

Getting Serious About Solar Water Heating



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Attributes of SHW Systems

- Higher conversion efficiency than PV, most other renewables
- High front-end costs, steady return over time
- 100% of savings flow to host
- Very little parasitic energy loss
- Energy capture varies with the seasons
- Supplements, not replaces, domestic heating fuel
- Value proportional to internal demand for hot water
- Long life -- performance degradation is minor



Solar water heating is an excellent cold-climate renewable energy technology

Segoe Terrace Apartments, Madison

Outline of SHW White Paper

- Explain value proposition of SHW
- Identify strategies currently in place to support the SHW market in Wisconsin
- Identify barriers that inhibit market penetration
- Survey actions undertaken in other jurisdictions to promote market penetration of SHW
- Document successful installations
- Propose policies for furthering market penetration

Challenges Along the Way

2008 was a very volatile year for SHW

- Extreme price swings for natural gas – first up then down

- Fluid federal policy picture:
 - Solar investment tax credit (ITC) set to expire 12/31/08
 - ITC extended 10/08; \$\$ cap retained for residential SHW installations
 - New incentives in stimulus package passed in February; residential cap removed

Value Proposition System Owner Benefits

- Less expensive (on a life-cycle basis)
- Predictable return
- Negligible risk



Maniowoc Rapids Car Wash

Value Proposition to Society

- Emission-free
- Non-depleting
- Indigenous
- Highly secure



Rooftop - Osceola Middle School

Natural Gas Retail Price History

Average annual price
increase 1983 – 2007 **4.6%**

Average annual price
increase 2003 - 2007 **13.0%**

However, Over the Last 12 Months ...

Wholesale Prices (Henry Hub)

Date	Price (\$/MMBtu)
3/13/08	9.69
7/3/08	13.31
3/11/09	3.92

Source: Energy Information Agency

SHW Potential in Wisconsin

Can offset between 2.6% to 4.1% of NG use

- Avoiding 150 million therms/year
- Saving \$150 million annually (2006 prices)
- Offsetting 820,000 metric ton of CO₂

Source: National Renewable Energy Laboratory

SHW Market Strategies in Place for Wisconsin

- 1) **Financial rewards** – performance-based awards up to 25% of installed cost. Residential capped at \$2,500; \$40K cap for commercial systems; \$50K cap for nonprofit entities.
- 2) **Infrastructure development** - Workshops to train practitioners to install and maintain systems.
- 3) **Quality assurance** - (e.g., required system configurations, performance testing, support for NABCEP accreditation).
- 4) **Education/marketing** – targeted mailings to potential system hosts, case studies, fact sheets, installer profiles.

Targeted Commercial Sectors

- Health care facilities
- Fitness centers
- Apartment buildings
- Dormitories
- Food processing plants
- Car washes
- Hotels/motels
- Restaurants/bakeries
- Fire stations
- Water parks
- Laundromats

Number of SHW Installations in Wisconsin (by year)

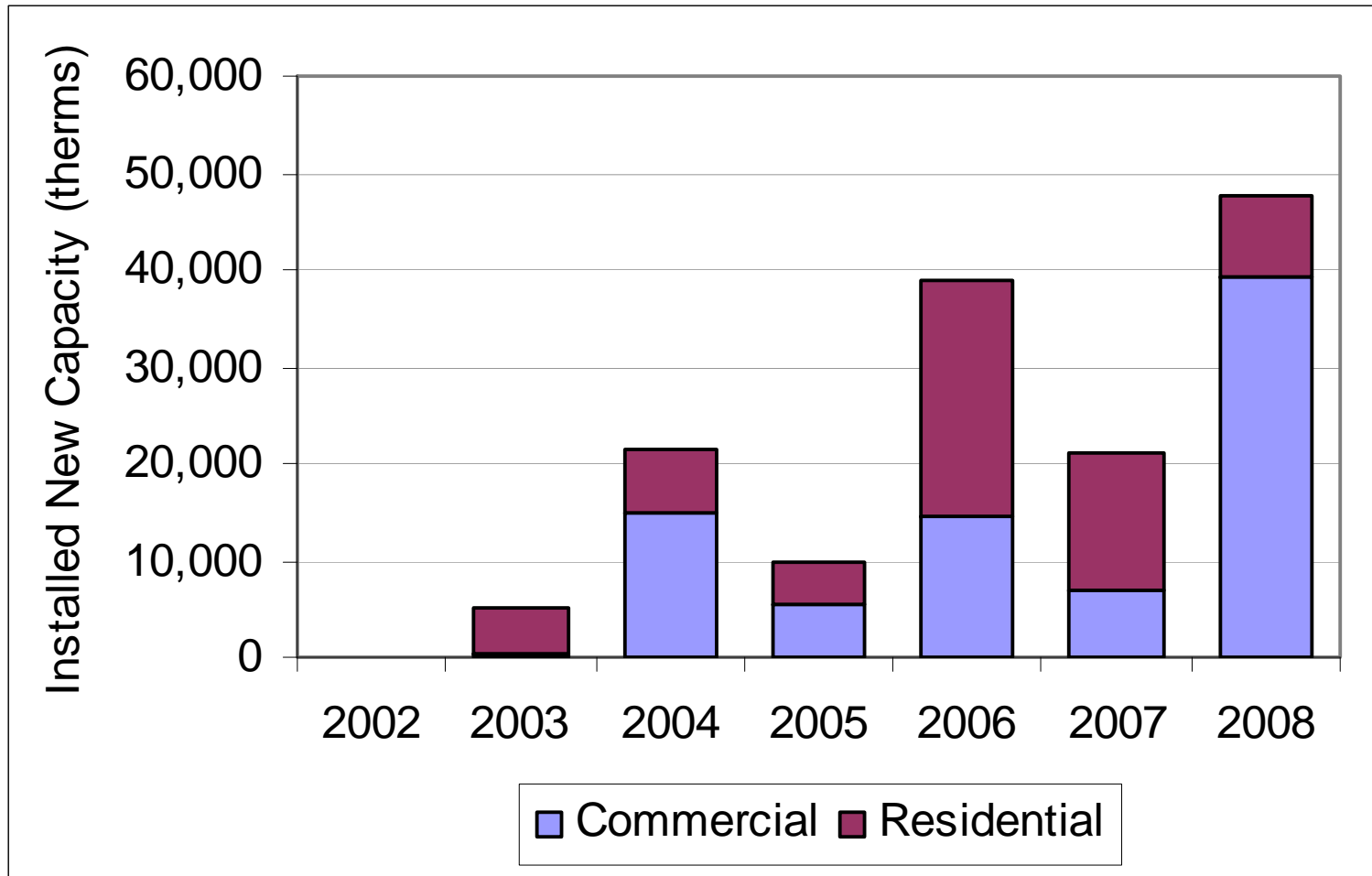
Year	Commercial	Residential
2002	0	1
2003	1	25
2004	3	31
2005	1	19
2006	7	111
2007	10	83
2008	28	101
Total	50	371

Residential systems saving 81,833 therms/year

Commercial systems saving 62,303 therms/year.

Annual volume of CO₂ avoided: 800 metric tons.

Annual Therm Savings



Other Signs of Market Movement

- Since 2002, the number of full-service installers has climbed from single-digit territory (6) up to 64.
- MREA's 2009 E&T curriculum on SHW
 - 9 introductory classes
 - 7 site assessor classes
 - 12 installation labs
 - 5 advanced level workshops

Other Policy Mechanisms

State

- Starting 7/1/09 SHW systems are exempt from sales tax
- SHW systems are exempt from local property taxes

Federal

- ITC covers 30% of system cost, good through 2016
- Accelerated depreciation
- In rural areas, REAP grants (Farm Bill Sec. 9007) cover 25% of system cost

How Is Wisconsin Doing?

The good news: Wisconsin is a regional leader.

Compared with several European countries, WI is lagging badly

The bad news: That's not saying much. There's virtually no installation activity in MI, IN, and IA

In US, SHW installation activity is most robust in CA, AZ, OR and HI.

Country or state	SHW collector area per capita (in sq. ft.)
Greece Austria	2.5
Germany	1.0
Wisconsin	<0.02

Barriers to Market Penetration

- Up-front cost
- Unfamiliarity w/ SHW -- low energy IQ
- Industry infrastructure (improving)
- Concern with quality (improving)
- Others
 - Shading – buildings, trees, etc.
 - Problematic building/rooftop orientation
 - Structural integrity issues (esp. residential)
 - US is relatively NG-rich compared w/ Europe

Third-Party Ownership Could Overcome High Up-Front Cost



Madison East H.S.

When this system was installed, the owner (Solar Mining Co.) sold therms to the school district. There was no up-front cost to the district.

Regenesis Power and H&H Solar submitted a bid to the State of Wisconsin to provide hot water to state facilities using solar energy. Under the arrangement specified in the RFP, a third-party would own the solar hot water systems and sell therms to the state. The contract is still under negotiation. Assuming an agreement is reached, H&H Solar would be responsible for installing as much as 1 million sq. ft. of solar water heating capacity.



H&H installer Shawn Young on the roof of Fire Station No. 1, Madison



Fire Station No. 6, Madison

Policy Recommendations - Global Warming Task Force

- Extend Focus on Energy awards to residential and business customers that use heating oil and liquid propane gas (LPG).
- Allow energy savings from solar hot water systems to be applied to utility renewable energy requirements.
- Update state building codes to achieve zero-energy usage for new residential and commercial buildings by a date certain.

Additional Policy Recommendations

- Encourage utilities to own and install (or contract with third parties to own and install) solar thermal systems serving customers with electric water heating systems.
- Require new multifamily dwellings with central water heating to derive 50% of their hot water load from solar energy.
- Require new buildings in certain sectors (hospitals, assisted living centers, fire stations) to derive 50% of their hot water load from solar energy.
- Require existing buildings in the same sectors to incorporate solar water heating whenever boilers are replaced

Wigwam Mills SHW Profile



Wigwam Mills, Sheboygan

Lead contractor: Craig Tarr, Energy Concepts, Hudson
System installer: Paul Steiner, Steiner Plumbing and Electric, River Falls
Distributor: Hot Water Products, Milwaukee

System type: Drainback
Collector space: 1,080 sq. ft
Annual fuel savings: 2,132 therms
Installation cost: \$115,000
Avoided CO2 emissions: 12.5 tons/year
Solar contribution to hot water load: 47%
Preheated water volume: 1,300 gallons
Incoming water temperature: @45°
Focus on Energy award: \$17,059
Tax credit: 30%
Cost per sq. ft: \$106
Estimated payback: 9 years
Installation date: February 2008



Park Central Apartments Profile



On the roof:
8-panel SHW
system and
10 kW of PV

Two buildings
74 units total,
all occupied

Park Central Apartments Profile

Contractor: Cardinal Solar, Sun Prairie

Location: Madison

Installation date: July 2008

Type of system: Pressurized loop

Collector space: 320 sq. ft.

Annual fuel savings: 645.5 therms

Solar contribution to hot water load: 37%

Installation Cost: \$34,000

Preheated water volume: 350 gallons

Incoming water temperature: 45°- 55°

Focus on Energy reward: \$8,558.80

Tax credit: 30%

Cost per sq. ft.: \$106

Estimated payback: 6.5 years

Rate of return: 13.3%

(Note: Assumes displaced NG to average \$1.50/therm)



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