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HW--72813

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IRRADIATION PROCESSING DEPARTMENT

MONTHLY REPORT *Received by OSTI*

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HANFORD ATOMIC PRODUCTS OPERATION

GENERAL ELECTRIC

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This document consists of
75 pages.

IRRADIATION PROCESSING DEPARTMENT
MONTHLY REPORT
FEBRUARY, 1962

Compiled By
IPD Personnel

March 15, 1962

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DECLASSIFICATION NOT LEFT
UNCHANGED

By JPD 12
Date 5/23
U.S. Atomic Energy Commission

RICHLAND, WASHINGTON

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Classification Cancelled (Change)

By Authority of J. S. Tamm
6/1/62 8-10-62

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SUMMARY

RESEARCH AND ENGINEERING

Power levels were restricted by administrative limits at the K and C Reactors, by rupture control considerations at H Reactor, and by tube corrosion considerations at B, D, DR and F Reactors.

A standard size self-supported element failure occurred at C Reactor probably due to severe corrosion. Inspection of the element showed that six of the eight support rails were damaged, resulting in its being improperly positioned during irradiation.

Five N-size inner tubes charged into KER-1 Loop to evaluate the effect of pre-irradiation warp on the fuel behavior were discharged. Initial examination showed no gross distortion; they will be stored until precise measurements can be made. Five of the same type elements being irradiated in KER-2 Loop to evaluate high exposure distortion and swelling have reached an exposure of 2385 MWD/T.

Testing of KER-3 and 4 Loops which have been modified under project CGI-839 is in progress. Low power operation is presently authorized, with additional analysis necessary before proceeding to the higher powers representing full design conditions.

NPR Hazards Review - Volume I (Phase I - Production Only) has been completed and will be distributed upon AEC approval of the proposed distribution category.

Three samples of irradiated, recycled enriched uranium have undergone isotopic analysis. A discrepancy between theory and the analytical results is being investigated.

HW-72555, "Development and Application of Principles of Nuclear Instrumentation", was issued and will provide a reference for use in other reactor nuclear instrumentation survey studies.

MANUFACTURING

Reactor input production (MWD) was 3.7 per cent above forecast; 0.8 per cent above at the six old reactors and 6.6 per cent above at the K's.

Over-all time operated efficiency was 69.4 per cent (66.2 per cent forecast); 63.4 per cent at the six old reactors and 87.2 per cent at the K's. Efficiency was low at the old reactors due largely to scheduled outages for tube replacement.

There was no increase in the combined reactor instantaneous power level. The administrative level of 2310 megawatts was reached at C Reactor with an increase of 15 megawatts. The power level at B Reactor was increased 45 megawatts for a record level of 1930.

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Three ruptures, two I&E regular and one I&E enriched, were removed from the reactors. The regular metal ruptures were at C and D, the enriched at B.

FACILITIES ENGINEERING

A flexible vertical safety rod was successfully installed in VSR channel No. 48 at 105-C Reactor. The new flexible rod satisfactorily replaced a rigid rod which has been removed from service due to partial blockage of the channel.

A second VSR channel which had previously been binding the installed VSR was successfully broached to permit the utilization of an available rigid rod in the channel.

The detailed study of alternate methods of reducing radioisotope release to the Columbia River has been completed. The first report, results of a study evaluating the disposal of reactor effluent through an inland lake, has been completed. The results of this study indicate that there is little incentive for giving further consideration to this alternative method of effluent disposal.

A ten-tube refueling operation at equilibrium power was performed on February 9 at KE Reactor and was successful in all respects. Tubes were refueled at a rate sufficient to meet the reactor's continuous refueling requirements.

The summary report detailing the findings of the IPD Disaster Planning Study was issued.

Physical Completion Notices were issued for CGI-871, "Improvements to Dummy Decontamination Facilities", and CGI-884, "Rear Face Crossunder Lines".

NPR PROJECT

New computer programs are being developed to assist in transient analysis of hydraulic and thermal parameters for a closed recirculating loop.

Analysis of an inadvertent closure of a front connector inlet valve during full power operation has indicated that fuel meltdown will not occur.

The General Engineering Laboratory technical appraisal team, now 50 per cent complete in the review of the heat dissipation system, presented some preliminary findings to General Electric at Richland.

Important inconsistencies between the 105 and 109 confinement systems have been resolved.

The vendor of horizontal rods is experiencing difficulty in functional tests of the rod seals of the actuating cylinders.

Pressure relief valves for the primary loop may require development at HAP0 and do not appear to be obtainable directly from industry.

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Installation of the graphite moderator was started on January 22, 1962, with the first bar laid at 5:14 p.m. Installation (a total of 89 layers) was complete at 9:35 p.m., February 28, 1962. This operation was performed without difficulty and final stacking dimensions were well within design requirements.

Twenty-one zirconium process tubes were received from Harvey Aluminum February 20, 1962. This completes shipment of all process tubes, with the exception of eight pilot order tubes from Allegheny-Ludlum that were sent to Harvey Aluminum for possible repair if needed for construction spares.

Work of cleaning the installed stainless steel tubing for the flow monitoring system was terminated on February 27, 1962, when it was discovered that a considerable amount of tubing showed evidence of suspected stress corrosion cracking.

Both Taylor Forge and Ladish Company have qualified their procedures for manufacturing new pipe and replacing welds on existing pipe. Manufacture of both types of pipe is now under way at both plants.

GENERAL

RESPONSIBILITY

There was no significant change in responsibility.

FORCE SUMMARY

	<u>Exempt</u>	<u>Non-Exempt</u>	<u>Total</u>
General	7	1	8
Research and Engineering	102	59	161
Manufacturing	422	1379	1801
Facilities Engineering	105	39	144
NPR Project	99	32	131
Financial	17	13	30
TOTAL	752	1523	2275

SAFETY, SECURITY AND RADIATION EXPERIENCE

There were 68 medical treatment injuries, three security violations and no disabling injuries or radiation exposures exceeding 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.

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<u>Name</u>	<u>Date</u>	<u>Title</u>
R. R. Henderson	February 2, 1962	A Method of Fabricating a Control Spline
W. E. Vetter	February 15, 1962	Random Number Selector
D. D. Bisby	February 15, 1962	Trip and Response Time Detector
W. E. Vetter

General Manager

AB Greninger:DLD:kn

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RESEARCH AND ENGINEERING OPERATION

PROCESS AND REACTOR DEVELOPMENT

REACTOR FUELS

Present Reactor Technology

Overbore Fuel Development

Two columns of overbore-size bumper fuel elements were discharged from C Reactor during the 2-16-62 outage at an estimated average tube exposure of 765 MWD/T. No further discharges of self-supported overbore fuel occurred during the report period. The failed element referred to in last month's report remains in storage awaiting Radiometallurgical examination.

Self-Supported Fuel

A rupture classified as a groove corrosion side failure, was experienced in a CIVN-S fuel element on 2-3-62 at a tube exposure of 1003 MWD/T. Failure was apparently due to severe corrosion attack. Visual observation revealed six of the eight support rails were damaged resulting in improper fuel positioning in the process tube during irradiation.

Two columns which had been bypassed during a previous outage (2-3-62) were recharged during the 2-16-62 outage.

Two KVN-S columns were discharged from KW Reactor without difficulty during the 2-13-62 outage at an estimated average tube exposure of 800 MWD/T.

Bumper Fuel Development

Irradiation of these elements proceeded uneventfully.

Other Programs

Irradiation of nickel plated fuel continued uneventfully.

One column of coextruded Zircaloy clad material was discharged from KW Reactor during the 2-13-62 outage at an estimated average tube exposure of 1475 MWD/T.

Advanced Reactor Technology

NPR Fuel Development

The five 23-inch NIEL elements charged into KER-1 on December 14, 1961 to evaluate the effect of pre-irradiation warp condition on fuel behavior were discharged 2-17-62, at an exposure of 1075 MWD/T. cursory examination of the discharged elements indicated no grossly abnormal distortion. The elements will be stored until precise dimensional changes can be measured.

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KER-1 was recharged on 2-17-62 with a thermocouple element to evaluate the reliability and sensitivity of the thermocouple element as a crud film detector. Other objectives are to measure the temperature effect of crud film deposition as the result of decontamination of a carbon steel system and to measure the effect of filming resulting from loss of pH control. The thermocouple element and the four NIEL heater elements in the charge are scheduled to a 2000 MWD/T goal.

Five 23-inch NIEL elements charged in KER-2 on 9-17-61 to evaluate high exposure fuel element distortion and swelling have reached an exposure of 2385 MWD/T.

On 2-18-62, two NAEI fuel assemblies were charged in KER-3 to permit further testing of this loop, which has been modified for the irradiation of N Reactor prototype fuel elements under N Reactor conditions. The two elements in KER-3 have reached an exposure of 25 MWD/T.

Four capsules containing enriched Zr-2 jacketed fuel samples to determine the effect of jacket uniformity on localized jacket straining were charged into DR Reactor on 1-7-62. Target exposure is about 2000 MWD/T. Current exposure is 300 MWD/T.

Fuel Designation Codes:

OIIN	Old Reactors,	second I&E model, natural uranium element
OIIINB	Old Reactors,	third I&E model, natural uranium bumper rail element
CIVN	C Reactor,	fourth I&E model, natural uranium element
CVIN	C Reactor,	sixth I&E model, natural uranium element
CVINB	C Reactor,	sixth I&E model, natural uranium bumper element
CVINS	C Reactor,	sixth I&E model, natural uranium self-support element
KVNS	K Reactor,	fifth I&E model, natural uranium self-support element
NIEL	N Reactor,	inner tube, enriched uranium, first model
NINL	N Reactor,	inner tube, natural uranium, first model
NAEL	N Reactor,	concentric tube assemblies, enriched uranium, first model

REACTOR ENGINEERING

Present Reactor Technology

C Reactor Overbore - Zircaloy Tube Procurement

We have been notified by Chase Brass and Copper Company that they have been unable to fabricate successfully Zr-2 C-overbore-size process tubes under their demonstration order for O-5 tubes (H2K-25177).

K Reactor Fuel Design Confirmation

Test data indicate the KVNS fuel element, designed for use in K Reactor normal-size Zircaloy tubes, performs as expected. A comparison between predicted and experimental conditions is shown below:

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STATUS REPORT OF PRODUCTION TESTS

Test No.	Type Metal	Tubes	Reactor	Goal		Remarks
				Exposure	Current Exposure	
IP-216-A	Normal prod. natural and enriched fuel elements	126	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-263-A Supp. A	Nickel plated fuel	50	DR	Twice normal variable goal	1000 MWD/T	Demonstrate on a pilot scale that satisfactory nickel plate adhesion has been attained and that reducing nominal plate thickness from .6 mil to .2 mil does not affect this parameter.
IP-272-A	I&E self-supported fuel	69	C	Variable +200		Provides for testing of CIVN geometry fuel in C Reactor ribless zirconium tubes.
IP-381-A & IP-431-A	I&E self-supported fuel overbore size	62	C	800 MWD/T		Provide preliminary qualitative data regarding irradiation behavior of larger fuel element designs. PT-IP-431 expands the test facility up to 65 tubes.
IP-377-A	Five 23-inch N Reactor inner fuel tube elements, KER-2	1	KE	3000 MWD/T	2385 MWD/T	Elements charged in KER-2 on 9-17-61 for high exposure tests.
IP-397-A	Zircaloy clad enriched I&E fuel elements	2	KW	Variable	1480 MWD/T	Provide irradiation experience for elements fabricated by NPR manufacturing process.
IP-402-A Supp. A	Enriched uranium samples	1	DR	2000 MWD/T	300 MWD/T	Zr-2 jacketed samples in NaK filled Zr-2 capsules charged 1-7-62, to evaluate effect of jacket uniformity on localized jacket straining.

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<u>Test No.</u>	<u>Type Metal</u>	<u>Tubes</u>	<u>Reactor</u>	<u>Goal Exposure</u>	<u>Current Exposure</u>	<u>Remarks</u>
IP-409-A	I&E self-supported fuel	2	KW	800 MMD/T		Provide qualitative data to confirm the fuel geometry design. Two columns discharged on 2-13-62 at goal. Both were recharged.
IP-432-A	Elliptical vs. regular bumpers	20	D	Variable	360 MMD/T	Provide a comparison of corrosion characteristics of "elliptical" bumper rails to current bumper rail design to determine their feasibility. Test charged during 12-16-61 outage.
IP-448-A	One enriched thermocouple element; four 17 inch N Reactor inner fuel tube elements, KER-1	1	KE	<2000 MMD/T	50 MMD/T	Test is to evaluate the reliability of thermocouple elements and to evaluate temperature effects of crud in carbon steel system. Elements charged 2-17-62.
IP-455-A	Five 23-inch N Reactor inner fuel tube elements, KER-1	1	KE	<1000 MMD/T	1075 MMD/T	Elements charged in KER-1 on 12-14-61 to evaluate preirradiation warp. Fuel discharged at goal on 2-17-62.
IP-477-A	Two 23-inch N Reactor fuel elements, KER-3	1	KE	<3000 MMD/T	25 MMD/T	Elements were charged 2-18-62, to permit loop testing with fuel.

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	<u>Predicted</u>	<u>Experimental</u>
F_A - Annular Flow Fraction	0.660	0.649
F_H - Hole Flow Fraction	0.340	0.351
Q_A - Annular Power Fraction	0.693	0.684
Q_H - Hole Power Fraction	0.307	0.316
Q_A/F_A	1.05	1.05
Q_H/F_H	.903	.90
Flow	61 gpm	60.6 gpm

Graphite Distortion Monitoring

A channel displacement measuring device (optical) has been tested on a distorted channel mock-up. Vertical displacements measured were within 0.1 inch of those obtained with a mercury manometer. Further mechanical improvements will be made prior to routine reactor application.

Advanced Reactor Technology

KER Loop Testing

Before the beginning of low-power fuel irradiation in KER Loops 3 and 4, (modified by Project CGI-839) a dump test was performed to investigate the flow transient that results from a total loss of pumping power and the initiation of backup coolant flow. Analysis of the test results revealed that the early low-powered operation of the modified loops can be accomplished safely and with adequate emergency backup coolant. Further analysis of the test data will be required to determine adequacy under Project CGI-839 design conditions. Following the test, Loop 3 was loaded with two prototype NPR fuel elements.

NPR Hazards Review

The NPR Hazards Review - Volume I (Phase I - Production Only) has been completed and transmitted to the HOO-AEC. Internal and external release of the document is being held up pending receipt of AEC approval of the distribution category. The distribution category assigned the document was that for Hanford production information.

Technical Bases for Standards

Seven additional Technical Bases were prepared this reporting period. A total of 61 Technical Bases have been prepared in rough draft form.

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Technical Manual

Preparation of both Volume I and Volume II is proceeding on or ahead of schedule.

REACTOR PHYSICS

Fuel and Tube Variations

Studies of the physics efforts associated with changes in fuel length, diameter and cladding materials were completed and the results appear in HW-72675, "Preliminary Fuel Element Design Studies for the 2000 Program Task Force", by C. M. Heeb and W. A. Blyckert. Though the results are expressed in terms of net return changes, the study was confined to the physics effects and did not cover other engineering or fuel factors.

In similar fashion, HW-72692, "Effect of Process Tube Material Changes on Reactor Economics" was issued during the month. The report summarizes the physics effects of changes in the process tubes.

E-N Load

The second E-N load in H Reactor was discharged at the end of January. The large batch dissolution of the E metal from the first E-N core has been completed but analytical results have not been reported.

Pinchbottle Program

Three samples of irradiated, recycled enriched uranium have undergone isotopic analysis. Analytical results for Np^{237} yield are given below together with theoretical values. The obvious discrepancy between theory and analytical results is being investigated.

<u>Sample</u>	<u>Neptunium Yield From E-Metal</u>	
	<u>Np^{237} g/T (Analytical)</u>	<u>Np^{237} g/T (Theoretical)</u>
A. Recycle	2.92	~2.10
B. Recycle	3.40	~2.75
C. Recycle	4.33	~3.15
D. Virgin (comparison)	2.70	~2.40

The percent of recycled fuel in the enriched fuel in the reactors at the end of January and discharged during January are given below.

	<u>Percentage of Recycled Fuel in Enriched Fuel</u>							
	<u>B</u>	<u>C</u>	<u>D</u>	<u>DR</u>	<u>F</u>	<u>H</u>	<u>KE</u>	<u>KW</u>
January 31 Status	<u>75</u>	<u>91</u>	<u>69</u>	<u>76</u>	<u>68</u>	<u>70</u>	<u>95</u>	<u>97</u>
January 31 Discharge	66	82	0	54	100	53	97	98

The wide range of discharge composition from the D and F Reactors is due to the small number of fuel columns discharged during the month.

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Nuclear Safety

Various studies in the area of nuclear safety continued. These included evaluation of a method to test directly the poison strength of unirradiated poison splines, further analysis of the instrumentation requirements in the old reactors, analysis of flux distortion effects on control effectiveness both in old reactors and NPR and programing efforts to allow calculations of NPR response to a prolonged reactivity ramp addition. Results from each of the studies will be reported as they are obtained.

Basic Studies

To evaluate an analytical method of calculating collision probabilities in a tube-in-tube fuel element, several Monte Carlo first flight collision probability computations were made. The results are given in the following table. Comparison with analytical results obtained by C. R. Richey for the same element reveals good agreement.

<u>First Flight Collision Probability</u>			<u>Number of Histories</u>
<u>Wet Element</u>	<u>Analytical</u>	<u>Monte Carlo</u>	
P _{OO}	.215	.213	6,560
P _{OI}	.072	.073	6,560
P _{II}	.225	.230	3,440
P _{IO}	.109	.108	3,440
<u>Dry Element</u>			
P _{OO}	.223	.219	6,590
P _{OI}	.087	.089	6,590
P _{II}	.229	.249	3,410
P _{IO}	.130	.131	3,410

The subscripts refer to the source region and the region in which the collision occurred. Thus, P_{OI} is the probability that a neutron born in the outer uranium tube will collide in the inner uranium tube. Wet or dry designates whether or not the fuel assembly contained any internal water.

An additional run was made to check the Monte Carlo program. For a solid rod where the macroscopic cross-section times the radius is 0.50, the exact first flight collision probability is 0.40405. The results of 10,000 neutron histories using the Monte Carlo program yielded a first flight collision probability of 0.4004.

RADIOLOGICAL ENGINEERING

Radiation Control Experience

The following table summarizes the radiation exposure experience of critical IPD classifications through 4 weeks of the 1962 badge year:

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Classification	Total Dose	No. of Employees	Average Dose/Employee	Extrapolated Year End Average	No. of Employees over 3r Extrapolated Exposure
Radiation Monitors	17594 mr	82	215 mr	2792 mr	32
Processing Operators	43964	254	173	2247	59
Pipefitters	22408	107	209	2714	51
Millwrights	16409	84	195	2532	28

Lapse of Radiation Control

Lapse of Radiation Control
Distribution by Reactor and Component

	B	C	D	DR	F	H	KE	KW	IPD Totals
Processing	0	1	2	0	1	1	2	1	7
Maintenance	4	0	0	0	0	1	2	0	7
Power	0	0	0	0	0	0	0	0	0
Suppl. Crews	0	0	0	0	0	0	0	1	1
Applied Reactor Eng.	0	0	0	0	0	1	0	0	1
Research & Engineering	0	1	0	0	0	0	1	1	3
Facilities Engr.	0	0	0	0	0	0	0	0	0
Central Maint.	0	0	0	0	0	0	0	0	0
Reactor Areas	1	0	0	0	1	0	0	0	2
Assigned Totals	5	2	2	0	2	3	4	3	21
IPD General									

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.

Effluent Water Data

The table below shows the average concentrations of radioisotopes in reactor effluent water from samples taken during January 1962. Concentrations are in units of 10^{-12} curies/cc.

Reactor	As ⁷⁶	p ³²	Zn ⁶⁵	Np ²³⁹	Cr ⁵¹
B	68	4.4	*	*	*
C	91	8.8	36	180	1100
D	64	7.4	18	150	680
DR	63	9.6	47	100	860
F	50	8.1	61	160	2600
H	60	7.0	90	90	460
KE	54	11.4	18	90	680
KW	55	10.9	15	100	800

* No valid sample.

Effluent Measurements - Nickel Plated Fuel

The following are the average amounts of p³² (10^{-12} curies/cc) found in reactor

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effluent in conjunction with the irradiation test of chemplated nickel fuel elements at 105-DR.

<u>Time Samples Taken</u>	<u>Normal Effluent</u>	<u>Nickel Plated Fuel Effluent</u>
9-18-61 to 11-27-61	5.6	17.8
12-4-61 to 2-5-62	11.9	205

The last samples (2-5-62) were also analyzed for Co^{58} . Lack of calibration prevents reporting absolute concentration but the concentration of Co^{58} in the effluent from tubes containing nickel plated fuel was between 10 and 20 times the concentration found in the riser (normal) samples.

Since the riser sample contains the effluent from some 50 tubes containing nickel plated elements, the "normal" is somewhat higher than it would have been if the nickel were absent. The charges were evenly distributed in the tube patterns. Hence, no abnormal distortion of the riser samples would be expected.

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PROCESS TECHNOLOGY OPERATION

REACTOR POWER LEVEL LIMITATIONS

The power level limitations that predominated at all reactors during the month of February are as follows: B, D, DR, and F reactors' power levels were limited by tube corrosion considerations; H reactor's power level was limited by rupture control considerations; and power levels at the C and K reactors were restricted by administrative limits.

PROCESS STANDARDS

HW-46000 B - Process Standards, Reactor

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

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

Probing specifications of the present standard have become inadequate due to the inability to extrapolate probe results from one tube to another. To minimize the possibility of fuel element jacket damage during the charge operation on tubes above row 37, additional probing requirements have been added to the standard. These requirements specify the probing of all new process tubes above row 37 and the probing of tubes to be charged with fuel elements having greater effective diameters or lengths.

HW-46000-D - Process Standards, Reactor

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

Process Standard C-040 - "Graphite Temperature Limits"

This standard specifies the number of graphite thermocouple stringers that must be maintained and the number of thermocouples in each stringer to obtain the desired temperature coverage of the graphite moderator.

Heavier gauge wire was authorized in thermocouple stringer construction to increase the life of the stringers. The number of thermocouples required in each stringer was reduced to enable stringer construction with heavier gauge wire.

Process Standard D-070 - "Reactor Confinement"

This standard governs the utilization of the confinement system, CGI-791, which is being installed in the Hanford reactors.

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

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

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HW-46000-F - Process Standards, Reactor

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

Process Standard C-040 - "Graphite Temperature Limits"

Revisions to this standard were identical to those made for HW-46000-D, above.

HW-46000-H - Process Standards, Reactor

One standard was revised and two were deleted during the month. These were:

Process Standard D-070 - "Reactor Confinement"

Revisions to this standard were identical to those made for HW-46000-D, above.

Process Standard E-020 - Film Formation Control"

Process Standard F-010 - "Slug Inspection and Storage"

These standards were deleted in their entirety since all material in them was "Advice."

HW-46000-K - Process Standard, Reactor

One standard was revised and two were deleted during the month. These were:

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

Modification to the process water pump impellers under CGI-883 required a new schedule of pump configurations to correspond to the existing bulk water temperature limit schedule shown in Process Standard A-022. No change in bulk limits was necessary as a result of these pump modifications.

Process Standard E-020 - "Film Formation Control"

Process Standard F-010 - "Slug Inspection and Storage"

These standards were deleted in their entirety since all material in them was "Advice."

HW-41000 - Process Equipment Standards

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

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

Three minor changes were made to this standard. These were:

1. Nomenclature of certain check valves in process water headers was clarified to distinguish from other nearby check valves.

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2. The criteria for determining whether check valves function satisfactorily have been restated to simulate emergency conditions during the test of this equipment.
3. The frequency of testing V-73 valves at the K Reactors was changed from once per week to once per month. This was based upon a V-73 reliability study conducted by the Process Engineering Operation.

Process Equipment Standard A-030 - "HCR Cooling Water System"

The pressure relief valve setting in the water supply header to the horizontal control rods was restated for clarification of intent.

Process Equipment Standard A-040 - "Thermal and Biological Shield Cooling System"

Experience has shown that the frequency of flow checks on the cooling water of the bottom thermal shield at C Reactor may be reduced to once every three months. In addition, this standard requires that the visual flow gauge sight glasses at B, D, DR, F, and H Reactors be cleaned when flow indicating propellers are obscured, and propeller bearings be cleaned when rotation is not observed.

PROCESS CHANGE AUTHORIZATIONS

The number of process change authorizations issued during the month were: one to permit temporary deviation from Process Standards - Water Plant, HW-27155 Rev1; one to permit temporary deviation from Process Equipment Standards, HW-41000; and twelve to permit temporary deviation from Process Standards - Reactor, HW-46000. These were:

PCA #2-3 - "Crossunder Line Use, DR Reactor"

Process Standard A-030 specifies conditions for using the crossunder line. A test of the new crossunder line at DR Reactor during December, 1961, indicated the equipment did not fully meet design requirements. The deficiency was not considered sufficient to preclude use of the line, provided certain precautions were observed. Use of the line was authorized for a specified outage under detailed requirements specified in the process change authorization.

PCA #2-4 - "Vertical and Horizontal Rod Withdrawal, DR Reactor"

Following a water leak at DR Reactor during January, the possibility existed that the reactivity loss due to water in the moderator would be so severe that cold criticality could not be achieved within the established total control standard. The reactivity status could be verified by pulling the horizontal and vertical rods and obtaining a reciprocal counting rate. To pull the VSR's and HCR's with water pressure raised, as specified by process standards, would result in a significant production loss due to the resulting delay in outage work. Pulling VSR's and HCR's prior to raising

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water pressure was authorized provided the following precautions were observed: a subcritical monitor is constantly observed, flux monitor trips will be set close to the indicated readings, and the ball 3X hoppers will be manually tripped if riser pressure drops.

PCA #2-5 - "Top-of-Annulus Temperature Limit, C Reactor"

Process Standard A-021 authorizes use of water mixer pieces in process tubes to reduce the annulus temperature between the top of the tube and fuel element. Mixer location is specified in the standards.

Mixer pieces were placed in positions other than specified for C Reactor.

The PCA authorizes until June 29, 1962, operation with mixer pieces in other than specified locations, provided conservative annulus boiling limits are used until the mixing efficiency of mixer spools at these locations can be determined.

PCA #2-6 - "Shipment of Irradiated Doe and Rey Slugs, C Reactor"

An off-plant shipment of both Doe and Rey slugs is planned. These slugs are the last few remaining at Hanford and it is desirable to combine both Doe and Rey in one bucket. Mixture limits, in terms of number of slugs per bucket, are specified in Process Standard H-030, "Shipment of Irradiated Slugs." These criticality limits are based on considering each slug equal to the highest enriched slug in the mixture. This is conservative since the Rey slugs are longer and contain more U-235 than Doe slugs. Using this restriction would require an additional bucket and cask to complete the planned shipment.

Applying the same conservative restriction, but expressing the bucket loading limit in terms of total length of slugs, rather than number of slugs, a more favorable limit can be obtained for slugs having different lengths. Using this method for the specific problem, a bucket containing 45 Doe and 11 Rey slugs complies with the intent of present safety limitations and was authorized. Authorization was given to load and ship enriched material in quantities of 45 Doe and 11 Rey per cask.

PCA #2-7 - "Temporary Removal of High Pressure Crosstie, K Reactors"

Process Standards, Water Plant, 190-B-090, HW-27155 Rev1, specifies that the high pressure crosstie line (HPCT) normally be in service to provide a last ditch emergency water source from the sister reactor.

During completion of Project CG-844, it is necessary to remove this line from service to accomplish certain modifications on the line.

This process change authorizes until February 21, 1962, or until completion of the work, removal of the HPCT line from service for a maximum period of five hours, provided:

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1. One K Reactor is shut down.
2. No sub-normal electrical power conditions exist.
3. Normal generator backup shall exist.
4. HPCT line shall be restored to service as soon as possible if a sub-normal power condition or sub-normal generator condition develops during the HPCT line outage.

PCA #2-8 - "Water Shutoff Times, B Reactor"

Process Standard A-030 specifies that water not be shut off two adjacent crossheaders. Water shutoff curves are based upon calculations which assume the crossheaders above and below the uncooled header are being supplied with cooling water.

Static pressure measurements on both bottom crossheaders were required to evaluate flow capabilities of the crossunder line.

Heat generation calculations, after the reactor had been down two weeks, showed that flow could be stopped on the bottom two crossheaders for approximately 20 minutes without exceeding 100 C in any tube.

Water shut off for 20 minutes was authorized for the bottom two crossheaders at B Reactor.

PCA #2-9 - "Seismoscope By-Pass, D Reactor"

Process Standard D-040 permits by-pass of the seismoscope from the #1 safety circuit for five minutes during reactor operation provided the #1 safety circuit is tripped upon specified earthquake conditions.

During January, instrument trouble developed in the seismoscope circuit at D Reactor. It was estimated that repairs could be completed in about one hour. To avoid a costly reactor outage, authorization was given for one and one-half hours to remove the seismoscope from the #1 safety circuit to affect repairs on this equipment. Manual tripping of the #1 safety circuit was required upon evidence of specified earthquake conditions.

PCA #2-10 - "Horizontal Bowing Measurement, H 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. The purpose of these data is to monitor trends in horizontal distortion of the moderator.

Newly developed equipment was evaluated during a recent outage by taking data on four process tubes on which vertical distortion data were required. Thus, by checking the vertical profile with the new equipment against profile data obtained by standard methods (manometer traverse), the accuracy of the new equipment could be evaluated.

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Since evaluation of the data could not be completed during the outage, authorization was given to delay taking horizontal traverse data until the first outage after February 26, 1962.

PCA #2-11 - "Water Shutoff Times - C, D, F, and K Reactors"

During a reactor shutdown it is often necessary to remove shutdown flow from individual charges or complete crossheaders while maintenance is performed on process water pipes and fittings, or when removing a stuck or ruptured fuel element. Process Standard A-030 provides specifications for water shutoff which will ensure that the slug surface temperatures are maintained within acceptable limits. The water shutoff curves in Standard A-030 are based upon data for an aluminum process tube in a normal process channel; consequently, the data are not applicable to zirconium process tubes or to aluminum process tubes in overbored or cored process channels. For purposes of this PCA a normal process channel at a K Reactor is considered to be a channel in which the maximum powered slugs lie in the region of the graphite which is cored 30 mils.

This process change specifies that water shutoff on process tubes other than aluminum process tubes in a normal sized process channel (no overbore) shall not be calculated from information contained in Process Standard A-030, but must be obtained from the Process Technology Operation.

This PCA will expire on June 29, 1962, or on revision to the referenced standard, whichever is sooner.

PCA #2-12 - "C Elevator Control Circuit, DR Reactor"

Process Standard D-050 specifies that during reactor operation an electrical or mechanical device shall be in service that is designed to prevent work platform movement until obstructions within the process tube pattern are cleared. Such a device is required to ensure that work platform movement will not result in accidental breakage of front-face nozzles or water piping. Presently, an acceptable device, the "Interference Scanning Trolley," which will prevent or stop work platform movement if an object interrupts the trolley's movement, is being installed at DR Reactor.

This process change authorized until February 12, 1962, or until completion of the installation of the "Interference Scanning Trolley," whichever is sooner, continued use of the front work platform during reactor operation, provided the procedural controls specified in the process change are observed.

PCA #2-13 - "Crossunder Line Use, DR Reactor"

The conditions and requirements of this PCA are identical to those in PCA #2-3, above.

PROCESS ASSISTANCE

One engineer audited conformance to process standards by making 18 inspections at each reactor during the report period.

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RUPTURE EXPERIENCE

<u>Failure Date</u>	<u>Tube Number</u>	<u>Lot Number</u>	<u>Type of Material</u>	<u>Exposure MWD/T</u>	<u>Type of Failure</u>
2/3/62	2289-C	KT-019-A ⁽¹⁾	I&E N ⁽¹⁾	1003	Side-Other
2/18/62	3775-D	CZ-806-E	I&E NB	1158	Split-Trans.
2/26/62	2463-B	KY-082-A	I&E E (0.94%)	270	

Legend

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

I&E NB - This is the symbol for internally and externally cooled production reactor fuel elements of natural uranium which have projections (bumpers) welded to the fuel element jacket.

I&E E - This is the symbol for internally and externally cooled production reactor fuel elements with uranium cores enriched in U-235. The weight per cent U-235 in the core material is stated.

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

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

(1) This rupture occurred in a normal size natural self-supported fuel element charged in a ribless zirconium process tube. This charge was being irradiated under the auspices of Production Test IP-272-A.

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OPERATIONAL PHYSICS OPERATION

PILE PHYSICS ASSISTANCE

With improved operating continuity at the older reactors, flattening efficiency also increased. Nonequilibrium losses were higher than normal summer and fall values, primarily as a result of the increased time required to raise the power to the higher winter-time power levels; however, the average loss continued to be about 0.3 equivalent day, the average 1961 performance.

The availability of nonpoisonous splines for obtaining flux traverses has permitted improved evaluation of the axial flux distribution which has been particularly helpful in correcting C and DR Reactor flux distribution problems.

The central zone portion of the E-N load was discharged and replaced with natural uranium; subsequent operation proceeded without operating losses during the transition.

SUMMARY OF OPERATING DATA OF PHYSICS INTEREST
FOR THE MONTH OF FEBRUARY, 1962

Reactor	B	C	D	DR	F	H	KE	KW
ECT in February (1)	1445	1680	1510	1475	1490	1575	2560	2570
12-Month Average ECT	1500	1680	1490	1485	1465	1520	2530	2545
Equil. Scram Time (2)	14-16	30-35	15-17	18-22	15-23	20-30	20-25*	20-25*
No. of Scrams and Recoveries (3)	1/1	1/1	1/1	0/0	0/0	1/1	3/3	1/1
No. of Non-Scram Outages (4)	1/1	0/0	1/1	0/0	1/0	0/0	0/0	0/0
	2/0	4/0	5/0	1/0	2/0	3/0	2/0	2/0
Recording Period -								
From:	1-23	1-20	1-23	1-24	1-23	1-23	1-24	1-25
To:	2-19	2-20	2-19	2-20	2-20	2-19	2-20	2-20

*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 power 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.

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- (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. R. Fredsall

Water leaks continued to limit smooth operation; in addition to resulting outages, flattening efficiency was reduced as a result of water in the lattice.

The positioning mechanism of one subcritical monitor was out of service and the other functioned intermittently; replacement of the attendant shield pieces with smaller pieces has been planned to allow them to function properly.

Planning for the production test of the partial xenon-override core has been completed with charging scheduled during the outage of 3-1-62.

C Reactor - D. E. Newbrough

Both radial and axial flattening efficiency improved to the extent that the power level reached the administrative power level limit even with a reduced flow with one process pump out of service. A major contributing factor to the increased flattening efficiency was the achievement of a fairly constant reactivity status for the first time in several months; rod configuration changes to facilitate the rod replacement schedule, the charging of the 40-tube over-bore block, and the 24-inch downstream movement of the reactor loading had required continuing flattening adjustments which limited flattening efficiency.

The improved axial flux distribution resulting from the charge displacement away from the front flux depression has permitted a decrease in the length of the front enrichment charges from four to three E-metal pieces and a 10-15 per cent reduction in the number of charges; further flux distribution measurements and analyses are being performed to determine if a further reduction in the front enrichment inventory is warranted.

Axial flux distribution changes and burnout calculations indicate the boron in the tip of number 4 HCR, the last remaining downstream cadmium rod, is nearing burnout. Because the new half-rod scheduled for insertion in the number 4 position had not arrived, a special charge containing lithium-aluminum poison pieces downstream was charged to maintain the favorable axial flux distribution near the tip of the rod.

D Reactor - D. G. Albertson

An administrative effluent temperature limit, imposed to reduce tube corrosion, limited power levels.

Two adjacent VSR's which failed to meet standard rod-drop time requirements have limited startup and equilibrium levels. Plans were completed to broach these channels during the next scheduled outage. Replacement of number 8 HCR,

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which has been sticking, has also been scheduled for the next outage.

Operating continuity was interrupted by five outages.

IR Reactor - J. W. Hagan

Operating continuity was very good, being interrupted by only one outage.

Completion of the initial phase of the vertical-rod comparison test (between D and IR) revealed no significant shadowing of the IR vertical channels by residual 3X balls. Consequently, a local poison strength equivalent to the strength of the older reactor reactivity control strength was assumed for both the VSR's and 3X system, a conservative assumption since the sizes of the vertical channels and rods are larger in IR Reactor; as a result of demonstrating the greater control strength, supplementary poison requirements to satisfy total control could be decreased sufficiently to reduce minimum downtime by about five hours.

Axial flux traverses have shown that since the special upstream enrichment loadings were changed where the flux was depressed due to residual 3X balls (see January's report), the average flux distribution in these areas was increased in the front of the reactor from about 70 per cent to 90 per cent of the normal cosine value and the peak longitudinal flux was reduced from about 110 per cent to 105 per cent of the maximum flux of a cosine distribution. The average rupture potential in these areas (about one-third of the central zone of the reactor) is estimated to have been thereby reduced 60 per cent.

Flux distribution control during the fairly rapid long-term reactivity gain rate period with the block load was improved markedly through the technique of inserting and withdrawing splines in small increments as necessary to maintain steady longitudinal flux distribution.

F Reactor - R. B. Heiple

A relatively long operating period was experienced with only two outages, the second a scheduled two-week outage, interrupting continuity. The power level was reduced 15 per cent to decrease tube corrosion; flux distribution control at the lower level was steady as demonstrated by improved flattening efficiency.

Slow and sometimes erratic Flexowriter response has made Zone Temperature Monitor backup especially desirable; the latter system also is in need of maintenance.

A hot startup attempt failed when a VSR could not be readily withdrawn due to sticking; the shutdown resulted from a Panellit scram caused by rupture of a spline seal during a spline-stub insertion attempt.

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H Reactor - L. L. Grumme

The central striped portion of the E-N load was discharged and replaced by natural uranium; subsequent operation proceeded without incident. The initial ECT increased by 100 tubes as a result of the low and uniform central exposure but subsequently dropped 50 tubes at the low reactivity point following samarium buildup. Although only about 5 mk was carried in control rods at the minimum reactivity point (10 mk normal), distribution control flexibility was adequate. In order to maintain sufficient reactivity 43 spike enriched columns were added, and 12 of the 24 PCCF tubes were recharged with natural uranium; the availability of splines for supplemental control permitted this reduction in PCCF tubes.

Number 14 HCR, which is used as the long rod during operation, has been sticking near the full-out position and cannot be fully removed from the reactor. This has not affected operation since it is not necessary to remove the rod completely; however, replacement is scheduled for the near future.

KE Reactor - A. R. Kosmata

Power level and flux distribution control aspects were monitored very closely during the recent 10-tube charge-discharge demonstration with the Operational Fueling Facility. No problems were encountered as reactivity compensation with the rod system was accomplished very satisfactorily. Rather than causing flux distributional problems, the results indicated that with proper techniques operational fueling might be utilized effectively to counteract flux oscillations.

Nonequilibrium losses following the one outage which occurred were slightly over 0.3 equivalent day. The level of control efficiency with this particular startup would have resulted in a nonequilibrium loss of about 0.2 equivalent day with the lower power levels during the high inlet water temperature period of the year.

An evaluation of the effect of adjusting enrichment ring size and location, should fuel and tube performance economics so indicate, revealed that a reduction of 100 enrichment columns and a decrease in flattening efficiency of about 7 per cent would result from moving the enriched ring in toward the center of the reactor by two lattice units.

KW Reactor - R. A. Chitwood

The reactivity loss resulting from the very low residual exposure following a large discharge was compensated by increased enrichment and the effects of a lower power level (necessitated by the loss from service of a process water pump); the subsequent flattening efficiency actually increased, a normal result when fringe exposure exceeds significantly the central zone exposure.

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Difficulty was experienced in removing four VSR's; in addition to the planned program to correct this problem a more immediate schedule was established for measuring the drop time of the VSR's into the hot reactor to assure continued compliance with the applicable process standards. Operating continuity continued to be good with only two outages - one as a result of a Panellit trip, and the other scheduled.

PROCESS PHYSICS STUDIES

Safety Control Studies

Relief was obtained in the administration of total control at DR Reactor as a result of comparison tests made during January and February. PT IP-447-C had authorized comparison tests, both of individual rods by period techniques and of the full system by the rod-drop technique. The basic individual rod measurements were made at DR on January 13. After two unsuccessful tries due to flux distortion effects at B and D Reactors during the latter part of January, excellent comparison results were obtained at D on February 1. A report published as HW-72628, "Interim Report - PT IP-447-C, Rod Drop Transient Comparison D and DR Reactors, Re-definition of DR Vertical Safety System Strength," presents the results of these measurements and will serve as the basis for assuming the DR safety system to be at least as strong as that at the B-D-F Reactors.

Six new B-type VSR's installed at C Reactor have been taken into account in total control calculations and supplementary requirements. The fact that they are approximately two feet shorter than the normal C-rods requires an additional spline per tip near the bottom E-ring for equivalent effectiveness.

Control capacity information pertinent to disaster planning has been published in HW-72653. Basically, the document includes recommendations to place primary emphasis on ensuring against water loss during the limited time available between warning of an impending disaster and its occurrence.

HW-72555, "Development and Application of Principles of Nuclear Instrumentation" was issued during the month as a reference report for use in project justification and other reactor nuclear instrumentation survey studies. Results to date of the basic instrument criteria study described in that document are currently in rough draft form. Attempts are being made to draw conclusions on the basis of results to date adequate to support early decisions on project and interim action for improved safety instrumentation protection.

Pile Reactivity Studies

Operational Physics is currently scheduled to carry out the stack purity test at NPR on the first week end following completion of graphite layup; this should be early in March. Signatures have all been obtained for the authorization document for this measurement. A practice run at NPR turned up several minor problems not encountered in the previous White Bluffs trials. Other NPR work proceeded on the analysis of reactivity transients and control configurations, and on preparation of the startup document and startup test planning.

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A renormalization in the accountability program is again planned in conjunction with Nuclear Materials for July 1. The July 1, 1961, normalization has worked out close to expectations on plutonium yields in natural uranium, but predictions are still about 1.5 per cent higher than desired on plutonium recovery from E-metal.

Control Efficiency Studies

Components ordered by Equipment Development for use in the intended automatic control test are due next month. Work is still in progress on control rod logic circuits. The production test sponsored at KW Reactor for HLO for the purpose of obtaining empirical transfer function data will apparently need a supplement to permit deliberate rod movements large enough for test purposes.

Reactivity measurements in the Hanford test pile on sections of irradiated splines indicate a possible reduction in spline strength from corrosion on the downstream end of the spline. Additional measurements on highly irradiated splines will be sought to confirm these indications. HW-72497, "Characteristics of Splines for Temperature Distribution Control," was issued during the month.

The striped core loading of the second E-N cycle has now been discharged leaving only the fringe blanket; the latter will be discharged late in CY 1962.

Shield Protection Studies

The 125 depleted uranium pieces for PT IP-400-C have now been fabricated. It is planned that a block of approximately 100 tubes be loaded with these pieces upstream of the regular charge to determine their effectiveness in reducing front-face radiation levels.

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TESTING OPERATION

IRRADIATION TESTING OPERATION

DR-1 Loop

The DR-1 Gas Loop was operated continuously throughout the report period. Test conditions were maintained on the test element for 307 hours. The total time at test reference conditions is now 4925 hours, with 3236 hours at 1500 F, 139 hours at 1550 F, 183 hours at 1600 F, 141 hours at 1650 F, and 1226 hours at 1700 F. The test element was cycled once from reference conditions to ambient temperature and has now acquired a total of 38 cycles.

At the request of General Atomic, the test reference temperature was lowered from 1700 F to 1500 F.

H-1 Loop

The new test section closure and Zircaloy-2 flow liner were installed and pressure tested in the H-1 Loop during the January 26 tube outage. Design Change No. 541 was issued to authorize this modification.

Installation of back-up instrumentation for automatic operation of the loop has been completed.

NAA-111

The irradiation of specimens of U-Mo alloys for Atomics International in the 2D test hole at KW Reactor continued at reference conditions. A neutron flux traverse taken adjacent to NAA-111 sample showed that the flux at that location is approximately 86 per cent of what a true front-to-rear cosine curve would indicate.

HAPO-222

Two uranium swelling capsules were charged into test hole 3674 in KW Reactor. A total of four uranium swelling capsules are now undergoing irradiation in KW Reactor.

Borescoping Activities

Process Channels 4073 and 4279, B Reactor - These channels were examined before and after broaching to determine damage to the stack from broaching. Little or no change to the channel was noted after broaching.

VSR Channel No. 43, KW Reactor - This channel was examined several times during an attempt to jack the misaligned channel blocks back in place. A filler block was moved back in place but the tube block would not move.

VSR Channels, C Reactor - Several channels were examined to assist in re-aligning the channel.

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HCR, KW Reactor - The bore of a horizontal control rod was examined for possible leaks between the boron and water channel. The bore surface had scale buildup, but no visible leaks could be seen.

Process Channels 2679, 2675, and 2683, H Reactor - These channels were borescoped, boregaged, and vertical bowing measurements taken to assist in the development of improved tube replacement equipment.

Sample Irradiations

The following irradiation samples were handled:

<u>Reactor</u>	<u>Test Hole</u>	<u>Facility</u>	<u>Request No.</u>	<u>No. of Samples</u>	<u>Material-Purpose</u>
KE	2D	Quickie	HAPO-184	9	Washington Designated Program
KE	2B	Magazine	ORNL-202	1	Fe (isotope production)
KE	2B	Magazine	ORNL-204	1	Hg (isotope production)
KE	2B	Magazine	ORNL-193	5	KCl (isotope production)
KW	3674	General Purpose	HAPO-222	2	Uranium (swelling test capsule)
D		Process Channel	HAPO-098	10	Graphite (burnout rate study)
KE	2D	Quickie	HAPO-172	4	Effluent water (activation analysis study)
KW	2C	Hot Graphite	HAPO-177	4	Graphite (damage study)
C	Y	Hot Graphite	HAPO-177	8	Graphite (damage study)
KE	2D	Quickie	HAPO-252	2	Arsenic (tracer isotope production)
DR		PCCF	HAPO-252	3	Arsenic (tracer isotope production)
KE	2D	Quickie	HAPO-254	3	Arsenic and phosphorus (tracer isotope production)
KW	4C	Snout	HAPO-177	1	Boron carbide in graphite (damage study)
		*Gamma	HAPO-171	17	Plastics and rubber (damage studies)
		*Gamma		1	pH meters (radiation damage study)
		*Gamma		2	Organic solutions (radiation damage studies)
KE	2D	Quickie	HAPO-256	1	Plutonium (fission yields of heavy plutonium isotopes)

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

Vertical Bowing Measurements

Following is a summary of vertical bowing measurements. All distances are measured from the inlet tube flange.

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<u>Reactor</u>	<u>Tube No.</u>	<u>Remarks</u>
D	4493	No previous data
D	4674	Up .12" at 9'6" in 4 months No contraction noted
D	4453	Up .08" at 10'4" in 1 year Down .10" at 22' in 1 year
H	4354	Up .02" at 9' in 13 months Down .14" at 19' in 13 months
H	4393	Down .06" at 9' in 13 months Down .11" at 20' in 13 months
H	4674	Up .04" at 7' in 6 months Down .22" at 22'8" in 6 months
H	H-1 Loop	No previous data

COOLANT TESTING OPERATIONKER Loop Operation

KER-1 - Testing of five 23-inch NIEL elements as authorized by PT IP-455-A was completed with discharge of the tube during the February 16 outage. The loop was recharged with one thermocouple element and four 17-inch NIEL fuel elements as authorized by PT IP-448-A. The primary objectives of the test are to develop a thermocouple element for N Reactor to serve as a crud sensing device for N Reactor startup and study the temperature effect of fuel pieces as a function of crud formation in a carbon steel loop. Operating conditions are 285 C, 1600 psi, and pH 10.

KER-2 - Testing of five 23-inch NIEL elements as authorized by PT IP-377-A continued. Operating conditions are 210 C, 1600 psi, and pH 10.

KER-3 - Two 23-inch N Reactor fuel elements (NAEL, consisting of an inner element, NIEL and an outer element NOEL) were charged on February 18 as authorized by PT IP-477-A. Solid steel dummies were charged for control of pressure drop across the process tube. Operation and functional testing of loop equipment is in progress. Loop operating conditions are 285 C, 1550 psi, and pH 10.

KER-4 - Dummies to simulate pressure drop characteristics of a normal fuel element loading were charged during the January 23 outage. Operational tests of loop equipment and process water back-up systems were performed. During the outage of February 16 the electrically operated dump valve, installed under Project CGI-839, could not be closed and the loop was placed on single-pass operation.

1706-KE Single-Pass Tube Operation

All eight tubes were supplied normal process water from Building 105-KE.

SP-2 (3050-KE) and SP-6 (4863-KE) were charged with 28 CIVNS elements and SP-4 (4456-KE) was charged with 38 KIVN elements during the outage of January 23.

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SP-3 (4355-KE) was charged with 38 KIVNS elements and SP-5 (4557-KE) was charged with 28 CIVNS elements during the outage of February 16.

Trace addition of sodium silicate to SP-4 as authorized by PT IP-437-A was completed on February 21.

KE Reactor Outage Time Requirements

No unscheduled outages were charged to production testing. A total of 13 hours was charged to production tests as listed below:

<u>Production Test</u>	<u>Description</u>	<u>Hours</u>
PT IP-361-A	Charge-discharge SP-2, 4, and 6	1.0
PT IP-455-A	KER-1 scram, personnel error	0.5
PT IP-455-A	Tray discharge KER-1	4.8
PT IP-448-A	Charge KER-1	1.8
PT IP-477-A	Charge KER-3	2.5
PT IP-361-A	Charge-discharge SP-3 and SP-5	2.4

A total of 10.4 hours was charged to Project CGI-839 during the outage of January 23 for front and rear face piping revisions on KER-3 and KER-4 and charging of KER-4 with pressure drop elements.

Out-of-Reactor Facility Operation

TF-1 - Testing to evaluate cracking of normal carbon steel, stainless steel, Zircaloy-2, Stellite 6 and 12, and Haynes Alloy coupons was completed. Testing to evaluate cracking of stressed samples of AMS-5616 at 300 C and pH 10 continued.

TF-2 - A fretting corrosion test of Zircaloy-2 at 300 C and pH 10 began on February 8. The test was discontinued on February 14 because of a failure of a sample holder. A second fretting corrosion test of Zircaloy-2 at 300 C began on February 22 and continued.

TF-3 - Testing of the behavior of aluminum X-8001 cladding under conditions of heat transfer, and corrosion testing of aluminum X-8001, 304 stainless steel and Zircaloy-2 coupons continued. Loop operating conditions are 3200 psi, 600 F, and pH 7.

TF-4 - Stress cracking evaluation of prestressed samples of 17-4 PH stainless steel and 406 stainless steel at 300 C and pH 10 was completed on February 9. Uniform corrosion testing of A-212 carbon steel, sensitized and non-sensitized 304 stainless steel and Zircaloy-2 at 186 C and pH 10 using lithium hydroxide for pH control began on February 9.

TF-5 - Neutral pH corrosion testing of carbon steels 1031, 1051, and A-212, sensitized and non-sensitized 304 stainless steel. C-1 alloy aluminum and Zircaloy-2 continued.

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TF-6 - Corrosion testing of aluminum X-8001, Zircaloy-2, and 304 stainless steel at pH 4.5 using chromic acid as an inhibitor and for pH control continued.

TF-7 - No testing was performed in the loop because of the failure of the main loop control valve on January 25. Valve repair was completed on February 22.

TF-8 - Corrosion testing of 304 stainless steel, Admiralty metal, 70-30 copper-nickel, A-212 carbon steel and silicon bronze was completed on February 9. Uniform corrosion testing of A-212 carbon steel, sensitized and non-sensitized 304 stainless steel, and Zircaloy-2 at 280 C and pH 10 (ammonium hydroxide for pH control) began on February 9.

TF-9 - One fuel element rupture test was completed.

TF-10 - No tests were scheduled.

TF-11 - No future testing is planned; the loop will be removed from service.

TF-13 - Testing of the effect of raw water film buildup on the heat exchanger tubes and corrosion testing of carbon steel, 304 stainless steel and 70-30 copper-nickel coupons continued. Corrosion testing of Admiralty metal was completed.

TF-15 - Minor mechanical and electrical revisions were completed. A five-day pre-conditioning run at 4800 psi and 900 F was completed on February 21. High temperature corrosion testing of 316 sensitized and non-sensitized stainless steel, 304 and 406 stainless steel, 316 welded stainless steel, Zircaloy-2 and 4, Hastelloy-X and Alleghany Ludlum D-979 began on February 21 and continued. Loop operating conditions are 900 F, 4800 psi with de-oxygenated-demineralized water.

COMPONENT TESTING OPERATION

Irradiated Fuel Element Examination

Examinations were completed on aluminum clad fuel elements from 32 tubes and visual examination of five NPR inner tube fuel elements.

Number of Tubes

Production Test

8	PT-216-A, Quality Certification Program
4	PT-310-A, Determination of the Dimensional Stability of Uranium Fuel Cores Classified by the Fuel Core Tester (UT-2)
10	PT-381-A, Oversize Fuel Element - C Reactor
10	PT-431-A, Oversize Fuel Element - C Reactor (Supplement to PT-381-A)

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Process Tube Corrosion Monitoring Program

In-reactor measurements of 1545 process tubes were completed. Listed below are the tubes measured for each reactor and document numbers of the reports issued.

<u>Reactor</u>	<u>No. of Tubes Probologged</u>	<u>Report No.</u>	<u>HW Number</u>
KE	32	10	72505
H	172	11	72540
H	110	12	72599
DR	237	13	72677
F	145	14	72690
KW	79	15	72694
KE	35	16	72755
C	735	17	72798

Visual examination was completed on 24 process tubes as follows:

<u>Reactor</u>	<u>Number of Tubes</u>	<u>Reason Removed</u>	<u>HW Number</u>
B	2	L	NR
C	9	RC	72570
D	9	L	72678
F	3	L	72516
H	1	L	NR

L - Leak
RC - Routine calibration
NR - Not reported

Critical Reactor Component Examination

All of the Truarc snap rings on the front face of KE Reactor were examined; two rings were found to be broken and a section missing from each ring.

Panellit System Programs

Gages repaired, calibrated by maintenance	-	56	
Gages meeting calibration criteria	-	44	(79%)
-previous month	-		(63%)
In-board gage reliability examinations	-	141	
Gages meeting examination criteria	-	134	(95%)
-previous month	-		None
-average for past year	-		(92%)

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Response time determinations	-	141	
Gages meeting examination criteria	-	141	(100%)
-previous month	-		None
-average for past year	-		(82%)
In-board Bourdon coil examinations	-	4677	
Non-leaking coils	-	4671	(99.87%)
-average rate for past two years	-		(99.57%)

Gage failures receiving failure analysis totaled 67.

On the exchange program, 984 gages were received and examined. Results were as follows:

	<u>Model 154-100-C</u>	<u>Model 154-100-K</u>	<u>Model 156-100-H</u>
Examined	315	383	268
Rejected	12	16	17
Rejection rate	4.0%	4.0%	6.0%
Previous month	11.0%	11.0%	22.0%

Rejection rate composite this month - 4.5%
last month -14.8%

O. H. Greager
Manager, Research and Engineering

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MANUFACTURING

PRODUCTION OPERATION

PRODUCTION PLANNING & SCHEDULING

Discharge Concentrations

February discharge exposures are compared to the previous two months in the following table.

Discharge Exposure Comparison (MWD/T)

	<u>Regular Uranium</u>		<u>Enriched Uranium</u>		<u>Over-all Exposure</u>
	<u>6 Old</u>	<u>2 K's</u>	<u>6 Old</u>	<u>2 K's</u>	
December	681	668	890	712	696
January	666	676	835	759	695
February	683	652	842	755	710

ESSENTIAL MATERIALS

Rail and truck shipments were as follows:

Carload shipments for IPD	-	201
Carload shipments for other Depts.	-	184
Truck shipments for IPD	-	<u>294</u>
Total		679

MISCELLANEOUS ACTIVITIES

The 1961-62 class of 16 IPD first-line supervisors and associated specialists completed the 33-session "Fundamentals of Manufacturing" course on Feb. 8. Course completion certificates were presented by O. C. Schroeder, Manager - Manufacturing, on Feb. 22.

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REACTOR OPERATION STATISTICS - PROCESSING

MONTH		REACTOR OPERATION STATISTICS - PROCESSING														
February, 1962		B	C	D	DR	F	H	SIX OLD	KE	KW	K'S	TOTAL				
INPUT PU (% OF FORECAST)		89.4	89.3	152.2	123.8	55.4	123.4	100.8	119.1	94.4	106.6	103.7				
TIME OPER EFF. (% OVERALL)		67.1	69.1	62.3	91.1	36.1	54.7	63.4	91.5	82.9	87.2	69.4				
NEW TUBES INSTALLED		6	12	3	0	364	189	574	0	1	1	575				
WATER LEAKS - TUBE		2	1	2	0	0	0	5	0	0	0	5				
- VAN STONE		4	0	0	0	0	1	5	0	0	0	5				
SLUG RUPTURES		1	1	1	0	0	0	3	0	0	0	3				
HELIUM CONSUMED -M CU.FT.		453.6	577.3	471.2	298.4	339.2	142.0	2218.7	162.7	273.7	436.4	2718.1				
CAUSES OF		NUMBER OF REACTOR OUTAGES AND HOURS														
REACTOR OUTAGES		NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	NO.	HRS.	
OPERATIONAL CAUSES						1	35.6	1	56.5		1	56.5	2	92.1		
FAULTY INST. OR CIR.				2	41.1			2	41.1				2	41.1		
FAULTY PROC.EQUIP.			1	1.5				1	1.5				1	1.5		
UNEXPLAINED									1	0.7	1	34.8	2	35.5		
CHARGE - DISCHARGE			1	166.4						1	72.0	1	72.0	2	238.4	
RUPTURE		1	62.1	1	39.5	1	40.9						3	142.5		
WATER LEAK		3	152.4			1	43.0	1	59.5				5	254.9		
TUBE REPLACEMENT				1	127.8			1	387.4(1)	301.5			2	816.7		
MAINTENANCE		1	6.0			1	0.3			3	12.6	1	8.0	4	20.6	
Adjust Sample Lines		1	0.5							1	0.5			1	0.5	
Abnormal Tube Pres.									1	2.7	1	2.7		1	2.7	
TOTAL		6	221.0	3	207.4	6	253.1	1	59.5	3	429.3	1	304.2	2	57.2	
		UTILIZATION OF REACTOR OUTAGE HOURS														
		TOTAL HOURS														
		% OF TIME														
CHARGE - DISCHARGE		15.1	57.9	31.4	21.9	46.0	69.3	241.6	24.1	43.5	67.6	309.2	5.8			
RUPTURE REMOVAL		12.5		14.0				26.5				26.5	0.5			
WATER LEAK		89.2	33.3	28.4	11.5	13.4	8.3	184.1				184.1	3.4			
TUBE REPLACEMENT		12.1	62.2	101.7	16.3	229.7	200.8	622.8	14.2	9.3	23.5	646.3	12.0			
MAINTENANCE		86.7	29.2	46.0	9.8	104.0	4.9	280.6	4.3	33.9	38.2	318.8	5.9			
STANDARD CHECK		4.2		4.6		3.2	7.3	19.3		0.9	0.9	20.2	0.4			
PRODUCTION TEST		0.7	17.4	11.2		5.3		34.6	13.9	5.4	19.3	53.9	1.0			
PROJECT WORK			7.4	.9		12.1	7.6	28.0		13.6	13.6	41.6	0.8			
OTHER		0.5		14.9		15.6	6.0	37.0	0.7	8.2	8.9	45.9	0.8			
TOTAL		221.0	207.4	253.1	59.5	429.3	304.2	1474.5	57.2	114.8	172.0	1646.5	30.6			

(1) Continuation of January outage.

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MONTH		REACTOR OPERATIONS STATISTICS — POWER									SHEET 1
February, 1962		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)	GPM AVG.	13069		1797		1576	1829			18271	
TO FILTER PLANT (BLDG.183)	GPM AVG.	61497		91045		50281	45700	183048	179011	610582	
TO FILTER PLANT (C&DR)	GPM AVG.	98591		68077						166668	
TO R & E (KER) FEO	GPM AVG.			203				183		386	
TOTAL	GPM AVG.	173157		161122		51857	47529	183231	179011	795907	
TOTAL	M GAL.	7729.7		7192.5		2314.9	2121.7	8443.3	8248.8	36050.9	
RESERVOIR WATER (BLDG.182)											
TO POWER HOUSE (BLDG.184)	GPM AVG.	570		72		219	65			926	
TO COND.SYSTEM(BLDG.190)	GPM AVG.			848		1347	1764			3959	
TO COND.SYSTEM (190DR & 183F)	GPM AVG.			877		10				887	
TO EXPORT SYSTEM INC. NPR.	GPM AVG.	12499								12499	
TOTAL	M GAL.	583.4		80.2		70.4	81.6			815.6	
FILTER WATER (BLDG. 183)											
TO POWER HOUSE (BLDG.184)	GPM AVG.	172		197		105	149			623	
TO PROCESS (BLDG. 190)	GPM AVG.	70574	76123	73200	81722	47053	40300	177328	173834	740134	
TO 108	GPM AVG.	2500	4500	93		568	931			8592	
TO 108DR	GPM AVG.			93						93	
TO FILTER PLANT (BLDG.183DR&F)	GPM AVG.		13787	15020						28807	
TO F & S SYSTEM	GPM AVG.	125		252		260	137	170	50	824	
TO R & E (KER) & FEO	GPM AVG.			153				5550		323	
BACKWASH	GPM AVG.	1913	4181	2037	1375	2295	4183			26661	
TOTAL	M GAL.	3360.7	4401.1	4064.2	3709.5	2244.5	2040.0	8434.9	8248.8	36503.7	
PROCESS WATER (BLDG. 190)											
TO REACTOR	GPM AVG.	70174	75723	72800	81322	46673	39800	171400	158100	715992	
TO REACTOR	GPM NOR.	88000	98000	87000	88000	88500	84700	188500	184800	907500	
POWER HOUSE (K AREA)	GPM AVG.							19	14	33	
108 (KE - KW)	GPM AVG.							5509	15320	20829	
TO R & E (KER)	GPM AVG.										
BUILDING USAGE	GPM AVG.	400	400	400	400	380	500	400	400	3280	
TOTAL	M GAL.	3150.4	3398.1	3267.6	3648.1	2100.4	1799.0	8171.3	8010.3	33545.2	
RIVER DATA											
ELEVATION (MSL,FT.)	(MAX.)	387.5		383.5		369.6	372.1			386.2	
	(MIN.)	384.3		375.3		364.4	369.5			377.9	
	(AVG.)	385.6		378.3		365.0	370.7			379.0	
TEMPERATURE	AVG. °F	37.8		42.0		42.1	41.9			39.2	

Note: KE-KW Reactors were based on 32 days. The other reactors on 31 days.

MONTH	REACTOR OPERATIONS STATISTICS — POWER										SHEET 2
	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW	TOTAL		
<u>WATER TREATMENT DATA</u>											
AT BLDG. 182	2745.2	4401.1	4064.2	3039.0	2244.5	2040.0	8434.9	8248.8	35217.7		
BLDG. 183											
<u>CHEMICAL CONSUMPTION</u>											
CHLORINE (BLDG. 182)	10010	10780	6600	3780	7257	10853	43796	43654	136730		
(BLDG. 183)	0.4	0.3	0.2	0.1	0.4	0.6	0.6	0.6	0.4		
LBS.											
LBS											
AVG PPM											
Alumina	101600	162818	136305	115156	75535	129685			721099		
ALUM	352	198	94554	28385	27452	34551	1101743	1140839	2428074		
LBS	* 17.8	* 17.8	* 18.9	* 19.3	* 17.6	* 32.6	15.7	16.6	19.5		
AVG PPM											
SEPARAN	250	550	700	425	300	550	1900	2550	7225		
LBS	.011	.015	.021	.017	.016	.032	.027	.037	.022		
AVG PPM											
SULPHURIC ACID	229362	370915	448372	327099	276738	215926	1140648	1188162	4197222		
(AG 100%)	10.0	10.1	13.2	12.9	14.8	12.7	16.2	17.3	13.4		
AVG PPM											
DICHROMATE	26095	39050	27225	30395	16594	16437	113271	109371	378438		
LBS											
<u>PURGE MATERIAL CONSUMPTION</u>											
SOLIDS	3100	13050	0	0	3800	0	0	850	20800		
LBS											

*Alumina and Alum combined for Avg. PPM in Alum Column

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REACTOR OPERATIONS STATISTICS -- POWER										SHEET 3	
MONTH	100-B	100-C	100-D	100-DR	100-F	100-H	100-KE	100-KW			
ANALYTICAL DATA											
RAW WATER											
PH	8.00	8.00	8.12	8.12	8.16	7.97	7.16	7.15			
TURBIDITY	8	8	9	12	10	12	12	12			
FINISHED WATER											
PH	7.00	7.00	7.00	6.94	6.91	6.96	6.61	6.60			
TURBIDITY	.004	.004	.003	.004	.002	.003	.005	.005			
CL ₂ RESIDUAL	.05	.05	0	0	.06	.13	.19	.18			
DICHROMATE	1.00	1.39	1.00	1.00	.95	1.02	1.72	1.80			
STEAM DATA											
GENERATED (MAX)	110000	131000	73000	76000	390000	48500	53000	101500			
(NOR)	81000	81000	50000	60665	272665						
(AVG)	88300	98642	50294	56455	293691	32200	32100	64300			
TOTAL	65741	73390	37419	42002	218552	24673	24603	49276			
TO PLANT	55748	62234	32929	35620	186531	22206	22142	44348			
COAL RECEIVED	2920	3102	1757	2216	9995						
CONSUMED	3732	4343	3033	2491	13599						
IN STORAGE	14763	15832	2074	6823	39492						
GEN. STEAM/LB. OF COAL	8.81	8.45	6.17	8.43	8.04						
ELECTRICAL DATA											
OIL RECEIVED						313560	129567	443127			
CONSUMED						219132	221787	440919			
IN STORAGE						1434580	1302832	2737412			
GEN. STEAM/GAL. OF OIL						112.6	110.9	111.8			
ELECTRICAL DATA											
TOTAL GENERATED KW HRS.						1607200	1686200	3293400			
						31200	110200	141400			
Peak Demand Control											

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APPLIED REACTOR ENGINEERING OPERATION

MAINTENANCE PRACTICES OPERATION

Rear Face Connectors

The Inconel tubing delivery is on schedule and the pigtail fabrication vendor has been selected. Initial pigtail delivery is scheduled for April, 1962.

Craft Training

An extensive course in First Year Electronics is scheduled for the Manufacturing Electrical and Instrument craftsmen, using a teaching machine.

PLANT EQUIPMENT ENGINEERING OPERATION

Graphite Thermocouples

Concurrence was received from Research and Engineering on the use of Inconel sheathed Geminol thermocouples for measuring graphite temperature. Arrangements were made with Plant Engineering, Facilities Engineering Operation, to provide detail designs for replacement of graphite stringers for all reactors. The new stringers will have a longer service life as well as lower initial cost.

Ball 3X Hopper and Vertical Safety Rod Channel Inspections

Two Ball 3X hopper mechanisms were inspected at H Reactor for internal corrosion and functional condition of all parts of the mechanism. The general condition of the mechanisms was good. The graphite in one VSR channel at KW Reactor was inspected and a protruding filler layer block was jacked back into position.

SPECIAL OUTAGE SERVICES OPERATION

Tube Replacement Tooling

The shortage of process tube splitters has been relieved. Vendor delivery of splitter blades is now greater than the mortality rate. A total of 225 splitters was available for the initial phase of the D Reactor outage.

Equipment installation in the tube replacement van is now 80 per cent complete and the van is in use as a mobile service unit.

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A full complement of air powered impact tools and rotary cutters has been received and is in service on tube replacement.

Tube Replacement Performance

The tube replacement rate at H Reactor was 0.8 hour per tube on a 300-tube outage. At F Reactor the replacement rate was 0.5 hour per tube on a 363-tube outage. A total of 663 tubes was replaced during the period January 29, 1962 through February 23, 1962 for a grand total of 1145 tubes replaced since January 1, 1962.

Tube Replacement Quality Control

At H Reactor a total of 341 tubing attempts was required to re-tube 300 channels. This represents a 14 per cent mortality rate on new tubes inserted at H Reactor.

At F Reactor a total of 373 tubing attempts was required to re-tube 363 channels.

The reasons channels required more than one tubing attempt are as follows:

H Reactor - Tube pulling mandrels pulled out - 16
Failed to pass acceptable probe - 25

F Reactor - Tube pulling mandrel pulled out - 6

B-C REACTOR OPERATION

EQUIPMENT EXPERIENCE

During a flush-discharge of metal at C Reactor, an irradiated slug lodged on a ledge on the rear wall of the discharge area. A high pressure stream of water was used to dislodge the slug. A section of plating was installed over the ledge to eliminate the location as a potential slug trap.

Six leaking process tubes were removed from B Reactor, two from C Reactor. Eleven other tubes with thin walls were replaced at C Reactor as part of a corrosion monitoring program.

A new flexible vertical safety rod was installed at C Reactor in replacement of one which was binding in its channel. A restriction to rod movement in another channel was eliminated by broaching and vacuuming the channel.

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IMPROVEMENT EXPERIENCE

The installation of 16 additional bumper nozzles at B Reactor brought the total installed to date to 944, 53 per cent of the ultimate total.

Extensive repairs to three rear omega seals and numerous process tube bellows were accomplished to reduce gas losses at B Reactor.

Repairs to the east 107-C effluent basin were completed and the facility returned to service.

RADIATION MONITORING EXPERIENCE

An engineer's trousers were contaminated to 2000 c/m while he assisted in slug location work at the C Reactor discharge area.

Dislodgment of a misplaced fuel element from a niche in the rear shielding wall at C Reactor was accomplished with a maximum personnel dose rate of 10 r/hr. Dose measurements up to 1000 r/hr. were recorded during the time the slug was exposed.

D-DR REACTOR OPERATION

OPERATING EXPERIENCE

Equilibrium operating levels at D and DR Reactors were limited primarily by tube exit water temperature limits established to control tube corrosion.

Of six outages at D Reactor, one was scheduled and five were unscheduled. The scheduled shutdown was begun on February 23 for process tube replacement. DR Reactor had one unscheduled shutdown due to process tube leak indications. However, efforts to locate the leak were unsuccessful.

EQUIPMENT EXPERIENCE

The installation of Inconel rear face pigtails is 28 and 46 per cent complete at D and DR Reactors, respectively. Bumper nozzles have been installed on 44 per cent of the DR Reactor process tubes. Replacement of rear face thermocouples at D Reactor is 56 per cent complete.

Three process tubes were replaced at D Reactor in February exclusive of those being replaced during the tube replacement outage in progress at month's end.

IMPROVEMENT EXPERIENCE

A modified system for supplying decontaminating agents at D Reactor was placed in operation. The increased flow achieved will decrease the outage time required for decontamination of rear face hardware.

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Beneficial use was achieved at D Reactor from improvements made in the dummy decontamination facilities (Project CGI-871).

Savings of approximately \$4,000 were realized during the month as a result of reducing the amount of dichromate added to process water for D and DR Reactors from 2.0 to 1.0 ppm (nominal).

RADIATION EXPERIENCE

Two lapses of radiation control occurred at D Reactor. Categories of these lapses of control were skin contamination (1) and unplanned radiation exposure of personnel (1). Internal and external decontamination of D Reactor rear face piping was carried out in conjunction with the extended shutdown.

F REACTOR OPERATION

OPERATING EXPERIENCE

The power level at F Reactor was restricted by tube exit water temperature limits established to control tube corrosion. Production was limited by a scheduled outage for tube replacement.

EQUIPMENT EXPERIENCE

Replacements included 364 process tubes, 75 process tube thermocouples, 186 rear face water connectors, and 10 defective pressure monitor Panellit gauges.

Failure of the pole-mounted disconnects at 1608-F Building caused a small pole crossarm fire and resulted in loss of electrical power for approximately one hour in 105-F and 108-F on February 17. The situation was satisfactorily handled through normal emergency procedures.

Broaching tests resulted in the rejection of 31 nozzles of the 96 tested. Rejections were mainly due to deep pitting at the groove which holds the rear snap-ring. The rejection rate was 32 per cent whereas the normal rate has been approximately 10 per cent.

IMPROVEMENT EXPERIENCE

Injection fittings for 53 front nozzles for Production Test IP-471-AE, Detection and Temperature Repair of Leaking Process Tubes While Operating, were installed on February 10.

RADIATION MONITORING EXPERIENCE

Decontamination of rear face piping reduced average dose rates from 73 mr/hour to 26 mr/hour on the rear face.

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One employee received an estimated exposure of 10 seconds to a 15 r/hour source while locating an irradiated fuel element which was lodged on the 10-foot near catwalk. The element was subsequently washed into the storage basin by using a fire hose from the labyrinth.

H REACTOR OPERATION

OPERATING EXPERIENCE

The highest power level attained during February was 1810 MW, limited by tube power for rupture control.

A tube replacement outage which started January 27 was concluded February 13 with a total of 300 tubes replaced, 189 during February.

EQUIPMENT EXPERIENCE

At the end of the tube replacement outage, the reactor was leak tested and tube 1583 was found to have a rear Van Stone leak; also, tube 2375 was damaged during charging and found to be leaking.

To minimize tube leaks until the next tube replacement outage, 74 tubes were short-charged and rear Van Stone inserts were installed in 489 tubes. After start-up, 786 gallons of water were removed from the graphite moderator before the water collection rate returned to normal.

Installation was completed on a new first-stage impeller on No. 7 190 Annex pump running assembly and the unit was returned to normal service on February 2. Inspection of the No. 3 annex pump runner on February 1, revealed deep cracks in the first-stage impeller. The intermediate sleeve bushing was found to be worn and cracked and the shaft scored. New runner components were installed before returning the unit to service. The problem is being further investigated.

IMPROVEMENT EXPERIENCE

Replacement of Panellit gauges, MJA-29, "New Front Adjust Panellit Gauge", continued. A total of 828 gauges has been installed to date.

Twenty-five front face nozzles were replaced with broached nozzles for bumper fuel elements. To date 1586 nozzles have been replaced.

The installation of a door on top of the reactor to permit access to the rear face catwalk was completed. The door lock is inter-tied with the charging machine circuit to prevent entry to the rear face during discharging or flushing of fuel elements. The access door will permit work on the neoprene seal and the thermocouple duct to be performed simultaneously with other rear platform work.

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KE-KW REACTOR OPERATION

OPERATING EXPERIENCE

Equilibrium power levels at KE Reactor were limited primarily by the administrative limit.

At KW Reactor, coolant water flows were 11 per cent below normal for a six-day period when five-pump sets instead of six were in operation. As a result equilibrium power levels were approximately 700 megawatts lower during this period.

EQUIPMENT EXPERIENCE

The current schedule of on-reactor tests of the Operational Fueling Facility at KE Reactor was concluded with the successful discharge and recharge of 10 regular metal tubes during reactor operation.

IMPROVEMENT EXPERIENCE

The installation of rebuilt, front adjustment gauges under the Panellit system modification project is 34 and 39 per cent complete at KE and KW Reactors, respectively.

A new low lift pump of higher capacity and the final design impeller under Project CGI-883 were installed in No. 6 pump unit at 190-KW.

The N Reactor type tube in KER Loop 3 was charged with two "N" fuel elements under Production Test IP-477-A.

Manager, Manufacturing

OC Schroeder:DLD:bam

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FACILITIES ENGINEERING

REACTOR MODIFICATION DESIGN

Preliminary designs of impact extruded replacement inlet nozzles and caps for possible use at the 105-K Reactors with zirconium process tubes have been prepared. Purchase requisitions have been issued for prototypes of the proposed nozzles for test and evaluation purposes. Design for other components of the proposed assemblies are being prepared.

Following successful completion of off-reactor testing of the prototype 105-C Reactor flexible vertical safety rod, this rod was installed in channel No. 35 at 105-C Reactor to replace a "B" sized rigid rod which would not enter the last foot of VSR channel. The larger sized flexible rod successfully entered the full length of the channel with a measured drop time of 1.88 seconds which is well within process standard requirements.

Purchase orders have been placed for five each of the flexible metal bellows used to connect the Ball 3X system to the top thermal shield at 105-C and K Reactors. These bellows will be destructively tested to determine the deflection caused by graphite distortion which can be accommodated between the thermal and biological shields without interference with Ball 3X system operation.

The detailed study program for the performance of a continuing series of studies of alternate methods of radioisotope release to the Columbia River has been issued. The program is planned to require two to four man years of effort per year for approximately 24 months.

The study report on the feasibility of disposal of the reactor effluent through an Inland Lake has been completed. The results of this study indicate that a significant reduction in river contamination will not be realized by discharging the reactor effluent to an artificial lake prior to its return to the Columbia River.

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EQUIPMENT DEVELOPMENT

Tube Replacement

Major items now being developed in support of the tube replacement program are: (a) a remotely controlled tube chopper, (b) drilling equipment mounted on the work platform, (c) anodized tubes and insertion devices, (d) decontamination.

A pulling and chopping assembly was mounted on a traveling actuator carriage similar to that used for actuating rear face flapper valves at 105-KE. It is located by television in front of the tube to be pulled and operated remotely. It is presently located in 189-D awaiting test installation on a reactor.

A partial prototype of an elevator-mounted drill has been built and demonstrated in 108-D. Used with drilling cutters developed and on order, it will be capable of restoring the channels to initial size, for which a broach is now used, and enlarging the bore diameter at any desired position. Similar cutters were used in the test overboring of C Reactor.

To inhibit the galling which characterizes most of the difficult and incomplete tube insertions at DR and H Reactors, an anodized outer surface is being tested. Equipment to do the anodizing has been installed in 108-D Building, and production of a few anodized tubes is in progress. Eight tubes were installed in H Reactor in channels which, after broaching, failed to take a standard tube. This test is regarded as inconclusive, since force measurements were not available.

Operational Fueling Facility

Operational fueling tests were performed at 105-KE on February 9, and were successful in all respects. Ten tubes were refueled at equilibrium power at an average rate of one every thirty minutes -- a rate sufficient to meet the reactor's continuous refueling requirements.

Cavitation damage to the flexible front connectors on K Reactors occurs when the charge is flushed from the tube with full front header pressure. A venturi to be mounted at the nozzle, so that cavitation occurs downstream of the connector, has been designed. One assembly is on test at 105-KE, another is on test in the laboratory. Both were examined after approximately 500 operating hours. There is no damage to the connectors. Both nozzles were damaged, the on-reactor nozzle less severely than the one in the laboratory. The nozzle in the laboratory exhibits pits approximately 5/32" deep after the 500 hours. This service is approximately equivalent to 160 years in operational fueling.

Temperature Monitoring Equipment

The 116 point model of the high speed scanning equipment purchased for test and evaluation under Project CGI-802, has been under test in the 1713-D laboratory for more than a year. Final acceptance tests were performed this month. Requirements have been amply met.

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NPR Design Test

A total of 705 hours were expended on design test service to NPR.

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PLANT ENGINEERING

DRAFTING

Services provided during the month:

New and revised drawings	213
Layouts and sketches	88
Microfilm prints reproduced	608
Microfilm drawings voided	624
Microfilm drawings added	1595
Ozolid check prints reproduced	1539
Catalogs added to files	26
Customers serviced - microfilm files	316
Customers serviced - catalog files	47
BPF's and specifications added to files	4

EQUIPMENT APPLICATION ENGINEERING

Poison Splines

A need has existed, particularly in the older reactors, for finer control, in the use of poison splines. This need has been fulfilled by design of a spline with about 50 per cent of the boron carbide content of regular splines.

Recent discussions with spline vendors indicated a large amount of spline material too short for regular use. Drawing H-4-39093 was revised and approved for use of splines with one weld. On the first order for 600 splines, the modification has resulted in a 15 per cent reduction in unit price.

REACTOR, PLANT ENGINEERING

Rear Crossheader Expansion Joints and Guides - B, D, F, DR, H Reactors

Rear crossheader expansion joints and crossheader guides have been successfully demonstrated as a means of alleviating the problems of rear crossheader vibration and thermally induced stress at the ends of the headers. Document HW-72575, "Study of Expansion Joints and Guides for Rear Crossheaders B, D, F, DR, H, and C Reactors," has been issued to document study work on this problem.

WATER PLANT & UTILITIES ENGINEERING

IPD Disaster Planning Study

An IPD Task Force has been engaged in a study of operational and facility requirements for increased public safeguards from Hanford reactors and for decreased reactor system vulnerability in the event of regional enemy attack. The study was completed, and a summary report issued.

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Bauxite Utilization - K Area

Resolution of the minimum equipment requirements for utilization of the bauxite sulfuric acid process in the 183-K water treatment was achieved. A preliminary engineering report was issued and approved as a basis for project proposal preparation.

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PROJECT ENGINEERING

CGI-791 - Reactor Confinement (Accrual Account)

The instrument calibration ports have been installed in all the 119 Buildings. Installation of the 119-D and DR Building air conditioning units was started. The installation of reserve lubrication oil reservoirs for the 105-KE Building exhaust fan diesels was completed and the installation was started at 105-KW.

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

The Certified Design Schedule for Phase II of this project, the two-out-of-three trip safety circuit system, indicating a completion date of September 1, 1963, has been approved by the Atomic Energy Commission. The design criteria and scope drawing for this system have been approved by the Design Council and forwarded for AEC approval.

CGI-844 - 100-K Area Coolant Backup

182-K Building walls were completed following concrete pour around the 36" discharge header. Roofing is complete except for gravel placement.

CGI-861 - Expansion of Electrical Distribution Systems, 105-B, D, and F Buildings

Beneficial use at D and F Reactors was attained February 28, 1962. Plant forces are continuing load transfer cleanup work at B, D, and F Reactors.

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

The Physical Completion Notice on this project was issued February 26, 1962. \$7,930 has been accrued to complete the acid storage facility at the 105-H Building and complete other minor work items.

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

During an outage starting February 12 at 105-KW, the No. 6 low lift and high lift process water pump sets were modified. The high lift pump was the first unit to be modified in accordance with Byron-Jackson's latest volute revision design. After these units were started up, the performance of the No. 6 high lift was acceptable over all ranges of required flow. The low lift pump, however, developed an unacceptable degree of vibration; consequently, the No. 6 units were shut down and the reactor started up on five process pumps. A Byron-Jackson representative arrived on plant February 17, to supervise the complete reinstallation of the No. 6 low lift pumping unit. This work was completed and the unit started up on February 22.

The vendor has not yet completed the 500 hour (now in progress) test run of the submersible river pumps. If their present schedule holds, the first pumps should be received during March.

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The hydraulic model test of the 105-K Reactor downcomer approach section performed by Washington State University have been completed and the study report issued. The model test results indicate that the existing downcomer and approach section configuration will be satisfactory for post CGI-883 process flow rates but make recommendations regarding a number of minor changes to provide a greater margin of safety under various process conditions. These changes have been included in the design for this project.

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

Work on this project is essentially finished and the completion notice, with exceptions, was issued on February 28, 1962.

Flow capacity tests on the crossunder line system have been completed at 105-B, DR, H, C, and F Reactors. The test results indicate that the crossunder line capacity at all reactors will be restricted if the criterion of "no rear riser water level above the bottom crossheader" is adhered to. Several procedural changes in crossunder operation such as valving the affected crossheaders to an existing alternate drain system are available as a permanent solution to the problem. These various alternatives are currently being evaluated.

CGI-904 - Improvements to Gamma Monitoring Systems, 105-B, C, D, DR, F, and H Buildings

During February, new rear face sample lines to the far side sample rooms were installed at 105-H; A and B sample room components were installed at 105-F and the preinstallation assembly of components for the A sample room at 105-D was completed.

CGI-905 - Interim Modifications for Improved Coolant Backup, B, C, D, DR, F, and H Reactors

The Certified Design Schedule for this project has been approved by the Atomic Energy Commission. The design criteria and scope drawings have been completed and submitted for Design Council review; however, approval of this material has been delayed pending resolution of several questions regarding operation of the export surge suppressors.

A work release has been issued to J. A. Jones Construction Company to start construction March 1.

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

Work has started on the filter supply piping. The underground electrical duct between the 165-KE tunnel and the 1705-KE head house was poured. Form erection and concrete pouring for the support walls for the flocculation and settling basins was started.

The Frank Lohse Construction Company was awarded the contract for construction of the 1705-KE head house structure. The contractor started work on the site February 14, 1962, and poured the building foundations during the last two weeks of February.

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

Procurement of the six Analog-to-Digital Converters from ASTRODATA, INC. is being negotiated by HOO-AEC; there has been about a month's delay in the anticipated order placement date. In order to complete the project work on schedule, lost time will have to be made up during the installation phase of this project. This delay is jeopardizing the project completion date.

MJA-21, 25, 29 - Pressure Monitor Modification and Repair, 105-C, KE-KW,
and H Buildings

	<u>C</u>	<u>H</u>	<u>KE</u>	<u>KW</u>	<u>Total</u>
Gauges installed this period:	268	326	--	--	594
Gauges installed to date:	1174	865	1087	971	4097

5,871 switches have been accepted to date.

CPFF CONSTRUCTION SERVICE CONTRACTOR-LIAISON

Issued five new work orders and supplemented four old jobs for a total of \$226,910 to J. A. Jones Construction Company.

PLANT FORCES WORK REVIEW

The Labor Standards Board approved two jobs for assignment to plant forces, which are estimated to cost \$7,516,200.

Manager, Facilities Engineering

RT Jessen:dgm

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NPR PROJECT

PROCESS DESIGN OPERATION

Research and Development

Development of Computer Programs

Two computer programs using the IBM 709 digital computer are being developed to assist in further transient analysis of pressurized recirculating cooling systems. The first program is for the analysis of hydraulic transients caused by pipe ruptures. This program will permit a determination of the change in pressure, temperature, and flow within the primary cooling system following a pipe rupture of any size at several typical locations. The program will also calculate the flow out of the rupture into the Zone I confinement area.

The second program has been written to facilitate the calculation of thermal transients in a generalized cooling system. This program will determine the temperatures existing throughout the cooling system during transients caused by the reactor such as a scram, or by transients caused by the heat removal system. The program has been used successfully for studies of the NPR during scram.

Inlet Valve Closure Study

A preliminary study has been made to determine the effect of inadvertent closure of the inlet valve located in the front connectors. The valve was assumed to fail during full power operation and closes against the mechanical stop for the shutdown flow position. Initially a scram will occur and flow in the affected tube decreases sharply and superheated steam is generated. After about 20 seconds, however, the equilibrium flow of about one lb/sec is established, and the effluent becomes high quality steam. The results of the analysis indicate that a fuel meltdown in the process tube will not occur.

General Engineering Laboratory Technical Appraisal

The GEL review team conducting the technical appraisal of the NPR cooling systems visited Richland on February 14 and 15, and an interim review was presented to IPD management. No major points have been developed; however, such items as the fabrication testing and function of the butterfly steam control valves are being studied in some detail. The technical appraisal is now more than 50 per cent completed. The appraisal effort has moved rapidly during the past month covering a large number of areas. It is planned that the work will be sharply reduced about March 1, and the study delayed until Bailey Meter Company completes the planned analog and instrument engineering studies.

Project CAI-816

109 Confinement System

The design concept for the 109 confinement system submitted by Burns and Roe on December 15, 1961, was reviewed by General Electric and comments

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were developed largely involving inconsistencies with the 105-N Building design approach. Since these differences became difficult to resolve, and the timing was critical, a meeting was held on February 21, 1962, at the Burns and Roe offices to expedite resolution. The meeting was successful and mutual agreement was reached.

Horizontal Rods

Testing at the vendor's plant has indicated that under certain conditions, the currently designed packing glands of the drive cylinder for the horizontal rod can cause piston rod seizure. This seizure has occurred during scram near the end of the cylinder's stroke. The first prototype model tested at HAPO and the production prototype also tested here did not exhibit this problem. The vendor was using a slightly modified packing seal when the first seizure occurred but has demonstrated that the standard seal previously tested at HAPO will seize under certain circumstances. The gland tightness adjustment of the seal is an important factor in that oil leakage can be so minimized that insufficient lubrication exists for the seal during the high speed scram. Conversely, a loose adjustment to the seal aggravates the uneven motion of the rod during slow speeds due to the difference between the dynamic and the static friction of the seal. The unevenness in the motion of the rod with the loose seal can be tolerated to some degree, however, it has not been possible to reach an agreement with the vendor on an acceptable relaxation of this requirement. The specification requires that no visible unevenness of motion is permitted and the vendor takes the position that this is impossible to do. The packing seals are the design of the vendor and it may be necessary to redesign the seal and use a different material which would give a more satisfactory combination of properties. The current problem is a mixture of technical and contractual items. Limited parallel testing at HAPO of a modified seal has indicated that solutions to the problem are feasible.

Pressure Relief Valves

Current design calls for four relief valves located in the 105 Building to prevent overpressure of the primary loop. It is desirable that these valves open and reseal at closely controlled pressure adjustments. Large relief valves for high pressure water service are rather unique to industry and it has not been possible to arrive at vendor agreements to build a spring-loaded valve indicated for code intent. A number of alternate valves are now under study and an attempt is being made to minimize development and fabrication problems by utilization of a modified standard valve externally operated. Timing on this design is not yet critical in that these valves are flanged into the primary loop and will not be required until early loop flow testing.

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DEVELOPMENT AND TESTING

At the end of February 1962, development and testing was 94 per cent complete, on schedule.

Final reports were issued, thus completing DT-1081 - NPR Inlet Barrier Wall Sleeve Seal Plugs, and DT-1097 - NPR High Temperature Cable End Seals.

Calculations based on data taken on five in-core flux monitor chambers installed in the KW Reactor showed a significant change in calibration from the time the equipment was installed. This confirms the earlier expectation that a calibration medium such as a traveling wire flux monitor will be required as part of a complete in-core flux monitoring system. An IBM program has been prepared to determine the relationship between the neutron exposure of the chambers and adjacent fuel as part of an effort to determine chamber burnout characteristics.

The Component Test Loop operated 50 hours at 550 F in the performance of fuel element spacer flow tests and connector stress and vibration tests. The 200-HP pump was utilized in this testing providing a nominal flow of 200 gpm. Downtime of the Loop during this reporting period was dictated by testing requirements. Pressurizer heater replacement was accomplished during one of the shutdowns as was replacement of the outboard mechanical seal of the 200-HP pump. The process tube of the full-tube mockup was borescoped for a distance of 13 feet following a recent discharge of a spacer fuel column; several scratches were revealed through the autoclave film and these are being analyzed as to cause and effect. Prior to the above 50-hour operation, strain gage and vibration data on the full-tube mockup were obtained for flow rates of 100, 140, 170, 200 and 240 gpm at temperatures of 300 and 550 F.

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FIELD ENGINEERING OPERATION

Construction

105-N and 109-N Buildings

Work has continued throughout the past month in the inlet and outlet pipe spaces on installation of structural steel and insulating materials for the thermo-barrier. The shielding doors are also being installed in these pipe spaces.

General architectural work including false ceilings, cranes, and painting continued throughout the building with good progress being made.

The installation of general building service piping has continued to make good progress in the 105-N Building. The fire protection sprinkler system has now been installed in Areas 1 and 4, however, this system has not been tested nor has a complete punch list been prepared.

The Zone IV supply ventilation system duct work is now complete except for grills, diffusers, and registers. The ventilation equipment for this system has also been installed. The subcontractor on this work has now shown considerable improvement in the workmanship being applied. The Zone V ventilation unit installation is nearly complete and the refrigeration unit has been charged with refrigerant.

It was necessary to request re-qualification of instrument tubing brazers due to poor workmanship. These workmen passed the re-qualification tests without difficulty and the work has now been resumed and is, in general, proceeding satisfactorily as far as quality of work is concerned.

After considerable investigation, a cleaning procedure was established that produced reasonably good results in cleaning the installed stainless steel tubing for the flow monitor system. On February 23, 1962, however, several instances of cracked tubing were discovered. Investigation is underway to determine the cause of these cracks and until this is determined, the cleaning work has been suspended.

The tubing bundle assemblies for the inner rod room wall penetrations for the rupture monitor system have now been fabricated. These assemblies are now being prepared for pressure grouting and then will be ready for installation.

Work has continued throughout the past month by Johnson Service Company on the installation of the building heating and ventilation control systems.

Approximately 427,000 feet of wire with radiation resistance insulation has been received at the job site. Samples of this wire have been taken to determine conformance with the radiation resistance requirements.

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Final inspection of the exposed electrical conduit included in SC-99 was made on February 3, in Rooms 1, 2, 6, and 12 and in Corridors 1 and 2.

117-N Building

Very little progress was made on this building during the past month. The work was held up pending delivery of filter frame inserts. The vendor is still having difficulty in fabricating these inserts to the necessary tolerances.

181-N Building

Tests on the No. 4 pump unit and its drive motor were run during the month with some indications that motor temperatures are higher than allowed by specification.

182-N Building

The installation of pipe and equipment has continued during the month with a considerable amount of equipment now installed.

163-N and 183-N Buildings

The subcontractor on the piping and equipment started installation of general piping supports.

Outfall Structure

The discharge end of the river effluent line was placed in the excavated trench February 27, 1962. This pipe is now being installed with flanges to permit the work to proceed in a flooded excavation with the use of divers.

Underground Piping and Electrical

The raw water lines and discharge in the 109-N Building are now being hydrostatically tested and these lines are being back filled.

Pile Erection

Installation of the graphite moderator was completed at 9:35 p.m. on Wednesday, February 28, 1962. Over-all dimensional control of critical shield-to-graphite relationships was held very close to design predictions. The installation of the graphite moderator was performed without difficulty and ahead of predicted schedules.

Installation of graphite cooling tubes was completed concurrent with graphite lay up, and tube flaring and expansion bellow installation is proceeding.

Equipment assembly for process tube installation is underway, and tube rolling craftsmen have been trained. Most components necessary for the process tube assembly are on hand or enroute.

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On-site inspection of Ball 3-X hoppers and plug assemblies has indicated serious problems in dimensions which threaten the operability and interchangeability of these units. An optical check is being made of the hoppers to determine the rework necessary to make them usable. Other corrective measures to the lower and upper plug assemblies is also under way. All repair work is being done by J. A. Jones.

Plans and procedures are being developed for proceeding with installation of the shielding on top of the unit, inner-rod room assemblies, cooling headers, etc.

Zirconium Process Tubes

The C-25 tube shop facilities were made available to HLO for processing of PRTR tubes for the period February 5 - March 5, inclusive. Following this, Kaiser Engineers will again resume processing of the final 21 tubes received from Harvey Aluminum on February 20, and will maintain construction work forces as necessary to accommodate the tube installation program.

Of the 1066 tubes received, 1003 are completed and in final storage, 42 have been rejected as not meeting specifications, and 21 are in process.

Administration

The following material has been issued during the period of January 22, 1962, through February 18, 1962:

Drawings	355
Criteria	5
Specifications	5
Requisitions	60
ATP's	1
Other	20
TOTAL	<u>446</u>

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

Drawings	18
Specifications	2
Scope	0
ATP's	3
TOTAL	<u>23</u>

Bailey Meter material processed as of February 18, 1962, is as follows:

Released for Comments drawings	59
Released as Noted for Fabrication drawings	62
Released for Fabrication drawings	18
Not Released for Fabrication drawings (B&R)	7
Not Approved drawings (GE)	7
TOTAL	<u>153</u>

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PRIMARY LOOP

Pittsburgh Testing Laboratory has been engaged by Kaiser Engineers to provide non-destructive testing and quality control services for primary pipe, both at the HUICO shop and in the field. Pipe shipped to the field now totals 57.0 tons. Shipment of pipe to HUICO from their suppliers now totals 646.4 tons, of which 323.7 tons represent high-pressure piping.

The following is the status of primary pipe approval data as of the end of February, 1962:

Total Number Received	2039
(Include 1,297 received for information only)	
Number Approved	584
Number Approved With Exceptions	41
Number Not Approved	36
Number Currently Being Reviewed	81
By General Electric and Burns and Roe Jointly	14
By Burns and Roe (109-N)	67
Number Received for Information Only - No	1297
Approval Required	

CONSULTING ENGINEERS

The study program being carried out for the Division of Reactor Development is continuing. The reactor concept being developed is of a graphite moderated, pressure tube type in which the coolant is completely transformed from water to superheated steam inside the reactor core. Two cases are being studied rated 300 and 1000 eMW. Preliminary optimization studies have been completed. The design has been developed in outline shown in a series of sketches and is now being estimated for capital and fuel costs. A presentation of the design for use in a forthcoming DRD meeting is being prepared.

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PROGRAM EVALUATIONDesign Status

	<u>Wt'd Total</u>	<u>Certified Schedule</u>	<u>Actual % Complete</u>
<u>Reactor Plant as of 3/1/62</u>			
<u>Title I</u>			
Scope		100	100 (1)
<u>Title II</u>			
Drawings	70	96.0	94.1 (2)
Specifications	8	100	98.4
Requisitions	8	96.5	87.7
ATP's	4	81.5	41.8
Development and Testing	<u>10</u>	<u>92.5</u>	<u>94.0</u>
Total	100	94.0	91.9
<u>Heat Dissipation Plant as of 3/1/62</u>			
<u>Title I</u>			
Scope		100	98.8
<u>Title II</u>			
Detail Design		99.5	94.5
	<u>Req'd</u>	<u>No. Issued to Scheduled</u>	<u>Actual</u>
Preliminary Drawings (bid)	1130	1108	1108
Detail Drawings (for const.)	1130	1108	1108
Specifications (bid)	153	152	150
Requisitions	183	169	169
ATP's	13	5	0
<u>Composite Design Completion as of 3/1/62</u> <u>(Reactor and Heat Dissipation Combined)</u>			
		<u>Certified Schedule</u>	<u>Actual % Complete</u>
Total		97.1	93.9

(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 2510 to 2520.

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Cost Estimate

On February 9, 1962, HOO-AEC submitted recommended schedule and estimate revisions to Washington. They recommended that, (a) the construction completion date be extended from October 1, 1962 to October 1, 1963, and (b) authorized funds be increased from \$145 million to \$182.6 million. To date, no formal acceptance of these recommendations has been received.

Schedules

See previous paragraph for recommended extension of the project completion date.

The construction status as of 3/1/62, based on the Preliminary Revision # 3 to the AEC Construction Schedule, dated October 26, 1961, is as follows:

	<u>Scheduled</u>	<u>Actual</u>
Temporary Construction	71	71
General Area Systems	60	61
105-N Building	67	37
109-N Heat Exchanger Building	58	41
163N-183N Water Treatment Facilities	98	95
181-N River Water Pump House	99.5	99
182-N High Lift Pump House	92	70
184-N Standby Power House	91	80
153-N Switchgear Building	96	98.5
NPR Project (CAI-816)	66	46

Manager, NPR Project

JS McMahon:mf

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SIGNIFICANT REPORTS ISSUED

<u>Number</u>	<u>Class'n.</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-72594	Unclass.	ER Rudock	2/5/62	Project CGI-839 - Modification of Fuel Element Test Facilities, 1706-KER - KER Loops Safety Circuit Improvements, Project Representative Meeting No. 4
HW-72629	Unclass.	FJ Kempf	2/7/62	Project CGI-884 Representatives Meeting No. 6
HW-71919	Unclass.	CT Main, Inc.	12/22/60	CGI-844, 100-K Coolant Backup System Hydraulic Transient Computations Consultant Agreement CA-262
HW-72683	Unclass.	PJ Hollifield	2/14/62	K Reactor Process Tube Nozzle Stresses
HW-WSU-7	Secret	CC Lomax ER Tinney	1/31/62	Model Test of the Inlet to K Downcomer DDR-135 HAPO Contract
HW-GEL-1	Conf.	NH Wood	2/8/62	Final Report - Graphite Distortion C Reactor
HW-72698	Unclass.	EL Etheridge	2/15/62	Development Test IP-494-E On-Pile Test of Flexible Vertical Safety Control Rod 105-C Reactor
HW-72742	Secret	KM Keene	2/20/62	Project CGI-883, Model Test of Inlet to K Downcomer HW-WSU-7
HW-72738	Secret	MH Schack	2/20/62	River Contamination Reduction Studies Program Outline and Schedule
HW-72819	Secret	LM Keene	2/26/62	River Contamination Reduction Studies An Evaluation of the Artificial Lake Concept

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<u>Number</u>	<u>Class'n.</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-72367	Unclass.	RR Henderson FJ Kempf	1/19/62	PT IP-483-AT Installation of Test Sleeves in One Vertical Safety Rod Channel Force Measurements 105-C
HW-72113	Unclass.	AJ Lindsay	12/29/61	Process Tube Flow Monitor
HW-71421	Unclass.	DB Lovett	10/20/61	Measurement of Beckman Chamber Saturation Properties
HW-72519	Unclass.	W Dalos	2/5/62	Development Test IP-487-K Anodized Process Tubes
--	Unclass.	W Dalos	2/19/62	Television Coverage for Tube Replacement Operations
HW-72710	Secret	RS Hammond PB McCarthy KG Hawkins	2/15/62	Results of Ten Tube Operational Fueling on February 9, 1962
HW-70687	Secret	PB McCarthy PA Carlson	2/9/62	Operational Fueling Facility with Uranium Charges - PT IP-429-AK - Enriched Metal Charging with Venturi at Nozzle
--	Unclass.	MP Black	1/30/62	Strength and Leak Tests on Modified 558 B-D-F Inlet Nozzles
HW-72610	Unclass.	LC Cole	2/6/62	Design Test 1097 - NPR High Temperature Cable End Seals Test Report
--	Unclass.	JL Rusk	2/13/62	Connector Tubing -- Full Tube Mock-up
HW-72697	Unclass.	JL Rusk	2/15/62	Design Test 1081-B -- NPR Sealing Plug for Inlet Barrier Wall Penetration Sleeves
HW-72714	Unclass.	RL Hibbard, Jr.	2/16/62	Nozzle Cap Gasket Test Interim Report
HW-72433	Unclass.	HA Kramer	1/29/62	A Compilation of Water Temperature Near Grand Coulee Dam in Environs of Lake Roosevelt

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HW-72563	Secret	RT Jaske et al	2/15/62	Irradiation Processing Department Defense Capa- bility Study Plan
HW-72410	Unclass.	KD Coughren	2/5/62	Preliminary Engineering Report Modifications of Charge and Discharge Platforms, All 105 Bldgs.
HW-72575	Secret	PH Hutton	2/8/62	Study of Expansion Joints and Guides for Rear Cross- headers - B,D,F,DR, H, and C Reactors
HW-72312	Conf.	VG Blanchette JL Deichman FJ Mollerus	1/31/62	Safety Circuit Relaying Study
HW-72647	Conf.	RK Robinson	2/8/62	NPR Parameters During Operating Transient Conditions - Phase I
HW-72727	Secret	DL Condotta	2/19/62	Reactor Design Analysis Monthly Report, January, 1962
HW-72716 RD	Unclass.	GT Haugland	2/5/62	NPR Connector Venturi Forging Defects

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TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
ER Rudock	Byron Jackson Pumps Inc., Los Angeles	2/7-12/62	Discuss Problems and review performance tests of CGI-839 canned motor process pumps
	APED, San Jose	2/13-14/62	Discuss employment opportuni- ties
MH Schack	Oregon State College	2/28-	Discuss crossunder line
DE Cooley	Corvallis, Oregon	3/1/62	model tests
LC Cole	Rucker Company San Francisco	2/7-10/62	To assist NPR with instru- mentation on horizontal control rod - Trip requested by NPR
A McDonald	Precision Engineering Seattle, Washington	2/23/62	To witness and evaluate magnaflux testing on DeLaval pump shaft
JM Fox, Jr.	Ladish Company Milwaukee, Wis.	1/31/62	Examine Ladish metallurgy relative to NPR main headers
	Taylor-Forge Chicago, Ill.	2/1/62	NPR metallurgy
	Ladish Company Milwaukee, Wis.	2/19/62	NPR piping metallurgy
	General Electric Co. Schenectady, N. Y.	2/21/62	NPR piping metallurgy
	Burns and Roe New York, N. Y.	2/22/62	NPR piping metallurgy
	BIF Industries Providence, R. I.	2/23/62	NPR piping metallurgy
FAR Stainken	California State Polytechnic College San Luis Obispo, Calif.	2/19-20/62	Participate in Company's BS/MS recruiting program
	University of Santa Clara Santa Clara, Calif.	2/21/62	Same

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Name	Firm & Location	Date	Purpose
FAR Stainken	Vallecitos Atomic Lab. Pleasanton, Calif.	2/22/62	Discuss problems of placement and engineering administration
	Atomic Power Equipment Department, San Jose, Calif.		Same
	University of Calif. Berkeley, Calif.	2/26/62	Participate in Company's BS/MS recruiting program
DH Curtiss	Harvey Aluminum Co. Torrance, Calif.	2/4-7/62	Discuss procurement of NPR process tubes
RW Benoliel	GE - Engrg. Services Crotonville, N. Y.	2/6-11/62	Discussions with Services Division personnel
GF Owsley	University of Oregon Eugene, Oregon	2/13-15/62	Technical recruiting
R Nilson GF Owsley	DuPont Company	2/24-3/1/62	Technical information exchange
RW Benoliel	Beryllium Corp. of Am. Reading, Pa.	2/24-3/3/62	Discussions on pyrolytic graphite
	National Carbon Co. New York, N. Y.		Same
	Raytheon Co. Boston, Mass.		Same
	American Metal Products Detroit, Mich.		Same
	GE - Metallurgical Products Department Detroit, Michigan		Same
WJ Mundt GE Wade	Burns and Roe, Inc. Hempstead, N. Y.	2/20-23/62	Resolve design features of confinement system
JF Nesbitt	AMF Atomics Greenwich, Connecticut	1/30-2/2/62	Witness tests and review status of underwater metal handling system
GA Newell	Smith Dynamics Los Angeles, Calif.	1/25/62	Discuss design and fabrication problems of the horizontal rod and drive
	Rucker Company Oakland, Calif.	1/26-30/62 & 2/9/62	Same

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
JD McCullough	Panellit Division, ISI Skokie, Ill.	1/31/62	Discuss rod flow monitor and zone temperature monitor
	Avien, Inc. Woodside, N. Y.	2/1-2/62	Discuss process tube flow monitor
	Barton Instrument Corp. Monterey Park, Calif.	2/5/62	Discuss process tube flow monitor
	ISI Los Angeles, Calif.	2/6/62	Discuss temperature monitor and data logging system
	Astrodata, Inc. Anaheim, Calif.	2/7/62	Discuss rod position display
RA Rohrbacher	Heath Plating, Inc. Kent, Washington	2/6/62	Discuss RTD Cable plating
WM Harty	Rucker Company Oakland, Calif.	2/4-9/62 & 2/26-3/2/62	Discuss design and fabrica- tion problems of the horizon- tal rod and drive
LP Reinig	Mason-Neilan Co. Norwood, Mass.	2/17-20/62	Discuss problems with the fabrication of NPR inlet and diversion valves.
	Chandler-Evans Hartford, Conn.	2/21-23/62	Same
DR Resner	Ladish Company Cudahy, Wisc.	2/5-3/2/62	Provide technical liaison to NPR piping vendor
WW McIntosh	Ladish Company Cudahy, Wisconsin	2/4-16/62 & 2/26-3/2/62	Provide technical liaison to NPR piping vendor
CL Buckner	Ladish Company Cudahy, Wisconsin	1/29-2/7/62	Gather records of pipe manufacturing and processing
CD Shadinger	Ladish Company Cudahy, Wisconsin	2/21 to present	Provide technical liaison to NPR piping vendor
DE Sebade	Aluminum Co. of Am. Cressona & Lancaster, Pa.	2/12-15/62	Discuss production of impact extruded inlet nozzles

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VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
KW Templin	Byron Jackson Pumps Inc., Los Angeles	2/8-9/62	To observe and obtain measurements of 190-K process pumping unit vibration.
NH Wood	General Engr'g. Lab. General Electric Schenectady, New York	1/30-2/1/62	Discuss results of GEL studies of reactor graphite distortion problem
FW Kamsler RG Lawson	Astrodata Anaheim, Calif.	1/31-2/1/62	To discuss final report on DDR-133 contract
JD Cochran	General Aluminum Corp., Spokane, Wash.	2/16/62	To discuss flapper cap moulding dimensions
WH Taylor JC Rau	Electric Storage Battery Co., Portland, Oregon & San Francisco, Calif.	2/13-16/62	Consultation on storage battery problems
R Day	Byron-Jackson Pumps Inc., Los Angeles	2/17/62	To supervise reinstallation of new low lift pump
RD Doctor	Atomics International Canoga Park, Calif.	2/19/62	Discuss irradiation program
PJ Hastings MW Burkett	National Carbon Co. New York, N. Y.	2/19-20/62	Discussions on graphite
JE Bauld	National Carbon Co. Cleveland, Ohio	2/19-20/62	Discussions on graphite
DW Leiby H Stern D Brown	General Engr'g. Lab. General Electric Co. Schenectady, N. Y.	2/14-15/62	Present interim oral report of their technical review to IPD management
CF Paulson	Private Consultant Summit, New Jersey	2/31-22/62	Cleaning procedures and pro- tecting of piping systems and equipment
GT Lewis	Burns and Roe, Inc. Hempstead, N. Y.	2/15/62	Discuss confinement system
PG Patch WS Christian V Lawford	Barton Instrument Corp. Monterey Park, Calif.	2/13/62	Discuss flow transducers and racks

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<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
HT David PB Smith AL Danielson	Bailey Meter Company Cleveland, Ohio	2/14/62	Attend Task Force meeting
WH Coleman	General Electric Co. Fort Wayne, Indiana	2/21/62	Discuss Manufacturing Training Program

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