



Climate Change : Climate Solutions

Concentrating Solar Power: Oasis or Mirage?

Covered by concentrating solar power plants, less than one percent of the world's deserts could produce all of our electricity by 2050. So what is stopping us from doing it?



The Nevada Solar One CSP power plant near Las Vegas, Nevada. The 400-acre, 64 MW CSP plant produces enough energy to power about 14,000 homes (Photo: Reuters)

About five hundred years ago, Leonardo da Vinci scribbled a few sketches into his notebook showing how to concentrate and use solar energy. Going back even further, soldiers in ancient Greece are said to have set enemy ships ablaze by using their shields to concentrate reflected sunlight on sails. A few thousand years later, concentrating solar power (CSP) could become the world's most promising renewable energy technology.

CSP, or solar thermal, refers to the different ways to concentrate solar energy with panels and mirrors to heat up water and generate steam. Huge projects have already been built in Spain, Australia, and a 280-Megawatt (MW) plant in Arizona will be generating enough electricity for 70,000 homes by 2011 on otherwise unproductive desert land.

"The potential is absolutely colossal," says German physicist Gerhard Knies. "In principle, all of the world's energy needs could be met from less than one percent of the world's desert areas, although it would be advisable to develop other sources of renewable energy as well."

Knies is well-known, at least among clean energy enthusiasts, for his map of North Africa, on which he placed three red squares of varying sizes. Each square illustrates how much of the Sahara would have to be covered by CSP facilities to produce enough electricity for Germany, Europe, and the whole world.



CSP Potential (click on map to enlarge)

The squares indicate the size of land that, if covered by CSP plants, could generate as much electricity as currently consumed by the world (biggest square), the European Union (middle), and Germany (smallest) (Map: TREC)

At first glance, Knies' map seems simplistic. But then comes the

inevitable question: "Why shouldn't this work?" It is a question that applies not only to solar, but to a handful of other renewable energy technologies that theoretically represent cleaner, safer, and renewable alternatives to coal, oil, gas, and nuclear.

Juice from concentrate

With Morocco and Algeria already planning CSP projects, one big challenge will be delivering this solar energy to European consumers across the Mediterranean. Most of the world's electricity grids use alternating current (AC), which cannot be effectively transferred over long distances.

Now there is talk in Europe and North America of converting century-old AC grids to direct current (DC). Although this would give grids more flexibility by drawing from distant energy sources, it would require significant investment in infrastructure. For New Yorkers to get their electricity from wind turbines in the Midwest, for example, about 13 billion dollars would be needed, according to testimony at a recent U.S. Senate committee on renewable energy.

Along with transmission, the other technological challenge is storing the power produced by solar thermal plants. One proposed solution is to use solar energy to heat molten salt in insulated tanks, which would stay hot longer and can give off energy hours after being heated up. This would allow solar electricity production at night.

At the moment, CSP is more expensive than electricity from conventional sources, such as coal, nuclear, and natural gas. CSP power currently costs about 17 cents per kilowatt hour (kWh), though industry developers claim the costs could drop to around 7-10 cents kWh within several years. One California-based company, SUNGRI, says its technology could bring CSP costs down to 5 cents a kWh, which would put it on par with coal electricity.

"We have the technical know-how and the industrial capacity," says Gerhard Knies, who now coordinates TREC, a network of experts in favor of a massive scale-up of renewable energy. "The main thing that is missing at present is an understanding of how urgent it is to replace dirty and dangerous sources of power with clean and safe resources like CSP."

Fresh-squeezed

Perhaps the biggest question facing CSP's future is how governments will support an industry still in its infancy. About 350 MW of CSP capacity were built in California's sun-drenched Mojave Desert with government help during the 1980s and early 1990s, but this support dried up when energy prices plummeted.

Over the last few years, however, renewed interest in low-carbon, alternative energy sources has led to government funding for projects in Spain, Australia, and now again in the United States. The large-scale expansion of CSP would depend largely on continued incentives, which looks anything but certain.

In May, the German government slashed subsidies to the country's

world-leading solar power industry. A month later, the U.S. government announced a freeze on new solar energy projects on federal land until a two-year study on the environmental impacts of CSP plants is completed. The hardest blow came with the Senate's June rejection of a bill that would extend 18 billion dollars of tax credits to would-be renewable energy investors.

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The solar industry sees these as potentially crippling setbacks in the short term, but the biggest firms are also not likely to close up shop. Any number of factors - a 200-dollar barrel of oil or a U.S. carbon-trading scheme during the next U.S. presidency, for example - might sweeten the deal for investors. After centuries in the making, the idea of giant mirrors in the desert could then become the alternative energy source long dreamt of, an idea that should be irresistible even to the few politicians without a narcissistic streak.

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