



BIOMASS



SOLAR



WIND

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COURTESY OF ENERGY CENTER OF WISCONSIN

Park Central Apartments in downtown Madison offers its tenants solar hot water and solar electricity as green amenities (see case study on next page).

Water heating can be a significant cost in the operation of multifamily residential buildings. On average, water heaters account for between 15 and 25 percent of the energy consumed by residents in multifamily dwellings, according to the Energy Information Administration (EIA), the independent statistical agency of the U.S. Department of Energy. For some multifamily residences, a solar water heating system, which uses the sun's energy to preheat water entering an existing gas or electric water heater, may be a cost effective means to reduce monthly heating bills.

HOW THESE SYSTEMS WORK

Solar water heating systems are comprised of three main components: solar collectors, a closed-loop, insulated piping system, and a storage tank. Collector arrays will typically exceed 100 square feet in surface area to support the hot-water demand of multifamily residences. To maximize solar absorption, solar collectors are usually placed on an unshaded section of the roof facing south at a 30 to 60 degree tilt angle.

To prevent freezing in colder climates, pipes within a solar hot water system are filled with a non-toxic anti-freeze solution, called solar fluid. Pumps cycle this fluid

through the solar collector where it absorbs the sun's energy. The heated solar fluid then travels through insulated pipes to a storage tank, where a heat exchanger indirectly preheats city water. Depending on the weather and season, the solar fluid can reach temperatures of 70 to 140 degrees Fahrenheit before exiting a collector. The system will deliver energy savings as long as the temperature of the solar fluid entering the heat exchanger exceeds that of city water (typically 50 degrees Fahrenheit). In some cases, systems can supply a traditional gas or electric water heater with enough preheated water to reduce heating costs by as much as 50 percent.

In multifamily buildings, the optimal configuration is a centralized installation that can efficiently supply preheated water for the entire building. In addition to providing for the tenants' domestic needs, these systems can supply hot water for such shared amenities as heated swimming pools, laundry facilities, communal kitchens and restrooms. Using solar water heating systems to offset the energy costs of maintaining these shared amenities can save both facility owners and tenants a significant amount of money over time.

CASE STUDY—PARK CENTRAL APARTMENTS—MADISON, WISCONSIN



COURTESY OF RENEW WISCONSIN

Although not visible from the street, the solar energy systems at the Park Central Apartments add green value for landlord and tenant alike. The solar hot water panels (at right) are flanked by the 10 kW solar electric system.

Developers of multifamily dwellings increasingly are looking for strategies to integrate energy saving features into new construction. In part, this trend is a response to high prices for natural gas and electricity. However, developers are also integrating energy saving measures into new construction to improve the marketability of their properties and to satisfy customer demand for greener living spaces. To meet this demand, developers must examine multiple energy saving technologies, spanning measures from installing energy efficient lighting and appliances to using renewable solar energy.

Park Central Apartments, located in downtown Madison, is a development that has integrated solar hot water technology into a complete portfolio of energy saving measures. Park Central Apartments' solar hot water system services 52 of the 76 units (which range from studio to three-bedroom units). The solar hot water system will save its tenants an estimated 37 percent of the building's water-heating load. In addition to the solar hot water system, the electrical load for common spaces within the Park Central Apartments building is partly satisfied by a 10-kilowatt (kW) solar array.

The developer implemented several energy efficiency measures to reduce the building's overall energy consumption, allowing the renewable energy system to satisfy more of the energy load. For example, the units are outfitted with ENERGY STAR® qualified appliances and windows, energy saving showerheads and aerators, and the developer also installed a high efficiency furnace. The heavily insulated basement parking area is not heated, further reducing the building's heating load. In addition, according to the developer, the R-value (a measure of heat resistance for insulation) for apartment units exceeds code by 20 percent. The developer's passion for renovating old public buildings and new construction

with energy saving measures has helped to make it Wisconsin's first "green built" multifamily residence.

Park Central Apartments' solar hot water heater is a closed-loop, pressurized hydraulic system. The 320-square-foot solar collector is located on the building's roof and is largely hidden from view at the street level. Pumps cycle the solar fluid from the collector to a set of hot water tanks located five stories below within the building's basement. Because the solar hot water system was installed during construction, the intake and return pipes were routed from the roof to the hot water storage tanks using interior space. Routing pipes through an interior space—as opposed to routing them along the outside of a building—limits heat loss and improves system efficiency. Physically, the limiting factor for the solar hot water system was the allocation of space for the hot water storage tanks in the basement. Otherwise, additional roof space could have been used to increase the size of the collector and further reduce the building's natural gas water heating load.

FINANCIAL INCENTIVES REDUCE COSTS

According to the developer, the solar water heating system installer was a valuable resource when applying for and obtaining financial incentives from Focus on Energy and the federal government. Integrating the installation of the solar water heating system with the rest of the building construction was relatively seamless. In the end, the decision to "go solar" was less about the complexities of adding additional systems to the existing HVAC system design and more about whether solar technology could be installed affordably and provide an attractive return on investment. With the help of Focus on Energy's financial incentives for new construction, energy efficiency upgrades and renewable energy systems—which totaled more than \$65,000—the projects offered a practical return for this multifamily building.

CASE STUDY—PARK CENTRAL APARTMENTS—continued

CASE STUDY FACTS

FACILITY

Park Central Apartments—Madison, Wisconsin

Contact: Stone House Development, Inc.

- Phone: 608.251.6000
- E-mail: info@stonehousedevelopment.com

Installer: Cardinal Heating and Air Conditioning
Sun Prairie, Wisconsin

- Phone: 608.837.9367
- E-mail: keith@cardinalhvac.com

Electrical Supplier: Madison Gas and Electric

Gas Supplier: Madison Gas and Electric

SYSTEM CHARACTERISTICS

- Closed-loop, hydraulic solar hot water heating system
- 320-sq./ft. solar collector, manufactured by Solar Skies
- 350 gallons of preheated water
- 45–55 degree F incoming water temperature
- 37-percent contribution to hot water load

SYSTEM COSTS AND BENEFITS*

- Total installation cost of \$34,000
- Focus on Energy incentives of \$8,558
- Federal tax credit of \$10,200
- State & federal depreciation of \$10,900 (over five years)

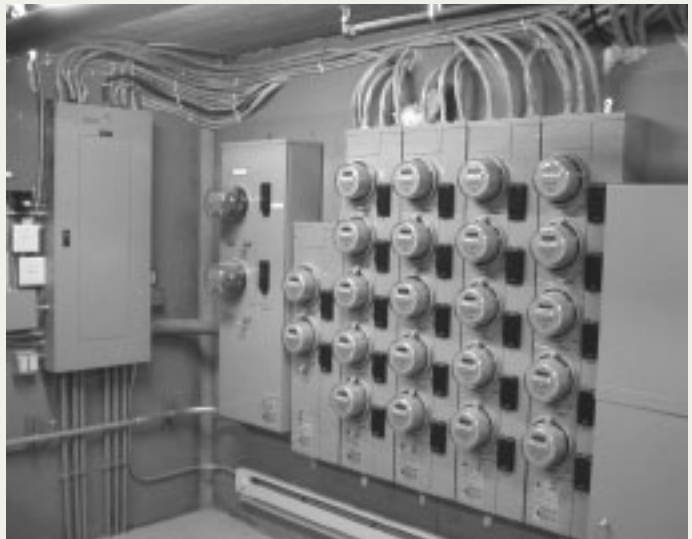
Energy Savings: 856 therms (25 percent of building's water-heating load)

Estimated annual dollar savings: Approximately \$940 for the first year

*Incentives differ among specific sites and systems and federal taxes may apply. Consult a tax professional and apply for your Focus on Energy reward after calculating water heating load and obtaining system costs.



COURTESY OF ENERGY CENTER OF WISCONSIN



COURTESY OF FULL SPECTRUM SOLAR

Most solar water heating systems are financed using a mix of cash, public or private loans, Focus on Energy incentives and federal tax credits. Larger solar water heating systems typically offer greater returns on investment than those designed for smaller facilities. Regardless, facilities of all sizes can benefit from installing a solar water heating system given the existing Focus on Energy and federal incentives. Focus on Energy currently offers implementation grants of up to 25 percent of the total cost of a newly installed system. Implementation grants are higher (35 percent) for government and nonprofit organizations. At the federal level, qualifying property owners can take advantage of a one-time tax credit equal to 30 percent of total system costs. The federal government offers additional tax savings through the use of an accelerated, five-year depreciation schedule. All told, incentives

can add up to more than 60 percent of the cost of a new solar hot water system.

It is difficult to place a dollar amount on the environmental benefits associated with installing a renewable energy system in a multifamily residence. However, many developers now recognize that reducing a facility's carbon footprint may positively affect its marketability, and property owners should feel justified in adjusting the rent to help pay for a green amenity like solar water heating. A recent survey conducted by the U.S. Green Building Council shows that consumers are becoming increasingly aware of the benefits associated with choosing green living spaces. In addition to lower energy costs, the vast majority of people living in green homes feel that their living space allows them to pursue a healthier and more sustainable lifestyle.¹

¹ The Green Home Consumer—Driving Demand for Green Homes, McGraw-Hill Construction, 2008.

HOW TO GET STARTED

Interested building owners are encouraged to take advantage of Focus on Energy's site assessment program to determine if solar water heating is a practical investment. These assessments involve a visit to your location by a trained and certified site assessor. With your assistance, an assessor will estimate the size of a solar water heating system that best matches your average water-heating load. The assessor will also determine if there is adequate room at the facility for collectors, pipe runs and water storage tanks. Finally, the assessor will provide a written report including the information collected during the site assessment, cost estimates for equipment and installation and a summarized financial analysis of the investment. Focus on Energy will pay for 50 percent of the cost of a site assessment for an eligible customer. For more information, visit focusonenergy.com/siteassessments.

If the assessment report indicates that a solar water heating system is appropriate for your facility, the next step is to solicit bids for the project. To qualify for Focus on Energy incentives, the solar water heating system must be installed by a Focus on Energy Full Service Installer. A list of approved installers is provided with the

assessment report, but can also be found by visiting focusonenergy.com/fullserviceinstallers. Solicit several bids from approved installers before choosing one for your project. You must submit a completed Cash-Back Reward application and receive Focus on Energy approval before purchasing, ordering or installing any equipment or services. Finally, it is a good idea to ensure that the installer you select is knowledgeable about local permit requirements and can obtain them if necessary.

LEARN MORE

Focus on Energy

For information on Focus on Energy renewable energy incentives.

focusonenergy.com/reincentives

For renewable energy information.

focusonenergy.com/renewable

Database of State Incentives for Renewables & Efficiency

For a complete listing of other local and federal incentives, consult the Database for State Incentives for Renewables and Efficiency (DSIRE).

dsireusa.org

