



Solar Solutions

Unleash the power

O F S I L I C O N



Solar Energy 101: The Basics

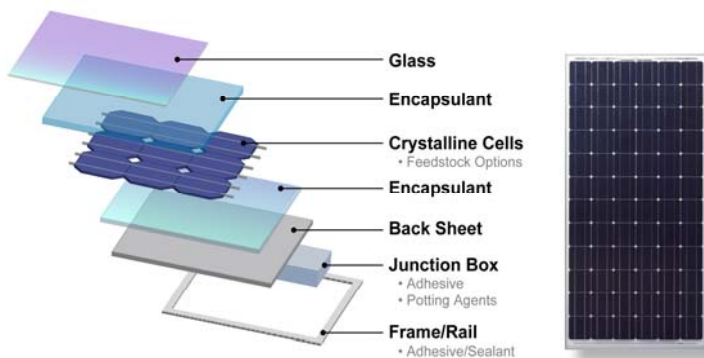
Solar is one of the most talked-about alternative energy sources in the world today. Enough energy comes from the sun in one hour to power the global population for a year. Even though the amount of sunlight varies around the world, sunlight is a totally renewable resource, unlike oil, coal and natural gas. As long as life exists on the earth, sunlight will play a role.

We know that our sun is actually a very large and hot star emitting lots of power in its rays. How do we go about harnessing that power effectively, so it can help generate electricity, which is an important part of modern life?

The sun's rays transmit both heat and light. The heat is used in thermal systems to produce hot water and hot air for commercial and residential heating use, as well as power generation with steam or sterling engines. The light is used in photovoltaic systems to convert light to electricity, and this is one of the main areas where our solar industry is concentrating its efforts today.

The solar industry, like many others, has its own unique vocabulary. For example:

Photo (light) + voltaic (produces voltage) = photovoltaic (PV) system



Solar modules consist of layers of materials like a sandwich. A solar cell is made from a thin wafer of silicon, similar to computer chips, but bigger.

The light carries energy into the cell, and the cell and the wires connected to the cell convert the light energy into another kind of energy - electric current. No electricity is stored in the cell. If you want to understand more about photons and electrons and how this all works a quick video tutorial is available: www1.eere.energy.gov/solar/video/solarcell1.mpg.

Solar cells are interconnected in a matrix to form a module. One solar cell produces electricity at a voltage of approximately 0.5 volts at room temperature, so 36 cells connected together in a module produce enough voltage to charge a 12-volt battery. However, the solar cell heats up while exposed to the sun, reducing the operating voltage to about 14-15 volts. A 12-volt battery needs about 14 volts to charge it, so the 36-cell module is the standard used in charging 12-volt batteries. The cells are connected and placed between a tough glass front and a back surface within a frame and sealed, as shown in the illustration. Dow Corning is developing encapsulant technology to protect the cells in the module. The encapsulant keeps out moisture and contaminants, which could cause the module to fail, so it is a critical part of the manufacturing process. Dow Corning® brand products are also used to seal the frame, adhere the junction box on the back of the panel and potting agents to fill the junction box. The potting agents protect the electrical components in the junction box.

Once assembled, the panel is ready for installation. Additional equipment is needed for off-grid systems, including a battery storage system. Off-grid systems are stand-alone units that do not feed electricity back to a power company.

An example of an on-grid system is the solar panels installed by Dow Corning and Hemlock Semiconductor Corporation at the Dow Diamond

baseball park, where the excess power generated is sold back to Consumers Energy, the local utility company. The panels generate electricity year-round.

Dow Corning and Hemlock Semiconductor both play significant roles in the solar energy industry. Dow Corning provides materials and services for the entire solar industry, from the basic building blocks of silicon feedstock for ingots and wafers production to solar module frame assembly and sealing materials. Hemlock Semiconductor is a world leader in the production of polycrystalline silicon, the cornerstone material used to produce solar cells that harvest energy from sunlight.



Dow Diamond, Midland, Michigan

Dow Corning Corporation, based in Midland, Michigan, provides performance-enhancing solutions to serve the diverse needs of more than 25,000 customers worldwide. A global leader in silicon-based technology and innovation, offering more than 7,000 products and services, Dow Corning is equally owned by The Dow Chemical Company and Corning, Incorporated. More than half of Dow Corning's annual sales are outside the United States.

Hemlock Semiconductor Corporation is a world leader in the production of polycrystalline silicon and other silicon-based products used in the manufacturing of semiconductor devices and passive solar cells and modules. Headquartered in Hemlock, Michigan, Hemlock Semiconductor is owned in majority by Dow Corning Corporation.
www.hsccpoly.com

For more information about the solar technology please visit www.dowcorning.com/solar or email us at solar.solutions@dowcorning.com.

LIMITED WARRANTY DISCLAIMER

To the full extent permitted by law, Dow Corning disclaims any and all liability with respect to your use of, or reliance upon, any report, data, procedure, conclusions or opinion contained in the information provided to you. You agree that you have the sole obligation to decide whether information provided by Dow Corning will work in your processes or will be safe and efficacious in your applications. It is your sole responsibility to determine the suitability of any products made by or for you in reliance on the information provided to you. Dow Corning does not make any warranty or representation, express or implied, with respect to the utility or completeness of the information provided to you and specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

AV No. pending, 10460

Dow Corning is a registered trademark of Dow Corning Corporation.
©2008 Dow Corning Corporation. All rights reserved.

Form No. 06-1028-01



Solar
Solutions