

Title: Raising Temperatures with Next-Generation Concentrating Solar-Thermal Power

Description: Researchers at the U.S. Department of Energy's Sandia National Laboratories use particles to store heat in a next-generation (Gen3) concentrating solar-thermal power (CSP) plant. These particles are heated by the sun, using an array of mirrors, and can reach over 1,000 degrees Celsius. This heat can be stored, generate electricity, or used in processes that require high heat, like in materials synthesis or cement making. Learn more about CSP research at the U.S. Department of Energy:

<https://www.energy.gov/eere/solar/concentrating-solar-thermal-power>

Transcript:

Concentrating solar thermal power uses a large array of mirrors to focus and concentrate the sunlight onto a receiver that conventionally has a heat transfer fluid – molten nitrate salt – flowing through tubes. That gets heated to just under 600 degrees Celsius, and once that's hot, it can be stored for use even when the sun's not shining, to spin a turbine and generator for large-scale electricity production.

The challenge has been that molten nitrate salts can decompose at 600 degrees Celsius and the Department of Energy is looking at advanced, next-generation power cycles that require temperatures of 700 degrees or higher, so we need to look for new materials or new media to get to these more efficient and more cost effective power cycles.

So with the Gen3 technology that we're developing, it uses falling particles through the receiver instead of liquids or gasses flowing through tubes. We drop particles through the receiver and the concentrated sunlight strikes and irradiates the particles directly, which is much more efficient than having to heat tubes and then the heat transfer fluid indirectly.

I like to call this technology particle power.

Solid particles have a number of advantages over conventional heat transfer fluids used in CSP. The particles can achieve much higher temperatures, well over 1,000 degrees Celsius, and they don't freeze.

What's exciting is the use of particles opens up a whole new world beyond just power production.

The particles can also be used for high temperature process heat in manufacturing, materials synthesis, cement making.

The future of CSP and Gen3 using solid particles is very exciting.