

SOLAR

New Dawn for Solar Regulation

by Lesley Mandros Bell

New efforts to measure the efficiency and durability of solar water heaters are improving the solar industry's credibility, lost during its unregulated growth in the '70s and early '80s.

Now that the "fly by night" days of quick-sell, low-maintenance solar sales are long past, testing, rating, and certification are being refined to help repair the damage and prevent a recurrence.

In one example of this increased interest, the Florida Solar Energy Center is currently holding the final trials in a competition for low-cost, high-efficiency solar water heaters. Over 66 system designs from around the country (mostly from the Southeast) were submitted, of which five finalists are still being tested. They are: Virginia Solar Components Inc., Rustburg, Va.; Solar City, Tampa, Fla.; Solar Development Inc., Riviera Beach, Fla.; Thermomax USA Ltd., Winter Park, Fla.; and City of Lake Worth, Lake Worth, Fla. Four of these five systems draw on technology that has existed for years, proving that consumer satisfaction and awareness need attention, not solar water heating technology itself, according to Carter Quillen of Florida Solar Energy Center. The need for regulation is essential for acceptance of the technology, equal only to the need for financing, declares Quillen. "The solar industry needs to be made accountable for the cost of the energy that it delivers."

To that end, the Solar Rating and Certification Corp. (SRCC), a non-profit organization formed by the solar industry and state energy officials to rate and certify the performance of solar energy equipment, is establishing a new set of guidelines entitled the "Operating Guidelines and Minimum Standards for Solar Water Heating Systems—OG-300-91." With this guide, the organization hopes to provide consumers with information to help them to choose the best system for their needs.

The new set of standards, not the SRCC's first, refines and augments the information of its earlier standards into



Increased testing and certification coupled with longer manufacturer warranties and accountability may restore consumer trust in solar technology. (Test modules at Florida Solar Energy Center.)

a more useful form. In conjunction with OG-300, the predecessor OG-100 standards provide certification and performance ratings for solar collectors. Under OG-100, independent laboratories test each collector, and SRCC certifies it if it passes several tests of durability and performance and rates its efficiency. Consumers reading the reports can then base purchases on collector output levels.

SRCC realized that installation procedure and component compatibility were equally important issues, and set out to establish a testing apparatus for whole systems. "Collector rating was similar to getting the MPG rating for an engine outside of a car—the systems rating is that same engine in a car and road-tested under various conditions," says Linda Ladas of SRCC, explaining how the new guidelines would assist consumers in the selection of the most efficient and cost-effective systems. The SRCC accepts solar water heating systems with all types of components, reviewing them for "material and component design and reliability." The components of each system (pumps, collectors, etc.) are certified or approved by their own regulatory group before being submitted for SRCC certification. Completed systems are then computer modelled to determine performance, and those accepted for certification are documented by SRCC to allow "a direct comparison of the

Lesley Mandros Bell is assistant editor of *Home Energy*.

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performance ratings of active, integral collector storage systems, and thermosiphon systems."

SRCC derives the new systems ratings from the laboratory tests of the collectors, along with the specifications of all other components as inputs to a simulation. In the case of integral collector or thermosiphon systems, the collector is not independent, so those whole systems are submitted for laboratory testing under an intermediate rating program, OG-200 (see Table 1). However, even those systems apply for OG-300 to ensure that the supplier is meeting installation requirements, adequate installation, operation, and maintenance information, Ladas explains.

SRCC hopes to use the overall system rating to direct attention beyond the collectors, to issues of component compatibility and substitution. OG-200 provides consumers with some whole system data, but does not allow for component substitution, which alone limits consumer choices when it comes to system maintenance and repair. With the new program, not only are entire heating systems and individual parts tested and certified, but additional components are approved for compatibility and substitution. (For instance, in repairing an existing system, a contractor may substitute a pump he has in stock, or one that is less expensive without losing the rating or system guarantee, as long as that pump has been SRCC-certified as an acceptable substitute.)

Sacramento Municipal Utility District is currently working with SRCC to adapt the new ratings to their solar water heating rebate program. Cliff Murley, an energy specialist and solar engineer with the utility, described the role that the SRCC certification guidelines would play in its program, a program which delivers rebates \$400-1,450 to customers who install approved solar water heating systems. The Sacramento utility is currently receiving packages from solar contractors, including a completed SRCC application form and additional utility requirements. While SRCC tests the systems for certification, the utility determines potential customer savings.

Sacramento uses the Transient System Simulation Program (TRNSYS), a computer model developed originally by the University of Wisconsin's Solar Energy Laboratory, to determine savings potential. TRNSYS allows researchers to enter weather data for a typical meteorological year, along with the energy rating for the solar collector or system, deriving the annual projected savings figure based on weather. While this application of TRNSYS is still in development, Murley foresees that it will ultimately become a popular design tool for the solar industry in the construction of more efficient systems. "For our program, we require that the salesperson include the utility's TRNSYS-determined estimation of monthly energy savings on the bid," says Murley. "This way, the customer doesn't have to rely on sales claims."

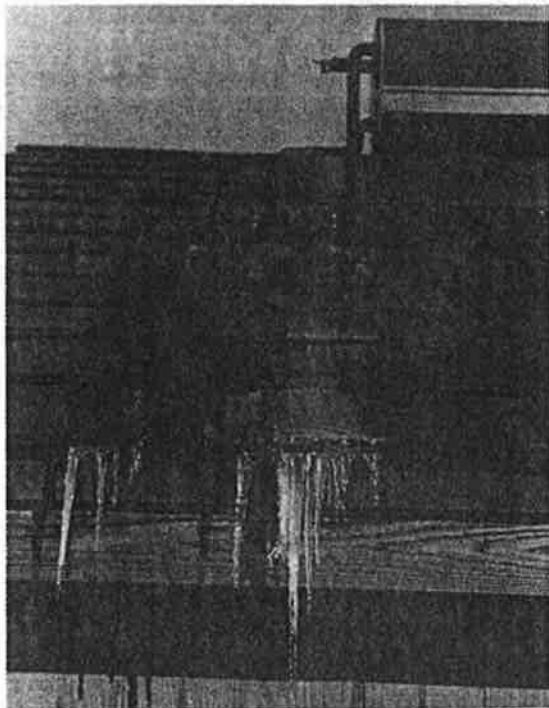
Murley is enthusiastic about the potential of the latest SRCC certification standards to increase consumer trust and improve design efficiency. *The Buyers Guide for Solar Domestic Hot Water Systems* published by the California

Table 1. Whole Solar Water Heating System Ratings to Date¹

	Manufacturer	Trade Name	Model No.	Collector	FLUID CAPACITY (gal)		Supplemental Tank	Q _{SAV} ¹ (Btu/day)	FES(E) ²
					Solar Storage Tank Nominal	Measured			
Forced Circulation	Kimex Int'l Technologies	Kimex Solar DHW	KS1301	0.87	82	79	52	43,100	94%
Integral Collector Storage Systems (ICS)	SunEarth Inc.	Copper Heart	SS-2000	N/A	35	32	52	29,800	69%
	Nippon Electric	Sun Family	SS-300	"	60	56	48	21,100	52%
	Glass America Inc.			"					
	SunEarth Inc.	Copper Heart Jr.	SS-1500	"	20	20	52	20,300	47%
	Nippon Electric	Sun Family	SS-200	"	40	37	48	15,700	38%
	Glass America Inc.								
Thermosiphon Systems	Solahart USA	Solahart SHS	300JK P2	1.00	80	N/A	52	39,100	85%
	"	Solahart SWHS	300JK	"	"	"	N/A	31,400	68%
	"	Solahart SWH	300JK P1	"	"	"	52	28,700	63%
	"	Solahart SWS	80GE (2)	0.42	"	"	N/A	28,600	62%
	"	Solahart SWS	80CE	"	"	"	52	28,000	61%
	"	Solahart SWH	300JD	1.00	80	"	"	26,600	58%
	Solahart	Solahart	180JK	0.95	47	47	"	17,100	37%
Self-Pumping System	Sage Advance Corporation	Copper Cricket	Copper Cricket 1A	1.56	52	N/A	"	22,000	46%

Source: *Directory of SRCC Certified Solar Collector and Water Heating System Ratings*, Part B. Washington, D.C.: Solar Rating & Certification Corp., Dec. 1991.

1. A.k.a. OG-200. More extensive system ratings are due this summer (OG-300). The ratings in this table are for integrated, single-unit systems only, where part substitution is not possible, and are meant as an example of SRCC's rating systems. Extensive collector ratings (OG-100) have already been published, also in *Directory of SRCC Certified Solar Collector and Water Heating System Ratings*.
2. Q_{SAV} = Solar Energy Delivered (energy saved by solar system under SRCC test conditions). Takes into account auxiliary or parasitic energy use (the amount of energy used to power pumps, controllers, shutters, trackers, etc., needed to operate the system) as well as the standby and combustion losses of supplemental (conventional) tank.
3. FES(E) = Fractional Energy Savings (Electric). Percentage of energy used by fairly efficient conventional electric water heater that is saved by addition of solar water heater).



Catherine Coombs, courtesy of FSEC

When freeze protection fails, consumer dissatisfaction follows. The new SRCC certification guidelines are one way that the Sacramento Municipal Utility District hopes to prevent problems such as the one visible in this thermosiphon collector unit.

Energy Commission in 1985 recommended consumers purchase systems with oversized collectors to compensate for performance degradation due to the system design and component selection—a degradation that Murley estimates to be potentially as high as 50%. He suggests that the SRCC certified systems will reduce such losses, resulting in higher efficiency, and the system rating will accurately project energy savings, resulting in higher customer acceptance. Also, the SRCC ratings mean that manufacturers, not installers, will be the designers of whole, component-compatible systems.

“By adopting the SRCC certification system,” claims Murley, “we will acquire an additional degree of confidence that the engineering analysis [done for certification] will manifest itself in actual energy savings. [With the standards] we have a higher degree of confidence as to the durability, reliability, and projected energy savings of a system.” Murley listed installation guidelines, prescribed warranties, and an operations manual for system owners as additional benefits mandated under the SRCC program. (Certification requires a 5-year collector warranty followed by an additional 5-year, pro-rated warranty, and the utility requires contractors add an additional 3-year full-system warranty.)

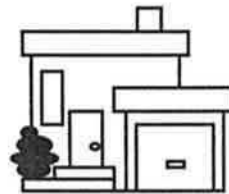
Sacramento Municipal Utility District also has plans to work with National Renewable Energy Laboratory (formerly Solar Energy Research Institute) on in-field monitoring of installed systems to compare projected and actual savings. Ultimately, Murley hopes, the program will become a model for other utilities, showing “how a utility can successfully implement solar as a part of an overall DSM strategy.”

Quillen commends the Sacramento Municipal Utility District rebate program for “blazing a trail” for other groups to follow by establishing the viability of solar rebate programs. While Quillen would like to see less simulation and more hands-on testing, he says that the SRCC certification system “is doing the best job it has ever done right now. It is a very difficult task.”

The new (OG-300) standards were to be available in June. Send a self-addressed stamped envelope to Linda Ladas at SRCC, 777 N. Capitol St., N.E., Suite 805, Washington, DC 20002. ■

Acknowledgements

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