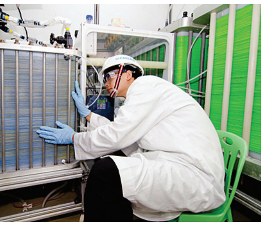

news brief

Please Drink the Water
A Siemens pilot plant in Singapore has demonstrated a way of using electric fields to turn seawater into drinking water using half the energy of today's most common method, reverse osmosis. The field pulls ions in the seawater through membranes, captures them, and transports them away, leaving a stream of freshwater.

Photon Recycling Breaks Solar Power Record

Strange as it sounds, a better light emitter is a better energy producer

By creating a solar cell that also does a good job of emitting light, a California start-up has produced the new efficiency record holder for a solar cell with a single *p-n* junction. When combined with a novel manufacturing method, the technology will be a path toward solar power at a cost competitive with that of fossil fuels, according to its maker, Santa Clara–based Alta Devices.

In June, at the 37th IEEE Photovoltaic Specialist Conference, in Seattle, researchers from Alta reported the creation of a gallium-arsenide cell with an efficiency of 28.2 percent. That beats the previous record of 26.4 percent, which itself was the first improvement in years over the previous 26.1 percent.

Key to achieving the record was building a solar cell that was good not only at taking in light but also at letting it out. One factor in such external fluorescence extraction—a measure of how much incoming light comes back out—is a process called photon recycling. When a photon in sunlight is absorbed in a photovoltaic material, it splits into an electron and a hole. The electrons that pass out of the cell can be used as electricity, but many of them are lost in the semiconductor when they recombine with holes to produce either waste heat or new photons. By carefully growing a high-quality, single-crystal film of gallium arsenide, the researchers managed to ensure that more than 90 percent of the recombinations would result in new photons. Those recycled photons can split and recombine into new photons repeatedly, giving the light more opportunities to either create usable current or escape.

Eli Yablonovitch, an engineering professor at the University of California, Berkeley, and a cofounder of Alta, admits that making a solar cell good at giving off light sounds counterintuitive. But better light extraction is an indirect indicator of how efficiently the cell is using photons. "A great solar cell has to be a great LED," he says.

Cells with higher external fluorescent efficiency also have higher voltage. The previous record holder for efficiency produced 1.03 volts; the Alta device reached 1.11 V. "In 12 months, a technology that had been essentially stagnant for decades had increased by 8 percent," Yablonovitch says. The theoretical limit is 1.15 V.

The device is nearer the theoretical limit for conversion efficiency, too. The maximum is 33.5 percent. "We can see a path to 30 percent with our same design right now," says Christopher Norris, CEO of Alta.

Yong-Hang Zhang, director of the Center for Nanophotonics at Arizona State University, thinks it should be possible to build practical solar cells with better than 30 percent efficiency "by texturing the surface, removing the substrate, and adding a highly reflective reflector at the back of the cell," he says.

While gallium arsenide is naturally better at converting light to electricity than the chief contenders, it tends to be more expensive. Alta solves this problem by using a process called epitaxial liftoff, developed by Yablonovitch, that minimizes the amount of GaAs used.

Alta plans to produce samples of its solar cells sometime this year and expects to have early commercial shipments by late next year, Norris says. The company has raised US $130 million to develop its production process.

—Neil Savage

A version of this article appeared online as "Solar Cell Breaks Efficiency Record."

LEFT: RON DAHLQUIST/GETTY IMAGES; RIGHT: SIEMENS