

Solar Roofing Shingles

Integrating photovoltaics into roofing shingles produces clean solar power

Thin-film photovoltaic (PV) cells are now doubling as rooftop shingles. U.S. Department of Energy (DOE) research on thin-film PV and a growing interest in integrating PV into buildings has resulted in this new building material that generates electricity using sunlight.

The new PV shingles are being manufactured by a U.S. company, United Solar Systems Corporation, which has already achieved quarterly sales of \$1 million. The company employs 90 people in Troy, Michigan, and San Diego, California. By 2001, the company expects to achieve annual domestic sales of 3 megawatts (MW) and equal or greater international export sales.

The energy generated from a building's PV rooftop shingles can provide power both to the building and to the utility's power grid.

Several demonstration projects, including a solar rooftop system showcased at the Southface Energy and Environmental Resource Center in Atlanta, Georgia, have proven that these innovative shingles can provide clean electricity.

PV shingles offer many advantages:

- Provide the same protection, durability, and flexibility as ordinary asphalt shingles
- Aesthetically appealing, blending with standard roofs and normal home construction
- Replaces roofing material—additional shingles underneath are unnecessary
- Low installation costs
- Lightweight.

The Office of Power Technologies is part of the Office of Energy Efficiency and Renewable Energy

Highlights

- ***Two-thirds of the electricity generated in the United States is now used in buildings.***
- ***Electricity generated by photovoltaic (PV) shingles on buildings supplies power to the building and to the utility grid.***
- ***PV shingles provide environmentally safe, clean energy to help meet future electrical needs.***
- ***Quarterly sales of PV shingles have hit \$1 million.***
- ***DOE research and development progress on thin-film PV contributed to a manufacturer's decision to open the first large-scale production plant in the world.***



NREL/PIX04577

The PV shingles shown here on a house in Atlanta, Georgia, won Popular Science magazine's grand award for "What's New in Environmental Technology." The PV shingles cover the inner portion of the lower roof section.

By 2001, United Solar Systems Corporation expects to achieve domestic annual sales of 3 MW.

These flexible solar shingles were developed through a partnership between the U.S. DOE, Energy Conversion Devices, Inc., and United Solar Systems Corporation under several programs, including Building Opportunities in the United States for PV (PV:BONUS).

By bringing together industry teams of architects, building contractors and materials manufacturers, utilities, and PV systems designers, PV:BONUS has helped accelerate the development of innovative PV products for buildings.



NREL/PTX04566

Thin-film PV shingles installed on building rooftops can take the place of conventional asphalt shingles and generate electricity.

Through ongoing support from a related DOE program called the Thin-Film Partnership, United Solar Systems Corporation recently opened a 5-MW amorphous-silicon PV manufacturing plant in Michigan. The first large-scale, thin-film PV plant in the world, it produces the PV material for the solar shingles.

The solar roofing shingles project is part of DOE's Photovoltaics Program, which by 2010, offers the potential to:

- Create a \$2 billion PV industry in the United States
- Remove 10 million metric tons of carbon dioxide from the air each year worldwide
- Cut the price of PV electricity to less than \$0.1 per kilowatt-hour
- Create nearly 50,000 high-tech jobs in the United States.

To make photovoltaics less expensive and more reliable, DOE's five-year plan calls for research in advanced thin-film PV, innovative manufacturing techniques, and more efficient PV cells.



U.S. Department of Energy

Energy Conversion Devices, Inc.

United Solar Systems Corporation

For More Information:

Visit the partners' Web sites to learn more about this successful renewable energy technology:

United Solar Systems:
<http://www.ovonic.com/unitedsolar/roof.html>
<http://www.ovonic.com/unitedsolar/roofapps.html>

U.S. Department of Energy:
<http://www.eren.doe.gov/pv/pubs.html>
<http://www.eren.doe.gov/pv/award.html>

Publications:
U.S. Department of Energy, *Photovoltaic Energy Program Overview—Fiscal Year 1996*. DOE/GO-10097-365, April 1997.
www.eren.doe.gov/pv/96overview.html

or contact:
Energy Efficiency and Renewable Energy Clearinghouse (EREC)
P.O. Box 3048
Merrifield, VA 22116
(800)-DOE-EREC
www.eren.doe.gov/consumerinfo/
email: doe.erec@nciinc.com



Produced for the
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

by the
National Renewable Energy Laboratory
a DOE national laboratory

DOE/GO-10098-491
September 1998, revised August 2000

Printed with renewable-source ink on paper containing at least 50% wastepaper, including 20% postconsumer waste

