

PD-MAT-091

53

9365710

SN 744410

**UNITED STATES
INTERNATIONAL DEVELOPMENT
COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT**

**MANAGEMENT
REPORT**

**PHOTOVOLTAIC
DEVELOPMENT
AND SUPPORT
PROJECT**

NOVEMBER 1982

**LEVELS 2 & 3
FOR OFFICIAL USE ONLY**

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION - LEWIS RESEARCH CENTER

**UNITED STATES
INTERNATIONAL DEVELOPMENT
COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT**

**MANAGEMENT
REPORT**

**PHOTOVOLTAIC
DEVELOPMENT
AND SUPPORT
PROJECT**

**AID/NASA
INTERAGENCY
AGREEMENT
DSB-5710-2-79**

Accomplishment: William J. Bifano December 27, 1982
Date

Approval: W. J. M. ... December 27, 1982
Date

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION - LEWIS RESEARCH CENTER

CENTER LEWIS RESEARCH CTR.

RESPONSIBILITY:

APPROVAL W. MASICA

ACCOMPLISHMENT W. J. BIFANO

TABLE OF CONTENTS

PHOTOVOLTAIC
PROJECT: DEVELOPMENT AND
SUPPORT PROJECT



- 1.0 Introduction and Background
- 2.0 Objective
- 3.0 Activities
- 4.0 Status of Activities
- 5.0 Project Management
- 6.0 Project Schedules
- 7.0 Financial Status
- 8.0 In-house Personnel
- 9.0 Distribution List

<p>CENTER <u>LEWIS RESEARCH CTR.</u></p> <p>RESPONSIBILITY:</p> <p>APPROVAL <u>W. MASICA</u></p> <p>ACCOMPLISHMENT <u>W. J. BIFANO</u></p>	<p style="text-align: center;">NARRATIVE ANALYSIS</p> <p style="text-align: center;">(2&3 LEVEL)</p> <p>PROJECT: PHOTOVOLTAIC DEVELOPMENT AND SUPPORT PROJECT</p>	<p>STATUS AS OF <u>November 30, 1982</u></p> <p style="text-align: center;">(DATE) (INITIALS)</p>
--	--	---

1.0 INTRODUCTION AND BACKGROUND

The Photovoltaic Development and Support Project is being implemented by the NASA Lewis Research Center (LeRC) for the U.S. Agency for International Development, Bureau for Science and Technology, Office of Energy. The purpose of the project is to facilitate the use of photovoltaics for a variety of applications in support of AID's development assistance activities.

A Participating Agency Services Agreement (PASA No. NASA/DSB 5710-2-79) authorizing this project was signed by AID August 28, 1979, and approved by NASA August 30, 1979. Under this agreement, AID provided an initial funding authority of \$2,000,000. This PASA was amended in August 1980 and August 1981 to provide additional funding authority of \$500,000 and \$921,000, respectively. Total funding authority received to date is \$3,421,000.

2.0 OBJECTIVE

The major objective of this project is to demonstrate the suitability of photovoltaic (PV) power systems for meeting basic electrical requirements in rural areas of developing countries.

The Project Management function at the LeRC is being performed by the Solar Energy Projects Office in the Solar and Electrochemistry Division of the Energy Directorate.

3.0 ACTIVITIES

The activities required to accomplish the Project objectives are:

1. Planning and Studies
2. Field Test Support
3. Applications
4. Training and Information
5. Management

<p>CENTER <u>LEWIS RESEARCH CTR.</u></p> <p>RESPONSIBILITY:</p> <p>APPROVAL <u>W. MASICA</u></p> <p>ACCOMPLISHMENT <u>W. J. BIFANO</u></p>	<p style="text-align: center;">NARRATIVE ANALYSIS</p> <p style="text-align: center;">PROJECT: PHOTOVOLTAIC DEVELOPMENT AND SUPPORT PROJECT</p> <p style="text-align: center;">(2&3 LEVEL)</p>	<p>STATUS AS OF <u>November 30, 1982</u></p> <p style="text-align: center;">(DATE) (INITIALS)</p>
--	--	---

4.0 STATUS OF ACTIVITIES

4.1 Planning and Studies

4.1.1 Survey, Analysis and Selection Task

Activity complete

4.1.2 System Definition Study

Activity complete

4.2 Field Test Support

4.2.1 Project Definition

ASEAN Project - The support services contractor team submitted a trip report covering their TDY in Malaysia, Thailand, Philippines and Indonesia and a draft of the Implementation Plan (in typing at NASA LeRC). A meeting between LeRC and ASIA/TR personnel (Bob Ichord and Gail Warshaw) was held at AID/W November 10 to discuss follow-on activities. ASIA/TR is planning to formally request that NASA LeRC coordinate the ASEAN water pumping project via a two-year PASA (currently in preparation)

4.2.2 Load Identification and Acquisition

Activity complete

4.2.3 Load Testing and Evaluation

The Solar Power Corporation refrigerator/freezer unit is in final check-out for a one-year endurance test. The complete system testing is being delayed pending delivery of the Solar Power Corp. PV array to the LeRC.

CENTER LEWIS RESEARCH CTR.

RESPONSIBILITY:

APPROVAL F. MASICA

ACCOMPLISHMENT W. J. BIFANO

NARRATIVE ANALYSIS

PROJECT: PHOTOVOLTAIC
DEVELOPMENT AND
SUPPORT PROJECT



STATUS AS OF November 30, 1982
(DATE) (INITIALS)

4.3 Applications

4.3.1 Medical Refrigerators

As noted in last month's report, the Solavolt International (SV/I) procurement (second buy) has been delayed. SV/I personnel visited LeRC on November 18 to discuss a number of issues which have impeded progress. Arthur Sams of Polar Products, a prospective subcontractor to SV/I, was included in the discussions via telephone. SV/I and Polar Products personnel subsequently met on November 23 and reached agreement on areas of responsibility and funding levels. Solavolt is now preparing a final cost proposal for submittal to LeRC.

(Note: Although current plans call for the procurement of ten additional R/F systems, only nine will be deployed due to budgetary constraints. The tenth unit will be delivered to LeRC and held as a spare. Since 11 R/F units are currently being deployed for AID under the SPC procurement, only 9 more units are required to bring the total to 20 as indicated in the Annual Operating Plan.)

Contract NAS3-22246: Deployment of PV-Powered Refrigerators

Seven R/F systems have been installed to date by the Solar Power Corp. and are operating satisfactorily. The remaining four R/F systems slated for installation in African countries are in the final stages of packaging. The preferred method of shipping wet batteries is still being investigated by SPC's freight forwarder.

The overall status of the PV medical refrigerator field test activity is summarized in Table 1.

CENTER LEWIS RESEARCH CTR.

RESPONSIBILITY:

APPROVAL W. MASICA

ACCOMPLISHMENT W. J. BIFANO

NARRATIVE ANALYSIS

PROJECT: PHOTOVOLTAIC
DEVELOPMENT AND
SUPPORT PROJECT

2&3
LEVEL

STATUS AS OF November 30, 1982
(DATE) (INITIALS)

4.3.2 Medical Applications

Contract NAS 3-22240: Photovoltaic Development and Support Program for Medical Systems in Developing Countries

US AID/Guyana confirmed that the PV medical system for Waramuri arrived in Georgetown and was cleared through customs. However, due to delays in transit (from estimated two weeks to five weeks) the shipment could not be transported to the site in time to complete the installation and training activities before the year-end holidays. The installation in Guyana will begin in early January, 1983.

US AID/Ecuador confirmed the arrival in Quito of the PV medical system for Pedro Vicente Maldonado. Ecuadorean Institute of Sanitary Works (IEOS) initiated procedure for customs clearance. Installation in Ecuador is scheduled to begin in early February, 1983.

The PV medical system for Zimbabwe departed from the U.S.A. on October 30. The system was sea freighted to Durban, South Africa, from where it will be transported by rail to Harare. The Solarex Corp. freight forwarder's estimated arrival time in Harare is early to mid-December. Installation in Zimbabwe is scheduled for the middle of February, 1983.

One PV medical system for Kenya departed from the U.S.A. on November 23. The second system is at the loading dock (scheduled for shipment on December 2). Freight forwarder's estimated time in transit is about four weeks. Installation of both systems in Kenya is scheduled to begin by the middle of March, 1983.

The status of the PV medical application for each participating AID country is summarized in Table 2.

CENTER LEWIS RESEARCH CTR.

RESPONSIBILITY:

APPROVAL W. MASICA

ACCOMPLISHMENT W. J. BIFANO

NARRATIVE ANALYSIS

PROJECT: PHOTOVOLTAIC
DEVELOPMENT AND
SUPPORT PROJECT

2&3
LEVEL

STATUS AS OF November 30, 1982
(DATE) (INITIALS)

4.3.3 Remote Earth Station(s)

The RFP for the development of a PV power system for remote satellite earth stations is scheduled to be released on December 6. Questions regarding the expected usage and the expected required daily availability of the remote earth station have been transmitted via the AID Rural Satellite Program to the Senegal Ministry of Information. This information will affect the size of the PV power system.

4.4 Training and Information

The camera-ready copy of the lecture material for the technical sessions of the PV seminars associated with the PV medical systems installations has been completed and Dr. Roberts initiated the printing of copies for distribution to the seminar's attendees. Drs. Roberts and Kokole of the University of Michigan visited LeRC on November 16 to discuss and prepare a draft of the complete structure of the seminar. The draft will be sent to the host countries project managers and the respective AID missions for review and comments.

A letter from US AID/Ecuador was received at LeRC requesting postponement of the PV technology seminar in Quito until June/July, 1983. Problems posed by this request (i.e., budgetary and contractual constraints) were subsequently discussed with AID/Ecuador (telecon, Marsik/Garza) on November 19. Leo Garza agreed that due to the stated constraints the seminar should be held as originally planned, in tandem with the seminar activity in Guyana.

The seminars are now scheduled as follows:

- First week of March, 1983 in Guyana
- Second week of March, 1983 in Ecuador
- Second week of April, 1983 in Zimbabwe
- Third week of April, 1983 in Kenya

<p>CENTER <u>LEWIS RESEARCH CTR.</u></p> <p>RESPONSIBILITY:</p> <p>APPROVAL <u>W. MASICA</u></p> <p>ACCOMPLISHMENT <u>W. J. BIFANO</u></p>	<p style="text-align: center;">NARRATIVE ANALYSIS</p> <p style="text-align: center;">PHOTOVOLTAIC PROJECT: DEVELOPMENT AND SUPPORT PROJECT</p> <p style="text-align: center;">2&3 LEVEL</p>	<p>STATUS AS OF <u>November 30, 1982</u></p> <p style="text-align: center;">(DATE) (INITIALS)</p>
--	--	---

5.0 PROJECT MANAGEMENT

The Annual Review meeting scheduled for December has been postponed by S&T/EY pending receipt of initial performance data from medical system and vaccine refrigerator field tests.

Background information relative to small business procurements was submitted to S&T in anticipation of the December 9 Congressional hearings by the Committee on Small Business.

The AID photovoltaic activities managed by LeRC were reviewed for NASA Headquarters personnel on November 4.

TABLE 1 - MEDICAL REFRIGERATOR APPLICATION: STATUS

<u>Mission</u>	<u>Tentative Sites</u>	<u>Status/Remarks</u>	<u>Action Needed</u>
Zaire	Kionzo	Cable Kinshasa 10412 informed LeRC that the LSGPA has been signed and a copy of the signed document is being mailed to LeRC.	LeRC to inform mission when shipping schedule set.
Zimbabwe	Chiota	Signed Grant Agreement has been received at LeRC.	LeRC to inform mission when shipping schedule set.
Liberia	Suehn Village	Cable Monrovia 08957 informed LeRC that the Suehn clinic construction has been completed. Also shipping and receiving information was provided.	LeRC to inform mission when shipping schedule set.
Indonesia	1) Cingbwibulan 2) Batujaya	Two refrigerators installed in April. Operating satisfactorily.	None
Morocco	Bouaboute	Copy of the signed LSGPA received at LeRC along with information that the refrigerator system is to be consigned to the Ministry of Public Health.	LeRC to inform mission when shipping schedule set.
Upper Volta	Orodara	Cable Ouagadougou 04278 states that the US AID/UV expects a completed and signed agreement by the end of August. Not received as of November 30. Project site has been changed to Orodara. NASA cable, November 22, requested site specific information for the new site and also the status of the agreement.	Mission to inform LeRC when the LSGPA is signed. MOH/GOUV is to provide site specific information.
Egypt	TBD	Cable Cairo 93773 states that site identification and site specific information can be expected within a month.	None
Guyana	Schepmoed	Refrigerator installed in September. First set of operation data received at LeRC. Performance is satisfactory.	None
Ecuador	Comuna Cobos	Cable Quito 7017 confirmed that SPC completed installation of unit with assistance from IEOS. Refrigerator is operational.	None

8

<u>Mission</u>	<u>Tentative Sites</u>	<u>Status/Remarks</u>	<u>Action Needed</u>
Dominican Republic	Las Tablas	Refrigerator was installed at Las Tablas before the end of August. Operation reported as satisfactory.	None
Honduras	Aldea Las Selvas	Site specific information and shipping information received.	LeRC to inform mission when shipping schedule set.
Guatemala	Tierra Blanca	Refrigerator installed on October 7. Operation reported as satisfactory.	None
Haiti	Anse-a-Veau	LeRC/SPC team installed unit in late August-early September. Refrigerator operational.	None
Tunisia	Es-Smirat	NASA cable Oct. 22 informed U.S. AID/T that the draft MOU received at LeRC has been reviewed and is satisfactory. Cable Tunis 8380 advises that GOT suggests and US AID concurs that the refrigerator should be installed and operated under existing Renewable Energy project 664-0325. US AID/Washington legal is investigating this form of obligation.	Final decision on participation in project by GOT. Legal opinion by US AID/Washington.
REDSO/WA	Abidjan	NASA cable dated November 22 requested status of project agreement. In the Kohls/Thaler telecon of November 23, REDSO/WA confirmed continued interest in the project and requested US AID/Washington and CDC/Atlanta opinions if the equipment could enter Ivory Coast under existing CDC/GOIC agreement.	Legal opinions by US AID/Wash. and CDC/Atlanta.
St. Vincent	Sandy Bay	Signed LSGPA received by LeRC.	LeRC to inform mission when shipping schedule set.

5

<u>Mission</u>	<u>Tentative Sites</u>	<u>Status/Remarks</u>	<u>Action Needed</u>
Bangladesh	TBD	Draft LSGPA mailed to Dacca September 14. Cable Dacca 0237 informed LeRC that intended user, International Center Diarrhoeal Disease Research Bangladesh, (ICDDR B) has to obtain clearances from the Martial Law Admin. (MLA/BDG) before agreeing to accept experimental unit and participating in evaluation. Draft LSGPA was forwarded to ICDDR B by US AID/Bangladesh.	Confirmation of interest in project by GOB.
Thailand	Nakhon Sawan Province	Draft LSGPA mailed to Bangkok on September 14. Cable Bangkok 52611 provided site information, shipping info and name of responsible person. Copy of signed agreement with addition site information received at LeRC.	LeRC to inform mission when shipping schedule set.

TABLE 2 - PV MEDICAL SYSTEM APPLICATIONS: STATUS

<u>Country</u>	<u>Status</u>
<u>Guyana:</u>	The Implementation Plan has been signed by the Project Managers in Guyana and the signature page returned to LeRC. The Guyana National Energy Authority (GNEA) and the Institute for Applied Science and Technology (IAST) were chosen by the GOG to provide in-country technical support to the MOH. A draft of the Project Implementation Letter (PIL) for the PV medical refrigerator (to be used as an attachment to the existing agreement) was provided by LeRC personnel during the TDY in November and was signed by both US AID/G and GOG. US AID/Guyana has accepted responsibility for receiving the equipment and clearing customs. Tentative outline and schedule for the PV Technology Seminar in Guyana have been jointly prepared by the Guyana Project Committee and LeRC. PV medical system for Waramuri departed U.S.A. on October 13. Arrival of the shipment in Georgetown was confirmed on November 18.
<u>Ecuador:</u>	The Operation Plan (to be used in lieu of an Implementation Plan) was sent to US AID/E on May 7. A draft of PIL for the PV medical refrigerator was provided during TDY in November and is currently being translated and prepared for signatures by AID/E. Ecuadorean National Institute for Sanitary Works (IEOS) provided complete set of architectural drawings for the Pedro Vicente Maldonado Health Subcenter. Tentative outline for the PV Technology Seminary in Ecuador has been jointly prepared by the National Energy Institute (INE) and LeRC. PV medical system for Pedro Vicente Maldonado departed U.S.A. on October 21. Arrival of the shipment in Quito was confirmed in cable Quito 8372.
<u>Kenya:</u>	The Implementation Plan (IP) for the medical systems in Kenya was signed by both the US AID/K and MOH/GOK and the signature page received at LeRC. MOH received from the Kenya Post and Telecommunication Corporation a frequency allocation for the use of two-way radios which will be provided with the medical systems. The operation license will be issued following the payment of the fee by the MOH. Ministry of Energy (MOE) agreed to provide in-country technical support to the MOH. Tentative outline and schedule for the PV Technology Seminar in Kenya have been jointly prepared by the MOE and LeRC. PV medical system for Kibwezi departed U.S.A. on November 23.
<u>Zimbabwe:</u>	Project Implementation Letter (PIL) for the PV medical system for Chikwakwa was signed by the Ministry of Industry and Energy Development (MIED) and US AID/Zimbabwe. Project Agreement Amendment for the addition of a refrigerator has been signed by US AID/Zimbabwe and by the Secretary for Economic Planning and is awaiting countersignature by the MIED. Tentative outline and schedule for the PV Technology Seminar in Zimbabwe have been jointly prepared by the MIED and LeRC. PV medical system for Chikwakwa departed U.S.A. on October 30.

CENTER Lewis Research Ctr.

MASTER PROGRAM/PROJECT SCHEDULE

RESPONSIBILITY:

APPROVAL W. MASICA

ACCOMPLISHMENT W. J. BIFANO

PROJECT:

PHOTOVOLTAIC
DEVELOPMENT AND
SUPPORT PROGRAM

2 & 3
LEVEL

STATUS AS OF November 30, 1982
(DATE) (INITIALS)

MILESTONES	← FY 1981 →			← FY 1982 →												← FY 1983 →		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
4.1 <u>PLANNING AND STUDIES</u>																		
4.1.1 SURVEY, ANALYSIS AND SELECTION																		
4.1.2 SYSTEM DEFINITION STUDY																		
4.2 <u>FIELD TEST SUPPORT</u>																		
4.2.1 PROJECT DEFINITION																		
4.2.2 LOAD IDENTIFICATION																		
o CATALOG OF MEDICAL APPLIANCES																		
4.2.3 LOAD TESTING AND EVALUATION																		
o MEDICAL REFRIGERATOR (IN-HOUSE)																		

NOTES:

- 1... N = RESCHEDULED MILESTONE
- A AWARD CONTRACT OR GRANT
- B BEGIN
- C ACTIVITY COMPLETE

- K CONTRACT COMPLETE
- R RELEASE RFP OR IFB
- V SITE VISIT
- P PROCUREMENT

- T TESTING
- a ANNUAL REVIEW
- b ANNUAL OPERATING PLAN COMPLETE

- A - Asean TDY
- P - Pakistan TDY

- S - Senegal/Mali/UV TDY
- I - Indonesia TDY
- M - Medical Systems TDY
- E - Egypt TDY
- H - Haiti/Barbados TDY

2

<p>CENTER <u>Lewis Research Ctr.</u></p> <p>RESPONSIBILITY:</p> <p>APPROVAL <u>W. MASICA</u></p> <p>ACCOMPLISHMENT <u>W. J. BIFANO</u></p>	<p>MASTER PROGRAM/PROJECT SCHEDULE</p> <p>PROJECT: PHOTOVOLTAIC DEVELOPMENT AND SUPPORT PROJECT</p> <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin: 0 auto;"> 2 & 3 LEVEL </div>	<p>STATUS AS OF <u>November 30, 1982</u></p> <p style="text-align: center;">(DATE) (INITIALS)</p>
--	---	---

MILESTONES	← FY 1981 →			← FY 1982 →												← FY 1983 →		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
4.3 APPLICATIONS																		
4.3.1 MEDICAL REFRIGERATOR																		
o CONTRACT FOR FABRICATION, DEPLOYMENT AND SERVICE																		
1ST BUY (11 UNITS)		▼R					▼A*				▼S							
2ND BUY (9 UNITS)																		
4.3.2 MEDICAL SYSTEMS																		
o CONTRACT FOR DESIGN, DEVELOPMENT AND DEPLOYMENT							▼A											▼S
4.3.3 REMOTE EARTH STATION(S)																		
o CONTRACT FOR DESIGN, DEVELOPMENT AND DEPLOYMENT																		▼R
4.4 TRAINING AND INFORMATION.																		
5.0 PROJECT MANAGEMENT																		
						▼a							▼b					▼c

NOTES: *Contract signed by Solar Power Corp.

<p>1... N = RESCHEDULED MILESTONE</p> <p>A AWARD CONTRACT OR GRANT</p> <p>B BEGIN</p> <p>C ACTIVITY COMPLETE</p>	<p>K CONTRACT COMPLETE</p> <p>R RELEASE RFP OR IFB</p> <p>V SITE VISIT</p> <p>P PROCUREMENT</p>	<p>S SYSTEM INSTALLATION</p> <p>T TESTING</p> <p>a ANNUAL REVIEW</p> <p>b ANNUAL OPERATING PLAN COMPLETE</p>
--	---	--

CENTER Lewis Research Center

FINANCIAL STATUS

OBLIGATIONS AND COSTS FOR TOTAL PROJECT, INCLUDING PURCHASES, PERSONNEL EFFORT AND TRAVEL.

RESPONSIBILITY:

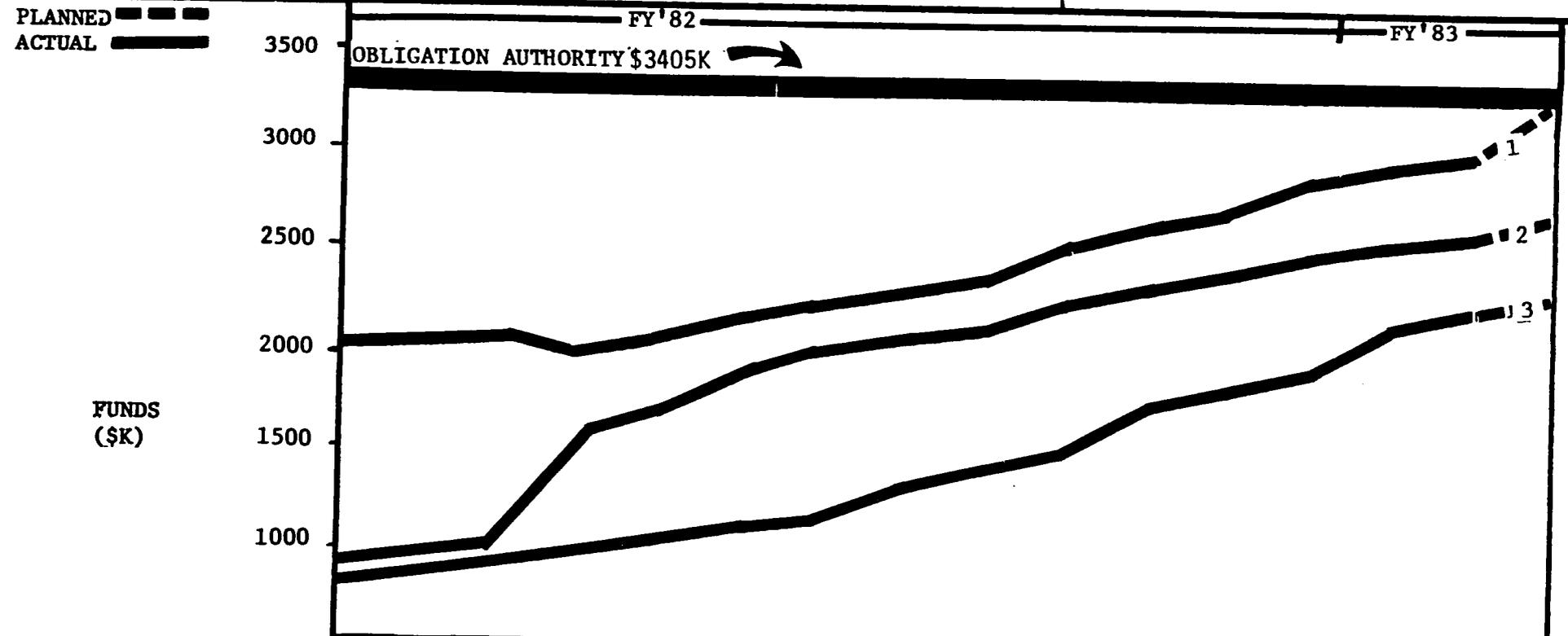
APPROVAL W. MASICA

ACCOMPLISHMENT W. BIFANO

PROJECT: PHOTOVOLTAIC DEVELOPMENT AND SUPPORT PROJECT

2&3 LEVEL

STATUS AS OF November 30, 1982
(DATE)



Cumulative		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Authority		3405	3405	3405	3405	3405	3405	3405	3405	3405	3405	3405	3405	3405	3405	3405
1	Commitments (Actual)	2055	2075	*1919	1979	2170	2235	2336	2366	2559	2585	2677	2827	2886	2912	
2	Obligations (Actual)	940	963	1780	1794	1996	2015	2127	2187	2235	2261	2328	2432	2445	2502	
3	Costs (Actual)	862	921	971	986	1027	1180	1306	1429	1513	1816	1895	2134	2212	2238	

*Decommitment with respect to PV Medical Systems following contract award.

CENTER Lewis Research Center

IN-HOUSE PERSONNEL

RESPONSIBILITY:

APPROVAL W. MASICA

ACCOMPLISHMENT W. BIFANO

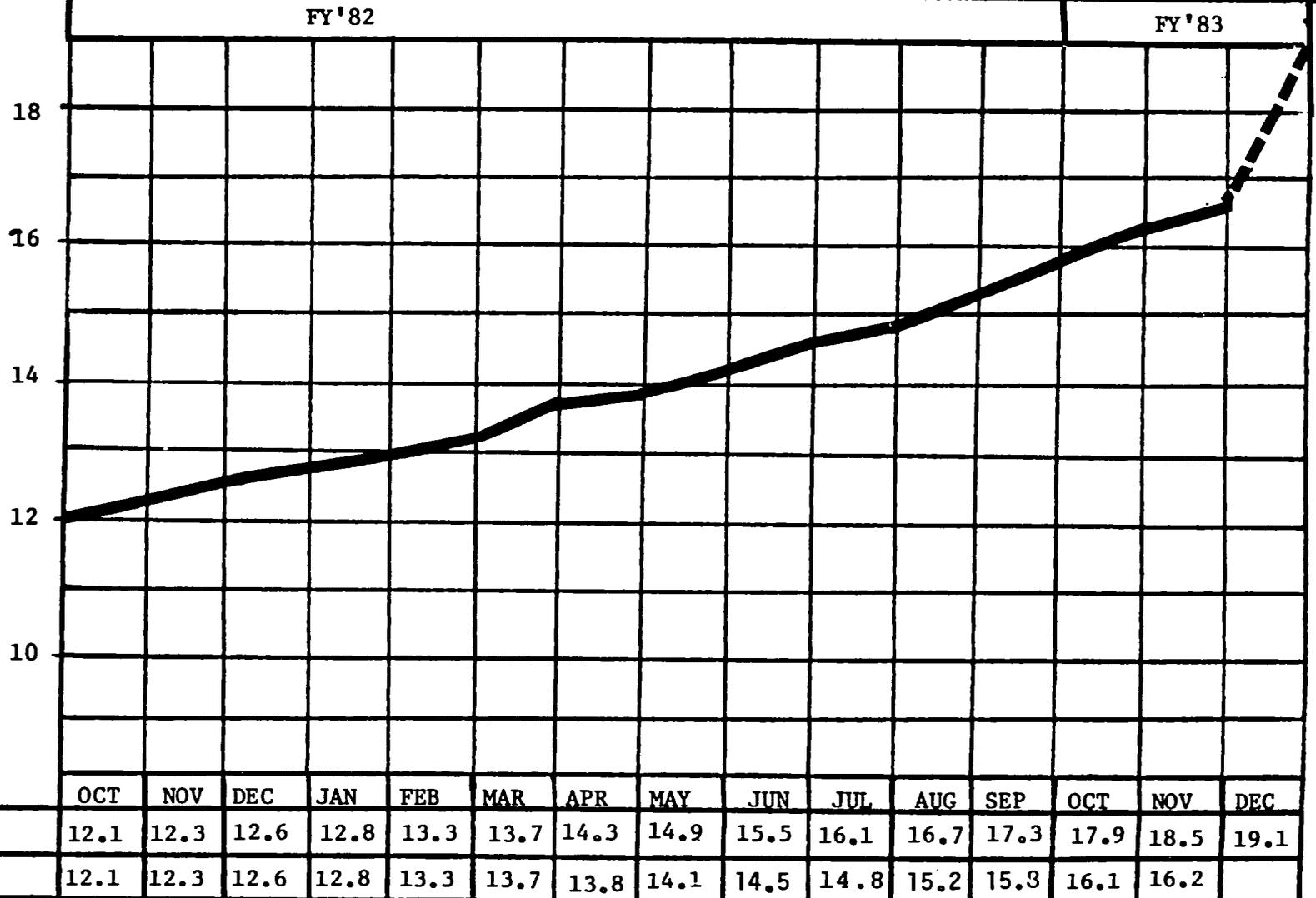
283
LEVEL

PROJECT: PHOTOVOLTAIC
DEVELOPMENT AND SUPPORT
PROJECT

STATUS AS OF November 30, 1982
(DATE)

PLANNED 
ACTUAL 

Cumulative Person Years



Total	Planned	12.1	12.3	12.6	12.8	13.3	13.7	14.3	14.9	15.5	16.1	16.7	17.3	17.9	18.5	19.1
	Actual	12.1	12.3	12.6	12.8	13.3	13.7	13.8	14.1	14.5	14.8	15.2	15.3	16.1	16.2	

51

CENTER <u>LEWIS RESEARCH CTR.</u> RESPONSIBILITY: APPROVAL <u>W. MASICA</u> ACCOMPLISHMENT <u>W. J. BIFANO</u>	9.0 DISTRIBUTION PROJECT: PHOTOVOLTAIC DEVELOPMENT AND SUPPORT PROJECT	
---	---	---

<u>AGENCY FOR INTERNATIONAL DEVELOPMENT</u>	<u>NASA LEWIS RESEARCH CENTER</u>
S. Toth W. Eilers C. Pease D. Sprague J. Zedalis C. Duisberg B. Turner <u>NASA HEADQUARTERS</u> RE-1/D. A. Beattie RET-1/F. C. Schwenk RET-1/H. D. Calahan (3 copies) LID-18/K. Kleinsorge <u>JET PROPULSION LABORATORY</u> J. Prayer <u>DEPARTMENT OF STATE</u> J. Christoff <u>DEPARTMENT OF ENERGY</u> Technical Cooperation Office. A. Krantz M. Prince L. Herwig T. Mock	A. J. Stofan H. O. Slone M. J. Hartmann W. L. Stewart J. E. Burnett V. Hlavin T U Office G. Tunder A. Long 3-2 3-5 3-7 3-6 3-16 3-10 7-3 6-6 500-305