



Energy Design Update[®]

The Monthly Newsletter on Energy-Efficient Housing, from Aspen Publishers

Vol. 26, No. 2

February 2006

INDUSTRY NEWS

Solar and Efficient Water Heating

In February 2004, the US Department of Energy (DOE) invited manufacturers of energy-efficient water heaters and solar thermal equipment to attend a conference in Baltimore, Maryland, on the future of water heating technology. At the conference, representatives from the DOE's Solar Energy Technologies Program proposed a public/private partnership to produce a "roadmap" describing ways to encourage the adoption of high-efficiency water heaters and solar hot water systems.

The group recently produced a report, "Solar and Efficient Water Heating: A Technology Roadmap" (see Figure 1). The range of water heaters examined in the report includes solar water heaters, heat-pump water heaters, high-efficiency natural gas water heaters, gas-fired instantaneous water heaters, electric instantaneous water heaters, and drainwater heat-recovery devices.

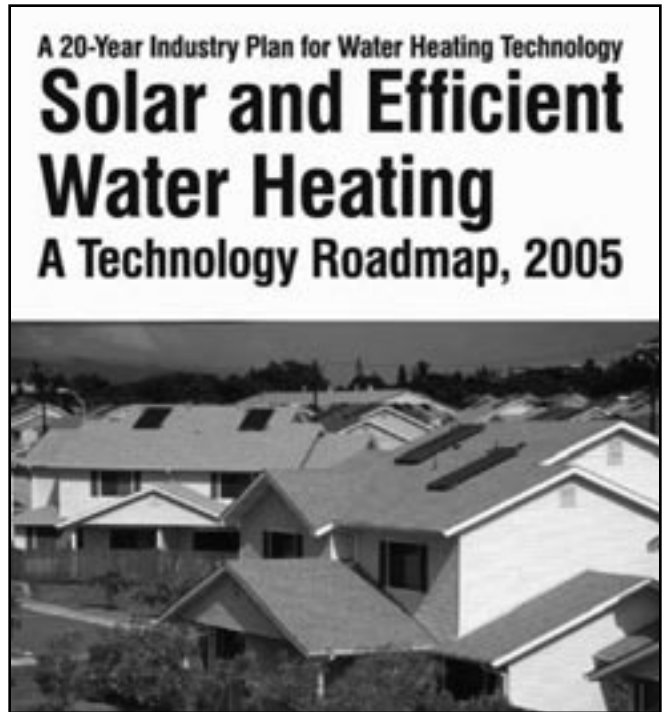


Figure 1. "Solar and Efficient Water Heating" was jointly produced by a group of water-heater manufacturers and employees of the US Department of Energy.

The report notes that 99% of all water heaters sold in the US are conventional tank-type electric or natural gas water heaters. Needless to say, manufacturers of more efficient water heaters wish they had a bigger share of the water-heater market.

In Praise of Drainwater Heat Recovery

The Roadmap authors are notably optimistic. For example, here's what they have to say about heat-pump water heater dependability: "Early generations of high-efficiency electric water heaters

ASPEN
PUBLISHERS

IN THIS ISSUE

INDUSTRY NEWS

Solar and Efficient Water Heating.....1

NEWS BRIEFS4

RESEARCH AND IDEAS

The Right Way To Cathedralize An Attic8

INFORMATION RESOURCES

Ecohouse 211

READERS' FORUM14

BACK PAGE

Keeping Up With The Word
Police, Round Two16

(in particular heat-pump water heaters) experienced durability and reliability problems. While these incidents were localized and isolated, they tainted the public perception of the technology; a taint that remains despite the passage of more than a decade and the introduction of vastly improved products." Yet researchers analyzing data from one of the most recent field tests of heat-pump water heaters concluded that the failure rate was still "higher than would be acceptable in the residential water-heater market" (see *EDU*, August 2004).

Among the highly praised technologies examined by the Roadmap authors are desuperheaters and drain-water heat-recovery devices. A desuperheater is a heat exchanger that uses waste heat from an air conditioner to preheat domestic hot water (see *EDU*, December 1998). According to the Roadmap, "Heat can be efficiently recovered by desuperheaters from the hot air exhausted from central air conditioners. This proven heat-recovery technology has found widespread use in Florida, and can meet all of a home's water heating needs during periods when the air conditioning unit is extensively used."

Drainwater heat recovery, the neglected orphan of water-heating technologies, finds favor with the Roadmap authors. They note, "The Energy Information Agency estimates that residential consumers can save up to 34% of the energy used to heat water by installing a drainpipe heat recovery system; the system can pay for itself in two to five years with average use. ... Currently available residential drain-line heat-recovery units can be purchased for under \$500. This is an insignificant sum when building a house or commercial space. That same \$500, however, can be a large line item during a remodel or retrofit. This suggests that the primary market for the product will be in new construction, where the product cost is insignificant and the plumbing can be completed easily (and where plumbing designs can be rationalized to maximize the benefit of the heat-recovery equipment)."

Hurdles Ahead

For years, energy efficiency experts have bemoaned the fact that solar hot water systems, heat-pump water heaters, and instantaneous water heaters make up a very small part of the water heater market. These experts sometimes forget that conventional water heaters have a lot going for them: they are widely available, dependable, and cheap.

Most homeowners ignore their water heaters. About once every ten years, the average homeowner goes down to the basement and notices that the water heater is sitting in a pool of water. At that point, the \$350 special at Home Depot looks good. As the Roadmap document notes, "Solar water heating, and to some extent high-performance water heaters, have had disappointing market penetration for many of the same reasons: higher upfront costs; lack of familiarity with buyers and the building trades; and lack of product support."

In spite of these hurdles, the Roadmap sets optimistic goals: "The goal of this Roadmap is to reduce primary fossil fuel use for water heating by 25% by 2020—through solar energy that directly displaces fossil fuels; more efficient gas and electric water heating technologies; and improved hot water distribution products and designs." Yet this goal is unlikely to be met unless there is either a sudden spike in energy prices or a significant increase in government incentives in favor of the listed technologies.

Industry Wish List: More Incentives

Equipment manufacturers consulted by the Roadmap authors—apparently including even veterans of the solar boom-and-bust cycle of the late 1970s—advocate increased government incentives for solar thermal equipment. The Roadmap notes that, in Germany, solar thermal incentives have had a significant effect on the market: "It is useful to note that, the climate in

Editor: Martin Holladay
Managing Editor: Vicki Dean

Publisher: Paul Gibson
Editorial Director: Ellen Ros

Production Editor: Paul Iannuzzo
Developmental Editor: Amy Havlan

Energy Design Update (ISSN 0741-3629) is published monthly by Aspen Publishers, A WoltersKluwer Company, 111 Eighth Avenue, New York, NY 10011. (212) 771-0600. One-year subscription costs \$399. To subscribe, call 1-800-638-8437. For customer service, call 1-800-234-1660. POSTMASTER: Send address changes to *Energy Design Update*, Aspen Publishers, 7201 McKinney Circle, Frederick, MD 21704. All rights reserved. Duplication in any form without permission, including photocopying and electronic reproduction, is prohibited. Printed in the U.S.A.

© 2006 Aspen Publishers, Inc.
a Wolters Kluwer business

Requests for permission to reproduce content should be directed to Aspen Publishers Web site at www.aspenpublishers.com, or fax a letter of intent to the permissions department at 1-212-771-0803. For article reprints and reprint quotes, contact *FosteReprints* at 1-866-879-9144.

Editor's Contact Information: Martin Holladay, Energy Design Update, P.O. Box 153, Sheffield, VT 05866. E-mail: holladay@sover.net; Tel: (802) 626-1082; Fax: (802) 626-9982.

Energy Design Update is designed to provide accurate and authoritative information in regard to the subject matter covered. It is sold with the understanding that the publisher is not engaged in rendering legal, accounting, or other professional service. If legal advice or other expert assistance is required, the services of a competent professional person should be sought. —From a declaration of Principles jointly adopted by a Committee of the American Bar Association and a Committee of Publishers.

Germany is similar to the northern snow belt tier of US states, the population of Germany is approximately 82.5 million versus the U.S. population of 295 million, and an equivalent of approximately 150,000 solar water heating systems per year are installed in Germany versus 6,000 in the United States.”

Another region where incentives have successfully boosted sales of solar thermal equipment is Hawaii: “Hawaii ... operates an extremely effective rebate program for solar water heaters that combines state tax incentives with utility company marketing and implementation. By offering a 35% or \$1,750 tax credit for single-family home customers who replace an existing electric water heater with a solar system, the state and its utilities have created the strongest solar water heating market in the United States.”

Many solar thermal equipment manufacturers are jealous of existing incentives for the installation of photovoltaic systems: “California, Arizona, Nevada, New Jersey and a host of other states operate programs that offer homeowners and businesses significant financial incentives for installing renewable energy generation (photovoltaics, wind-powered generators, etc.). These programs can effectively reduce the cost of such systems by up to half. Solar water heaters have largely been excluded from these incentives despite the fact that they also use renewable energy to reduce electricity consumption from fossil fuels, and directly reduce natural gas consumption, at a lower cost than photovoltaic electric systems.”

Industry Wish List: An Energy Star Label for Water Heaters

The equipment manufacturers contributing to the Roadmap document also show signs of label lust—specifically, a longing for access to the Energy Star label: “Due to the significant marketing benefits that accrue from such recognition, the solar water heating industry strongly desires to obtain an Energy Star rating for their products.” That lust seems unlikely to be fulfilled, however. The DOE struggled for years to develop an Energy Star label for water heaters before announcing in early 2004 that it was giving up on the idea (see *EDU*, July 2003, and “News Briefs,” March 2004).

Even if water heaters continue to be ineligible for an Energy Star label, some water heater manufacturers propose developing a new label or rating system to help consumers compare the energy use of competing water heaters: “Roadmap participants recommend development of a consumer-friendly, multi-industry

standard measurement that presents the true energy and water costs of differing water heating technologies. The measurement should take into account the strengths and weaknesses of all technologies (by showing energy and water savings for the typical residence), and should show seasonal and regional performance. Developing such a standard cross-platform measurement will require more detailed information on hot water demand than is currently used to develop the Energy Guide (also known as the “yellow tag”) energy usage information. Using more detailed, real-world data will allow for the development of comparative economic analyses geared to residential and commercial customers, allowing them to consider life-cycle as well as first costs. Developing an easy-to-understand comparative measurement is seen as one step necessary to gain ‘big box’ acceptance of high-efficiency water heaters.”

Of course, the same economic rivalries that sank efforts to develop an Energy Star label for water heaters—rivalries between manufacturers of different types of water-heating equipment, as well as rivalries between manufacturers of equipment using different fuels—are likely to stymie efforts to develop a new rating system or consumer information tag.

R&D Challenges

The Roadmap authors propose several areas for further research and development work. These include:

- Engineering improvements to heat-pump water heaters aimed at reducing manufacturing costs and improving product reliability.
- The development of plastic solar collectors that are cheaper to manufacture and better able to resist damage in freezing climates.

DOE engineers working to develop plastic solar collectors are aiming high. “The research goals are to produce systems capable of providing hot water for both building space heating and domestic hot water, at levelized energy costs of just 6¢/kWh—a 50% to 70% cost reduction compared to current systems. ... The research goals include reducing weight by 40%, costs by 33%, achieving 80% of the thermal performance of current state-of-the-art drainback systems, and cutting in half the labor required for installation.” Time will tell whether these goals are realistic.

“Solar and Efficient Water Heating: A Technology Roadmap” is posted online at www.nabcep.org/documents/Water%20Heating%20Roadmap%20US%20DOE.pdf.