. Inspection revealed pits approximately 1/4" across and over 1/16" deep on the inner wall of the pipe opposite the Parker fitting entrance.

One hundred fifty-one tubes were probologged in July. Significant items replaced were: 50 process tubes, 31 failed process tube thermocouples, 87 process tube thermocouples for the full replacement program, two rear face crossheader adapters, eight stop-gap resistance temperature detectors, 312 rear face and two front face water connectors and 44 reamed front face nozzles to accommodate enriched bumper fuel elements. Three Panellit gauges were replaced and approximately 940 gauges were adjusted.

The No. 2 Cuno strainer sheared a pin during an attempted Dicalite purge of the reactor on July 9. The lower end of the shaft was machined down and the sheared pin replaced. The inboard gland on the No. 1 purge pump leaked so badly that the purge had to be discontinued. Satisfactory repairs have not yet been made.

A leaking tube was found in the upper left rear of No. 1 boiler on July 31. The No. 2 boiler was placed in service to permit repairs.

IMPROVEMENT EXPERIENCE

The Interim Bauxite Feed System installation was completed on July 24 except for some minor revisions. The east side feed was put into operation on July 25.

A Horizontal Control Rod "deadman" switch control as per Design Change 487-F was installed at the 105-F Reactor. The installation limits Horizontal Control Rod withdrawal when water temperatures are approaching the bulk outlet limits. The control will assist both in operating at a constant power level and insuring that inadvertent rod withdrawal cannot occur.

Replacement separator baffles were designed, fabricated and installed in the condenser unit of the Gas Drying System in No. 1 and No. 3 Dryer Rooms. The work was completed on an accelerated basis because of the urgent need for maximum efficiency in the system.

A "fail safe" type "tight wire" sensing device was installed below the bottom edge of the light fixtures and upper super-structure of the "D" elevator as an added safety feature to protect personnel working from the rear catwalk.

The rear face tugger was mounted on a new frame and installed on the "D" elevator. Improved movement qualities will reduce associated hazards while operating this equipment.

Work was completed on an auxiliary tank and pump for spot decontamination on the rear face.

RADIATION EXPERIENCE

Four lapses of radiation control were assessed to F Reactor Operation during the month. A localized possible exposure of 2.9 rads to the skin of an employee was estimated upon radioautograph of a small particle of contamination found on his work overalls. Basic assumptions of a 1/4" fixed separation between the skin and contamination and a 16 hour exposure are conservative. Actual exposure could be much lower.

Chemical decontamination reduced rear face dose rates to about one-half of previous levels.

No evidence of increase in F Area sanitary or raw water background activity has been noted following obstruction of the H Area effluent outfall line.

H REACTOR OPERATION

OPERATING EXPERIENCE

Input production was 117.3 per cent of forecast. Time operated efficiency was 93.7 per cent, the highest so far this year. The maximum level attained was 1725 MW and was limited by bulk outlet temperature. There were 47.0 outage hours during the month as a result of three unscheduled reactor outages caused by process tube leaks, leaking front face tube caps, and a ruptured pigtail.

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EQUIPMENT EXPERIENCE

An inspection of the 1904 outfall system during the July 7 reactor outage revealed that the reactor effluent water was discharging down the overflow flume. Subsequent investigation using dye tests, diver surveys of the river bottom, and depth checks of the river bed revealed that a new river bottom has been formed over a wide area to a depth of six to seven feet, covering the exit end of the lines. On August 3, 1961, the upstream line cleared itself, thus permitting the effluent water to be discharged through the discharge line rather than the overflow flume. The system will be closely monitored to determine if the downstream line will also clear itself, making corrective action scheduled to commence August 21, 1961, unnecessary.

The reactor was shut down on July 7, 1961, due to a high water collection rate. A small group of tubes were suspected as a result of galvanic action measurements and previous helium leak test data. A hydrostatic test of the tubes revealed that process tube 2389 was leaking. A subsequent full pile helium leak test also located a leak in process tube 4276. Both tubes were probologged prior to removal. Tube 2389 had a minimum wall thickness of 34 mils and a pinhole leak on the top of the tube 15-1/2 feet from the rear Van Stone flange caused by external corrosion. Tube 4276 had a minimum wall thickness of 32 mils and a transverse crack one-half inch from the rear Van Stone flange.

IMPROVEMENT EXPERIENCE

The preparation of alum from the interim bauxite facility was started on the east and west halves of the filter plant on July 11 and July 14, respectively. The west half remained in continuous operation for the balance of the month while the east half was out of service from July 19 to July 27 for containment box revisions. Although the system is generally operable, several revisions are in progress to improve efficiency, safety, and operability.

Sodium dichromate concentration in the process water was reduced from 2.0 to 1.0 ppm on July 5, in compliance with recommendations from the Research and Engineering Operation (letter, "Reduction of Dichromate Feed", O. H. Greager to O. C. Schroeder). Alum feed rates were increased to 18 ppm on July 14, in conjunction with the P³² reduction program.

Authorization was approved to provide installation of broached nozzles on all process tubes except the outer lattice tubes which have a lithium-aluminum blanket loading. In addition, the two spare charging machines will be modified to handle bumper fuel elements.

RADIATION MONITORING

Dose rates to personnel were well controlled during the month. There were no significant contamination problems.

KE-KW REACTOR OPERATION

OPERATING EXPERIENCE

Power levels were limited at both reactors by bulk outlet temperatures.

KE Reactor experienced a scheduled outage for metal processing and an unscheduled outage due to a Panellit trip caused by malfunction of the operational charge-discharge time delay relay while conducting a test charge-discharge of a process tube. At KW Reactor an unscheduled outage was required for orifice cage replacement work. Unscheduled outages were also required due to grounding of a Panellit circuit caused by a leaking bourdon tube and for a Panellit trip.

EQUIPMENT EXPERIENCE

Additional outage time was required during the scheduled outage at KE Reactor to replace a leaking crossheader expansion joint. A total of four expansion joints were replaced at KE Reactor during the month.

An inspection of bourdon tubes for Panellit gauges at both reactors was completed utilizing the services of R&E personnel. Defective gauges were replaced.

IMPROVEMENT EXPERIENCE

At KE Reactor three process tubes containing natural uranium fuel elements were flush discharged during reactor operation. A single tube equipped with special hardware for OCD was successfully charged with solid aluminum elements during the approach to turnaround level. A second test involving charge-discharge of a tube with solid aluminum elements failed due to a malfunction in the monitor box of the OCD equipment.

Instruments were installed on the rear face effluent piping system at KE Reactor to measure and record vibration, pressure and temperature variations. Information obtained will be used to aid evaluation of the effects of operating at bulk outlet temperatures and the increased water flows associated with Project CG-883.

The wall thickness of 80 process tubes at KE Reactor was measured by the probolog method to establish a base point for comparing corrosion rates of process tubes with KW Reactor. The finished water acidity is 6.6 pH at KW Reactor and 6.9 at KE Reactor.

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Under Project CGI-844, the excavation work for the diesel pumphouse building was completed. The sluice gates for both clearwells were installed and tested.

RADIATION MONITORING EXPERIENCE

A radiation monitor received higher than planned radiation exposure during removal of a graphite stringer at KE Reactor. The incident was investigated and reported in document HW-70567.

A. R. Maguire for

Manager, Manufacturing

OC Schroeder/kmn

FACILITIES ENGINEERING

REACTOR MODIFICATION DESIGN

RESEARCH AND DEVELOPMENT

Tools have been designed for installation of the first prototype overbore process tube assembly of the 40 tube overbore test and for the removal of ruptured fuel elements. The use of the training mockup at White Bluffs has proven helpful in indicating problem areas of both design and tooling.

Hydraulic flow testing of the first prototype 105-C Reactor overbore process tube assembly has been completed utilizing various fuel loadings in process tubes. Results of these tests indicate the assembly to function satisfactorily. Flow and calibration tests of the first five pinna meter assemblies indicate them to be uniform and accurate.

Procurement of vendor supplied items required for the overbore installation is complete except for the gas tube, gas tube adapter, and gunbarrels. These items have been fabricated in the shop to permit installation of the prototype as scheduled.

Graphite distortion data collection continued at 105-C and DR Reactors. At 105-C Reactor an inspection of the No. 57 vertical safety rod channel by use of a borescope revealed graphite blocks protruding into the channel from the front and rear and the channel to be completely blocked about 38 feet down from the top of the reactor. Five vertical safety rod channels at DR Reactor were inspected with the borescope subsequent to the recent third safety system ball 3X drop. Broken blocks were observed on six to eleven per cent of the graphite layers in channels in the rod pattern fringe. Block breakage, notably in the upper portions of the graphite stack, was observed on only front and rear channel walls.

DESIGN PROJECTS

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

Performance and flow tests on two of the 175 horsepower pumps for 1706-KER in-pile loops have been completed. Leakage problems have been corrected and, following modification of the thrust bearings, the pump performance and flow tests will be repeated.

CGI-844 - 100-K Coolant Backup System

The vendor's plant was visited to observe tests and inspect the three 1200 horsepower diesel engines being purchased to drive the emergency coolant backup pumps at 182-K. The engine performed satisfactorily and assumed full load 8.5 seconds after starting.

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

Detailed design is 100 per cent complete.

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EQUIPMENT DEVELOPMENT

EXISTING REACTOR WORK

Overboring Equipment

New equipment fabrication and existing machine improvements currently being made include: (a) Modifications to the tri-bore machine. Those accomplished have reduced the cutting time from more than 15 minutes to 10 minutes. (b) New graphite drill designed to eliminate the need for coordination with the rear face. (c) Gunbarrel removal equipment. (d) A combination coring-over-boring cutter, permitting the channel to be bored with two different diameters, one larger than the gunbarrel.

Tube Replacement

Incidents of difficult tube insertion during routine maintenance operations are being investigated. It has been found that graphite tube blocks are longitudinally split, and that this occurs in channels which will not pass a 1.730" plug gage after having passed a 1.740" broach. The inference that the blocks spring open to pass the broach and close behind it to clamp the tube is obvious. A preliminary attempt at drilling before tube insertion with a 1.740" end mill appears to have been successful.

Charging-While-Operating

Three 105-KE Reactor tubes were discharged during operation without significant incident. In 11 days of operation following the discharge there was no evidence of non-controllable cycling.

A Mark VI flapper was installed on the rear and a flapper nozzle on the front of one tube in KE Reactor under provisions of PT IP-417-K. This production test permits charging of non-fissionable material during operation. One such discharge-charge cycle was accomplished while the reactor was being started.

NEW PRODUCTION REACTOR

Design Test Activity

Activity was reported on 14 design tests being conducted by Equipment Development under instruction of NPR design engineers. The following tests were completed.

- DT-1110 - NPR Compact Machine Tool Relay for Fuel Handling System Console
- DT-1113 - NPR Annunciator Functional Test

The following new design tests were received and assigned with Equipment Development:

- DT-1121 - NPR Process Tube Assembly Gas Seals
- DT-1126 - Coextruded Zircaloy to Steel Tube Joint Test
- DT-1127 - NPR Fuel Canister Functional Test

Testing Facilities

A 200 horsepower mechanical seal pump has been installed in the NPR-PCE Loop, however, electrical supply problems have so far prevented running tests. The pump is to be used to supply full scale flow to a full scale one-tube mockup of the NPR. Material for the mockup is being fabricated.

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PLANT ENGINEERING

DRAFTING

Services provided during the month:

New and revised drawings	177
Layouts and sketches	74
Microfilm prints reproduced	631
Microfilm drawings added	1932
Microfilm drawings voided	652
Ozalid check prints reproduced	883
Catalogs added to files	51
Customers serviced - Microfilm files	248
Customers serviced - Catalog files	33
BPF's and Specifications added to files	20

EQUIPMENT APPLICATION ENGINEERING

Spline Straighteners

Feasibility of successfully reclaiming many of the used splines through the use of a straightener has been determined. An order for a prototype straightener has been placed. Planning work is under way for setting up auxiliary equipment.

Elevator Modification Program

The weighing of the charge elevators in 105-C, D, F, H, KE, and KW has been completed. The Haughton Elevator Company is presently calculating the basic weights for all of the charge elevators so that accurate net loads can be determined for program planning. The discharge area elevators have adequate capacity.

Closed Circuit Television Scope

A preliminary report (HW-65436) has been issued covering the proposed installation of closed circuit television equipment in all 105 Buildings. Proposed system includes facilities for simultaneous viewing of two or more areas in the building from the Control Room. Prototype equipment is operating at 105-B and C Reactors.

REACTOR, PLANT ENGINEERING

Gunbarrel Flange Snap Ring Failure - K Reactors

Loading tests have been run on the snap rings and the resultant problems reviewed with the vendor's technical consultant. Samples of failed snap rings have been sent to the vendor's laboratory in New York for analysis.

Grand Coulee River Cooling Program

The River Cooling Program was put in effect July 26, 1961. Inventory of cold water available was materially reduced because of flood control manipulations by the Corps of Engineers, which resulted in the early release of large quantities of cold water normally available for our cooling program.

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PROJECT ENGINEERING

PROJECTS

CGI-791 - Reactor Confinement

Phase I and II

The construction service contractor, J. A. Jones Company, awarded a contract for \$20,900 to the R. J. Britton Company for berm stabilization around the filter buildings.

P. A. Armstrong, D. A. Hoover, A. W. Hervin and J. W. Scoggin of Project Engineering were called to testify at a hearing before an AEC Hearing Examiner regarding claims submitted by the R. B. Miles Construction Company.

Phase III - Ventilation Modifications and Tie-Ins

Acceptance tests on the ventilation system balance are 90 per cent complete at 105-B and 90 per cent complete at 105-C.

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

Problems associated with the vendor meeting specifications has delayed delivery of four recirculating pumps. Project is 19 per cent complete versus scheduled 60 per cent. Delivery of pumps is expected by September 15. A revised certified progress schedule is being prepared, which will reflect addition of safety circuit improvements to the scope of the work, deferment of modifications to Loops 1 and 2, and delays in construction progress due to late delivery of equipment.

CGI-861 - Expansion of Electrical Distribution System, 105-B, D, & F Buildings.

Receipt of the load center feeder cables is expected around September 15, 1961. The delay in procurement of these cables extends the completion of this project work beyond the directive completion date of November 30, 1961. A revised proposal will be submitted requesting an extension of the completion date.

Project CGI-871 - Improvement to Dummy Decontamination Facilities, 105-B, C, D, DR, F, and H Buildings

A revised project proposal is being prepared requesting an extension of the directive completion date and additional funds to perform the authorized project work.

CGI-906 - Poison Spline Coilers, All Reactors

The 105-C installation has been reworked and put in service.

On July 19, 1961, the AEC concurred with our proposal for the elimination of six of the spare spline coilers.

CGI-933 - Water Treatment Pilot Plant, 100-K Area

A design schedule has been forwarded to the AEC for approval. The first five drawings are approximately 50 per cent complete. A specification for metering pumps has been issued for comment.

MJA-21, 25, 29 - Pressure Monitor System Improvements, 105-C, H, KE, and KW Buildings

Panellit Incorporated is experiencing difficulty in procuring mercury switches. A substitute switch has been received for on-site testing and approval.

CPFF CONSTRUCTION SERVICE CONTRACTOR-LIAISON

Issued seven new work orders and supplemented one old job for a total of \$390,225 to J. A. Jones Company.

PLANT FORCES WORK REVIEW

The Labor Standards Board approved three jobs for assignment to Plant Forces which are estimated to cost \$241,800.

PROJECT PROPOSALS

Project Proposals Approved

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

Directive No. HW-485, Modification No. 4, dated July 13, 1961, authorized interim increase in project funds from \$2,100,000 to \$2,200,000 for inclusion of safety circuit features. Additional contingency funds will be made available if and when cost experience on the project indicates a requirement therefor.

Project Proposals Submitted to AEC

CGI-939 Analog to Digital Converter System for Temperature Monitoring B, C, D, DR, F, and H Reactors

CGI-940 Installation of Oil Burning Facilities in Lead Boiler, 184-H

Manager Facilities Engineering

RT Jessen:dgm

NPR PROJECT

PROCESS DESIGN OPERATION

Project AEC-179

Two documents, HW-68500 RD4 and HW-68501 RD4, concerned with converting the NPR to dual purpose operation have been approved by General Electric. The documents provide data needed for Title I design of the power generating plant and reactor plant modifications regarding (a) reactor plant design performance, and (b) requirements placed on the power generating plant to maintain reactor plant safety and operability. The documents have been forwarded to the Commission for use as a design basis by the Architect-Engineer.

At the request of the Commission, a brief review was made of a suggestion to locate the 184-N turbine-generator building in the reactor plant area. It was concluded that a comprehensive study would be needed to adequately evaluate the alternate location.

Work Authority AEC-179 (2), dated July 13, 1961, has been received which increases the scope of work to the review of Architect-Engineer Title I drawings and scope documents insofar as they involve reactor safety and operation. It also increases the total funds now authorized for General Electric to \$37,000.

Project CAI-816

Bailey Meter Company submitted a cost estimate of \$1,791,287.50 to Kaiser Engineers on July 15, 1961, for the 109-N instrumentation and control package. Kaiser Engineers have requested a bid review by Burns and Roe. The cost includes \$70,000 for computer engineering and computer rental, however, the installation cost is not included in this price. Kaiser Engineers and the Commission have requested additional details on delivery and overhead costs from Bailey. F. J. Mollerus, Jr., and G. L. Swezea visited Bailey Meter on July 11 through 14, 1961, to discuss Bailey analog studies, pre-production temperature detectors, and primary water graphic panel wiring.

C. F. Braun, fabricator of heater wells for the primary loop pressurizer, has advised Burns and Roe that the tubing used has been found to contain 0.24 percent cobalt instead of the specified 0.05 percent cobalt content. Burns and Roe has requested that General Electric review C. F. Braun's request to deviate from the 0.05 cobalt limit in Standard Section N-3. Burns and Roe were advised that this deviation would not be acceptable since it is anticipated that as much as five to ten per cent of the cobalt activity in the primary loop may come from the heater surfaces of the pressurizer as originally specified. A five-fold increase in cobalt contamination would be intolerable from a maintenance and waste disposal standpoint.

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Project CAI-816 (Continued)

A prototype of the horizontal rod drive has been received from the Rucker Company. This prototype has undergone extensive testing in the vendor's shops and minor deficiencies have been observed. It is planned to continue testing at 189-D as a further shakedown in the operation of the rod drive prior to assembly of the balance of the order.

The contract for the underwater fuel sorting machine manufactured by AMF includes shakedown of the equipment prior to shipment. AMF has cleared a building area, and tank erection for the underwater tests has started. Design is essentially complete and nearly all orders from outside suppliers have been placed. A prototype of the conveyor system which transports discharged fuel elements from the rear face to the sorting machine has been received by AMF from a subcontractor and will undergo a dry test in the near future.

General Electric design personnel and Kaiser Engineers have held extensive meetings to examine instrument line routing within the pipe spaces. The flow monitor sensing lines, the RTD signal lines, the rupture monitor sample lines, and the inlet and diversion valve control lines have been discussed. With exception of the flow monitor flow lines, only minor changes have been made. General Electric has proposed two alternate flow monitor routing designs in addition to the approved design and final selection has not yet been made.

DEVELOPMENT AND TESTING

It is estimated that NPR Development and Testing is 87.5 per cent complete, on schedule.

Hardened 400-series stainless steel parts were found to be sensitive to stress corrosion cracking as they were used in prototype inlet and diversion valves. As production planning progresses, a development program is also active to qualify these materials at lower hardness or to provide material substitutions. Wear tests are being performed at the General Engineering Laboratory as authorized by ATH-IP-9-61. These tests will compare wear qualities of material combinations which performed satisfactorily in the prototype valves with those of the same materials at lower hardness. Accelerated stress corrosion tests are under way at Hanford for prototype and the respective proposed production order material substitutions.

The following design tests were completed and final reports issued:

- DT-1110 - NPR Compact Machine Tool Relay for Fuel Handling System Console;
- DT-1113 - NPR Annunciator Functional Test.

Laboratory testing has been completed for the GE-APED In-core Flux Monitor Chambers and Associated Cables. The equipment was transported to the KW Reactor where installation will be made. Significant handling problems are expected to be encountered with discharge of the test assembly due to

high radiation levels. Accordingly, plans were developed by operating and engineering authorities for provision of necessary tooling and methods to install, test and remove the assembly.

The prototype flow monitor pressure-to-electrical transducers supplied by Barton and Swartwout have been undergoing tests since May, 1961. Neither model meets specification requirements as yet. Barton has continued to attempt correction of the hysteresis problem and Swartwout units have exhibited zero shifts with static pressure changes, excess temperature sensitivity and transformer phase shift beyond the specified amount. Accuracy of Avien prototype flow controllers has been found to be satisfactory. High and low limit indicators were not acceptable since the master unit could be tripped without identifying the channel which initiated the trip. The General Dynamics prototype showed unsatisfactory trip point accuracy and indicator perceptibility was poor. Faulty construction was generally evidenced in the Hydro-Aire model with loose wiring connections, relay and timer failures.

Irradiated fuel handling equipment tests have been directed toward evaluation of fuel clip designs, net wear and process tube tip-off concepts. One of two tip-off models that were tested showed consistency in maintaining a desired vertical orientation of fuel elements at impact. Buoyancy of the chain mat was reduced by installation of a larger number of rubber inner-tubes with lower over-all displacement. This arrangement resulted in greater deceleration forces applied to falling fuel elements and a decision was made to evaluate use of small tubes of greater displacement.

The ball 3X trip mechanism and horizontal rod drive production units for testing have advanced in assembly at the laboratory. The trip mechanism hopper gate was removed and weighted so that it would be representative of normal operation. Arrival of the rod drive was delayed by functional problems experienced at the vendor's shop.

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FIELD ENGINEERING OPERATION

Construction

105-N and 109-N Buildings

As of July 28, Kaiser Engineers has placed a total of approximately 16,100 cubic yards of concrete in the 105-N structure. The pouring rate has dropped off considerably as Kaiser Engineers' work on this area nears completion. Approximately 500 cubic yards was poured during July as compared with approximately 1,270 for the previous month.

The structural steel for the maintenance shops in Area Four has been installed. The installation of metal decking for the roofing is in progress in this area and also over the process area, the storage basin, and the transfer area.

Work is also now under way on the concrete block interior partition walls in Area Four.

Work is continuing on the installation of supply ventilation units for Zones 2, 3, and 4. The problem of the steam coils supplied by the Trane Company for these ventilation units now seems to have been resolved.

The majority of the confinement seals for pipe penetrations in Zone 1 walls below 0'-0" level have now been applied. These have not yet been satisfactorily tested, although several attempts have been made. There also is some question as to the adequacy of the sealant used. Preparations are under way to perform laboratory tests on sealant samples and efforts are continuing to perform the required pressure or vacuum tests of the seals which are in place.

Under subcontract SC-37 HUICO has now installed the 24-inch ERW line in corridors 1 and 2, and partially in corridor 5. Four of the field welds made to date have not yet been accepted due principally to unsatisfactory radiographs. One of these four welds is currently being repaired on the basis of x-rays made by General Electric Radiographic Testing.

The installation by Kaiser Engineers of copper tubing for instrument lines has been stopped due to the lack of qualified weldors for the silver brazed capillary action joints. The efforts to train people for this work so they may produce satisfactory quality test samples are continuing.

Approximately 850 of the required 1,138 inlet flow monitor tubing lines have been pulled through the left inlet pipe space wall penetration. About 100 of the similar lines are now being placed through the penetration on the right side inlet pipe space penetration. This tubing is being routed to its final location on temporary supports in the valve rack rooms, but not in the pipe space.

Work is continuing to progress in the 105-N Building on the installation of permanent light fixtures and ventilation ducts.

Approximately 40 per cent of the concrete slab at elevation + 40' on the 109-N Building is now in place. The subcontractor on this building, Drake-Cleveland, has also started the installation of the dump condensers.

The fifth heat exchanger for the primary loop was delivered to the job site during the week of July 24, but has not yet been installed in the 109-N Building. The total number of heat exchangers installed to date is four.

116-N Ventilation Stack for 105-N Building

The stack foundation has been placed and the first stack pour of 7'-6" was made on July 28.

117-N Filter Building

The subcontractor, Rasmussen-Beck, has now placed approximately 315 cubic yards of concrete in the exhaust tunnel for Zones 2 and 3.

151-N Substation

The 230-13.8 KV system through the transformer and up to the source side of the incoming 13.8 KV breaker has been accepted and turned over to Operations.

The construction site is now being supplied electrical power for the 230 KV transmission line.

153-N Building

The two 10,000 KVA transformers have been tested and found to be satisfactory except that the turn ratio is below the ASA specified tolerances. Burns and Roe, Inc. has referred this exception to their New York office for action.

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181-N Building

A total of two of the pump wells in this building have now been dewatered and the sluice gates tested. Because of the difficulty in dewatering these wells, the dewatering requirement has been referred to the heat conversion plant project representatives.

182-N Building

The concrete walls and the substructure of this building are now approximately 40 per cent complete to the 0'-0" level. Two of the water storage tanks are now ready for installation.

163-N and 183-N Buildings

The installation of pipe and electrical equipment in these buildings has continued to progress.

184-N Building

The metal siding on this building is now essentially complete and the application of built-up roofing has been started. The draft fans and the ducts are now in place. The turbine generator has been delivered to the job site.

Seal Well and Outfall Structure

The walls are in place and the subcontract has been awarded for the river discharge pipe line.

Underground Piping and Electrical

This work is continuing and includes the large piping from the river pump house to the pump condensers and back to the outfall structure.

Pile Erection

Machining the top of "I" sections to grade has been successfully completed with all points being within tolerance. Some additional machining for final adjustment may be required following crate erection if foundation settlement occurs.

Crate fabrication for the primary shield is nearing completion at Yuba Consolidated Industries with the crates checking substantially within tolerances.

First tier side crates have been welded in place together with adjoining corner crates and grouted. Tier I and II outlet crates are being set in place for check of roller contact. These cannot be permanently placed until the first 20 boron plates for the bottom thermal shield are installed.

Plans are being developed in cooperation with Kaiser Engineers for the fabrication of boron shield components at Hanford if Baldwin-Lima-Hamilton cannot produce acceptable components.

Graphite

Production of completed graphite details is now 85 per cent complete compared to the scheduled 89 per cent based on the revised production schedule issued July 19. Fabrication shop work is currently on a two-shift, nine-hour, six-day week.

Mock-up of completed graphite details is now 44 per cent complete and is proceeding in accordance with the revised schedule of July 19. Work is being performed ten hours per day, six days per week.

Delivery of graphite is now complete except for 200 additional bars which are being purchased at Kaiser Engineers' request. These bars are scheduled to be delivered during the latter part of August.

Zirconium

A total of 852 tubes have been processed through the autoclave operation; 669 have been accepted as complete and approximately 158 tubes require rework by grit blast and reautoclaving. Completed tube output exceeds the schedule by 1.3 per cent. Eight hundred and ninety-three NPR process tubes and 685 graphite cooling tubes have been received.

Grit blasting of localized areas of unacceptable autoclave film on the outside of tubes was perfected. Eleven tubes have been successfully grit blasted and reautoclaved. Scratches through the autoclave film due to handling in the tube shop reduced the number of acceptable reautoclaved tubes by 50 per cent. Corrective action has been taken to reduce the scratching. Grit blasting of the I.D. surface is still awaiting delivery of the grit blasting equipment from Vacu-Blast Company.

Shop output was somewhat hampered by two contractor personnel walkouts. On July 5, 1961, the Kaiser pipefitters walked out for approximately 21 hours over a dispute at 100-N. On July 10, 1961, the Foothill electricians walked out for approximately 24 hours in protest of HLO operating test equipment on PRTR tubes on the 12-8 shift without Foothill electrical standby.

Administration

The following material was processed during the period of June 19, 1961 through July 23, 1961.

Drawings	522
Criteria	18
Specifications	27
Requisitions	122
ATP's	5
Other	41
Total	735

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

Drawings	55
Specifications	1
Scope	0
ATP's	4
Total	<u>60</u>

SPECIAL ASSIGNMENT

Primary Loop Engineering

Progress on primary piping continues below scheduled rates. Out of approximately 1600 tons total piping required, 46.7 tons have been processed through the HUICO shop. This process tonnage consists of 58 spool pieces with a total of 106 welds. The estimated total number of welds required for the job is 21,000.

The following was the status of the approval data on the HUICO subcontract as of July 31, 1961:

Total Number Received	1408 (include 653 received for information only)
Number Approved	469
Number Approved with Exceptions	37
Number Not Approved	227
Number Currently Being Reviewed	13
Number Received for Information Only (No Approval Required)	653

PROGRAM EVALUATION

Design Status

	<u>Wt'd Total</u>	<u>Certified Schedule</u>	<u>Actual % Complete</u>
<u>Reactor Plant as of 8/1/61</u>			
<u>Title I</u>			
Scope		100	100 (1)
<u>Title II</u>			
Drawings	70	91.0	88.4 (2)
Specifications	8	100.0	95.9
Requisitions	8	80.0	78.5
ATP's	4	50.0	30.5
Development and Testing	<u>10</u>	<u>84.0</u>	<u>88.0</u>
Total	100	87.0	86.0

Heat Dissipation Plant as of 8/1/61

<u>Title I</u>			
Scope		100	98.75
<u>Title II</u>			
Detail Design		90.0	91.0
	<u>Req'd</u>	<u>No. Issued to 7/22/61 Scheduled</u>	<u>Actual</u>
Preliminary Drawings (bid)	934	925	925
Detail Drawings (for const.)	1026	936	936
Specifications (bid)	153	151	151
Requisitions	171	169	169
ATP's	-	0	0

<u>Composite Design Completion as of 8/1/61 (Reactor and Heat Dissipation Combined)</u>		<u>Certified Schedule</u>	<u>Actual % Complete</u>
Total		90.0	89.7

- (1) This percentage represents only the completion of 44 criteria and does not include updating or revising.
- (2) The number of required drawings is changed from 2425 to 2440.

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Cost Estimate

On July 28, 1961, Mr. J. E. Travis, Manager, Hanford Operations Office, AEC, submitted to Mr. G. F. Quinn, Director, Division of Production, Headquarters, AEC, a recommendation that the AEC request authorization of \$165 million (an increase of \$20 million) for completion of Project CAI-816, exclusive of supporting facilities. A summary of this cost estimate by major features is shown below.

	<u>Direct Cost</u>	<u>Change Order Allowance</u>	<u>Total</u>
Engineered Equipment	\$ 48,000,000	\$ 1,400,000	\$ 49,400,000
Subcontracts	47,300,000	9,400,000	56,700,000
CPFF	20,678,000	500,000	21,178,000
Indirects	15,554,000		15,554,000
Engineering	17,000,000		17,000,000
Contingency			5,168,000
	<u>\$148,532,000</u>	<u>\$11,300,000</u>	<u>\$165,000,000</u>

The cost plus commitment totals through Fiscal Year 1963 were estimated as follows:

FY 1961 Actual	\$103,259,548
FY 1962 Estimated	
1st Quarter	\$118,000,000
2nd Quarter	\$130,000,000
3rd Quarter	\$138,000,000
4th Quarter	\$141,500,000
FY 1963 Estimated	\$165,000,000

A cost estimate review meeting will be scheduled after the AEC has established a firm project completion date.

Schedules

In the letter referenced above, Mr. Travis recommended the extension of Project CAI-816 construction completion date from October 1, 1962 to March 1, 1963. This schedule was based on the following critical flow path: (1) August 1, 1962 - total completion of the process unit and primary loop including installation of all equipment, process tubes and connectors, followed by the sequential steps of; (2) November 15, 1962 - complete hydrostatic testing of the primary system at code pressure, final connection to the loop of all instrument lines, and hydrostatic testing of instrument connections; and (3) March 1, 1963 - complete final pre-nuclear testing of the loop at full flow, temperature and pressure.

The five month delay in Project completion was attributed to the following:
(1) primary system was to have been completed and tested by September 1, 1962.

This date has slipped to November 15, 1962, representing a schedule delay of two and one-half months, and (2) the initial schedule allowed for one month of primary system flow tests. Three and one-half months will be required for these tests, representing an additional two and one-half months delay.

The construction status as of 8/1/61 is as follows:

	<u>Schedule of 2/13/61</u>	<u>Actual</u>
Temporary Construction	67.0	67.0
General Area Systems	31.0	20.0
105-N Building	20.0	18.0
109-N Heat Exchanger Building	22.0	20.0
163N-183N Water Treatment	45.0	59.0
181-N River Water Pump House	84.0	94.0
182-N High Lift Pump House	8.0	10.0
184-N Standby Power House	<u>31.0</u>	<u>36.0</u>
NPR Project (CAI-816)	25.0	23.0

Manager, NPR Project

JS McMahon:bk

OF [REDACTED]

FINANCIALGENERAL ACCOUNTING OPERATION

The inventory of fixed property in 100-D Area began on July 24, 1961.

PRODUCT COST AND BUDGETS OPERATION

A helium price increase budgeted for July 1, 1961 will be deferred for about three months and will not be as great as anticipated.

B, C, and H Areas are now using bauxite in place of higher cost liquid alum. DR equipment changes have been made and D and F Areas expect to change over in July.

A new General Services Administration contract for fuel oil reflects a price increase of \$0.27 per barrel (9.3%). This will increase K Area costs by approximately \$39 000 per year.

PERSONNEL ACCOUNTING

Total number of personnel assigned to the Department at month end was 2 307, a decrease of two when compared with last month. Included are ten summer or temporary employees.

PROCEDURES

A study of radiation monitor requirements and a review of exposure time recording has been initiated at K Area. B-C Reactor has requested a review of all their procedures. These reviews should result in simplified procedures as well as elimination of others.

SH Small

Manager-Finance

SH Small:ch

[REDACTED] UNCLASSIFIED

RELATIONS PRACTICES

Two PhDs were interviewed with no offers extended. Six employees transferred into the Department: three from Hanford Laboratories, one from Chemical Processing Department and two MTP trainees from other GE components. Three employees transferred to Hanford Laboratories, one to Fuels Preparation Department and one MTP trainee and one monthly employee to other GE components.

A total of \$155 was paid to nine suggesters. The largest award was \$65.

Communication activities included the publication of six Management News Bulletins, and one priority message. GE NEWS coverage included 12 items about IPD activities totaling 126 column inches. Five HAPC-OPGs and six IPD-OPGs were issued.

One IPD employee retired in July.

There were 62 medical treatment injuries, no disabling injuries and one security violation reported.

W. A. Shanks

Manager - Relations Practices

UNCLASSIFIED

SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-69324	Unclassified	FJ Kempf	4-20-61	Design Test Request No. 1100, Flexible VSR Test for 105-C.
HW-69524	Unclassified	EL Etheridge	5-8-61	Design Test 1108, 10r-C Overbore Zircaloy-2 Process Tube Van Stone Joint Strength.
HW-70038	Unclassified	NF Fifer	7-12-61	Production Test IP-241-AE On-Pile Test of Alternate Hardware Designs 105-C Reactor.
HW-70092	Confidential	FJ Kempf	7-14-61	C Reactor VSR Channels No. 41 and 58 Distortion Data.
HW-70184	Secret	EL Etheridge	7-6-61	105-C Overbore 40 Tube Test Process Tube Assembly Flow and Pressure Drop Calibration Test.
HW-70186	Unclassified	Chas. T. Main, Inc.	6-15-61	Summary Report on Transient Performance, Hanford Export Water System.
HW-WSU-1	Secret	CC Lomax WSU	6-28-61	Analytical Considerations for K Downcomer and Bellows for General Electric Co.
HW-WSU-3	Confidential	CC Lomax WSU	6-20-61	Expansion Joint Tests.
HW-WSU-4	Secret	CC Lomax WSU	7-6-61	Model Test of Downcomer Orifice Plates for General Electric Co.
HW-70044	Secret	DH Frieling	6-26-61	105-KE Rear Face Piping Test During Operation At Maximum Bulk Outlet Temperature - DT-IP-419-E.
HW-70495	Unclassified	Weller Reed, Consultant	6-26-61	Audit of Power House Facilities, 184 Building, 100-F Area.

DECLASSIFIED

HW-70625

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-70155	Confidential	LB Brinkman	7-7-61	NPR Irradiated Fuel Element Examination Equipment.
--	Unclassified	JC Baudendistel	7-26-61	Report of Investigation - Independent Coal Company and Other Vendors.
--	Unclassified	NL Jones	7-10-61	Quarterly Savings and Improvement Report.
HW-70217	Secret	RS Hammond	7-28-61	Three-Tube Discharge of Irradiated Uranium While Operating at KE Reactor.
--	Unclassified	RS Hammond	7-24-61	Discharge-Charge of Solid Aluminum, KE Reactor.
HW-70342	Unclassified	E Hollister	7-20-61	Final Report - Octant Monitor Test Drilling.
HW-69458	Unclassified	WEB Lander	7-11-61	Evaluation of Low Pressure Flow Regulators for CGI-904, Supplement One.
HW-70358	Unclassified	JD Maguire	7-13-61	Design Test 1114 - 105-C Overbored Tube Outlet Collar Water Seal Test Report.
HW-70398	Unclassified	LC Cole GK Hurst	7-14-61	Design Test 1113 - NPR Annunciator Functional Test Report.
HW-70496	Unclassified	LC Cole	7-21-61	Design Test 1094 - NPR Control Rod Tip Weld Fatigue Test - Interim Report No. 1.
HW-70497	Unclassified	JD Maguire	7-21-61	105-K Broached Nozzle Test Final Report.
HW-70506	Unclassified	LC Cole	7-21-61	Design Test 1110 - NPR Compact Machine Tool Relay for Fuel Handling System Console - Final Report.

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-70469	Confidential	J Muraoka	7-28-61	Preliminary Hazards Analysis of an NPR Process Tube.
HW-69907	Confidential	GL Locke	7-23-61	Steam Release for NPR Primary Piping Failures.
HW-70191	Unclassified	HG Johnson	7-14-61	A Review of the NPR Emergency Cooling System.
HW-69553 ADD1	Confidential	FJ Mollerus, Jr.	7-14-61	Stability of the Dump Condensers - Addendum 1.
HW-68500 RD3	Confidential	EM Kratz HR Kosmata	7-11-61	Design Bases - NPR Conversion to Phase II Dual Purpose Reactor Plant.
HW-68500 RD4	Confidential	EM Kratz HR Kosmata	7-21-61	Design Bases - NPR Conversion to Phase II Dual Purpose Reactor Plant.
HW-68501 RD3	Confidential	FJ Mollerus, Jr. DL Condotta	7-11-61	System Transients and Operational Criteria for NPR Conversion.
HW-68501 RD4	Confidential	FJ Mollerus, Jr. DL Condotta	7-21-61	System Transients and Operational Criteria for NPR Conversion.
HW-70414	Secret	DL Condotta	7-16-61	Reactor Design Analysis Monthly Report.
HW-70210	Confidential	FJ Mollerus, Jr.	7-18-61	NPR Process Tube Load and Thermal Stresses.
HW-57252 REV 4	Unclassified	WD Bainard	7-20-61	NPR Water Quality Design Bases.
HW-69374	Unclassified	GE Peck	7-28-61	Factors Involved in Replacement of NPR Evaporators.
--	Unclassified	CL Buckner HE Hylbak	7-11-61	Exhibit No. 6 - Consumable Inserts for Welding.
--	Unclassified	CL Buckner HE Hylbak	7-11-61	Exhibit No. 7 - Surface Protection.

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HW-70625

<u>Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-70192	Unclassified	WD Bainard WR Conley MC Fraser GR Hosack JP Sluka EW Wilson WJ Love	7-6-61	Control of Ambient Conditions Within the NPR Heat Exchangers during Construction Through Startup.
HW-70454	Secret	WD Richmond	7-20-61	Investigation of Ball 3X Trip Incident at 105-DR, July 11, 1961.

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
DH Curtiss	Harvey Aluminum Co. Torrance, Calif.	7/9-14/61	Discussion of tube procurement contracts.
	Bridgeport Brass Co. Riverside, Calif.		" "
	Tube Reducing Corp. Wallington, N.J.		" "
	Reactive Metals, Inc. Niles, Ohio		" "
	Aluminum Co. of Am. Pittsburgh, Pa.		" "
ER Rudock	Harms Tool Co. Seattle, Wash.	7-12-61	Inspect gas tubes and establish machining procedures for overbore process tube equipment.
DF Watson	General Motors Co. Diesel Plant Cleveland, Ohio	7/17-20/61	Witness engine tests and inspect completed facilities.
MH Schack	Albrook Hydraulic Lab. Wash. State Univ. Pullman, Wash.	7/19-20/61	Discuss model testing of the 100-K downcomer.
HW Heacock	Professional Engineers Seattle, Wash.	7/4-8/61	Attend National Society of Professional Engineers Annual Meeting.
HA Kramer	Grand Coulee Dam Grand Coulee, Wash.	7/13-28/61	Measure thermocline.

Name	Firm & Location	Date	Purpose
A McDonald	GE Service Shop Seattle, Wash.	7-17-61	To review schedule covering rework of the balance of the 4500 HP Motors.
JH Hoage	Brooks & Perkins Detroit, Mich.	7-30-61 to 8-7-61	Discuss with poison spline vendors arrangements for establishing quality control procedures.
	General Astrometals Corp. Yonkers, New York		" "
	Reactor Materials, Inc. Peekskill, New York		" "
	Sintercast West Nyack, New York		" "
CA Munro	Norfin, Inc. Seattle, Wash.	7/6-7/61	Review Contract DDR-129.
CA Munro	Norfin, Inc. Seattle, Wash.	7/25-27/61	Observe tests of tri-bore machine Contract DDR-129.
R Sherrard DF Arnold	Epsco-West Anaheim, Calif.	6/20-23/61	Review work on DDR-133, full scale high speed scanning system.
HS Davis	ASCE Committee Meeting Chicago, Illinois	6-26-61	Attend committee meeting.
	ASTM Committee Meeting Atlantic City, N.J.	6/27-28/61	Attend committee meeting.
	Yuba Consolidated Ind. Benecia, Calif.	6-29-61	Inspect crate fabrication.
JE Stice	Baldwin-Lima-Hamilton Philadelphia, Pa.	6-29-61 & 7-20-61	Determine progress of fabrication of boron shield components.
LP Reinig	Mason-Neilan Norwood, Massachusetts	7/5-7/61	Approve production drawings and procedures and to arrange test program for material substitutions.
	Chandler-Evans Hartford, Connecticut		
GT Haugland	Baldwin-Lima-Hamilton Philadelphia, Pa.	7/10-27/61	Give technical assistance on thermal shield fabrication.

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HW-70625

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
FJ Mollerus, Jr. GL Swezea	Bailey Meter Company Cleveland, Ohio	7/10-14/61	Discuss engineering studies of 109-N instrumentation and control to be done by Bailey Meter.
CD Shadinger	Vacu-Blast Co., Inc. Belmont, Calif.	7/20-21/61	Accompany Kaiser Engineers on inspection of Vacu-Elast equipment prior to shipment to project.
JW Green	Anton Electronics Co.	7/19-20/61	Discussions on component specifications for the NPR fuel rupture monitor.
KW McKay	Cleveland Diesel Div. of General Motors Cleveland, Ohio	7/18-19/61	Observe final run-in and testing of diesel engines to be installed on Project CGI-844.

VISITORS

JJ Schneider D Tuel	Wyandotte Chemical Co. J. B. Ford Division Los Nietos, Calif.	7/10-14/61	Discuss reactor decontamination problems.
JA Cox	Oak Ridge Nat'l. Lab. Oak Ridge, Tenn.	7/17-18/61	Discuss procedures of training reactor operators.
P Pariseau F Morris	Turco Products, Inc. Wilmington, Calif.	7/19-21/61	Discuss decontamination and cleaning methods of materials.
ER Tinney	Hydraulic Consultant Pullman, Wash.	7-24-61	To inspect and discuss plant effluent system.
JS Stutheit	E. I. DuPont Savannah River, Ga.	6-19-61	To discuss high speed scanner system and concepts.
George Kanen	Dage Television Div. Thompson-Ramo-Woodridge Michigan City, Ind.	7-28-61	Visited to inspect TV camera which has been exposed to high radiation on the actuator at KE Reactor.
Frank Morris Paul Pearseau	Turco Products Co. Los Angeles, Calif.	7-19-61	To discuss reactor radiation.

Name	Firm & Location	Date	Purpose
HS Blumberg	Metallurgical Consultant New York City	6/20-22/61	Consultation regarding NPR fabrication metallurgy.
Dr. EO Bergman	Piping Code Consultant San Marino, Calif.	7/10-13/61	Review primary piping standards and progress; discuss bolting con- siderations of the Grayloc couplings.
R Granada	Barton Instrument Corp. Monterey Park, Calif.	7/10-14/61	Analyzing test data and performing tests on the process tube flow monitor transducer prototypes.
FR Cooper Dr. JS Anderson	Hydro-Aire Company Burbank, Calif.	7-14-61	Discuss testing and performance of the process tube flow monitor controller prototypes and trans- ducer prototypes.
HS Blumberg	Metallurgical Consultant New York, New York	7/20-22/61	Discuss NPR process piping, specification, inspection, fabrication and field erection problems.
RA Williamson	Holmes and Narver Los Angeles, Calif.	7-21-61	Deliver final report on structural audit of 105-N Bldg. and observe present status of the 105-N.
JG Schneeman	X-Ray Products Corp. Pico-Rivera, Calif.	7/24-26/61	Discuss non-destructive testing being used as material control on the process tube assembly components.

**DATE
FILMED**

02/02/93