



**SUMMARY
OF SRCC
CERTIFIED
SOLAR
COLLECTOR
AND
WATER HEATING
SYSTEM RATINGS**

November 2006

www.solar-rating.org

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SRCC RATING AND CERTIFICATION PROGRAMS

The Solar Rating & Certification Corporation (SRCC) is an independent, non-profit organization which certifies and rates the performance of solar energy equipment. The SRCC was formed in 1980.

The SRCC currently operates three solar certification programs: collector certification (OG 100), water heating system certification (OG 300), and a certification program for solar swimming pool heating systems (OG 400). The collector certification program (OG 100) applies to that part of a solar energy system which is exposed to the sun and collects the sun's heat. The collectors can be used to heat water, buildings, and for other purposes. The solar water heating system certification program (OG 300) deals with the entire solar system (collectors, controls, storage tanks, heat exchangers, pumps, etc.) used to heat domestic hot water using the sun. This program integrates results of collector tests and system tests with computer simulations and determines whether systems meet minimum standards for system durability, reliability, safety and operation. It also evaluates factors affecting total system design, installation, maintenance and service. The solar swimming pool heating system certification program (OG 400) deals only with complete systems for heating swimming pools.

This summary contains ratings for solar collectors and heating systems which have been certified and rated by SRCC. Additional information is contained in the full Directory of SRCC Certified Solar Collector and Water Heating System Ratings. Contact the SRCC office in Cocoa, FL for ordering information.

The information in this summary provides reliable and comparable data for solar water heating collectors and systems you may be considering buying. The rating information is a helpful tool for comparing the efficiency of the various solar systems on the market. Remember, though, that not all solar energy systems are tested and rated as a "package" or a system. Many systems you consider may have only the collectors rated by SRCC. While you can, and should, compare collector ratings, you cannot compare collector ratings with system ratings. The reason for this is two-fold. First, the collector rating shows the performance of one component in the solar package while the system rating shows the performance of an entire solar package. Second, each rating, whether a collector rating or a system rating, is developed using a separate set of assumed conditions. Therefore, this summary is divided into two sections: collectors and systems. All collectors and systems which have been certified by SRCC will bear the SRCC label, which is your assurance that an independent party has verified the performance and basic durability of the solar product you are considering.

Both the full directory and this summary contain "performance" information about the solar collectors and systems. "Performance" data relates to the energy output of the collector or system. The SRCC performance information contained in this summary provides a way to compare the **relative** performance of different solar water heating collectors and systems, not the **actual** performance you can expect from a given collector or system. This is because the collectors and systems are rated under standard laboratory conditions which are certain to be different from those in your home. **Think of the SRCC ratings as you do the MPG ratings for cars -- a benchmark, but not necessarily the same performance you will experience.** Remember, too, that performance (or energy output) is only one criterion in choosing a solar energy collector or system. Quality of installation, cost, availability of service and parts, and the expected life of the equipment are also important points to consider. Equipment which is well designed and well built, but poorly installed, cannot perform according to the manufacturer's specifications.

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COLLECTORS CERTIFIED UNDER OG100

HOW COLLECTORS ARE CERTIFIED UNDER THE OG 100 PROTOCOL

Each time SRCC allows a solar manufacturer to attach the SRCC label to its product, very specific steps have been followed to assure consumers that the product meets SRCC's approval and that the performance information provided to you is correct. First, SRCC selects a solar collector at random from the manufacturer's facility. The collector is then sent for testing to an independent laboratory accredited by SRCC. When the collector is received by the lab, it is subjected to a variety of durability tests to reveal any leaks, to check the integrity of construction, and to assess the collector's resistance to changes in water temperature. Following the durability tests, the energy output of the collector is measured to determine the performance of the collector under a specified set of conditions. These measurements result in the performance equations which are used to calculate performance ratings. Finally, when the testing is complete, the lab partially disassembles the collector and inspects it for any hidden problems.

SRCC then reviews the results and calculates of the ratings which appear in the directory. The SRCC also checks the collector design for reliability and durability. When the collector is certified, the manufacturer is notified and required to begin affixing the SRCC label to the solar collector. The manufacturer must provide a copy of the Certification Award with each certified collector.

TYPES OF SOLAR COLLECTORS

As you shop for a solar collector, you may see several different types. They are:

1. **Unglazed flat-plate liquid-type collectors** are those in which a liquid is heated by the sun in a stationary collector which does not have glass or other transparent covering. These collectors are commonly used in swimming pool heating systems.
2. **Glazed flat-plate liquid-type collectors** are those in which a liquid is heated by the sun in a stationary collector which has a cover of glass or other transparent material. They are the most common type of collectors and are often used for domestic water heating and space heating systems.
3. **Air-type collectors** are those in which the sun heats air rather than a liquid in the collector. They are most commonly used for space heating applications.

All three types of collectors work well and can be compared with others of the same type, using the ratings in this directory.

HOW TO USE THE OG 100 SUMMARY

SRCC has divided the collectors in this section of the directory according to the two types: unglazed and glazed. A performance rating under 15 different weather and operating conditions is published in the full SRCC directory. This summary lists the most commonly used rating for each collector type. The collector with the higher rating generally produces more energy than those with lower ratings. However, such a comparison should not be the only basis for your choice of a solar energy system. The remainder of the system and the quality of the installation are also critically important factors in how well your solar system works, and how much energy and money you save. Remember, too, that the energy output of the collectors in the directory has been measured under test conditions, which are almost certainly not the same as the collector will be subjected to on your home.

COMPARING COLLECTOR EFFICIENCY AND COST

With the ratings discussed above, it is easy to compare the energy output of one collector to another. It can be difficult however, to take into account the price of the different collectors.

One method is to compare the energy output for each dollar spent on different collectors. Or, in other words, how many Btu (or MJ) does a dollar buy if spent on Collector #1 or on Collector #2? This question can be answered by dividing the energy output by the cost of the collector. For example, you are considering a solar water heating application. Collector

#1 has a rating in Category C (for solar water heating) of 29 MJ (per collector per day) or 21,000 Btu (per collector per day). Collector #1 sells for \$387. Collector #2 is rated at 35 MJ or 33,000 Btu. It sells for \$675. Thus:

Collector #1

$$\frac{29 \text{ MJ}}{\$ 387} = 0.07 \text{ MJ} / \$ \quad \text{or} \quad \frac{21,000 \text{ Btu}}{\$ 387} = 54.26 \text{ Btu} / \$$$

Collector #2

$$\frac{35 \text{ MJ}}{\$ 675} = 0.05 \text{ MJ} / \$ \quad \text{or} \quad \frac{33,000 \text{ Btu}}{\$ 675} = 48.89 \text{ Btu} / \$$$

Collector #1 is the better buy, based on performance under the test conditions alone. The higher the number of MJ's or Btu's per dollar, the more cost-effective the collector is...all other things being equal. Remember, though, that the design and quality of the rest of the system and the installation are also critical to a good solar energy system.

RATINGS SUMMARY OF OG-100 CERTIFIED GLAZED COLLECTORS*

Manufacturer	Model Number	Brand Name	Gross Area (m ²)	Gross Area (ft ²)	Absorber Coating	Y Intercept	Slope (W/m ² -C)	Slope (Btu/hr-ft ² -F)	Clear C (MJ/Day)	Clear C (kBtu/Day)
ACR Solar International	10-01	Skyline	0.93	10.0	Selective Coating	0.602	-3.76	-0.663	9	8
ACR Solar International	20-01	Skyline	1.87	20.1	Selective Coating	0.604	-3.73	-0.657	18	17
Alternate Energy Technologies	AE-21	Alternate Energy	1.93	20.8	Selective Coating	0.706	-4.91	-0.865	22	21
Alternate Energy Technologies	AE-21E	American Energy	1.93	20.7	Moderately Selective Black Paint	0.660	-6.37	-1.123	20	19
Alternate Energy Technologies	AE-24	Alternate Energy	2.21	23.8	Selective Coating	0.706	-4.91	-0.865	25	24
Alternate Energy Technologies	AE-24E	American Energy	2.21	23.8	Moderately Selective Black Paint	0.655	-6.37	-1.123	23	21
Alternate Energy Technologies	AE-26	Alternate Energy	2.35	25.4	Selective Coating	0.706	-4.91	-0.865	27	25
Alternate Energy Technologies	AE-26E	American Energy	2.36	25.4	Moderately Selective Black Paint	0.655	-6.37	-1.123	24	23
Alternate Energy Technologies	AE-28	Alternate Energy	2.60	28.0	Selective Coating	0.706	-4.91	-0.865	29	28
Alternate Energy Technologies	AE-28E	American Energy	2.60	28.0	Moderately Selective Black Paint	0.655	-6.37	-1.123	26	25
Alternate Energy Technologies	AE-32	Alternate Energy	2.96	31.9	Selective Coating	0.706	-4.91	-0.865	33	32
Alternate Energy Technologies	AE-32E	American Energy	2.97	31.9	Moderately Selective Black Paint	0.655	-6.37	-1.123	30	29
Alternate Energy Technologies	AE-40	Alternate Energy	3.70	39.8	Selective Coating	0.706	-4.91	-0.865	42	40
Alternate Energy Technologies	AE-40E	American Energy	3.70	39.8	Moderately Selective Black Paint	0.655	-6.37	-1.123	38	36
Alternate Energy Technologies	AE-50	Alternate Energy	4.66	50.2	Selective Coating	0.706	-4.91	-0.865	53	50
Alternate Energy Technologies	AE-56	Alternate Energy	5.18	55.7	Selective Coating	0.706	-4.91	-0.865	58	55
Alternate Energy Technologies	MSC-21	Morning Star	2.00	21.5	Selective Coating	0.706	-4.91	-0.865	23	21
Alternate Energy Technologies	MSC-21E	Morning Star	2.00	21.5	Moderately Selective Black Paint	0.655	-6.37	-1.123	20	19
Alternate Energy Technologies	MSC-24	Morning Star	2.28	24.5	Selective Coating	0.706	-4.91	-0.865	26	24
Alternate Energy Technologies	MSC-24E	Morning Star	2.27	24.4	Moderately Selective Black Paint	0.655	-6.37	-1.123	23	22
Alternate Energy Technologies	MSC-26	Morning Star	2.42	26.0	Selective Coating	0.706	-4.91	-0.865	27	26
Alternate Energy Technologies	MSC-26E	Morning Star	2.41	25.9	Moderately Selective Black Paint	0.655	-6.37	-1.123	24	23
Alternate Energy Technologies	MSC-28	Morning Star	2.66	28.7	Selective Coating	0.706	-4.91	-0.865	30	29
Alternate Energy Technologies	MSC-28E	Morning Star	2.65	28.5	Moderately Selective Black Paint	0.655	-6.37	-1.123	27	26
Alternate Energy Technologies	MSC-32	Morning Star	3.03	32.7	Selective Coating	0.706	-4.91	-0.865	34	32
Alternate Energy Technologies	MSC-32E	Morning Star	3.02	32.5	Moderately Selective Black Paint	0.655	-6.37	-1.123	31	29
Alternate Energy Technologies	MSC-40	Morning Star	3.92	42.2	Selective Coating	0.706	-4.91	-0.865	44	42

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RATINGS SUMMARY OF OG-100 CERTIFIED GLAZED COLLECTORS*

Manufacturer	Model Number	Brand Name	Gross Area (m ²)	Gross Area (ft ²)	Absorber Coating	Y Intercept	Slope (W/m ² -C)	Slope (Btu/hr-ft ² -F)	Clear C (MJ/Day)	Clear C (kBtu/Day)
Alternate Energy Technologies	MSC-40E	Morning Star	3.76	40.5	Moderately Selective Black Paint	0.655	-6.37	-1.123	38	36
Alternate Energy Technologies	ST-21E	Starfire	1.97	21.2	Moderately Selective Black Paint	0.674	-6.02	-1.061	20	19
Alternate Energy Technologies	ST-40E	Starfire	3.58	38.5	Moderately Selective Black Paint	0.674	-6.02	-1.061	36	35
American Solar Works	ASW52B	American Solar Works	2.86	30.8	Sputtered aluminium nitride	0.481	-1.65	-0.291	23	22
Apricus Solar Co., Ltd.	AP-10	Apricus	1.34	14.4	Sputtered aluminum nitride	0.418	-1.17	-0.206	12	12
Apricus Solar Co., Ltd.	AP-20	Apricus	2.71	29.2	Sputtered aluminum nitride	0.418	-1.17	-0.206	25	23
Apricus Solar Co., Ltd.	AP-22	Apricus	2.98	32.1	Sputtered aluminum nitride	0.418	-1.17	-0.206	27	26
Apricus Solar Co., Ltd.	AP-30	Apricus	4.05	43.6	Sputtered aluminum nitride	0.418	-1.17	-0.206	37	35
Beijing Sunda Solar Energy Technology Co Ltd	SEIDO 10-10AS/AB	SUNDA	1.68	18.1	Sputtered aluminum nitrate	0.462	-1.57	-0.276	15	14
Beijing Sunda Solar Energy Technology Co Ltd	SEIDO 10-20AS/AB	SUNDA	3.39	36.5	Sputtered aluminum nitrate	0.462	-1.57	-0.276	30	28
Beijing Sunda Solar Energy Technology Co Ltd	SEIDO 1-16	SUNDA	3.99	43.0	Sputtered aluminium nitride	0.529	-1.70	-0.299	37	35
Beijing Sunda Solar Energy Technology Co Ltd	SEIDO 1-8	SUNDA	2.00	21.5	Sputtered aluminium nitride	0.529	-1.70	-0.299	19	18
Beijing Sunda Solar Energy Technology Co Ltd	SEIDO 5-16 AS/AB	SUNDA	4.10	44.1	Sputtered aluminium nitride	0.492	-1.92	-0.339	38	36
Beijing Sunda Solar Energy Technology Co Ltd	SEIDO 5-8 AS/AB	SUNDA	2.03	21.8	Sputtered aluminium nitride	0.492	-1.92	-0.339	19	18
BTF, Ltd.	SP-20	Solar Patriot	3.08	33.1	Sputtered aluminum nitride	0.345	-1.15	-0.203	25	23
Enerworks, Inc.	COL-4X8-NL-SG1-SH10US	Commercial Collector	2.87	30.9	Vapor Deposition Selective Coating	0.768	-4.03	-0.711	39	37
Enerworks, Inc.	COL-4x8-TL-SG1-SD10US	Residential Collector	2.87	30.9	Vapor Deposition Selective Coating	0.726	-5.11	-0.901	33	32
Genersys PLC	1000-10	Genersys	2.04	21.9	Metallic Oxide	0.591	-3.99	-0.704	20	19
Heliodyne, Inc.	Gobi 308	Heliodyne	2.24	24.1	Black Chrome	0.733	-4.74	-0.835	28	26
Heliodyne, Inc.	Gobi 3366	Heliodyne	2.49	26.8	Black Chrome	0.734	-4.68	-0.825	31	30
Heliodyne, Inc.	Gobi 408	Heliodyne	3.00	32.3	Black Chrome	0.737	-4.57	-0.805	39	37
Heliodyne, Inc.	Gobi 410	Heliodyne	3.74	40.3	Black Chrome	0.737	-4.57	-0.805	48	46
Heliodyne, Inc.	Mojave 408	Heliodyne	3.00	32.3	Polyester Flat Black Paint	0.726	-6.08	-1.071	34	32
Heliodyne, Inc.	Mojave 410	Heliodyne	3.73	40.1	Polyester Flat Black Paint	0.726	-6.08	-1.071	42	40
King Solar Products	KS-32	King Solar Products Inc. (AET)	2.96	31.9	Selective Coating	0.706	-4.91	-0.865	33	32

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Manufacturer	Model Number	Brand Name	Gross Area (m ²)	Gross Area (ft ²)	Absorber Coating	Y Intercept	Slope (W/m ² -C)	Slope (Btu/hr-ft ² -F)	Clear C (MJ/Day)	Clear C (kBtu/Day)
King Solar Products	KS-40	King Solar Products Inc. (AET)	3.70	39.8	Selective Coating	0.706	-4.91	-0.865	42	40
Mr. Sun Solar	AE-40	Sol-Reliant	3.70	39.8	Selective Coating	0.706	-4.91	-0.865	42	40
Mr. Sun Solar	AE-50	Sol-Reliant	4.66	50.2	Selective Coating	0.706	-4.91	-0.865	53	50
Mr. Sun Solar	AE-56	Sol-Reliant	5.18	55.7	Selective Coating	0.706	-4.91	-0.865	58	55
R&R Solar Supply	EPI-308CU(3'x7')	Copper Star 21	1.90	20.5	Moderately Selective Black Paint	0.708	-6.11	-1.077	21	20
R&R Solar Supply	EPI-308CU(3'x8')	Copper Star 24	2.17	23.3	Moderately Selective Black Paint	0.708	-6.11	-1.077	24	22
R&R Solar Supply	EPI-308CU(4'x8')	Copper Star 32	2.92	31.4	Moderately Selective Black Paint	0.708	-6.11	-1.077	32	30
R&R Solar Supply	EPI-308SS(3'x7')	Sunlast 21	1.90	20.5	Moderately Selective Black Paint	0.708	-6.11	-1.077	21	20
R&R Solar Supply	EPI-308SS(3'x8')	Sunlast 24	2.17	23.3	Moderately Selective Black Paint	0.708	-6.11	-1.077	24	22
R&R Solar Supply	EPI-308SS(4'x8')	Sunlast 32	2.92	31.4	Moderately Selective Black Paint	0.708	-6.11	-1.077	32	30
R&R Solar Supply	Sunpro 21	Sunpro	1.90	20.5	Moderately Selective Black Paint	0.708	-6.11	-1.077	21	20
R&R Solar Supply	Sunpro 24	Sunpro	2.17	23.3	Moderately Selective Black Paint	0.708	-6.11	-1.077	24	23
R&R Solar Supply	Sunpro 32	Sunpro	2.92	31.4	Moderately Selective Black Paint	0.708	-6.11	-1.077	32	30
R&R Solar Supply	Sunpro 40	Sunpro	3.64	39.2	Moderately Selective Black Paint	0.708	-6.11	-1.077	40	38
Radco Products, Inc.	308C-HP	Radco	2.20	23.7	Black Chrome	0.778	-4.96	-0.875	28	26
Radco Products, Inc.	308P-HP	Radco	2.20	23.7	Flat Black Paint	0.764	-7.51	-1.323	24	23
Radco Products, Inc.	408C-HP	Radco	3.00	32.3	Black Chrome	0.779	-4.77	-0.841	38	36
Radco Products, Inc.	408P-HP	Radco	3.00	32.3	Flat Black Paint	0.768	-7.24	-1.276	32	30
Radco Products, Inc.	410C-HP	Radco	3.71	39.9	Black Chrome	0.779	-4.77	-0.841	47	45
Radco Products, Inc.	410P-HP	Radco	3.71	39.9	Flat Black Paint	0.768	-7.24	-1.276	40	38
Radco Products, Inc.	412C-HP	Radco	4.49	48.3	Black Chrome	0.779	-4.77	-0.841	57	54
Radco Products, Inc.	412P-HP	Radco	4.49	48.3	Flat Black Paint	0.768	-7.24	-1.276	49	46
Rheem Water Heaters	RS21-BC	Rheem	1.98	21.3	Black Chrome	0.759	-5.93	-1.045	24	23
Rheem Water Heaters	RS21-BP	Rheem	1.98	21.3	Polyester Flat Black Paint	0.772	-8.36	-1.473	23	22
Rheem Water Heaters	RS21-SC	Rheem	1.98	21.4	Titanium oxide	0.750	-4.87	-0.858	24	23
Schuco International KG	V, H, LA	Premium	2.70	29.1	Sputtered cermet	0.718	-4.28	-0.754	33	31
Schuco International KG	V, LA	Slimline	2.31	24.9	Sputtered cermet	0.715	-3.99	-0.704	28	27
Sealed Air Corporation	FW-48		4.40	47.4	None	0.739	-8.21	-1.447	44	42
Solahart Industries	Bt	Solahart	1.98	21.4	Titanium oxide	0.750	-4.87	-0.858	24	23
Solahart Industries	J	Solahart	1.98	21.3	Polyester Flat Black Paint	0.772	-8.36	-1.473	23	22
Solahart Industries	Kf	Solahart	1.98	21.3	Black Chrome	0.759	-5.93	-1.045	24	23
Solahart Industries	L	Solahart	1.98	21.3	Polyester Flat Black Paint	0.625	-7.47	-1.316	16	15
Solahart Industries	M	Solahart	1.98	21.3	Black Chrome	0.625	-4.53	-0.798	20	19

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RATINGS SUMMARY OF OG-100 CERTIFIED GLAZED COLLECTORS*

Manufacturer	Model Number	Brand Name	Gross Area (m ²)	Gross Area (ft ²)	Absorber Coating	Y Intercept	Slope (W/m ² -C)	Slope (Btu/hr-ft ² -F)	Clear C (MJ/Day)	Clear C (kBtu/Day)
Solar Capital Partners LLC	Typ A	Glutmuagl	10.70	115.2	Sputtered aluminum nitride	0.630	-3.88	-0.684	94	89
Solar Development, Inc.	SD8-28	Solar Development	2.60	28.0	Selective Coating	0.706	-4.91	-0.865	29	28
Solar Energy, Inc.	SE-21		2.03	21.9	Selective Coating	0.704	-4.49	-0.790	24	22
Solar Energy, Inc.	SE-24		2.31	24.9	Selective Coating	0.704	-4.49	-0.790	27	25
Solar Energy, Inc.	SE-28		2.51	27.0	Selective Coating	0.704	-4.49	-0.790	29	28
Solar Energy, Inc.	SE-32		2.87	30.9	Selective Coating	0.704	-4.49	-0.790	33	32
Solar Energy, Inc.	SE-40		3.58	38.6	Selective Coating	0.704	-4.49	-0.790	42	39
Solar Mining Company	SMC/AET 26		2.35	25.4	Selective Coating	0.706	-4.91	-0.865	27	25
Solar Mining Company	SMC/AET 32		2.96	31.9	Selective Coating	0.706	-4.91	-0.865	33	32
Solar Mining Company	SMC/AET 40		3.70	39.8	Selective Coating	0.706	-4.91	-0.865	42	40
Solargenix Energy, LLC	WS0503	Winston Series CPC	2.24	24.1	Moderately Selective Black Paint	0.600	-5.68	-1.001	19	18
Solene	SLCO-30	Solene-Corona	2.28	24.5	Black Chrome	0.782	-4.60	-0.811	28	27
Solene	SLCO-32	Solene-Corona	2.95	31.8	Black Chrome	0.785	-4.60	-0.810	36	35
Solene	SLCO-40	Solene-Corona	3.61	38.9	Black Chrome	0.787	-4.60	-0.810	45	42
Solene	SLCR-30	Solene/Chromagen	2.81	30.3	Black Chrome	0.735	-5.37	-0.945	35	33
Solene	SLCR-32	Solene/Chromagen	2.97	32.0	Black Chrome	0.735	-5.37	-0.945	37	35
Solene	SLCR-40	Solene/Chromagen	3.72	40.1	Black Chrome	0.735	-5.37	-0.945	46	44
Stiebel Eltron	Sol 25 Plus	Stiebel Eltron	2.73	29.4	Sputtered titanium nitride	0.660	-4.29	-0.755	32	30
SunBank Solar	SB10	SunBank	0.93	10.0	Selective Coating	0.602	-3.76	-0.663	9	8
SunBank Solar	SB20	SunBank	1.87	20.1	Selective Coating	0.604	-3.73	-0.657	18	17
SunEarth, Inc.	EC-20	Empire	1.83	19.7	Black Chrome	0.714	-4.13	-0.727	22	20
SunEarth, Inc.	EC-21	Empire	1.97	21.2	Black Chrome	0.714	-4.13	-0.727	23	22
SunEarth, Inc.	EC-24	Empire	2.29	24.7	Black Chrome	0.714	-4.13	-0.727	27	26
SunEarth, Inc.	EC-32	Empire	3.05	32.8	Black Chrome	0.714	-4.13	-0.727	36	34
SunEarth, Inc.	EC-40	Empire	3.80	40.9	Black Chrome	0.714	-4.13	-0.727	45	42
SunEarth, Inc.	EP-20	Empire	1.83	19.7	Moderately Selective Black Paint	0.682	-4.54	-0.800	21	19
SunEarth, Inc.	EP-21	Empire	1.97	21.2	Moderately Selective Black Paint	0.682	-4.54	-0.800	22	21
SunEarth, Inc.	EP-24	Empire	2.29	24.7	Moderately Selective Black Paint	0.682	-4.54	-0.800	26	24
SunEarth, Inc.	EP-32	Empire	3.05	32.8	Moderately Selective Black Paint	0.682	-4.54	-0.800	34	32
SunEarth, Inc.	EP-40	Empire	3.80	40.9	Moderately Selective Black Paint	0.682	-4.54	-0.800	43	40
SunEarth, Inc.	IC-24	Imperial	2.30	24.8	Black Chrome	0.714	-4.13	-0.727	27	26
SunEarth, Inc.	IC-32	Imperial	3.06	33.0	Black Chrome	0.714	-4.13	-0.727	36	34

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RATINGS SUMMARY OF OG-100 CERTIFIED GLAZED COLLECTORS*

Manufacturer	Model Number	Brand Name	Gross Area (m ²)	Gross Area (ft ²)	Absorber Coating	Y Intercept	Slope (W/m ² -C)	Slope (Btu/hr-ft ² -F)	Clear C (MJ/Day)	Clear C (kBtu/Day)
SunEarth, Inc.	IC-40	Imperial	3.81	41.0	Black Chrome	0.714	-4.13	-0.727	45	43
SunEarth, Inc.	IP-24	Imperial	2.30	24.8	Moderately Selective Black Paint	0.682	-4.54	-0.800	26	24
SunEarth, Inc.	IP-32	Imperial	3.06	33.0	Moderately Selective Black Paint	0.682	-4.54	-0.800	34	33
SunEarth, Inc.	IP-40	Imperial	3.81	41.0	Moderately Selective Black Paint	0.682	-4.54	-0.800	43	41
SunEarth, Inc.	SC-24	Sunwise	2.29	24.7	Black Chrome	0.714	-4.13	-0.727	27	26
SunEarth, Inc.	SC-32	Sunwise	3.05	32.8	Black Chrome	0.714	-4.13	-0.727	36	34
SunEarth, Inc.	SC-40	Sunwise	3.80	40.9	Black Chrome	0.714	-4.13	-0.727	45	42
SunEarth, Inc.	SP-24	Sunwise	2.29	24.7	Moderately Selective Black Paint	0.682	-4.54	-0.800	26	24
SunEarth, Inc.	SP-32	Sunwise	3.05	32.8	Moderately Selective Black Paint	0.682	-4.54	-0.800	34	32
SunEarth, Inc.	SP-40	Sunwise	3.80	40.9	Moderately Selective Black Paint	0.682	-4.54	-0.800	43	40
SunEarth, Inc.	SSC-21	SolarStar	1.86	20.0	Black Chrome	0.714	-4.13	-0.727	22	21
SunEarth, Inc.	SSC-24	SolarStar	2.16	23.2	Black Chrome	0.714	-4.13	-0.727	25	24
SunEarth, Inc.	SSC-32	SolarStar	2.91	31.3	Black Chrome	0.714	-4.13	-0.727	34	33
SunEarth, Inc.	SSC-40	SolarStar	3.63	39.1	Black Chrome	0.714	-4.13	-0.727	43	41
SunEarth, Inc.	SSP-21	SolarStar	1.86	20.0	Moderately Selective Black Paint	0.682	-4.54	-0.800	21	20
SunEarth, Inc.	SSP-24	SolarStar	2.16	23.2	Moderately Selective Black Paint	0.682	-4.54	-0.800	24	23
SunEarth, Inc.	SSP-32	SolarStar	2.91	31.3	Moderately Selective Black Paint	0.682	-4.54	-0.800	33	31
SunEarth, Inc.	SSP-40	SolarStar	3.63	39.1	Moderately Selective Black Paint	0.682	-4.54	-0.800	41	39
Sunsaray Solar Manufacturing, Inc.	NC-32	Northern Comfort	3.18	34.2	Black Nickel	0.508	-4.84	-0.853	24	23
Synergy Solar	S19.78	Synergy	1.85	19.9	Moderately Selective Black Paint	0.626	-6.01	-1.060	17	16
Synergy Solar	S26.68	Synergy	2.48	26.7	Moderately Selective Black Paint	0.626	-6.01	-1.060	23	22
Synergy Solar	T19.78	Synergy	1.85	19.9	Sputtered aluminum nitride	0.647	-4.67	-0.822	19	18
Synergy Solar	T26.68	Synergy	2.48	26.7	Sputtered aluminum nitride	0.647	-4.67	-0.822	26	24
Synergy Solar	TC-26.52	Synergy	2.48	26.7	Sputtered aluminum nitride	0.697	-4.57	-0.806	28	26
Thermo Technologies	TMA-600-20	Mazdon	3.06	32.9	Black Chrome	0.530	-1.42	-0.250	28	26
Thermo Technologies	TMA-600-30	Mazdon	4.58	49.3	Black Chrome	0.530	-1.42	-0.250	42	40
Thermomax Industries Ltd.	AST20	Solamax	2.85	30.7	Sputtered aluminum nitride	0.574	-3.05	-0.537	24	23
Thermomax Industries Ltd.	AST30	Solamax	4.28	46.1	Sputtered aluminum nitride	0.574	-3.05	-0.537	36	34

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RATINGS SUMMARY OF OG-100 CERTIFIED GLAZED COLLECTORS*

Manufacturer	Model Number	Brand Name	Gross Area (m ²)	Gross Area (ft ²)	Absorber Coating	Y Intercept	Slope (W/m ² -C)	Slope (Btu/hr-ft ² -F)	Clear C (MJ/Day)	Clear C (kBtu/Day)
Thermomax Industries Ltd.	AST50	Solamax	7.13	76.7	Sputtered aluminum nitride	0.574	-3.05	-0.537	60	56
Viessmann Manufacturing Company (US) Inc.	SV1, SH1	Vitosol 100	2.52	27.2	Sputtered cermet	0.720	-3.50	-0.616	31	30
Viessmann Manufacturing Company (US) Inc.	Type SP3, 2m ²	Vitosol 300	2.88	31.0	Sputtered cermet	0.509	-1.09	-0.193	28	26
Viessmann Manufacturing Company (US) Inc.	Type SP3, 3m ²	Vitosol 300	4.29	46.2	Sputtered cermet	0.509	-1.09	-0.193	42	39

***OG100 Glazed Collectors Column Headings:**

Y Intercept	Intercept of the first order collector performance equation.
Slope (W/sq m-C)	Slope of the first order collector performance equation in SI units.
Slope (Btu/hr-sq ft-C)	Slope of the first order collector performance equation in IP units.
Clear C (MJDay)	Performance rating (SI Units) of the collector under clear conditions for rating category C.
Clear C (kBtu/Day)	Performance rating (IP Units) of the collector under clear conditions for rating category C.

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RATINGS SUMMARY OF OG-100 CERTIFIED UNGLAZED COLLECTORS*

Manufacturer	Model Number Tested	Brand Name	Gross Area (m ²)	Gross Area (ft ²)	Absorber Coating	Y Intercept	Slope (W/m ² -C)	Slope (Btu/hr-ft ² -F)	Clear A (MJ/m ² -Day)	Clear A (kBtu/ft ² -Day)
Dawn Solar Systems, Inc.	3004-CT	Dawn Solar	9.64	103.8	None	0.074	-2.78	-0.490	2	.2
Dawn Solar Systems, Inc.	3004L	Dawn Solar	9.30	100.1	Dark Green Fluorocarbon	0.126	-3.67	-0.647	2	.2
Heliocol USA, Inc.	HC-30	Heliocol	2.70	29.1	None	0.871	-21.31	-3.755	23	2.0
Sealed Air Corporation	FP-48		4.36	46.9	None	0.794	-15.94	-2.809	20	1.7
Sealed Air Corporation	FS-48		4.40	47.4	None	0.781	-15.22	-2.682	19	1.7
SolarTech International LLC	ST-300	SolarTech	3.23	34.8	None	0.709	-21.99	-3.875	20	1.7
Suntrek Industries, Inc.		SunTrek	3.87	41.6	None	0.860	-17.68	-3.115	20	1.7
Techno-Solis, Inc.	SM-40 / C20TS10	Swimmaster	3.96	42.7	None	0.802	-16.39	-2.889	18	1.6

NOTE: ALL SIZES OF THESE COLLECTOR MODELS ARE CERTIFIED.

*** OG100 Unglazed Collectors Column Headings:**

- Y Intercept Intercept of the first order collector performance equation.
- Slope (W/sq m-C) Slope of the first order collector performance equation in SI units.
- Slope (Btu/hr-sq ft-C) Slope of the first order collector performance equation in IP units.
- Clear A (MJ/sq m-Day) Performance rating (SI Units) of the collector per unit area under clear conditions for rating category A.
- Clear A (kBtu/sq ft-Day) Performance rating (IP Units) of the collector per unit area under clear conditions for rating category A.

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SYSTEMS CERTIFIED UNDER OG 300

HOW SYSTEMS ARE CERTIFIED UNDER THE OG 300 PROTOCOL

The process for rating and certifying solar water heating systems under the OG 300 protocol includes five steps for each system being rated:

1. The collectors which are part of the system must be tested and rated under the OG 100 protocol.
2. Passive systems in which the collector can not be tested separately must be rated and certified under a system testing protocol.
3. The complete specified system of collectors, tanks, pumps, motors, valves, piping, etc., is evaluated for essential elements related to:
 - system design;
 - projected durability and reliability;
 - safety;
 - operation and service procedures;
 - installation guidelines;
 - operation and maintenance manuals.
4. Data from the OG 100 collector test, the system test, and the review of design and installation guidelines are input to a computer program called *TRNSYS*. That program calculates system performance under a set of prescribed conditions.
5. Numerical results of the design and installation review (step 3) and the *TRNSYS* evaluation are integrated and entered on a certification to the supplier.

TYPES OF SOLAR WATER HEATING SYSTEMS

As you shop for solar water heating systems, you will probably see several different types. In general, all solar water heating systems fall into one of these four categories:

1. **Forced Circulation** or “active systems” are those that use a pump to circulate the water or other fluid from the collector where it is heated by the sun to the storage tank where it is kept until you need it.
2. **Integral Collector Storage (ICS)** systems, or “batch” water heaters, combine the collector and the storage tank into one. That is, the sun shines into the collector and strikes the storage tank directly, heating the water.
3. **Thermosyphon** systems have a separate storage tank, located above the collector. Liquid (which could be water or an antifreeze solution) warmed in the collector rises naturally to the storage tank where it is kept until needed.
4. **Self-Pumping** systems are those that use a phase change (liquid-vapor) or other passive means to cause the fluid in the collector to circulate and transport heat from the collector to the storage.

The ICS, thermosyphon and self-pumping systems are often called “passive” solar systems because they do not use mechanical energy to move the heated water. All four types of solar systems work well, and you should compare the performance of one type with the others.

HOW TO USE THE OG 300 SUMMARY

The thermal performance rating is based on the system design and performance projections derived from testing of the collector components used in the system, or from testing and evaluation of the system as a whole. The type of auxiliary system (e.g. gas or electric) utilized will have a large impact on the overall performance of the system. These differences arise because different types of auxiliary systems have varying standby losses and fuel conversion efficiencies. Although the auxiliary system may affect the solar system's performance, in many cases, the solar output is mostly independent of the auxiliary system used. Because gas backup systems have lower efficiencies and higher standby losses than do electric systems, it should be expected that the entire system's (including backup) performance will be lower, even if the solar output from both system types is equal.

SRCC uses the Solar Energy Factor (SEF) as its performance rating for solar domestic water heating systems. The SEF is defined as the energy delivered by the system divided by the electrical or gas energy put into the system. The SEF is presented as a number similar to the Energy Factor (EF) given to conventional water heaters by the Gas Appliance Manufacturers Association (GAMA)¹, but with the exceptions noted in the Rating Parameters Section of the directory.

$$SEF = \frac{Q_{DEL}}{Q_{AUX} + Q_{PAR}}$$

Where:

Q_{DEL} = Energy delivered to the hot water load: Using the SRCC rating conditions, this value is 43,302 kJ/day (41,045 Btu/day).

Q_{AUX} = Daily amount of energy used by the auxiliary water heater or backup element with a solar system operating, kJ/day (Btu/day). To convert to kWh, divide this value by 3,600 (3,412). To convert to therms, divide this value by 105,000 (100,000).

Q_{PAR} = Parasitic energy: Daily amounts of AC electrical energy used to power pumps, controllers, shutters, trackers, or any other item needed to operate the SDHW system, kJ/day (Btu/day). To convert to kWh, divide this value by 3,600 (3,412).

Because the hot water load assumed for calculating the SEF for all systems is the same, regardless of system size, large systems might be able to provide all of the hot water without consuming any auxiliary energy. This will cause the SEF to become very large. If one of these large systems also happens to use a control strategy that consumes no parasitic energy (ICS, thermosiphon, PV powered pump, etc.) the sum of Q_{AUX} and Q_{PAR} can be zero. This will cause the calculated value of SEF to approach infinity. In those cases, the SEF is listed in this summary as 99.9 or 999.9.

The Solar Energy Factor can be converted to an equivalent Solar Fraction (SF) as follows:

$$SF = 1 - \frac{EF}{SEF} \quad \text{The EF for the SRCC electric auxiliary tank is 0.9 and for the gas tank is 0.6}$$

In this context, the Solar Fraction is the portion of the total conventional hot water heating load (delivered energy and tank standby losses) provided by solar energy. Note that an alternate definition for Solar Fraction is often used. In this alternate definition, solar fraction is the portion of the water heating load (losses are NOT included) provided by solar energy. The alternate method of calculating solar fraction will yield higher solar fractions. Therefore, use caution when comparing the solar fraction for specific systems, inputs into energy codes (such as California's Title 24), or outputs from software (such as F-Chart) to ensure that the same calculation procedure for solar fraction has been used.

¹ Gas Appliance Manufacturers Association, "Consumer's Directory of Certified Efficiency Ratings for Residential Water Heating and Water Heating Equipment", 1994, pp. 138-218

The Solar Energy Factor can be converted to an equivalent Solar Savings (Q_{SOLAR}) as follows:

$$Q_{\text{SOLAR}} = Q_{\text{DEL}} \left(\frac{1}{\text{EF}} - \frac{1}{\text{SEF}} \right) = \text{SF} * Q_{\text{CONV}}$$

Where:

- Q_{CONV} = Daily amount of energy used by the auxiliary water heater or backup element without a solar system. The SRCC standard electric auxiliary tank has an energy usage of 47,865 kJ/day (45,369 Btu/day). The SRCC standard gas auxiliary tank has an energy usage of 72,348 kJ/day (68,576 Btu/day).
- EF = The Energy Factor is the ratio of delivered energy to input energy for the reference auxiliary tank without a solar contribution. The balance of the energy is lost to the surroundings due to standby losses and conversion efficiency.
- Q_{SOLAR} = The Solar Savings is the amount of the total conventional water heating load (delivered energy and tank standby losses) provided by solar energy minus any parasitic energy use.

Note that the SEF does not directly follow the Solar Fraction. Examples of equivalent values of SEF and Solar Fraction are:

SEF	Solar Fraction with Electric Auxiliary	Solar Fraction with Gas Auxiliary
1	10%	40%
2	55%	70%
3	70%	80%
4	78%	85%
5	82%	88%
10	91%	94%
15	94%	96%

SYSTEMS CERTIFIED WITH ELECTRIC AUXILIARY

COMPARING SYSTEM COSTS FOR SYSTEMS WITH AN ELECTRIC AUXILIARY

The Energy Factor (EF) and the Solar Energy Factor (SEF) can be used to compare different water heating systems with one another and to estimate typical yearly operating costs for the specified rating conditions. Note that the performance any individual consumer will experience may differ due to location and hot water usage. The SEF includes all of the conditions specified for the DOE EF test, plus several solar specific conditions. The EF and SEF can be used to compare solar and electric system's energy use on a one-to-one basis. For electric systems, the following calculation can be used:

$$\text{Yearly Cost (\$)} = 365 \text{ days} * 12.03 \text{ kWh/EF} * \$x/\text{kWh}$$

Examples:

Assume that electricity costs \$0.12/kWh

1. TYPICAL ELECTRIC WATER HEATER (EF=0.86)

$$\text{YEARLY COST} = 365 * 12.03 / 0.86 * 0.12 = \$612.69$$

2. TYPICAL SOLAR SYSTEM (SEF=2.0)

$$\text{YEARLY COST} = 365 * 12.03 / 2.0 * 0.12 = \$263.46$$

Note that the solar system saves \$349.23 (\$612.69 - \$263.46) per year. This figure can be used as the energy cost savings basis for an economic analysis of a solar hot water system based on the assumptions for the standard DOE (EF) and SRCC OG 300 (SEF) rating conditions. Other factors such as initial cost, maintenance, inflation, interest rate, and replacement costs also need to be considered when making an economic analysis.

RATINGS SUMMARY OF OG-300 CERTIFIED SYSTEMS WITH ELECTRIC AUXILIARY

System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
ACR Solar International	Skyline 2001 System 3	200131C50	Direct Forced Circulation	5/24/2000	1.4	29938	173
ACR Solar International	Skyline 2001 System 3	200132C50	Direct Forced Circulation	5/24/2000	2.1	20649	173
ACR Solar International	Skyline 2001 System 3	200133C80	Direct Forced Circulation	5/24/2000	3.2	13362	173
ACR Solar International	Skyline 2001 System 3	200133C50	Direct Forced Circulation	5/24/2000	3.2	13362	173
ACR Solar International	Skyline 2001 System 3	200132C80	Direct Forced Circulation	12/15/2005	2.0	22025	173
ACR Solar International	Skyline 2001 System 3	200132C502TE	Direct Forced Circulation	12/9/2002	1.8	23359	173
ACR Solar International	Skyline 2001 System 3	200132C50T20E	Direct Forced Circulation	12/9/2002	1.8	23491	0
ACR Solar International	Skyline 2001 System 5	200152C80EX	Direct Forced Circulation	2/15/2001	1.7	25112	0
ACR Solar International	Skyline 2001 System 5	200153C80EX	Direct Forced Circulation	2/15/2001	2.1	20320	0
ACR Solar International	Skyline 2001 System 5	200154C80EX	Direct Forced Circulation	2/15/2001	2.6	16565	0
ACR Solar International	Skyline 2001 System 5	200152C80EX2TE	Direct Forced Circulation	12/9/2002	1.6	27725	0
ACR Solar International	Skyline 2001 System 5	200153C80EX2TE	Direct Forced Circulation	12/9/2002	1.9	23216	0
Alternate Energy Technologies	EagleSun	DB-80-40	Indirect Forced Circulation	8/22/2006	1.7	20408	5357
Alternate Energy Technologies	EagleSun	DB-80-52	Indirect Forced Circulation	8/22/2006	2.0	16163	5338
Alternate Energy Technologies	EagleSun	DB-80-64	Indirect Forced Circulation	8/22/2006	2.5	11797	5338
Alternate Energy Technologies	EagleSun	DB-80-80	Indirect Forced Circulation	8/22/2006	3.7	6796	4790
Alternate Energy Technologies	EagleSun	DB-120-64	Indirect Forced Circulation	8/22/2006	2.1	15090	5338
Alternate Energy Technologies	EagleSun	DB-120-80	Indirect Forced Circulation	8/22/2006	2.7	11102	4781
Alternate Energy Technologies	EagleSun	DB-120-96	Indirect Forced Circulation	8/22/2006	4.0	5953	4781
Alternate Energy Technologies	EagleSun DX	DX-80-40	Indirect Forced Circulation	8/22/2006	2.0	16507	5280
Alternate Energy Technologies	EagleSun DX	DX-80-52	Indirect Forced Circulation	8/22/2006	2.8	10424	5261
Alternate Energy Technologies	EagleSun DX	DX-80-64	Indirect Forced Circulation	8/22/2006	5.1	3286	5249
Alternate Energy Technologies	EagleSun DX	DX-80-80	Indirect Forced Circulation	8/22/2006	9.1	0	4762
Alternate Energy Technologies	EagleSun DX	DX-120-64	Indirect Forced Circulation	8/22/2006	4.9	3603	5251
Alternate Energy Technologies	EagleSun DX	DX-120-80	Indirect Forced Circulation	8/22/2006	9.1	0	4762
Alternate Energy Technologies	EagleSun DX	DX-120-96	Indirect Forced Circulation	8/22/2006	9.8	0	4422
Bobcat & Sun, Inc.	Sun-Pak	SP32CHE-1	Indirect Forced Circulation	9/8/1994	1.5	22229	6078
Bobcat & Sun, Inc.	Sun-Pak	SP64CHE-1	Indirect Forced Circulation	9/8/1994	2.6	10496	6078
Bobcat & Sun, Inc.	Sun-Pak	SP40CHE-1	Indirect Forced Circulation	9/8/1994	1.7	18726	6078
Bobcat & Sun, Inc.	Sun-Pak	SP80CHE-1	Indirect Forced Circulation	9/8/1994	3.8	5354	6100
Bobcat & Sun, Inc.	Sun-Pak	SP32CHE	Indirect Forced Circulation	9/8/1994	1.4	25896	6100
Bobcat & Sun, Inc.	Sun-Pak	SP64CHE	Indirect Forced Circulation	9/8/1994	2.0	15073	6078

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RATINGS SUMMARY OF OG-300 CERTIFIED SYSTEMS WITH ELECTRIC AUXILIARY

System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
Bobcat & Sun, Inc.	Sun-Pak	SP40CHE	Indirect Forced Circulation	9/8/1994	1.5	22785	6100
Bobcat & Sun, Inc.	Sun-Pak	SP80CHE	Indirect Forced Circulation	9/8/1994	2.5	10995	6078
Butler Sun Solutions	Solar Butler	BSS-S1-40Ea	Indirect Forced Circulation	7/1/2004	1.3	31950	1064
Butler Sun Solutions	Solar Butler	BSS-S1-40Eb	Indirect Forced Circulation	7/1/2004	1.2	36486	961
Butler Sun Solutions	Solar Butler	BSS-S1-50Ea	Indirect Forced Circulation	7/1/2004	1.4	29892	1008
Butler Sun Solutions	Solar Butler	BSS-S1-80Ea	Indirect Forced Circulation	7/1/2004	1.7	25095	1064
Butler Sun Solutions	Solar Butler	BSS-S1-80Ec	Indirect Forced Circulation	7/1/2004	1.4	30002	1002
Butler Sun Solutions	Solar Butler	BSS-S1-50Ec	Indirect Forced Circulation	7/1/2004	1.3	31209	1004
Butler Sun Solutions	Solar Butler	BSS-S1-40Ec	Indirect Forced Circulation	8/29/2005	1.4	30611	1004
Butler Sun Solutions	Solar Butler	BSS-PV1-40Ea	Indirect Forced Circulation	9/15/2005	1.3	32533	0
Butler Sun Solutions	Solar Butler	BSS-PV1-40Eb	Indirect Forced Circulation	9/15/2005	1.2	36810	0
Butler Sun Solutions	Solar Butler	BSS-PV1-50Ea	Indirect Forced Circulation	9/15/2005	1.4	30459	0
Butler Sun Solutions	Solar Butler	BSS-PV1-80Ea	Indirect Forced Circulation	9/15/2005	1.7	26179	0
Butler Sun Solutions	Solar Butler	BSS-PV1-80Ec	Indirect Forced Circulation	9/15/2005	1.4	30724	0
Butler Sun Solutions	Solar Butler	BSS-PV1-50Ec	Indirect Forced Circulation	9/15/2005	1.4	31776	0
Butler Sun Solutions	Solar Butler	BSS-PV1-40Ec	Indirect Forced Circulation	9/15/2005	1.4	31183	0
Butler Sun Solutions	Solar Butler	BSS-S1-80E2a	Indirect Forced Circulation	9/15/2005	1.5	28597	1242
Butler Sun Solutions	Solar Butler	BSS-S1-80E2b	Indirect Forced Circulation	9/15/2005	1.4	30642	1242
Butler Sun Solutions	Solar Butler	BSS-PV1-80E2a	Indirect Forced Circulation	9/15/2005	1.5	29609	0
Butler Sun Solutions	Solar Butler	BSS-PV1-80E2b	Indirect Forced Circulation	9/15/2005	1.7	26162	0
Energy Laboratories, Inc.	Roof Integrated Thermosiphon System	RITH 72 E	Direct Thermosyphon	8/18/2006	1.8	24363	0
Heliodyne, Inc.	Helio-Flo	HF 1408 G 80 AC S E	Direct Forced Circulation	10/25/2004	2.3	18055	1145
Heliodyne, Inc.	Helio-Flo	HF 1410 G 80 AC S E	Direct Forced Circulation	10/25/2004	2.8	14458	1145
Heliodyne, Inc.	Helio-Flo	HF 1410 G 120 AC S E	Direct Forced Circulation	10/25/2004	2.7	14776	1145
Heliodyne, Inc.	Helio-Flo	HF 23366 G 80 AC S E	Direct Forced Circulation	10/25/2004	5.2	7245	1145
Heliodyne, Inc.	Helio-Flo	HF 2408 G 80 AC S E	Direct Forced Circulation	10/25/2004	10.5	3009	1117
Heliodyne, Inc.	Helio-Flo	HF 2408 G 120 AC S E	Direct Forced Circulation	10/25/2004	37.8	0	1145
Heliodyne, Inc.	Helio-Flo	HF 2410 G 120 AC S E	Direct Forced Circulation	10/25/2004	41.8	0	1037
Heliodyne, Inc.	Helio-Flo	HF 3408 G 120 AC S E	Direct Forced Circulation	10/25/2004	16.5	0	2621
Heliodyne, Inc.	Helio-Flo	HF 3410 G 160 AC S E	Direct Forced Circulation	10/25/2004	16.5	0	2621
Heliodyne, Inc.	Helio-Flo	HF 1410 G 80 AC D E	Direct Forced Circulation	10/25/2004	2.2	18892	1145
Heliodyne, Inc.	Helio-Flo	HF 23366 G 80 AC D E	Direct Forced Circulation	10/25/2004	2.9	13872	1145

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System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
Heliodyne, Inc.	Helio-Flo	HF 2408 G 80 AC D E	Direct Forced Circulation	10/25/2004	4.1	9437	1145
Heliodyne, Inc.	Helio-Flo	HF 2408 G 120 AC D E	Direct Forced Circulation	10/25/2004	3.9	10022	1145
Heliodyne, Inc.	Helio-Flo	HF 2410 G 120 AC D E	Direct Forced Circulation	10/25/2004	6.9	5254	1037
Heliodyne, Inc.	Helio-Flo	HF 3408 G 120 AC D E	Direct Forced Circulation	10/25/2004	6.6	3896	2621
Heliodyne, Inc.	Helio-Flo	HF 3410 G 120 AC D E	Direct Forced Circulation	10/25/2004	7.6	3347	2315
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 408 G 65 ACS	Indirect Forced Circulation	10/1/1992	1.8	19851	4163
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 410 G 80 ACS	Indirect Forced Circulation	10/1/1992	2.1	16415	4163
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 408 G 120 ACS	Indirect Forced Circulation	10/1/1992	4.1	6156	4422
Heliodyne, Inc.	Heliopak	DWCL HE HP 1 408 G 80 ACS	Indirect Forced Circulation	10/1/1992	1.8	22473	2045
Heliodyne, Inc.	Heliopak	DWCL HE HP 1 410 G 80 ACS	Indirect Forced Circulation	10/1/1992	2.1	18868	2045
Heliodyne, Inc.	Heliopak	DWCL HE HP 1 308 G 80 ACS	Indirect Forced Circulation	4/16/1998	1.5	26787	2045
Heliodyne, Inc.	Heliopak	DWCL HE HP 1 3366 G 80 ACS	Indirect Forced Circulation	7/9/2001	1.6	25344	2045
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 3366 G 50 ACS	Indirect Forced Circulation	7/9/2001	1.6	22292	4163
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 3366 G 80 ACS	Indirect Forced Circulation	7/9/2001	1.6	22844	4178
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 3366 G 80 ACS	Indirect Forced Circulation	7/9/2001	2.8	11716	3753
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 3366 G 120 ACS	Indirect Forced Circulation	7/9/2001	2.5	13557	3743
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 408 G 80 ACS	Indirect Forced Circulation	7/9/2001	1.8	19520	4167
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 410 G 120 ACS	Indirect Forced Circulation	7/9/2001	11.5	0	3758
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 410 G 65 ACD	Indirect Forced Circulation	10/1/1992	1.8	20387	4178
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 408 G 80 ACD	Indirect Forced Circulation	10/1/1992	2.6	12281	4331
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 408 G 120 ACD	Indirect Forced Circulation	10/1/1992	2.6	12598	4331
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 410 G 120 ACD	Indirect Forced Circulation	10/1/1992	3.6	7611	4331
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 308 G 65 ACD	Indirect Forced Circulation	4/16/1998	1.3	28005	4193
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 408 G 65 ACD	Indirect Forced Circulation	4/16/1998	1.5	23790	4178
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 3366 G 80 ACD	Indirect Forced Circulation	7/9/2001	1.4	26804	4178
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 3366 G 80 ACD	Indirect Forced Circulation	7/9/2001	2.1	16603	3758
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 408 G 80 ACD	Indirect Forced Circulation	7/9/2001	1.5	24018	4178
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 410 G 80 ACD	Indirect Forced Circulation	7/9/2001	1.7	20651	4178
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 410 G 80 PVS	Indirect Forced Circulation	12/10/1996	2.3	19124	0
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 308 G 80 PVS	Indirect Forced Circulation	12/10/1996	2.6	16769	0
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 408 G 65 PVS	Indirect Forced Circulation	7/15/1998	1.9	22746	0
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 410 G 80 PVD	Indirect Forced Circulation	12/10/1996	1.8	23716	0

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System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 308 G 80 PVD	Indirect Forced Circulation	12/10/1996	2.0	21310	0
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 408 G 65 PVD	Indirect Forced Circulation	7/15/1998	1.6	26779	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 1 3366 G PV 50 EE S	Indirect Forced Circulation	4/28/2006	1.5	29680	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 1 3366 G PV 65 EE S	Indirect Forced Circulation	4/28/2006	1.4	30624	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 1 408 G PV 50 EE S	Indirect Forced Circulation	4/28/2006	1.7	25282	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 1 408 G PV 65 EE S	Indirect Forced Circulation	4/28/2006	1.6	26699	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 1 408 G PV 80 EE S	Indirect Forced Circulation	4/28/2006	1.6	26869	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 1 410 G PV 65 EE S	Indirect Forced Circulation	4/28/2006	1.9	23005	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 1 410 G PV 80 EE S	Indirect Forced Circulation	4/28/2006	1.9	22632	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 2 3366 G PV 80 EE S	Indirect Forced Circulation	4/28/2006	2.5	17338	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 2 408 G PV 120 SE S	Indirect Forced Circulation	4/28/2006	3.0	14505	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 2 410 G PV 120 SE S	Indirect Forced Circulation	4/28/2006	5.3	8134	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 3 3366 G PV 120 SE S	Indirect Forced Circulation	4/28/2006	5.3	8202	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 3 408 G PV 120 SE S	Indirect Forced Circulation	4/28/2006	12.2	3559	0
Heliodyne, Inc.	HP HELIX AC	HP 1 408 GAC WAC 50 S	Indirect Forced Circulation	2/18/2000	1.9	20473	2663
Heliodyne, Inc.	HP HELIX AC	HP 1 410 GAC WAC 80 S	Indirect Forced Circulation	2/9/2000	1.9	19605	2653
Morley Manufacturing	High Sierra Drainback	HS60B/40	Indirect Forced Circulation	12/9/1994	1.7	22963	2650
Mr. Sun Solar	Sol-Reliant	SR56EPVDB	Indirect Forced Circulation	12/9/2004	2.8	15441	0
Mr. Sun Solar	Sol-Reliant	SR40EPVDB	Indirect Forced Circulation	10/5/2006	2.0	21492	0
Radco Products, Inc.	Copper Sunsation	CSHX60	Indirect Thermosyphon	2/27/1996	1.3	32151	0
Radco Products, Inc.	Copper Sunsation	CSHX80	Indirect Thermosyphon	2/27/1996	1.5	29028	0
Radco Products, Inc.	Copper Sunsation	CSHX100	Indirect Thermosyphon	2/27/1996	1.6	27776	0
Radco Products, Inc.	Copper Sunsation	CSHX40	Indirect Thermosyphon	3/4/1996	1.2	35661	0
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-8-65-D-40P	Indirect Forced Circulation	12/9/1994	1.4	24587	5785
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-8-80-D-64P	Indirect Forced Circulation	12/9/1994	1.8	18811	5785
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-12-120-D-80P	Indirect Forced Circulation	12/28/1994	2.0	16532	5403
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-8-65S-40P	Indirect Forced Circulation	12/28/1994	1.6	20804	5785
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-8-80S-64P	Indirect Forced Circulation	12/28/1994	2.1	14998	5278
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-8-120S-80P	Indirect Forced Circulation	12/28/1994	2.2	14275	5188
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-8-80S-40P	Indirect Forced Circulation	8/1/2005	1.7	20431	5785
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-8-80S-40C	Indirect Forced Circulation	8/1/2005	1.9	16250	6382
Solahart Industries	SOLAHART	181L	Direct Thermosyphon	3/28/2003	1.4	30472	0
Solahart Industries	SOLAHART	302L	Direct Thermosyphon	3/28/2003	1.7	26037	0
Solahart Industries	SOLAHART	303L	Direct Thermosyphon	3/28/2003	2.2	19882	0

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System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
Solahart Industries	SOLAHART	443L	Direct Thermosyphon	3/28/2003	1.9	23201	0
Solahart Industries	SOLAHART	444L	Direct Thermosyphon	3/28/2003	2.3	18602	0
Solahart Industries	SOLAHART	181J & 181J Free Heat	Indirect Thermosyphon	3/28/2003	1.3	32290	0
Solahart Industries	SOLAHART	182J & 182J Free Heat	Indirect Thermosyphon	3/28/2003	1.7	24913	0
Solahart Industries	SOLAHART	302J & 302J Free Heat	Indirect Thermosyphon	3/28/2003	1.5	28607	0
Solahart Industries	SOLAHART	302JXII	Indirect Thermosyphon	3/28/2003	1.5	28607	0
Solahart Industries	SOLAHART	303J & 303J Free Heat	Indirect Thermosyphon	3/28/2003	1.8	23766	0
Solahart Industries	SOLAHART	303JXII	Indirect Thermosyphon	3/28/2003	1.8	23766	0
Solahart Industries	SOLAHART	443J & 443J Free Heat	Indirect Thermosyphon	3/28/2003	1.6	26883	0
Solahart Industries	SOLAHART	443JXII	Indirect Thermosyphon	3/28/2003	1.6	26883	0
Solahart Industries	SOLAHART	444J & 444J Free Heat	Indirect Thermosyphon	3/28/2003	1.9	22941	0
Solahart Industries	SOLAHART	444JXII	Indirect Thermosyphon	3/28/2003	1.9	22941	0
Solahart Industries	SOLAHART	181KF & 181KF Free Heat	Indirect Thermosyphon	3/28/2003	1.4	31292	0
Solahart Industries	SOLAHART	181BCXII	Indirect Thermosyphon	3/28/2003	1.3	32194	0
Solahart Industries	SOLAHART	182KF & 182KF Free Heat	Indirect Thermosyphon	3/28/2003	2.0	21956	0
Solahart Industries	SOLAHART	182BCXII	Indirect Thermosyphon	3/28/2003	1.9	22980	0
Solahart Industries	SOLAHART	302KF & 302KF Free Heat	Indirect Thermosyphon	3/28/2003	1.7	26187	0
Solahart Industries	SOLAHART	302BCXII	Indirect Thermosyphon	3/28/2003	1.7	26187	0
Solahart Industries	SOLAHART	303KF & 303KF Free Heat	Indirect Thermosyphon	3/28/2003	2.3	18830	0
Solahart Industries	SOLAHART	303BCXII	Indirect Thermosyphon	3/28/2003	2.3	18830	0
Solahart Industries	SOLAHART	443KF & 443KF Free Heat	Indirect Thermosyphon	3/28/2003	2.0	21421	0
Solahart Industries	SOLAHART	443BCXII	Indirect Thermosyphon	3/28/2003	2.0	21421	0
Solahart Industries	SOLAHART	444KF & 444KF Free Heat	Indirect Thermosyphon	3/28/2003	3.0	14515	0
Solahart Industries	SOLAHART	444BCXII	Indirect Thermosyphon	3/28/2003	3.0	14515	0
Solahart Industries	SOLAHART	ASE 181L	Direct Thermosyphon	3/28/2003	1.3	32395	0
Solahart Industries	SOLAHART	ASE 302L	Direct Thermosyphon	3/28/2003	1.7	25688	0
Solahart Industries	SOLAHART	ASE 303L	Direct Thermosyphon	3/28/2003	2.0	21332	0
Solahart Industries	SOLAHART	ASE 443L	Direct Thermosyphon	3/28/2003	2.0	21889	0
Solahart Industries	SOLAHART	ASE 444L	Direct Thermosyphon	3/28/2003	2.3	18950	0
Solahart Industries	SOLAHART	ASE 181J & ASE 181J Free Heat	Indirect Thermosyphon	3/28/2003	1.3	32382	0
Solahart Industries	SOLAHART	ASE 182J & ASE 182J Free Heat	Indirect Thermosyphon	3/28/2003	1.7	26105	0
Solahart Industries	SOLAHART	ASE 302J & ASE 302J Free Heat	Indirect Thermosyphon	3/28/2003	1.6	26254	0
Solahart Industries	SOLAHART	ASE 302JXII	Indirect Thermosyphon	3/28/2003	1.6	26254	0
Solahart Industries	SOLAHART	ASE 303J & ASE 303J Free Heat	Indirect Thermosyphon	3/28/2003	1.9	22723	0
Solahart Industries	SOLAHART	ASE 303JXII	Indirect Thermosyphon	3/28/2003	1.9	22723	0
Solahart Industries	SOLAHART	ASE 443J & ASE 443J Free Heat	Indirect Thermosyphon	3/28/2003	1.9	22910	0

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System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
Solahart Industries	SOLAHART	ASE 443JXII	Indirect Thermosyphon	3/28/2003	1.9	22910	0
Solahart Industries	SOLAHART	ASE 444J & ASE 444J Free Heat	Indirect Thermosyphon	3/28/2003	2.1	20603	0
Solahart Industries	SOLAHART	ASE 444JXII	Indirect Thermosyphon	3/28/2003	2.1	20603	0
Solahart Industries	SOLAHART	ASE 181KF & ASE 181KF Free Heat	Indirect Thermosyphon	3/28/2003	1.4	31113	0
Solahart Industries	SOLAHART	ASE 181BCXII	Indirect Thermosyphon	3/28/2003	1.4	31113	0
Solahart Industries	SOLAHART	ASE 182KF & ASE 182KF Free Heat	Indirect Thermosyphon	3/28/2003	1.9	23060	0
Solahart Industries	SOLAHART	ASE 182BCXII	Indirect Thermosyphon	3/28/2003	1.9	23060	0
Solahart Industries	SOLAHART	ASE 302KF & ASE 302KF Free Heat	Indirect Thermosyphon	3/28/2003	1.9	23369	0
Solahart Industries	SOLAHART	ASE 302BCXII	Indirect Thermosyphon	3/28/2003	1.9	23369	0
Solahart Industries	SOLAHART	ASE 303KF & ASE 303KF Free Heat	Indirect Thermosyphon	3/28/2003	2.4	18083	0
Solahart Industries	SOLAHART	ASE 303BCXII	Indirect Thermosyphon	3/28/2003	2.4	18083	0
Solahart Industries	SOLAHART	ASE 443KF & ASE 443KF Free Heat	Indirect Thermosyphon	3/28/2003	2.3	18470	0
Solahart Industries	SOLAHART	ASE 443BCXII	Indirect Thermosyphon	3/28/2003	2.3	18470	0
Solahart Industries	SOLAHART	ASE 444KF & ASE 444KF Free Heat	Indirect Thermosyphon	3/28/2003	2.9	14937	0
Solahart Industries	SOLAHART	ASE 444BCXII	Indirect Thermosyphon	3/28/2003	2.9	14937	0
Solahart Industries	Streamline Electric	270SL-2Bt	Direct Forced Circulation	4/21/2005	2.5	15716	1760
Solahart Industries	Streamline Electric	270SL-2L	Direct Forced Circulation	4/21/2005	1.7	24011	1584
Solahart Industries	Streamline Electric	270SL-3Bt	Direct Forced Circulation	4/21/2005	8.0	3767	1613
Solahart Industries	Streamline Electric	270SL-3L	Direct Forced Circulation	4/21/2005	2.3	17384	1408
Solahart Industries	Streamline Electric	340SL-2Bt	Direct Forced Circulation	4/21/2005	2.3	16807	1760
Solahart Industries	Streamline Electric	340SL-2L	Direct Forced Circulation	4/21/2005	1.6	24969	1584
Solahart Industries	Streamline Electric	340SL-3Bt	Direct Forced Circulation	4/21/2005	6.8	4711	1672
Solahart Industries	Streamline Electric	340SL-3L	Direct Forced Circulation	4/21/2005	2.1	19028	1531
Solahart Industries	Streamline Electric	430SL-2Bt	Direct Forced Circulation	4/21/2005	2.3	17010	1760
Solahart Industries	Streamline Electric	430SL-2L	Direct Forced Circulation	4/21/2005	1.6	25673	1584
Solahart Industries	Streamline Electric	430SL-3Bt	Direct Forced Circulation	4/21/2005	7.6	4090	1637
Solahart Industries	Streamline Electric	430SL-3L	Direct Forced Circulation	4/21/2005	2.0	20037	1584
Solene	Solene/Chromagen DC Closed Loop	SLCR32DC-80HE	Indirect Forced Circulation	3/17/2006	1.7	22247	2927
Solene	Solene/Chromagen DC Closed Loop	SLCR40DC-80HE	Indirect Forced Circulation	3/17/2006	2.0	18462	2927
Solene	Solene/Chromagen DC Closed Loop	SLCR64DC-80HE	Indirect Forced Circulation	3/17/2006	3.3	10101	2927
Solene	Solene/Chromagen DC Closed Loop	SLCR80DC-80HE	Indirect Forced Circulation	3/17/2006	5.5	5309	2621
Solene	Solene/Chromagen DC Closed Loop	SLCR60DC-80HE	Indirect Forced Circulation		3.1	11077	2927

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RATINGS SUMMARY OF OG-300 CERTIFIED SYSTEMS WITH ELECTRIC AUXILIARY

System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
Solene	Solene/Chromagen DC Open Loop	SLCR32DC-66	Direct Forced Circulation	1/9/2006	1.8	21392	2117
Solene	Solene/Chromagen DC Open Loop	SLCR40DC-80	Direct Forced Circulation	1/9/2006	2.1	18216	2117
Solene	Solene/Chromagen DC Open Loop	SLCR60DC-80	Direct Forced Circulation	1/9/2006	5.8	5478	2009
Solene	Solene/Chromagen DC Open Loop	SLCR64DC-120	Direct Forced Circulation	1/9/2006	20.5	0	2117
Solene	Solene/Chromagen DC Open Loop	SLCR80DC-120	Direct Forced Circulation	1/9/2006	22.8	0	1901
Solene	Solene/Chromagen Drain Back	SLCR32DC-80DB	Indirect Forced Circulation	3/15/2006	1.7	23096	3121
Solene	Solene/Chromagen Drain Back	SLCR40DC-80DB	Indirect Forced Circulation	3/15/2006	1.9	19456	3121
Solene	Solene/Chromagen Drain Back	SLCR64DC-80DB	Indirect Forced Circulation	3/15/2006	3.0	11153	3110
Solene	Solene/Chromagen Drain Back	SLCR80DC-80DB	Indirect Forced Circulation	3/15/2006	4.9	6057	2794
Solene	Solene/Chromagen Drain Back	SLCR60DC-80DB	Indirect Forced Circulation		2.9	12043	3110
Solene	Solene/Chromagen PV Open Loop	SLCR32PV-66	Direct Forced Circulation	3/20/2006	2.5	17598	0
Solene	Solene/Chromagen PV Open Loop	SLCR40PV-80	Direct Forced Circulation	3/20/2006	3.6	12068	0
Solene	Solene/Chromagen PV Open Loop	SLCR60PV-80	Direct Forced Circulation		999.9	0	0
Solene	Solene/Chromagen PV Open Loop	SLCR64PV-120	Direct Forced Circulation		999.9	0	0
Solene	Solene/Chromagen PV Open Loop	SLCR80PV-120	Direct Forced Circulation		999.9	0	0
Sun Systems, Inc.	CopperSun	CS440-E	Direct Integral Collector Storage	4/29/1998	1.5	29315	0
Sun Systems, Inc.	CopperSun	CS330-E	Direct Integral Collector Storage	4/24/2000	1.3	32195	0
Sun Systems, Inc.	CopperSun	CS340-E	Direct Integral Collector Storage	4/24/2000	1.3	32439	0
Sun Systems, Inc.	CopperSun	CS450-E	Direct Integral Collector Storage	4/24/2000	1.5	29725	0
Sun Systems, Inc.	CopperSun	CS330SV-E	Direct Integral Collector Storage	5/22/2003	1.3	33812	0
Sun Systems, Inc.	CopperSun	CS340SV-E	Direct Integral Collector Storage	5/22/2003	1.3	34128	0
SunEarth, Inc.	Cascade	EPRD-40-80	Indirect Forced Circulation	6/10/2003	1.9	18030	5015
SunEarth, Inc.	Cascade	ECRD-40-80	Indirect Forced Circulation	6/10/2003	2.0	16697	5015
SunEarth, Inc.	Cascade	EPRD-42-80	Indirect Forced Circulation	6/10/2003	1.9	17698	5033
SunEarth, Inc.	Cascade	ECRD-42-80	Indirect Forced Circulation	6/10/2003	2.0	16339	5033
SunEarth, Inc.	Cascade	EPRD-48-80	Indirect Forced Circulation	6/10/2003	2.2	15288	4493
SunEarth, Inc.	Cascade	ECRD-48-80	Indirect Forced Circulation	6/10/2003	2.3	13723	5033
SunEarth, Inc.	Cascade	EPRD-64-80	Indirect Forced Circulation	6/10/2003	3.0	9983	4493
SunEarth, Inc.	Cascade	ECRD-64-80	Indirect Forced Circulation	6/10/2003	3.5	7892	4493
SunEarth, Inc.	Cascade	EPRD-40-80-2	Indirect Forced Circulation	6/10/2003	1.6	22903	5015
SunEarth, Inc.	Cascade	ECRD-40-80-2	Indirect Forced Circulation	6/10/2003	1.6	21758	5015
SunEarth, Inc.	Cascade	EPRD-42-80-2	Indirect Forced Circulation	6/10/2003	1.6	22585	5033

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RATINGS SUMMARY OF OG-300 CERTIFIED SYSTEMS WITH ELECTRIC AUXILIARY

System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
SunEarth, Inc.	Cascade	ECRD-42-80-2	Indirect Forced Circulation	6/10/2003	1.6	21415	5033
SunEarth, Inc.	Cascade	EPRD-48-80-2	Indirect Forced Circulation	6/10/2003	1.7	20423	4493
SunEarth, Inc.	Cascade	ECRD-48-80-2	Indirect Forced Circulation	6/10/2003	1.8	18756	5033
SunEarth, Inc.	Cascade	EPRD-64-80-2	Indirect Forced Circulation	6/10/2003	2.2	15357	4493
SunEarth, Inc.	Cascade	ECRD-64-80-2	Indirect Forced Circulation	6/10/2003	2.4	13609	4493
SunEarth, Inc.	Cascade HX	EPDX32-52-2	Indirect Forced Circulation		1.5	25792	3862
SunEarth, Inc.	Cascade HX	ECDX32-52-2	Indirect Forced Circulation		1.5	24812	3862
SunEarth, Inc.	Cascade HX	EPDX40-52-2	Indirect Forced Circulation		1.6	23004	3472
SunEarth, Inc.	Cascade HX	ECDX40-52-2	Indirect Forced Circulation		1.7	21556	3820
SunEarth, Inc.	Cascade HX	EPDX40-80-2	Indirect Forced Circulation		1.6	23142	3848
SunEarth, Inc.	Cascade HX	ECDX40-80-2	Indirect Forced Circulation		1.7	21979	3848
SunEarth, Inc.	Cascade HX	EPDX32-52	Indirect Forced Circulation		1.7	21278	3806
SunEarth, Inc.	Cascade HX	ECDX32-52	Indirect Forced Circulation		1.8	20110	3778
SunEarth, Inc.	Cascade HX	EPDX40-52	Indirect Forced Circulation		2.0	18161	3472
SunEarth, Inc.	Cascade HX	ECDX40-52	Indirect Forced Circulation		2.1	16997	3472
SunEarth, Inc.	Cascade HX	EPDX40-80	Indirect Forced Circulation		2.0	18579	3472
SunEarth, Inc.	Cascade HX	ECDX40-80	Indirect Forced Circulation		2.1	17278	3750
SunEarth, Inc.	Cascade HX	EPDX48-80	Indirect Forced Circulation		2.3	15771	3472
SunEarth, Inc.	Cascade HX	ECDX48-80	Indirect Forced Circulation		2.4	14641	3472
SunEarth, Inc.	Cascade HX	EPDX64-80	Indirect Forced Circulation		3.3	9537	3486
SunEarth, Inc.	Cascade HX	ECDX64-80	Indirect Forced Circulation		3.9	7547	3480
SunEarth, Inc.	Cascade HX	EPDX80-120	Indirect Forced Circulation		4.5	6178	3483
SunEarth, Inc.	Cascade HX	ECDX80-120	Indirect Forced Circulation		8.6	1550	3484
SunEarth, Inc.	Cascade HX	EPDX48-80-2	Indirect Forced Circulation		1.8	20497	3486
SunEarth, Inc.	Cascade HX	ECDX48-80-2	Indirect Forced Circulation		1.9	19066	3486
SunEarth, Inc.	Cascade HX	EPDX64-80-2	Indirect Forced Circulation		2.2	15779	3486
SunEarth, Inc.	Cascade HX	ECDX64-80-2	Indirect Forced Circulation		2.5	13956	3486
SunEarth, Inc.	Cascade HX	EPDX80-120-2	Indirect Forced Circulation		2.7	12306	3486
SunEarth, Inc.	Cascade HX	ECDX80-120-2	Indirect Forced Circulation		3.3	9542	3486
SunEarth, Inc.	Cascade HX	EPDX96-120	Indirect Forced Circulation		12.4	0	3486
SunEarth, Inc.	Cascade HX	ECDX96-120	Indirect Forced Circulation		12.4	0	3486
SunEarth, Inc.	Cascade HX	EPDX96-120-2	Indirect Forced Circulation		3.6	8430	3486

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System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
SunEarth, Inc.	Cascade HX	ECDX96-120-2	Indirect Forced Circulation		4.8	5540	3486
SunEarth, Inc.	CopperHeart	CP-30	Direct Integral Collector Storage	10/1/1992	1.4	30317	0
SunEarth, Inc.	CopperHeart	CP-40	Direct Integral Collector Storage	10/1/1992	1.5	28114	0
SunEarth, Inc.	CopperHeart	CP-60P	Direct Integral Collector Storage	10/1/1992	1.8	24128	0
SunEarth, Inc.	CopperHeart	CP-20	Direct Integral Collector Storage	10/11/1999	1.2	35266	0
SunEarth, Inc.	CopperHeart	CP-80P	Direct Integral Collector Storage	10/11/1999	2.0	21511	0
SunEarth, Inc.	SOLARAY	TE32P-80-1	Indirect Forced Circulation	3/23/1993	1.8	21946	2013
SunEarth, Inc.	SOLARAY	TE32C-80-1	Indirect Forced Circulation	3/23/1993	1.9	20964	2013
SunEarth, Inc.	SOLARAY	TE40P-80-1	Indirect Forced Circulation	3/23/1993	2.1	18488	2013
SunEarth, Inc.	SOLARAY	TE40C-80-1	Indirect Forced Circulation	3/23/1993	2.3	17093	2013
SunEarth, Inc.	SOLARAY	TE64P-80-1	Indirect Forced Circulation	3/18/1995	3.7	10007	1814
SunEarth, Inc.	SOLARAY	TE64C-80-1	Indirect Forced Circulation	3/18/1995	4.5	7900	1814
SunEarth, Inc.	SOLARAY	TE48P-80-1	Indirect Forced Circulation	4/10/2001	2.5	15397	1814
SunEarth, Inc.	SOLARAY	TE48C-80-1	Indirect Forced Circulation	4/10/2001	2.7	13992	1814
SunEarth, Inc.	SOLARAY	TE32P-80-2	Indirect Forced Circulation	1/30/1996	1.6	24701	2013
SunEarth, Inc.	SOLARAY	TE32C-80-2	Indirect Forced Circulation	1/30/1996	1.7	23753	2013
SunEarth, Inc.	SOLARAY	TE40P-80-2	Indirect Forced Circulation	1/30/1996	1.8	21473	2013
SunEarth, Inc.	SOLARAY	TE40C-80-2	Indirect Forced Circulation	1/30/1996	1.9	20345	2013
SunEarth, Inc.	SOLARAY	TE64P-80-2	Indirect Forced Circulation	1/30/1996	2.8	13458	1814
SunEarth, Inc.	SOLARAY	TE64C-80-2	Indirect Forced Circulation	1/30/1996	3.2	11640	1814
SunEarth, Inc.	SOLARAY	TE48P-80-2	Indirect Forced Circulation	4/10/2001	2.1	18664	1814
SunEarth, Inc.	SOLARAY	TE48C-80-2	Indirect Forced Circulation	4/10/2001	2.3	17284	1814
SunEarth, Inc.	SOLARAY	TE40C-80-2-PV	Indirect Forced Circulation	2/26/2001	1.9	23394	0
SunEarth, Inc.	SOLARAY	TE64C-80-2-PV	Indirect Forced Circulation	2/26/2001	2.8	15532	0
SunEarth, Inc.	SOLARAY	TE40P-80-2-PV	Indirect Forced Circulation	2/26/2001	1.8	24521	0
SunEarth, Inc.	SOLARAY	TE64P-80-2-PV	Indirect Forced Circulation	2/26/2001	2.5	17281	0
SunEarth, Inc.	SOLARAY	TE48P-80-2-PV	Indirect Forced Circulation	4/10/2001	2.0	21815	0
SunEarth, Inc.	SOLARAY	TE48C-80-2-PV	Indirect Forced Circulation	4/10/2001	2.1	20475	0
SunEarth, Inc.	SOLARAY	TE40C-80-PV	Indirect Forced Circulation	2/26/2001	2.1	20542	0
SunEarth, Inc.	SOLARAY	TE64C-80-PV	Indirect Forced Circulation	2/26/2001	3.6	11970	0
SunEarth, Inc.	SOLARAY	TE40P-80-PV	Indirect Forced Circulation	2/26/2001	2.0	21714	0
SunEarth, Inc.	SOLARAY	TE64P-80-PV	Indirect Forced Circulation	2/26/2001	3.1	13929	0

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System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
SunEarth, Inc.	SOLARAY	TE48P-80-PV	Indirect Forced Circulation	4/10/2001	2.3	18786	0
SunEarth, Inc.	SOLARAY	TE48C-80-PV	Indirect Forced Circulation	4/10/2001	2.5	17334	0
SunEarth, Inc.	SunSaver	NF40P-80T	Direct Forced Circulation	10/27/1995	2.2	16384	2927
SunEarth, Inc.	SunSaver	NF40P-80S	Direct Forced Circulation	10/27/1995	2.1	17536	2927
SunEarth, Inc.	SunSiphon	EPGX48-21-2	Indirect Thermosyphon	5/20/2001	1.2	35116	0
SunEarth, Inc.	SunSiphon	EPGX48-24-2	Indirect Thermosyphon	5/20/2001	1.3	33885	0
SunEarth, Inc.	SunSiphon	EPGX48-32-2	Indirect Thermosyphon	5/20/2001	1.4	31296	0
SunEarth, Inc.	SunSiphon	EPGX80-40-2	Indirect Thermosyphon	5/20/2001	1.5	28582	0
SunEarth, Inc.	SunSiphon	EPGX80-42-2	Indirect Thermosyphon	5/20/2001	1.5	28190	0
SunEarth, Inc.	SunSiphon	EPGX80-48-2	Indirect Thermosyphon	5/20/2001	1.6	26507	0
SunEarth, Inc.	SunSiphon	EPGX80-63-2	Indirect Thermosyphon	5/20/2001	1.8	23595	0
SunEarth, Inc.	SunSiphon	EPGX80-64-2	Indirect Thermosyphon	5/20/2001	1.9	23177	0
SunEarth, Inc.	SunSiphon	EPGX116-63-2	Indirect Thermosyphon	5/20/2001	1.9	23162	0
SunEarth, Inc.	SunSiphon	EPGX116-64-2	Indirect Thermosyphon	5/20/2001	1.9	22743	0
SunEarth, Inc.	SunSiphon	EPGX116-80-2	Indirect Thermosyphon	5/20/2001	2.2	19995	0
SunEarth, Inc.	SunSource	HX40P-80	Indirect Forced Circulation	2/9/1996	1.9	20602	1775
SunEarth, Inc.	SunSource	HX64P-120	Indirect Forced Circulation	2/9/1996	3.1	12051	1703
Synergy Solar	Drainback Stainless HX	60-DT	Indirect Forced Circulation		2.2	14942	4704
Synergy Solar	Drainback Stainless HX	53-DT	Indirect Forced Circulation		2.1	15526	4704
Synergy Solar	Drainback Stainless HX	80-DT	Indirect Forced Circulation		3.4	8237	4685
Synergy Solar	Drainback Stainless HX	107-DT	Indirect Forced Circulation		5.6	3038	4685
Synergy Solar	Drainback Stainless HX	S53-DT	Indirect Forced Circulation		1.8	19813	4704
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE®	PT-35-CN	Direct Integral Collector Storage	4/9/1997	1.4	30325	0
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE®	PT-40-CN	Direct Integral Collector Storage	4/9/1997	1.6	26418	0
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE® Passive Solar Water Heater	PT-50-CN	Direct Integral Collector Storage	4/9/1997	1.7	26240	0
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE®	PT-30-CN	Direct Integral Collector Storage	4/9/1997	1.4	30482	0
Thermomax Industries Ltd.	Thermomax Mazdon	Mazdon 30	Indirect Forced Circulation	2/21/2002	2.2	16509	2927
Thermomax Industries Ltd.	Thermomax Mazdon	Mazdon 40	Indirect Forced Circulation	2/21/2002	3.6	9264	2927
Thermomax Industries Ltd.	Thermomax Solamax	Solamax 20R	Indirect Forced Circulation	6/30/2004	1.5	25860	2927
Thermomax Industries Ltd.	Thermomax Solamax	Solamax 30R	Indirect Forced Circulation	6/30/2004	1.9	19647	2927

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System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
Thermomax Industries Ltd.	Thermomax Solamax	Solamax 40R	Indirect Forced Circulation	6/30/2004	2.5	14274	2927
Thermomax Industries Ltd.	Thermomax Solamax	Solamax 50R	Indirect Forced Circulation	6/30/2004	3.5	9566	2927
Thermomax Industries Ltd.	Thermomax Solamax	Solamax 60R	Indirect Forced Circulation	6/30/2004	5.8	4519	2927
Thermomax Industries Ltd.	Thermomax Solamax	Solamax 20W	Indirect Forced Circulation	6/30/2004	1.2	35623	1672
Thermomax Industries Ltd.	Thermomax Solamax	Solamax 30W	Indirect Forced Circulation	6/30/2004	1.7	23208	2570
Thermomax Industries Ltd.	Thermomax Solamax	Solamax 40W	Indirect Forced Circulation	6/30/2004	2.1	18190	2621
TrendSetter Industries	Six Rivers Solar	SRS-100-2-40-PC-E	Indirect Forced Circulation	7/2/2001	1.9	20565	2650
TrendSetter Industries	Six Rivers Solar	SRS-200-3-40-PC-E	Indirect Forced Circulation	7/2/2001	2.5	14955	2650
TrendSetter Industries	Six Rivers Solar	SRS-200-4-40-PC-E	Indirect Forced Circulation	7/2/2001	3.4	10350	2340
TrendSetter Industries	Six Rivers Solar	SRS-300-5-40-PC-E	Indirect Forced Circulation	7/2/2001	4.6	7108	2340
TrendSetter Industries	Six Rivers Solar	SRS-300-6-40-PC-E	Indirect Forced Circulation	7/2/2001	5.6	5329	2340

*** OG300 Column Headings:**

SEF Solar Energy Factor:

$$SEF = \frac{Q_{DEL}}{Q_{AUX} + Q_{PAR}}$$

Where:

- Q_{DEL} = Daily amount of energy delivered to the hot water load using the SRCC rating conditions, this value is 43,302 kJ/day. To convert to kWh, divide this value by 3,600.
- Q_{AUX} = Daily amount of energy used by the auxiliary water heater or backup element, with the solar system operating (kJ/day). To convert to kWh, divide this value by 3,600.
- Q_{PAR} = Parasitic energy: Daily amounts of AC electrical energy used to power pumps, controllers, shutters, trackers, or any other item needed to operate the SDHW system (kJ/day). To convert to kWh, divide this value by 3,600.

SYSTEMS CERTIFIED WITH GAS AUXILIARY

COMPARING SYSTEM COSTS FOR SYSTEMS WITH A GAS AUXILIARY

The Energy Factor (EF) and the Solar Energy Factor (SEF) can be used to compare different water heating systems with one another and to estimate typical yearly operating costs for the specified rating conditions. Note that the performance any individual consumer will experience may differ due to location and hot water usage. The SEF includes all of the conditions specified for the DOE EF test, plus several solar specific conditions. The EF and SEF can be used to compare solar and gas system's energy use on a one-to-one basis. For gas systems, the following calculation can be used:

$$\text{Yearly Cost (\$)} = 365 \text{ days} * 0.4105 / \text{EF} * \$x/\text{therm}$$

Examples:

Assume that gas costs \$1.60/therm

1. TYPICAL GAS WATER HEATER (EF=0.6)

$$\text{YEARLY COST} = 365 * 0.4105 / 0.6 * 1.60 = \$399.55$$

2. TYPICAL SOLAR SYSTEM (SEF=1.1)

$$\text{YEARLY COST} = 365 * 0.4105 / 1.1 * 1.60 = \$217.94$$

Note that the solar system saves \$181.61 (\$399.55 - \$217.94) per year. This figure can be used as the energy cost savings basis for an economic analysis of a solar hot water system based on the assumptions for the standard DOE (EF) and SRCC OG 300 (SEF) rating conditions. Other factors such as initial cost, maintenance, inflation, interest rate, and replacement costs also need to be considered when making an economic analysis.

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System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
ACR Solar International	Skyline 2001 System 3	200132C502TG	Direct Forced Circulation	12/9/2002	1.0	42546	173
ACR Solar International	Skyline 2001 System 3	200132C50T20G	Direct Forced Circulation	12/9/2002	0.8	52163	0
ACR Solar International	Skyline 2001 System 5	200152C80EX2TG	Direct Forced Circulation	12/9/2002	0.9	48173	0
ACR Solar International	Skyline 2001 System 5	200153C80EX2TG	Direct Forced Circulation	12/9/2002	1.0	42358	0
Butler Sun Solutions	Solar Butler	BSS-S1-40Ga	Indirect Forced Circulation	7/1/2004	0.7	59575	1123
Butler Sun Solutions	Solar Butler	BSS-S1-40Gb	Indirect Forced Circulation	7/1/2004	0.7	65092	1004
Butler Sun Solutions	Solar Butler	BSS-S1-50Ga	Indirect Forced Circulation	7/1/2004	0.8	55855	1123
Butler Sun Solutions	Solar Butler	BSS-S1-80Ga	Indirect Forced Circulation	7/1/2004	0.8	53661	1123
Butler Sun Solutions	Solar Butler	BSS-S1-80Gc	Indirect Forced Circulation	7/1/2004	0.7	59041	1123
Butler Sun Solutions	Solar Butler	BSS-S1-50Gc	Indirect Forced Circulation	7/1/2004	0.7	56845	1012
Butler Sun Solutions	Solar Butler	BSS-S1-40Gc	Indirect Forced Circulation	8/29/2005	0.7	57969	1012
Butler Sun Solutions	Solar Butler	BSS-PV1-40Ga	Indirect Forced Circulation	9/15/2005	1.0	41288	0
Butler Sun Solutions	Solar Butler	BSS-PV1-40Gb	Indirect Forced Circulation	9/15/2005	0.9	49176	0
Butler Sun Solutions	Solar Butler	BSS-PV1-50Ga	Indirect Forced Circulation	9/15/2005	1.2	36138	0
Butler Sun Solutions	Solar Butler	BSS-PV1-80Ga	Indirect Forced Circulation	9/15/2005	1.3	33513	0
Butler Sun Solutions	Solar Butler	BSS-PV1-80Gc	Indirect Forced Circulation	9/15/2005	1.1	39242	0
Butler Sun Solutions	Solar Butler	BSS-PV1-50Gc	Indirect Forced Circulation	9/15/2005	1.1	38101	0
Butler Sun Solutions	Solar Butler	BSS-PV1-40Gc	Indirect Forced Circulation	9/15/2005	1.1	38882	0
Butler Sun Solutions	Solar Butler	BSS-S1-80G2a	Indirect Forced Circulation	9/15/2005	0.9	47029	1242
Butler Sun Solutions	Solar Butler	BSS-S1-80G2b	Indirect Forced Circulation	9/15/2005	0.8	49730	1242
Butler Sun Solutions	Solar Butler	BSS-PV1-80G2a	Indirect Forced Circulation	9/15/2005	0.9	48357	0
Butler Sun Solutions	Solar Butler	BSS-PV1-80G2b	Indirect Forced Circulation	9/15/2005	1.0	43825	0
Heliodyne, Inc.	Helio-Flo	HF 13366 G 50 AC D Z	Direct Forced Circulation	10/25/2004	1.0	42974	1145
Heliodyne, Inc.	Helio-Flo	HF 1408 G 50 AC D Z	Direct Forced Circulation	10/25/2004	1.1	39247	1145
Heliodyne, Inc.	Helio-Flo	HF 1410 G 80 AC D Z	Direct Forced Circulation	10/25/2004	1.2	34393	1145
Heliodyne, Inc.	Helio-Flo	HF 23366 G 80 AC D Z	Direct Forced Circulation	10/25/2004	1.5	27763	1145
Heliodyne, Inc.	Helio-Flo	HF 2408 G 80 AC D Z	Direct Forced Circulation	10/25/2004	1.8	22580	1145
Heliodyne, Inc.	Helio-Flo	HF 2408 G 120 AC D Z	Direct Forced Circulation	10/25/2004	1.8	23384	1145
Heliodyne, Inc.	Helio-Flo	HF 2410 G 120 AC D Z	Direct Forced Circulation	10/25/2004	2.4	16931	1037
Heliodyne, Inc.	Helio-Flo	HF 3408 G 120 AC D Z	Direct Forced Circulation	10/25/2004	2.4	15231	2621
Heliodyne, Inc.	Helio-Flo	HF 3410 G 120 AC D Z	Direct Forced Circulation	10/25/2004	2.7	13791	2315
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 410 G 65 ACD Z	Indirect Forced Circulation	4/16/1998	1.1	36223	4178

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RATINGS SUMMARY OF OG-300 CERTIFIED SYSTEMS WITH GAS AUXILIARY

System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 408 G 80 ACD Z	Indirect Forced Circulation	4/16/1998	1.4	25658	4331
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 408 G 120 ACD Z	Indirect Forced Circulation	4/16/1998	1.4	26096	4331
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 410 G 120 ACD Z	Indirect Forced Circulation	4/16/1998	1.7	20667	4331
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 308 G 65 ACD Z	Indirect Forced Circulation	4/16/1998	0.9	46270	4193
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 408 G 65 ACD Z	Indirect Forced Circulation	4/16/1998	1.0	40752	4178
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 3366 G 80 ACD Z	Indirect Forced Circulation	7/9/2001	0.9	44689	4178
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 3366 G 80 ACD Z	Indirect Forced Circulation	7/9/2001	1.2	31388	3758
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 408 G 80 ACD Z	Indirect Forced Circulation	7/9/2001	1.0	41049	4178
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 410 G 80 ACD Z	Indirect Forced Circulation	7/9/2001	1.1	36538	4178
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 410 G 80 PVD Z	Indirect Forced Circulation	4/16/1998	1.1	40604	0
Heliodyne, Inc.	Heliopak	16 DWCL HP 2 308 G 80 PVD Z	Indirect Forced Circulation	4/16/1998	1.2	37433	0
Heliodyne, Inc.	Heliopak	16 DWCL HP 1 408 G 65 PVD Z	Indirect Forced Circulation	7/15/1998	1.0	44635	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 1 3366 G PV 50 EE D Z	Indirect Forced Circulation	4/28/2006	1.0	45337	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 1 408 G PV 50 EE D Z	Indirect Forced Circulation	4/28/2006	1.0	41533	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 1 410 G PV 80 EE D Z	Indirect Forced Circulation	4/28/2006	1.2	36914	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 2 3366 G PV 80 EE D Z	Indirect Forced Circulation	4/28/2006	1.3	32884	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 2 408 G PV 80 EE D Z	Indirect Forced Circulation	4/28/2006	1.5	28893	0
Heliodyne, Inc.	Helio-Pak Helix SS PV	HP HX SS 2 410 G PV 120 SE D Z	Indirect Forced Circulation	4/28/2006	1.7	25279	0
Mr. Sun Solar	Sol-Reliant	SR56GPVDB	Indirect Forced Circulation	12/9/2004	1.4	30609	0
Mr. Sun Solar	Sol-Reliant	SR40GPVDB	Indirect Forced Circulation	10/16/2006	1.1	38530	0
Radco Products, Inc.	Copper Sunsation	CSHX60GB	Indirect Thermosyphon	7/13/1998	0.8	51672	0
Radco Products, Inc.	Copper Sunsation	CSHX80GB	Indirect Thermosyphon	7/13/1998	0.9	47481	0
Radco Products, Inc.	Copper Sunsation	CSHX100GB	Indirect Thermosyphon	7/13/1998	0.9	45882	0
Radco Products, Inc.	Copper Sunsation	CSHX40GB	Indirect Thermosyphon	7/13/1998	0.8	56279	0
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-8-65-GD-40P	Indirect Forced Circulation	7/13/1998	0.9	41748	5785
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-8-80-GD-64P	Indirect Forced Circulation	7/13/1998	1.1	34249	5785
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-12-120-GD-80P	Indirect Forced Circulation	7/13/1998	1.2	31300	5403
Radco Products, Inc.	Drainback Heat Exchanger	R-DBHX-8-40-GS-32P	Indirect Forced Circulation	4/4/2002	0.6	65718	4137
Solahart Industries	SOLAHART	ASG 181L	Direct Thermosyphon	3/28/2003	0.8	52022	0
Solahart Industries	SOLAHART	ASG 302L	Direct Thermosyphon	3/28/2003	1.0	43163	0
Solahart Industries	SOLAHART	ASG 303L	Direct Thermosyphon	3/28/2003	1.2	37339	0
Solahart Industries	SOLAHART	ASG 443L	Direct Thermosyphon	3/28/2003	1.1	38114	0
Solahart Industries	SOLAHART	ASG 444L	Direct Thermosyphon	3/28/2003	1.3	34435	0
Solahart Industries	SOLAHART	ASG 181J & ASG 181J Free Heat	Indirect Thermosyphon	3/28/2003	0.8	51999	0
Solahart Industries	SOLAHART	ASG 182J & ASG 182J Free Heat	Indirect Thermosyphon	3/28/2003	1.0	43691	0

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System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
Solahart Industries	SOLAHART	ASG 302J & ASG 302J Free Heat	Indirect Thermosyphon	3/28/2003	1.0	43888	0
Solahart Industries	SOLAHART	ASG 302JXII	Indirect Thermosyphon	3/28/2003	1.0	43888	0
Solahart Industries	SOLAHART	ASG 303J & ASG 302J Free Heat	Indirect Thermosyphon	3/28/2003	1.1	39184	0
Solahart Industries	SOLAHART	ASG 303JXII	Indirect Thermosyphon	3/28/2003	1.1	39184	0
Solahart Industries	SOLAHART	ASG 443J & ASG 443J Free Heat	Indirect Thermosyphon	3/28/2003	1.1	39427	0
Solahart Industries	SOLAHART	ASG 443JXII	Indirect Thermosyphon	3/28/2003	1.1	39427	0
Solahart Industries	SOLAHART	ASG 444J & ASG 444J Free Heat	Indirect Thermosyphon	3/28/2003	1.2	36613	0
Solahart Industries	SOLAHART	ASG 444JXII	Indirect Thermosyphon	3/28/2003	1.2	36613	0
Solahart Industries	SOLAHART	ASG 181KF & ASG 181KF Free Heat	Indirect Thermosyphon	3/28/2003	0.9	50331	0
Solahart Industries	SOLAHART	ASG 181BCXII	Indirect Thermosyphon	3/28/2003	0.9	50331	0
Solahart Industries	SOLAHART	ASG 182KF & ASG 182KF Free Heat	Indirect Thermosyphon	3/28/2003	1.1	39686	0
Solahart Industries	SOLAHART	ASG 182BCXII	Indirect Thermosyphon	3/28/2003	1.1	39686	0
Solahart Industries	SOLAHART	ASG 302KF & ASG 302KF Free Heat	Indirect Thermosyphon	3/28/2003	1.1	40101	0
Solahart Industries	SOLAHART	ASG 302BCXII	Indirect Thermosyphon	3/28/2003	1.1	40101	0
Solahart Industries	SOLAHART	ASG 303KF & ASG 303KF Free Heat	Indirect Thermosyphon	3/28/2003	1.3	33273	0
Solahart Industries	SOLAHART	ASG 303BCXII	Indirect Thermosyphon	3/28/2003	1.3	33273	0
Solahart Industries	SOLAHART	ASG 443KF & ASG 443KF Free Heat	Indirect Thermosyphon	3/28/2003	1.3	33780	0
Solahart Industries	SOLAHART	ASG 443BCXII	Indirect Thermosyphon	3/28/2003	1.3	33780	0
Solahart Industries	SOLAHART	ASG 444KF & ASG 444KF Free Heat	Indirect Thermosyphon	3/28/2003	1.5	29104	0
Solahart Industries	SOLAHART	ASG 444BCXII	Indirect Thermosyphon	3/28/2003	1.5	29104	0
Sun Systems, Inc.	CopperSun	CS440-G	Direct Integral Collector Storage	1/19/1999	0.9	47731	0
Sun Systems, Inc.	CopperSun	CS330-G	Direct Integral Collector Storage	4/24/2000	0.8	51558	0
Sun Systems, Inc.	CopperSun	CS340-G	Direct Integral Collector Storage	4/24/2000	0.8	51899	0
Sun Systems, Inc.	CopperSun	CS450-G	Direct Integral Collector Storage	4/24/2000	0.9	48290	0
Sun Systems, Inc.	CopperSun	CS330SV-G	Direct Integral Collector Storage	5/22/2003	0.8	53686	0
Sun Systems, Inc.	CopperSun	CS340SV-G	Direct Integral Collector Storage	5/22/2003	0.8	54120	0
SunEarth, Inc.	Cascade	EPRD-40-80-2G	Indirect Forced Circulation	6/10/2003	1.0	39560	5015
SunEarth, Inc.	Cascade	ECRD-40-80-2G	Indirect Forced Circulation	6/10/2003	1.0	38041	5015
SunEarth, Inc.	Cascade	EPRD-42-80-2G	Indirect Forced Circulation	6/10/2003	1.0	39133	5033
SunEarth, Inc.	Cascade	ECRD-42-80-2G	Indirect Forced Circulation	6/10/2003	1.0	37576	5033
SunEarth, Inc.	Cascade	EPRD-48-80-2G	Indirect Forced Circulation	6/10/2003	1.1	36241	4493
SunEarth, Inc.	Cascade	ECRD-48-80-2G	Indirect Forced Circulation	6/10/2003	1.1	34177	5033
SunEarth, Inc.	Cascade	EPRD-64-80-2G	Indirect Forced Circulation	6/10/2003	1.3	29722	4493

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System Supplier	System Name	System Model Number	System Description	Cert Date	SEF	Q aux	Q par
SunEarth, Inc.	Cascade	ECRD-64-80-2G	Indirect Forced Circulation	6/10/2003	1.4	27386	4493
SunEarth, Inc.	Cascade	EPRD-64-80-75G	Indirect Forced Circulation	8/13/2003	0.9	42034	4493
SunEarth, Inc.	Cascade	EPRD-64-80-100G	Indirect Forced Circulation	8/13/2003	0.9	43615	4493
SunEarth, Inc.	Cascade HX	EPDX32-52-2G	Indirect Forced Circulation		0.9	43359	3862
SunEarth, Inc.	Cascade HX	ECDX32-52-2G	Indirect Forced Circulation		0.9	42090	3862
SunEarth, Inc.	Cascade HX	EPDX40-52-2G	Indirect Forced Circulation		1.0	39710	3472
SunEarth, Inc.	Cascade HX	ECDX40-52-2G	Indirect Forced Circulation		1.0	37795	3820
SunEarth, Inc.	Cascade HX	EPDX40-80-2G	Indirect Forced Circulation		1.0	39893	3848
SunEarth, Inc.	Cascade HX	ECDX40-80-2G	Indirect Forced Circulation		1.0	38354	3848
SunEarth, Inc.	Cascade HX	EPDX48-80-2G	Indirect Forced Circulation		1.1	36363	3486
SunEarth, Inc.	Cascade HX	ECDX48-80-2G	Indirect Forced Circulation		1.1	34568	3486
SunEarth, Inc.	Cascade HX	EPDX64-80-2G	Indirect Forced Circulation		1.3	30372	3486
SunEarth, Inc.	Cascade HX	ECDX64-80-2G	Indirect Forced Circulation		1.4	27927	3486
SunEarth, Inc.	Cascade HX	EPDX80-120-2G	Indirect Forced Circulation		1.5	25705	3486
SunEarth, Inc.	Cascade HX	ECDX80-120-2G	Indirect Forced Circulation		1.7	22748	3486
SunEarth, Inc.	Cascade HX	EPDX96-120-2G	Indirect Forced Circulation		1.7	21383	3486
SunEarth, Inc.	Cascade HX	ECDX96-120-2G	Indirect Forced Circulation		2.0	17780	3486
SunEarth, Inc.	CopperHeart	CP-20G	Direct Integral Collector Storage	4/10/2001	0.8	56332	0
SunEarth, Inc.	CopperHeart	CP-30G	Direct Integral Collector Storage	4/10/2001	0.9	49913	0
SunEarth, Inc.	CopperHeart	CP-40G	Direct Integral Collector Storage	4/10/2001	0.9	47036	0
SunEarth, Inc.	CopperHeart	CP-60PG	Direct Integral Collector Storage	4/10/2001	1.0	41757	0
SunEarth, Inc.	CopperHeart	CP-80PG	Direct Integral Collector Storage	4/10/2001	1.1	38335	0
SunEarth, Inc.	CopperHeart	CP-20-TLG	Direct Integral Collector Storage	8/19/2002	1.2	37565	0
SunEarth, Inc.	CopperHeart	CP-30-TLG	Direct Integral Collector Storage	8/19/2002	1.4	31598	0
SunEarth, Inc.	CopperHeart	CP-40-TLG	Direct Integral Collector Storage	8/19/2002	1.5	28940	0
SunEarth, Inc.	SOLARAY	TE40P-80-2G	Indirect Forced Circulation	4/10/2001	1.1	38499	2013
SunEarth, Inc.	SOLARAY	TE40C-80-2G	Indirect Forced Circulation	4/10/2001	1.1	37033	2013
SunEarth, Inc.	SOLARAY	TE48P-80-2G	Indirect Forced Circulation	4/10/2001	1.2	34809	1814
SunEarth, Inc.	SOLARAY	TE48C-80-2G	Indirect Forced Circulation	4/10/2001	1.2	32998	1814
SunEarth, Inc.	SOLARAY	TE64P-80-2G	Indirect Forced Circulation	4/10/2001	1.4	28196	1814
SunEarth, Inc.	SOLARAY	TE64C-80-2G	Indirect Forced Circulation	4/10/2001	1.6	25825	1814
SunEarth, Inc.	SOLARAY	TE48P-80-75G	Indirect Forced Circulation	7/21/2002	0.9	46632	1814
SunEarth, Inc.	SOLARAY	TE40P-80-2G-PV	Indirect Forced Circulation	4/10/2001	1.0	42447	0

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SunEarth, Inc.	SOLARAY	TE40C-80-2G-PV	Indirect Forced Circulation	4/10/2001	1.1	40988	0
SunEarth, Inc.	SOLARAY	TE48P-80-2G-PV	Indirect Forced Circulation	4/10/2001	1.1	38941	0
SunEarth, Inc.	SOLARAY	TE48C-80-2G-PV	Indirect Forced Circulation	4/10/2001	1.2	37182	0
SunEarth, Inc.	SOLARAY	TE64P-80-2G-PV	Indirect Forced Circulation	4/10/2001	1.3	32994	0
SunEarth, Inc.	SOLARAY	TE64C-80-2G-PV	Indirect Forced Circulation	4/10/2001	1.4	30730	0
SunEarth, Inc.	SunSiphon	EPGX48-21-2G	Indirect Thermosyphon	5/20/2001	0.8	56126	0
SunEarth, Inc.	SunSiphon	EPGX48-24-2G	Indirect Thermosyphon	5/20/2001	0.8	54527	0
SunEarth, Inc.	SunSiphon	EPGX48-32-2G	Indirect Thermosyphon	5/20/2001	0.8	51158	0
SunEarth, Inc.	SunSiphon	EPGX80-40-2G	Indirect Thermosyphon	5/20/2001	0.9	47679	0
SunEarth, Inc.	SunSiphon	EPGX80-42-2G	Indirect Thermosyphon	5/20/2001	0.9	47174	0
SunEarth, Inc.	SunSiphon	EPGX80-48-2G	Indirect Thermosyphon	5/20/2001	1.0	44970	0
SunEarth, Inc.	SunSiphon	EPGX80-63-2G	Indirect Thermosyphon	5/20/2001	1.1	41170	0
SunEarth, Inc.	SunSiphon	EPGX80-64-2G	Indirect Thermosyphon	5/20/2001	1.1	40629	0
SunEarth, Inc.	SunSiphon	EPGX116-63-2G	Indirect Thermosyphon	5/20/2001	1.1	40605	0
SunEarth, Inc.	SunSiphon	EPGX116-64-2G	Indirect Thermosyphon	5/20/2001	1.1	40064	0
SunEarth, Inc.	SunSiphon	EPGX116-80-2G	Indirect Thermosyphon	5/20/2001	1.2	36427	0
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE®	PT-30-CN-G	Direct Integral Collector Storage	8/24/1998	0.9	49406	0
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE®	PT-35-CN-G	Direct Integral Collector Storage	8/24/1998	0.9	49212	0
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE®	PT-40-CN-G	Direct Integral Collector Storage	8/24/1998	1.0	44048	0
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE®	PT-50-CN-G	Direct Integral Collector Storage	8/24/1998	1.0	43833	0
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE®	PT-40-CN-GX	Direct Integral Collector Storage	9/15/1998	1.0	42775	0
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE®	PT-50-CN-GX	Direct Integral Collector Storage	9/15/1998	1.0	43672	0
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE®	PT-40-CN2-GX75	Direct Integral Collector Storage	1/15/1999	1.0	42351	0
Thermal Conversion Technology, Inc. (TCT Solar)	PROGRESSIVTUBE®	PT-40-CN2-GX100	Direct Integral Collector Storage	6/14/1999	1.1	40624	0
TrendSetter Industries	Six Rivers Solar	SRS-100-2-40-PC	Indirect Forced Circulation	7/2/2001	1.1	36537	2650
TrendSetter Industries	Six Rivers Solar	SRS-200-3-40-PC	Indirect Forced Circulation	7/2/2001	1.4	29183	2650
TrendSetter Industries	Six Rivers Solar	SRS-200-4-40-PC	Indirect Forced Circulation	7/2/2001	1.7	22797	2340
TrendSetter Industries	Six Rivers Solar	SRS-300-5-40-PC	Indirect Forced Circulation	7/2/2001	2.0	19648	2340
TrendSetter Industries	Six Rivers Solar	SRS-300-6-40-PC	Indirect Forced Circulation	7/2/2001	2.2	16966	2340

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TrendSetter Industries	Six Rivers Solar	SRS-050-1-32-PC	Indirect Forced Circulation	11/20/2001	0.8	49001	2959
TrendSetter Industries	Six Rivers Solar	SRS-050-1-40-PC	Indirect Forced Circulation	11/20/2001	0.9	45561	2959
TrendSetter Industries	Six Rivers Solar	SRS-100-2-32-PC	Indirect Forced Circulation	3/7/2002	1.1	38383	2681
TrendSetter Industries	Six Rivers Solar	SRS-070-1-40-PC	Indirect Forced Circulation	6/13/2005	1.5	25810	2959
TrendSetter Industries	Six Rivers Solar	SRS-150-2-40-PC	Indirect Forced Circulation	6/13/2005	2.5	14936	2650
TrendSetter Industries	Six Rivers Solar	SRS-150-3-32-PC	Indirect Forced Circulation	6/13/2005	3.2	10942	2650
TrendSetter Industries	Six Rivers Solar	TS-100-1-30-PC	Indirect Forced Circulation	6/13/2005	1.3	29502	2959
TrendSetter Industries	Six Rivers Solar	TS-150-2-22-PC	Indirect Forced Circulation	6/13/2005	1.6	23962	2959
TrendSetter Industries	Six Rivers Solar	TS-200-3-30-PC	Indirect Forced Circulation	6/13/2005	4.7	6168	2959
TrendSetter Industries	Six Rivers Solar	TS-200-4-30-PC	Indirect Forced Circulation	6/13/2005	15.9	75	2641
TrendSetter Industries	Six Rivers Solar	TS-300-5-30-PC	Indirect Forced Circulation	6/13/2005	18.0	0	2412
TrendSetter Industries	Six Rivers Solar	TS-300-6-30-PC	Indirect Forced Circulation	6/13/2005	20.4	0	2123

*** OG300 Column Headings:**

SEF Solar Energy Factor:

$$SEF = \frac{Q_{DEL}}{Q_{AUX} + Q_{PAR}}$$

Where:

Q_{DEL} = Daily amount of energy delivered to the hot water load using the SRCC rating conditions, this value is 43,302 kJ/day. To convert to kWh, divide this value by 3,600.

Q_{AUX} = Daily amount of energy used by the auxiliary water heater or backup element, with the solar system operating (kJ/day). To convert to kWh, divide this value by 3,600.

Q_{PAR} = Parasitic energy: Daily amounts of AC electrical energy used to power pumps, controllers, shutters, trackers, or any other item needed to operate the SDHW system (kJ/day). To convert to kWh, divide this value by 3,600.

November 2006

Certification must be renewed annually. For current status contact:
SOLAR RATING & CERTIFICATION CORPORATION

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