Department of Energy

Holographic technology could increase solar efficiency

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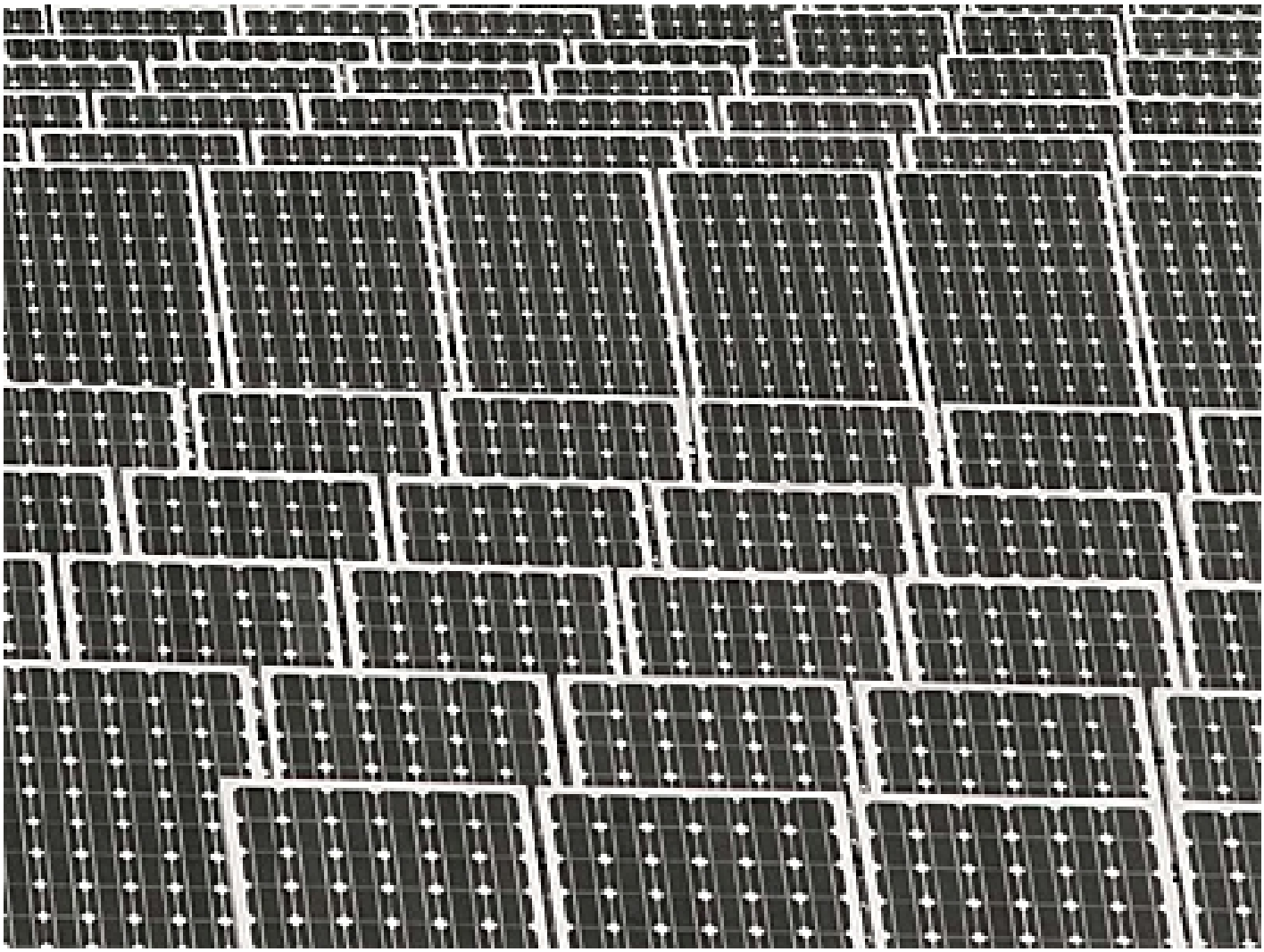

Luminit's co-generation technology could combine photovoltaics (shown in this file photo) and solar thermal energy. | File photo

- Co-generation technology could combine photovoltaics and solar thermal
- Luminit’s technology bends and redirects sunlight to produce energy
- Research funded by Small Business Innovation Research grant

There are two major technologies in solar energy: photovoltaics and solar thermal.

Most people are more familiar with photovoltaics (PV) - the flat solar panels popping up on rooftops across the United States. Then there’s solar thermal energy, which uses the sun’s heat to power a heat engine that makes electricity.

Luminit, LLC wants to use both technologies at once.

The Torrance, Calif.-based company is working on a product that could help solar energy producers get both kinds of energy out of the same sunlight -- potentially

increasing a system's return. Using holographic thin-film, Luminit is working on a solar cogeneration system that also tracks sunlight across the sky without movable parts.

"[The holographic film] has a prismatic effect, so when light hits it, it will bend the light and split the different wavelengths," says Marie Todd, a manager for Luminit. "By controlling how that split works, we can control how some wavelengths can hit the silicon wafer."

The U.S. Department of Energy is supporting Luminit's research with a Small Business Innovation Research grant, funded by the Recovery Act. The $999,986 grant supports Phase II of the research -- which means Luminit is past the concept stage and starting to develop a prototype. Phase I, the concept stage, was supported by a $150,000 SBIR grant.

Bend the light

Holographic optical elements are thin films that have been "printed" using lasers to record how light waves move around them. They can replace traditional optics, such as lenses and mirrors, with lighter-weight and more durable materials.

These are not a typical part of solar energy generation. Like the holograms used in toys or credit cards, Todd says, Luminit's holographic technology "bends" light waves using the principle of diffraction.

But instead of doing it for a 3-D effect, the company can split the visible wavelengths of sunlight and the infrared wavelengths, directing each at the appropriate solar energy generator – PV or solar thermal. The result: the split increases the efficiency of the PV panels – generating more energy from the same sunlight.

Splitting the wavelengths also reduces wear and tear on PV panels by reducing their heat. And of course, by combining two generation systems into one, the company expects to reduce systems' size and cost.

Redirect the light

And that's just part of what holographic technology offers to solar energy generation.

Because of its light-bending properties, holographic thin film can also redirect sunlight to the location of the makers' choosing, and concentrate it on that target.

Currently, some other solar energy generators use moving parts to track the sun as it "moves" across the sky, and mirrors and lenses to concentrate it. As sunlight passes through holographic thin film, Luminit can achieve the same effects – without moving parts - by layering multiple films over the same area.

"Whatever angle the sun is coming from, there will be some [holographic film] that will respond to that and bend the light appropriately," Todd says. "It's not going to degrade the amount of light that is getting to the silicon."

Todd also notes that Luminit's films replace breakable, heavy parts like motors and glass mirrors with a polymer that can be designed to be as lightweight and durable as necessary.

New jobs

Todd says Luminit is about a year from manufacturing plans. But when it is ready, the company believes its cogeneration concept could be used anywhere, from large-scale generation to residences to mobile applications, such as military field kitchens.

As the research gets closer to commercialization, Todd says, the company anticipates adding more employees, as well as partnering with solar energy manufacturers to make the device.

"We would have to put on more staff in order to actually manufacture this film," she says. "We anticipate a lot of job creation at the tail end and into Phase III."

What does this mean for me?

LORELEI LAIRD

Lorelei Laird is a writer with Energy Empowers.

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1000 Independence Ave. SW
Washington DC 20585
202-586-5000

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