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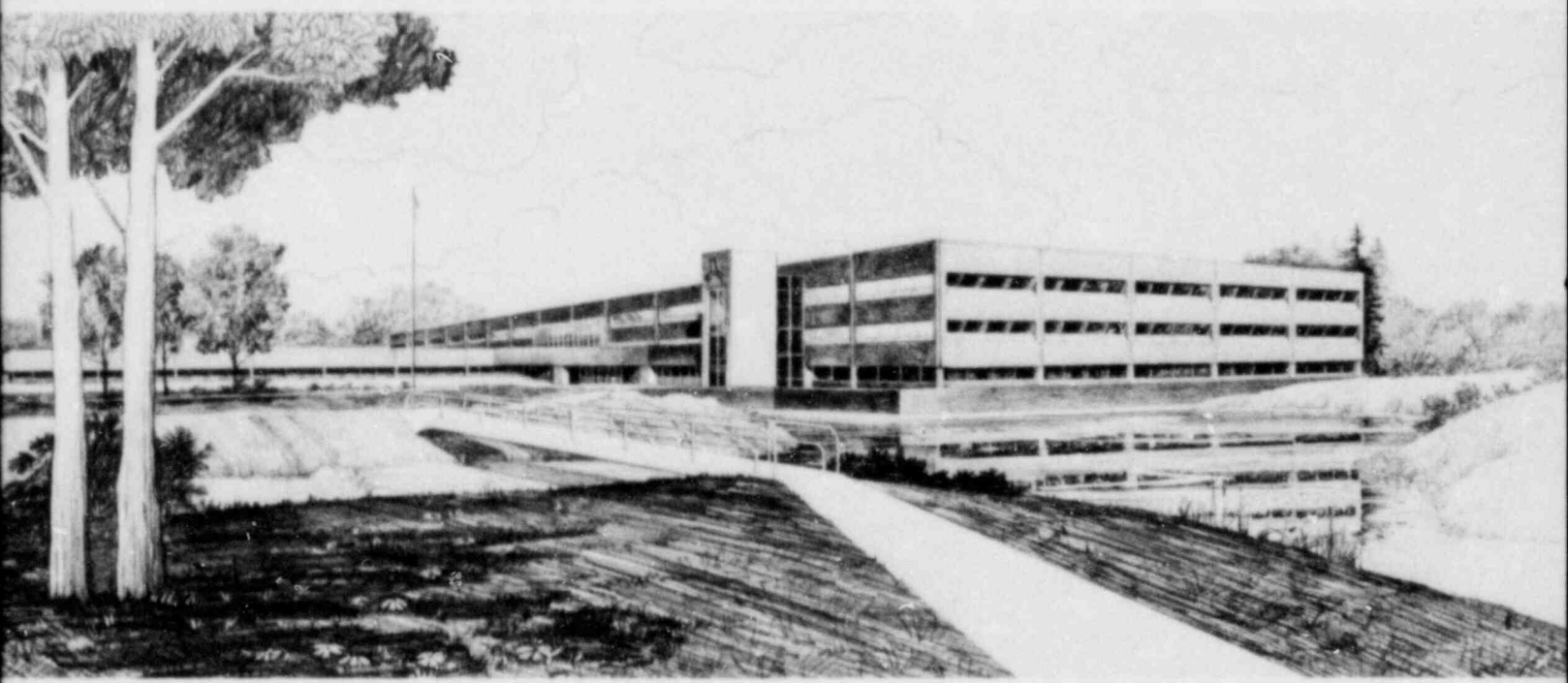
July 1982

MAY 1982 LOFT PROGRESS REPORT  
TO FOREIGN PARTICIPANTS

*NRC Research and/or Technical Assistance Rept*

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Idaho Operations Office • Idaho National Engineering Laboratory



This is an informal report intended for use as a preliminary or working document

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## INTERIM REPORT

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✓ **Responsible NRC Individual and NRC Office or Division:**

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This document was prepared primarily for preliminary or internal use. It has not received full review and approval. Since there may be substantive changes, this document should not be considered final.

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Idaho Falls, Idaho 83415

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MAY 1982 LOFT PROGRESS REPORT  
TO FOREIGN PARTICIPANTS

ACCOMPLISHMENTS

General Overview of LOFT Program

With the completion of LOFT Experiments L9-3 and L6-6 in April 1982, the main thrust of the work effort for the LOFT Program during May was in preparation for LOFT Experiment L2-5 to be conducted on the target date of June 16, 1982.

The LOFT Review Group Meeting was held in Salt Lake City, Utah, on May 11 and 12, 1982. The meeting provided a new format to enable smaller groups to meet to discuss specific issues in more depth, and then to report the summary of the discussions to all the meeting attendees. It was felt to be a very successful and productive meeting.

LOFT Program Activities

Work and Analyses for Experiment Preparation

Preparation for LOFT Experiment L2-5 included: completion of the reconfiguration of the blowdown system for a double-ended large break, system reviews, plant walk throughs, and preparation of Facility Change Form (FCF) L-9030 for the continued use of control Valves CV-P139-200 and -201 as replacements for relief Valves RV-200 and -201 (the main primary coolant system relief valves).

The Experiment L2-5 Programmatic Risk Assessment Document (PRAD), which establishes the programmatic risk from potential problems that could develop during the course of the experiment, was completed.

The F2 instrumented fuel bundle being fabricated by Exxon Nuclear Company (ENC) is proceeding on schedule. The proper number of temperature

compensated fuel rod plenum pressure transducers, plenum pressure switches, Inconel thermocouples (TCs), and transition joints are being shipped by other contractors to ENC as scheduled for the fuel bundle fabrication.

#### Experiment Data Instrumentation Preparation

Training was accomplished on the recently received acoustic emission analyzer. Documentation and work packages were completed to install the analyzer to measure background noise during Experiment L2-5. The analyzer is expected to provide additional information on the time of fuel rupture in Experiment L2-6.

Changes in batch and real-time automated data qualification (ADQ) have been started for Experiment L2-5. The batch methodology will incorporate an integral technique for TCs to allow direct redundancy comparison of TCs that display dissimilar time histories. The real-time ADQ is being modified to include the reactor vessel upper plenum.

The fuel TC responses from Experiment L9-3 and the Power Burst Facility (PBF) experiments were evaluated to determine if an inherent problem exists with these instruments that would indicate Experiment L2-5 objectives could not be met. Preliminary analysis indicates the transient responses of these TCs are reasonable and suggest no problems. However, the steady state temperatures show large variations. These temperature variations could be caused by either fuel behavior or TC degradation.

Fabrication of Rakes D1 and D3 was completed for Experiment L6-8. Final assembly is awaiting delivery of the modular mag disc-turbine transducers (MDTTs).

The task force that is investigating embedded TC failures published their findings (Stn-26-82). Their findings included (a) probable causes consisting of TC wire separations, shunting through the TC insulator, and/or chemical reactions between the TC materials, and (b) evidence that the problem may be generic to small diameter, metal-sheathed, mineral-oxide-insulated, Type K thermocouples.

LOFT Technical Report (LTR) LO-14-82-081, "Burst Strength of Zircaloy Tubing with Embedded Thermocouples," was published.

### Experiment Planning

Revision 1 of the Experiment L2-5 Operating Specification was approved for issue. Changes to the original document include a revised preexperiment power history requirement, revised experiment objectives which account for fuel cladding TC failures in the center fuel bundle, and revisions in the critical measurement list for the experiment.

The Experiment L2-5 Prediction Document was completed and transmitted to DOE-ID. Experiment L2-5 support activities continued.

A draft of Failure Modes Effects and Consequence Analysis (FMECA) for Experiment L2-5 has been prepared. No significant problems, which were not identified for previous experiments, have been identified.

The Experiment L2-5 safety analysis has been prepared and is currently in EG&G Idaho review.

The Experiment L2-6 Working Group on Fission Product Measurements issued the initial draft of a report summarizing recommendations and additional work to be completed prior to Experiment L2-6. Comments will be reviewed and incorporated into the final draft.

Evaluation of the radioactivity release potential and cleanup for Experiment L2-6 is continuing. Preliminary data were presented at the May meeting of the LOFT Review Group in Salt Lake City, Utah.

The safety analysis for the fast rod withdrawal portions of Experiment L6-8 was completed. The analysis for Experiment L6-8C was initiated.

### Posttest Analyses and Documentation

LTR LO-08-82-193, "Detector Response to Continuous Boron Dilution Rates in the LOFT Core," was issued and was used to predetermine the count rate necessary to achieve criticality during Experiment L6-6. With this analysis, the Research Reactor Safety Assurance Branch was able to assure a critical reactor condition and pinpoint the critical time within 10 seconds for Experiments L6-6A and L6-6B.

The Experiment Data Report for Experiment L9-3 was published on schedule, and the Experiment Data Report for Experiment L6-6 is proceeding on schedule.

The Quick-Look Report (QLR) for the LOFT boron dilution Experiment L6-6 was completed and issued (EGG-LOFT-5867).

The Data Integrity Review Committee (DIRC) activities were completed for Experiment L6-6. DIRC activities for Experiment L2-5 were started.

The posttest analysis documents for Experiments L5-1, L8-2, and L9-1 are complete and are in EG&G Idaho review. The Experiment L9-3 posttest analysis has been initiated.

### Topical Reports, Studies, and Presentations

The Community for Safety of Nuclear Installations (CSNI) Working Group on Emergency Core Cooling Systems (ECCS) and Fuel Behavior was attended at Tokai, Japan. A paper, entitled "Experiments Required to Understand Severe Core Damage Consequences: Experience Gained from Large Break LOCA Work," was presented.

Two papers on making differential pressure measurements in pressurized water reactors, and a paper on the real-time mass inventory system (MIS) were presented at the Instrument Society of America Symposium in Las Vegas, Nevada.

A paper entitled "Turbine Transducer Developed for Adverse Conditions" was presented at the 1982 Symposium on Instrumentation and Control for Fossil Energy Processes in Houston, Texas. A paper on automatic data qualification (ADQ) was also written for this Symposium.

A paper, entitled "Monitoring Pressurized Water Reactor Vessel Liquid Level with Self-Powered Neutron Detectors During Loss-of-Coolant Accidents," was completed for the American Nuclear Society (ANS) Topical Meeting on Reactor Physics and Core Thermal Hydraulics at Kiamesha Lake, New York, on September 22-24, 1982.

Two papers have been accepted for the Second International Topical Meeting on Nuclear Reactor Thermal-Hydraulics at Santa Barbara, California, on January 11-14, 1983. The papers, currently being prepared, are "Natural Circulation Cooling Characteristics During Pressurized Water Reactor Accident Simulations," and "Pump Power as a Measure of Pump Inlet Density During Bubbly Two-Phase Flow."



## FOREIGN-FUNDED TASK SUMMARIES

Foreign funded projects are summarized in this section.

### Summary of Tasks Funded by Japan (JAERI)

The steady state RELAP5 computer code run for LOBI is 99% complete. The resolution of a steam generator level control problem is the only work which remains to complete the RELAP5 deck initialization for LOBI.

Work for the post-critical heat flux (CHF) heat transfer testing at the LOFT Test Support Facility (LTSF) continued. The test assembly was completed and made operational; hardware and data system problems were resolved. Professor Nete' and Dr. Sundaram from Lehigh University visited the facility to assist in the checkout of the test loop and the vapor superheat probes, which were developed at Lehigh for use in the post-CHF test section.

### Summary of Tasks Funded by Germany (FRG)

The report documenting calculations for LOFT Experiment L3-7 has received EG&G Idaho review and is ready for publication.

Work was performed for the F2 fuel rod pressure transducer temperature compensation. Proof-of-principle testing was concluded with satisfactory results. Algorithm derivation for the temperature compensation method was begun on the production transducers, and environmental testing of the system electronics was begun.

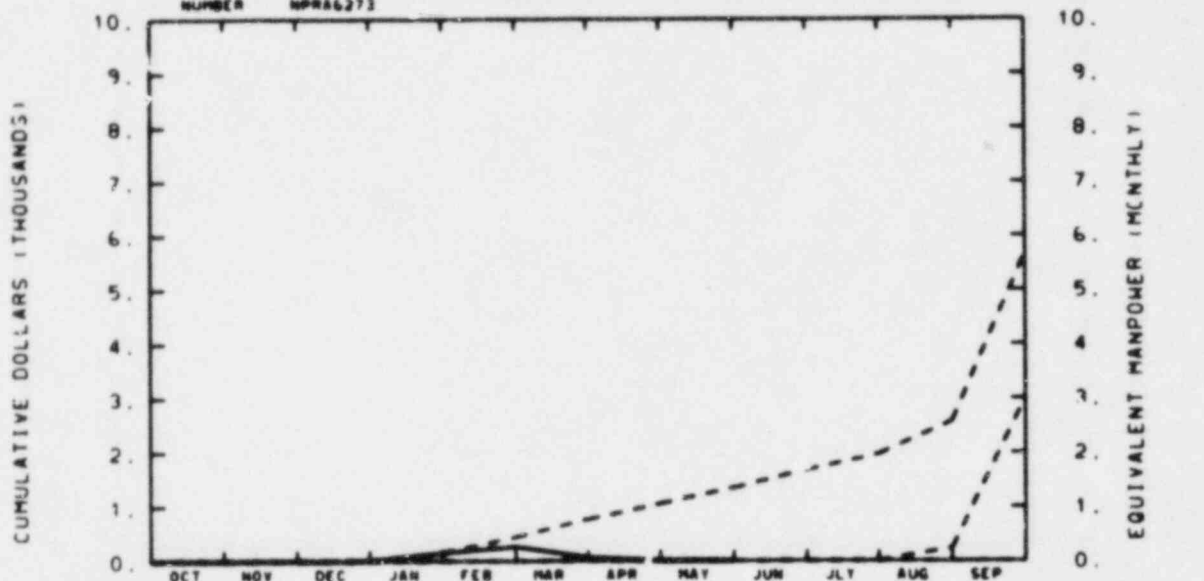
### Summary of Tasks Funded by France (CEA)

Twenty fuel rod plenum pressure transducer systems were delivered to EG&G Idaho. Design reviews were held for modifications to the LOFT facility to permit installing the temperature compensated electronics that will be used in conjunction with the pressure transducers. Procurement began for materials required for the LOFT facility modifications.

FOREIGN-FUNDED COST GRAPHS

EG&G IDAHO INC.  
AUSTRIAN FUNDS - 5A

NUMBER NPR6273



TOTAL PROGRAM

BUDGET	0	0	0	0	0	1	1	1	2	2	3	6
ACTUAL	0	0	0	0	0	0	0	0				

MATERIAL

BUDGET	0	0	0	0	0	0	0	0	0	0	0	3
ACTUAL	0	0	0	0	0	0	0	0				

MANPOWER

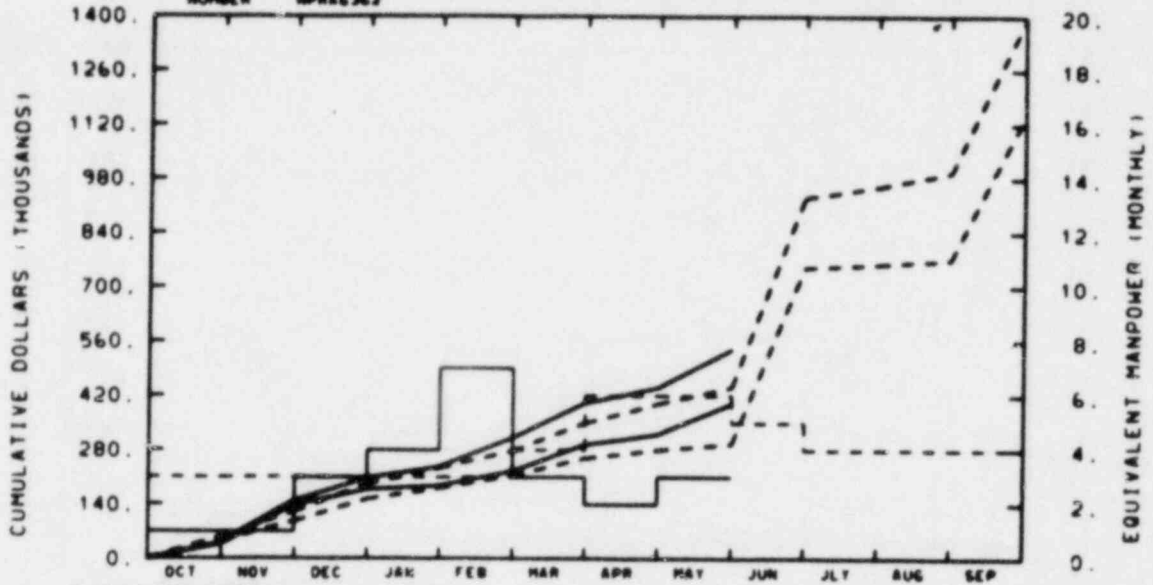
BUDGET	0	0	0	0	0	0	0	0	0	0	0	0
ACTUAL	0	0	0	0	0	0	0	0				

BUDGET  
-----  
ACTUAL  
\_\_\_\_\_

Travel charges are expected in June 1982 for the annual LOFT review tour to Europe and Austria. No underrun problem exists.

EG&G IDAHO INC.  
FRENCH FUNDS - 5F

NUMBER WPR46362



TOTAL PROGRAM

BUDGET	57	121	192	233	278	350	399	443	931	959	995	1292
ACTUAL	42	150	208	237	312	401	441	540				

MATERIAL

BUDGET	46	97	153	181	214	259	280	296	751	755	770	1143
ACTUAL	37	138	178	188	226	294	321	400				

MANPOWER

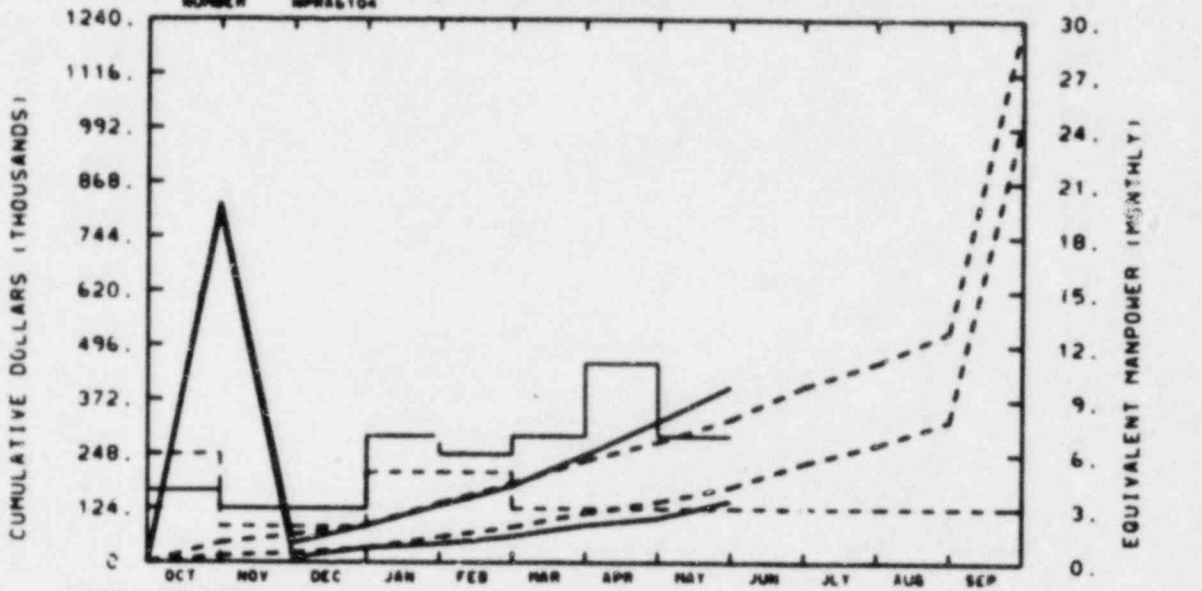
BUDGET	3	3	3	3	3	4	6	6	5	4	4	4
ACTUAL	1	1	3	4	7	3	2	2				

BUDGET  
-----  
ACTUAL  
\_\_\_\_\_

Charges were made to this account that should have been made to the capital equipment portion of the F2 fuel bundle task. The improper charges will be transferred to correct the indicated overrun.

EG&G IDAHO INC.  
GERMAN FUNDS - 5G

NUMBER NPR46104



TOTAL PROGRAM

BUDGET	45	64	86	136	181	234	276	328	403	457	528	1238
ACTUAL	818	45	85	131	175	247	322	403				

MATERIAL

BUDGET	15	23	33	59	82	113	140	173	229	270	325	1018
ACTUAL	802	11	34	44	60	86	102	142				

MANPOWER

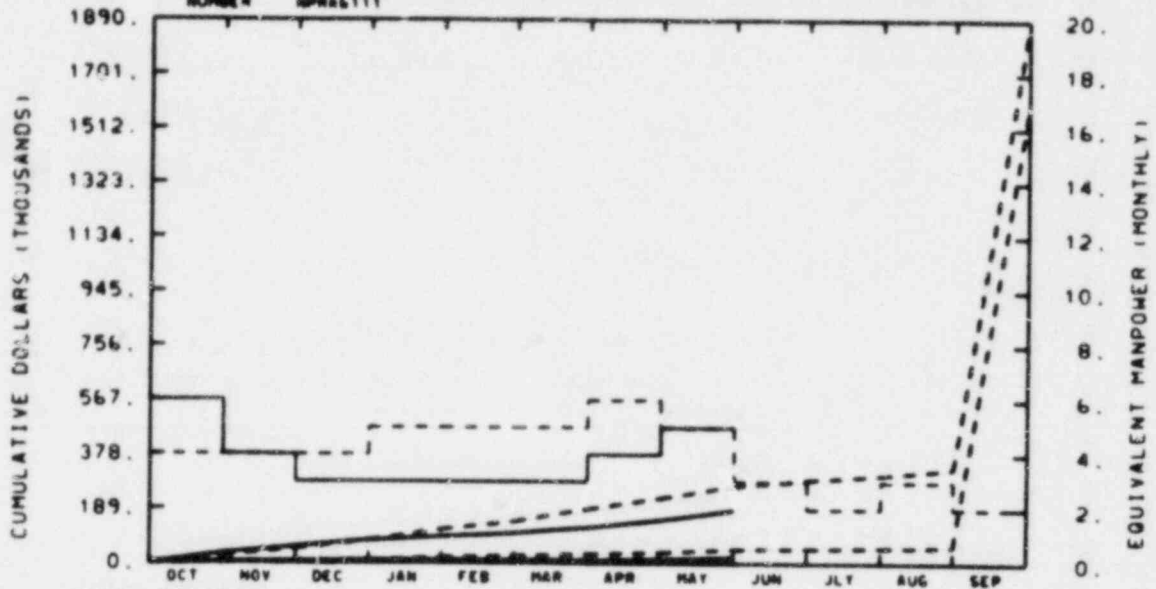
BUDGET	6	2	2	5	5	3	3	3	3	3	3	3
ACTUAL	4	3	3	7	6	7	11	7				

BUDGET - - - - -  
ACTUAL - - - - -

Charges were made to this account that should have been made to the capital equipment portion of the F2 fuel bundle task. The improper charges will be transferred to correct the indicated overrun.

EG&G IDAHO INC.  
 JAPANESE FUNDS - 5J

NUMBER N986111



TOTAL PROGRAM												
BUDGET	23	53	79	117	145	189	227	269	291	307	329	1892
ACTUAL	33	58	79	92	104	125	151	186				

MATERIAL												
BUDGET	3	6	9	21	25	32	39	49	53	55	59	1595
ACTUAL	3	7	11	11	11	11	15	22				

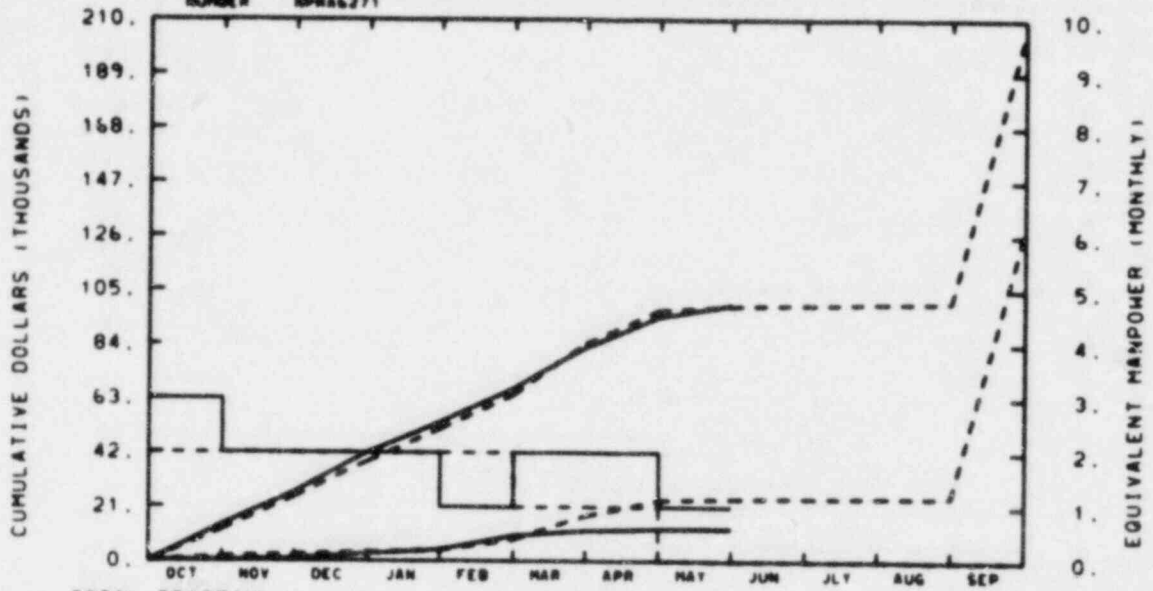
MANPOWER												
BUDGET	4	4	4	5	5	5	6	5	3	2	3	2
ACTUAL	6	4	3	3	3	3	4	5				

BUDGET  
 - - - - -  
 ACTUAL  
 \_\_\_\_\_

The testing portion of the post-CHF task was delayed due to higher priority work at the LOFT Test Support Facility (LTSF). A management review of the post-CHF task has indicated budget and shedule adjustment requirements which will be effected through Change Control Board (CCB) action.

EG&G IDAHO INC.  
 NETHERLANDS FUNDS - 5M

NUMBER NPRA6271



TOTAL PROGRAM

BUDGET	12	25	49	51	64	84	97	99	99	100	100	206
ACTUAL	14	27	42	54	67	83	95	99				

MATERIAL

BUDGET	2	3	3	4	8	18	24	24	24	25	25	130
ACTUAL	0	1	3	4	10	12	12	13				

MANPOWER

BUDGET	2	2	2	2	2	1	1	0	0	0	0	0
ACTUAL	3	2	2	2	1	2	2	1				

BUDGET  
 - - - - -  
 ACTUAL  
 \_\_\_\_\_

No significant variance.

TABLE 1. PLANNED LOFT EXPERIMENT SEQUENCE

Test ID	Commitment Date	Description
CV leak test	07/09/81 <sup>a</sup>	Required test of containment leak integrity.
L6-7/L9-2	07/31/81 <sup>a</sup>	Simulated turbine trip multiple failure continuation of L6-7.
L5-1	10/26/81 <sup>a</sup>	Intermediate size break (accumulator line).
L8-2	11/16/81 <sup>a</sup>	Core uncover at high decay heat level.
Replace A2 with F1	11/19/81 through 01/29/82 <sup>a</sup>	F1 center fuel pressurized to 350 psig.
L9-3	04/07/82 <sup>a</sup>	Anticipated transient without scram (ATWS) loss of feedwater.
L6-6	04/21/82 <sup>a</sup>	Boron dilution from cold shutdown.
L2-5	07/15/82	200% cold leg break at 50 MW to produce the worst probable core thermal-hydraulic conditions, without fuel damage.
L6-8	10/21/82	Three anticipated transients.
L9-4	11/18/82	ATWS.
Replace F1 with F2	02/23/83	F2 fuel bundle pressurized.
L2-6	03/24/83	200% cold leg break double-ended at 50 MW.
Initiate cold shutdown	09/29/83	In standby--cold without core.

a. Completed.



TABLE 2. FOREIGN-FUNDED ACCOUNTING AT END OF MAY 1982  
(thousands of dollars)

Participant	Total Funds Provided	Funds Spent (Completed Tasks)	Reserve	Spending Authorized (Current Tasks)
JAERI	7000	4725.0	1511.3	763.7 <sup>a</sup>
FRG	6260	4610.3	629.3	1020.4 <sup>a</sup>
CEA	2000	47.5	347.4	1605.1 <sup>a</sup>
ECN	640	372.0	98.7	169.3 <sup>a</sup>
FZS	<u>147</u>	<u>141.3</u>	<u>0</u>	<u>5.7</u>
Total	16047	9895.8	2586.7	3564.2 <sup>a</sup>

a. Includes FY-1983 funds identified for the baseline (Q82-2-0), but spending of those funds has not yet been authorized.

TABLE 3. FOREIGN-FUNDED TASK SUMMARY AT END OF MAY 1982  
(thousands of dollars)

<u>Task Description</u>	<u>Spending Authorized</u>	<u>Spending to Date</u>	<u>Budget to Date</u>	<u>Scheduled Completion</u>
<u>JAERI Tasks</u>				
5J12211 JAERI Management (FY-1982)	58.0	39.4	29.1	September 1982
5J12211 JAERI MANAGEMENT (FY-1983) <sup>a</sup>	25.4	0	0	September 1983
5J12212 JAERI Delegate Support (FY-1982)	19.0	2.8	5.2	September 1982
5J12212 JAERI Delegate Support (FY-1983) <sup>a</sup>	16.0	0	0	September 1983
5J12223 International Program Evaluation (FY-1982)	64.0	16.5	25.3	September 1982
5J12223 International Program Evaluation (FY-1983) <sup>a</sup>	99.2	0	0	September 1983
5J12231 Post-CHF Phase II	151.0	52.6	147.7	August 1982
5J12232 Post-CHF Phase I	235.1	235.2	235.2	November 1982
5J12233 Density for Post-CHF	44.6	40.1	27.8	August 1982
5J13321 Display Evaluation	<u>51.4</u>	<u>51.0</u>	<u>51.4</u>	Completed
Total	763.7	437.6	521.7	
<u>FRG Tasks</u>				
5G12E11 Experimental Analysis	255.4	255.4	255.4	Completed
5G12211 FRG Management (FY-1982)	37.0	22.9	26.9	September 1982
5G12211 FRG Management (FY-1983) <sup>a</sup>	25.4	0	0	September 1983
5G12212 FRG Delegate Support (FY-1982)	18.0	12.9	8.2	September 1982
5G12212 FRG Delegate Support (FY-1983) <sup>a</sup>	15.9	0	0	September 1983
5G12223 International Program Evaluation	70.0	69.8	70	Completed
5G12512 Facility Response Study	104.0	101.4	102.3	May 1982
5G12513 LOFT Scaling	52.0	41.5	50.3	September 1982
5G13311 Temperature Compensation	<u>442.7</u>	<u>269.2</u>	<u>189.7</u>	September 1982
Total	1020.4	773.1	702.2	

TABLE 3. (continued)

<u>Task Description</u>	<u>Spending Authorized</u>	<u>Spending to Date</u>	<u>Budget to Date</u>	<u>Scheduled Completion</u>
<u>CEA Tasks</u>				
5F12211 CEA Management (FY-1982)	37.0	20.4	17.7	September 1982
5F12211 CEA Management (FY-1983) <sup>a</sup>	24.0	0	0	September 1983
5F12212 CEA Delegate Support (FY-1982)	18.0	8.6	6.6	September 1982
5F12212 CEA Delegate Support (FY-1983) <sup>a</sup>	15.9	0	0	September 1983
5F13N12 F2 Fuel Bundle	369.4	359.9	369.4	Completed
5F13311 Temperature Compensation	649.5	202.6	95.0	September 1982
5F14N21 Fuel Instrumentation	<u>491.3</u>	<u>469.5</u>	<u>475.0</u>	July 1982
Total	1605.1	1061.0	963.7	
<u>ECN Tasks</u>				
5N12211 ECN Management (FY-1982)	14.0	7.7	6.0	September 1982
5N12211 ECN Management (FY-1983) <sup>a</sup>	14.7	0	0	September 1983
5N12226 Startup and Operational Test	78.1	76.8	78.1	May 1982
5N12227 Nuclear/Electric Rod	<u>62.5</u>	<u>62.6</u>	<u>62.5</u>	Completed
Total	169.3	147.1	146.6	
<u>F25 Tasks</u>				
5A12211 F25 Management	<u>5.7</u>	<u>0</u>	<u>1.1</u>	September 1982
Total	5.7	0	1.1	

a. FY-1983 funding has been identified for the baseline (Q82-2-0), but spending is not yet authorized.