

How Solar Works

THE SLEEK SOLAR PANELS THAT STRETCH OUT IN FRONT OF YOU ARE CONVERTING ENERGY FROM THE SUN—93 MILLION MILES AWAY FROM EARTH—INTO ENOUGH ELECTRICITY TO POWER ABOUT 1,700 MINNESOTA HOMES FOR ONE YEAR.

The 10-megawatt system covers about 62 acres and is made up of 116,208 panels and eight inverters that convert the direct current electricity produced by the solar power plant into the alternating current used by most of the appliances and devices in our homes and businesses. The expected output from this system is about 17,000,000 kilowatt-hours, or 17,000 megawatt-hours per year. A typical Minnesota Power residential customer uses about 9,600 kilowatt-hours per year.

These thin-film panels, manufactured by First Solar of Ohio, with their uniform black appearance may look different from other solar panels you have seen. They're made by coating glass with a thin layer of cadmium telluride that absorbs the sun's energy and converts it to electricity. Other solar panels commonly used on homes and businesses are made with silicon crystals.

The solar power plant is constructed on what used to be a field where Camp Ripley stored gravel. Contractors cleared and leveled the site, installed underground electrical cable and built the racks to support the panels before using specialized equipment to install the panels.

Crews used a small excavator-style vehicle outfitted with mechanical arms to place panels in position, eliminating the need for workers to climb ladders and helping them to install as many as 4,000 panels a day. Native grasses and wildflowers planted among the panels will help provide food for pollinators such as bees and butterflies.

The power produced by any solar photovoltaic system will vary throughout each day and season. A solar power plant obviously will produce more power during the longer days of summer and less during the shorter days of winter. Weather also plays an important role in power production. Solar panels produce more electricity on clear, cool days than when it is overcast and hot. Shading from clouds can significantly affect the amount of electricity produced.

The 193 rows of solar panels face due south and each is installed at a 35-degree angle. This allows the panels to face directly into the sunlight more of the time, and the tilt helps them shed snow more quickly, an important consideration in Minnesota. Snow-covered panels can't produce electricity.

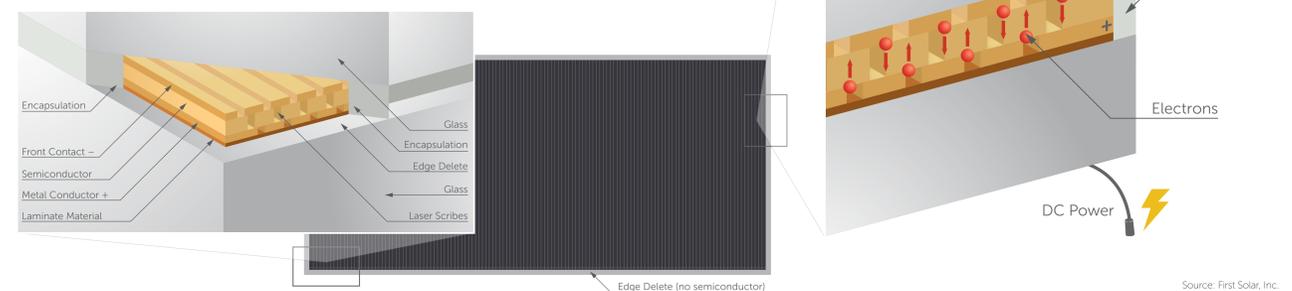
Despite its size, the system has no moving parts. That keeps maintenance to a minimum, perhaps an occasional washing if the panels get too dusty. The solar power plant is designed to withstand half-inch hail and 105 mph winds and is expected to generate electricity for at least three decades.



Photo courtesy of First Solar, Inc.

The photovoltaic (PV) process

Sunlight hits the solar panel
Photons, the sun's energy, can be reflected, absorbed or pass through the panel
As energy is absorbed, electrons are freed
The free electrons move within an electric field, which creates an electrical current in the cell
Metal contacts in the panel collect this current and conduct it outside the panel, producing useful electrical power



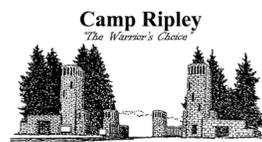
Source: First Solar, Inc.

Solar panels

Solar panels are made out of a semiconductive material, in this case cadmium telluride, treated so that the sun's rays create a flow of electrons, or electrical current.

Solar power plant

Energy from the solar array is converted into alternating current and fed into Minnesota Power's distribution system. From these wires and poles, the electricity flows to homes and businesses.



A SPECIAL THANK YOU



TO OUR CONTRACTORS