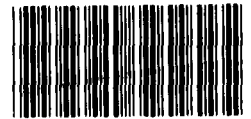


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UNITED STATES GENERAL ACCOUNTING OFFICE  
WASHINGTON, D.C. 20548

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STATEMENT OF  
ALLAN I. MENDELOWITZ  
ASSOCIATE DIRECTOR, INTERNATIONAL DIVISION  
U.S. GENERAL ACCOUNTING OFFICE  
BEFORE THE  
SUBCOMMITTEE ON ENERGY CONSERVATION AND POWER  
HOUSE COMMITTEE ON ENERGY AND COMMERCE  
AND THE  
SUBCOMMITTEE ON ENERGY, ENVIRONMENT AND SAFETY  
ISSUES AFFECTING SMALL BUSINESS  
HOUSE COMMITTEE ON SMALL BUSINESS  
ON  
INDUSTRY VIEWS ON THE EFFECT OF PROPOSED  
BUDGET REDUCTIONS ON THE ABILITY OF THE  
U.S. PHOTOVOLTAICS INDUSTRY TO COMPETE  
IN FOREIGN MARKETS

Mr. Chairmen and Members of the Subcommittees:

We are pleased to be here today to discuss with you the views of members of the U.S. photovoltaics industry concerning the effects that the proposed solar energy budget reductions

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may have on the industry's ability to compete in foreign markets. My statement and our report issued on September 15, 1981 (ID-81-63) are based on a survey of the industry that we made in April and May of this year at the request of the Subcommittee on Energy Research and Development, Senate Committee on Energy and Natural Resources.

Our information is based on in-depth interviews with 30 representatives of private companies and experts involved in the photovoltaics industry. Our sample includes a cross-section of companies of various sizes and activities.

In considering the industry responses to our questions, one should keep in mind that these statements were made in April 1981, shortly after the administration had announced its proposed energy budget for fiscal year 1982 which includes a sharp reduction in funding for a number of programs, including photovoltaics.

#### THE NATIONAL PHOTOVOLTAICS PROGRAM

Legislation since 1973 has been directed at reducing the cost of solar energy and accelerating its commercialization. These efforts culminated, for photovoltaics, in the passage of the Solar Photovoltaic Energy Research, Development, and Demonstration Act (Public Law 95-590), November 4, 1978, which mandated a 10-year, \$1.5-billion program of accelerated " \* \* \* research, development, and demonstration of solar photovoltaic energy technologies leading to early competitive commercial applicability of such technologies \* \* \*" with the long-term objective of producing " \* \* \* electricity from photovoltaic systems cost-competitive with utility-generated electricity from conventional sources."

The photovoltaics program at the time of our survey included research, development, and demonstration projects. The objective was to reduce the cost of all elements of a photovoltaic system, including its installation and operation, to achieve cost/performance goals established by the Department of Energy (DOE).

Research and development funding has assisted the development of new, lower cost photovoltaic technologies. The cost per peak watt has declined dramatically, but the current average price, reported to be about \$10.00, is still considerably higher than the 1982 DOE goal of \$2.80.

In addition to concentrated R&D efforts, the program included both domestic and foreign market development and commercialization programs. DOE's International Market Development Program, which includes market analysis, export seminars for U.S. companies, and product exhibitions and seminars overseas (jointly sponsored with the Department of Commerce) was developed to encourage and assist small and "new-to-export" U.S. companies to enter foreign markets.

At the beginning of 1981, the United States also participated in or had under consideration a large number of joint projects under bilateral international cooperative solar energy agreements. A number of these projects involved photovoltaic system demonstrations and/or tests and provided U.S. companies with additional sales opportunities and foreign market exposure.

This was the situation at the time the budget reductions were proposed.

## PROPOSED BUDGET REDUCTIONS

This administration's fiscal year 1982 budget would reduce Federal expenditures on photovoltaic R&D to \$62.9 million, a 59 percent decrease from the fiscal year 1981 appropriation. It would completely eliminate the DOE International Market Development Program, for which \$4 million was originally budgeted for 1981. It also proposed to eliminate specific funding for international cooperative solar energy agreements with other countries except for the U.S.-Saudi Arabia joint agreement (SOLERAS), now in its third year. Funding for this agreement would be stretched out. Although the Congress is considering higher funding than that proposed by the administration, it is the administration's requested budget reductions that our interviewees commented upon.

## INDUSTRY VIEWS

It is difficult to generalize on the views of the firms and experts we interviewed because of the diversity of the sample firms - i.e., large firms and small ones, subsidiaries of major corporations and independents, and R&D firms and manufacturers. The observation with the most general applicability is that firms which are highly dependent on Federal Government programs are also those which foresaw the most adverse consequences from the proposed funding reduction. Firms with primarily nongovernmental funding, especially the affiliates of major corporations such as the oil companies, foresaw little or no negative consequences. For example, about two-thirds of the firms we interviewed believed that the proposed budget cuts would reduce the ability of U.S.

firms to compete in foreign markets. However, subsidiaries of the major oil companies felt that there would be little or no effect on the industry's ability to compete.

With this observation in mind, the industry views can be characterized as follows.

#### R&D programs

Government programs have supported research on a wide range of photovoltaic technologies. Nearly all the companies cited the value of the R&D programs in accelerating the development of the technology. There were some criticisms of various points of program management and contract administration, but the majority opinion was that a high level of Government assisted R&D is still needed for continued industry growth and for the United States to maintain its position vis-a-vis foreign competition. Support for R&D funding came from all subsets of respondents.

#### Foreign market development

Foreign market development includes foreign market analysis, overseas trade shows, export seminars, and overseas demonstration projects. Most respondents believe these activities are important in facilitating exports. However, it was the smaller companies (those most lacking in export expertise and financial resources) which view foreign market development assistance from the Government as very important. The officials of subsidiaries of large corporations indicated they had little need for such assistance because they had access to the worldwide marketing operations of

their parent corporations. However, even some of these officials believe there is a continuing need for enhancing public awareness of photovoltaics with trade shows and demonstration projects.

#### International cooperative agreements

The international cooperative agreements are designed to further solar technology and benefit both contracting parties. Most of the firms we interviewed felt that the U.S. industry had received little benefit from the projects initiated under these agreements. Obviously, the firms which received major contracts for these projects would not agree with this assessment. The general feeling in the industry is that the projects initiated under the agreements are not well integrated into the overall U.S. domestic program and that information generated from these projects has not been evenly disseminated throughout the industry. Officials of the Solar Energy Research Institute believe that the projects may be primarily justifiable on foreign policy grounds rather than on their contribution to the U.S. solar energy program.

#### Ability to compete in foreign markets

Most of the officials interviewed believe that U.S. technology is still ahead of that of France, Germany, and Japan-- the three countries that most of the companies perceive as their major competitors. Many, however, expressed concern that those countries could quickly overtake us if we greatly reduce our R&D budget. All three of these competitors appear to be seriously developing solar energy in general and photovoltaics in particular. Budgetary support for such programs in all three

countries appears to be increasing. Their solar energy programs provide assistance to their industries in developing technology and marketing.

In summary, most of the firms we interviewed believe that the development and rate of commercialization of photovoltaics is influenced by the level of Federal Government funding. Nevertheless, if the firms' responses are to be taken as a prediction, the impression we are left with is that a viable U.S. photovoltaics industry would survive the proposed budget cuts. However, our interviews indicate the industry will be different than that which we have today. Those firms more dependent on Federal programs may find it difficult to continue to participate in the development and marketing of photovoltaic products. A number of firms, both large and small, indicated that without Federal support they would reduce R&D efforts in new technologies, thus possibly slowing the development of lower-cost advanced photovoltaics. Subsidiaries of major corporations with substantial financial resources are least likely to curtail their R&D efforts and worldwide marketing.

Mr. Chairmen, this concludes my prepared statement. I would be happy to answer any questions you may have.

SUMMARY OF INDUSTRY RESPONSES TO SELECTED GAO QUESTIONSBY SUBSETS OF RESPONDENTS (note a)

Question A: Will the FV industry ever reach the "take off" point where no Federal assistance is needed?

<u>Selected industry segments</u>	<u>Yes</u>		<u>Not sure</u>		<u>No comment</u>		<u>Total</u>
	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	
Small independent companies	2	33	0	0	4	67	6
Oil company subsidiaries	4	100	0	0	0	0	4
Other major corporations or subsidiaries	8	89	0	0	1	11	9
Other	<u>8</u>	73	<u>1</u>	9	<u>2</u>	18	<u>11</u>
Sample total	<u>22</u>	73	<u>1</u>	4	<u>7</u>	23	<u>30</u>
Commercially active companies	11	79	0	0	3	21	14
Other	<u>11</u>	69	<u>1</u>	6	<u>4</u>	25	<u>16</u>
Sample total	<u>22</u>	73	<u>1</u>	4	<u>7</u>	23	<u>30</u>
Exporters	9	82	0	0	2	18	11
Non-exporters	<u>13</u>	69	<u>1</u>	5	<u>5</u>	26	<u>19</u>
Sample total	<u>22</u>	73	<u>1</u>	4	<u>7</u>	23	<u>30</u>

a/Key to Sample Stratification is on page 15.



Question B: Did your company plan its PV capital investment on the basis of the Federal Government's commitment to spend \$1.5 billion on PV during the next 10 years?

<u>Selected industry segments</u>	<u>Yes</u>		<u>No</u>		<u>Do not know</u>		<u>No comment</u>		<u>Total</u>
	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	
Small independent companies	1	17	4	66	0	0	1	17	6
Oil company subsidiaries	0	0	4	100	0	0	0	0	4
Other major corporations or subsidiaries	2	22	6	67	1	11	0	0	9
Other	<u>4</u>	36	<u>3</u>	28	<u>0</u>	0	<u>4</u>	36	<u>11</u>
Sample total	<u>7</u>	23	<u>17</u>	57	<u>1</u>	3	<u>5</u>	17	<u>30</u>
Commercially active companies	2	14	11	79	0	0	1	7	14
Other	<u>5</u>	31	<u>6</u>	38	<u>1</u>	6	<u>4</u>	25	<u>16</u>
Sample total	<u>7</u>	23	<u>17</u>	57	<u>1</u>	3	<u>5</u>	17	<u>30</u>
Exporters	1	9	10	91	0	0	0	0	11
Non-exporters	<u>6</u>	32	<u>7</u>	37	<u>1</u>	5	<u>5</u>	26	<u>19</u>
Sample total	<u>7</u>	23	<u>17</u>	57	<u>1</u>	3	<u>5</u>	17	<u>30</u>

Question C: Are foreign companies or governments developing their technology at a faster rate than is the United States?

<u>Selected industry segments</u>	<u>Yes</u>		<u>No</u>		<u>Not sure</u>		<u>No comment</u>		<u>Total</u>
	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	
Small independent companies	2	33	2	34	0	0	2	33	6
Oil company subsidiaries	1	25	1	25	1	25	1	25	4
Other major corporations or subsidiaries	1	11	4	45	1	11	3	33	9
Other	<u>4</u>	36	<u>7</u>	64	<u>0</u>	0	<u>0</u>	0	<u>11</u>
Sample total	<u>8</u>	26	<u>14</u>	47	<u>2</u>	7	<u>6</u>	20	<u>30</u>
Commercially active companies	2	14	10	72	1	7	1	7	14
Other	<u>6</u>	38	<u>4</u>	25	<u>1</u>	6	<u>5</u>	31	<u>16</u>
Sample total	<u>8</u>	26	<u>14</u>	47	<u>2</u>	7	<u>6</u>	20	<u>30</u>
Exporters	2	18	7	64	1	9	1	9	11
Non-exporters	<u>6</u>	32	<u>7</u>	37	<u>1</u>	5	<u>5</u>	26	<u>19</u>
Sample total	<u>8</u>	26	<u>14</u>	47	<u>2</u>	7	<u>6</u>	20	<u>30</u>

Question D: How will the proposed budget cuts affect the U.S. photovoltaic industry's ability to compete in foreign markets?

<u>Selected industry segments</u>	<u>Cuts will hurt</u>		<u>Cuts will have no effect</u>		<u>No Comment</u>		<u>Total</u>
	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	
Small independent companies	4	66	1	17	1	17	6
Oil company subsidiaries	0	0	4	100	0	0	4
Other major corporations or subsidiaries	5	56	3	33	1	11	9
Other	<u>9</u>	82	<u>0</u>	0	<u>2</u>	18	<u>11</u>
Sample total	<u>18</u>	60	<u>8</u>	27	<u>4</u>	13	<u>30</u>
Commercially active companies	10	71	4	29	0	0	14
Other	<u>8</u>	50	<u>4</u>	25	<u>4</u>	25	<u>16</u>
Sample total	<u>18</u>	60	<u>8</u>	27	<u>4</u>	13	<u>30</u>
Exporters	7	64	4	36	0	0	11
Non-exporters	<u>11</u>	58	<u>4</u>	21	<u>4</u>	21	<u>19</u>
Sample total	<u>18</u>	60	<u>8</u>	27	<u>4</u>	13	<u>30</u>

Question E: Will the withdrawal of the U.S. Government from demonstration and commercialization slow the development and commercialization of solar energy?

<u>Selected industry segments</u>	<u>Yes</u>		<u>No</u>		<u>No comment</u>		<u>Total</u>
	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	<u>Num-ber</u>	<u>Per-cent</u>	
Small independent companies	3	50	1	17	2	33	6
Oil company subsidiaries	2	50	1	25	1	25	4
Other major corporations or subsidiaries	7	78	1	11	1	11	9
Other	<u>9</u>	82	<u>2</u>	18	<u>0</u>	0	<u>11</u>
Sample total	<u>21</u>	70	<u>5</u>	17	<u>4</u>	13	<u>30</u>
Commercially active companies	10	72	3	21	1	7	14
Other	<u>11</u>	69	<u>2</u>	12	<u>3</u>	19	<u>16</u>
Sample total	<u>21</u>	70	<u>5</u>	17	<u>4</u>	13	<u>30</u>
Exporters	8	73	2	18	1	9	11
Non-exporters	<u>13</u>	68	<u>3</u>	16	<u>3</u>	16	<u>19</u>
Sample total	<u>21</u>	70	<u>5</u>	17	<u>4</u>	13	<u>30</u>

Question F: If Government assistance is still needed, what forms should that assistance take?

<u>Selected industry segments</u>	<u>Market De- velopment and R&amp;D</u>		<u>Market De- velopment only</u>		<u>R&amp;D only</u>		<u>SBA Loans</u>		<u>No Comment</u>		<u>Total</u>
	<u>Num- ber</u>	<u>Per- cent</u>	<u>Num- ber</u>	<u>Per- cent</u>	<u>Num- ber</u>	<u>Per- cent</u>	<u>Num- ber</u>	<u>Per- cent</u>	<u>Num- ber</u>	<u>Per- cent</u>	
Small independent companies	1	17	2	32	1	17	1	17	1	17	6
Oil company subsidiaries	2	50	0	0	2	50	0	0	0	0	4
Other major corporations or subsidiaries	6	67	1	11	2	22	0	0	0	0	9
Other	<u>7</u>	64	<u>4</u>	36	<u>0</u>	0	<u>0</u>	0	<u>0</u>	0	<u>11</u>
Sample total	<u>16</u>	54	<u>7</u>	24	<u>5</u>	16	<u>1</u>	3	<u>1</u>	3	<u>30</u>
Commercially active companies	8	57	4	29	1	7	1	7	0	0	14
Other	<u>8</u>	50	<u>3</u>	19	<u>4</u>	25	<u>0</u>	0	<u>1</u>	6	<u>16</u>
Sample total	<u>16</u>	54	<u>7</u>	24	<u>5</u>	16	<u>1</u>	3	<u>1</u>	3	<u>30</u>
Exporters	6	55	3	27	1	9	1	9	0	0	11
Non-exporters	<u>10</u>	53	<u>4</u>	21	<u>4</u>	21	<u>0</u>	0	<u>1</u>	5	<u>19</u>
Sample total	<u>16</u>	54	<u>7</u>	24	<u>5</u>	16	<u>1</u>	3	<u>1</u>	3	<u>30</u>

KEY TO SAMPLE STRATIFICATIONSmall independent companies (75 or fewer employees)

Crystal Systems, Inc.  
 DSET Laboratories, Inc.  
 Energy Materials Corporation  
 Free Energy Systems, Inc.  
 Solenergy Corporation  
 Sollos, Inc.

Oil company subsidiaries

ARCO Solar Industries  
 Exxon Enterprises (Solar Power Corporation)  
 Mobil Tyco Solar Energy Corporation  
 SES, Inc.

Other major corporations or subsidiaries

Lockheed Missiles and Space Company  
 Martin Marietta Aerospace Company  
 Microwave Associates, Inc. (MACOM, Inc.)  
 Motorola, Inc.  
 Photowatt International, Inc. (Compagnie Generale d'Electricite)  
 Spectrolab, Inc. (Hughes Aircraft Company)  
 Thermo Electron Corporation  
 Varian Associates, Inc.  
 Westinghouse Electric Corporation

Commercially active companies

Acurex Corporation  
 Applied Solar Energy Corporation  
 ARCO Solar Industries  
 DSET Laboratories, Inc.  
 Exxon Enterprises (Solar Power Corporation)  
 Ford, Bacon & Davis Utah, Inc.  
 Free Energy Systems, Inc.  
 International Rectifier Corporation  
 Motorola, Inc.  
 Photowatt International, Inc.  
 Solarex Corporation  
 Solenergy Corporation  
 Sollos, Inc.  
 Spectrolab, Inc.

Exporters

Applied Solar Energy Corporation  
 ARCO Solar Industries  
 DSET Laboratories, Inc.  
 Exxon Enterprises (Solar Power Corporation)  
 Free Energy Systems, Inc.

Motorola, Inc.  
Photowatt International, Inc.  
Solarex Corporation  
Solenergy Corporation  
Sollos, Inc.  
Spectrolab, Inc.

SUMMARY OF GAO TESTIMONY BEFORE THE  
SUBCOMMITTEE ON ENERGY, CONSERVATION AND POWER  
HOUSE COMMITTEE ON ENERGY AND COMMERCE  
AND THE  
SUBCOMMITTEE ON ENERGY, ENVIRONMENT AND SAFETY ISSUES  
AFFECTING SMALL BUSINESS  
HOUSE COMMITTEE ON SMALL BUSINESS  
ON INDUSTRY VIEWS ON THE EFFECT OF PROPOSED BUDGET REDUCTIONS ON THE  
ABILITY OF THE U.S. PHOTOVOLTAICS INDUSTRY TO COMPETE IN FOREIGN MARKETS

- GAO has reported and summarized the responses of 30 private photovoltaic companies and experts to questions concerning the proposed budget reductions. GAO has not independently analyzed, and takes no position on, possible effects of these reductions.
- The U.S. photovoltaic industry is very diverse—large and small companies, independents and subsidiaries of large corporations, commercially active companies and research companies, etc.—and presented diverse viewpoints difficult to generalize, but firms dependent on Federal Government program funding generally foresaw the most adverse consequences from the proposed budget reductions, whereas those with primarily private funding foresaw fewer negative consequences.
- Two-thirds of the firms interviewed believed that the proposed budget cuts would reduce the ability of the U.S. firms to compete in foreign markets. Subsidiaries of the major oil companies, however, felt there would be little or no effect on the industry's ability to compete in foreign markets.
- Most companies cited the value of R&D programs in accelerating technological development and regretted the reduction of R&D funding.
- Most companies (including some who said they themselves did not need such assistance) said the Government should continue foreign market development efforts, such as trade shows, export promotion activities, and demonstration projects.
- Few companies said that past international cooperative agreements have been of value to U.S. industry, although most said that appropriate demonstration projects in foreign market areas are needed.
- Most companies felt that U.S. technology is still ahead of major foreign competitors, but feared that reduced U.S. R&D may reverse this.