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## **SOLAR THERMAL SYSTEMS — FOR DOMESTIC HOT WATER**

### **Description:**

Solar thermal applications cover a wide range of products and technologies. However, all are designed to capture solar energy in the form of heat. A home owner can use the sun for cooking, heating hot water for a home, warming a swimming pool, radiant heating, and even as an alternative to air conditioning.

Typically, residential solar thermal applications include either a passive collector design that incorporates a thermal mass with no mechanical systems, or an active design that includes electronic controls and circulating pumps. A thermal mass is any material that stores solar energy during the day and releases the energy in the form of heat at night, when the temperature is cooler. Common thermal masses include concrete, natural stone, and water. Both passive and active designs offset the amount of energy required by a household.

While the combinations of using solar thermal systems are endless, the most common application in use today centers around the production of domestic hot water, which is the focus of this paper. An average solar domestic hot water system can produce up to half the hot water required by a typical household in New York State. A typical system includes a solar thermal collector, a medium (such as anti-freeze or similar fluid) to transport heat from the collector, a heat exchanger, and a reservoir (collection) tank. Many systems include a secondary hot water tank to supplement heat and ensure hot water is always available.

In northern climates, including New York, where below-freezing temperatures are normal during the winter months, a flat plate collector or an evacuated tube collector—in combination with a non-freezing heat transfer fluid (medium)—is the solar thermal collector of choice. Both collector types are designed to be roof-mounted and can be linked together to form a thermal collection array that balances the hot water production needs of the household with installation costs.

Solar domestic hot water systems can be installed in any geographic area of the State, on any household or building with optimal sun exposure—reducing the cost of heating water and saving both energy and money. Using the sun as a clean, abundant, reliable, affordable, renewable energy source, solar thermal systems are considered a valuable element of a livable community.

### **Benefits:**

*For homeowners*

- The reduced cost of heating water with a solar thermal system makes homeownership more affordable for older people, people with disabilities, and families—supporting successful aging in place and supporting the efforts of family caregivers.

- The application of solar thermal systems for apartment buildings contributes to the affordability of rents for lower-income older people, people with disabilities, and families.
- A solar system may extend the life of a secondary hot water tank (if included in the system).

*For the community*

- Reduction in the annual amount of carbon dioxide and other greenhouse gases produced by conventional water heaters improves air quality in homes and across the community, creating a more healthy living environment.
- Use of solar thermal systems reduces use of costly conventional heating methods such as electricity (as well as reduces the drain on the country's electrical grid) and reduces the use of non-renewable fossil fuels.

**Impediments or barriers to development or implementation:**

- *Climate:*
  - Certain types of solar domestic hot water systems cannot be installed in climates that experience freezing temperatures.
- *Cost:*
  - Although installation costs are recouped over time through operational savings, the upfront cost to install a solar domestic hot water system is high. On average, a typical residential system costs approximately \$5,000 for materials, plus the cost of installation by a professional.
  - Solar domestic hot water systems require regular maintenance, which on average costs \$100 annually.
- *Codes:*
  - Zoning and building codes relating to the installation of solar domestic hot water systems are established at the local level and may vary from community to community.

**Resource—law:**

- Recording of solar energy easements, including solar hot water, is governed by New York State Real Property Law, Article 9: NY CLS Real P § 335-b (2008): <http://www.dsireusa.org/documents/Incentives/NY01Ra.htm>.

**Resource—example:**

- Jeffrey Perlman and Andrew McNamara (August, 2008), *Solar Domestic Hot Water Technologies Assessment: Final Report 08-09*. Albany, New York: New York State Energy Research and Development Authority. <http://www.nyserda.ny.gov/en/Publications/Research-and-Development/~media/Files/Publications/Research/Other%20Technical%20Reports/report%2008-09%20solar%20domestic%20hot%20water%20-%20web.ashx>

**Resource—written and Web:**

- DSIRE SOLAR—Established in 1995, DSIRE is an ongoing project of the North Carolina Solar Center and the Interstate Renewable Energy Council and is funded by the U.S. Department of Energy. DSIRE is a comprehensive source of information on state, local, utility, and federal incentives and policies that promote renewable energy and energy efficiency: <http://www.dsireusa.org>.
- U.S. Department of Energy, National Renewable Energy Laboratory (NREL):
  - **NREL's Mission:** NREL develops renewable energy and energy efficiency technologies and practices, advances related science and engineering, and transfers knowledge and innovations to address the nation's energy and environmental goals.
  - **NREL's Strategy:** NREL has forged a focused strategic direction to increase its impact on the U.S. Department of Energy's (DOE) and on our nation's energy goals by accelerating the research path from scientific innovations to market-viable alternative energy solutions. [www.nrel.gov](http://www.nrel.gov).
- Office of Energy Efficiency and Renewable Energy (December, 2003), *A Consumer's Guide: Heat Your Water with the Sun*. Washington, DC: U.S. Department of Energy. <http://www.nrel.gov/docs/fy04osti/34279.pdf>.