Sustainable Energy Resources for Consumers (SERC) Success Story: Maryland

The Maryland SERC program leverages diverse and bold energy upgrade measures to maximize savings

Maryland boosts energy savings for low-income residences with wind turbines; solar photovoltaics (PV); geothermal heat pumps; mini-split ductless heat pumps; hybrid heat pump water heaters; and high-efficiency heating, ventilating, and air-conditioning (HVAC) systems.

In 2007, the Energy Independence and Security Act (EISA) included a provision that in any year for which the U.S. Department of Energy's (DOE) Weatherization Assistance Program (WAP) funding exceeded $275 million, up to 2% of the funding could channel through to SERC to pay for "materials, benefits, and renewable and domestic energy technologies" that are not traditionally allowed under WAP. Through the increased funding of the American Recovery and Reinvestment Act of 2009, $90 million was invested to test these types of technologies in low-income residences and to help local agencies expand their skillsets to install these technologies. These appropriated SERC funds went to nearly 100 local agencies throughout 27 states that were currently installing, testing, and reporting on the effectiveness of these newer technologies.

Maryland has installed some of the most challenging Energy Efficiency and Renewable Energy (EERE) upgrades with a grant from the DOE SERC program for low-income families. WAP granted Maryland $2,561,300 to install residential wind turbines, solar photovoltaics (PV), geothermal heat pumps, mini-split ductless heat pumps, hybrid heat pump water heaters, and high-efficiency heating, ventilating, and air conditioning (HVAC) systems. The systems are expected to save an estimated 20% to 30% on energy costs for low-income residents. As recommended for any home receiving renewables, the residents' homes first received WAP weatherization, thus completing the recommended first step in well-planned EERE upgrades.

Maryland SERC was carried out by two local weatherization agencies: Chesapeake and Ohio (C&O) Conservation in the Hagerstown area and the Garrett County Community Action Committee in the Oakland area, both in the upper northwest rural area of Maryland. The two agencies will have affected 215 households in total, with upgrades completed by a combination of in-house crews and contractors. C&O Conservation will have installed 165 upgrades and Garrett County Community Action Committee will have installed 63 upgrades in total. An NREL monitoring visit in March of 2013 reported the two agencies have become efficient at quality installations, and they were innovative in addressing challenges experienced at the beginning of the SERC program. Staff carefully selected technologies appropriate for Maryland's climate and ensured that clients/residences were well-matched to the appropriate technology, especially regarding wind, geothermal and solar PV.

In Swanton, Maryland, a 2.1 kilowatt (kW) residential wind turbine with a 45 foot hub height is pictured above. *Photo by James Salasovich, NREL*

In Maryland's application to SERC, C&O Conservation presented a case to upgrade 150 HVAC systems that were discovered as faulty during weatherization tests in their service territory. In the end, they were able to install 165 units. One client had a dual fuel system installed, a 20 seasonal energy efficiency ratio (SEER) heat pump and the existing oil furnace) and their oil consumption dropped by 75% after receiving a high-efficiency heat pump. Another client had a dual-fuel SEER heat pump and a 92% efficient gas furnace installed. His energy needs "decreased so much that the utility company accused him of tampering with the meter," stated Nancy Gilbert of C&O Conservation.

A Wide Variety of EERE Options Offered to Low-Income Families by Maryland SERC

- Wind Turbines (3)
- Solar PV (16 single-family homes)
- Geothermal Heat Pumps (4)
- Mini-Split Ductless Heat Pumps (10)
- Hybrid Heat Pump Water Heaters (23)
- Duel Fuel Heat Pumps
- All Climate Heat Pumps (7)
- Home Energy Monitors (60)

Two small wind projects are rated at 2.1 kW each and reduced the client's annual electric savings by as much as 50%

- Hub height is 45 feet
- Cost $21,500 each
- 12-foot diameter rotor with a downwind rotor
- Blades are made of a 3-layer fiberglass reinforced composite
- Rotor speed is between 50 and 330 revolutions per minute (rpm)
- Installation price is $10.24 per kW
- Life expectancy is 25 years
- Maintenance of turbine is required
- Client saw a 50% drop in electric charges from utility company and reported overall satisfaction.

C&O Conservation also installed oil, gas, electric, and hybrid HVAC systems.

Mini-split ductless heat pumps systems save energy for several reasons. Firstly, they have no ducts, so they avoid the energy losses associated with the ductwork of central forced air systems. Duct losses can account for more than 30% of energy consumption for space conditioning, especially if the ducts are leaky and in an unconditioned space such as an attic or crawl space. Secondly, if you heat with electricity, a heat pump can trim the amount of electricity you use for heating by as much as 30% to 40%. You can take advantage of the fact that – unlike earlier versions – newer models of ductless mini-split heat pumps operate effectively in cold temperatures. To learn more, visit DOE's EERE's energy basics website: http://www.eere.energy.gov/basics/buildings/ductless_mini_split.html.

Maryland also wanted to install dual fuel or hybrid heat pumps that combine a high-efficiency heat pump with an existing home furnace to create one system that heats, cools, and saves energy. The dual fuel heat pump system is designed to boost heating efficiency. When the heat pump is running, the furnace rests. Since heaters can lose 31% to 52% to move heat rather than to produce it, energy is saved using the dual fuel heat pump. The heat pump will keep the average home comfortable until the temperature outside drops to 33°F. It's only when your home starts to lose heat faster than the heat pump can replace it that the furnace activates. Megan Bauer, Energy Specialist of the Oakland area, stated, "Some of the clients who received these installations were elderly and had previously relied on heat from expensive electric baseboard heaters or even wood stoves that they had to constantly tend to for heat. Although this funding source was very unique and very forward thinking, we remain hopeful that such funding will again become available for us to facilitate another program like SERC."

The Maryland SERC program installed some of the most diverse and bold SERC retrofits, including several geothermal heat pumps with a vertical well field. In the photos above, the geothermal well field is made up of 3 bore holes with depths of 185, 175 feet and 165 feet deep. The well field is located in the side yard and the piping from the ground carries transfer fluid and enters the residence in the basement at ground temperature (50º-70ºF), where the heat pump air handler is located inside. The heat pump heats the incoming air up to 10º-20ºF, or to the desired room temperature. The pumping throughout the ground loop is done by two 2.5-horsepower high-efficiency pumps.

Mini-Split Ductless Heat Pump. *Photo by James Salasovich, NREL*

In Garrett County, Maryland, a modular home receives a 2.1 kW wind turbine in a rural setting. The recipient noticed a 50% drop in electricity use. *Photo by James Salasovich, NREL*

The home was selected because the technology fit well with the client's energy needs and the ability to understand and maintain the system. The system cost $34,000 and will supply heating and cooling for approximately 30 to 40 years.

Maryland SERC is scheduled to finish installations by fall of 2013. Oak Ridge National Laboratory (ORNL) will be undertaking an evaluation of the SERC projects that will cover both quantitative impacts of the technologies installed as well as process evaluation of the agencies and their projects. To learn more about ORNL's evaluation work, please visit the Oak Ridge National Laboratory website: *www.ornl.gov/*

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