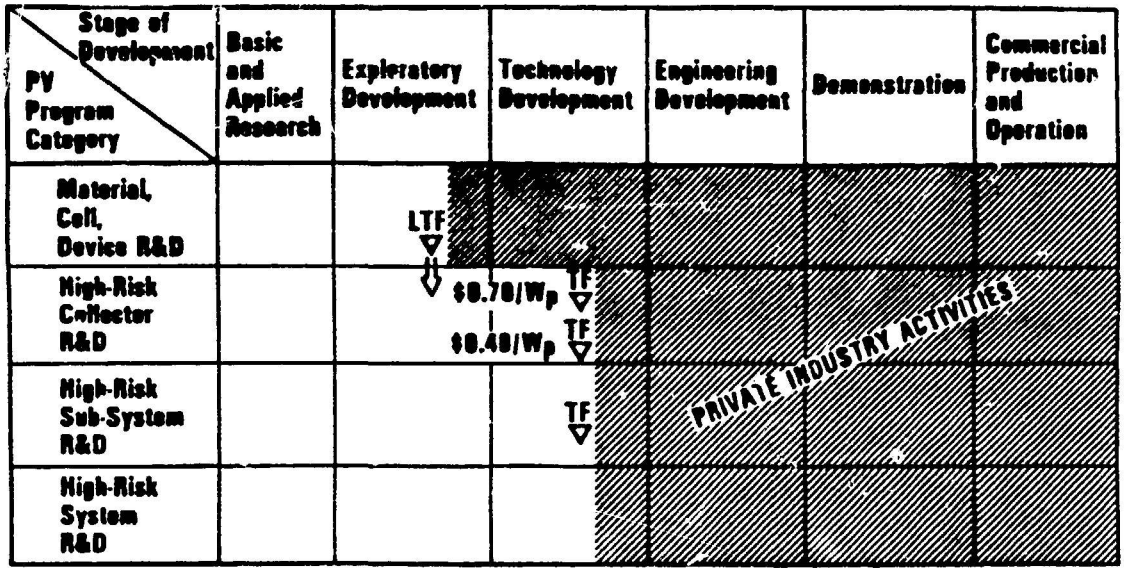
Plenary Session

NATIONAL PHOTOVOLTAICS PROGRAM

U.S. DEPARTMENT OF ENERGY

M. Prince

Program Structure



FY82 Funding Levels by Program Element

(MILLIONS OF DOLLARS)

PROGRAM ELEMENTS	FY 82 APPROPRIATIONS
MATERIALS RESEARCH	23.9
ADVANCED CONCEPTS	11.6
SUPPORTING RESEARCH	2.2
SYSTEMS RESEARCH	20.5*
TECHNOLOGY DEVELOPMENT	3.6
EXPERIMENTS	12.2**
CAPITAL EQUIPMENT	4.0
TOTAL	78.0

* INCLUDES THE SE RESIDENTIAL EXPERIMENTAL STATION

** INCLUDES COMPLETION OF NATIONAL EXEMPLAR PROJECT AND THE 1 MW SMUD PROJECT

Detailed Funding Levels With Organizational Responsibility

ACTIVITY	RESPONSIBLE AGENCY	FUNDING ($ MILLIONS)
MATERIALS RESEARCH		
AMORPHOUS MATERIALS*	SERI	3.8
STABILITY & EFFICIENCY OF THIN FILMS	SERI	4.1
HIGH EFFICIENCY DEVICE CONCEPTS	SERI	3.3
SILICON AND POLYCRYSTALLINE SHEET*	SERI	2.5
SILICON MATERIAL PURIFICATION*	JPL	2.9
RIBBON AND SHEET SILICON RESEARCH	JPL	6.8
ENVIRONMENTAL DEGRADATION RESEARCH	JPL	1.5
ADVANCED CONCEPTS		
ELECTROCHEMICAL MATERIALS AND CELLS*	SERI	2.0
CONCENTRATOR MATERIALS AND CELLS	SANDIA	2.2
POWER QUALITY AND CONTROL RESEARCH*	SANDIA	3.1
CELL AND MODULE FORMATION RESEARCH	JPL	4.7
SUPPORTING RESEARCH		
DIAGNOSTIC EQUIPMENT	SERI	2.2
SYSTEMS RESEARCH		
SYSTEMS RESEARCH	SANDIA	1.1
CRITICAL SUBSYSTEMS DEVELOPMENT	SANDIA	1.3
CONCENTRATOR RESEARCH AND TESTING	SANDIA	4.9
DATA COLLECTION OF EXPERIMENTS AND ANALYSIS	SANDIA	4.8
SYSTEMS EXPERIMENTS, OPERATIONS/ CLOSEOUT	VARIOUS	5.6
ENGINEERING SCIENCES RESEARCH	JPL	3.4
SE RES	SANDIA	2.0
TECHNICAL DEVELOPMENT		
SILICON TECHNOLOGY DEVELOPMENT	JPL	3.6
OTHER		
SMUD*	HQ	6.8
NATIONAL EXEMPLAR	ORO	5.4
	TOTAL	78.0

Program Cost Sharing With Industry

ACTIVITIES	DOE SHARE*	PRIVATE SHARE
AMORPHOUS MATERIALS	$ .8 M	$ .2 M
SILICON AND POLYCRYSTALLINE SHEET	.6 M	.2 M
ELECTROCHEMICAL MATERIALS & CELLS	2.5 M	.7 M
SILICON MATERIAL PURIFICATION	1.5 M	8.5 M
CELL AND MODULE FORMATION RESEARCH	4.0 M	.9 M
SMUD PROJECT	6.8 M	5.2 M

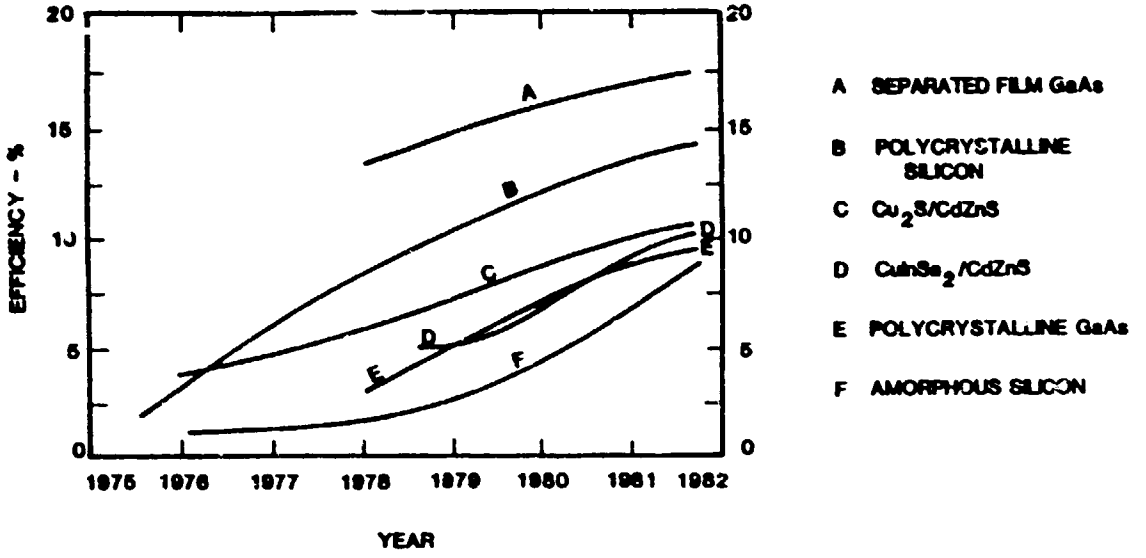
* APPLIES TO COST-SHARED CONTRACTS ONLY

Major Accomplishments

TECHNOLOGY ELEMENTS	1975	1981
o EFFICIENCY		
- SILICON	8%	20%
- THIN FILMS	1-3%	5-11%
o CELL COSTS	$50/Wp	$7/Wp
o MODULE LIFE (TERRESTRIAL)	1-2 YEARS	10 YEARS
o TERRESTRIAL SYSTEM EXPERIMENTS	FEW SMALL REMOTE USES	2,700 SMALL EXPERIMENTS (FPUP); 15 MAJOR PROJECTS (AS LARGE AS 350 KWp)
o INDUSTRIAL BASE	A FEW SMALL SPECIALITY COMPANIES (SEVERAL KWp SALES IN 1975)	RAPIDLY EXPANDING INDUSTRIAL BASE; MORE THAN 15 CELL SUPPLIERS (5 MWp SALES IN 1981)
o FABRICATION TECHNOLOGY	EXPENSIVE MANUAL OPERATION	SEMI-AUTOMATED PILOT PRODUCTION OF CELLS; RIBBON PROCESSES NEAR COMMERCIALIZATION

Cell Efficiency vs Time for Non-Single-Crystal Silicon Devices

(THIN FILM TECHNOLOGIES)



State of U.S. PV Industry

(1) DEVELOPED HIGHLY-RELIABLE PRODUCTS TO SUPPLY REMOTE ELECTRICITY FOR COMMUNICATIONS, CORROSION CONTROL, NAVIGATIONAL AIDS, HOME AND FARM USES

(2) INVESTED IN INFRASTRUCTURE TO DELIVER AND SERVICE THESE PRODUCTS

(3) INCREASED SALES AND REVENUES AT A VERY HEALTHY RATE

	1979	1980	1981	1982 (EST)
SALES	1.4 MWp	3.2 MWp	5 MWp	7.5 MWp
REVENUE	$30 MILLION	$50 MILLION	$75 MILLION	$100 MILLION

(4) INVESTED APPROXIMATELY $40 MILLION IN 1981 INTO RESEARCH ON IMPROVED PHOTOVOLTAIC CELLS AND MODULES

History of U.S. Prices and PV Module Production