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HW--79769

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N - REACTOR DEPARTMENT

MONTHLY REPORT

NOVEMBER

1963

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HANFORD ATOMIC PRODUCTS OPERATION

RICHLAND, WASHINGTON

GENERAL ELECTRIC

MASTER

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N-REACTOR DEPARTMENT

MONTHLY REPORT -- NOVEMBER 1963

Compiled by N-Reactor Department

December 9, 1963 - Richland, Washington

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

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TABLE OF CONTENTS

General Summary	A-1 through A-7
N Reactor Fuels Operation	B-1 through B-12
Research & Engineering Operation	C-1 through C-8
N Reactor Project Operation	D-1 through D-11
N Reactor Plant Operation	E-1 through E-3

GENERAL SUMMARY

N REACTOR FUELS

Manufacturing

One hundred per cent of the extrusion requirements of .94 enriched fuels for the first reactor load were completed on November 13, 1963. Extrusions of natural and 1.25 enriched fuel for use in the physics tests were processed during the month. At month end, 90 per cent of the first load requirements had been transferred to finished storage. Shipments to reactor site consisted of 105 boxes of acceptable .94 enriched fuels and 24 boxes of reject assemblies.

A severe component shortage occurred in November as a result of the accelerated extrusion rate in order to complete first load as rapidly as possible. To preclude a shutdown, emergency procedures were put into effect such as using zirconium shells with marginal pitting problems, welding the evacuation hole shut on 1/4 inch front end plates so they could be used as rear end plates, and completing part of the outer extrusions with copper nose cones, some with standard 1/4 inch plates and some with remaining 1/2 inch plates.

Seven 1.25 and two 1.60 enriched uranium primaries were successfully extruded during November. The extrusions of the 1.25 were processed through the Shop to autoradiograph in five working days, which constitutes a significant achievement in view of the fact that nuclear safety requirements greatly restricted our processing efficiency.

Rewelding of NOE fuels was initiated in the 306 Pilot Plant during November. Experience to date indicates about 40 pieces per day can be produced with a yield of at least 80 per cent for the weld flameout and surface irregularity categories.

Engineering

Support sizing investigations have been completed. The present support has sufficient strength for first load charging; however, it has been determined that additional support strength cannot be obtained without support crown deformation. Alternate designs are currently being investigated. A die for producing a "T" cross member for stiffening outer supports has been procured. Testing of the "T" will be completed during December.

Increased engineering effort has been placed on investigating the unusual clad variation defects of the NOE extrusions. The defect consists of a thick clad area, accompanied by a surface indentation or dimple on the ID Zircaloy clad.

RESEARCH & ENGINEERING

A review of the feasibility and cost for the production of tungsten - rhenium from the irradiation of tungsten reveals little incentive for such a program.

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The N inner enriched (NIE-1) fuel elements with unbonded end closures reached an exposure of 810 MWD/T in KER Loop #1 without incident. Discharge is planned in January. Eight prototype Li-Al target elements in KER Loop #2 have reached an exposure corresponding to a gas volume ratio (GVR) of 14. Discharge is scheduled in January at a GVR of 17. "First load" fuel element charges in KER Loops #3 and #4 have reached exposures of 1622 MWD/T and 1145 MWD/T, respectively, without incident.

An engineering study has been initiated to determine the nature of a test that would effectively simulate the heating and quenching cycle that would result if gamma heating under emergency conditions raised the mean fuel element temperature to 1800 F before emergency raw water was admitted.

The analogue simulation model of the N Reactor steam generators has been set up, debugged and production runs are under way. Process parameter requirements for the N Reactor data system have been identified and are being programmed into the reactor information file system.

All process standards required for the performance of start-up test N-1 have been approved and issued. Physics start-up crews are being trained.

All programmed steady-state tests of the electrically heated mock-ups of an N fuel column have been completed and analyses are under way. The column is being modified for a new series of tests. A special two-phase flow experiment was made with this test column operating at conditions equivalent to a tube power of 6200 KW. The data obtained indicated that no sub-cooled film boiling existed under this maximum power condition.

The maximum Phase 1 (five loop) flow capability of the primary cooling system was re-examined on the basis of recently gained laboratory data. The analysis showed a favorable increase over earlier predicted flow capabilities.

N REACTOR PROJECT

A design analysis has indicated that in the postulated incident of an accidental primary loop dump and a delayed operation of the diesels, the fuel temperatures would not reach the boiling point if electric power were assumed to be available and the primary loop injection pumps continued to function.

The confinement system shear pins have been redesigned for conformance to the newly established release pressures of the revised confinement system design criteria.

Charging tests prototypical of initial fuel loading conditions have yielded satisfactory results with respect to fuel element support integrity and process tube autoclave finish.

Design testing has demonstrated the operability of production-run pilot and control valves in the RV-2 relief assembly. Testing of the full-size production-run primary relief valve is now being initiated.

Final acceptance was made for the 109-N Building on November 15, 1963. This completed the transfer of all 100-N facilities to General Electric.

The charging machine was placed on the "W" elevator on November 15, and operational testing has now started.

The recirculation of the primary loop was conducted with three pumps on December 1, 1963.

Repair of steam generator unit 3B by sleeving the tube ends is now 58 per cent complete. All work on unit 3B is scheduled to be completed by mid-December. Preliminary work for repair of steam generator unit 4A has been under way on a limited scale. To date the tube-in-tube sheet welds on the primary side have been cut free. Procedures for further field work on unit 4A have not been submitted for approval as yet.

N REACTOR PLANT

All dummies for fuel loading have been received. Fuel, both reject and special as well as production grade fuel, is now being received.

Procedures to maintain SS material accountability and satisfy production scheduling requirements have been established.

The boiler developed a leaky tube on November 27. Pressure was reduced, and the unit continued in service until 8:00 a.m. on November 28. The leak was found to be in a weld in a 3-inch front wall tube. Repairs were effected immediately, and the boiler was returned to service after approximately a nine hour outage.

The Demineralizer Plant operated during the month, and a considerable portion of the OTP of this facility was completed.

All of the exceptions to official 105 Building acceptance were cleared and accepted during the month.

Development of operating procedures continued during the month with work in progress on 22 procedures necessary for initial fuel loading. Those procedures in final form are now being issued.

Staffing of shift maintenance crews is completed for instrument and electrical crafts. Pipefitter and millwright staffing will be completed in December. Miscellaneous craft personnel are now on plant or arranged for by January 1, 1964.

Maintenance responsibility for the entire area was assumed during November, including the heavy load generated by the testing program and by completion of the installation of maintenance shop equipment.

Formal training in operation of the work scheduling, control, and reporting system was completed by Planning & Scheduling personnel responsible for

system operation. Certification training for processing operators and supervisors was fully established and continued on shift as scheduled. Operation and maintenance work for the testing program is providing valuable on-the-job field training in depth for operators and maintenance personnel in trouble shooting as well as system and equipment manipulation and repairs.

PERSONNEL STATISTICS

Number of employees as of October 31, 1963. 614
 Number of employees as of November 30, 1963. 606

	<u>Exempt</u>	<u>Nonexempt</u>	<u>Total</u>
General	2	2	4
Finance	15	8	23
N Reactor Fuels	53	113	166
Research & Engineering	50	9	59
N Reactor Plant	60	177	237
N Reactor Project	<u>91</u>	<u>26</u>	<u>117</u>
 TOTAL	 <u>271</u>	 <u>335</u>	 <u>606</u>

Employment

	<u>Exempt</u>	<u>Nonexempt</u>	<u>Total</u>
Additions	2	11	13
Reductions	<u>6</u>	<u>15</u>	<u>21</u>
 Net Reductions	 <u>4</u>	 <u>4</u>	 <u>8</u>

SAFETY & SECURITY

Days without a disabling injury 365
 Hours worked without a disabling injury 1 083 284
 Medical treatment injuries (November) 28

There was 1 security violation in the Department during November, 1963.

SUGGESTION PLAN PARTICIPATION

	<u>November</u>	<u>Year-to-Date</u>
Number of eligible employees	335	276
Number of suggestions received	34	342
Number of suggestions acted upon	32	266
Number of suggestions adopted	13	114

	<u>November</u>	<u>Year-to-Date</u>
Net annual savings	\$1 970	\$26 735
Amount of awards	\$ 260	\$ 3 745
Per cent of awards to savings	13.2	14.0
Average amount of awards	\$ 20.00	\$ 32.85

PATENT SUMMARY - NOVEMBER, 1963

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 November. 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.

STAFF

General Manager
 Manager, Employee Relations
 Manager, Finance
 Manager, N Reactor Fuels
 Manager, N Reactor Plant
 Manager, N Reactor Project
 Manager, Research & Engineering

R. L. Dickeman
 C. O. Steinnagel
 J. Milne
 L. M. Loeb
 W. M. Mathis
 J. S. McMahon
 M. C. Leverett

R L Dickeman
 General Manager
 N Reactor Department

RL Dickeman:skd

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HW-79769

N-REACTOR FUELS OPERATION
NOVEMBER 1963

I. PRODUCTION STATISTICS

	<u>Current Month</u>		<u>Last Month</u> <u>Actual</u>	<u>First Load</u>		
	<u>Scheduled</u> <u>Tons</u>	<u>Actual</u> <u>Tons</u>		<u>Schd.</u> <u>Tons</u>	<u>Tons</u> <u>To Date</u>	<u>%</u> <u>Compl.</u>
<u>Shop Input *</u>						
Inners	11.5	2.4	33.0			
Outers	51.5	38.3	53.5			
Total	<u>63.0</u>	<u>40.7</u>	<u>86.5</u>	<u>700</u>	<u>718</u>	<u>102.5</u>
<u>Shop Output</u>						
<u>Autoclaves</u>						
Inners	---	16.8	8.6			
Outers	---	15.5	32.7			
Total	<u>50.0</u>	<u>32.3</u>	<u>41.3</u>	<u>420</u>	<u>398</u>	<u>94.8</u>
Transferred to Finished Storage	105	76.4	115.4			
Material in Finished Storage	370	335.9	255.9			
<u>Throughput by Stations</u>						
<u>Station</u>	<u>Inners</u>		<u>Outers</u>		<u>Total</u>	
Extrusions (billets)	17		179		196	
Cut-up first	247		2366		2613	
Cut-up rework	0		780		780	
Chemical milling (ends)	0		6389		6389	
Braze (ends)	572		6486		7058	
Heat treat	494		3387		3881	
Straightening	61		29		90	
End test (ends)	1818		6027		7845	
Vacu-blast	956		2747		3703	
Welding (ends)	2302		4643		6945	
Clad and bond test	1171		2631		3802	
Support weld	2298		1528		3806	
Autoclave	2805		1238		4043	
Final etch	2221		1265		3486	

* 100% of first load extrusion requirements were completed on November 13, 1963.

<u>Other Statistics</u>	<u>Inners</u>	<u>Outers</u>	<u>Total</u>
Support fabrication	14,597	23,347	37,944
Locking clip fabrication	0	4,622	4,622
Special extrusions			20
Tubes scrapped	126	163	289 -
			5025.35
			lbs.
Oxide burned	24 batches		* lbs.
* None transferred during month.			

Shop Yield

<u>Current Month</u>	<u>Inners</u>	<u>Outers</u>	<u>Total</u>
First Run	84.9	54.6	68.3
Estimated Rework	4.2	11.3	8.2
Total	89.1	65.8	76.5
<u>Previous Month</u>			
First Run	80.9	48.6	55.8
Estimated Rework	4.9	10.5	9.2
Total	85.8	59.1	65.0
<u>First Load to Date</u>			
Total Yield	66.7	51.4	56.3

II. SHOP OPERATIONS

A. Production

Extrusion requirements of .94 enriched fuels for the first reactor load were completed on November 13, 1963. Extrusion of natural and 1.25 enriched fuel for use in physics tests were processed through the balance of the month. A new high of 21 outer extrusions during an eight-hour shift was established during the month.

Output production continued at a high rate with 76 tons transferred to finished storage. At month end 90% of first load requirements had been completed. Shipments to the reactor site consisted of 105 boxes of acceptable .94 enriched fuels and 24 boxes of reject assemblies to be used for charging and pre-startup tests.

On November 4, 1963, the ten chemical workers on temporary assignment were returned to the Production Fuels Section, IPD. Work assignments were rescheduled with 12 employees

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HW-79769

assigned to the Day-Swing shift.

B. Plant Problems

During late October and early November, the extrusion rate was accelerated in order to complete the first load as rapidly as possible. This resulted in a severe component shortage in November. To preclude a shutdown, this involved using zirconium shells with marginal pitting problems, welding the evacuation hole shut on quarter-inch front end plates so they could be used as rear end plates, completing part of the outer extrusions with copper nose cones, part with standard quarter inch plates and part with the remaining half-inch plates.

Uranium contamination occurred at the cut-off saw as a result of the increased throughput. A conveyor was installed to stop the spread. Sufficient operating experience has not been obtained to determine if the conveyor will stop contamination spread.

Seven categories of reject fuels are presently being held rather than being scrapped. These include all NOE and NIE weld rejects, surface variation rejects, peel test rejects, heat treat warp rejects greater than 100 mils, straightened pieces with over 30 mils warp, warp rejects with greater than 35 mils at final inspection and all NOT internal clad variation rejects that meet minimum clad thickness requirements. Action is being taken by Engineering to determine if these fuels can be reworked or should be scrapped.

A fire estimated at \$200 occurred on the UT-9 end closure tester on November 11. The Brush recorder was being left on during the graveyard shift, resulting in paper being expelled onto the floor. Since high voltage was on the recording pins, apparently fuzz which collects on the pin was ignited by the spark trace and fell into the roll of paper, igniting it. The wires were burned off of the recorder and all the knobs burned off the front panel. No internal damage was observed. Procedures have now been established to assure that the swing operators turn off all Brush recorders.

C. Plant Improvements and Achievements

Seven 1.25 and two 1.60 enriched uranium primaries were successfully extruded. Some uranium contamination was experienced in the press area requiring 17 hours of Engineering and 27 hours of Shop effort to remove the contamination. The extrusions of 1.25 enriched uranium were processed through the Shop to the autoradiograph in five working days. This is considered a significant achievement in view of the fact that nuclear safety requirements greatly restricted our processing efficiency.

With the assistance of Support Services, P-Q shifts were established for all four craft groups within Shop Operations. A meeting was held between HAMTC and Union Relations representatives and details of rotations within each craft were successfully established.

Rewelding of NOE fuels was initiated in the 306 Pilot Plant on November 13. Experience to date indicates about 40 pieces per day can be produced by two men with a yield of at least 80 per cent for the weld flameout and surface irregularity categories.

On November 1, 1963, a new record was established on the end closure tester consisting of 714 ends tested during a normal eight-hour shift.

The cut-off saw has operated all month with no spindle bearing or blade guide problems. It appears this exceptional operation without failure can be contributed to the new lubrication procedures which have been initiated to force foreign matter out of the bearings. An automatic lubrication system will be installed at the next overhaul.

W. Miller, a welder in Mechanical Crafts, has just received confirmation that he has been accepted as a Senior Engineering Technician by the Board of Trustees of the Institute for the Certification of Engineering Technicians. To our knowledge, this is the first man that has been accepted in N-Reactor Fuels.

III. QUALITY CONTROL OPERATION

The investigation of the occurrence in some of the fuels of uranium in the braze area of the end closure has shown that fuels in this category consist of three subgroups. Subgroup No. 1 was similar to Category I and was released for reactor charging. Subgroups No. 2 and No. 3, because of sample evaluation, will need to be 100 per cent alpha counted to make a decision on charging.

The certification of fuel assemblies was stopped for one week during November, awaiting final evaluation of Category II braze material. It was decided to remove from the first load all assemblies containing uranium contamination in the braze. Forty-one boxes that had been shipped to the reactor site have been returned to the 300 Area for removal of the assemblies under Category II.

IV. ENGINEERING

A. Materials Engineering

Cladding Thickness Variation

Eighty outer billets were coextruded during November to evaluate the effect of increased primary extrusion ram speed

and cooler primary extrusion mandrels on cladding variation. Fabrication results will be available by mid-December.

Currently, work is under way to correlate production data for clad variation which has been accumulated in the NUF system with billet chemistry information. This work is the first attempt to use the production data for an engineering correlation. Some difficulties have been encountered due to missing data and the need for IBM card sorting.

Zircaloy Strip

Bids on a 200 pound lot of strip rolled by the Turk's Head process were received from two vendors. Both bids quoted a price lower than that we are currently paying for on-site fabricated strip. Orders will be placed with both vendors.

B. Process Engineering

Test Fuel Fabrication

Inner fuels with unbonded 90° chevron end closures are now being fabricated for testing the KER Loop. Cap design is final and the welding process has been established.

Extrusion Unbond

A rear end defect containing a large blister between the OD copper and the Zircaloy was tested to determine the analysis of the gas enclosed in the blistered area. Test data shows that the entrapped gasses are products of the extrusion lubricant and air, indicating rupture of the copper can at some point during the extrusion process. We are currently investigating the possibility of obtaining a similar analysis of the entrapped gasses (if any) in the small unbonded areas found between the Zircaloy and the uranium. This work, together with analysis of deformation during initial upset of the billet, is expected to help in defining the unbond mechanism.

Braze Closure Process

Use of beveled Zircaloy end caps in production was initiated during the month. A high weld blowout reject rate has been experienced on this material. This particular incident is being thoroughly investigated in order to determine the cause of this high rejection rate.

Charge Machine Testing

During the past month ten columns of 24-inch fuels, four columns of 18-inch fuels, and two columns of 12-inch fuels

were charged using prototypic reactor startup conditions. In addition, six columns of fuel were charged using back pressures varying from 700 to 1900 pounds. One support was deflected to .011 inch during the 1500 pound back pressure test. All other support deflections were .005 inch or less. Based on these and prior results which were equally successful, it has been concluded that the present support will perform adequately during initial reactor charging.

Support Design

Support sizing investigations have been completed. Although the present support has sufficient strength for first load charging, it has been determined that additional support strength cannot be obtained without support crown deformation. Because this is not considered a desirable approach for improving support strength, alternate designs are being investigated.

A die for producing the "T" cross member for stiffening outer supports has been procured. Testing of the "T" will be completed during December.

A support impact testing device was fabricated and initial impact data has been obtained. Although impact strength is a direct function of deflection strength, support rigidity or ductility changes could influence impact strength somewhat differently than deflection strength. The impact test will be used to check new support designs and attempt to more closely correlate charge test results. Based on theoretical analyses of support strength, it has been concluded that the most profitable area for support design changes lies in designing the support with a shorter bridge length and/or thicker cross section.

Clad Thickness Variation

Increased engineering effort is being placed on investigation of the unusual clad variation defect in the NOE extrusions. This defect consists of a thick clad area accompanied by a surface indentation or dimple on the ID Zircaloy clad. During the past three months this defect has occurred on 20%, or 108, of the NOE billets extruded. Of this number, a total of 346 (25%) fuels have been rejected. Metallographic studies of the dimpled area have shown that the Zircaloy clad is as much as 100 per cent thicker than normal in the dimple area. The Zircaloy grain structure varies widely between dimpled and non-dimpled areas and microhardness tests show the Zircaloy in the area of the dimple to be harder than the normal clad.

C. Nuclear Safety and Process SpecificationsEngineering Specifications

Samples of the new engineering specifications were provided to Quality Control to assist them in developing the new Quality Control manual.

Nuclear Safety

Operating Procedure for the processing of 1.25 per cent enriched uranium in the 333 Building was issued in November.

D. Equipment and Maintenance EngineeringBillet Handling and Tool Preheat

The design for the new billet handling equipment has been approved and fabrication has been initiated.

Process changes for cut-off preheating have been approved allowing final specifications to be completed for new tooling and graphite preheat furnace.

V. TESTING METHODSA. N-Fuels TestingUltrasonic Tests on Billets

Pre-characterization of extrusion behavior appears to be yielding to the current approach involving testing of both the uranium billets and the Zircaloy cans using ultrasonic boundary wave techniques. While the correlations have not been perfect, results are encouraging and could act to reduce present reject levels. The data from 21 extrusions has been examined and arranged in an empirical formula. As soon as coefficients are determined, suitable readout devices will be provided and production application made.

Support and Clip Welding

A series of 50 locking clips were welded on the locking clip welder in a deliberate attempt to produce penetrations. The sample clip welds were examined using a small diameter ultrasonic beam from a transducer inside the fuel component and maps of the weld bond area on more than 20 clips were made for correlation with destructive metallographic examination. In no case did the ultrasound indicate over penetration and this condition was confirmed metallographically. One sample did show that the clad was not bonded to the uranium under the clip. This interpretation proved to be accurate by destructive examination. Work on mapping the clips of production fuel in the time suspect group has been started, but is handicapped by rough surface conditions on the clip in the vicinity of the dimple which may complicate testing. The extent of this condition will be determined and investigation of locking clip machining to a smooth surface will also be followed.

Pan Bore Camera

To provide for easier and better utilization of the pan bore camera, it has been set up in the 333 Building and is ready to be operated routinely. The Optical Shop is adjusting the focus on one auxiliary borescope head and is repairing another.

B. AlSi Fuel Testing

Hot Die Sized Fuel Element Tester - UE-3

The modifications to improve testers operation are being completed and the tester is being made ready to be put back into service. The installation of the new fans, changing of cables, and the design and construction of a new nickel thickness probe have been completed. The parts necessary to double the throughput have been assembled and will be installed shortly.

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N-REACTOR FUELS OPERATION
NOVEMBER 1963

TRIPS

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Purpose</u>
Loeb, LM	General Electric Saratoga, N.Y.		11-1 to 11-22-63	Attending Modern Engineering Course.
Darsow, DW & Studer, RR	JBM Tool & Die Corp. Bryan, Ohio	E Johnson	11-11-63	Coextrusion tooling.
	Brush Beryllium Co. Elmore, Ohio	KA Wickle	11-11-63	Braze ring technology.
	Winslow Mfg. Co. Cleveland, Ohio	M Price	11-12-63	Coextrusion tooling.
	Brush Beryllium Co. Cleveland, Ohio	HG Piper	11-12-63	Braze ring procurement.
	Bridgeport Brass Co. Niles, Ohio	J Carroll	11-13-63	Zr products.
	American Welding & Mfg. Co. Warren, Ohio	J Farrell	11-13-63	Zircaloy end caps.
	Nuclear Metals, Inc. Concord, Mass.	P Loewenstein	11-14-63	Braze rings.
Darsow, DW	Anaconda American Copper & Brass Co. Buffalo, New York	G Wycoff	11-15-63	Copper Zirc. parts.
Studer, RR	NUMEC Apollo, Pa.	T Morton	11-15-63	Braze materials, Zircaloy.
Correy, TB	Sciaky Bros., Inc. Chicago, Illinois	PE Tade	11-12-63	Discuss electron beam welding.
	General Electric Cincinnati, Ohio	HE Schultz	11-13- & 11-14-63	Electron beam symposium.
	Battelle Memorial Institute Columbus, Ohio	ES Hodge	11-15-63	Discuss metal joining.
	Southwest Brass San Antonio, Texas	FW Davis	11-18-63	Organize classi- fied metal joining meeting.
	Solar Aircraft Co. San Diego, Calif.	AG Metcalfe	11-19-63	Discuss metal joining.

N-REACTOR FUELS OPERATION
NOVEMBER 1963

VISITORS

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Purpose</u>
Carroll, JR and Driver, J	Bridgeport Brass Niles Ohio Portland, Oregon Sales Representative	DW Darsow	11-20-63	Zirc. products.
Nenne, E	Sciaky Brothers Chicago, Illinois	TB Correy	11-21-63	Check TIG and MIG welding equipment.

ORGANIZATION AND PERSONNEL

	<u>10/31/63</u>	<u>11/30/63</u>
Exempt	55*	54
Nonexempt	<u>122**</u>	<u>113</u>
Total	<u>177</u>	<u>167</u>

Tech Grads Assigned to N-Reactor Fuels = 3

* Includes two temporary upgrades to exempt from nonexempt rolls.

** Includes temporary employees.

Additions

<u>Name</u>	<u>From</u>	<u>To</u>	<u>Effective Date</u>
Murphy, RJ (Nonexempt)	CPD	Quality Control	11/1/63
Glick, F (Nonexempt)	Hanford Laboratories	Quality Control	11/11/63
Northrop, RO (Nonexempt)	IPD	Materials	11/18/63
Cozad, RE (Nonexempt)	IPD	Shop Operations	11/4/63

ORGANIZATION AND PERSONNEL (Continued)Deletions

<u>Name</u>	<u>From</u>	<u>To</u>	<u>Effective Date</u>
Robinson, RK (Exempt)	N-Fuels Engrg.	Hanford Labs.	11/1/63
Hewitt, GT (Nonexempt)	Quality Control	Hanford Labs.	11/18/63
Claphan, JD (Nonexempt)	N-Fuels Engrg.	Hanford Labs.	11/25/63

(In addition to the above, ten temporary employees returned to IPD on 11/4/63. These employees are listed in Monthly Record Report for August, 1963, HW-78805 B.)

INVENTIONS

All engineering personnel engaged in work that might reasonably be expected to result in inventions or discoveries advise that to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during November, 1963. 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.

SIGNIFICANT REPORTS

<u>HW Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-79719	Unclassified	JP Keenan	11/21/63	Progress Report - Outer Supports Deflection Test Data and Summary.
HW-79597	Unclassified	DH Walker	11/11/63	Measurement Error - Coextrusion Shop Heat Treat - Third Quarter, 1963.
HW-79598	Unclassified	DH Walker	11/11/63	Measurement Error - Coextrusion Shop Pre- Mill Inspection - Third Quarter, 1963.
HW-79727	Unclassified	WE Stavig	11/22/63	N-Reactor Fuels Quality Cost.

SECURITY

There was one security violation in the N-Reactor Fuels Operation during November. Total CYTD - 9.

Manager, N-Reactor Fuels

LM Loeb:mf

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HW-79769

RESEARCH AND ENGINEERING

1. ADVANCE TECHNOLOGY

A review was made to determine the feasibility and cost for the production of tungsten-rhenium alloys from the irradiation of tungsten targets in the N-Reactor. The study indicated, as reported in Reference 1, that N-Reactor is not capable, with a favorable target composition (enriched in tungsten-186), of producing an alloy containing 25 atom per cent rhenium. The maximum atom per cent of rhenium-187 reached after 12.5 years of irradiation is 21.6. The cost for this product is in excess of \$150/gram Re. Since there is little incentive for production of tungsten-rhenium alloys containing less than 25 atom per cent rhenium and the extremely high cost of \$150 per gram of rhenium as compared to a market price of \$1.50 per gram, it was concluded that the study was only of academic interest. IPD arrived at a similar conclusion with respect to irradiation of tungsten in their reactors.

2. REACTOR ENGINEERING

All programmed steady-state tests of the electrically heated mockup of a N fuel column have been completed. The experimental work has been temporarily suspended to allow completion of analysis of data obtained thus far and to permit modifications in the test apparatus.

A special two-phase flow experiment was made with the test section operating at its full power capabilities, which would be equivalent to a tube power of 6200 KW. Data obtained under both subcooled and quality exit condition and at prototypic 6-loop rear riser pressures and inlet temperatures indicated that no subcooled film boiling (burnout) existed in the test section under this maximum power condition.

The following technical bases have been completed and are being published:

- Pressurizer, Function and Description
- Pressurizer Pressure Relief and Venting System
- Settings - Interim Basis
- Level Limits, Alarm and Trip Settings
- Pressure Control - Operation and Limits
- Temperature Limits - Interim Basis
- Boiling Point Suppression Limits on Nuclear Instrumentation
- Trip Levels

Work is continuing on other technical bases for the Primary Cooling System, Secondary Cooling System, and Circulating Raw Water System.

The maximum Phase I (five loop) flow capability of the primary cooling system was re-examined on the basis of the knowledge of pressure drop characteristics recently gained from laboratory data. Current indications are that the system will supply 86×10^6 lb/hr to the reactor, if no orificing is provided, and 83×10^6 lb/hr at a 90 per cent orificing efficiency, corresponding to a flattening efficiency of 78 per cent. These figures represent a favorable increase over a maximum of 81.8×10^6 lb/hr previously estimated.

A comprehensive study has been made of the Electric Boat Analysis of the vibration response characteristics of the Primary Cooling System. The results of this study indicated that there are several points in the primary coolant headers, process tube connectors and emergency raw water lines where vibration measurements should be made. In addition it has been determined that there are also several similar points in the diversion effluent line and the dump line to the basin. A document has been prepared specifying (a) the particular locations in the primary system that should be monitored for vibration during operational tests, (b) the testing method to be used in determining the extent of vibration at each point in question, (c) the expected time during flow testing when vibration data should be obtained, and (d) the data required from the vibration tests so that an accurate analysis can be obtained. A design test has been started to evaluate the effect of the pipe thermal insulation on the response characteristics of vibration pickups. This test will determine if the thermal insulation must be removed from the primary piping to obtain accurate vibrations.

The strain gage installation on the primary piping is nearly completed.

3. REACTOR PHYSICS

A document has been published (HW-79237) which describes in detail the lattice parameter and spectral index experiments which have been planned for the N-Reactor startup program.

The status of hardware and progress of Hanford Laboratories personnel is summarized in Table I.

The single tube survey study has been completed. The results of the study indicate that probably the most restrictive parameter of the single tube fuel is its high fuel temperature. For a single tube without flow spacer, this parameter limits the fuel weight to about 11 lb/ft even if a maximum uranium temperature of 550 C is assumed tolerable. Introduction of a canned void flow spacer into the

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HW-79769

single tube improves the conditions considerably, and fuel weights of 19 - 20 lb/ft may be attained before the maximum uranium temperature of 550 C is exceeded in a central tube. However, the Pu production rate is still lower than in the present standard tube-in-tube fuel element.

TABLE I

SPECIAL FUEL ELEMENT FABRICATION PROGRESS

<u>Item</u>	<u>Cost Estimate</u>	<u>Work Orders To Date</u>	<u>Per Cent Completion</u>	<u>Completion Date (Actual or Estimated)</u>
<u>COLD TEST</u>	\$8960-Total	\$8510-Total		December 1, 1963
Design			99%	December 1, 1963
Fuel Machining	4500	4500	95%	November 22, 1963
Canning	2000	3250	50%	December 1, 1963
Clad - outside vendor	1500	Not required local supply		
Radio Activant Procurement	(HL)	-	90%	November 21, 1963
Graphite	(300)			
Nickel F. P. Catchers	(0)	760	100%	
Water Pin Holders	(660)	Cancelled	-	
<u>HOT TEST</u>	\$7840-Total	\$7750-Total		
Design	-	-	99%	December 7, 1963
Fuel Drilling)				
Fuel Machining)	(5500)	5500	89%	November 22, 1963
Canning	(1000)	2250	50%	December 7, 1963
Radio Activant Procurement	(HL)	-	90%	November 21, 1963
Water Pin Holders	(1340)	Cancelled	-	-
Miscellaneous	-	-	-	-
<u>TOTALS</u>	\$16,800	\$16,260		

Indications are that one would achieve the goal of higher Pu production and still remain below 550 C in fuel temperature with a single fuel tube surrounding a depleted uranium target rod. This was the only type of arrangement found in the study which satisfied both criteria.

4. CONTROLS, INSTRUMENTS AND SYSTEMS ANALYSIS

An Appropriation Request has been submitted to cover the cost of material and labor for fabrication and construction of the process tube monitoring equipment. Low-temperature hydrided Zircaloy tube specimens have been furnished to personnel of Hanford Laboratories and N-Fuels Section for continuation of their work on eddy current and ultrasonic hydride detection probing methods, respectively.

The steam generator analog model has been set up, debugged, and production runs have started as part of the systems analysis program. Liquid level transients are being investigated for scram and power setback disturbances. The entire secondary system will not be simulated until completion of the installation and checking out of the expansion of the Hanford Laboratories' analog computer facility.

The process parameter requirements for the N-Reactor data system have been identified and given to Business Systems Development Operation of Contract and Accounting Operation for programming into the reactor information filing system. Work is now under way in establishing coding for the reactor systems, subsystems, and components.

Tests to destruction of two fuel element rupture monitor chambers which had received ten decontamination flush cycles showed no statistically significant change in the burst strength of the chambers. Three chambers are receiving an additional ten decontamination cycles, after which they will also be given a burst test.

A study is being conducted jointly with Chemistry and Metallurgy on the effects of uranium contamination of the fuel elements on the fuel rupture monitor system performance.

Technical bases have been issued on the N-Reactor Boiling Point Suppression Limits and on the Nuclear Instrumentation Trip Levels for the N-Reactor.

A joint study is being conducted with personnel of N-Reactor Plant on an analysis of the reliability of the emergency raw water control system, determining its ability to meet the criteria of being available when needed and yet not causing spurious dumps.

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HW-79769

Several attempts to perform Pre-Production Test - PPT-1 "Pre-loading Eddy Current Signature Tests of N-Reactor Process Tubes" were unsuccessful because of abrasive material found in the process tubes. PPT-1 is therefore deferred indefinitely until satisfactory cleaning of the process tubes is accomplished. It is doubtful if this test can be worked into the schedule before the deadline of fuel loading. A final report of the test observations of the some 50-odd tubes tested to date is being prepared.

Nondestructive Testing Operation of Hanford Laboratories has demonstrated the operability of a prototype probe for measuring the clearance between the fuel element and the process tube in the range of 100 - 130 mils. This probe will be used to check fuel element support integrity after reactor loading. Construction of the final device is awaiting delivery of special materials.

5. CHEMISTRY AND METALLURGY

Long term evaluation of crud buildup in ammoniated coolant at N primary system conditions is continuing in KER-1. The N Inner Enriched (NIE-1) elements with unbonded closures in the loading have reached an exposure of 810 MWD/T. Discharge is scheduled during January.

Irradiation of eight prototype Li-Al target elements and NIE-1 heater elements continues. The target elements have reached an exposure corresponding approximately to a gas volume ratio (GVR) of 14. The test is scheduled for discharge at a GVR of 17 in mid-January.

Irradiation testing of first load fuel element assemblies is continuing in KER-3 and KER-4. The time operating efficiency was excellent during the past month. The exposures reached 1622 MWD/T for the third charge and 1145 MWD/T for the fourth charge as of December 3, 1963.

At the November meeting with the ACRS in Washington, the consequence of a dump of the primary loop and a delay in actuation of emergency raw water cooling was discussed in detail. During the course of the meeting, a test was performed at Hanford on an unirradiated fuel element. The element was heated to 1800 F and water quenched; as is to be expected, no visible damage to the fuel element resulted. The ACRS questioned the applicability of these results to an irradiated fuel element. An engineering study is now under way to determine the nature of a test that will effectively simulate the heating and quenching cycle that would result if the gamma heating raised the volume mean fuel element temperature to 1800 F before the emergency raw water was admitted.

6. PROCESS EVALUATION AND CONTROL

The detailed procedures for performance of the portions of Startup Test N-1 which do not require recirculation (Part 1 of two parts) is circulating for approval. Physics startup crews are undergoing training.

All process standards required for performance of Startup Test N-1 have been approved and issued. These standards are listed below:

- B-206 Oil Fired Boiler
- B-210 Circulating Raw Water
- B-211 Filtered Water
- B-212 Demineralized Water System
- B-215 Emergency Cooling System
- B-220 Graphite Cooling System
- B-225 Reactor Shield Cooling
- B-230 Gas System
- B-235 Ball Safety System
- B-240 Horizontal Control Rod
- B-260 Nuclear Instrumentation
- B-270 Safety Circuit System
- B-275 Seismoscope
- B-286 Water Quality
- C-300 Fissile Material Control
- 501 Startup Physics Testing N-1

Three nuclear safety process specifications have been prepared for use by the Fuels Section.

Progress of the testing program as of November 21, 1963 is as follows:

Procedure Preparation:	Schedule	93.6%*
	Actual	79.2%
Test Performance:	Schedule	29.3%*
	Actual	17.3%

*Schedule values are based on revised NRD schedule, issued by program evaluation on 10/31/63. Test performance is scheduled at 48% by 12/15/63.

SIGNIFICANT REPORTS ISSUED

HW-79602RD, "Production of Tungsten-Rhenium Alloys in N-Reactor,"
J. W. Riches, November 11, 1963 - Secret

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HW-79769

HW-79602, "A Preliminary Study of Production of Tungsten-Rhenium Alloys in N-Reactor," J. W. Riches and E. G. Pierick, November 19, 1963 - Secret

HW-79373, "Engineering Study of the 105N - 109N Fog Spray System," November 20, 1963, D. D. Stepnewski and R. H. Shoemaker - Unclassified

Design Test No. 1204, "Effects of Thermal Insulation on Response Characteristics of Vibration Tests for 100-N Primary Piping System," J. A. Mitchell

HW-78255 REV. "Criteria and Scope Startup Test N-2, Low Power Testing Program (OTP T0060)," R. E. Hall, E. E. Leitz, October 27, 1963 - Unclassified

HW-79069, "Analysis and Evaluation of the NPR Seismoscope System," L. D. Philipp, November 8, 1963 - Unclassified

TRIPS

<u>Name</u>	<u>Destination</u>	<u>Date</u>	<u>Purpose</u>
J. W. Riches	New York	11/16-22	AIF meeting
D. H. Curtiss	Cincinnati, O.	11/12-13	Fuel Element Development Committee
R. E. Hall	Washington	11/7/63	ACRS Meeting
W. S. Nechodom			
J. W. Vanderbeek			
R. E. Trumble			
M. C. Leverett			

VISITORS

<u>Name</u>	<u>Affiliation</u>	<u>Date</u>	<u>Purpose</u>
P. R. Pluta	APED - San Jose	11/18-22	Consultation

PERSONNEL

Additions

J. M. Bird - Advance Technology

SECURITY VIOLATIONS

None

INVENTIONS

All Research and Engineering personnel engaged in work that might reasonably be expected to result in inventions or discoveries advise that to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during November, 1963. Such persons further advise that for the period herein covered by this report, notebook records, if any, kept in the course of their work have been examined for possible inventions or discoveries.

M. C. Leverett

M. C. Leverett
Manager
Research and Engineering

MCL:LCC:dd

Reference 1: "HW-79602, "A preliminary Study of Production of Tungsten-Rhenium Alloys in N-Reactor," J. W. Riches and E. G. Pierick, November 19, 1963 - Secret

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N-REACTOR PROJECTPROCESS DESIGN OPERATIONProcess Research and Development

An analysis has been made of fuel element temperature transients during the postulated incident of an accidental primary loop dump, accompanied by delayed operation of the emergency cooling water diesel pumps, during which time electric power is assumed to be available and the primary loop injection pumps continue to function. The analysis assumed that for 240 seconds after scram, the fuel would be cooled by the dump blow-down; but between 240 and 410 seconds after scram, the cooling water flow would lapse while the injection water was filling the hot leg between the primary pumps and the reactor outlet check valves. (A complete lapse of cooling water flow would actually not occur.) By machine computation the fuel temperature at 410 seconds was found to be 1430F. Following that, the distribution of the injection water flow throughout the core was estimated by comparison with an analysis of HW-66651. This approach showed that the minimum tube flow would be about 0.5 lbs/sec with a total flow of 1,000 lbs/sec under comparable heat removal conditions. Calculations based on this flow level from the injection system indicated that fuel temperatures would not reach the melting point, and in fact would appear to be limited to less than 1500F even if the emergency cooling system never operated.

The maximum capacity of the secondary cooling system as a function of reactor power level has been calculated. The results have been determined as a function of several parameters such as steam velocity, circulating water outlet temperature, dump condenser surface, and condensate outlet temperature. The calculations indicated that the condensate pumps would limit the power level at about 130 per cent. The data will be documented at a later date.

Project CAI-816Crib Overflow Trench

In order to reduce the potential for a direct radioactive release from the crib to the river, an overflow trench of approximately three million gallons capacity was incorporated by design change into the Radioactive Waste Crib facility. This addition will provide total system capacity of approximately four million gallons.

Gas System Instrumentation

A major obstacle in calibration of the gas chromatographs in the pile gas instrumentation system has been overcome by elimination of excess moisture in the calibrating gas supply. The service engineer for Beckman Instrument Company, supplier of the gas chromatographs, participated in final checkout and successful calibration of the installed units.

Confinement Shear Pins

In line with the latest revision to the confinement system design criteria, an investigation was made of the shear pins for the roof vent weatherheads, the common wall cross-vents, and the pile gas relief vent cover. The existing shear pins, purchased to a given value of hardness, did not all conform to the newly established release pressures, nor did they exhibit the narrow range of response necessary for sequential release of particular vents. By performing shear tests on samples from bars of various types of materials, a fairly accurate value of shearing strength was established for each. From these results, specific materials were selected for the various vent applications and are to be used for refabrication and replacement of the respective shear pins.

Review of Supports for Primary Piping

A program is being completed for determining the dynamic response of the primary piping system in 105-N and 109-N. A portable vibration analyzer and the necessary accelerometers have been purchased to permit measurements of frequency and amplitude at critical points on the various piping loops. In addition, equipment of a more stationary type, available at Hanford, will be used for more extensive observation of localized sections. Provisions are also being made for monitoring any one of the weldable strain gage locations for cyclic variations in strains up to 50 cps.

Charging Equipment

Ten charges of 24-inch fuel, prototypical of initial load fuel, were moved from the pallets through the magazine loader, into a prototypically modified magazine, and then into an empty process tube assembly minus the rear nozzle. Out of the 1,440 fuel element supports in the test series, no significant support deformation occurred. In addition, two columns of 18-inch fuel and one column of 12-inch fuel were charged under the same conditions with similar results. Seven more columns of fuel were charged against various back pressures to simulate column loading forces from 700 to 1900 pounds. Except for one support which deformed 0.011 inch, all support deformations were acceptably below 0.006 inch. Surface damage on all supports was within acceptable limits and the process tube used in the test did not exhibit any scratching through the autoclave finish.

Common Wall Cross-Vents

In a design review of the common wall confinement cross-vents, it was found that the panels would buckle or rupture prior to shear pin release during a 105-N confinement pressurization incident. In order to reduce the stress levels in the panels from approximately 60,000 to 20,000 psi, additional cross-members were designed for necessary panel reinforcement.

Ball System

Although gate-opening failures were not experienced in releasing balls from the hoppers in design tests a year ago, some failures did occur on the installed trip mechanisms and hoppers when filled with balls. A few of the existing gates were subsequently modified by adding a taper. The modified gates performed satisfactorily in tests but had a limited life. The design of a replacement tapered hopper gate was then made, and it was satisfactorily demonstrated in over 100 drops on one such gate at 189-D. Alternate methods of solving the release problem were also explored, such as by tumbling the balls to reduce the coefficient of friction and by shimming the gate springs to increase the lifting force on the gate springs. However, the final approach was to replace the installed gates with tapered gates of the new design.

117-N Filters

At the conclusion of on-site tests of three filters supplied with patches, the vendor was informed that filters with patched media would be acceptable. The vendor was also informed that the filter frames should be tested for leakage at the pressure specified in the purchase order. This was done and the filters were shipped. They are currently being tested in the 200-Area for verification of as-received integrity.

Equipment Development and Testing

The Component Test Loop at 189-D is currently being utilized for testing of RV-2 relief valve assemblies. So far, two production pilot valves and three production control valves from DeVar-Kinetics have been tested satisfactorily and accepted for installation in the primary loop. The third pilot valve is being returned to the vendor for examination and rebuilding as necessary to correct the malfunctioning. All testing to date has been conducted with the 2-inch prototype primary relief valve. The currently scheduled tests will check the functional operability and reliability of the full-size 6-inch primary relief valves in conjunction with the prototype pilot and control valves.

FIELD ENGINEERING OPERATIONConstruction105-N Building

The Reactor Nuclear System, Audio Communication System and the elevators were accepted on November 5, 1963, and the Temperature Monitoring and Fuel Rupture System were accepted on November 15, 1963. The acceptance of these systems completed the acceptance of the 105-N Building.

Approximately 70 per cent of the Zone I and II electrical conduit and sleeve seals and approximately 41 per cent of the interstice seals have been completed. The external pipe and tubing Zone I seals are approximately 85 per cent complete.

All instrument connections to the primary loop in the 105-N Building have now been completed but the final hydrostatic test has not been performed.

Contractor testing was completed this month in the building Radiation Monitoring System, the Shield Cooling Instrumentation, the Horizontal Rod Position Indicating System (both TV display and data logging sections), Audio and Video Communications System, Ball System, Horizontal Rod Control System, and the 105-N Building safety circuit. Contractor testing is continuing on the remaining 105-N Building electrical and instrument systems. This work includes principally the Central Data Logger, Primary and miscellaneous Water System, and the Emergency Raw Water System, the Reactor Nuclear System, and the Fuel Rupture Monitor System.

Functional testing of the Ball System showed the hopper gates and probes required redesign. The modified gates and probes were fabricated, installed and tested, and operational testing of the Ball System has been initiated.

The charging machine was placed on the "W" elevator on November 15th. Installation and functional testing has been completed, and operational testing was started November 30th.

Functional testing of the irradiated metal handling equipment is continuing, however, this has been delayed because of the need to repair hydraulic cylinders for the cannister loading equipment.

109-N Building

The Project Acceptance of the 109-N Building was made effective

November 15, 1963. This completes the transfer of all 100-N facilities to General Electric.

The dry run testing of the Bailey Meter Instrument Systems which controls the 109-N Building Process System was started on November 19, 1963. This testing of the first section which controls the primary loop pressure was completed November 27th. Work is in progress on the testing of the pressurizer level and process injection pump control and the graphite cooling system.

Installation of strain gauges on primary loop piping was started November 13, 1963 and is continuing. Satisfactory progress is being made.

Hydrostatic testing of the 16 dump condensers has been completed; three will require repair.

The valve testing program in the 109-N Building has been making good progress with all of the valves required for flow testing of the primary loop at their minimum required category of operation or better. This does not include the Bailey Meter control valves which are being tested along with the instrument system.

On November 23d, the primary loop was filled with water and recirculation was started with Pump No. 1. Recirculation was continued with Pumps No.'s 1, 2 and 5, to flush the process piping. This flushing was completed December 1, 1963, and the loop was placed in a dry lay up condition to permit repair of leaks noted and the completion of the remaining valve work.

182-N Building

The membrane for the after-heat removal tank was received on November 25, 1963, and is now being installed.

NPR Testing Program

During the report period, three additional test procedures were issued for comment, four were issued as approved, and actual testing of six systems was initiated.

Over-all status of testing progress may be summarized as follows:

Total number of tests scheduled	39
Scoped	38
Issued for Comment	36
Issued as Approved	26
Tests Started	24
Tests Completed	8

	<u>Preparation</u>		<u>Performance</u>	
	<u>Scheduled</u>	<u>Actual</u>	<u>Scheduled*</u>	<u>Actual</u>
This Month	93.6%	79.2%	29.0%	17.3%
Last Month	94.0%	73.0%	43.0%	11.0%

*Scheduled performance based on latest official target schedule.

Steam Generators

Repair of steam generator unit 3B, which is affected by stress corrosion cracking in the tubes within the tube sheet area, is being done by rolling and welding 7-inch long Incoloy sleeves in each tube end. This work is now 58 per cent complete. All repair work on unit 3B is scheduled to be completed by December 13, 1963.

Steam generator unit 4A, which is affected by extensive intergranular corrosion throughout the tube lengths, is to be repaired by retubing. Field work to date on unit 4A has been mostly limited to the primary side. All tube-to-tube sheet welds have been cut free on the primary side and some preliminary work has been started in preparation for cutting one head from the secondary vessel. To date, procedures have not been received from Combustion Engineering for further work.

Inconel 600 will be used for the retubing material. This material will be purchased in accordance with MIL-T-22945 (SHIPS). Orders for the tube material will be placed early in December. Over-all completion of repair of steam generator unit 4A is scheduled for October 1, 1964.

N-PLANT ENGINEERINGStart-up Support

Plant Engineering has continued to provide technical direction of instrument calibration which has progressed consistently with requirements for fuel loading. Electrical engineering assistance has been provided as needed for resolution of elevator problems. Direction of safety circuit testing has also been provided.

Maintenance Standards

One Maintenance Standard has been approved; 17 have been routed for approval and 14 were issued for comment. A revaluation to determine the minimum maintenance standards for submittal to the Commission has been essentially completed by Research and Engineering and Plant Engineering. A list of these standards has been scheduled for release in December.

Equipment Development

Maintenance Tool Development needed for fuel loading has continued on schedule. The more important tools which must be developed thereafter include those needed for irradiated process tube removal, moderator cooling tube removal and removal and installation of certain valves. Plans have been made to have this development work provided by IPD and off-site vendors. Contacts were made to establish costs and schedules for the development items subsequent to the establishment of concurrence as to requirements by Operating forces and Plant Engineering.

PROGRAM EVALUATIONDesign Status

Title I - 100 per cent complete.

Title II - 100 per cent complete.

Costs

On November 15, 1963, General Electric received an interim AEC Work Authority, Number 816 (12), authorizing \$700,000 additional punch list funds ("custody agreements" item).

Schedules

On February 1, 1963, RLOO-AEC issued Revision #5 to the Certified Construction Schedule. This schedule shows a construction completion of March 15, 1964.

The 105 Reactor Building was transferred to General Electric on October 15, 1963, and the 109 Heat Dissipation Building was transferred to General Electric on November 15, 1963. This completed the transfer of all Project CAI-816 facilities to the custody of General Electric.

The construction status as of December 1, 1963, based on Revision #5 to the AEC construction schedule dated February 1, 1963, is as follows:

	<u>Scheduled</u>	<u>Actual</u>
Temporary Construction	96	99
General Area Systems	99	99.9
105-N Reactor Building	98	99.4
109-N Heat Exchanger Building	98	98.5
163N-183N Water Treat. Facilities	100	100
181-N River Water Pump House	100	100
182-N High Lift Pump House	100	100
184-N Standby Power House	100	99.9
153-N Switchgear Building	100	100
NPR Project (CAI-816)	98	99

Revision 1 of the integrated sequence schedule was issued on November 25, 1963 to all parties concerned. This schedule displays the major items of remaining construction, contractor testing, operational testing, calibration, and operational and physics startup steps.

RESPONSIBILITY

There was no change in responsibility since last month's report.

ORGANIZATION AND PERSONNEL

		<u>10-31-63</u>	<u>11-30-63</u>
<u>Exempt</u>			
Permanent		92	92
On Loan		3	4
Tech. Grads.		3	3
<u>Nonexempt</u>		24	26

<u>Personnel Changes</u>			
<u>Name</u>	<u>From</u>	<u>To</u>	<u>Effective Date</u>
PC Althoff (exempt)	N-R Plant	N-Plant Eng'g.	11-1-63
GR Klingler (exempt)	N-R Plant	N-Plant Eng'g.	11-1-63
JP Thomas (exempt)	N-R Plant	N-Plant Eng'g.	11-1-63
AB Dunning (exempt)	N-R Plant	Field Eng'g.	11-1-63
MB Carl (nonexempt)	New Hire	Draw., Spec., & Mat'l. Control	11-1-63
DB Morrison (nonexempt)	New Hire	" "	11-1-63
ML Worby (nonexempt)	New Hire	" "	11-1-63
AC Rediske (exempt)	Field Eng'g.	N-R Plant	11-18-63
WM Harty (exempt)	Process Design	Purex, CPD	11-15-63
GH Brown (exempt)	Field Engineering	Terminate - ROF	11-27-63
LE Flanagan (nonexempt)	N-R Project	Terminate - Resignation	11-27-63

SAFETY AND SECURITY

There were no disabling injuries or security violations reported during November.

INVENTIONS OR DISCOVERIES

All persons engaged in work that might reasonably be expected to result in inventions or discoveries advise that, to the best of their knowledge and belief, no inventions or discoveries were made in the course of their work during the period covered by this report. 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.

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
NO Strand	Ladish Co., Cudahy, Wisc.	11-18/19	Discuss inspection of pipe for conversion
	Combustion Engineering Chattanooga, Tennessee	11-20/21	Review specifications for procurement of Inconel tubing
	ANS-7 Committee Meeting New York, N. Y.	11-22	Attend meeting on reactor components
EM Kratz	Ladish Co., Cudahy, Wisc.	11-16/21	Discuss 6th cell primary pipe manufacture
	Burns and Roe Hempstead, N. Y.		Conversion design
WJ Dowis	Atomic Industrial Forum Meeting, New York, N.Y.	11-18/21	Attend meeting
	ASME Meeting Philadelphia, Pa.	11-20	Attend meeting
JD McCullough	Robertshaw Fulton Los Angeles, Calif.	10-31/ 11-2	Discuss hopper probes
RK Bollinger	GE-APED San Jose, Calif.	11-10/12	Discuss ion chambers
FJ Mollerus, jr.	Burns and Roe, Inc. Hempstead, N.Y.	11-18/20	Consult on conversion

VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
A Woolsey	Aerol Associates Bremerton, Wash.	10-17	Discuss tube probing and leak measurement equipment and techniques
R Wheeler	Ingersoll Rand Seattle, Wash.	10-30	Discuss multiple spindle air tool for nozzle cap application
PG Beston	Canadian G.E., Ltd.	11-5/6	Telecons regarding Cu clad fuel feet and power reactors
T Stuhlfire R Austin C Liokas	Foxboro Company Foxboro, Mass.	11-12/14	Discuss design problems associated with power calculator
S Friezner	Specialized Testing Serv. N. Hollywood, Calif.	11-13/16	Consult on strain gage system for primary loop
WH Pitman E Garey	AMF Atomics Grenwich, Conn.	10-25/ 11-16	Repair and tests on irradiated metal handling system.
J Bottmer	General Motors Seattle, Wash.	11-4/6 11-20/22	Consult on 1600 HP diesel engines
J Mullen	American Switch Company Portland, Oregon	11-21/22	Consult on Asco air control valves on 1600 HP diesel engines

SIGNIFICANT REPORTS ISSUED

<u>Doc. No.</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-79392	Unclassified	FJ Mollerus, Jr.	10-30-63	User's Manual for N-Heat, N-Reactor Lattice Heat Transfer Program for the IBM 7090 Computer
HW-79467	Secret	HR Kosmata	10-31-63	Reactor Design Analysis Monthly Report, Oct., 1963

JS McMahon:mbs

Manager, N-Reactor Project

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HW-79769

N REACTOR PLANT OPERATION

N PLANNING AND SCHEDULING

Equipment listing is completed. Tags on hand are being bundled into location groups to facilitate their placement.

The last shipment of fuel spacer dummies was received on November 15 completing the order.

Procedures to maintain SS material accountability and satisfy production scheduling requirements for initial loading are established.

A training program for subsection personnel and the Shift Schedulers and Clerks was concluded with a system simulation run on November 27. A two-day training program on the P & S system was conducted for two groups of mechanical maintenance personnel.

A review of the essential material budget was made resulting in a \$201,000 reduction in the FY '64 budget.

It was necessary to re-invite bulk hydrogen bids when none of those received in November met the specifications. New bids are due December 13.

N PROCESSING OPERATION

The boiler developed a leaky tube on November 27. Pressure was reduced and the unit continued in service until 8:00 AM on November 28. The leak was found to be in a weld in a 3-inch front wall tube. Repairs were effected immediately and the boiler was returned to service after approximately a nine hour outage.

The Demineralizer Plant operated during the month and a considerable portion of the OTP of this facility was completed. There is a problem with resin plugging the strainer in the degassifier outlet. This appears to be resin dislodged from the degassifier rather than a leaking screen.

Several butterfly valves have needed repair during the month due to rupture gaskets. This may be a problem of concern for later operation.

Ammonium hydroxide was added to the primary loop water during initial cell circulation tests. The temporary facility is adequate for initial operation.

Operational tests on 9 systems were conducted during the month in 105-109. One test, No. 36, was completed.

Filling of the primary loop was conducted on November 23. The loop was leak tested at 1200 psi to establish necessary leak repairs required before hydro-

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static testing of the loop. The loop was flushed and TSP was added after which the loop was drained for leak repairs.

All dummies for fuel loading have been received and are on hand. Fuel, both reject and special as well as production grade fuel, is now being received.

Two fires were experienced during the month both due to construction activities. As a result a fire watch was initiated to cover major construction areas each day after construction forces leave.

Control Supervisors were assigned to shift crews on November 11, 1963. Assignment Supervisors and Shift Managers will be assigned early in December.

Procedure development continued during the month and work is in progress on 22 procedures necessary for initial fuel loading. Procedures in final form are now being issued.

Certification Training activities continued throughout the month on shift. Administration of the test program was turned over to C. A. Mansius at month's end. Ten sections of the Training Guide for facility operators have now been completed. Radiation training for certification groups was initiated during the month and two shifts have been covered.

N REACTOR MAINTENANCE OPERATION

The instrument-electrical shift crews are staffed at more than planned strength and still are not adequate in number to handle the peak work load of current plant activity. Our accomplishment is thus limited.

The mechanical (millwright and pipefitter) crews received an increase of twelve to place them at 87% of planned full strength with 100% scheduled January 6.

Additional service craft such as (2) janitors, (1) painter, (1) truck driver, were added to improve the maintenance performance capability. Remaining requirements (asbestos worker, rigger, etc.) have been requisitioned and service agreements initiated with other maintenance organizations.

At month end N Maintenance personnel had assumed responsibility for and were performing the maintenance function for the entire plant except certain small hutments occupied by construction contractor personnel.

Approximately 131 additional maintenance procedures were approved and placed in the system. Our first estimate is that approximately 2500 will be complete by the time of power ascension.

In the field of maintenance tooling advancement was made by acquisition of additional (\$14,000) Kaiser Engineer stocks and the planning and preparation of the 105 building blue tool room facilities.

A significant portion of maintenance exempt manhours was applied to trouble shooting and analysis of system irregularities exposed by attempts to follow testing procedures.

N Maintenance, Continued

Besides handling the test support and normal plant maintenance workload the mechanical crews have been completing the installation of equipment and facilities in maintenance shop spaces.

SIGNIFICANT REPORTS ISSUED

None

TRIPS

<u>Name</u>	<u>Location</u>	<u>Date</u>	<u>Purpose</u>
E. W. Wilson	Hempstead, New York	11/17 to 11/21/63	Conversion Design
H. A. Carlberg	Walla Walla, Washington	11/18/63	Meeting with BPA personnel

VISITORS

None

PERSONNEL

<u>Additions</u>	<u>From</u>	<u>To</u>	<u>Date</u>
Sheryl Ritchie *	New Hire	Planning & Scheduling	11/11/63
H. D. Norton	IPD	Plant Maintenance	11/11/63
W. H. Bailey	IPD	Plant Maintenance	11/18/63
A. C. Rediske	Project Sect.	Plant Maintenance	11/18/63
R. H. Warren	CPD	Planning & Scheduling	11/25/63
A. W. Romine	IPD	Plant Maintenance	11/25/63
J. C. VanMetre	IPD	Plant Maintenance	11/25/63

Deletions

P. C. Althoff	Plant Maintenance	Project Section	11/1/63
G. R. Klingler	Plant Maintenance	Project Section	11/1/63
A. B. Dunning	Planning & Scheduling	Project Section	11/1/63
J. P. Thomas	Plant Maintenance	Project Section	11/1/63
L. E. Dibbern	Plant Processing	CPD	11/18/63

* Temporary

W Mathis
Manager - N Reactor Plant

WM Mathis:ds

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**DATE
FILMED
01/22/93**