

ORIGINAL

Decision 93689 NOV 5 1981

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Application of Sunmaster Corporation for eligibility to participate in the Demonstration Utility Solar Financing Program of OII42 Decisions 92251, 92501 and 92769.

Application 60938 (Filed September 28, 1981)

O P I N I O N

On September 16, 1980 we issued Decision (D.) 92251 establishing demonstration solar financing programs for Pacific Gas and Electric Company, San Diego Gas & Electric Company, Southern California Edison Company, and Southern California Gas. We subsequently modified this decision by D.92501, December 5, 1980, and D.92769, March 3, 1981. In these decisions we specified a checklist of requirements for domestic solar water heaters. Solar water heaters must meet all checklist requirements to be eligible for the solar financing program effective March 1, 1981.

By letter dated July 15, 1981 to the Energy Conservation Branch (ECB), Allied Energy Systems, Inc. requested on behalf of Sunmaster Corporation (Sunmaster), eligibility to participate in the Demonstration Utility Solar Financing Program, OII42 of D.92251, 92501, and 92769 for its evacuated tube collector solar hot water and heating systems. By letter dated September 22, 1981 from

Sunmaster to the ECB, Allied Energy Systems, Inc. was confirmed as Sunmaster's corporate agent for the State of California. As used herein, Sunmaster refers to Sunmaster Corporation or its dealers.

Sunmaster's Position

Sunmaster contends that the sizing requirements for its evacuated tube nontracking collectors should be 4.3 square feet of collector per 10 gallons of heated water needed. Sunmaster's evacuated tube panels are each 14 square feet.

Sunmaster's solar systems are equipped with drainback freeze protection. Also, Sunmaster's solar systems have temperature control devices which it contends act as time clocks. The systems meet California Energy Commission tax credit warranty requirements.

ECB Position

The Commission opposes the use of undersized or noncertified solar water heating systems, because they may not produce enough energy savings for their users or for ratepayers.^{1/} However, ECB staff recognizes that the performance of nonconventional systems may be estimated when some data is available, such as that provided by Sunmaster and discussed below.

ECB is persuaded by Sunmaster's application that its systems have the potential for meeting the program performance criterion. However, ECB proposes that Sunmaster's units be monitored.

^{1/} D.92251, p.45, paragraph 3.

Each installation must yield 60% net energy savings established by a rigorous monitoring program in randomly selected installations. The installations selected will be at the sole discretion of the ECB.

Discussion

Solar domestic water heating systems monitored in California to date have often yielded solar fractions well under 60%. These units appear to be too small to produce worthwhile savings for their users or for ratepayers. Additional collectors or a larger storage tank for solar heated water would likely improve the performance of these systems.

The Commission in D.92251 specifically directed staff to evaluate under a monitoring program "the extent to which solar water heating can be relied upon to provide adequate and reliable supplies of energy".^{1/} The Commission then adopted in D.92501 a checklist of standards to assure the quality, safety, and proper sizing of solar systems in its demonstration program. The Commission has revised this checklist in subsequent decisions based on the expertise of many persons knowledgeable in solar technology. The checklist requires that a system be sized to displace 60% of conventional energy. The Commission recognized that its sizing methodology is applicable only to flat plate systems and directed

^{1/} D.92251, p.2, paragraph 3.

the ECB to approve alternate sizing guidelines for nonflat plate systems on a case-by-case basis. It also directed the ECB to grant exemptions to the quality and safety standards only if such exemptions in no way decreases system quality or safety.

Sunmaster Concentrator Efficiency

Sunmaster has provided performance data for its concentrating collector compiled by DSET, a certified solar equipment testing organization. The data reflect an efficiency better than a flat plate above medium temperatures, offset by lower than flat plate efficiency at low temperatures, in part because the Sunmaster collector has a lower area for heat losses than a flat plate collector. The Sunmaster collector will have relatively greater efficiency during the summer than a flat plate collector; however, usable solar energy in summer is limited by demand, not by system performance.

Conversely, the Sunmaster collector will have relatively less efficiency during the winter than a flat plate collector, when the usable solar energy is limited by system size and performance. Thus the fixed concentrating Sunmaster collector in low to medium temperature domestic water heating applications may deliver less usable solar energy than most flat plate collectors.

Threshold Losses

Typical flat plate systems rely on the effect of solar radiation in raising the temperature of the collector to a minimum value - an ability which decreases when ambient air temperatures are low, again because of heat losses. The Sunmaster system, however, collects solar energy whenever solar radiation itself reaches a minimum intensity. In either case low incident radiation is lost whenever it is too weak to trigger the circulation pump. Thus, the Sunmaster collector with less mass, fewer losses, and more "on" time would perform better in, for example, a cold climate space heating application than would a flat plate collector. A net advantage in a California climate water heating application has not been established. Sunmaster did not quantify threshold losses.

Incident Angle Modifier

Because Sunmaster concentrating collectors focus the incident radiation from a direct beam to achieve maximum performance, their output falls off more rapidly than does the output of flat plate collectors when radiation deviates from the perpendicular. Sunmaster provided performance data to quantify this effect, in addition to the efficiency data discussed above.

A comparison of the annual average energy collection was made in the case of a similar concentrator by evaluating its incident angle modifier equation for a similar concentrator with the

equation for a typical flat plate collector. Since the concentrating collector was fixed, not tracking, its daily integrated output was about three-quarters that of the flat plate collector.

We will require comparable sizing for all fixed concentrating systems, since ECB staff do not have the resources to evaluate all performance claims independently. We interpret our role to be that of assuring, in the face of uncertainty, that minimum energy savings are provided by systems we find eligible. Thus we will rely on conservative judgments, to be refined with monitoring data as those data becomes available.

ECB Monitoring

ECB evaluations of Sunmaster equipment will be based on the monitoring objectives set forth below:

- a. The system must be large enough to provide at least 60% of the normalized metered usage of conventional energy for water heating including adjustments for pumping and freeze protection.
- b. The monitoring system testing shall be carried out in households which have been determined by the ECB to have used 300 therms of natural gas per year (or a comparable amount of electricity) for water heating.
- c. In households where less than 300 therms per year or equivalent is used, Sunmaster systems will be eligible for the program provided the solar contribution is at least 60%.

The ECB has established its method for monitoring of eight systems to include choosing as a minimum four at random in the warmer climate areas and four at random in the colder climate areas. Two systems in each climate area shall be served with natural gas and two with electric backup.

Sunmaster will participate in a system monitoring program lasting a minimum of nine months with interim reviews. After six months of monitoring, if any of the eight solar systems is not displacing 60% of conventional use (according to data extrapolated over twelve months), then the ECB staff will discuss these results with Sunmaster and allow Sunmaster to recommend the upgrading of all future similarly situated installations to avoid disqualification from the program.

Sunmaster systems will be monitored as follows: One electric meter will be used to monitor parasitic energy use by the solar system and the second electric meter will be used to measure electric backup energy requirements. The same monitoring equipment will be used to establish actual electrical conventional hot water heating energy consumption. A 60% net savings over the actual measured consumption will be required of solar systems for OII42 compliance.

On natural gas backup systems a gas flow meter will be used for measurement of natural gas backup fuel use. Other metering will be the same as for the electric backup systems.

On natural gas backup systems each kilowatt-hour of electricity used for system pumping and control will be added to the system auxiliary backup usage in a manner consistent with that adopted for all other systems being monitored under this program.

ECB is satisfied that Sunmaster has provided reasonable supporting data to proceed as a participant in the Demonstration Solar Financing Program based on the conditions set forth below. The conditions for eligibility must be met, whether by Sunmaster or by its dealers, installers, or others.

Until the results of this monitoring program establish otherwise, the minimum sizing criteria are as follows:

<u>Number of Bedrooms</u>	<u>Area (ft²) of Collector</u>	<u>Number of Panels</u>	<u>Solar Storage (Gallons)</u>
1-2	42	3	66
3	56	4	82
4	84	6	82
5	98	7	120

- A. Sunmaster retains the right to ask for modifications of the above requirements pending system monitoring results.
- B. Sunmaster will recommend that back-up water heaters remain installed when solar storage tanks are added.
- C. Sunmaster will provide instructions to customers to turn off pilot lights on gas water heaters during summer months.
- D. Sunmaster will provide instructions to customers to turn off the auxiliary electric backup during summer months.

- E. Sunmaster will recommend the installation of time clocks on all systems that use electricity as auxiliary backup.
- F. For the evaluation of onsite hot water heating conventional performance, Sunmaster retains the right to request monitoring results of base energy use not to exceed one month at a time, including the option to do this in different seasons.
- G. Sunmaster retains the right to request adjustment of system performance results if needed to account for deviations from:
 - 1) Expected temperature and insolation levels (unusual climate), and
 - 2) Expected water consumption during the monitoring period.
- H. Except for the relief (exemptions) set forth Sunmaster and its contractors will be expected to adhere to all other currently effective installation requirements set forth in D.92251, 92501 and 92769 and subsequent decisions.

Sunmaster will meet the minimum quality and sizing criteria as contained in D.92551, 92501, and 92769 except as specified in the following paragraph.

Sunmaster will not install as part of this program any systems serving one- and two-bedroom homes with less than 3 collectors (a total of 42 square feet) and 66 gallons of storage. For three-bedroom homes Sunmaster shall install no less than four collectors (56 square feet) and 82 gallons of storage, for four-bedroom homes no less than 6 collectors (84 square feet) and 82

gallons of storage, and for five-bedroom homes Sunmaster shall install no less than 7 collectors (98 square feet) and 120 gallons of storage.

Any reference to this decision in correspondence, marketing literature, or media advertising shall also contain the full text of this Disclaimer of Product Endorsement.

"California Public Utilities Commission, in no way endorses, recommends, or warrants the durability, suitability, reliability, or the short- or long-term energy savings performance of this system for domestic water heating or any other application."

While this disclaimer is applicable to any system under our demonstration program, it is important to set it out here because of the exemption being requested by Sunmaster, so that any doubts of whether or not this order would constitute an implied endorsement are removed. We agree with ECB's position and the agreement it has reached with Sunmaster as set out above.

ECB recommends the application be granted ex parte. We believe that public hearings would serve no useful purpose.

Finding

Properly sized, Sunmaster systems may reasonably be expected to supply 60% net energy savings over nonsolar consumption as previously discussed. Additionally, installations of Sunmaster systems should be monitored to ensure a 60% net savings.

Conclusions

1. The request for eligibility by Sunmaster is reasonable and should be granted subject to the agreements between ECB and Sunmaster as previously discussed.

2. The following order should be effective the date of signature in order to allow Sunmaster to participate in the solar financing program at the earliest time.

O R D E R

IT IS ORDERED that:

1. Sunmaster Corporation (Sunmaster) is granted eligibility for its evacuated tube collector solar hot water and heating systems.

2. The eligibility requested is granted subject to Sunmaster's full acceptance and compliance with the requirements specified by the ECB including the Disclaimer of Product Endorsement.

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3. Except as granted and provided, Sunmaster and its contractors shall adhere to all other currently effective installation requirements set forth in D.92251, 92501, and 92769.

This order is effective today.

Dated NOV 3 1981, at San Francisco, California.

JOHN E. BRYSON
President
RICHARD D. GRAVELLE
LEONARD M. GRIMES, JR.
VICTOR CALVO
PRISCILLA C. GREW
Commissioners

I certify that this decision was approved by the above Commissioners today.

