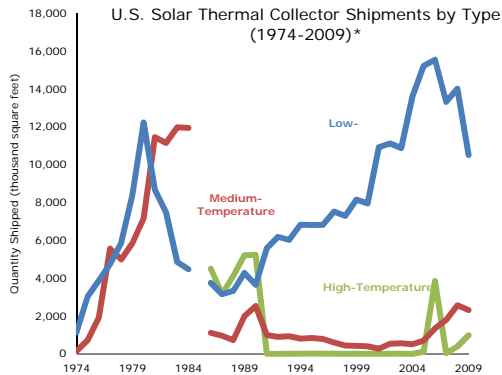


Solar Thermal Fact Sheet

Thermal Collector Production

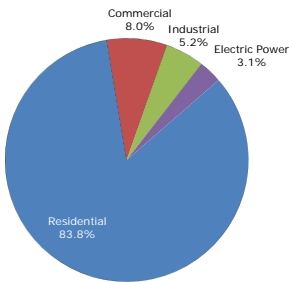


Quantity Shipped by Type (2009):
Low (< 110°F) 10,551,000 ft²
Medium (110-180°F) 2,307,000 ft²
High (> 180°F) 980,000 ft²

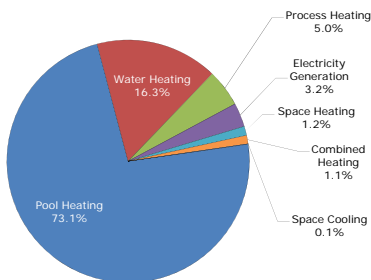
*No data for 1985

Thermal Collector Distribution

U.S. Solar Thermal Collector Shipments by Market Sector (2009)



U.S. Solar Thermal Collector Shipments by End Use (2009)



Key References

U.S. Department of Energy
 National Renewable Energy Laboratory
 Federal Energy Management Program
 U.S. Energy Information Administration

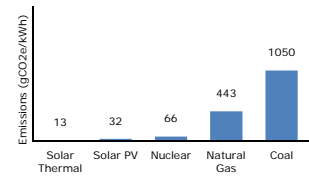
Cost Efficiency

Electricity Savings-to-Investment Ratio for Solar Water Heating



Greenhouse Emission Estimates

Lifecycle Estimates for Electricity Generators (2008)



Key Terms and Technologies

Solar Thermal Energy (STE)

Technology that uses design features to capture and transfer solar energy and use it for heating and cooling applications, often in buildings.

Solar Thermal Collectors

Low-Temperature Collectors
Operate below 110°F

Medium-Temperature Collectors
Usually operate between 140-180°F, but sometimes can operate as low as 110°F

High-Temperature Collectors
Operate above 180°F

Solar Air Heat

Technology that uses glazed and unglazed collectors to transfer solar insolation into buildings to heat and/or condition air. Used in residential, commercial, and industrial buildings.

Solar-Driven Cooling

Technology that uses solar heat to pump cool air through a building by way of convective heat transfer.

Process Heat

Technology that uses solar evaporation ponds and concentrated solar energy to provide integral heat storage for large, nonresidential buildings.

Seasonal Thermal Energy Storage

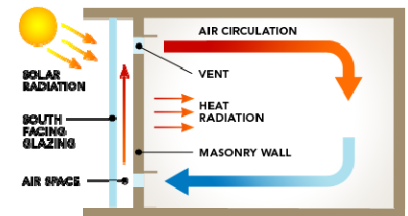
Process of storing solar thermal energy between seasons and in the short-term. Commonly includes stone, concrete, water as storage materials.

Passive vs. Active Solar

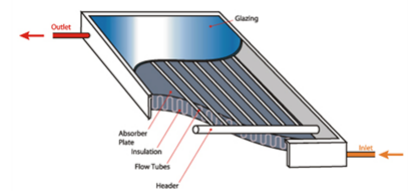
Passive solar design incorporates building features that absorb and distribute solar thermal energy without mechanical or electrical devices, which are used in active solar heating.

Technology Examples:

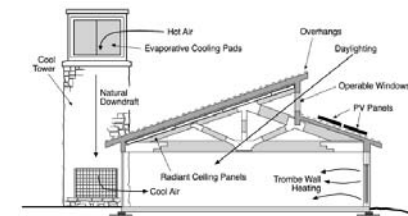
Trombe Wall (Passive)



Low-Temperature Collector (Active) Flat Plate Collector



Solar Chimney (Passive)



Source: NREL and NPS drawings.

Solar Thermal Fact Sheet References

Thermal Collector Production	Cost Efficiency	Greenhouse Emission Estimates
<p>Bredehoeft, G. (2012, September 27). Solar thermal collector shipments by type, price, and trade, 1974-2009. <i>U.S. Energy Information Administration - Annual Energy Review 2011</i>. Retrieved April 15, 2014, from http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb1006</p>	<p>Energy technology cost and performance data for distributed generation. (n.d.). <i>National Renewable Energy Laboratory</i>. Retrieved April 15, 2014, from http://www.nrel.gov/analysis/tech_cost_data.html</p>	<p>Sovacool, B. K. (2008). Valuing the greenhouse gas emissions from nuclear power: A critical survey. <i>Energy Policy</i>, 36(8), 2950-2963.</p>
Key Terms and Technologies		
<p style="text-align: center;">Thermal Collector Distribution</p> <p>Bredehoeft, G. (2012, September 27). Solar thermal collector shipments by market sector, end Use, and type, 2001-2009. <i>U.S. Energy Information Administration - Annual Energy Review 2011</i>. Retrieved April 15, 2014, from http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb1007</p>	<p>Solar Thermal Energy (STE) Energy explained: Solar thermal collectors. (n.d.). U.S. Energy Information Administration. Retrieved April 15, 2014, from http://www.eia.gov/energyexplained/index.cfm?page=solar_thermal_collectors</p> <p>Solar Thermal Collectors Bredehoeft, G. (2012, September 27). Solar thermal collector shipments by type, price, and trade, 1974-2009. <i>U.S. Energy Information Administration - Annual Energy Review 2011</i>. Retrieved April 15, 2014, from http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb1006</p> <p>Solar Air Heat Learning: Solar process heat. (n.d.). <i>National Renewable Energy Laboratory</i>. Retrieved April 15, 2014, from http://www.nrel.gov/learning/re_solar_process.html</p> <p>Solar-Driven Cooling Learning: Solar process heat. (n.d.). <i>National Renewable Energy Laboratory</i>. Retrieved April 15, 2014, from http://www.nrel.gov/learning/re_solar_process.html</p> <p>Process Heat Learning: Solar process heat. (n.d.). <i>National Renewable Energy Laboratory</i>. Retrieved April 15, 2014, from http://www.nrel.gov/learning/re_solar_process.html</p> <p>Seasonal Thermal Energy Storage Hui, L., Edem, N. K., Nolwenn, L. P., & Lingai, L. (2011). Evaluation of a seasonal storage system of solar energy for house heating using different absorption couples. <i>Energy Conversion and Management</i>, 52(6), 2427-2436.</p>	<p>Passive vs. Active Solar Energy explained: Solar thermal collectors. (n.d.). U.S. Energy Information Administration. Retrieved April 15, 2014, from http://www.eia.gov/energyexplained/index.cfm?page=solar_thermal_collectors</p> <p>Technology Examples:</p> <p><i>Trombe Wall (Passive)</i> http://meadowlarkbuilders.com/assets/trombe-wall-day.png</p> <p><i>Low-Temperature Collector (Active)</i> http://renewables.morris.umn.edu/images/solar/flatplate-diagram.png</p> <p><i>Solar Chimney (Passive)</i> http://upload.wikimedia.org/wikipedia/commons/c/c5/Zion_Visitors_Center_Cool_Tower.PNG</p>