July 25, 1980

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SECY-80-349

INFORMATION REPORT

For: The Commissioners

From: Robert J. Budnitz, Director
Office of Nuclear Regulatory Research

Thru: Executive Director of Operations

Subject: SEMIANNUAL REPORT TO THE COMMISSION ON THE 3D PROGRAM COST AND SCHEDULE

Purpose: To inform the Commission (as requested by memo dated December 7, 1978, commenting on SECY-78-594) of the cost and schedule status for the 3D program.

Discussion: The Official Agreement on Research Participation and Technical Exchange Between the Federal Minister for Research and Technology of the Federal Republic of Germany (BMFT), the Japan Atomic Energy Research Institute (JAERI) and the United States Nuclear Regulatory Commission (USNRC) on a Coordinated Analytical and Experimental Study of the Thermohydraulic Behavior of Emergency Core Coolant During the Refill and Reflood Phase of a Loss-of-Coolant Accident in a Pressurized Water Reactor (3D Program), as finalized in SECY 79-391, was signed by NRC Chairman John Ahearne, Minister Volker Hauff of the Federal Republic of Germany and by President Hiroshi Murata of the Japan Atomic Energy Research Institute on April 18, 1980.

Status:

The last of the Core I 3D ECC reflood and refill tests in the JAERI Cylindrical Core Test Facility (CCTF) was completed in May 1980. The CCTF has been shut down until January 1981 (when a few more refill tests are to be run with Core I) to provide a window for erection work on the Slab Core Test Facility (SCTF) which is being constructed in the same high-bay area of the JAERI LSRT building. The first five CCTF Core I quick-look test reports have been received and analyzed by NRC. The heater bundle peak clad temperature, quench pattern and behavior during reflood tests in the 2000-rod large-scale CCTF systems effects tests are in good agreement with USNRC FLECHT

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test results obtained with a 100-rod scaled systems effects test facility, as well as with preliminary calculations obtained with the TRAC-PD2 code. The USNRC-supplied instrumentation (spool pieces, LLD's, etc.) has proven to be essential in analysis of the data in order to provide unambiguous mass balance information.

Final agreement was reached in May 1980 between NRC, JAERI (and its contractor, IHI) and the NRC contractors (the DOE laboratories ORNL, INEL and LASL) on the selection, location and delivery of all the USNRC-provided instrumentation for the SCTF Core I. The in-core guide tube impedance probes and liquid level detectors (LLD), the cold leg and vent pipe spool pieces and the upper plenum fluid distribution grid (FDG) for this facility were delivered to Japan in May/June 1980. Fabrication is in progress on the hot leg spool pieces, downcomer FDG, video-optical probe and remaining NRC instruments to be delivered to Japan in the period between July 1980 and January 1981. The design of instrumentation for CCTF Core II has been started.

The 340-rod PKL systems effects test facility in Germany was redirected by the BMFT last summer on the basis of recommendations from the 3D Program to investigate events leading to core uncovery in PWR's during small breaks with natural circulation. The NRC had the spool pieces and turbines, which we supplied last year for PKL Core II, modified in order to measure the low flows anticipated in the natural circulation tests in the extended test program with PKL Core I. In addition, NRC loaned the FRG a pulse neutron activation (PNA) device built by Sandia (based on an Argonne National Laboratory design) for measuring more accurately the extremely low loop velocities.

The natural circulation small break and core uncovery tests in PKL Core I were completed in June 1980 and the facility shut down in preparation for installing Core II later this year. The preliminary quick-look test results have been supplied to the NRC. Detailed test reports are to be issued later.

The PKL steady-state natural circulation tests at 0.75% (equivalent PWR) full power demonstrated that the heater bundle could be adequately cooled by single and two-phase primary natural circulation flow over a range of primary steam voids up to 30%. At high steam void fraction in the primary system, the top of the core bundle was uncovered but still the bundle was adequately cooled by reflux steam/water heat transfer to the steam generator. Transient tests, at 1.3% (equivalent PWR) full power with small and medium-size breaks and ECC injection and secondary heat removal, exhibited similar cooling of the core with single and two-phase natural circulation and reflux boiling occurring with increasing break size. In all the tests, the heater bundle was adequately cooled by either natural circulation or reflux boiling action.

The German UPTF system design was reviewed and accepted by a FRG review group in a meeting in Germany during May 1980. Because an effort is being made by the BMFT to obtain a fixed-price contract for the facility construction, the award of UPTF fabrication contracts will be delayed into early CY 1981 and hence delay UPTF construction completion.

Schedule:

The current 3D test facility schedules are given in Figure 1. There is no significant change in the JAERI CCTF and SCTF schedules. However, the start of testing in the German UPTF facility will now be delayed by 2 years to January 1984. This will have an impact on the NRC 3D Program funding needs as discussed below.

The delivery of 3D instrumentation is on schedule matching the JAERI facility requirements. The milestones for this are shown in Figure 2. The only effort currently behind schedule is that associated with the TRAC CCTF post-test analysis at LASL. LASL has experienced difficulty in getting acceptable predictions with TRAC-P1A. LASL is working on an improved version of TRAC PD-2, which is expected to resolve this problem.

Costs:

The 3D budget projection and expenditures for this fiscal year up to and thru May 1980 are shown in Figure 3. The expenditures of all the contractors are within baseline budget agreements. A cost underrun is anticipated in FY 80 because of (1) material purchase commitments for which funds are yet to be costed, and (2) the deferral of the start of UPTF instrumentation design and fabrication because of the slip in the German facility schedule.

Impact on 3D Cost Estimate From UPTF Schedule Slippage

The German UPTF schedule was initially delayed last fall while FRG Government approval for the increased costs of changing the UPTF facility to full scale was sought. Since FRG Ministerial approval of the increased German 3D budget in January 1980, the German program is incurring additional delays in selecting a construction contractor. As a result, testing in UPTF is not expected to start until January 1984, approximately 2 years later than originally scheduled. The impacts on NRC's 3D estimated costs due to this delay will be:

(1) To defer $1.6 million of the baseline estimated costs in FY 80 to later years, and

(2) To increase the 3D estimated overall requirements by about $3.4 million in and after FY 83.

A preliminary 3D cost estimate is shown in Figure 4. A more accurate estimate will be submitted for the Commission's approval after the exact German UPTF schedule is established in the coming July 3D Coordination Meeting at Munich.

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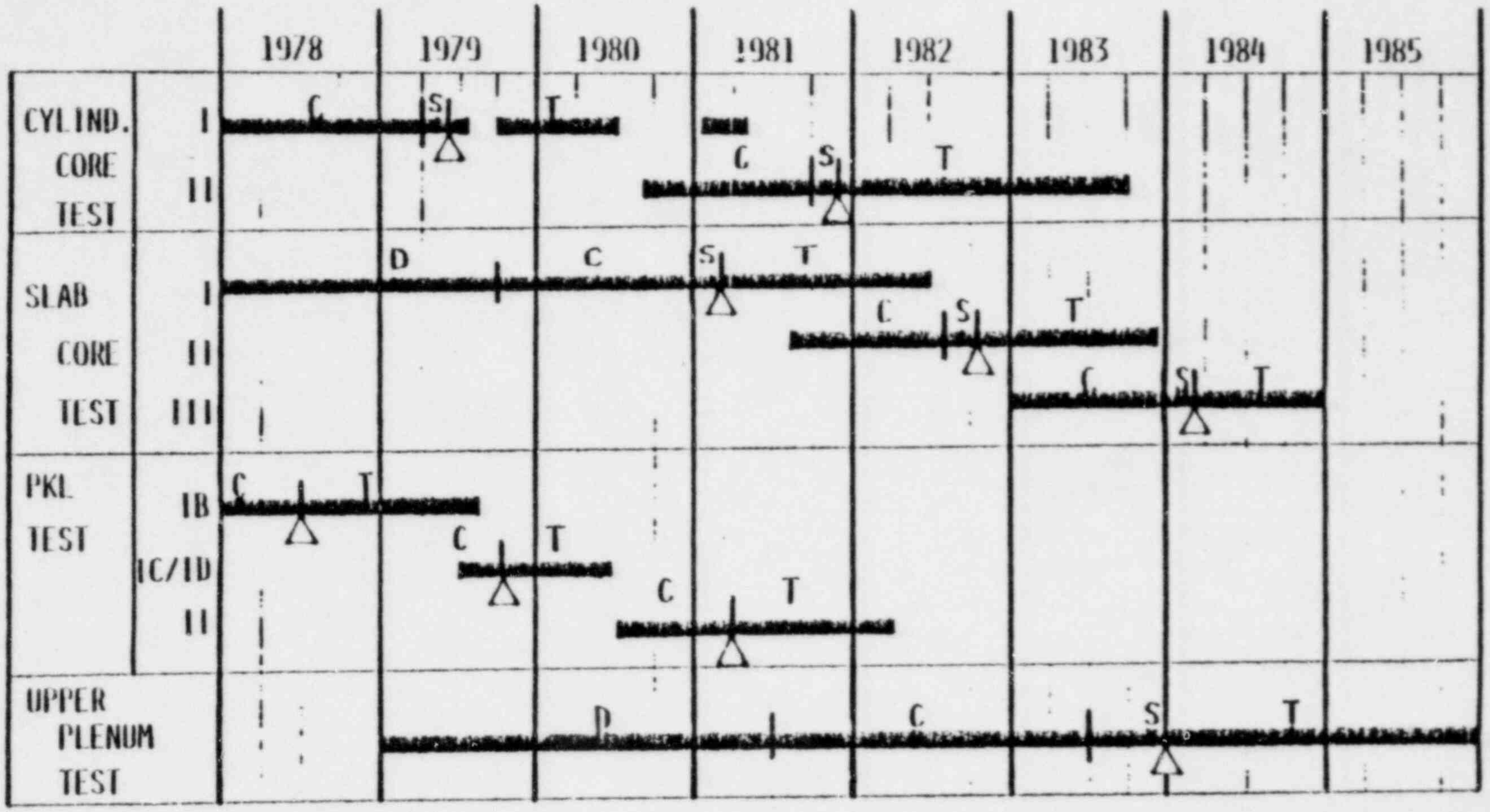
Robert J. Budnitz, Director
Office of Nuclear Regulatory Research

Enclosures:
Figures 1, 2, 3, & 4

2D/3D TEST FACILITY SCHEDULE

CALENDAR YEAR



D = DESIGN

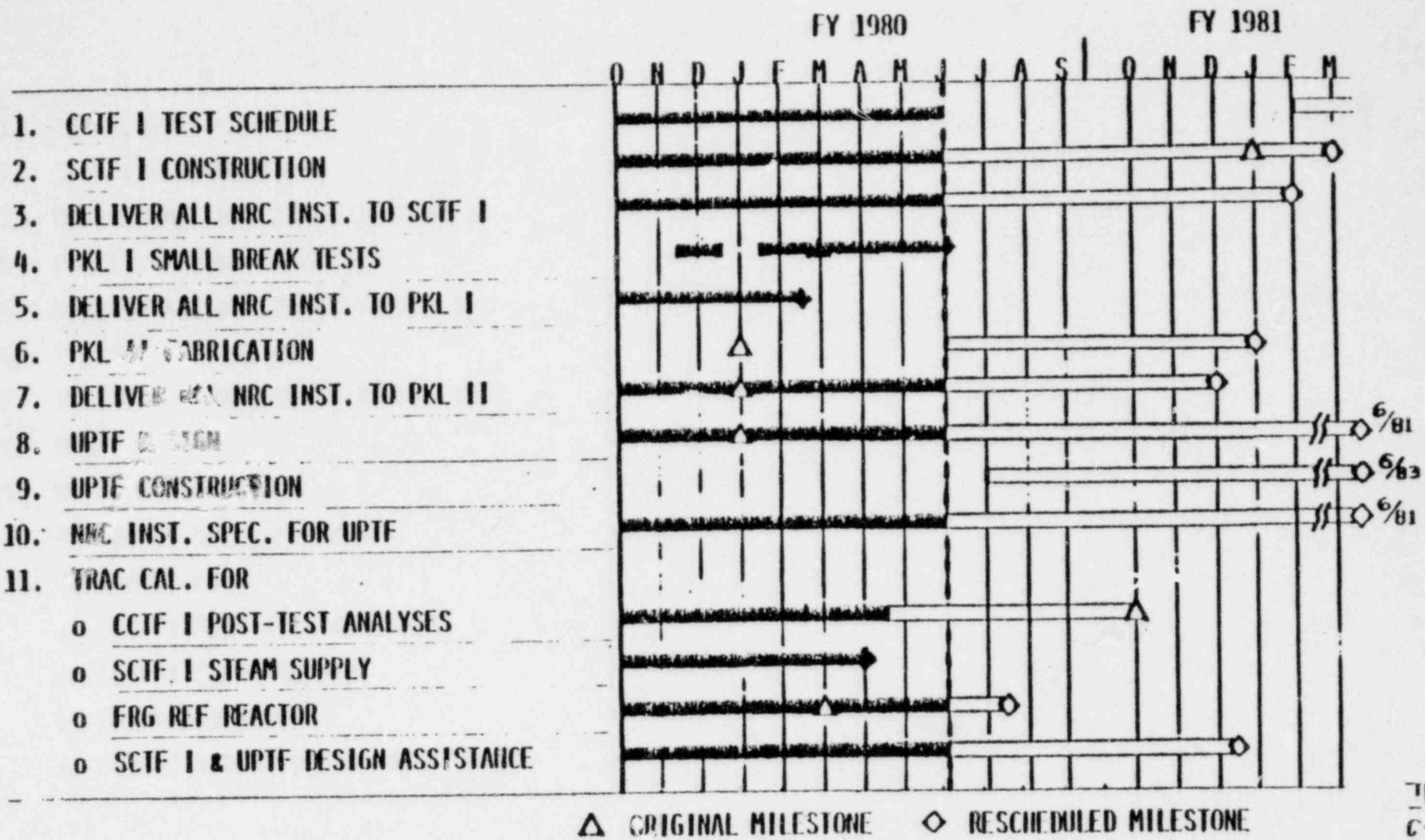
C = CONSTRUCTION

S = SHAKEDOWN

T = TEST

△ = START OF TEST

2D/3D MILESTONES IN CY 1980



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2D/3D BUDGET AND COST

FOR FY 1980

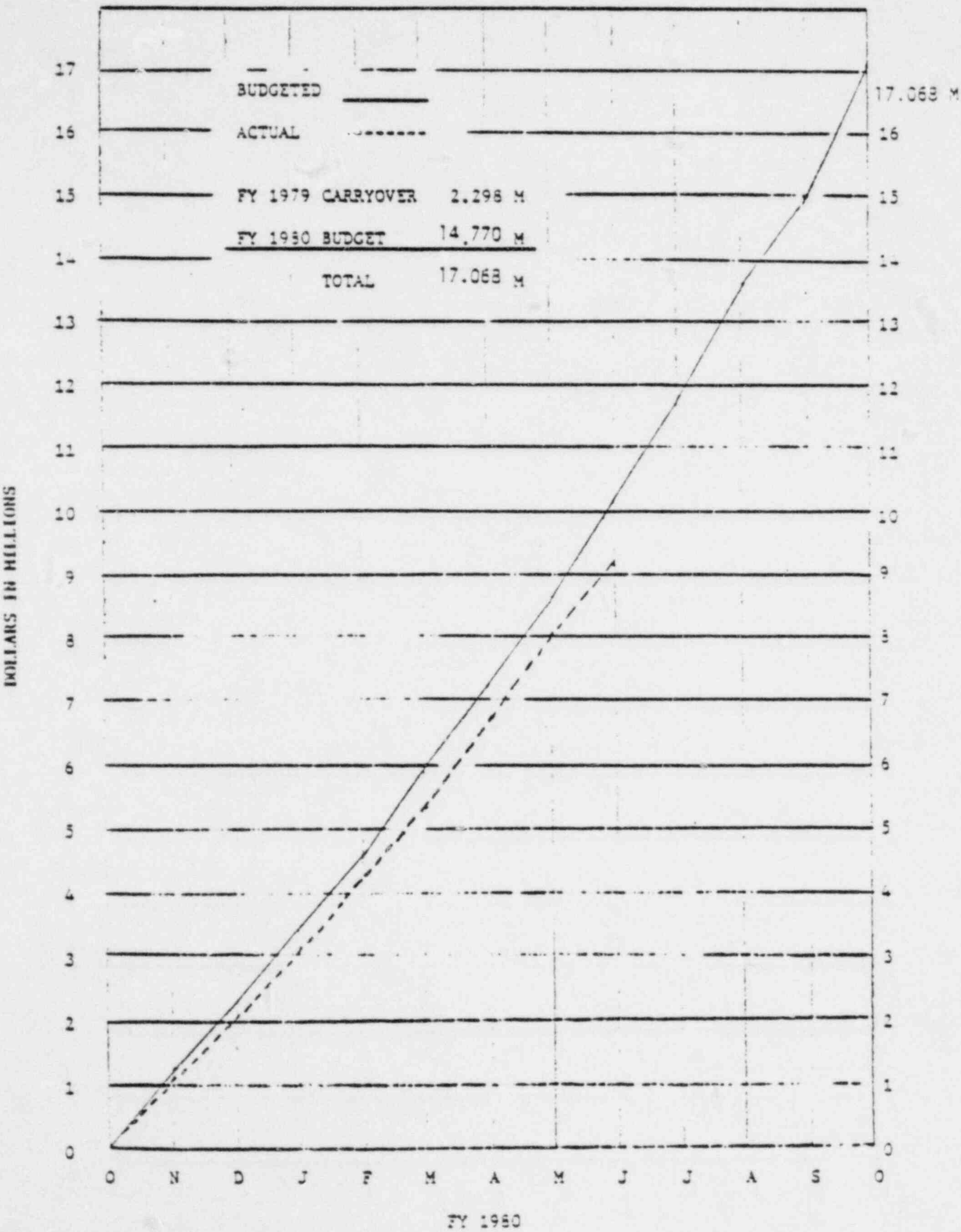

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Fig. 4

June 11, 1980

2D/3D USNRC PROGRAM COST ESTIMATE (PRELIMINARY)

Program	Contr	FIN		Cost Estimate by Fiscal Year in $K 78	79	80	81	82	83	84	85	TOTAL
3D Tech Supp & Instr	INEL	A6100	Base	3340	3329	4272	3618	720	707	-	-	15986
			A/P	3340	3349	4363	2950	2142	1300	600	300	18344
LL Detector Grid	INEL	A6282	Base	-	160	1270	370	-	-	-	-	1800
			A/P	-	160	805	700	350	100	100	50	2265
UPTF DAS	INEL	A6289	Base	-	432	1319	1099	300	100	-	-	3250
			A/P	-	378	644	700	400	300	500	300	3222
UPTF DAS	ORNL	30425	Base	-	34	-	-	-	-	-	-	34
			A/P	-	34	-	-	-	-	-	-	34
Adv Instr for Ref St	ORNL	30413	Base	2303	3375	4886	2175	814	486	-	-	14039
			A/P	2303	3375	4335	3225	1114	900	400	300	15952
Instr Dev Loop	ORNL	30427	Base	-	1400	1413	-	-	-	-	-	2813
			A/P	-	1400	1413	-	-	-	-	-	2813
LWR Exps & Lenses	LASL	A7044	Base	475	500	550	476	365	365	210	-	2941
			A/P	475	650	550	476	265	250	200	100	2966
TRAC Applic	LASL	A7049	Base	675	1084	1300	1648	2090	2658	1454	-	10909
			A/P	800	934	1300	1334	1479	1700	1700	1500	10747
LOCA/ECCS Supp	MPR	35537	Base	525	415	415	415	300	250	-	-	2320
			A/P	525	415	385	215	250	250	-	-	2040
3D Res Engr	NUS	36272	Base	330	120	375	100	-	-	-	-	925
			A/P	330	120	405	400	-	-	-	-	1255
UPTF Oper Asst	UND	37090	Base	-	-	-	150	250	400	200	-	1000
			A/P	-	-	-	-	-	200	400	200	800
			Base	7648	10849	15800	10051	4839	4966	1864	-	56017
TOTAL (Operating Expenses)			A/P	7773	10815	14200	10000	6000	5000	3900	2750	60438
3D Tech Supp & Inst Cap Eq	INEL	A6295	Base	-	-	-	-	-	-	-	-	-
			A/P	-	-	26	20	-	-	-	-	46
Rod Lens Cap Eq	LASL	A7050	Base	50	70	70	-	-	-	-	-	190
			A/P	50	70	70	75	100	-	-	-	365
AIRS Cap Eq	ORNL	30414	Base	537	250	546	272	44	79	-	-	1728
			A/P	537	250	474	300	100	79	-	-	1740
IDL Cap Eq	ORNL	30428	Base	-	65	-	-	-	-	-	-	65
				-	65	-	-	-	-	-	-	65
			Base	587	385	616	272	44	79	-	-	1983
TOTAL (Capital Expenses)			A/P	587	385	570	395	200	79	-	-	2216
CONTINGENCY			Base	-	-	-	-	-	-	-	-	1000
			A/P	-	-	-	-	-	-	-	-	-
TOTAL OP EXP PLUS CAP EXP			Base	8235	11234	16416	10323	4883	5045	1864	-	59000
			A/P	8360	11200	14770	10395	6200	5079	3900	2750	62554

A/P - Actual thru FY80 proposed based on RES markup for FY 81 on.
Base - Baseline projected on December 1978.