DECLASSIFIED

HW--77139

DE93 003955

DECLASSIFIED

By Authority of RUC 66-4

DS Lewis 8-25-92

J Tang 9-23-92

TL Phillips 9-28-92

This document contains

45 pages. [REDACTED]

N-REACTOR DEPARTMENT

MONTHLY REPORT -- MARCH 1963

Compiled by N-Reactor Department

APR 8 1963

March 7, 1963 - Richland, Washington

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

LEGAL NOTICE

This report was prepared as an account of Government sponsored work. Neither the United States, nor the Commission, nor any person acting on behalf of the Commission:

A. Makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this report, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or

B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of any information, apparatus, method, or process disclosed in this report.

As used in the above, "person acting on behalf of the Commission" includes any employee or contractor of the Commission, or employee of such contractor, to the extent that such employee or contractor of the Commission, or employee of such contractor prepares, disseminates, or provides access to, any information pursuant to his employment or contract with the Commission, or his employment with such contractor.

Received by OSTI

NOV 30 1992

Route to:	Number	Location	Files Route Date	Signature and Date
RL00-JE Davis				

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

MASTER

DISTRIBUTION RESTRICTED TO U.S. ONLY

A-1

DECLASSIFIED

DECLASSIFIED

HW-77139

DISTRIBUTION

Copy Number

1	W. E. Johnson
2	R. L. Dickeman
3	A. B. Greninger
4	H. M. Parker
5	H. D. Tibbals
6,7,8,9,10,11	J. E. Travis, AEC-HOO
12,13	F. P. Baranowski Director - Division of Production Washington 25, D.C.
14	F. E. Crever
15	Savannah River Operations Office
16	F. H. Belcher - St. Louis Area Office
17	C. L. Karl - Fernald Area Office
18	J. W. Ruch - Oak Ridge Operations Office
19	M. C. Leverett
20	L. M. Loeb
21	W. M. Mathis - J. S. McMahon
22	J. Milne
23	C. O. Steinnagel
24	D. R. Stenquist
25,26,27	Extra Copies
28	300 Files
29	Records Service Center

TABLE OF CONTENTS

General Summary	A-1 through A-7
N-Reactor Fuels Operation	B-1 through B-17
Research & Engineering Operation	C-1 through C-3
N-Reactor Project Operation	D-1 through D-12
Financial Operation	E-1 through E-2
N-Reactor Plant Operation	F-1 through F-4

GENERAL SUMMARY

N-REACTOR FUELS

Manufacturing

Production input during March consisted of 100 outer tube extrusions and 59 inner tube extrusions for a total of 29.8 tons, 119 per cent of forecast. Total input production at the end of the month was 56.6 per cent of first load requirements. Output production (through autoclave) which was limited to inner fuel elements consisted of 1,823 pieces, a total of 12.7 tons and 36 per cent of forecast. Output production to date is 13 per cent of first load requirements. Yields for March were 74 per cent for outers, 72 per cent for inners, for a 73 per cent total. Cumulative yields to date are 57 per cent for outers, 60 per cent for inners, for a total first-load yield of 58 per cent.

The second autoclave rupture of an outer fuel element occurred on March 7. Investigation revealed this rupture to be identical to the previous rupture. Further investigation concludes that both ruptures resulted from defective locking clip welds caused by a malfunction of the welder. This condition has been corrected and welding will be resumed as proper weld conditions are established. Autoclaving of outer material was held up during the month pending solution of this problem.

Engineering

On-site support fabrication is proceeding routinely and inner support supplies have been such that approximately 100 pieces per day are being processed through support weld. Strip will continue to be fabricated on-site until off-site vendors can be established.

It has been established that up to 100 tons of uranium in the NPR feed stream at Fernald has become contaminated with phosphorus. Evaluation of the effects of this impurity on fabrication and irradiation is underway. Tentative specifications to control, or minimize, this condition are being developed.

Two UT-2 testers, fabricated on-site, have been shipped to National Lead Company in accordance with revised delivery schedule.

RESEARCH & ENGINEERING

Testing of the NPR-Prototype Concept Evaluation full scale facility (of one N-Reactor process tube) is in progress to provide the isothermal pressure drop data necessary for the testing program which will be performed by the Thermal Hydraulics Operation of Hanford Laboratories.

An analysis has been completed of the magnitude of the uncertainty in the predicted reactivity of N-Reactor under operating conditions. This was done

DECLASSIFIED

DECLASSIFIED

HW-77139

to determine the probability that a small quantity of some additional fuel of a slightly higher enrichment would be useful in reaching full operating conditions.

A draft report on the nuclear aspects of the production capabilities of N-Reactor for several heavy isotopes has been prepared.

A one-node reactor kinetics model of N-Reactor has been debugged on Systems Research Operation's analog computer. Production runs of various reactor transients will commence during the first week of April.

The fluid flow subroutine of the dump condenser digital computer code is completed. The heat transfer portion of the code is 50 per cent complete.

Irradiation Testing in Support of N-Reactor Fuel Programs

The charge of N-inner fuels which was undergoing test in KER Loop No. 1 to evaluate "crud" formation was discharged because of loop operating difficulties. The loop was recharged with N-inner fuels to evaluate the use of NH_4OH for pH control of the coolant.

Eight N-inner tubes, which were undergoing test in KER Loop No. 2 to evaluate the behavior of bonded and unbonded contoured end closures, were discharged at an exposure of 1900 MWD/T. No obvious distortions at the end caps were disclosed by visual examination.

Fourteen N-fuel elements in KER Loop No. 4 have reached an exposure of 1250 MWD/T. Planned exposure of 2100 MWD/T should be attained in June.

A test (in F-Reactor) to evaluate the effect of temperature, clad thickness and clad uniformity on localized jacket splitting has reached an exposure of 1120 MWD/T. One of the four tubes of capsules under test was discharged for examination at an exposure of 1300 MWD/T. Planned exposure of 2000 MWD/T for the remaining tubes should be attained about May 1, 1963.

N-REACTOR PROJECT

All scheduled General Electric acceptance test procedures have been prepared and issued.

Preliminary laboratory tests demonstrate the feasibility of a "one-step" chemical cleaning process to remove organic coatings, rust and millscale from the secondary cooling system.

It has been determined that the cause of the slow-speed jerky motion problem with horizontal rod drives is poor quality cast-iron piston rings. Drives have been reworked to add new piston rings and tests show they operate quite smoothly at slow and fast speeds.

PERSONNEL STATISTICS

Number of employees as of February 28, 1963 461
 Number of employees as of March 31, 1963 483

	<u>Exempt</u>	<u>Nonexempt</u>	<u>Total</u>
General	3	2	5
Finance	14	8	22
N-Reactor Fuels	53	108	161
Research & Engineering	34	9	43
N-Reactor Plant	52	87	139
N-Reactor Project	<u>90</u>	<u>23</u>	<u>113</u>
 TOTAL	 <u>246</u>	 <u>237</u>	 <u>483</u>

Employment

	<u>Exempt</u>	<u>Nonexempt</u>	<u>Total</u>
Additions	5	21	26
Reductions	<u>2</u>	<u>2</u>	<u>4</u>
 Net Additions	 <u>3</u>	 <u>19</u>	 <u>22</u>

SAFETY & SECURITY

Days without a disabling injury 121
 Hours worked without a lost disabling injury 290,525
 Medical treatment injuries (March) 6

There were 2 security violations in the Department during March, 1963.

SUGGESTION PLAN PARTICIPATION

	<u>March</u>	<u>Year-to-Date</u>
Number of eligible employees	237	216
Number of suggestions received	19	66
Number of suggestions acted upon	17	46
Number of suggestions adopted	4	17
Net annual savings	\$ 250	\$ 2 527
Amount of awards	\$ 45	\$ 430
Per cent of awards to savings	18.0	17.0
Average amount of awards	\$ 11.25	\$ 25.29

PATENT SUMMARY - MARCH 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 March. 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	R. L. Dickeman
Manager, Employee Relations	C. O. Steinnagel
Manager, Finance	J. Milne
Manager, N-Reactor Fuels	L. M. Loeb
Manager, N-Reactor Plant	W. M. Mathis
Manager, N-Reactor Project	J. S. McMahon
Manager, Research & Engineering	M. C. Leverett

R L Dickeman

General Manager
N-Reactor Department

RL Dickeman:skd

DECLASSIFIED

DECLASSIFIED

HW-77139

N-REACTOR FUELS OPERATION

MANUFACTURING

Production - Coextrusion Shop

A total of 159 billets were extruded during March of which 100 were outers and 59 were inners. Production extrusions exceeded forecast by 19% and represented an input of 30 tons. Total input to date is 365 tons or 56.6% of first load requirements.

Shop output, through autoclaves, was 1,823 pieces or 12.7 tons, bringing the total production to date to 50.4 tons or 13% of first load requirements.

Thirteen tons of fuel elements have been completely assembled ready for storage. However, they are currently being held pending a resolution of the locking clip weld problem.

Shop output (through the autoclaves) was limited to inner fuel elements. Inner support supplies improved sufficiently to permit an average of 100 pieces a day through support welding. Autoclaving of outer material was in hold status pending resolution of the locking clip welding problem.

Approximately 700 fuel elements that have been held in a questionable category, upwards to 1 1/2 years, have been examined and disposition determined. Approximately 500 were scrapped and the balance put back into the production stream.

Production Statistics

	<u>Scheduled</u> <u>Tons</u>		<u>Actual</u> <u>Tons</u>	<u>Percent</u>
Shop Input - Current Month	25		30	119.2
- First Load	645		365	56.6
Shop Output - Current Month	35		12.7	36.2
- First Load (Autoclaved)	385		50.4	13.0
- Finished Assemblies	385		13.0	3.4
Station Throughput -	<u>Inners</u>	<u>Outers</u>	<u>Total</u>	<u>In-Process Inventory</u>
Extrusion	59	100	159	-0-
Cutup First	1 098	1 128	2 226	228
Cutup Rework	136	192	328	-0-
Chemical Milling (Ends)	3 622	920	4 542	311
Braze (Ends)	3 937	1 330	5 267	646
Heat Treat	2 293	641	2 934	92
Machining (Ends)	4 130	1 460	5 590	152
Vacu-Blast	2 091	525	2 616	200
Welding (Ends)	3 989	1 033	5 022	160
End Test (Ends)	4 196	2 013	6 214	-0-
Clad and Bond Test	2 034	560	2 644	223
Support Weld	2 044	96	2 140	12 741
Autoclaves	1 823	-0-	1 823	645
To Final Inspection	852	-0-	852	4 545

Oxide Burner - 100 batches burned = 3 048.62 pounds.

Shop Yield - First Run

Current Month:

	<u>Outer</u>	<u>Inner</u>	<u>Total</u>
1. <u>Ton Input</u>	10.5	14.6	25.1
2. <u>Ton Output</u>			
a. Waiting Support Weld	7.8	-1.6 ⁽¹⁾	7.2
b. Final Inspection	0.0	12.1	12.1
c. Final Storage	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
Total	7.8 ⁽²⁾	10.5	18.3
3. <u>Percent Yield</u>	74.3	71.9	72.9

Comments

- (1) More pieces were processed to final inspection than were transferred through autoradiograph.
- (2) On March 1, the 75 mil rejection limit for warp straightening was changed to 100 mils.

First Load to Date - March 31, 1963:

1. <u>Ton Input</u>	184.8	87.1	271.9
2. <u>Ton Output</u>			
a. Waiting Support Weld	78.5 ⁽¹⁾	29.6	108.1 ⁽³⁾
b. Final Inspection	26.5	22.6	49.1
c. Final Storage	<u>0.0⁽²⁾</u>	<u>0.0</u>	<u>0.0</u>
Total	105.0	52.2	157.2
3. <u>Percent Yield</u>	56.8	60.0	57.8

Comments

- (1) The tonnage figure for outers was adjusted for the change from 8 to 12 mils variation. All pieces that had been in a questionable account for 8-12 mils variation were put into the Waiting Support Weld account.
- (2) Tonnage figures listed on past reports in the Final Storage account were transferred into the Final Inspection account.
- (3) All material being "Held" for process violations are in the Waiting Support Weld account.

DECLASSIFIED

HW-77139

Plant Operation

Copper extrusion components and uranium billets are in short supply. Efforts are currently under way to resolve the problem.

During the month, eight billets were rejected at the loader due to loss of vacuum.

This condition was established by the use of the testing equipment designed for leak detection. Had this equipment not been available all the billets would have failed in extrusion at considerable expense. The leaks occurred in the crimped end of the evacuation tubes. Design modification of the crimping head and circuitry is being studied.

Considerable effort has been expended this month on the Spike Welder including revisions of control power connections, operators control stations, and instrumentation for process testing. Considerable data has been collected and the welder is being turned back to Process Engineering for evaluation of capacities and capabilities prior to establishing a process.

Surface variation rejections at chemical milling were reduced significantly this month. Only three days of production had significant numbers of surface variation rejects and a portion of these rejects were from the horizontal milling evaluation. However, surface variation is still a serious problem being much higher than experienced in the past. The reclaiming process at chemical milling is progressing satisfactorily, resulting in very few pieces being reworked.

The braze station enclosure was completed during March. During the two weeks' period of construction, operations in this area worked the 4-12 shift.

An Engineering Change Notice has been issued to revise the power supply to the autoclave preheaters by transforming Line 1 from 480 V to 240 V. This should prevent further loss from overvoltage at this point. The amplistats are being relocated for ease of maintenance and adjustment. Thermocouples are being studied and it appears desirable to increase the size of the wire from #18 to #14 and parallel connect one side to decrease resistance to the instrument. Thermocouples would also be placed on jacks at point of entrance into the autoclave. Present schedules call for accomplishing necessary revisions to autoclaves on a one-week basis.

Coating of floors in the chemical bay mezzanine has been completed. Areas covered were only those where the most serious problems existed. Due to cost considerations, it was deemed advisable to obtain experience with the type coating currently used before making complete application to the total mezzanine floor area.

A study involving the introduction of natural uranium into the process was made and a report written outlining the work stations involved, the changes necessary, and the parties responsible for effecting the necessary changes.

Equipment for the manufacture of NOT supports within the 333 Building was designed and installed during March. A job hazard breakdown has been written, inspection equipment obtained and procedures written, an operator trained in the use of the press and inspection methods and production of supports started.

Plant Operation (Continued)

Offsite bids for fabrication of the pallets for finished fuels were received and reviewed and a vendor assigned to make 100 such pallets for the Manufacturing Operation. A partial delivery of 50 pallets is scheduled for early April, with the remainder of the order to be completed and delivered five weeks later.

Equipment design modification has been made which will increase the capacity of the beta-heat treat station. The equipment is now being fabricated, and upon completion will be installed and will undergo testing by Process Control.

Work is currently in progress in the 306 Building to reactivate certain idle equipment and remove, relocate, and revise other equipment to increase the efficiency of the N-RD Pilot Plant operations. A work order has been issued to disassemble and store the magna-thermic heat treat scanner, now located in the Pilot Plant, in order to make room for other equipment and to reactivate and revise the vapor blast machine for use in cleaning zirconium strips. A complete overhaul of the pilot evacuation equipment in the N-RD Pilot Plant was completed during March.

DECLASSIFIED

DECLASSIFIED

HW-77139

N-FUELS PRODUCT ENGINEERING

Fuel Element Testing

KER Loop Testing

Loop 1 - This loop is still operating on "throwaway charges" of N-inner fuels for loop testing and water quality studies.

Loop 2 - The "tapered end closure" test was discharged on March 26 at about 1900 MWD/T accumulated exposure. It was recharged with eight KSE-5, 1.6% enriched pieces which will be irradiated until about May 20 when the process tube is scheduled for replacement.

Loop 3 - Loop 3 is still down for pump replacement.

Loop 4 - The fourteen prototypic N-Reactor assemblies (NAE-1) have now reached an accumulated exposure of approximately 1300 MWD/T. Goal exposure is 2100 MWD/T and should be reached about June 1, 1963.

Test Fuels Available

NIE-1 Throwaway Material - Five, 23" NIE-1 elements with shroud tubes are available for charging in Loops 1 or 2. Twenty, 17" NIE-1 elements are scheduled for completion by April 19.

KSE-5 - 1.6% Enriched - There are now eighteen of these fuels in storage at KE. This will make two charges since it is now considered advisable to charge only eight pieces per tube.

2% Zr-U Alloy NIN - A charge consisting of six of these elements along with six companion NIN elements is in storage at KE for charging into Loops 1 or 2.

NAE-1, Prototypic N-Reactor Fuel - A charge of fourteen of these elements is in storage at KE for charge-discharge tests in Loops 3 or 4. These elements do not have the latest support hardware and will be replaced with more up-to-date elements immediately.

Materials Development

Phosphorus Impurity in Uranium

During December, January and February, the feed site used varying amounts of recovered uranium residues contaminated with phosphorus for preparation of ingots for NPR billets. As a result, over 100 tons of NPR uranium in cast form is contaminated with various amounts of phosphorus. Because of the absence of phosphorus in the uranium feeds previously used, no phosphorus specification has ever been established. Also, no experience has been obtained with the fabrication characteristics of uranium contaminated with phosphorus and no irradiation experience is available.

At the present time, a temporary specification limit of 50 ppm has been established for use in selecting billets to be coextruded. This limit shall also apply to the acceptance of ingots being cast at the present time. This limit will remain in effect while coextrusion testing of uranium contaminated with between 50 and 100 ppm phosphorus is completed. If fabrication experience in the 50 to 100 ppm range is favorable, it is planned to establish the specification limits for phosphorus at about 80 ppm.

The 50 ppm temporary limit is based on the fact that much of the recycle uranium in the I&E stream has been contaminated with phosphorus up to this level. The work in progress to validate an 80 ppm limit is based on the realization that this limit would permit receipt of sufficient quantities of uranium to prevent slippage of the NPR fabrication schedule.

Uranium Symmetry

Primary extrusion tests in recent months have shown that chamfering the lead end of the cast ingot improves the concentricity of the primary extrusion by centering the ingot in the die. This centering effect tends to overcome eccentricity problems in the cast ingot and results in more symmetrical uranium characteristics in the finished billet. During recent months, the feed site has encountered increasing difficulty in controlling the eccentricity of the hollow cast ingots. At the present time, approximately 25% of the castings have wall thickness variations greater than the 0.060 inch specification limit.

In order to take advantage of the concentricity improvement through chamfering and provide some relief for the feed site process problem, permission has been given to waive the 0.060 inch maximum wall variation specification on a temporary basis with the following provisions:

- 1) All as-cast ingots with wall variations between 60 and 80 mils will be end chamfered prior to primary extrusion;
- 2) All ingots with wall thickness variations above 0.080 inch may be O.D. machined to wall thickness variation less than 0.080 inch and end chamfered before primary extrusion.

This authorization has been granted on a temporary basis and will expire July 1. By that time correction of the process problem at the feed site should be possible. Also prior to July 1, sufficient data shall have been generated through primary extrusion and coextrusion of O.D. turned and chamfered ingots to provide a basis for a specification review. It is anticipated that specifications will be changed to require end chamfering of all ingots and possibly O.D. turning to very narrow concentricity limits.

DECLASSIFIED

HW-77139

Support Hardware Fabrication

A complete on-site production capability for all items of support hardware has been demonstrated at this time. Inner tube supports are in production in the HL facilities at a rate of 8500 per week which is slightly more than production need. Over 10,000 acceptable outer supports have been fabricated, inspected and backlogged against production needs. Check-out of the tooling for locking clip fabrication is essentially complete. One final grinding of a radius is all that remains before the locking clip tooling is ready for parts fabrication. Steel shoes are being fabricated by HL and an inventory of over 25,000 shoes is in place.

The objectives of the on-site fabrication program at this point are to provide back-up tooling for the on-site fabrication facilities in the event of tool breakage or excessive wear. A second objective is to phase out the Hanford Laboratories support fabrication program. Tooling is now being fabricated for forming of all support hardware within the N-Fuels operation. Plans are to develop off-site sources for zircaloy strip. An interim supply of strip may be obtained by extruding 3/8" diameter rod in the Hanford Laboratories facilities and Turks Heading this extruded rod off-site. This process would eliminate the need for sheet bar extrusions and release the Hanford Laboratory rolling mill for other development work.

Extrusion Process

Extrusions - The following extrusions were made during the month:

11.1 inch Tooling - Five zircaloy billets, # Z-178, Z-179, Z-180, Z-181, and Z-182 were extruded to 5.875" bar stock for subsequent reduction to sheet bar stock.

7.58 inch Tooling - One zircaloy clad, copper core NOT extrusion for support welding experiments and one NOE, ZT-28 for inner cladding test.

6.0 inch Tooling - Seven extrusions, Z-170; three Z-176, of .375 x 3.750" flat bar stock for support hardware; one extrusion, Z-169 for shroud tube stock and one solid bar, Z-177 for cap stock.

Inner Tube-I.D. Bonding - Extrusions of inner fuel tubes is proceeding routinely again. The use of 1/2" front end plates has resulted in satisfactory performance, although the basic cause for the earlier trouble has yet to be determined.

Brazing Process

The problem of incomplete melting of outer braze rings discussed in the February report has fairly well subsided. Apparently, a small number of lots of outer rings contained abnormal quantities of dendritic zirconium carbide. This problem was never encountered with inner rings and although it still shows up occasionally with outer rings, it is not now considered a serious problem.

One of the braze ring vendors has recently submitted sample rings made by direct casting to size of zirconium-beryllium alloy. These have been evaluated in the Pilot Plant by making closures. They gave completely satisfactory results when carried through the process, including 72 hours in 400°C steam autoclaving. They will be tested further by autoclaving for 14 days in 360°C water.

Chemical Process

A test to evaluate the process capability of horizontal chemical milling was performed in the 333 Building facilities. An engineering prototype basket was used and the work was done by Process Engineering personnel. The principal advantage of horizontal milling lies in the increased production rate since both ends of the fuel pieces are milled simultaneously. Results of the test were evaluated for product quality and production rate. A total of 210 inner fuel sections were processed and of the first 105, 33 were outside of specifications for excessive surface variation. The second group of 105 were processed under more optimized conditions and all were acceptable.

This test indicated that the processing time for horizontal milling is approximately 3.5 hours as compared to over 6 hours to completely mill fuel by the vertical process. Practically, this means that it should be possible to complete two loads per shift while it is only possible to do one by the present vertical milling process.

Autoclave Process

White Welds-Water Cycle Autoclaving - The fuel elements being processed under PWR-CX-41 to determine the cause(s) for the white corrosion product formation on weld beads after fourteen day, 360°C water autoclaving, have been pre-tested and alpha counted. After three day exposure to 400°C steam, the welds on all of the test fuels had a dark gray to black appearance. The major difference in appearance of the welds as determined visibly, was the standard TIG welded fuel element autoclaved without the final bright etch treatment exhibited a darker, more metallic luster than the other welds. The alpha count of the fuel element welds before and after the autoclave treatment indicated a decrease in uranium contamination after autoclaving by nearly one-half of pre-autoclave levels.

After alpha counting, the fuel elements were charged into a 360°C water autoclave for fourteen days and will be discharged March 29, 1963.

DECLASSIFIED

HW-77139

Rupture Evaluation-333 Production Autoclave - Comparisons of the 24 inch NOE fuel element that ruptured March 7 in Autoclave #5 with the previous 24 inch NOE failure in January resulted in significant similarities.

Although the two fuel element ruptures occurred several months apart, up until autoclaving the two elements had been processed no more than one week apart through all prior fabrication steps. A comparison of the two production N-fuel failures that have occurred during the final autoclave treatment is detailed as follows:

<u>COMPARISON</u>	<u>AUTOCLAVE RUPTURE #1</u>	<u>AUTOCLAVE RUPTURE #2</u>
Type fuel element	24 inch NOE	24 inch NOE
Time in autoclave	400°C steam autoclave after 18 hrs. exposure	400°C steam autoclave after 9 hrs. exposure
Apparent location of failure	180° Die position; at locking clip and outer support	180° Die position; at locking clip and outer support
Hardware severed from fuel by rupture	Two locking clips and one outer support	Two locking clips and one outer support
Unusual fragments from rupture	One locking clip attached to a spherical section of cladding with a crack in the clad at one of the spot welds. The cracked cladding was at the apex of the spherically shaped cladding.	One locking clip attached to a spherical section of cladding with a crack in the clad at one of the spot welds. The cracked cladding was at the apex of the spherically shaped cladding.
Location of locking clip	Suspect locking clip was located in the base of the ruptured fuel at the bottom and covered with 13-15 inches of sludge that had filled the tube during rupture process.	Same location as autoclave rupture #1.

Fuel Element Supports - Design and Attachment

N-Charge Machine Testing - All scheduled charge machine tests were completed. For the characteristics evaluated, 30° and 45° suitcase-type outer support performed better than the arch-type supports. The 30° suitcase-type supports appeared to be somewhat better than the 45° supports. Four more fuel charges are being prepared to further evaluate the difference between 30° and 45° suitcase supports.

Inner Supports

Welding of inner supports has been routine during the month with an output rate of about 100 fuel elements per day. There have been no significant process problems. At present, support thickness is being monitored at final assembly and there exists a need for improved thickness measurement techniques. It is essential that proper thickness be maintained so that the as-assembled elements will be adequately rigid.

Outer Supports

Attachment of outer supports is held up until modifications to the locking clip welding process are completed. The strength of the outer support after final etch and autoclave is being evaluated as the basis for revised functional specifications. These tests indicate that the new 45° outer support has a compressive strength of approximately 75 pounds for 10 mils deflection and 350 pounds for 30 mils deflection.

Locking Clips

In the course of the investigation of the recent autoclave ruptures, it was found that the projection welder being used for locking clip attachment was capable of malfunctioning such that abnormally high currents would produce defective welds. It was further determined that such malfunction was the result of improper electrical circuits within the machine. These conditions have been corrected and the process is being re-calibrated. Locking clip welding will be resumed as soon as satisfactory welding conditions have been established.

Steel Shoes

10,000 shoes have been fabricated by HL. Skirt height and tab length on all parts have deviated from specifications. All deviations are of the same magnitude and in the same direction from the specified dimensions. 500 - 1000 of these have been used on charge test material and they have performed satisfactorily. The remaining 9000 parts will be accepted for production use on a waiver basis. The decision has been made to use shoes of different thicknesses to compensate for those supports which are too low or too high.

Equipment Development

Projects Completed

Outer Support Fabrication - The outer support fabrication die was mounted in the 10 ton mechanical press in 333 Building and checked out. Operations now are making outer supports without projections. (Projections are stamped by Hanford Laboratory's personnel.)

DECLASSIFIED

HW-77139

Inner Support Sizing - Hand tools to size inner supports were modified to permit "hard" sizing.

Miscellaneous - Appropriation Request Responsibilities and Approvals procedure was issued. Engineering Change Notice Responsibilities and Approvals procedure was issued. An equipment budget expenditure forecast for remainder of FY-63 was prepared and issued.

Projects in Progress

Outer Support Fabrication Dies - Instead of making inserts for the existing die, a new die set is being made. This new die set is made so that shear blades and form inserts can be replaced individually in case of breakage or wear. The new die set will form-stamp the support with projections instead of using two separate die sets as is done now. The new die set will be in production the week of April 22.

Outer Support Shoe Fabrication Dies - The shoe fabrication die is about 75% complete. A one-ton air press is modified to receive the die set. The die with press will be ready for production the week of April 22. This die set will fabricate only 0.010" thick shoes. If shoes of 0.0125" and 0.015" thickness are required, two new die sets can be fabricated or the thicker shoes can be bought off-site. The latter is suggested as the proper course of action.

Locking Clip Fabrication - The locking clip die set was fabricated and test parts were made and inspected. Some minor cleanup work on the die may be required before putting it into production. The die set will be ready for production usage the week of April 11 if parts are approved. The locking clip die set will be installed in the 10-ton press and the outer support die set will be removed over to the 8-ton press.

Assembly Locking Tool - The locking clip made by the HAPO die set is stronger, and therefore, requires more force to bend around the inner support. The existing locking pliers are not strong enough. Another model of locking tool, previously built for this task, is being modified and tested. It presently appears that it will work. An air or hydraulic unit may be built later.

Inner Support Fabrication - The target date of March 15 to receive all equipment was not met due to procurement problems. It will be the week of April 1 before all equipment is here. The target date of April 15 will probably shift to April 29 before equipment is ready for production.

Inner Support Sizing - An existing hydraulic device for sizing three inner supports at once has been tested. Due to support alignment, this device was not satisfactory. A new device was designed and is being fabricated. It will be ready for test the week of April 15.

NOT Support Welder Fixtures - Parts to modify the support welder table fixture are being fabricated. The parts are scheduled to be complete by April 29. Work is underway to redesign the electrode holder to eliminate error in positioning the electrode.

TESTING METHODS OPERATION

N-Fuel Testing

Billet tester work was continued in an attempt to elucidate the relation between billet extrusion performance and pre-extrusion test data. As one test approach, eddy current equipment is being readied for taking pre-extrusion data. The design, construction, and incorporation of comparator circuits and readout circuits was completed, and the circuits successfully operated on a prototype tester. Completion of this work, together with an impedance plane display planned for completion in April, will permit billet data acquisition in May.

Work on the use of nondestructive tests for process control at the braze station continued. To measure variability of the process, recordings were made of the control voltage to induction heater generators as given by the optical pyrometers. Variations were found: between the point of melting and the point of control; between operators; between runs by the entrance of argon; and between degreased and etched braze rings. In the latter instance, temperature variance was confirmed by thermocouple measurements; the etched rings gave reproducible braze temperatures and a tighter control band. No correlation was found between braze rings of different eddy current test response and the degree of control achieved. The significance of the process variability found above will next be related to end closures alpha contamination. Possible corrective actions include programming of the braze cycle and utilization of vibrational energy. Specific recommendations will be made upon completion of the test work.

Throughput and maintenance improvements of N-Fuels testers continued as items of sustained interest. A source of regular maintenance has been the adjustable fuel element drive rollers used on the existing equipment. A new design of roller utilizing double bearings and roller chains was made to obviate bearing wear and belt slippage of the old design. Laboratory run-in tests were completed on the new drive rollers indicating full conformance to expected improved performance. They will be installed on the 333 Building testers as the machines become available for changeover.

AlSi Fuel Testing

Operation of the 313 Building testers continue to be of interest to Testing Methods as providing an index for design improvements and operating deficiencies. Availability at about a ninety percent level appears to be the balance point for economical operation of the existing testers. Testing Methods auditing of availability and reproducibility was continued for internal use only; publication as a document has been discontinued. In general, reproducibility levels held steady over quite a spread (up to 92% for the UT-4, down to 20% for the UE-1, external bond); further work needs to be done in tester operation to reduce bias. Testing Methods will continue to give assistance as requested.

DECLASSIFIED

HW-77139

Electrical and electronic work on fabrication of a hot die sized fuel testing station (UE-3) consisted of cleanup items. Debugging of the electronic circuits has been delayed due to remodeling work in the Testing Methods laboratory, but will be started in the Electronic Fabrication Shop.

Using the prototype UE-3 available in the laboratory, hot die sized fuel elements were examined for cap-to-core bonding. Current process improvements appear to make cap-to-core bond more difficult to detect. Even though a metallurgical bond may not now be achieved, the resultant mechanical bond appears to transmit ultrasound. In the past, either the bond was good or it was cracked; in the latter instance, this condition was readily detected. A thermal shock treatment may be desirable to permit detection of cases where a mechanical bond is present.

Destructive analysis of a series of eighty fuel elements tested some time ago showed good correlation between the nondestructive can wall thickness measurements and the actual can wall thickness.

The shipping schedule for two automatic grain size and surface testers (UT-2) being built by Testing Methods Operation for National Lead Company of Ohio was met. Debugging of the units was satisfactorily completed and they were crated and shipped on March 29. Plant operation follow-up will be provided after the units are received at National Lead Company and installation completed.

Irradiated Fuel Testing Facilities

The test station for examination of irradiated N-fuels (UT-10) was transferred from 189-D to 105-KE, and mechanical and electrical installation was completed March 25, 1963. Beneficial results should be forthcoming in April. Schematics for the essential elements of the UT-10 are in drafting. A preliminary instruction book for operation and calibration of the unit is in preparation. A maintenance manual and performance specifications will be drafted as operating experience is obtained.

Operation of the irradiated AlSi fuel tester (UT-11) was held up awaiting receipt of transducers; the transducers were received at month's end and reproducibility testing will proceed.

General

A prototypic gamma counting, single channel analyzer system, for plutonium uniformity of PRTR developmental fuel elements was set up and checked out in the 308 Building. Both vibrationally compacted and swagged fuel elements are being routinely measured. The equipment will be operated by Ceramic Fuels Fabrication Development Operation to gain experience and establish parameters for permanent instrumentation to be engineered and supplied by Testing Methods Operation.

Investigations utilizing ultrasound to detect hydrogen embrittlement in zirconium process tubes continued with encouraging results. A working prototype of the wide band ultrasonic readout system for hydride detection was built and demonstrated on KER size tube sections. Signal to noise ratio was low and more elaborate gating circuits will be necessary, but basic workability was shown. Additional hydride samples in NPR process tubing are being fabricated.

Ultrasonic transducer problems related to uniformity continue to be of interest from the standpoint of improving ultrasonic instrumentation reproducibility. Two methods have been devised for analyzing the intensity distribution within an ultrasonic beam so that transducer characteristics can be specified. One method utilizes thin metal plates cut at 45° angles to reflect a thin section of the beam for observation with the Schlieren system. The second method involves the use of optical interference phenomena by making a liquid surface one face of a dilatation interferometer. Sound pressures disturbing the liquid surface should be measurable and thereby reflect the cross-section of the ultrasound beam. Both methods will be explored as possible ways of describing transducer characteristics so that tester operation can be made more reproducible.

DECLASSIFIED

DECLASSIFIED

VISITORS

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
C. E. Bussert	National Lead Co., Cincinnati, Ohio	L. M. Loeb	3/21-22	Discuss NPR fuel Supply.
C. V. Dodd	Oak Ridge Nat'l Lab	R. L. Brown, Jr.	3/25/63	Discuss NDT.

TRIPS

R. B. Socky	Los Angeles 1) Northrup Co. 2) Automation Inds. 3) X-Ray Products Inc.		3/17-22	Participate in Nat'l Convention of SNT as Nat'l board director and speaker at two technical sessions - confer on NDT at Northrup, Automation, and X-Ray Products.
S. M. Gill	Yakima, Washington	---	3/8-12	Participate in
L. T. Hagie	" "		"	Business Effectiveness
L. A. Jones	" "		"	Program
W. R. Krehbiel	" "		"	" " "
H. S. Krider	" "		"	" " "
J. W. Nickolaus	" "		"	" " "
R. B. Socky	" "		"	" " "
H. L. Sterling	" "		"	" " "
S. M. Gill	Society Meeting Los Angeles, Calif.	---	3/18-22	Attend Western Metals and interview candidate for employment.
T. B. Correy	Lawrence Radiation Lab Livermore, California	W. R. Holeman W. F. Brunner	3/18	Discussion on vapor deposition & pressure bonding.
"	Temescal Metallurgical Berkley, California	H. R. Smith W. N. Kiely	3/19	" "
"	Thermionics Labs Hayward, California	E. M. Whitson	"	" "
"	Society Meeting Los Angeles, Calif.	---	3/20-21	Attend Western Metals Congress of American Society for Metals.
E. W. Darsow H. P. Kraemer	Alaskan Copper & Brass Seattle, Wash.	Kermit Rosen	3/18	Copper tubes and end plates.
"	Western Pneumatic Tube Kirkland, Wash.	Carsen Eckmann	3/18	Copper sleeves.
"	Renton Coil Spring Renton, Wash.	Burwell Pepka	3/18	Supports.
"	Wilkins & Assoc. Tacoma, Wash.	John Redding	3/18	Copper tubes and end plates.

TRIPS (Continued)

<u>Name</u>	<u>Company</u>	<u>Contact</u>	<u>Date</u>	<u>Reason</u>
D. W. Darsow	Bridgeport Brass Riverside, California	Claren Hoehne	3/19	Zircaloy Cladding.
"	Airline Welding and Engineering Gardena, California	D. Bower	3/20	Copper sleeves.
"	Harvey Aluminum Torrance, California	G. Christensen	3/21	End Caps.
"	Ducommun Metals Supply Los Angeles, California	E. Lady	3/22	Copper sheet.
"	Mozcik Tool & Die Detroit, Mich.	---	3/25	Extrusion tooling.
"	JBM Tool, Bryan, Ohio	E. Johnson	3/26	" "
"	Bridgeport Brass Niles, Ohio	---	3/27	Zircaloy strip.
"	Konzig Tool, Cleveland	---	3/28	Extrusion tooling.
"	Winslow Mfg. Co. Cleveland, Ohio	--	3/28	" "
C. H. Shaw	Moczik Tool & Die Detroit, Michigan	Carl Eising	3/25	Discuss extrusion tooling fabrication and development
"	Ajax Steel & Forge Detroit, Michigan	Ed Laing	3/25	" "
"	JBM Tool & Die Bryan, Ohio	Ez Johnson	3/26	" "
"	Bridgeport Brass Co. Ashtabula, Ohio	J. Puterbaugh	3/27	Monitor primary extrusion of NPR uranium billet stock.
"	Kemsig Tool Cleveland, Ohio	Q. Kemsig	3/28	Discuss extrusion tooling.
"	Winslow Manufacturing Cleveland, Ohio	R. Pringle	3/28	" "

DECLASSIFIED

DECLASSIFIED

HW-77139

ORGANIZATION AND PERSONNEL

	<u>2-28-63</u>	<u>3-31-63</u>
Exempt	52*	54
Nonexempt	<u>109</u>	<u>109</u>
Total	<u>161</u>	<u>163</u>
Tech Grads Assigned to N-Reactor Fuels		<u>2</u>

Transfers

<u>Name</u>	<u>From</u>	<u>To</u>	<u>Effective Date</u>
T. S. Dodge (exempt)	New Hire	Quality Control, NRD	3-11-63
B. D. Hopkins (exempt)	Tech Grad	Quality Control, NRD	3-1-63
M. F. Tschauner (nonexempt)	Manufacturing, IPD	Quality Control, NRD	3-25-63
N. C. Davis (nonexempt)	N-Fuels Product Engineering, NRD	Advance Fuels Development, HL	3-25-63

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 March, 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

HW-77020 X-Ray, Inspection Tool For NPR Cap-To-Clad Voids, G. L. Wilfert, dated March 21, 1963.

HW-77061 Status Report: Reprocessing of N-Fuel White Oxide Autoclave Rejects (Summaries of work performed under Pilot Plant PWR's 35 and 50), W. G. Hudson, dated March 25, 1963.

SECURITY VIOLATIONS

There were no security violations in the N-Reactor Fuels Operation during March. Total CYTD - 1.

L. M. Loeb:pml

S.M. Gie
for

Manager - N-Reactor Fuels

*Includes 2 MTP's.

RESEARCH AND ENGINEERING

The N-Reactor Department 02 R&D budget for 1964-1965 was planned and published.

A one-node reactor kinetics model of N-Reactor has been debugged on Systems Research Operation's analog computer. Production runs of various reactor transients will commence about April 3 or 4.

The fluid flow subroutine of the dump condenser digital computer code is completed. The heat transfer portion of the code is about 50 per cent complete.

An analysis has been completed of the magnitude of the uncertainty in the predicted reactivity of N-Reactor under operating conditions. This work was done to determine the probability that a small quantity of some additional fuel of a slightly higher enrichment would be useful in reaching full operating conditions.

A draft report on the nuclear aspects of the production capabilities of N-Reactor for several heavy isotopes has been prepared.

Testing of the NPR-Prototype Concept Evaluation full scale facility in the 189-D laboratory is now in progress to provide isothermal pressure drop data for the testing program to be performed by the Thermal Hydraulics Operation, Hanford Laboratories. Testing will be completed by May 10, and a report summarizing all test data will be submitted to Reactor Engineering by Equipment Laboratory and Testing, Irradiation Processing Department, by May 20.

A Physics Section has been issued to the Process Evaluation and Control Sub-section for inclusion in Volume 5 of the N-Reactor Hazards Review document.

A report, Data Logging and Data Display, was issued. Upon completion of minor revisions this will be incorporated in the NPR Hazards Review document being prepared by the Process Evaluation and Control Sub-section.

All Reactor Engineering contributions to Volume 1 of the revised Hazards Review are now complete, the section on reactor cooling having been submitted to Process Evaluation and Control. Of the programmed contributions to Volume 2, a description of the process tube flow and temperature monitor system has been completed on schedule and a description of the header-to-header portion of the reactor cooling system will be submitted by April 5.

Operational Test T-0041, Traveling Screen and Wash System, was completed on March 29.

Irradiation Testing in Support of N-Reactor Fuel

KER-1

Twelve 17-inch N inner fuel elements charged into KER-1 on February 16, 1963, to evaluate the crud formation resulting from the carbon steel rusting and

DECLASSIFIED

HW-77139

cleaning test, PT-IP-551-A, were discharged March 4, 1963, at an exposure of 275 MWD/T because of loop operating difficulties. The loop was recharged on March 5, 1963, with five 23-inch N inner fuel elements to evaluate the use of NH_4OH for coolant pH control, PT-IP-536-A, Supplement C. The exposure of these elements as of March 20, 1963, was 270 MWD/T.

KER-2

The eight 17-inch N inner tubes charged into KER-2 on November 27, 1962, to evaluate the behavior of bonded and unbonded contoured end closures, PT-IP-536-A, Supplement A, were discharged March 26, 1963, at an exposure of 1900 MWD/T. Preliminary visual examination of the elements disclosed no obvious distortion at the end caps. Planned examination of the elements includes OD, ID, and warp measurements, density measurements, and destructive examination in the Radiometallurgy Laboratory.

KER-2 was recharged on March 26, 1963, with eight 12-inch enriched single tube elements, PT-IP-544-A, to evaluate the swelling behavior of fuel at high uranium temperatures.

KER-3

KER-3 is empty while the loop pumps are being tested. Fourteen N elements with a coolant flow channel temperature measuring thermocouple train will be charged in KER-3 at the next outage.

KER-4

The fourteen N fuel elements charged into KER-4 on September 26, 1962, had reached an exposure of 1250 MWD/T by March 20, 1963. The test is planned for an exposure of 2100 MWD/T which should be attained in June, 1963.

Cladding Studies Test

A test to evaluate the effect of temperature, clad thickness, and clad uniformity on the localized jacket splitting failure mechanism of coextruded Zr-2 jacketed rod samples, PT-IP-510-A, charged into F-Reactor on January 13, 1963, had reached an exposure of 1120 MWD/T on March 20, 1963. One of the four tubes of capsules was discharged March 28, 1963, at an exposure of 1300 MWD/T. The remaining tubes will be irradiated to about 2000 MWD/T and will be discharged in May, 1963.

SIGNIFICANT REPORTS ISSUED

HW-76943, "Radiological Protection Considerations in the Design and Layout of the Export Power Plant at 100-N," by J. W. Vanderbeek, March 13, 1963 (unclassified).

HW-75919, "Engineering Analysis and Evaluation of Critical NPR Low Voltage Electrical Power Systems," J. R. Bolliger, January 18, 1963, (Unclassified).

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
T. W. Evans	Los Angeles, California	March 17-22	Western Metals Congress
R. E. Hall	USAEC - Chicago, Illinois	March 25	Discuss Health & Safety Monitoring Practices re reactor facilities under that office.
R. E. Hall	American Power Conference Chicago, Illinois	March 26, 27 and 28	Attend Meeting
J. W. Riches	Re-Entry Systems Dept. Philadelphia, Pa.	March 5	Technical Recruiting
J. W. Riches	USAEC- Washington	March 6 & 7	Special program meeting of FEDC

PERSONNEL

Additions

<u>Name</u>	<u>From</u>	<u>To</u>	<u>Date</u>
B. S. Kosut	HL, Reactor & Fuels	Chemistry & Metallurgy	3-1-63

SECURITY VIOLATIONS

There was one security violations for the month.

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 March, 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.

DECLASSIFIED

MC Leverett:LCC:mlk

M. C. Leverett
Manager
Research and Engineering

N-REACTOR PROJECT

PROCESS DESIGN OPERATION

Process Research and Development

A study of the circulating raw water system has been made. It is concluded that the optimum closure time for the circulating water pump discharge valves is about four seconds. Significant flow reversal will occur through powerless pumps with longer closure times. The study has been extended to consider boiling in the dump condensers during transients.

The primary loop flow coast-down following a scram has been calculated for the proposed Phase II operating conditions.

Conversion

Six design bases and criteria documents for use in conversion have been prepared.

The proposed Phase II operating conditions were examined for hydraulic instability, subcooled boiling, and burnout limits in the process tubes. The analyses show that the Phase II conditions meet the technical criteria and are in general less critical than the Phase I conditions.

Project CAI-816

Acceptance Test Procedures

All scheduled (52) General Electric acceptance test procedures have been prepared and issued. Included were the primary loop cold and hot system tests prepared jointly with Burns and Roe.

Circulating Raw Water System

An amendment to the specification for circulating raw water pump butterfly valves has been received from Burns and Roe and is being studied. The amendment covers the change from electric motor to hydraulic cylinder operation, adjustable to open or close in a range from 2 to 10 seconds.

Hot Water Quality Laboratory

Amendment No. 2 to the specification for "Water Monitoring Equipment Associated with the Hot Water Quality Laboratory" was presented to Beckman Instrument Company representatives March 26, 1963. This amendment added the roughing cooler to the scope of the work in the specification.

Chemical Cleaning

Consulting engineers representing the Dow Industrial Service and Consolidated American Services, Inc. visited Hanford during the month. They have evaluated methods by which the NPR secondary piping system can be effectively and economically cleaned to the required degree. Contacts with these vendors have included repeated interest in performance of the entire cleaning operation in one step. Tests have been performed to evaluate claims made by Dow Industrial Service for their Vertan 675 and Vertan 690 and Consolidated American Services, Inc. for 4306-D-NPR. Preliminary screening of the Vertan 675 and 4306-D-NPR indicates that a solution of these materials circulated through piping containing rust, millscale and organic coatings will clean the pipe. In addition, the cleaning action leaves a metal surface protected against "flash" rusting.

Grayloc Couplings

On March 6, 1963, fifteen Grayloc joints were installed in the Component Test Loop for thermal cycle testing. The flanges of twelve of these joints were treated to duplicate various conditions of existing Grayloc flanges on the unit. These conditions included 5- and 10-second vacuum blast with and without burnishing and redressing by means of the various tools available. The remaining three joints were assembled using a fusion pass seal weld between sealing rib and flanges. On March 18, 1963, the loop was shut down after 929 thermal cycles. Leakage was detected on three 10-second vacuum blasted surfaces, on one 5-second vacuum blasted surface, and to a lesser degree on one Gray Tool machined surface and one Wilkins machined surface. No leakage was noted at the welded seals; a significant reduction in breaking torque (loosening of the clamps) was noted on the seal welded units which were deliberately assembled with flange non-parallelism.

Process Tube Diversion Valves

Assembly and hot testing of process tube diversion valves were resumed at Chandler Evans on March 28, 1963. Repair welding of extension tube forgings is under way at Alloy Nuclear and Northeast Welding. A number of extension tube forgings were accepted in a deviation request with thin walls caused by weld grinding. The reduced wall thickness is still within the ASA B 16.5 code.

Horizontal Rod Drives

It has been determined that the cause of the slow-speed jerky motion problem with horizontal rod drives is poor quality cast-iron piston rings. Drives have been reworked to add new piston rings and tests show they operate quite smoothly at slow and fast speeds. The piston ring vendor was contacted about the ring problem and furnished, without cost, replacement rings for the drives requiring rework.

Process Tube Flow Monitor Controllers

Fabrication of the 1,004 Process Tube Flow Monitor Controllers continues at Avien but at a rate less than desired. Production was as follows:

<u>Date</u>	<u>Number Passed Final Functional Tests</u>
3-1-63	336
3-8-63	398
3-15-63	468
3-22-63	512
3-28-63	555

Production has been limited by a shortage of indicator lamps, controller panels, and specially machined nuts for Fluxbars.

Rupture Monitor Valve Racks

The fourth and fifth rupture monitor valve racks, fabricated by Western Piping and Engineering, have been received at Hanford. The sixth and final rack to be fabricated by Western Piping and Engineering is nearly complete.

Equipment Development and Testing

Corrosion of inlet valve actuators by moisture migration has been studied in hot loop tests at the 189-D Laboratory. To assess the effects of bolt torques which were found to be lower than factory specified, three inlet valve actuator covers were torqued to the correct level and installed in the loop. Nitrogen was applied full time to one in order to prevent moisture admission; nitrogen was applied to another at times other than temperature equilibrium at 550F; and no nitrogen was applied at all to the third unit. After 14 days of exposure to the 550F temperature, which included thermal cycles between 550F and room temperature, normal operating pressure was applied to the valve actuators to determine operability. Both valves which had been fully or partially purged with nitrogen, respectively, operated normally. The third unit with no nitrogen purge during the loop operation failed to operate during the first six attempts of actuation. Thereafter operation was achieved. Subsequently the actuator covers were removed and it was found that the gas purge had prevented rust on the unit pressurized full time; partial prevention of rust was achieved on the other. The unit with no purge was rather badly rusted. Studies have been scheduled to best determine how a purge may be applied to inlet valve actuators during reactor operation.

Design tests performed on production run fuel element tipoffs showed a need for minor modifications due to lack of structural rigidity. Modifications to achieve desired performance included revisions to the support web to achieve desired clearance and rigidity. Functional tests performed thereafter showed conformance to requirements of the fuel handling system.

FIELD ENGINEERING OPERATIONConstruction105-N and 109-N Buildings

The alignment and checkout of nine more roof exhausters was completed during March. Alignment and rotation checks have also been completed on most of the mechanical equipment in the reactor gas system.

The installation of electrical cable for 105-N and 109-N Buildings is now about 55 per cent complete and about 33 per cent of the conductor terminations have been made.

The final inspection at the vendor's plant of the safety circuit panel has now been completed. The panel is being prepared for shipment.

The checkout and test of the video communications system for the 105-N and 109-N Buildings is now underway under the direction of the vendor representative.

The contractor testing of the pneumatic portion of the pile gas instrument system is now nearly completed and this part of the system is nearly ready for calibration. Contractor testing is also in progress on the graphite flow monitor sensing lines.

The installation of tubing is continuing on the tube flow monitor system and the fuel rupture monitor system. This work is also underway on the control lines for the butterfly and diversion valves.

All of the MgO cable for the left outlet pipe space is now in place and about 83 per cent of this work is completed in the right outlet pipe space.

117-N Building

Nothing new to report.

1310-N Facility

The 12" pipe has now been installed from the point of tie-in to the bottom of the waste storage tank to a point approximately 5' from the location of the pump house wall.

181-N Building

An attempt was made to run an operational test on the screen wash system, however, numerous deficiencies in the electrical circuitry were found. These have now been corrected and the system is ready for testing.

108-N Building

Errors and deficiencies were found in the electrical circuitry in building during initial operational tests. These have now been corrected.

163-N and 183-N Buildings

The clear-well overflow crib is now complete except for final grading and installation of the guard fence.

During shut down of the 184-N boiler, work is underway in the 163-N Building to correct system deficiencies. Vendor testing of this facility will be resumed after the boiler is back in operation.

182-N Building

The remainder of this facility was transferred to General Electric custody on March 22, 1963. Work is now underway on completion of punch list items and performance of contractor testing.

184-N Building

The boiler was taken out of service March 15, 1963, for the inspection and replacement of defective boiler tubes. This work is now underway and considerable other work is being done in the building during this outage. This includes replacing the auxiliary burner, correcting deficiencies on the soot blowers and the 14" non-return valve.

General Plant Telephone System

All of the exception items on the punch list for the general plant telephone system have now been completed.

Fire Alarm System

The inspection and testing of the 100-N Fire Alarm System has now been completed and the system is in operation.

Primary Piping

Spools shipped to the field from the HUICO shop now total 961 with 507 for the 105-N Building and 454 for the 109-N Building. This represents a total weight of 962 tons.

Essentially, all work has been completed in the HUICO shop with the exception of straightening and alignment of connector tubing and refacing of Grayloc hubs. To date a total of 766 outlet connectors and 326 inlet connectors have been shipped to the field.

In the field, erection of primary pipe is approximately 67 per cent complete.

Pipe Erection

Connector installation has been completed in the left outlet pipe space. Work is continuing in the other areas with over 50 per cent of the connector installation being completed.

The tooling for reworking the Grayloc hubs has been basically completed. The principle problem remaining is that of keeping the tools operable, however, spare parts are being bought and/or fabricated to alleviate this problem.

All rod drive assemblies have been installed on the right side. Installation is approximately 50 per cent completed on the left side. All faulty rod drives accepted from the vendor have been corrected.

Diversion valve installation is progressing slowly as a fill-in job. 114 valves had been installed by April 1, 1963.

NPR Testing Program

The overall effort on test procedure preparation has increased substantially during the past month; however, the effects of this are not yet reflected in progress percentages since no credit is taken for procedures in preparation until they have reached the comment stage. Overall progress to date is now 10.6% compared to the scheduled 28.4% which can be summarized as follows:

Tests Scheduled	47
Tests Scoped	23
In Preparation	10
Issued for Comment	3
Issued as Approved	3

Actual testing was initiated during the month on the following systems:

	<u>Per Cent Complete</u>
T0001 Water Pretreatment Facility	10
T0007 Fuel Oil Supply Systems	25
T0041 Traveling Screens and Wash System	95

Overall testing progress to date is 0.6 per cent compared to the scheduled 7.5 per cent.

Administration

The following material has been processed during the period of February 18 through March 17, 1963.

Drawings	290
Criteria	0
Specifications	2
Requisitions	38
ATP's	11
Other	<u>6</u>
Total	347

Title III and Test File.

A file to include all data pertaining to operational tests, Title III, contractor tests and instrument calibration, has been established.

Bailey-Meter material processed as of March 17, 1963, is as follows.

Released as Noted for Fabrication Drawings	102
Released for Information	141
Released for Fabrication Drawings	184
Not Released for Fabrication Drawings (B&R)	1
Approved without Exceptions (GE)	<u>6</u>
Total	434

Following is the status of Subcontract KE-11252 (HUICO) data as of March 21, 1963.

Total Number Received	2807 (Included 2007 received for Information Only)
Number Approved	750
Number Approved with Exceptions	27
Number Not Approved	23
Number Currently Being Reviewed	0
By GE & B&R jointly	0
By B&R (109-N)	0
Number Received for Information Only - No Approval Required	2007

PROGRAM EVALUATIONDesign Status

Title I - 100 per cent complete.

Title II - 100 per cent complete.

Costs

No change has been made in the Official Budget Estimate during this reporting period. The current estimate for Project CAI-816 remains at \$188,320,000. The Kaiser Engineers February 28, 1963 Cost Estimate displays an estimate \$7,046,600 higher than the Official Estimate. This is an indicated increase of \$125,000 since the January 31, 1963 report.

Work Authority Number CAI-816(N-1B), dated March 22, 1963, increased the authorization for completion of punch list items to \$175,000.

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 construction status as of April 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	87	87
General Area Systems	90	91
105-N Building	84	84
109-N Heat Exchanger Building	74	79
163N-183N Water Treat. Facilities	99	99
181-N River Water Pump House	99	99.8
182-N High Lift Pump House	100	99.1
184-N Standby Power House	99	99.8
153-N Switchgear Building	100	100.0
NPR Project (CAI-816)	82	84.4

RESPONSIBILITY

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

ORGANIZATION AND PERSONNEL

		<u>2-28-63</u>	<u>3-31-63</u>
<u>Exempt</u>			
Permanent		91	92
Tech. Grads.		2	1
<u>Non-Exempt</u>		<u>24</u>	<u>23</u>
TOTAL PERSONNEL		117	116
<u>Transfers</u>	<u>From</u>	<u>To</u>	<u>Effective Date</u>
Browning, RJ (exempt)	CE&UO	Pile Erection Eng'g.	3-1-63
Gross, PD (Tech.Grad.)	Rotational Prog.	Reactor Design Analysis	3-1-63
King, JH (Tech.Grad.)	Reactor Design Analysis	Termination	3-8-63
Koponen, BL (Tech.Grad.)	Reactor Design Analysis	Termination	3-1-63
Kent, BR (non-exempt)	Management	Leave of Absence	3-29-63

SAFETY AND SECURITY

No disabling injuries were reported. One security violation occurred during March.

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 and Location</u>	<u>Date</u>	<u>Purpose</u>
McCullough, JD	Avien Inc. Woodside, New York	2-18 to 3-5-63	To evaluate engineering, production and testing problems delaying completion of Flow Monitor System.
McCullough, JD	Chatham Electronics Div. of Tung-Sol Electric Livingston, New Jersey	2-18-63 and 3-6-63	To discuss development program to assist in production of acceptable thyratron indicators.
McCullough, JD	Industrial Control Products Corporation Caldwell, New Jersey	2-19-63	To observe tests on flow monitor DC power supply.
Reinig, LP	Chandler Evans Corp. West Hartford, Conn.	3-3 to 3-13-63	Diversion valve welding problems.
Bainard, WD	Beckman Instrument Co. Fullerton, California	3-4 to 3-9-63	Assist AEC in review of the work being performed on the Water Quality Laboratory Instrumentation package
Condotta, DL	Burns and Roe Hempstead, New York	3-11 to 3-13-63	To discuss design features of N-Reactor Conversion.
Mollerus, FJ, Jr.	Burns and Roe Hempstead, New York	3-11 to 3-13-63	To discuss design features of N-Reactor Conversion
Lenkersdorfer, HD	Union Machine Works Seattle, Washington	3-12-63	To review magazine support work.
Davis, HS	United Nuclear Corp. New York City, N. Y.	3-18 to 3-21-63	Symposium on Advanced Calculations Procedures for Shield Evaluation.
Bainard, WD	Beckman Instrument Co. Fullerton, California	3-19 to 3-22-63	Assist AEC in review of the work being performed on the Water Quality Laboratory Instrumentation package
Kosmata, HR	Nuclear Superheat Mtg. Idaho Falls, Idaho	3-20 to 3-22-63	To attend Semi-annual Superheat Conference.
Davis, HS	Burns and Roe Hempstead, New York	3-22-63	Technical discussions on piping supports in Cell No. 5.
Love, WJ	Idaho Falls, Idaho	3-19 thru 22	Attended AEC-sponsored Nuclear Superheat Meeting No. 8
Bernhagen, EM	Montek Incorporated Salt Lake City, Utah	3-25/26	Inspection of safety circuit panel
Kratz, EM	Burns and Roe Hempstead, New York	3-9 thru 3-14	Conversion design.

VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
Haaga, J	General Electric Co., APED San Jose, Calif.	3-28/29	Review of startup program.
Medwed, P	AMT' Atomics Greenwich, Connecticut	2-22	Discuss discharge conveyor.
Bibbo, D	May-Fran Manufacturing Co. Cleveland, Ohio	2-22	Discuss discharge conveyor.
Harper, OJ Deacon, W	Parker Aircraft Renton, Washington	2-27	Discuss "H" fittings.
Lundrigan, FG Eikum, L Rowe, RD Oldham, WA	Consolidated American Services Los Angeles, California	3-1/21 3-1/29 3-11/13 3-11/13	Consultation and discussion on chemical cleaning of piping systems.
Johnson, GA Hudgens, EW	Dow Industrial Services Los Angeles, California	3-1/28 3-4/5 & 3-25/27 3-4/5 & 3-25/27 3-18/22	Consultation and discussion on chemical cleaning of piping systems
Jobe, RJ			
Gorges, D			
Porter, J Lanier, W Boll, J	Beckman Instrument Co. Fullerton, California	3-26	Consultation regarding roughing coolers for Hot Water Quality Laboratory.

SIGNIFICANT REPORTS ISSUED

<u>HW Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-76850	Unclassified	WJ Love	3-14-63	Thermal Stress Analysis of a Bimetallic Tube Joint for "N" Reactor Application
HW-77076	Unclassified	EM Kratz	3-26-63	N-Reactor Conversion - Project Representative Meeting No. 1 - March 21, 1963
HW-77104	Unclassified	EM Kratz	3-28-63	N-Reactor Conversion - Project Representative Meeting No. 2 - March 25, 1963
HW-74986	Unclassified	FJ Mollerus, Jr.	3-1-63	Criteria and Scope for ATP-2511, NPR Heat Dissipation Plant, Post Critical Operation

UNCLASSIFIED

HW-77139

SIGNIFICANT REPORTS ISSUED (cont'd.)

<u>HW Number</u>	<u>Classification</u>	<u>Author</u>	<u>Date</u>	<u>Title</u>
HW-76406	Unclassified	Henke, LG Johnson, HG	3-22-63	Design Test Request 1158, N-Reactor RV-2 Pressure Relief Valve
HW-76662 Rev. 1	Unclassified	Davis, HS	3-15-62	NPR Power Conversion Project - Reactor Plant Modifications - Construction and Tie-in Requirements
HW-76663 RD	Confidential	Kosmata, HR Mollerus, FJ, Jr. Robinson, RK	3-12-63	NPR Conversion Project - Design Criteria, Design Operating Parameters
HW-76664 RD	Unclassified	Johnson, HG	3-28-63	N-Reactor Conversion Project - Design Criterion for Additions to the Primary Loop in the 109-N Building
HW-76923	Secret	Condotta, DL	3-12-63	Reactor Design Analysis - Monthly Report, February, 1963.

JS McMahon:mbs

Manager, N-Reactor Project

UNCLASSIFIED
D-12

FINANCIAL OPERATION
MARCH, 1963

The following were the principal activities of the NRD-Financial Operation other than those activities of a routine and continuing nature:

N-Reactor Business Information Project

Members of the Operation participated with representatives of N-Reactor Plant Section, Business Systems Development Operation, and Electronic Data Processing Operation in designing the Business Information System for N-Reactor operations. The basic and fundamental outline of the system had previously been prepared by members of N-Reactor Plant Section. The system was originally designed as a planning and maintenance control system, but has been redefined as a Business Information System. Activities during March related to this system were the following:

1. Feasibility study of the over-all system.
2. Preliminary definition of inputs, outputs and data processing passes.
3. Feasibility study of input equipment.

At the end of March detailed study of inputs and outputs were under way. Completion of the system, including debugging is presently scheduled for March 20, 1964. The estimated completion date may be moved ahead pending final determination of the date for initiation of fuel loading.

N-Reactor Production Study

During March a study of N-Reactor costs and capabilities was made for the period through FY 1972 and for a period subsequent to FY 1972. Certain members of the Financial Operation participated in this study.

Budgets

Several members of the component were engaged primarily in budget preparation during the month of March. These activities consisted primarily of the following:

1. Recast of the FY 1963 budget based on the latest allocation of funds.
2. Revision of the FY 1964 budget.
3. Preparation of the budget for FY 1965.

The budgets involved consisted of all budgets of the Department with the exception of the Plant Acquisition and Construction budget, which was prepared by N-Reactor Project Section. Financial Operation did, however, review the PAC budget.

Paperwork Reduction

The second monthly meeting of all members of the Financial Operation on the subject of paperwork reduction was held. These meetings will be continued on a monthly basis at least through calendar year 1963. Certain contributions for reduction of paperwork have already been made; however, work to date has primarily been associated with planning the work to be accomplished.

HAPO Overheads

Several meetings were held during the month on the subjects of:

1. Composition of the HAPO Overhead Pool.
2. Method to be used for allocating the Overhead Pool to operating departments and end function products.

At the end of the month these items had not been resolved satisfactorily.

Component Personnel

By the end of the month all presently planned personnel for the NRD Financial Operation were in place. The present complement consists of fourteen monthly salaried employees and eight weekly salaried employees. Two of the weekly salaried employees are Business Training Recruits and during April one of these will be changed to monthly salaried status. The addition to personnel for March was Dicksy Brown who transferred from CPD on March 18, 1963.

There were no significant reports issued, trips made, or visitors received.

Manager-Finance

J Milne:pw

N REACTOR PLANT OPERATIONPROVISIONAL CUSTODY OF FACILITIES

Building 182 was transferred to N Reactor Plant Operation as of March 22, 1963 on NPR Custody Agreement No. 7. The 184 boiler went down March 15 for repair by the vendor and completion of punch list items.

TRAININGOrientation

Group V, 25 people, completed the course on March 8. Group VI, 31 people, started the seven-week program on March 18.

Planning & Scheduling

On March 21, twelve pile operators began the ten-day training in the N Plant planning and scheduling system.

Maintenance:

A series of specialized maintenance procedures classes on N Plant equipment for appropriate craftsmen has been programmed. Twenty-four instrument oriented personnel began the first of the series on digital transistors on March 25.

Certification

Preparation of material is continuing. Start of the class was delayed due to a request by Union Relations.

Off-Site

Four maintenance oriented exempt personnel followed the overhaul efforts on the N. S. Savannah at her repair dock in Galveston, Texas, March 18 through March 22.

100-N TECHNICAL MANUAL, VOLUME II, EQUIPMENT DESCRIPTIONS

All sections excepting 21, were completed. Preparation of Section 21 is ahead of schedule, but is now expected by September 1, 1963.

TESTING

Operational testing of the screen wash system in 181 was completed. Operation testing of portions of systems in 183 and 184 is being performed as rapidly as the equipment is being made available. Preparation of detailed test procedures is well ahead of equipment turnover and is continuing. Identification of equipment for property control and planning and scheduling purposes is progressing on schedule.

PROCEDURE PREPARATION

Preparation of detailed operating procedures is on schedule. Procedures are being tested as part of the operational test program. Maintenance work procedures are programmed and being completed in conjunction with Maintenance Manual preparation. Both efforts are meeting set deadlines.

With the participation of personnel from CAO and NRD Financial, there was rapid progress in building the mechanics of the Planning and Scheduling system. Outputs were defined and prepared in format style, master files were defined, estimates of the programming established, and a rough draft feasibility study prepared.

SIGNIFICANT REPORTS ISSUED

None

TRIPS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
J. P. Thomas G. R. Klingler	Bailey Meter Co. Cleveland, Ohio	3/13 to 3/23	Observe Instrument Tests
H. C. Crose	National Safety Training Course, Chicago, Illinois	3/4 to 3/8	Attend Training Course
E. W. Wilson	Burns & Roe Hempstead, N. Y.	3/11 to 3/14	Discuss NPR design
D. C. Keck D. S. Lewis G. K. Dyekman W. L. Swanson	N. S. Savannah Galveston, Texas	3/16 to 3/22	Observe maintenance tests.
G. O. Amy D. S. Lewis T. M. Hall J. N. Charlton C. A. Junghans R. E. Whiteside C. W. Anthony W. L. Swanson C. D. Shadinger	U. S. Merchant Marine Academy Kings Point, N.Y.	3/30 to 4/13	Training on N. S. Savannah simulator

VISITORS

<u>Name</u>	<u>Firm & Location</u>	<u>Date</u>	<u>Purpose</u>
J. A. Haaga	APED, San Jose, Calif.	3/27, 28, 29	Consult on startup problems

PERSONNEL

<u>Additions</u>	<u>From</u>	<u>To</u>	<u>Date</u>
D. K. O'Neal (E)	N Reactor Project	Maint. Practices	3/1/63
A. W. Fash (E)	IPD	Planning & Sched.	3/15/63
E. S. Abbott	CE&UO	N Shift Operation	3/18/63
G. D. Burdsall	IPD	N Shift Operation	3/18/63
J. D. Cozad	IPD	N Shift Operation	3/18/63
F. H. Dale	IPD	N Shift Operation	3/18/63
H. O. Davis	IPD	N Shift Operation	3/18/63
R. L. Dean	IPD	N Shift Operation	3/18/63
L. R. Dyreng	IPD	N Shift Operation	3/18/63
R. Einar	IPD	N Shift Operation	3/18/63
O. L. Hill	IPD	N Shift Operation	3/18/63
H. H. Hunnicutt	IPD	N Shift Operation	3/18/63
G. D. Kaas	IPD	N Shift Operation	3/18/63
J. W. Mattis	IPD	N Shift Operation	3/18/63
R. F. Purkey	IPD	N Shift Operation	3/18/63
M. A. Rickaby	IPD	N Shift Operation	3/18/63
D. W. Sullivan	IPD	N Shift Operation	3/18/63
R. H. Ver Steeg	CPD	N Shift Operation	3/18/63
N. R. Vespier	IPD	N Shift Operation	3/18/63

UNCLASSIFIED

HW-77139

<u>Additions (Continued)</u>	<u>From</u>	<u>TO</u>	<u>Date</u>
B. G. Wheeler	IPD	N Shift Operation	3/18/63
W. A. Whitehead	IPD	N Shift Operation	3/18/63
D. L. Workman	IPD	N Shift Operation	3/18/63

Transfers

None

Manager - N Reactor Plant

WM Mathis:GVRs:ds

UNCLASSIFIED

F-4

END

**DATE
FILMED**

2 / 19 / 93