



Mirrors focus the power of about 600 suns on a receiver at the top of the Solúcar tower.

Solar Energy in Spain

Spain is forging ahead with plans to build concentrating solar power plants, establishing the country and Spanish companies as world leaders in the emerging field. At the same time, the number of installed photovoltaic systems is growing exponentially, and researchers continue to explore new ways to promote and improve solar power. This is the seventh in an eight-part series highlighting new technologies in Spain and is produced by Technology Review, Inc.'s custom-publishing division in partnership with the Trade Commission of Spain.

From the road to the Solúcar solar plant outside Seville, drivers can see what appear to be glowing white rays emanating from a tower, piercing the dry air, and alighting upon the upturned faces of the tilted mirror panels below. Appearances, though, are deceiving: those upturned mirrors are actually tracking the sun and radiating its energy onto a blindingly white square at the top of the tower, creating the equivalent of the power of 600 suns. That power is used to vaporize water into steam to power a turbine.

This tower plant uses concentrating solar technology with a central receiver. It's the first commercial central-receiver system in the world.

Spanish companies and research centers are taking the lead in the recent revival of concentrating solar power (CSP), a type of solar thermal power; expanses of mirrors are being assembled around the country. At the same time, Spanish companies are investing in huge photovoltaic (PV) fields, as companies dramatically increase production of PV panels and investigate the next generation of this technology. Spain is already fourth in the world in its use of solar power, and second in Europe, with more than 120 megawatts in about 8,300 installations. Within only the past 10 years, the number of companies working in solar energy has leapt from a couple of dozen to a few hundred.

Power from the Sun's Heat

Southern Spain, a region known the world over for its abundant sun and scarce rain, provides an ideal landscape for solar thermal

power. The tower outside Seville, built and operated by Solúcar, an Abengoa company, is the first of a number of solar thermal plants and will provide about 10 megawatts of power. The company Sener is completing Andasol 1, the first parabolic-trough plant in Europe—a 50-megawatt system outside Granada that will begin operation in the summer of 2008.

Unlike photovoltaic panels, which harness the movement of electrons between layers of a solar cell when the sun strikes the material, solar thermal power works by utilizing the heat of the sun. CSP has until recently cost nearly twice as much as traditional natural gas or coal power plants, and it is effective only on a large scale. "You need a very large budget to set up a concentrated solar power system," says Eduardo Zarza, director of concentrating solar research at the Solar Platform of Almería (PSA in Spanish), a research, development, and testing center. "You need a great deal of land, a steam turbine, an electricity generator, power equipment, people in the control room, staff to run the system." The costs are also front-loaded, unlike those of traditional plants: the fuel is free, unlike oil, gas, or coal, but the up-front development expense is significantly higher.

During and immediately following the energy crisis of the 1970s, nine solar thermal plants were built in California to produce a total of 350 megawatts, but until this year no new commercial plant had been built, anywhere in the world, for 15 years.

PV costs run nearly double those of solar thermal for a power plant of a similar size, but PV has the advantage of modularity; panels can be incorporated into individual homes, companies,

