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Solar Collector Manufacturing Activity, July through December, 1981

Energy Information Administration
Office of Coal, Nuclear, Electric and
Alternate Fuels
U.S. Department of Energy

MASTER

March 1982

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Solar-Collector Manufacturing Activity, July through December, 1981

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Office of Coal, Nuclear, Electric and
Alternate Fuels
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The Solar Collector Manufacturing Activity report presents production, sales, and end-use data from manufacturers of solar thermal collectors and photovoltaic modules. It provides annual and semiannual data necessary for the Department of Energy to execute its responsibility for (1) monitoring activities and trends in the solar collector manufacturing industry, and (2) providing information on the size and status of the industry to interested groups. These groups include the Solar Energy Research Institute, solar energy specialists, and manufacturers.

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SCMA

Total collector shipments for 1981 amounted to...an increase of .55 million square feet (3 percent) over the total for 1980..."

Solar Thermal Collectors

Total Producer Shipments

Thermal and Photovoltaic Solar Collector Manufacturing Activity

Solar collector manufacturing data presented in this Energy Information Administration (EIA) Energy Data Report allow comparisons of semiannual totals for the last three survey periods (July through December 1981, January through June 1981, and July through December 1980). Annual totals are also provided for the years 1979 through 1981. Semiannual and annual totals are revised during the survey period immediately following their publication to include reported data for late respondents: these reported data replace previous estimates for these companies.

During the second half of 1981, producer shipments of solar thermal collectors totaled 9.23 million square feet. These collectors were produced by 217 manufacturers.¹ Shipments were 1.49 million square feet (14 percent) lower than shipments reported for the first 6 months of 1981, and 1.25 million square feet (12 percent) below shipments reported for the last six months of 1980. (See Figure on page 2 and Table 1, page 9.)

Total collector shipments for 1981 amounted to 19.95 million square feet. This is an increase of .55 million square feet (3 percent) over the total for 1980 and 5.69 million (40 percent) over total shipments for 1979. (See Table 1, page 9.)

Of the 9.23 million square feet of thermal collectors produced during the last 6 months of 1981, 4.35 million square feet (47 percent) were manufactured by the 10 leading companies. The 10 leading manufacturers of low-temperature collectors² claimed 82 percent of this market during the second half of 1981, with shipments totaling 2.42 million square feet.

¹ Estimates for 26 nonrespondents are included here.

² For an explanation of low-temperature and other collector types, see Glossary, page 29.

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Figure.
Solar Collector
Manufacturing
Activity

"Of the 9.23 million square feet of thermal collectors produced during the last 6 months of 1981...47% were manufactured by 10 leading companies."

Sources: Form EIA-63, "Solar Collector Manufacturers and Importers Survey," 1978-1981. Voluntary telephone survey, 1974-1977.

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Shipments by Company
Headquarters Location

Collector Type

During the current period, shipments by the 10 leading manufacturers of medium-temperature collectors amounted to 2.94 million square feet (49 percent) of medium-temperature collectors, while the 10 leading manufacturers of special and "other" collectors produced 2.42 million square feet (99 percent) of all special and "other" collectors.

Companies with headquarters in California, New Jersey, New York, and Florida accounted for more than three-quarters of all shipments. Together they produced 7.07 million square feet (77 percent) of all collector shipments in the second half of 1981; 8.88 million square feet (83 percent) in the first half of 1981; and 8.73 million square feet (83 percent) in the second half of 1980. California is the leading State in collector manufacturing. Shipments from California companies totaled 53 percent, 52 percent, and 55 percent, respectively, of all solar collector shipments for the last three reporting periods. (See Table 4, page 12.)

Annual shipments from these four leading States during 1981 constituted 80 percent of all collector shipments, compared to 85 percent for 1980, and 80 percent for 1979. California manufacturers produced 53 percent of all shipments in 1981, 55 percent in 1980, and 50 percent in 1979. (See Table 3, page 11.)

Shipments of low-temperature collectors in the second half of 1981 represent a decrease of 48 percent from the first half of 1981, and a decrease of 52 percent from the second half of 1980. Production of medium-temperature, special and "other" collectors during the second half of 1981 increased by 23 percent over the first half of 1981, and by 46 percent over the second half of 1980. (See Table 5, page 13.)

During the current reporting period, shipments of low-temperature collectors constituted 32 percent (2.95 million square feet) of all shipments. Medium-temperature, special, and "other" collectors comprised the remaining 68 percent of the market.

Annual shipments of low-temperature collectors amounted to 8.56 million square feet (43 percent) in 1981, 12.23 million square feet (63 percent) in 1980, and 8.39 million square feet (59 percent) 1979. Annual shipments of medium-temperature collectors comprised 57 percent (11.39 million square feet) of all shipments in 1981, 37

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

End Use

percent (7.16 million square) in 1980, and 41 percent (5.86 million square feet) in 1979. (See Table 5, page 13.)

In the second half of 1981, 43 percent of all collectors were used for pool heating, 38 percent for hot water, 10 percent for space heating, 4 percent for space cooling, 3 percent for "other," 2 percent for industrial processing, and less than 1 percent for agricultural processing. Uses for the first half of 1981 were 53 percent for pool heating, 34 percent for hot water, 10 percent for space heating, less than 1 percent for space cooling, 2 percent for industrial processing, less than 1 percent for "other," and zero for agricultural processing. Uses during the second half of 1980 were 67 percent for pool heating, 10 percent for hot water, 8 percent for space heating, less than 1 percent for space cooling, 2 percent for industrial processing, 1 percent for "other," and less than 1 percent for agricultural processing. (See Table 10, page 18.)

Ninety-one percent of low-temperature collectors were used for pool heating in the second half of 1981; 89 percent of these were nonmetallic. During the first half of 1981, 94 percent of low-temperature collectors were used for pool heating, and 83 percent of these were nonmetallic. Figures for the second half of 1980 indicate that 90 percent of low-temperature collectors were used for pool heating, and 71 percent of these were nonmetallic. (See Table 10, page 18.)

During the second half of 1981, 56 percent of medium-temperature collectors were used for hot water, almost 99 percent of these were liquid; 21 percent were used for pool heating, almost 100 percent of these were liquid; and 14 percent were used for space heating, 76 percent of these were liquid. During the first half of 1981, 69 percent of medium-temperature collectors were used for hot water, 99 percent of these were liquid; 9 percent were used for pool heating, 99 percent of these were liquid; and 20 percent were used for space heating, 89 percent of these were liquid. The three leading end uses during the last half of 1980 were 60 percent for hot water, 99 percent of these were liquid; 11 percent for pool heating, 99 percent of these were liquid; and 21 percent for space heating, 60 percent of these were liquid. (See Table 10, page 18.)

Special concentrator and evacuated tube collectors were used primarily for domestic water heating (41 percent) and industrial processing (34 percent) in the second

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

half of 1981. During the first half of 1981, 36 percent of these special collectors were used for domestic water heating and 35 percent for industrial processing. During the second half of 1980, the distribution was 40 percent for domestic water heating and 20 percent for space cooling. (See Table 10, page 18.)

Market Sector

"Imports came from
Australia, Israel, Japan,
and Jordan."

In the second half of 1981, 6.87 million square feet (74 percent) of all solar collectors were used by the residential market sector. This represents a decrease from the previous two reporting periods. In the first half of 1981, 8.76 million square feet (82 percent) were used by the residential sector. In the second half of 1980 the numbers are similar; the residential sector used 8.55 million square feet (82 percent) of all collector shipments. (See Table 12, page 20.)

The commercial sector's market share increased to 1.33 million square feet (14 percent) in the second half of 1981, from a total of 1.19 million square feet (11 percent) in the first half of 1981. In the second half of 1980, 1.34 million square feet (13 percent of the total market) were used in the commercial sector. (See Table 12, page 20.)

Applications in the industrial, agricultural, and "other" market sectors increased to 12 percent of all shipments in the second half of 1981, compared to 7 percent in the first half of 1981, and 5 percent in the second half of 1980.

Imports

Imports totaled .124 million square feet in the second half of 1980, an increase of 74 percent over the first half of 1981, when .072 million square feet of collectors were imported. However, the total for July through December 1981 represents a decrease of 11 percent from the second half of 1980; imports in the last half of 1980 amounted to .140 million square feet. Medium-temperature collectors made up 100 percent (.124 million square feet) of the total shipments during the current survey period, compared to 57 percent (.041 million square feet) and 79 percent (.119 million square feet), respectively, for the two previous survey periods. (See Table 8, page 16.)

Four companies imported thermal collectors during the second half of 1981, three in the first half of the year, and seven in the second half of 1980. Imports came from Australia, Israel, Japan, and Jordan.

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Exports

Related Activities

During the second half of 1981, exports were down 64 percent from the first half of 1981, and 68 percent from the total for the second half of 1980. Exports of low-temperature collectors amounted to 78 percent, 90 percent, and 81 percent of all semiannual exports, respectively, for the July through December 1981, January through June 1981, and July through December 1980 survey periods. Twenty-one companies exported collectors to 19 countries and territories: Argentina, Australia, Austria, Bermuda, Belgium, Bahamas, Canada, Communist China, France, Italy, Japan, Netherlands, Pakistan, Republic of Korea, Saudi Arabia, Singapore, Spain, Taiwan (Republic of China), and the Virgin Islands. (See Table 8, page 16.)

During the current reporting period, companies engaged in activities related to solar collector manufacturing included: 154 in wholesale distribution; 114 in retail distribution; 121 in systems design and consulting; 97 in installation; 83 in component part manufacturing; and 154 in prototype development. This represents an increase over the first half of 1981 in the number of companies engaged in all activities excluding component part manufacturing, where the number of companies dropped by three. Figures for the second half of 1980 are higher in all six categories than those for the current survey period. Decreases evident in the two 1981 survey periods may indicate an industry trend away from participation in multiple activities toward greater specialization in a smaller number of areas. (See Table 15, page 27.)

Prototype Development

In the second half of 1981, 154 companies were involved in prototype development. This is an increase of 21 companies (14 percent) from the first half of 1980 and a decrease of 7 companies (4 percent) from the second half of 1980. Of the 250 prototypes under development in the current survey period, 56 percent were medium-temperature collectors, 27 percent were low-temperature collectors, 10 percent were special collectors, and 7 percent were listed in the "other" category. During the first half of 1981 percentages of medium- and low-temperature collectors were identical, 11 percent were special collectors, and 6 percent fell under "other." For the second half of 1980, 56 percent were medium-temperature collectors, 24 percent were low-temperature collectors, 11 percent were special collectors and the remaining 9 percent were "other" collectors. (See Table 16, page 27.)

"During the second half of 1981, exports were down 64 percent from the first half of 1981..."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Photovoltaic Modules

Market Sector

During the second half of 1981, 13 companies reported the manufacture and sale of photovoltaic modules capable of producing a total of 879 peak kilowatts. This is a decrease of 29 percent from the 1,238³ peak kilowatt capacity reported by the same companies for the first half of 1981. It is also 36 percent lower than the total of 1,373 peak kilowatts reported for the second half of 1980 by these companies. This downward trend may be attributed primarily to the poor state of the economy, rather than any reduction in production capacity. (See Table 17, page 28.) The reader should keep in mind, however, that three companies believed to be active in photovoltaic manufacturing, did not respond to this survey, and due to the relatively small number of firms in the industry, no estimation was attempted. Therefore, the figures reported may be somewhat conservative.

In the second half of 1981, 41 percent of all reported photovoltaic modules were used by the industrial market sector, 38 percent by the commercial sector, and 18 percent by residential customers. The "other" sector accounted for 2 percent of all modules used and the agricultural sector for less than 1 percent. Industrial users comprised 79 percent of the photovoltaic market in the first half of 1981, while commercial use was 14 percent and residential was only 2 percent. Percentages for the remaining sectors were 4 for "other," and slightly less than 2 for agricultural. In the second half of 1980, commercial users claimed 40 percent of the market, industrial users 30 percent, "other" users 10 percent, agricultural users 19 percent, and residential users were 1 percent of the total. (See Table 17, page 28.)

End Use

Photovoltaics were used primarily for remote communications and remote electricity generation during the last three reporting periods. These applications constituted 80 percent of the total in the second half of 1981, 96 percent in the first half of 1981, and 80 percent in the second half of 1980.

³ Totals for January through June 1981 and July through December 1980 were revised to reflect corrected totals for two companies reporting data in watts instead of kilowatts, and to adjust for late respondents.

Exports

Ten manufacturers reported exports during the current survey period, compared with eight and four, respectively, for the previous two reporting periods. Forty-one percent of all photovoltaic modules manufactured were exported in the second half of 1981, sixty-six percent in the first half of 1981, and two percent in the last half of 1980.

Photovoltaic modules were exported to 34 countries during the second half of 1981: Argentina, Australia, Brazil, British Honduras, Canada, Columbia, Costa Rica, France, Great Britain, Guatemala, India, Indonesia, Iraq, Italy, Japan, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Nigeria, Norway, Pakistan, Philippines, Saudi Arabia, Singapore, South Africa, Spain, Sweden, Switzerland, Thailand, Tunisia, Uruguay, and West Germany.

"Photovoltaic modules were
exported to 34 countries
during the second half of
1981."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 1. Summary of Solar Collector Manufacturing Activity^a (Thousand Square Feet)

Year	Number of Manufacturers ^b	Area		Total
		Low-Temperature	Medium-Temperature, Special, and Other	
1974	45	1,137	137	1,274
1975	131	3,026	717	3,743
1976	186	3,876	1,925	5,801
1977 First Half.....	196	2,514	2,506	5,020
Second Half.....	294	2,229	3,063	5,292
Total.....	321	4,743	5,569	10,312
1978 First Half.....	297	3,595	2,681	6,276
Second Half.....	247	2,277	2,307	4,584
Total.....	340	5,872	4,988	10,860
1979 First Half.....	250	4,356	2,545	6,901
Second Half.....	248	4,039	3,312	7,350
Total.....	349	8,395	5,857	14,251
1980 First Half				
Reported.....	213	5,650	2,733	8,383
Estimated.....	13	416	118	534
Total, First Half..	226	6,066	2,851	8,917
Second Half				
Reported.....	218	R5,649	3,715	R9,364
Estimated.....	30	R518	579	R1,117
Total, Second Half.	R249	6,167	4,314	R10,481
Total.....	276	R12,233	7,165	R19,398
1981 First Half				
Reported.....	R196	R5,582	R4,553	R10,135
Estimated.....	R54	R32	R554	R586
Total, First Half..	R250	R5,614	R5,107	R10,721
Second Half				
Reported.....	191	2,422	5,190	7,611
Estimated.....	26	528	1,090	1,618
Total, Second Half.	217	2,950	6,280	9,229
Total.....	282	8,563	11,387	19,950

^aSum of components may not equal total due to independent rounding.

^bTotal number of manufacturers for 1974 through 1979 represents the number of companies reporting activities for one or both halves of the calendar year. Total number of manufacturers represents the number of companies reporting manufacture of collectors for one or both halves of 1980 and 1981.

R = Revised.

Sources: EIA-63, "Solar Collector Manufacturers and Importers Survey," 1978-1980. Voluntary telephone survey 1974-1977.

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 2. Solar Collector Types Manufactured (Percent)

Year	Percent of Collectors		
	Low Temperature	Medium Temperature Special, and Other	Total
1974	89	11	100
1975	81	19	100
1976	67	33	100
1977	46	54	100
1978	57	43	100
1979	59	41	100
1980	R63	R37	100
1981	R43	R57	100

R = Revised.

Sources: EIA-63, "Solar Collector Manufacturers and Importers Survey," 1978-1980. Voluntary telephone survey 1974-1977.

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 3. Annual Shipments
By Location of
Company Headquarters^a
(Square Feet)

Location ^b	1981	1980	1979
	Shipments	Shipments	Shipments
Alabama.....	125,961	(c)	(c)
Arizona.....	729,815	269,261	323,127
California.....	10,480,041	10,653,168	7,076,692
Colorado.....	486,909	263,382	225,504
Connecticut.....	92,617	102,185	40,992
Florida.....	1,652,430	1,149,658	941,491
Georgia.....	72,014	25,764	68,698
Illinois.....	142,368	332,470	595,852
Iowa.....	25,909	26,195	17,439
Kansas.....	14,437	13,251	18,752
Maryland.....	(c)	(c)	22,748
Massachusetts....	140,987	79,884	116,386
Minnesota.....	111,360	86,154	53,305
New Jersey.....	1,902,143	2,785,247	1,759,823
New Mexico.....	(c)	(c)	13,244
New York.....	1,916,976	1,859,601	1,551,901
North Carolina...	11,935	19,768	20,223
Ohio.....	250,637	168,105	214,171
Pennsylvania.....	270,819	195,285	200,747
Tennessee.....	166,681	129,774	114,938
Texas.....	534,537	400,794	286,817
Virginia.....	308,930	R220,846	104,630
Wisconsin.....	38,344	(c)	23,790
Other ^d	474,216	617,097	459,511
U.S. Total.....	19,950,065	R19,397,889	14,250,789

^aIncludes adjusted data for nonrespondents.

^bLocation refers to the address of company headquarters but not necessarily the location of the manufacturing installation.

^cLess than three survey respondents for one or both halves of the year.

^dTotal for States having less than three respondents.

R = Revised.

Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 4. Semiannual
Shipments By Location
of Company Headquarters^a
(Square Feet)

Location ^b	July through December 1981		January through June 1981		July through December 1980	
	Number of Manufacturers	Shipments	Number of Manufacturers	Shipments	Number of Manufacturers	Shipments
Alabama.....	3	24,661	4	101,300	4	162,359
Arizona.....	14	457,581	14	272,234	11	151,475
California.....	54	4,922,440	R68	R5,557,601	72	5,761,473
Colorado.....	8	305,627	9	181,282	9	139,863
Connecticut.....	4	21,512	7	71,105	7	56,894
Florida.....	24	731,053	33	921,377	31	617,798
Georgia.....	4	35,610	4	36,404	3	10,864
Illinois.....	3	55,360	R3	R87,008	5	205,842
Indiana.....	(c)	(c)	R(c)	R(c)	3	45,444
Iowa.....	3	12,506	7	13,403	7	12,045
Kansas.....	3	8,488	3	5,949	3	9,056
Maryland.....	(c)	(c)	(c)	(c)	3	15,760
Massachusetts....	6	109,190	7	R31,797	7	45,782
Michigan.....	3	20,472	(c)	(c)	(c)	(c)
Minnesota.....	5	67,795	4	43,565	4	41,452
Missouri.....	(c)	(c)	3	584	(c)	(c)
New Jersey.....	6	541,675	6	1,360,468	6	1,407,115
New York.....	10	878,082	8	R1,038,894	11	943,541
North Carolina...	3	5,310	3	6,625	3	8,220
Ohio.....	9	136,167	9	114,470	8	105,425
Pennsylvania.....	7	138,018	7	132,800	6	104,051
Rhode Island.....	(c)	(c)	3	8,638	3	7,961
South Carolina...	(c)	(c)	R3	R10,964	(c)	(c)
Tennessee.....	4	95,830	3	R70,851	3	63,020
Texas.....	7	278,787	7	255,750	6	201,876
Virginia.....	7	132,463	6	176,467	R8	R157,586
Wisconsin.....	5	24,590	5	13,754	3	R11,846
Other ^d	25	225,662	23	R207,896	R23	R194,438
U.S.Total.....	217	9,228,879	R250	R10,721,186	R249	R10,481,186

^aIncludes adjusted data for nonrespondents.

^bLocation refers to the address of the company headquarters but not necessarily the location of the manufacturing installation.

^cLess than three survey respondents

^dTotal for States having less than three respondents. Less than three respondents were reported during July through December 1981 in the District of Columbia, Hawaii, Idaho, Indiana, Louisiana, Maine, Maryland, Missouri, Montana, Nebraska, New Mexico, Rhode Island, South Dakota, Utah, Vermont, Wyoming, and Puerto Rico.

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 5. Annual
Shipments By
Collector Type^a
(Square Feet)

Location ^b	1981		1980		1979	
	Low-Temperature	Medium-Tempera- ture, Special, and Other	Low-Temperature	Medium-Tempera- ture, Special, and Other	Low-Temperature	Medium-Tempera- ture, Special, and Other
Alabama.....	0	125,961	(c)	(c)	(c)	(c)
Arizona.....	98,864	632,951	32,180	237,081	24,426	298,681
California.....	5,861,483	4,618,558	8,338,288	2,314,880	5,526,763	1,549,929
Colorado.....	0	486,909	20,883	242,499	6,094	219,410
Connecticut.....	331	92,286	2,015	100,170	2,600	38,392
Florida.....	594,443	1,057,987	708,306	441,352	595,680	345,811
Georgia.....	0	72,014	0	25,764	860	67,838
Illinois.....	68,000	74,368	37,514	294,956	47,084	548,768
Indiana.....	0	25,909	4,431	21,764	0	17,439
Kansas.....	0	14,437	200	13,051	256	18,136
Maryland.....	(c)	(c)	(c)	(c)	0	22,748
Massachusetts....	0	140,987	27,224	52,660	82,540	33,846
Minnesota.....	0	111,360	0	86,154	0	53,305
New Jersey.....	1,221,792	680,351	2,221,226	564,021	1,286,629	473,194
New Mexico.....	(c)	(c)	(c)	(c)	0	13,244
New York.....	679,490	1,237,486	810,745	1,048,856	765,138	786,763
North Carolina..	0	11,935	0	19,768	0	20,223
Ohio.....	0	250,637	1,800	166,305	5,188	208,983
Pennsylvania....	0	270,818	0	195,285	23,940	176,807
Tennessee.....	0	166,681	0	129,774	0	149,938
Texas.....	6,760	527,777	6,440	394,354	7,640	279,177
Virginia.....	1,014	307,916	84,867	215,979	4,980	99,658
Wisconsin.....	0	38,344	(c)	(c)	0	23,790
Other ^d	33,099	441,117	17,172	599,925	14,500	445,001
U.S. Total....	8,563,276	11,386,789	812,233,391	7,164,598	8,394,318	5,856,451

^aIncludes adjusted data for nonrespondents.

^bLocation refers to the address of the company headquarters and not necessarily the location of the manufacturing installation.

^cLess than three survey respondents for one or both halves of the year.

^dTotal for States having less than three survey respondents.

R = Revised.

Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 6. Semiannual Shipments By Collector Type^a (Square Feet)

Location ^b	July through December 1981		January through June 1981		July through December 1980	
	Low-Temperature	Medium-Temperature, Special, and Other	Low-Temperature	Medium-Temperature, Special, and Other	Low-Temperature	Medium-Temperature, Special, and Other
Alabama.....	0	24,661	0	101,300	0	162,359
Arizona.....	72,942	384,639	23,922	248,312	16,240	135,235
California.....	2,090,109	2,832,331	R3,771,374	R1,786,227	4,208,373	1,553,100
Colorado.....	0	305,627	0	181,282	735	139,128
Connecticut.....	0	21,512	331	70,774	879	56,015
Florida.....	168,793	562,260	425,650	495,727	320,660	297,138
Georgia.....	0	35,610	0	36,404	0	10,864
Illinois.....	32,000	23,360	36,000	R51,008	31,034	174,808
Indiana.....	(c)	(c)	0	R5,096	0	45,444
Iowa.....	0	12,506	0	13,403	4,431	7,614
Kansas.....	0	8,488	0	5,949	0	9,056
Maryland.....	(c)	(c)	(c)	(c)	0	15,760
Massachusetts....	0	109,190	0	R31,797	16,374	29,408
Michigan.....	192	20,280	(c)	(c)	(c)	(c)
Minnesota.....	0	67,795	0	43,565	0	41,452
Missouri.....	(c)	(c)	0	584	(c)	(c)
New Jersey.....	325,576	216,099	896,216	464,252	1,110,774	296,341
New York.....	224,024	654,058	455,466	R583,428	436,970	506,571
North Carolina...	0	5,310	0	6,625	0	8,220
Ohio.....	0	136,167	0	114,470	1,150	104,275
Pennsylvania.....	0	138,018	0	132,800	0	104,051
Rhode Island.....	(c)	(c)	0	8,638	(c)	(c)
South Carolina...	(c)	(c)	R0	R10,964	(c)	(c)
Tennessee.....	0	95,830	0	R70,851	0	63,020
Texas.....	2,920	275,867	3,840	251,910	1,320	200,556
Virginia.....	360	132,103	654	175,813	R3,867	153,719
Wisconsin.....	0	24,590	0	13,754	0	R11,846
Other ^d	32,507	193,155	400	R202,400	14,866	422,942
U.S. Total.....	2,949,423	6,279,456	R5,613,853	R5,107,333	R6,167,673	4,313,513

^aIncludes adjusted data for nonrespondents.

^bLocation refers to the address of the company headquarters and not necessarily the location of the manufacturing installation.

^cLess than three survey respondents.

^dTotal for States having less than three survey respondents.

R = Revised.

Source: ETA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 7. Semiannual Shipments By Producer Size^a (Square Feet)

Producer Size (Square Feet of Production)	July through December 1981		January through June 1981		July through December 1980	
	Number of Manufacturers ^b	Shipments	Number of Manufacturers ^b	Shipments	Number of Manufacturers ^b	Shipments
Low-Temperature Collectors						
200,000 or greater...	4	1,632,776	6	4,137,019	9	5,384,482
100,000 - 199,999...	4	608,364	6	852,342	2	351,552
50,000 - 99,999...	6	425,674	R4	R292,723	0	0
10,000 - 49,999...	10	228,775	11	R235,049	15	306,594
2,000 - 9,999...	9	37,213	R20	R86,249	24	R116,243
1,000 - 1,999...	9	11,758	5	6,614	3	3,670
Less than 1,000.....	11	4,863	9	3,857	10	5,132
Total Low-Temperature.....	53	2,949,423	61	R5,613,853	63	R6,167,673
Medium-Temperature, Special, and Other Collectors						
50,000 or greater...	30	4,729,408	R29	R3,582,092	22	2,519,068
10,000 - 49,999.....	55	1,260,887	R47	R1,098,334	53	1,349,623
2,000 - 9,999.....	50	235,645	R75	R371,750	75	383,028
1,000 - 1,999.....	24	33,574	R21	R28,772	32	45,360
Less than 1,000.....	42	19,942	R55	R26,385	40	16,434
Total Medium-Temperature, Special and Other Collectors.....	201	6,279,456	227	R5,107,333	222	4,313,513
Total.....	—	9,228,879	—	R10,721,186	—	R10,481,186

^aIncludes adjusted data for nonrespondents.

^bManufacturers producing more than one collector type appear more than once.

Note: - Indicates data not applicable.

R = Revised.

Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 8. Import and Export Activity.^a (Square Feet)

Year, Number of Manufacturers and Type of Collector	Imports	Exports
<u>July through December 1981</u>		
Number of Companies.....	4	21
Collectors (Square Feet)		
Low-Temperature.....	0	138,853
Medium-Temperature and Special...	124,340	39,896
Total.....	124,340	178,749
<u>January through June 1981</u>		
Number of Companies.....	R3	25
Collectors (Square Feet)		
Low-Temperature.....	30,662	443,577
Medium-Temperature and Special...	40,860	51,994
Total.....	71,522	495,571
<u>July through December 1980</u>		
Number of Companies.....	7	36
Collectors (Square Feet)		
Low-Temperature.....	21,165	459,319
Medium-Temperature and Special...	118,566	107,103
Total.....	139,731	566,422

^aData not adjusted for nonrespondents.

R = Revised.

Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 9. Annual
Shipments By Collector
Type and End Use^a
(Thousand Square Feet)

Year and Collector Type	Pool Heating	Hot Water	Space Heating	Space Cooling	Industrial Processing	Agricultural Processing	Other	Total Reported Distribution
1981								
Low-Temperature, Nonmetallic...	7,045	65	20	0	80	16	6	7,231
Low-Temperature, Metallic.....	919	160	113	18	18	0	106	1,333
Medium-Temperature, Air.....	4	75	312	(b)	0	16	30	436
Medium-Temperature, Liquid....	1,698	6,658	1,515	346	117	13	16	10,502
Special, Concentrator.....	1	77	11	18	151	(b)	14	272
Special, Evacuated Tube.....	3	96	45	27	2	(b)	0	172
Other.....	(b)	5	1	0	(b)	0	0	6
TotalC.....	9,668	7,135	2,017	408	367	44	312	19,950
1980								
Low-Temperature, Nonmetallic...	9,353	24	84	1	139	9	1	R9,531
Low-Temperature, Metallic.....	1,956	622	76	1	48	0	(b)	R2,704
Medium-Temperature, Air.....	6	27	587	1	1	17	9	648
Medium-Temperature, Liquid....	695	3,975	959	74	132	28	159	6,022
Special, Concentrator.....	2	106	21	25	54	0	117	325
Special, Evacuated Tube.....	1	35	41	55	3	0	9	R144
Other.....	15	1	0	0	0	0	8	24
TotalC.....	12,029	4,790	1,688	156	377	54	302	R19,398
1979								
Low-Temperature, Nonmetallic...	6,743	20	23	15	69	59	18	6,946
Low-Temperature, Metallic.....	1,119	78	27	5	26	0	193	1,447
Medium-Temperature, Air.....	3	40	776	0	0	21	5	846
Medium-Temperature, Liquid....	684	2,658	787	44	83	42	164	4,462
Special, Concentrator.....	3	140	77	10	32	0	4	269
Special, Evacuated Tube.....	0	13	30	155	22	0	8	229
Other.....	(b)	9	(b)	3	1	40	3	57
TotalC.....	8,551	2,958	1,722	232	233	163	393	14,251

^aIncludes adjusted data for nonrespondents.

^bLess than 500 square feet.

^cSum of components may not equal total due to independent rounding.

R = Revised.

Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 10. Semiannual Shipments By Collector Type and End Use^a (Thousand Square Feet)

Survey Period and Collector Type	Pool Heating	Hot Water	Space Heating	Space Cooling	Industrial Processing	Agricultural Processing	Other	Total Reported Distribution
July through December 1981								
Low-Temperature, Nonmetallic...	2,380	3	10	0	25	16	6	2,440
Low-Temperature, Metallic.....	300	41	43	18	7	0	102	510
Medium-Temperature, Air.....	1	47	207	0	0	11	21	287
Medium-Temperature, Liquid....	1,284	3,316	658	300	48	11	127	5,744
Special, Concentrator.....	0	38	4	5	83	0	14	144
Special, Evacuated Tube.....	2	63	26	9	(b)	(b)	0	101
Other.....	0	4	0	0	0	0	0	4
Total ^c	3,967	3,511	948	332	162	38	271	9,229
January through June 1981								
Low-Temperature, Nonmetallic..	R4,664	62	10	0	55	0	0	R4,791
Low-Temperature, Metallic.....	R619	119	70	0	11	0	3	R823
Medium-Temperature, Air.....	R3	R28	R105	0	0	R5	9	R149
Medium-Temperature, Liquid....	R414	R3,343	R856	45	R69	1	29	R4,758
Special, Concentrator.....	R1	R39	7	13	68	0	0	R128
Special, Evacuated Tube.....	0	33	R19	17	1	0	0	R71
Other.....	0	1	1	0	0	0	0	2
Total ^c	R5,701	R3,624	R1,068	76	R205	R6	41	R10,721
July through December 1980								
Low-Temperature, Nonmetallic..	4,371	5	R4	0	62	0	0	R4,441
Low-Temperature, Metallic.....	1,175	460	R62	0	29	0	0	1,725
Medium-Temperature, Air.....	5	R18	357	1	0	16	8	405
Medium-Temperature, Liquid....	465	2,432	488	39	91	15	152	3,682
Special, Concentrator.....	1	51	15	13	33	0	1	114
Special, Evacuated Tube.....	1	30	21	28	1	0	8	R91
Other.....	15	0	0	0	0	0	8	23
Total ^c	6,033	2,996	R946	81	216	31	177	R10,481

^aIncludes adjusted data for nonrespondents.

^bLess than 500 square feet.

^cSum of components may not equal total due to independent rounding.

R = Revised.

Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 11. Annual Shipments
By Collector Type
and Market Sector^a
(Thousand Square Feet)

Year and Collector Type	Market Sector					Total	Government ^b
	Residential	Commercial	Industrial	Agricultural	Other		
1981							
Low-Temperature, Nonmetallic..	6,357	787	50	37	0	7,231	0
Low-Temperature, Metallic.....	1,002	111	201	6	13	1,333	0
Medium-Temperature, Air.....	346	63	2	16	10	436	10
Medium-Temperature, Liquid....	7,013	1,436	1,141	13	99	10,502	106
Special, Concentrator.....	65	33	119	50	5	272	123
Special, Evacuated Tube.....	42	90	6	(d)	34	172	6
Other.....	5	(d)	(d)	(d)	(d)	6	0
Total ^c	15,630	2,521	1,518	122	160	19,950	247
1980							
Low-Temperature, Nonmetallic..	R8,339	1,043	112	35	0	R9,530	0
Low-Temperature, Metallic.....	2,138	475	32	16	41	2,703	24
Medium-Temperature, Air.....	575	48	1	18	7	649	44
Medium-Temperature, Liquid....	4,893	652	242	25	208	6,021	225
Special, Concentrator.....	109	83	87	0	47	325	113
Special, Evacuated Tube.....	15	108	13	0	9	145	R11
Other.....	8	8	0	0	9	24	8
Total ^c	R16,077	2,417	488	94	321	R19,398	R425
1979							
Low-Temperature, Nonmetallic..	6,064	756	115	11	0	6,946	0
Low-Temperature, Metallic.....	1,057	170	22	5	193	1,447	2
Medium-Temperature, Air.....	735	80	3	21	7	846	9
Medium-Temperature, Liquid....	3,377	764	93	31	195	4,460	170
Special, Concentrator.....	135	79	38	0	14	265	6
Special, Evacuated Tube.....	17	1,163	41	0	7	229	120
Other.....	2	2	1	52	11	57	4
Total ^c	11,387	2,015	314	120	427	14,251	313

^aIncludes adjusted data for nonrespondents.

^bGovernment sector overlaps other sectors.

^cSum of components may not equal total due to independent rounding.

^dLess than 500 square feet.

R = Revised.

Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 12. Semiannual Shipments By Collector Type and Market Sector^a (Thousand Square Feet)

Survey Period and Collector Type	Market Sector					Total	Government ^b
	Residential	Commercial	Industrial	Agricultural	Other		
July through December 1981							
Low-Temperature, Nonmetallic..	2,167	246	0	26	0	2,440	0
Low-Temperature, Metallic.....	310	54	140	2	4	510	0
Medium-Temperature, Air.....	226	43	1	11	6	287	10
Medium-Temperature, Liquid....	4,102	931	685	11	15	5,744	70
Special, Concentrator.....	27	17	49	50	(d)	144	51
Special, Evacuated Tube.....	32	35	1	(d)	33	101	4
Other.....	4	0	0	0	0	4	0
Total Second Half ^c	6,868	1,328	875	100	58	9,229	134
January through June 1981							
Low-Temperature, Nonmetallic..	R4,190	539	50	12	0	R4,791	0
Low-Temperature, Metallic.....	R692	R57	62	4	9	R822	0
Medium-Temperature, Air.....	R119	R19	1	R5	4	R149	1
Medium-Temperature, Liquid....	R3,711	R505	R456	1	84	R4,758	R36
Special, Concentrator.....	R37	17	69	0	5	R128	R74
Special, Evacuated Tube.....	10	R56	4	(d)	(d)	R71	2
Other ^c	1	(d)	(d)	0	0	2	0
Total First Half ^c	R8,761	R1,193	R642	R22	102	R10,721	R112
July through December 1980							
Low-Temperature, Nonmetallic..	R3,925	455	49	12	0	R4,441	0
Low-Temperature, Metallic.....	1,194	461	20	10	41	1,726	1
Medium-Temperature, Air.....	350	33	0	16	6	405	37
Medium-Temperature, Liquid....	3,017	299	169	15	182	3,682	78
Special, Concentrator.....	51	21	38	0	3	113	23
Special, Evacuated Tube.....	9	65	9	0	8	91	11
Other.....	8	7	0	0	8	23	8
Total Second Half ^c	R8,554	1,341	285	53	248	R10,481	158

^aIncludes adjusted data for nonrespondents.

^bGovernment sector overlaps other sectors.

^cSum of components may not equal total due to independent rounding.

^dLess than 500 square feet.

R = Revised.

Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 13. Annual Shipments
By Market Sector and
Company Headquarters
Location^a
(Square Feet)

Location ^b	Market Sector					
	Residential	Commercial	Industrial	Agricultural	Other	Government ^c
Alabama						
1981.....	120,273	5,688	0	0	0	0
1980.....	(d)	(d)	(d)	(d)	(d)	(d)
1979.....	(d)	(d)	(d)	(d)	(d)	(d)
Arizona						
1981.....	682,921	40,321	1,505	0	5,068	0
1980.....	235,957	21,940	1,392	0	9,972	10,972
1979.....	313,313	2,028	0	0	7,786	6,134
California						
1981.....	8,177,364	1,033,741	1,201,236	43,232	24,468	84,963
1980.....	9,421,067	894,223	229,660	42,559	65,659	6,388
1979.....	6,027,647	559,169	186,381	15,000	228,494	14,994
Colorado						
1981.....	416,019	49,950	0	0	20,940	1,076
1980.....	199,003	56,927	0	0	7,451	57,888
1979.....	137,083	87,791	600	0	30	44,839
Connecticut						
1981.....	88,539	3,292	162	0	624	240
1980.....	101,492	0	440	0	253	0
1979.....	39,170	1,284	0	0	538	1,750
Florida						
1981.....	1,195,785	330,868	87,759	11,250	26,768	31,870
1980.....	722,887	411,457	3,461	128	11,725	16,732
1979.....	602,260	323,466	9,477	0	6,288	15,746
Georgia						
1981.....	67,922	4,092	0	0	0	0
1980.....	19,904	5,860	0	0	0	0
1979.....	67,600	990	0	0	108	72
Illinois						
1981.....	129,928	7,800	0	4,640	0	0
1980.....	299,230	1,000	0	32,240	0	0
1979.....	489,653	31,000	0	75,199	0	0
Iowa						
1981.....	21,562	1,228	722	2,383	14	0
1980.....	19,346	2,000	1,129	3,720	0	0
1979.....	10,307	2,396	5,960	2,176	0	0

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Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 13. Annual Shipments
By Market Sector and
Company Headquarters
Location^a (continued)
(Square Feet)

Location ^b	Market Sector					Government ^c
	Residential	Commercial	Industrial	Agricultural	Other	
Kansas						
1981.....	11,645	2,552	0	240	0	152
1980.....	11,225	0	0	500	1,526	0
1979.....	11,002	5,500	0	0	2,250	0
Maryland						
1981.....	(d)	(d)	(d)	(d)	(d)	(d)
1980.....	(d)	(d)	(d)	(d)	(d)	(d)
1979.....	9,470	10,278	3,000	0	0	0
Massachusetts						
1981.....	115,612	25,055	0	0	320	8,446
1980.....	51,048	14,404	0	0	14,432	14,400
1979.....	92,976	23,410	0	0	0	352
Minnesota						
1981.....	95,365	7,495	0	8,500	0	0
1980.....	36,454	380	45,380	590	3,350	0
1979.....	13,530	35,930	1,360	1,815	670	0
New Jersey						
1981.....	1,600,198	270,351	0	0	31,594	1,550
1980.....	2,316,851	419,232	0	0	49,164	12,480
1979.....	1,369,380	353,735	0	0	36,708	0
New Mexico						
1981.....	(d)	(d)	(d)	(d)	(d)	(d)
1980.....	(d)	(d)	(d)	(d)	(d)	(d)
1979.....	2,219	11,025	0	0	0	0
New York						
1981.....	1,646,978	260,986	8,292	0	720	20,008
1980.....	1,561,031	229,049	56,273	13,248	0	123,866
1979.....	1,320,865	160,979	53,057	11,575	5,425	100,142
North Carolina						
1981.....	8,305	3,630	0	0	0	0
1980.....	10,073	9,695	0	0	0	0
1979.....	12,638	3,919	1,600	2,002	64	0
Ohio						
1981.....	150,543	44,574	21,834	36	33,650	935
1980.....	90,423	50,495	26,291	24	872	0
1979.....	96,569	96,652	18,953	0	1,997	62,952

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Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 13. Annual Shipments:
By Market Sector and
Company Headquarters
Location^a (continued)
(Square Feet)

Location ^b	Market Sector					
	Residential	Commercial	Industrial	Agricultural	Other	Government ^c
Pennsylvania						
1981.....	230,434	38,714	518	0	1,152	720
1980.....	118,453	69,466	7,366	0	0	792
1979.....	91,375	85,732	23,640	0	0	17,000
Tennessee						
1981.....	99,986	66,695	0	0	0	0
1980.....	118,490	11,284	0	0	0	0
1979.....	110,060	2,464	2,304	111	0	4,215
Texas						
1981.....	138,863	242,940	100,648	50,046	2,040	70,847
1980.....	93,966	125,952	38,000	0	142,876	123,804
1979.....	96,604	121,013	0	0	69,200	21,851
Virginia						
1981.....	304,060	4,070	0	0	0	2,600
1980.....	R203,074	16,832	940	0	0	1,999
1979.....	82,474	22,164	0	0	0	680
Wisconsin						
1981.....	28,259	8,932	1,153	0	0	9,002
1980.....	(d)	(d)	(d)	(d)	(d)	(d)
1979.....	14,186	7,318	796	0	1,490	43
Other ^e						
1981.....	299,088	66,845	93,684	1,789	12,810	14,191
1980.....	447,612	76,685	77,770	1,340	13,690	54,384
1979.....	377,141	67,038	100,112	0	5,320	22,128
U.S. Total						
1981.....	15,629,649	2,520,619	1,517,513	122,116	160,168	246,600
1980.....	R16,077,586	2,416,881	488,102	94,349	320,970	423,705
1979.....	11,387,522	2,015,281	313,740	107,878	426,369	312,898

^aIncludes adjusted data for nonrespondents.

^bLocation refers to the address of the company headquarters and not necessarily the location of the manufacturing installation or location of solar collector end use.

^cGovernment sector overlaps other sectors.

^dLess than three survey respondents for one or both halves of the year.

^eTotal for States having less than three survey respondents.

R = Revised.

Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 14. Semiannual Shipments By Market Sector and Company Headquarters Location^a (Square Feet)

Location ^b	Market Sector					
	Residential	Commercial	Industrial	Agricultural	Other	Government ^c
Alabama						
1981 Jul-Dec.....	19,693	4,968	0	0	0	0
1981 Jan-Jun.....	100,580	720	0	0	0	0
1980 Jul-Dec.....	154,775	7,584	0	0	0	0
Arizona						
1981 Jul-Dec.....	424,364	33,217	0	0	0	0
1981 Jan-Jun.....	258,557	7,104	1,505	0	5,068	0
1980 Jul-Dec.....	125,493	21,790	1,050	0	3,142	4,142
California						
1981 Jul-Dec.....	3,454,508	606,338	816,041	27,657	17,896	14,963
1981 Jan-Jun.....	R4,722,856	R427,403	R385,195	15,575	6,572	R70,000
1980 Jul-Dec.....	4,983,319	582,313	108,508	21,909	65,424	0
Colorado						
1981 Jul-Dec.....	271,340	28,797	0	0	5,490	1,076
1981 Jan-Jun.....	144,679	21,153	0	0	15,450	0
1980 Jul-Dec.....	112,072	22,019	0	0	5,771	238
Connecticut						
1981 Jul-Dec.....	19,720	1,792	0	0	0	0
1981 Jan-Jun.....	68,819	1,500	162	0	624	240
1980 Jul-Dec.....	56,674	0	220	0	0	0
Florida						
1981 Jul-Dec.....	536,241	171,127	12,435	11,250	0	27,854
1981 Jan-Jun.....	659,544	159,741	75,324	0	26,768	4,016
1980 Jul-Dec.....	441,592	163,522	975	0	11,709	15,489
Georgia						
1981 Jul-Dec.....	35,610	0	0	0	0	0
1981 Jan-Jun.....	32,312	4,092	0	0	0	0
1980 Jul-Dec.....	7,004	3,860	0	0	0	0
Illinois						
1981 Jul-Dec.....	48,920	1,800	0	4,640	0	0
1981 Jan-Jun.....	R81,008	6,000	0	R0	0	0
1980 Jul-Dec.....	178,802	1,000	0	26,040	0	0
Indiana						
1981 Jul-Dec.....	(d)	(d)	(d)	(d)	(d)	(d)
1981 Jan-Jun.....	R2,256	R1,704	568	568	0	0
1980 Jul-Dec.....	36,474	8,370	0	600	0	0
Iowa						
1981 Jul-Dec.....	12,506	0	0	0	0	0
1981 Jan-Jun.....	9,056	1,228	722	2,383	14	0
1980 Jul-Dec.....	7,298	1,004	599	3,144	0	0

Footnotes on page 26.

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 14. Semiannual
Shipments By Market
Sector and Company
Headquarters Location^a
(continued)
(Square Feet)

Location ^b	Market Sector					
	Residential	Commercial	Industrial	Agricultural	Other	Government
Kansas						
1981 Jul-Dec.....	6,896	1,592	0	0	0	152
1981 Jan-Jun.....	4,749	960	0	240	0	0
1980 Jul-Dec.....	7,596	0	0	500	960	0
Massachusetts						
1981 Jul-Dec.....	95,870	13,000	0	0	320	112
1981 Jan-Jun.....	819,742	12,055	0	0	0	8,334
1980 Jul-Dec.....	22,978	8,404	0	0	14,400	14,400
Michigan						
1981 Jul-Dec.....	20,472	0	0	0	0	0
1981 Jan-Jun.....	(d)	(d)	(d)	(d)	(d)	(d)
1980 Jul-Dec.....	(d)	(d)	(d)	(d)	(d)	(d)
Minnesota						
1981 Jul-Dec.....	56,300	5,995	0	5,500	0	0
1981 Jan-Jun.....	39,065	1,500	0	3,000	0	0
1980 Jul-Dec.....	16,452	0	25,000	0	0	0
Missouri						
1981 Jul-Dec.....	(d)	(d)	(d)	(d)	(d)	(d)
1981 Jan-Jun.....	584	0	0	0	0	0
1980 Jul-Dec.....	(d)	(d)	(d)	(d)	(d)	(d)
New Jersey						
1981 Jul-Dec.....	462,715	78,960	0	0	0	1,550
1981 Jan-Jun.....	1,137,483	191,391	0	0	31,594	0
1980 Jul-Dec.....	1,131,808	238,827	0	0	36,480	12,480
New York						
1981 Jul-Dec.....	759,632	114,598	3,852	0	0	10,348
1981 Jan-Jun.....	887,346	8146,388	84,440	0	720	89,660
1980 Jul-Dec.....	783,221	137,820	22,500	0	0	33,266
North Carolina						
1981 Jul-Dec.....	5,310	0	0	0	0	0
1981 Jan-Jun.....	2,995	3,630	0	0	0	0
1980 Jul-Dec.....	5,070	3,150	0	0	0	0
Ohio						
1981 Jul-Dec.....	76,705	17,172	8,900	0	33,390	935
1981 Jan-Jun.....	73,838	27,402	12,934	36	260	0
1980 Jul-Dec.....	61,518	31,880	11,511	24	492	0
Pennsylvania						
1981 Jul-Dec.....	121,970	14,872	24	0	1,152	720
1981 Jan-Jun.....	108,464	23,842	494	0	0	0
1980 Jul-Dec.....	68,971	33,474	1,606	0	0	792

Footnotes on page 26.

Table 14. Semiannual Shipments By Market Sector and Company Headquarters Location^a (continued)
(Square Feet)

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Location ^b	Market Sector					
	Residential	Commercial	Industrial	Agricultural	Other	Government ^c
Rhode Island						
1981 Jul-Dec.....	(d)	(d)	(d)	(d)	(d)	(d)
1981 Jan-Jun.....	2,004	6,634	0	0	0	5,891
1980 Jul-Dec.....	3,058	4,903	0	0	0	4,694
South Carolina						
1981 Jul-Dec.....	(d)	(d)	(d)	(d)	(d)	(d)
1981 Jan-Jun.....	R10,212	R0	R752	R0	R0	R0
1980 Jul-Dec.....	(d)	(d)	(d)	(d)	(d)	(d)
Tennessee						
1981 Jul-Dec.....	45,767	50,063	0	0	0	0
1981 Jan-Jun.....	R54,219	R16,632	0	0	0	0
1980 Jul-Dec.....	55,152	7,868	0	0	0	0
Texas						
1981 Jul-Dec.....	70,629	125,487	32,648	50,023	0	57,843
1981 Jan-Jun.....	68,234	117,453	68,000	23	2,040	13,004
1980 Jul-Dec.....	28,463	25,537	38,000	0	109,876	34,548
Virginia						
1981 Jul-Dec.....	130,482	1,981	0	0	0	1,279
1981 Jan-Jun.....	173,578	2,889	0	0	0	1,321
1980 Jul-Dec.....	R146,914	10,432	240	0	0	1,053
Wisconsin						
1981 Jul-Dec.....	18,728	5,310	552	0	0	9,002
1981 Jan-Jun.....	9,531	3,622	601	0	0	0
1980 Jul-Dec.....	8,100	2,906	0	0	840	840
Other^e						
1981 Jul-Dec.....	173,814	50,541	680	627	0	8,300
1981 Jan-Jun.....	R89,746	7,966	91,684	594	12,810	0
1980 Jul-Dec.....	111,002	11,782	74,854	0	0	36,000
U.S. Total						
1981 Jul-Dec.....	6,868,192	1,327,610	875,132	99,697	58,248	134,134
1981 Jan-Jun.....	R8,761,457	R1,193,009	R642,381	R22,419	101,920	R112,466
1980 Jul-Dec.....	R8,554,366	1,340,445	285,063	52,217	249,094	157,942

^aIncludes adjusted data for nonrespondents.

^bLocation refers to the address of the company headquarters and not necessarily the location of the manufacturing installation or location of solar collector end use.

^cGovernment sector overlaps other sectors.

^dLess than three survey respondents.

^eTotal for States having less than three survey respondents, identified on page 15, footnote d.

R = Revised.

Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 15. Companies Engaged in Activities Related to Solar Collector Manufacturing^a
(Number of Companies)

Survey Period	Distribution		System Design/ Consulting	Activities		Prototype Development
	Wholesale	Retail		Installation	Manufacturing of Components	
July through December 1981	154	114	121	97	83	154
January through June 1981	R151	R103	R114	R82	R86	R133
July through December 1980	176	131	135	110	89	R161
January through June 1980	179	128	141	111	94	169
July through December 1979	183	140	165	130	100	214
January through June 1979	181	154	178	136	120	255
July through December 1978	188	149	173	135	107	238

^a Manufacturers engaged in more than one activity appear more than once.
R = Revised.
Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Table 16. Prototype Development
(Number of Prototypes)

Survey Period	Number of Companies	Low-Temperature		Medium-Temperature		Special		Other	Total
		Non-metallic	Metallic	Air	Liquid	Concentrator	Evacuated Tube		
July through December 1981	154	28	39	37	105	17	7	17	250
January through June 1981	R133	20	R37	R32	R88	R18	R6	R13	R214
July through December 1980	R161	R25	R39	43	107	24	7	24	269
January through June 1980	169	22	46	39	101	28	14	27	277
July through December 1979	214	24	58	56	134	35	9	26	342
January through June 1979	255	36	78	64	172	36	14	37	437
July through December 1978	238	38	65	64	150	42	12	42	413

R = Revised.
Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Thermal and Photovoltaic Solar Collector Manufacturing Activity (continued)

Table 17. Photovoltaic Modules
Manufacturing Activity^a
(Peak Kilowatts)

Survey Period	Number of Manufacturers	Market Sector					Exports ^b	Total ^c
		Residential	Commercial	Industrial	Agricultural	Other		
July through December 1981	13	161	338	358	7	15	358	879
January through June 1981	R14	24	R170	R980	R21	R43	R817	R1,238
July through December 1980	13	14	538	413	259	R149	R17	R1,373

^aData not adjusted for nonrespondents.

^bExports overlap other sectors.

^cTotal shipments including exports.

R = Revised. (Revisions reflect significant changes from the last report due to clarification of reporting units.)

Source: EIA-63, "Solar Collector Manufacturers and Importers Survey."

Glossary

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Low-Temperature Collector: A collector that generally operates in the temperature range below 110 degrees Fahrenheit. Typically, it has no glazing or insulation and is made of plastic or rubber, although some are made of metal.

Manufacturer: A company that produces either solar thermal collectors or photovoltaic modules, or both, and sells these products or plans to sell them within one year.

Medium-Temperature Collector: A collector that generally operates in the temperature range of 140 degrees Fahrenheit to 180 degrees Fahrenheit, but may operate at temperatures as low as 110 degrees Fahrenheit. Typically, it has one or two glazings, a metal frame, a metal absorption panel with integral flow channels or attached tubing (liquid collector) or with integral ducting (air collector), and insulation on the sides and back of the panel.

Photovoltaic Module: A group of photovoltaic cells. (Cells are solid-state devices that produce electricity when exposed to sunlight.) The electricity produced may be used immediately or stored in batteries for later use. They are used primarily in applications requiring remote power, such as radio communication, cathodic protection, and navigational aids.

Solar Energy Collector: A device designed to receive solar radiation and convert it into thermal or electrical energy. Normally, a solar thermal collector includes a frame, glazing, and an absorber together with appropriate insulation. The heat collected by the solar energy collector may be used immediately or stored for later use. Water or water antifreeze solutions are the most common working media for transferring heat from the collector; air and special oils which operate at high temperatures are also used in many systems. Pool covers and other devices which do not involve the transport of energy via a working medium are not considered to be solar thermal collectors for the purpose of this survey.

Special Collector: An evacuated tube collector or a concentrating (focusing) collector. Special collectors operate in the temperature range from just above ambient temperature (low concentration for pool heating) to several hundred degrees Fahrenheit (high concentration for air conditioning and specialized industrial processes).

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EIA-63
(3-79)U.S. DEPARTMENT OF ENERGY
Energy Information Administration
Washington, D.C. 20461Form Approved
OMB No. 038-R0403

SOLAR COLLECTOR MANUFACTURERS AND IMPORTERS SURVEY

This report is mandatory under Public Law 93-275

1.0 IDENTIFICATION DATA

1.1 Respondent Identification

Complete (a) - (d) only if label is incorrect

(a) Company Name:

(b) Street Address:

(c) City:

(d) State and Zip:

1.2 What is the name, title and telephone number of a person within your company to whom questions may be addressed regarding this submission?

(a) Name _____

(b) Title _____

(c) Telephone -
area code number

1.3 Place an "X" in the box indicating the reporting period. Enter the last two digits for the reporting year.

(a) ☐ Jan. - June 19 (b) ☐ July - Dec. 19

1.4 Is this a new or a revised report?

(a) ☐ New(b) ☐ Revised - Enter date of resubmission
mo. day yr.

2.0 MANUFACTURER / IMPORTER DATA

2.1 During the current reporting period, did your company ...

(a) Manufacture and sell solar energy collectors?

(a) ☐ Yes (b) ☐ No

(b) Manufacture, but have no reported sales of solar energy collectors?

(a) ☐ Yes (b) ☐ No

(c) Import solar energy collectors?

(a) ☐ Yes (b) ☐ No

(d) Export solar energy collectors?

(a) ☐ Yes (b) ☐ NoNOTE: 1. If you answered "Yes" to any part of 2.1 above, answer questions 3.1 and 3.2 and/or 3.3 as appropriate and complete the remainder of this form.
2. If you answered "No" to all of the questions in 2.1 above, complete 5.0 and return this form to the address specified in the instructions.

3.0 HISTORICAL / MARKETING DATA

3.1 In what year did your company start to manufacture solar energy collectors?

19

3.2 If you have manufacturing facilities in states in addition to the one shown on the address label, enter the State(s) in which these facilities are located in the spaces provided or mark the "no additional States" box.

(a) _____ DOE USE (d) _____ DOE USE

(b) _____ (e) _____

(c) _____ (f) _____

(g) ☐ No additional States.

3.3 In what year did your company start to import solar energy collectors?		19 <input type="text"/>
3.4 Is your normal market area ... (a) Local - Within a 50 mile radius of the manufacturing plant? (b) State - Sold only within the state where the manufacturing plant is located? (c) Regional - Within a 250 mile radius of the manufacturing plant? (d) National - Sold throughout the United States?		(check one) (a) ☐ Local (b) ☐ State (c) ☐ Regional (d) ☐ National
3.5 Place an "X" in each box to indicate all the activities in which your company is engaged: (Mark all that apply)		(a) ☐ Wholesale Distribution (b) ☐ Retail Distribution (c) ☐ Systems Design/Consulting (d) ☐ Installation (e) ☐ Manufacturer of Component Parts for Others (f) ☐ Prototype Development - answer 3.6 Skip 3.6 unless (f) is also marked.
3.6 Indicate the prototype(s) developed by your company. (Mark all that apply)		(a) ☐ Low Temperature Non-metallic (b) ☐ Low Temperature Metallic (c) ☐ Medium Temperature Air (d) ☐ Medium Temperature Liquid (e) ☐ Special, Concentrator (f) ☐ Special, Evacuated Tube (g) ☐ Other, Describe: _____
4.0 PUBLICATION		
4.1 Do you want the name and address of your company to appear in the Appendix of the Solar Collector Manufacturing and Importing Activities Report?		(a) ☐ Yes (b) ☐ No
4.2 Do you want to receive a copy of the Solar Collector Manufacturing and Importing Activities Report?		(a) ☐ Yes (b) ☐ No
5.0 CERTIFICATION		
I certify that the information contained herein and appended hereto is true and accurate to the best of my knowledge.		
Name	Date	Signature
Title		
Enter any additional remarks here:		
TITLE 18 USC 1001. Makes it a criminal offense for any person knowingly and willingly to make to any Agency or Department of the United States, any false, fictitious, or fraudulent statements as to any matter within its jurisdiction.		

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(3-79)

Company Name: _____

Company Identification: _____

Form Approved
OMB No. 038-R0403

6.0 COLLECTOR DATA. For each collector type shipped or imported and sold enter the following data:								
	COLLECTOR TYPE							TOTAL (h)
	Low Temperature		Medium Temperature		Special		Other	
	Non-Metallic (a)	Metallic (b)	Air (c)	Liquid (d)	Concentrator (e)	Evacuated Tube (f)	(g)	
6.1 Total Producer Shipments (sq. ft.)								
6.2 Total Value of Shipments (\$)								
6.3 Market Sector (sq. ft.)								
(a) Residential								
(b) Commercial								
(c) Industrial								
(d) Agriculture								
(e) Other, Describe:								
(f) Government	()	()	()	()	()	()	()	()
6.4 End Use (sq. ft.)								
(a) Pool Heating								
(b) Hot Water								
(c) Space Heating								
(d) Space Cooling								
(e) Industrial Processing								
(f) Agricultural Processing								
(g) Other, Describe:								
6.5 Imports (sq. ft.)								
6.6 Exports (sq. ft.)								
6.7 Imports received from:							DOE USE ONLY (a) ☐ ☐ (b) ☐ ☐ (c) ☐ ☐ (d) ☐ ☐	
6.8 Exports to:							DOE USE ONLY (a) ☐ ☐ (b) ☐ ☐ (c) ☐ ☐ (d) ☐ ☐	

Appendix A (continued)

EIA-63
(3-79)

Form Approved
OMB No. 038-R0403

INSTRUCTIONS FOR FORM EIA-63 SEMIANNUAL SOLAR COLLECTOR MANUFACTURES AND IMPORTERS SURVEY

GENERAL INFORMATION AND INSTRUCTIONS

I. PURPOSE

Form EIA-63 is designed to provide the data necessary for the Energy Information Administration (EIA) in the Department of Energy to execute its role in monitoring certain volumetric movements within the solar collector manufacturing industry and in providing information concerning the size and status of the industry. The publication containing the results of the survey will list solar collector manufacturers and importers.

II. WHO SHOULD SUBMIT

Form EIA-63 is to be submitted by all companies that manufacture solar energy collectors and/or companies that are importers of solar energy collectors.

III. WHERE TO SUBMIT

Companies should return completed EIA-63 forms to:

Solar Collector Manufacturers and Importers Survey
Code Number 2935
Department of Energy
Washington, D.C. 20461

Requests for further information and/or additional forms may be directed to the above address or by contacting the survey coordinator on our toll free telephone number (800) 424-9673.

IV. WHEN TO SUBMIT

Completed EIA-63 forms are due on the date specified in the covering letter. The reporting period is also specified in the covering letter. It will be either January 1 through June 30 or July 1 through December 31.

GENERAL INFORMATION AND INSTRUCTIONS (Cont'd)

V. MANDATORY REPORTING REQUIREMENTS

This report is mandatory and is being required pursuant to the authorities granted to DOE by the Federal Energy Administration Act of 1974 (P.L. 93-275).

VI. CONFIDENTIALITY OF INFORMATION

In accordance with Section 14 of the FEA Act, in responding to specific requests received from members of the public, data will be held confidential only to the extent that they are determined by DOE to be within the exemption for trade secrets and confidential commercial information as specified in the Freedom of Information Act (5 U.S.C. Sec. 552 (b) (4)).

DEFINITIONS

- A. Export — a solar collector shipment sent from the United States to another country.
- B. Import — a solar collector shipment sent into the United States from another country.
- C. Low Temperature Collector — a collector which generally operates in the temperature range below 110° F. It typically has no glazing and no insulation, and it is made of plastic or rubber, although some are made of metal.
- D. Medium Temperature Collector — a collector which generally operates in the temperature range of 140° F to 180° F, but it can also operate as low as 110° F. It typically has one or two glazings, a metal frame, a metal absorption panel with integral flow channels or attached tubing (liquid collector) or with integral ducting (air collector), and with insulation on the sides and the back.
- E. Producer Shipments — square feet of solar collectors shipped or installed in a manufacturer/importer's own facility for testing or actual use (includes exports).
- F. Prototype — an original type or form that serves as a model for future collector types.
- G. Solar Collector — a device designed to receive solar radiation and convert it to thermal energy. Normally, a solar collector includes a frame, glazing, and absorber together with appropriate insulation.

DEFINITIONS (Cont'd)

- H. Special Collector — an evacuated tube collector or a concentrating (focusing) collector.
- Special collectors operate in the temperature range from just above ambient (low concentration for pool heating) to several hundred degrees Fahrenheit (high concentration for air-conditioning and specialized industrial processes).
- I. For market sector categories in question 6.3:
1. Agriculture — solar applications related to food processing.
 2. Commercial — solar applications for use in businesses where services (rather than products) are provided, such as wholesale and retail trade and health and educational services.
 3. Industrial — solar applications for use in businesses where products (rather than services) are provided, such as in the manufacture and processing of goods and basic materials.
 4. Residential — solar applications related to any building used for residential occupancy which has a system for heating or cooling or both.

Appendix A (continued)

EIA-63
(3-79)

Form Approved
OMB No. 038-R0403

SPECIFIC INSTRUCTIONS

If you are filing a revised report, enter only the information to be corrected and the certification information. If additional space is needed for any response, please use the Remarks Section.

Specific instructions for most items are provided below. Items which are self-explanatory are not discussed.

Item	Instruction
1.1 (a) - (d)	Make any corrections to the company name or address in the space provided.
1.2 (a) - (c)	Enter the name, title, and telephone number of an individual within the reporting company who may be contacted for additional information regarding this submission.
Note:	<ol style="list-style-type: none"> 1. If you are a solar collector importer only, questions 3.1 and 3.2 will not apply to you. Leave them blank. Skip to 3.3 and continue with the remainder of the form. 2. If you are a solar collector manufacturer only, question 3.3 will not apply to you. Leave it blank. Answer questions 3.1, 3.2, and 3.4, and the remainder of the form. 3. If you are both an importer and a manufacturer, answer all questions beginning with 3.1 4. If your answer is "NO" to all of the Questions in 2.1, complete Section 5.0, CERTIFICATION, and return this form to the address in these instructions.
3.6 (a) - (g)	Answer this question only if box (f) was checked in answer to question 3.5. Please mark all answers that apply in 3.6.
5.0	This part must be completed each time the form is submitted. Enter the name and title of the individual designated by the company to sign the certification. This individual must sign in the spaces provided on the form and enter the date of signing.

Page 4

SPECIFIC INSTRUCTIONS (Cont'd)

<u>Item</u>	<u>Instruction</u>
Remarks Section:	Use this space to enter any additional comments or to clarify answers to any question on the EIA-63.
6.1	Enter the square feet in whole numbers (i.e. no decimals) of solar collector area shipped, including exports, or installed in the appropriate collector type column. Total should be the total square feet of all collector types.
6.2	Enter the dollar value, rounded to the nearest whole dollar, of the producer shipments by collector type. Total should be the total dollar value for all collector types.
6.3 (a) - (e)	For each appropriate market sector, enter the square feet of producer shipments of solar collectors by collector type.
6.3 (f)	For shipments identified in items 6.3 (a) - (e) indicate the amount of square feet of collectors intended for use in local, state or federal government facilities and housing or where government funding has been provided.
6.4 (a) - (g)	For each end use enter the square feet of producer shipments of solar collectors by collector type. For part (c), if collectors are used for space heating or space heating in combination with hot water, enter the total square feet. For part (d), if collectors are used for space cooling or space cooling in combination with hot water and/or space heating, enter the total square feet.
6.5	Enter the square feet by collector type.
6.6	Enter the square feet by collector type.
6.7	Enter the country(ies) from which solar collectors were imported.
6.8	Enter the country(ies) to which solar collectors were exported.

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Appendix B

History and Methodology of the Survey

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History and Methodology of the Survey

History of the Survey

The Energy Information Administration (EIA) of the Department of Energy (DOE) and its precursor organizations began in 1975 to conduct voluntary telephone surveys of known and probable manufacturers of solar thermal collectors. The goal of these surveys was to obtain information on manufacturing activity in the solar energy conversion industry. The first survey covered manufacturing activities for 1974. Succeeding surveys were conducted every 6 months to alert both public and private interests to any trends in the industry. The mandatory reporting of data under Public Law 93-275 began with the survey period covering July through December 1978.

This report presents the results of the July through December 1981 survey. Semiannual totals for the last three survey periods are presented for both solar thermal collector and photovoltaic module manufacturers. In addition, annual totals are presented for the years 1979 through 1981 for solar thermal collectors only.

Methodology of the Survey

Survey Form EIA-63 (Appendix A) was mailed to 328 companies identified as known or probable manufacturers or importers of solar thermal collectors, and to 27 companies identified as known or probable manufacturers of photovoltaic modules. Potential manufacturers were identified by utilizing prior EIA-63 mailing lists, and the EIA-701, "Active Solar Installer's Survey" mailing list. Listings from the Solar Energy Industries Association, trade publications, State directories of solar collector manufacturers, and personal inquiries were also used to identify potential respondents.

Responses to the Current Survey

Responses to the July through December 1981 survey for solar thermal collector manufacturers are shown in Table B1 on the following page.

Appendix B (continued)

Table B1. Solar Thermal Collector Manufacturer Response Profile (July Through December 1981)

Response Status	Number of Companies
Good Form	191
Out of Scope Form	111
Nonrespondent	26
Total	328

Of the 328 surveys mailed to potential manufacturers of solar thermal collectors, 191 were returned by active manufacturers, 111 were returned by out of scope companies and 26 forms were not returned. Out of scope companies are those which (1) report no manufacturing activity or (2) go out of business during the survey period in question.

Totals for solar thermal collectors presented in the Figure and Tables 1 through 16 in the text are based on (1) actual data for the 191 companies returning good forms, and (2) estimated data for the 26 nonrespondents. The total number of active manufacturers during the current survey period, 217, dropped from 250 during the first half of 1981 mainly as a result of a new survey procedure for deleting out of scope companies; they are now deleted after one less survey period with no reported manufacturing activity. Thus, the number of companies for which data are estimated is reduced.

Estimated values for nonrespondents from the July through December 1981 survey were imputed in the following manner.

1. Those companies that responded to both the survey for the second half of 1981 and the first half of 1981 were identified. For these companies, producer shipments, disaggregated by collector type, were summed for each reporting period. Growth factors for each of the six collector types were computed as the ratio of producer shipments reported for the second half of 1981 survey to producer shipments reported by these same companies for the first half of 1981 survey.
2. Data on producer shipments made during the first half of 1981 by the nonresponding companies were multiplied by the corresponding growth factor to

Appendix B (continued)

arrive at estimates for producer shipments made by these companies during the second half of 1981.

3. These estimates were added to values reported by respondents for the second half of 1981 survey to develop the adjusted totals.

Responses to the current survey by manufacturers of photovoltaic modules are itemized in Table B2 below.

Table B2. Photovoltaic Module Manufacturer Response Profile (July Through December 1981)

Response Status	Number of Companies
Completed Forms	13
Out of Scope Forms	11
Nonrespondent	3
Total	27

Totals presented in Table 17 in the text are based on completed forms from 13 companies actively engaged in photovoltaic module manufacturing. Data are not estimated for nonrespondents.

General Procedures

The EIA-63 is a semiannual report covering the six month periods from January through June and July through December. The surveys are mailed twice a year, in June and December. The questions are designed to elicit data on company manufacturing, importing, exporting, and other related activities.

Care has been taken to establish the survey universe accurately. However, as the solar collector manufacturing industry is subject to continuous entry and exit of manufacturers, it is possible that the universe for this survey might exclude some of the smaller manufacturers.

Solar thermal companies were requested to indicate the area (in square feet) of collectors manufactured, describe prototype development, note other activities in which they are engaged, and provide information concerning market sector and end-use. All these data are disaggregated by type of solar collector. Photovoltaic module manufacturers were asked to provide similar data indicating production capacity in peak kilowatts, rather than square feet.

Appendix B (continued)

Responses to the survey are first edited manually to verify the accuracy of the reporting and to ensure reliability of data. Individual company responses are then compared with data reported in previous surveys. Wherever manual editing procedures indicate discrepancies or omissions, error resolution calls are made to confirm and/or clarify data.

Manually edited EIA-63 forms are then keypunched and edited a second time, via an automated procedure, to check for errors. Follow-up procedures are carried out to reduce response bias resulting from a high nonresponse rate. Follow-up procedures consist of (1) reminder calls to all companies who have not completed and returned survey forms within 2 to 3 weeks of the mailout date and (2) a second round of calls to companies who have not responded within the one month period specified in the cover letter. During the second round of calls, data are taken over the phone, whenever possible. Data taken by telephone are entered onto blank forms which are returned to companies for verification and signature.

Appendix C

Manufacturers and Importers of Solar Thermal Collectors

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Manufacturers and Importers of Solar Collectors Responding to Survey *

Acorn Structures, Inc.
PO Box 250
Concord, MA 01742

Acurex Aerotherm
485 Clyde Ave.
Mountain View, CA 94042

Advance Tech. Engr. Co.
20317 Coulson St.
Woodland Hills, CA 91367

Air Control/Sun Control
PO Box 686
Ojai, CA 93023

Aircraftsman
PO Box 628
Millbrook, AL 36054

Alpha Solarco
1014 Vine St., Ste. 2530
Cincinnati, OH 45202

Alten Corp.
2581 Leghorn St.
Mountain View, CA 94043

Alternative Energy Res.
9440 Viscount, Ste. 220
El Paso, TX 79925

Amer. Home Slr Energy Sys.
23142 Alcalde Dr.
Luguna Hills, CA 92653

American Nat'l Energy Corp.
9637 Distribution Avenue
San Diego, CA 92121

American Solar Heat Corp.
7 National Pl.
Danbury, CT 06810

American Solar Systems
3838 Ragmert
Las Vegas, NV 89121

Ametek, Inc./Power Sys. Grp.
1025 Polinski Rd.
Ivyland, PA 18974

Amsol
404 E. Branch St.
Arroyo Grande, CA 93420

Approtech
770 Chestnut St.
San Jose, CA 95110

Aqua Solar, Inc.
1251 Seeds Ave.
Sarasota, FL 33577

Archer Industries
2051 Vineyard Ave.
Escondido, CA 92025

Astrolite Mfg., Inc.
756 N.W. 27th Ave.
Ft. Lauderdale, FL 33311

B & H Refrigeration Co.
1410 Second Ave.
Yuma, AZ 85364

Barstows Solar Heating
29060 Dracea St.
Sunnymeade, CA 92388

Beam Engineering, Inc.
732 N. Pastoria Ave.
Sunnyvale, CA 94086

Bio-Energy Sys., Inc.
221 Canal St., PO Box 87
Ellenville, NY 12483

Black Chrome Slr Pwr., Inc.
2805 Pinewood Ave.
W. Palm Beach, FL 33407

Cessna Solar Sys., Inc.
25 E. 69 Hwy.
Kansas City, MO 64119

* Only those companies requesting inclusion of their names and addresses in this report.

Appendix C (continued)

Chicago Solar Corp.
2001 Hwy. 3 N.
Fairbault, MN 55021

Cole Solar Systems, Inc.
440A E. Saint Elmo Rd.
Austin, TX 78745

Columbia Chase Corp.
55 High St.
Holbrook, MA 02343

Compool Corp.
1708 Stierman Rd.
Mountain View, CA 94043

Conserdyne Corp.
4437 San Fernando Rd.
Glendale, CA 91204

Continental Solar Sys., Inc.
5756 Lamar
Arvada, CO 80002

Coppersmiths
PO Box 907
Cypress, CA 90630

Custom Solar Heating Sys.
PO Box 375
Albany, NY 12201

D. W. Browning Cont. Co.
475 Carswell Ave.
Holly Hill, FL 32017

Davis Engineering, Inc.
9235 E. Walnut Dr.
City of Industry, CA 91744

Daystar Corp.
90 Cambridge St.
Burlington, MA 01803

Dean Solar Systems
23018 S. Normandie Ave.
Torrence, CA 90502

Deltair Solar Systems
PO Box 392
Excelsior, MN 55331

Diy-Sol, Inc.
PO Box 614
Marlboro, MA 01752

Dumont Industries
Main St.
Monmouth, ME 04259

Energy Control Systems
3324 Octavia St.
Raleigh, NC 27606

Energy Converters, Inc.
RT.1, Box 92, Johnson Rd.
Chickamauga, GA 30707

Energy Design Corp.
Box 34294
Memphis, TN 38134

Energy Professionals, Inc.
1424 W. 259th St.
Harbor City, CA 90710

Environ Energy Mgmt. Sys.
23845 Holman Hwy., #218
Monterey, CA 93940

Environmental Energy Mgmt.
2722 Temple Ave.
Signal Hill, CA 90806

Fafco
235 Constitution Dr.
Menlo Park, CA 94025

Falbel Energy Sys. Corp.
PO Box 6
Greenwich, CT 06830

Gem Mfg. Corp.
390 E. Tiffin St.
Bascom, OH 44809

Appendix C (continued)

General Electric Co.
PO Box 13601
Philadelphia, PA 19101

General Solar Systems
4040 Lake Park Rd.,
Youngstown, OH 44507

Goettl Air Conditioning
2005 E. Indian School Rd.
Phoenix, AZ 85016

Gould Solar, Inc.
4525 Westview Ln.
Titusville, FL 32780

Grumman Energy Sys., Inc.
445 Broad Hollow Rd.
Melville, NY 11747

Gulf Thermal Corp.
1645 12th St.
Sarasota, FL 33578

Gull Associated Energy
108 N. 11th St.
San Jose, CA 95112

Hale Akala Slr Res., Inc.
2800 Paa St., Ste. 209
Honolulu, HI 96819

Halstead and Mitchell
PO Box 1110
Scottsboro, AL 35768

Hansberger Refrig. & Elec.
2450 8th St.
Yuma, AZ 85364

Harrison Radiator Div./GM
A & E Building
Lockport, NY 14094

Helio Thermics, Inc.
1070 Orion St.
Greenville, SC 29605

Heliodyne Corp.
700 S. 4th St.
Richmond, CA 94804

Heliodyne, Inc.
2629 Charles St.
Rockford, IL 61108

Heliotherm, Inc.
W. Lenni Rd.
Lenni, PA 19052

Hodges and Company
20 Malunio Ave.
Kailua, HI 96734

Horizon Enterprises, Inc.
710 N.W. 10th Ave.
Homestead, FL 33030

Ilse Engineering
Hockamin Creek Rd., Drawer B
Finland, MN 55603

Innovations Unlimited, Inc.
4 Truman Rd.
Wilmington, MA 01887

Insolarator
7926 Convoy Ct.
San Diego, CA 92111

Int'l Solar Tech, Inc.
924 W. Wallstreet Pk.
Plainfield, IN 46168

Intertech./Slr. Corp. Amer.
100 Main Street
Warrenton, VA 22186

ISLC
9465 Mission Park Pl.
San Diego, CA 92071

J & J Solar, Inc.
1615 E. Catalina Dr.
Phoenix, AZ 85016

Appendix C (continued)

J & R Simmons Const. Co.
19 Margaret Rd.
Ormond Beach, FL 32074

Kalwall Corp/Slr Comp. Div.
Box 237
Manchester, NH 03105

KTA Products
1385A Park Center Rd.
Herndon, VA 22071

Largo Solar Systems, Inc.
991 S.W. 40th Ave.
Plantation, FL 33317

Lennox Industries, Inc.
PO Box 400450
Dallas, TX 75240

Lof Solar Energy Systems
1701 E. Broadway
Toledo, OH 43605

Lowes International, Inc.
PO Box 1845
Bradenton, FL 33506

McDonald Douglas Astro. Co.
5301 Bolsa Ave.
Huntington Beach, CA 92647

Mid-America Solar
1605 N. Grand
Pittsburgh, PA 66762

MNK Enterprises, Inc.
PO Box 87
Bancroft, ID 83217

Montela Solar Assoc., Inc.
PO Box 306
Prattville, AL 36067

Morning Star
138 Industrial Loop W.
Orange Park, FL 32073

National Solar Corp.
Main St.
Centerbrook, CT 06409

Natural Energy Tech.
7006 South 400 W.
Midvale, UT 84047

North Amer. Solar Dev. Co.
2800 Juniper St., Ste. 9
Fairfax, VA 22031

Northrup, Inc.
302 Nichols Dr.
Hutchins, TX 75141

Novan Energy, Inc.
1630 N. 63rd St.
Boulder, CO 80301

Omnium Company
1815 Orangethorpe Park
Anaheim, CA 92801

One Design, Inc.
Mountain Falls Route
Winchester, VA 22601

Owen Enterprises
PO Box 967
Wilmington, CA 90744

Owens Illinois, Inc.
PO Box 1035
Toledo, OH 43666

Pacific Solar Systems
711 Bangs Ave.
Modesto, CA 95356

Park Energy Co.
Star Rte., Box 9
Jackson, WY 83001

Permaloy Corporation
PO Box 1559
Ogden, UT 84402

Appendix C (continued)

Practical Solar Heating
2216 Montgomery St.
Bethlehem, PA 18015

Prima Industries, Inc.
1719 Great N K Rd.
Copinque, NY 11726

R. J. Sullivan & Sun
1835 3rd Ave., S.E.
Cedar Rapids, IA 52403

Ra-Los, Inc.
559 Union Ave.
Campbell, CA 95008

Radco Products, Inc.
2877 Industrial Pkwy.
Santa Maria, CA 93455

Raypak, Inc.
31111 Agoura Rd.
Westlake Vlg., CA 91359

Research Products Corp.
1015 E. Wash. Ave., Box 1467
Madison, WI 53701

Revere Slr/Architech Prods
PO Box 151
Rome, NY 13440

Reynolds Metals Co.
6601 W. Broad St.
Richmond, VA 23261

S H S Dura Solar, Inc.
5045L College Oak Dr.
Sacramento, CA 95941

S T A Corp.
PO Box 2284
Enfield, CT 06082

S. W. Energy Options
Rte. 8, Box 30-H
Silver City, NM 88061

Semco Corp.
5701 N.E. 14th Ave.
Ft. Lauderdale, FL 33334

Sol-aire/Energy Sys., Inc.
2750 S. Shoshone
Englewood, CO 80110

Sola Heat
1200 East 1st St.
Los Angeles, CA 90033

Solar Alternative, Inc.
71 Main St.
Brattleboro, VT 05301

Solar Central
7213 Ridge Rd.
Mechanicsburg, OH 43044

Solar Comfort Sys.
1624 Savannah Rd.
Lewes, DE 19958

Solar Dev. & Mfg.
113 Flint Rd., Box 511
Oak Ridge, TN 37830

Solar Development, Inc.
3323 Moline St.
Aurora, CO 80010

Solar Development, Inc.
3630 Reese Ave.
Riviera Beach, FL 33404

Solar Devices, Inc.
GPO Box 3727
San Juan, PR 00936

Solar Dynamics Corp.
550 Frontage Rd.
Northfield, IL 60093

Solar Dynamics of Arizona
1100 N. Lake Havasu Dr.
Lake Havasu, AZ 86403

Appendix C (continued)

Solar Electric, Inc.
403 S. Maple
West Branch, IA 52329	Solar Fin Systems
140 S. Dixie Hwy.
St. Augustine, FL 32084
Solar Energies of Calif.
11421 Woodside Avenue S.
Santee, AZ 92071	Solar Heat Co.
PO Box 110
Greenville, PA 16125
Solar Energy Appl., Inc.
1102 E. Washington St.
Phoenix, AZ 85034	Solar Heat Co.
PO Box 42
Hesperia, CA 92345
Solar Energy Comp., Inc.
441 Shearer Blvd.
Cocoa, FL 32922	Solar Heater Manufacturer
1011 6th Ave., S.
Lake Worth, FL 33460
Solar Energy Engineering
63 Maxwell Ct.
Santa Rosa, CA 95401	Solar Heating/Air Cond.
13584 49th St., N.
Clearwater, FL 33520
Solar Energy Products Co.
1909 E. 28th St.
Lorain, OH 44055	Solar Homes, Inc.
17 Narragansett Ave.
Jamestown, RI 02835
Solar Energy Products, Inc.
Mountain Pass
Hopewell Junction, NY 12533	Solar II Enterprises
19675 Skyline Blvd.
Los Gatos, CA 95030
Solar Energy Sys. & Prod.
500 N. Alley
Emmitsburg, MD 21727	Solar, Inc.
008 Sun Burst Ln.
Mead, NE 68041
Solar Energy Systems, Inc.
2345 Santa Fe Ave.
Los Angeles, CA 90058	Solar Industries, Inc.
2300 Hwy. 34
Manasquan, NJ 08736
Solar Engr. & Mfg. Co., Inc.
2284 N.E. First Ave.
Boca Raton, FL 33432	Solar Kinetics, Inc.
8120 Chancellor Row
Dallas, TX 75247
Solar Engineering Co.
2550 Belle Ave.
Casselberry, FL 32707	Solar Kit of Florida, Inc.
1102 139th Ave.
Tampa, FL 33612
Solar Farm Industries, Inc.
PO Box 242
Stockton, KS 67669	Solar Living, Inc.
PO Box 12
Netcong, NJ 07857

Appendix C (continued)

Solar Master of Oregon
PO Box 19221
Portland, OR 97219

Solar N R G, Inc.
308 S. Harbor City Blvd.
Melbourne, FL 32901

Solar One LTD
100 Park Ln.
Virginia Beach, VA 23451

Solar Research Systems
2116 S. Yale St.
Santa Anna, CA 92704

Solar Shelter Engr. Co.
550 E. 76th Ave.
Denver, CO 80229

Solar Transition, Inc.
9965 Business Park Ave., B
San Diego, CA 92131

Solar Usage Now, Inc.
450 E. Tiffin St., Box 306
Bascom, OH 44809

Solar Water Heaters of N P R
1214 U.S. Hwy. 19 N.
New Port Richey, FL 33552

Solar-Eye Products, Inc.
1300 N.W. McNab, Bldg. G & H
Ft. Lauderdale, FL 33309

Solara Associates, Inc.
1001 Conn Ave., N.W.,
Washington, D. C. 20036

Solarcell Corp.
707 S.W. 48th St.
Ft. Lauderdale, FL 33315

Solargizer International
2000 N. 98th St.
Bloomington, MN 55431

Solarlife
404 Lippincott Ave.
Riverton, NJ 08077

Solaron Corp.
1885 W. Dartmouth Ave.
Englewood, CO 80110

Solarsmith
PO Box 1024
Tualatin, OR 97062

Solartec, Inc.
250 Pennsylvania Ave.
Salem, OH 44460

Solectro-thermo, Inc.
1934 Lakeview Ave.
Dracut, MA 01826

Southeastern Slr. Sys., Inc
4705 J. Baker's Ferry Rd.
Atlanta, GA 30336

Southern Lgt./Univ. 100
501 Elwell Ave.
Orlando, FL 32803

Southwest Ener-tech, Inc.
3030 S. Valley View Blvd.
Las Vegas, NV 89102

Southwest Solar Corp.
441 N. Oak St.
Inglewood, CA 90301

SRD Corp.
Rt. 1, Box 26
Eastover, SC 29044

Star Pak Solar Systems
44480 Grand River Ave.
Novi, MI 48050

State Industries, Inc.
Cumberland St.
Ashland City, TN 37015

Appendix C (continued)

Sun Systems
3831 E. Broadway Rd.
Phoenix, AZ 85040

Sun Water, Inc.
PO Box 732
Northridge, CA 91328

Sun Wise, Inc.
2125 2nd Ave., N.W.
Great Falls, MT 59404

Sun-Heet, Inc.
11965 E. 49th Ave.
Denver, CO 80239

Sun-Pac, Inc.
PO Box 8169
Alexandria, LA 71306

Sun-Ray Solar Equip. Co.
4 Pines Bridges Rd.
Beacon Falls, CT 06403

Sun-Ray Solar Heaters
4898 Ronson Ct.
San Diego, CA 92111

Sunburst Solar Energy, Inc.
4131-A Power Inn Rd.
Sacramento, CA 95826

Sunco Solar, Inc.
761 Williams Rd.
Palm Springs, CA 92262

Suncor, Inc.
5575 Magnatron Blvd.
San Diego, CA 92111

Suncor, Inc. (TN)
2901 E. Magnolia
Knoxville, TN 37914

Sundu Co.
3319 Keys Ln.
Anaheim, CA 92804

Sunduit, Inc.
281 E. Jackson St.
Virden, IL 62690

Sunearth Solar Prod. Corp.
352 Godshall Dr.
Hurleysville, PA 19438

Sunflower Energy Works
101 Main St.
Lehigh, KS 67073

Sunpower Systems Corp.
510 S. 52nd St.
Tempe, AZ 85281

Sunray Solar Heat, Inc.
202 Classon Ave.
Brooklyn, NY 11205

Sunshine Unlimited
900 N. Jay St.
Chandler, AZ 85224

Sunspot Envir. Energy Sys.
PO Box 5110
San Diego, CA 92105

Sunworks Div./Enthone, Inc.
PO Box 2000
Somerville, NJ 08876

Surry Solar Services
249 Hickory St.
Mt. Airy, NC 27030

Swan Solar
7024 Winnetka Ave.
Canoga Park, CA 91303

Technitrek Corp.
34701 7th St., Bldg. 1B
Union City, CA 94587

The Best Solar Systems, Inc.
840 E. Bethany Home Rd.
Phoenix, AZ 85014

Appendix C (continued)

The Solar Collector
PO Box 272
Sausalito, CA 94965

Thermaco
6828 7th Ave.
Rio Linda, CA 95673

Toltec, Inc.
40th & E. Main St.
Clear Lake, IA 50428

Trendsetter Industries
7776 Trade St., #E
San Diego, CA 92121

U.S. Solar Corp.
PO Drawer K
Hampton, FL 32044

United Solar, Inc.
Brogdon Rd., Box 237
Steele, AL 35987

Urja, Inc.
3100 Shannon
Santa Ana, CA 92704

Virginia Solar Comp., Inc.
Rt. 3, Hwy. 29 S.
Rusturg, VA 24588

Vulcan Solar Ind., Inc.
6 Industrial Dr.
Smithfield, RI 02917

Wallace Company
831 Dorsey St.
Gainesville, GA 30501

Weather-Made Systems, Inc.
W. Hwy. 266, Rt. 7,
Springfield, MO 65802

Western Solar Dev., Inc.
1236 Callen St.
Vacaville, CA 95688

Whiteline, Inc.
PO Box 3071
Ashville, NC 28802

Wilkes Sun Energy Sys., Inc.
9060 S.E. Gomez, Box 1842
Hobe Sound, FL 33455

Ying Manufacturing Corp.
1957 W. 144th St.
Gardena, CA 90249

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Appendix D

Manufacturers of Photovoltaic Modules

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Manufacturers of Photovoltaic Modules Responding to Survey*

Applied Solar Energy Corp.
15251 E. Don Julian Road
City of Industry, CA 91746

Arco Solar Inc.
20554 Plummer
Chatsworth, CA 91311

E-Systems Energy Tech Ctr.
P. O. Box 226118
Dallas, TX 75266

Free Energy Systems Inc.
Holmes Industrial Park
Holmes, PA 19043

General Electric
501 Allendale Rd., Box 527
King of Prussia, PA 19406

Martin Marietta Inc.
P. O. Box 179, C-4000
Denver, CO 80201

Mobil Tyco
16 Hickory Drive
Waltham, MA 02154

Photowatt International Inc.
2414 W. 14th St.
Tempe, AZ 85281

Silicon Sensors Inc.
Highway 18 East
Dogerville, WI 53533

Solar Power Corp.
20 Cabot Rd.
Woburn, MA 01801

Solavolt Int'l
P.O. Box 2934
Phoenix, AZ 85062

Solec International
12533 Chardon Ave.
Hawthorne, CA 90250

Solenergy Corp.
171 Merrimac Street
Woburn, MA 01801

Sollos Inc.
2231 S. Carmelina
Los Angeles, CA 90024

Thermo-Electron
45 First Ave.
Waltham, MA 02154

Tideland Signal Corp.
4310 Directors Row
Houston, TX 77092

United Energy Corp.
1176-D Aster Ave.
Sunnyvale, CA 94086

* Only those companies requesting inclusion of their names and addresses in this report.

**U.S. Department of Energy
Energy Information Administration
National Energy Information Center, EI-20
Forrestal Building
Washington, D.C. 20585**

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