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PDR

JULY 1982 LOFT PROGRESS REPORT

TO FOREIGN PARTICIPANTS

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Operated by the U.S. Department of Energy

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

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ACCOMPLISHMENTS

General Overview of LOFT Program

The primary focus of this month's activities has been in preparation for the LOFT Experiment L6-8 series. Three anticipated transients are planned. The Experiment L6-8 series is scheduled to start on a target date of August 25, 1982, and be completed by September 1, 1982.

LOFT Program Activities

Work and Analyses for Experiment Preparation

The experiment design document (EDD) for Experiment L6-8 was revised and transmitted to the Department of Energy-Idaho Office (DOE-ID) for approval.

The experiment operating specification (EOS) for Experiment L6-8 was issued.

Work in the work window for the experiment operating procedure (EOP) for Experiment L6-8 was begun including control rod drive mechanism modifications, hot leg elbow removal, hot leg warmup line blind flange installation, miscellaneous valve work, and electrical work.

In-service inspection, plant modification, and surveillance testing required the Experiment L6-8 EOP was initiated.

The safety analysis calculations for Experiment L6-8 have been completed. Documentation has been drafted and is in LOFT management review.

Calculations of the required shutdown time following an inadvertent scram for Experiment L6-8B-2 were completed. This was necessary because the preconditioning of the control rod worth increased the worth beyond that analyzed for the control rod withdrawal accident upon startup following a scram. The required wait time to allow xenon decay (and hence, rod worth decay) is 25 hours.

The preliminary draft of the experiment safety analysis (ESA) document for Experiment L6-8 was completed.

The calculation of an iso-critical curve for the shutdown analysis for Experiment L6-8D was completed.

Modification of the LOFT control rod drive system has been completed. The modification permits a rod withdrawal rate increase to 24 in./min.

Plant reconfiguration work for Experiments L6-8 and L9-4, which included blind flanging the blowdown system hot leg to remove that volume from the reactor, is mostly complete. Only minor pipe support work remains to be completed.

The minimum pressurization temperature relief valve branch line reconfiguration is nearing completion. Only pipe support work remains to be completed.

Preliminary requirements for LOFT experimental control system termination criteria and real-time display for Experiment L2-6 were transmitted to the LOFT Measurement and Control System Branch.

Scoping reactor physics calculations have been completed to estimate the power increase and power distribution as a functon of UO_2 enrichment for a cluster of 24 rods (5 x 5 array, central guide tube) in the center LOFT fuel assembly. The results indicate a peaking factor increase as high as about 5 (93% enriched).

Initial radiation heat transfer calculations were performed on a 9 x 9 rod array of LOFT rods to determine whether transient fuel temperatures of 1473 to 2273 K could be achieved on selectively enriched fuel rods while limiting nominal LOFT rods to temperatures less than 1100 K. The results indicate a peak rod temperature of 1600 K could be achieved with 93% enriched fuel rods, although a thermal radiation shield will be necessary. These results were used in the Munich Consortium meetings related to fission product experiments. Thermal Engineering is working on potential designs of a radiation shield.

A design review was held on the F2 fuel module, and drafting was completed on the assembly drawings. Fuel Handling Procedure (FHP) 315 for assembly of the F2 module was completed and typed for final review. A site work release (SWR) was written for load testing of the assembly column and preparation of Building TAN-615 for fuel module assembly.

Construction of the sampling tool for sampling of the LOFT spent ion-exchanger resins was completed. A spectrum analysis of the spent resins is required prior to shipping the resins to the Waste Management Facility.

The design for modifying the blowdown suppression tank (BST) header decontamination system was completed. Operational concerns were identified by facility personnel, and modifications have been engineered to resolve those concerns.

An operational checkout of the waste gas processing system (WGPS) vault ventilation system was successfully performed. The vacuum capability of the ventilation system was verified to be within specified limits.

Experiment Data Instrumentation Preparation

Four ungrounded junction cladding thermocouples were selected for installation into the F2 fuel bundle for in-service measurement of insulator degradation.

Battelle Pacific Northwest Laboratories completed attachment of 49 of 64 thermocouples to fuel rod cladding tubes for the F2 fuel bundle.

Exxon Nuclear Company completed assembly of 41 of 58 instrumented fuel rods for the F2 fuel bundle.

Final shipment of internal cladding, grounded junction thermocouples was made to Exxon Nuclear Company in Richland, Washington.

Ungrounded junction thermocouples to be used for insulation resistance measurements in the F2 fuel bundle were fabricated and delivered to Exxon Nuclear Company in Richland, Washington.

Design reviews were held for the remote calibration system and the plenum pressure instrument system for the F2 fuel bundle.

The pulsed neutron activation generators were rebuilt at Sandia Laboratories and were returned and reinstalled in the LOFT system. Operational tests indicated an excellent neutron output.

A spare modular drag disc-turbine transducer (MDTT) rake has been fabricated and assembled. This rake is available for use in the intact loop of the LOFT reactor.

Posttest Analyses and Documentation

Qualification of Experiment L2-5 data was completed, and a LOFT data report (LDR) on the Experiment L2-5 sequence of events was completed and issued.

Summary results of a preliminary analysis of the potential thermal effects caused by injecting emergency core coolant (ECC) on the cold leg piping and downcomer walls which were observed in several LOFT experiments were sent to the Nuclear Regulatory Commission (NRC) to assist their investigations of pressurized thermal shock.

Automated data qualification (ADQ) software problems identified during Experiment L2-5 were corrected.

Topical Reports, Studies, and Presentations

Analysis of water phase separation in a pipe tee was performed in support of proposed testing in the LOFT Test Support Facility (LTSF) for the Shell Oil Company. The results were presented to representatives of the Shell Oil Company and LTSF, in support of LTSF future work planning.

ORIGEN2 computer code calculations and additional information were obtained in support of the Consortium fission product experiment project. Results of the calculations show that a transient is only necessary to produce additional fission products when a steady state irradiation history of low rod power is carried out ($\leq$12 kW/ft). When high rod power (16 to 23 kW/ft) steady state conditions prevail for a moderate period of time ($\sim$100 h), then a transient will not produce many additional fission products. This occurs because a very large fraction of the rod's inventory of fission products is already in the rod gap (for the high rod power case) and the additional increase of 1 to 2% due to the transient does not produce an important increase.

Interim Report EGG-LOFT-5555, "Evaluation of Analytical Capability to Predict Cladding Quench During a PWR Large Break Accident," was approved and will be issued.

LOFT Highlights Number 7 on the LOFT safety parameter display system was published.

Loss-of-coolant accident (LOCA) simulation experiments in the National Research Universal (NRU) reactor were further studied and compared to predicted results to assess current code capability to predict rod deformation and time of failure. This study was performed to assess code capabilities to predict the Experiment L2-6 fuel rod burst.

FOREIGN FUNDED TASK SUMMARIES

Foreign funded projects are summarized in this section.

Summary of Tasks Funded by Japan (JAERI)

The RELAP5 input deck was completed in preparation for performing a RELAP5 analysis of the Loop Blowdown Investigation (LOBI) facility for the Pre-Prediction Exercise (PREX) transient, Test A1-04.

Production testing in post-critical heat flux (post-CHF) test section at the LTSF was performed and is 75% complete.

Change Control Board (CCB) action approved funding authorization for JAERI management and JAERI delegate support for FY-1983. The CCB also approved the realignment of LOFT operating tasks to JAERI funding ($1,464,600 in FY-1982 and $998,100 in FY-1983).

Summary of Tasks Funded by Germany (FRG)

All instrumentation has been delivered and algorithm derivations have been completed for the temperature compensated pressure measurement instruments to be installed in the F2 fuel rods. This task is essentially complete except for the continuing consulting support which the Hanford Engineering Development Laboratory (HEDL) is providing to address questions or problems which may arise during installation of the instrumentation in the fuel rods.

The LOFT CCB approved the realignment of LOFT operating tasks to German funding ($608,300 in FY-1982 and $2,024,000 in FY-1983), and approved funding authorization for the FRG management and delegate support for FY-1983.

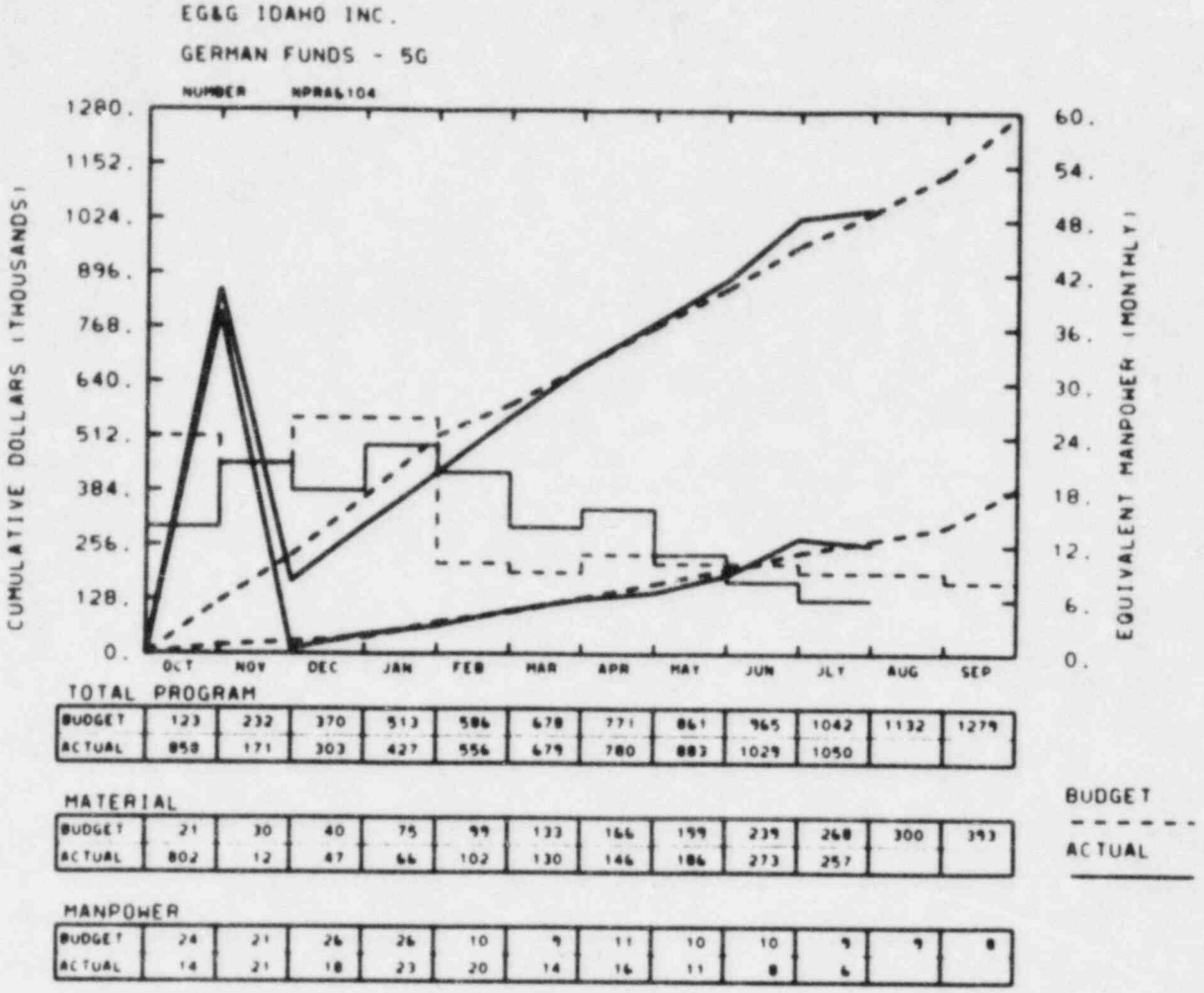
Summary of Tasks Funded by the Netherlands (ECN)

The $160K contribution from the Netherlands has been received by the NRC, and will be placed in the reserve account upon receipt from NRC and DOE-ID. The CCB approved realignment of LOFT operating work scope to ECN funding support ($418,000 in FY-1983). The Netherlands management task for FY-1983 was approved by the CCB.

Summary of Tasks Funded by Austria (FZS)

The $40K contribution from Austria has been received and will be placed in the Austrian reserve account.

FOREIGN-FUNDED COST GRAPHS



TOTAL PROGRAM

BUDGET	123	232	370	513	586	678	771	861	965	1042	1132	1279
ACTUAL	858	171	303	427	556	679	780	883	1029	1050		

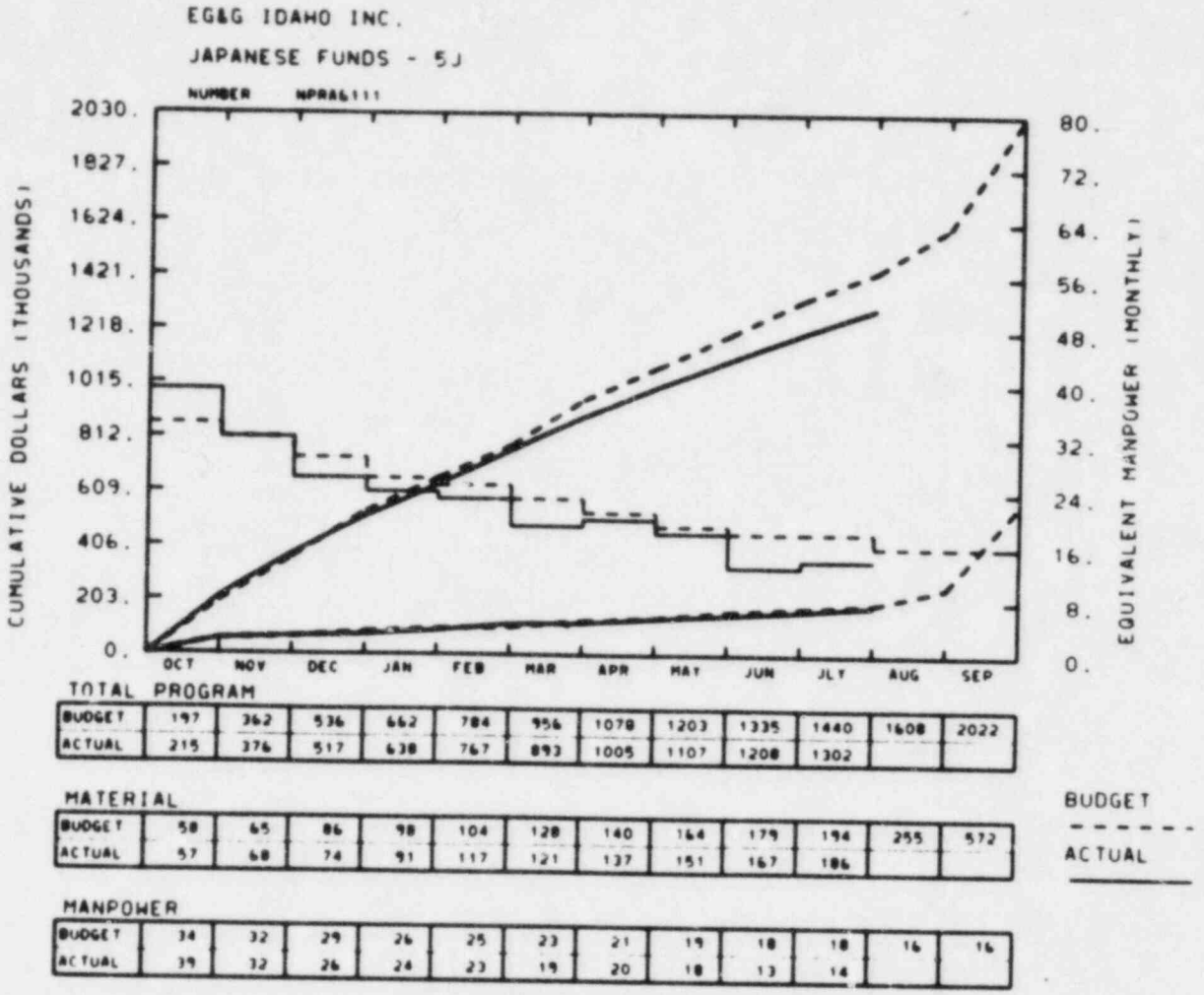
MATERIAL

BUDGET	21	30	40	75	99	133	166	199	239	268	300	393
ACTUAL	802	12	47	66	102	130	146	186	273	257		

MANPOWER

BUDGET	24	21	26	26	10	9	11	10	10	9	9	8
ACTUAL	14	21	18	23	20	14	16	11	8	6		

The German funded work for F2 fuel rod pressure transducer temperature compensation is 10% over budget, but this is due to a similar amount of the task expenses being charged ahead of schedule; therefore, no overrun problem exists. Some minor variances exist on a few tasks, and some discrepancies remain on the recent tasks transferred from operating to German funds. No year-end overrun is expected.



TOTAL PROGRAM

BUDGET	197	362	536	662	784	956	1078	1203	1335	1440	1608	2022
ACTUAL	215	376	517	638	767	893	1005	1107	1208	1302		

MATERIAL

BUDGET	58	65	86	98	104	128	140	164	179	194	255	572
ACTUAL	57	68	74	91	117	121	137	151	167	186		

MANPOWER

BUDGET	34	32	29	26	25	23	21	19	18	18	16	16
ACTUAL	39	32	26	24	23	19	20	18	13	14		

The indicated underrun is a result of a mismatch between the budget schedule and the actual schedule for the postcritical heat flux (post-CHF) task analysis which has been delayed due to scheduling priorities at the LTSF. Budget and schedule adjustments for the post-CHF task have been submitted for CCB review at the September meeting.

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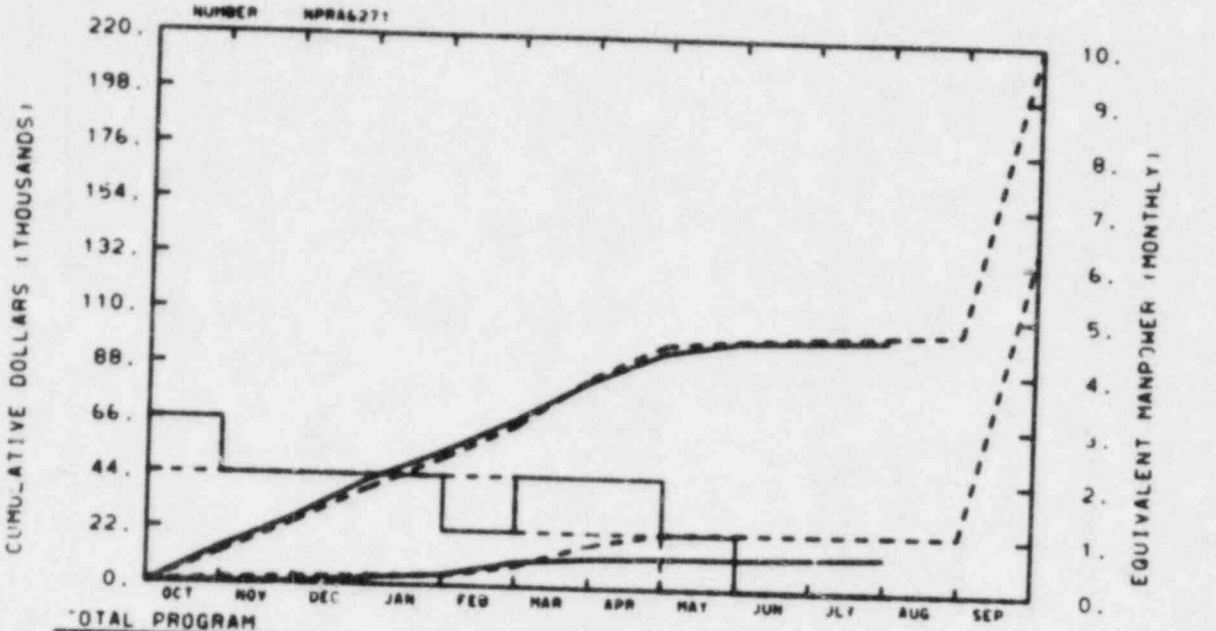
NETHERLANDS FUNDS - 5N



TOTAL PROGRAM

BUDGET	12	25	39	51	64	84	98	100	102	103	104	220
ACTUAL	14	27	42	54	67	83	95	99	100	101		

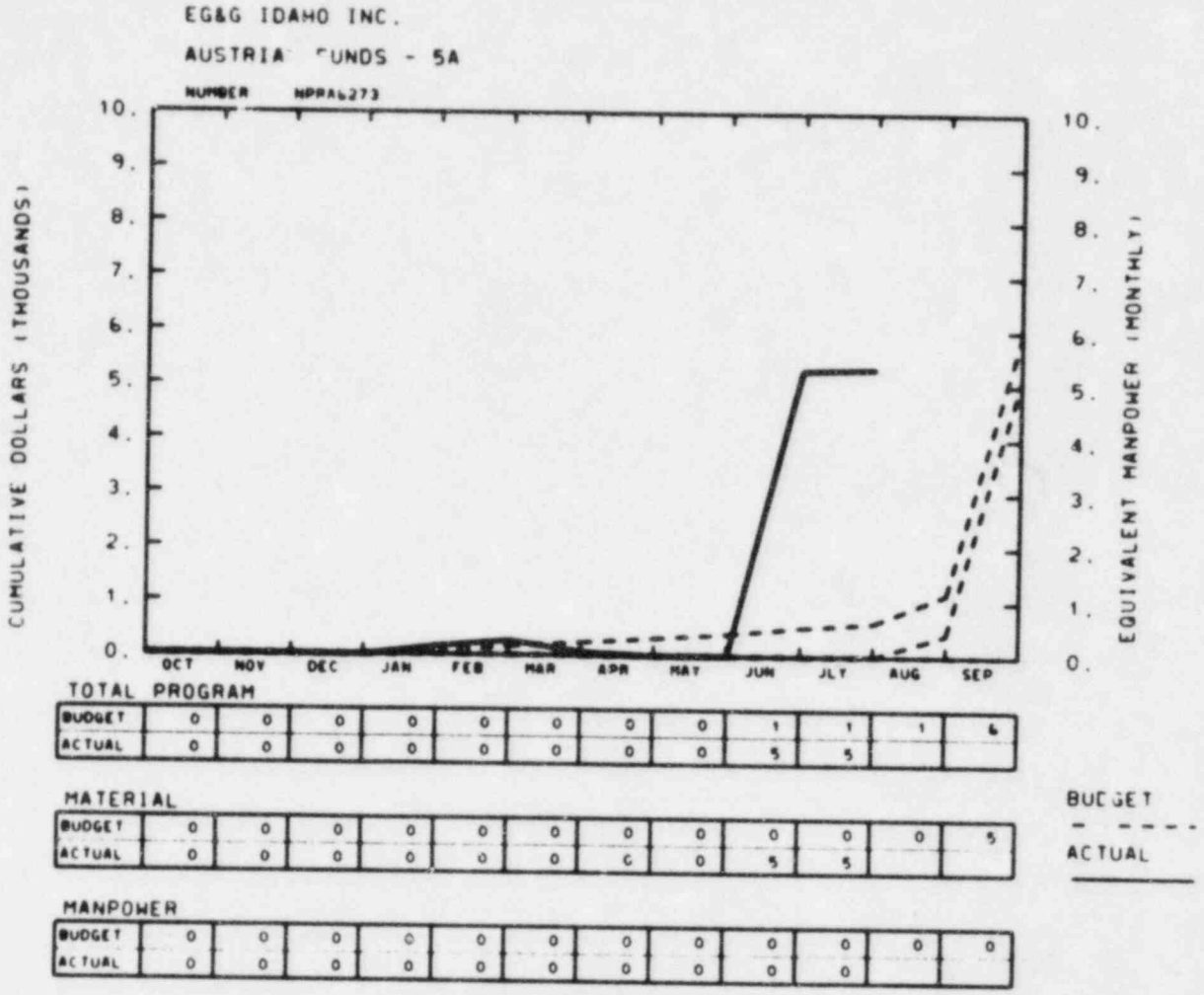
MATERIAL

BUDGET	2	3	3	4	8	17	22	23	23	23	23	137
ACTUAL	0	1	3	4	10	12	12	13	14	14		

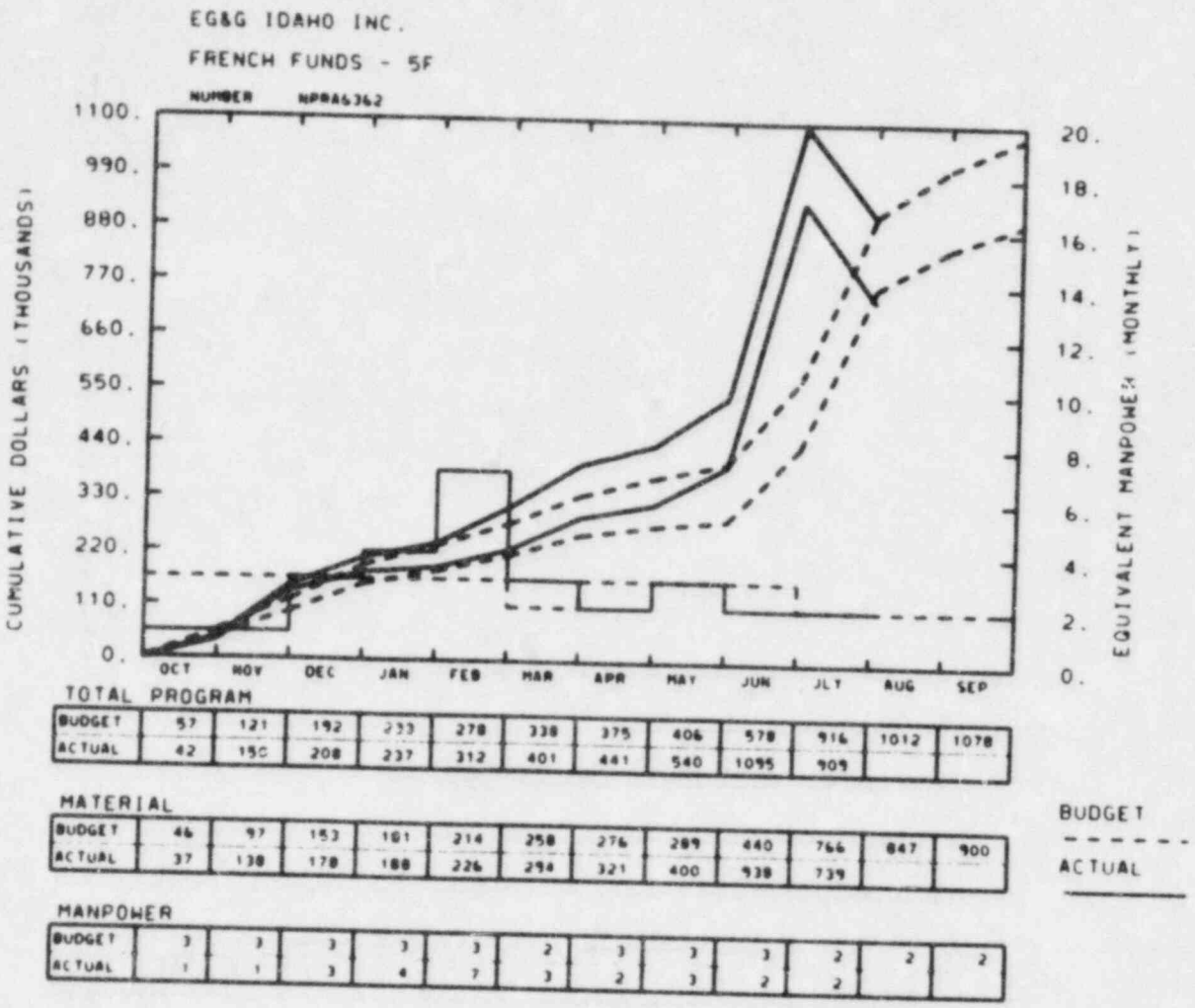
MANPOWER

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

No significant variance.



This account was used in June for NRC travel to Europe, including Austria, in support of the NRC-LOFT team annual information exchange. No overrun is anticipated, as these funds were being held for this trip.



The cost transfer was effected for the KAMAN subcontract whose costs were inadvertently charged to French funds and costs transferred to LOFT capital equipment funds. This action reduced the previously indicated overrun. No significant variance now exists. Rollovers from LOFT operating accounts have not yet been shown on this cost graph.

TABLE 1. PLANNED LOFT EXPERIMENT SEQUENCE

Test ID	Commitment Date	Description
CV leak test	07/09/81[a]	Required test of containment leak integrity.
L6-7/L9-2	07/31/81[a]	Simulated turbine trip multiple failure continuation of L6-7.
L5-1	10/26/81[a]	Intermediate size break (accumulator line).
L8-2	11/16/81[a]	Core uncovery at high decay heat level.
Replace A2 with F1	11/19/81 through 01/29/82[a]	F1 center fuel pressurized to 350 psig.
L9-3	04/07/82[a]	Anticipated transient without scram (ATWS) loss of feedwater.
L6-6	04/21/82[a]	Boron dilution from cold shutdown.
L2-5	06/16/82[a]	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 JULY 1982
(thousands of dollars)

Participant	Total Funds Provided	Funds Spent (Completed Tasks)	Reserve[a]	Spending Authorized (Current Tasks)
JAERI	7,000	4,776.4	<953.7>	3,177.3
FRG	6,260	5,039.7	<2,004.7>	3,225.0
CEA	2,000	908.2	<996.4>	2,088.2
ECN	640	512.6	<319.3>	446.7
FZS	147	141.3	0	5.7
Total	16,047	11,378.2	<4,274.1>	8,942.9

a. The negative balances shown in the "Reserve" column are used to balance this table to the total funds provided and do not reflect an overrun in actual spending against the Reserve. Future contributions by the respective countries will offset these negative Reserve balances.

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

Task Description	Spending Authorized	Spending to Date	Budget to Date	Scheduled Completion
JAERI Tasks				
5J12211 JAERI Management (FY-1982)	61.4	42.8	39.8	September 1982
5J12211 JAERI Management (FY-1983)	25.4	0	0	September 1983
5J12212 JAERI Delegate Support (FY-1982)	15.6	5.8	6.6	September 1982
5J12212 JAERI Delegate Support (FY-1983)	18.3	0	0	September 1983
5J12223 International Program Evaluation (FY-1982)	64.0	32.4	43.3	September 1982
5J12223 International Program Evaluation (FY-1983)	99.2	0	0	September 1983
5J12231 Post-CHF Phase II	151.0	81.2	151.0	March 1983
5J12232 Post-CHF Phase I	235.1	237.6	235.1	Completed
5J12233 Density for Post-CHF	44.6	41.0	34.7	September 1982
5332M11 DAVDS Support	564.7	241.6	260.9	September 1983
5332N21 Flow Measurements	611.0	413.7	447.9	September 1983
5332M22 Density Measurements	245.8	89.7	93.3	September 1983
5332M23 Pressure Measurements	602.2	248.0	257.4	September 1983
5332M25 Electrical and Test Support	160.6	68.6	71.3	September 1983
5332M31 Fuel Rod Instrumentation	88.4	0	0	September 1983
5332M32 Thermocouple Development	82.8	0	0	September 1983
5332M33 PNA Applications	76.8	0	0	September 1983
5332M37 Diagnostic Instrumentation	30.4	0	0	September 1983
Total	3177.3	1502.4	1641.3	
FRG Tasks				
5G12211 FRG Management (FY-1982)	40.5	27.8	33.1	September 1982
5G12211 FRG Management (FY-1983)	25.4	0	0	September 1983

TABLE 3. (continued)

Task Description		Spending Authorized	Spending to Date	Budget to Date	Scheduled Completion
FRG Tasks (continued)					
5G12212	FRG Delegate Support (FY-1982)	14.5	14.7	9.8	September 1982
5G12212	FRG Delegate Support (FY-1983)	17.6	0	0	September 1983
5G12513	LOFT Scaling	52.0	41.5	50.6	September 1982
5G13311	Temperature Compensation	442.7	376.1	332.0	September 1982
5G53957	Fuel Handling Documentation and Administration	279.0	199.1	228.6	September 1982
5553985	Post-L8-2 Fuel Change A2 to F1	329.3	333.8	329.3	September 1982
5G53986	F2 Fuel Change F1 to F2	252.7	0	0	September 1983
5G53987	Post-L2-6 Core Removal	484.7	0	0	September 1983
5G46221	Deficiencies, ODRs and LTRs	766.0	0	0	September 1983
5445252	L2-6 Test Support	354.1	0	0	September 1983
5G46231	ISI	166.5	0	0	September 1983
Total		3225.0	993.0	983.4	
CEA Tasks					
5F12211	CEA Management (FY-1982)	40.9	29.7	29.2	September 1982
5F12211	CEA Management (FY-1983)	24.0	0	0	September 1983
5F12212	CEA Delegate Support (FY-1982)	14.1	9.6	8.4	September 1982
5F12212	CEA Delegate Support (FY-1983)	15.9	0	0	September 1983
5F13311	Temperature Compensation	649.5	566.7	538.4	September 1982
5117E21	Nuclear versus Electric Rod Study	221.6	59.9	74.5	September 1983
5335XX	LOFT Data Processing (All)	741.9	0	0	September 1983
5115E31	Quick Look Reports	210.2	119.7	115.1	September 1983
5114EG2	L2-6 Specification and Coverage	170.1	56.4	65.7	September 1983
Total		2088.2	842.0	831.3	

TABLE 3. (continued)

Task Description	Spending Authorized	Spending to Date	Budget to Date	Scheduled Completion
ECN Tasks				
5N12211 ECN Management (FY-1982)	14.0	7.7	10.0	September 1982
5N12211 ECN Management (FY-1983)	14.7	0	0	September 1983
5771611 Operations Support Training	67.6	0	0	September 1983
5772621 LOFT Test Section	159.0	0	0	September 1983
5777671 LOFT Electrical Maintenance	191.4	0	0	September 1983
Total	446.7	7.7	10.0	
FZS Tasks				
5A12211 FZS Management	5.7	5.3	0.6	September 1982
Total	5.7	5.3	0.6	