## This fully transparent solar cell could make every window and screen a power source (updated)

- By Jamie Lendino on April 20, 2015 at 9:20 am
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Back in August 2014, researchers at Michigan State University have created a fully transparent solar concentrator, which could turn any window or sheet of glass (like your smartphone's screen) into a photovoltaic solar cell. Unlike other "transparent" solar cells that we've reported on in the past, this one really *is* transparent, as you can see in the photos throughout this story. According to Richard Lunt, who led the research at the time, the team is confident the transparent solar panels can be efficiently deployed in a wide range of settings, from "tall buildings with lots of windows or any kind of mobile device that demands high aesthetic quality like a phone or e-reader."

Today, Ubiquitous Energy, an <u>MIT startup we first reported on in 2013</u>, is now getting closer to bringing its transparent solar panels to market. Lunt cofounded the company and remains assistant professor of chemical engineering and materials science at Michigan State University. Essentially, what they're doing is instead of shrinking the components, they're changing the way the cell absorbs light. The cell selectively harvests the part of the solar spectrum we can't see with our eye, while letting regular visible light pass through.

Scientifically, a transparent solar panel is something of an oxymoron. Solar cells, specifically the photovoltaic kind, make energy by absorbing photons (sunlight) and converting them into electrons (electricity). If a material is transparent, however, by definition it means that all of the light passes *through* the medium to strike the back of your eye. This is why <u>previous transparent</u> solar cells have actually only been partially transparent — and, to add insult to injury, they usually they cast a colorful shadow too.





The organic salts absorb UV and infrared, and emit infrared — processes that occur outside of the visible spectrum, so that it appears transparent.

To get around this limitation, the Michigan State researchers use a slightly different technique for gathering sunlight. Instead of trying to create a transparent photovoltaic cell (which is nigh impossible), they use a *transparent luminescent solar concentrator* (TLSC). The TLSC consists of organic salts that absorb specific non-visible wavelengths of ultraviolet and infrared light, which they then luminesce (glow) as another wavelength of infrared light (also non-visible). This emitted infrared light is guided to the edge of plastic, where thin strips of conventional photovoltaic solar cell convert it into electricity. [Research paper: DOI: 10.1002/adom.201400103 – "Near-Infrared Harvesting Transparent Luminescent Solar Concentrators"]

If you look closely, you can see a couple of black strips along the edges of plastic block. Otherwise, though, the active organic material — and thus the bulk of the solar panel is highly transparent. (Read: <u>Solar singlet fission bends the laws of physics to boost solar power</u> <u>efficiency by 30%</u>.)

The prototype TLSC currently has an efficiency of around 1%, but they think 10& should be possible once production commences. Non-transparent luminescent concentrators (which bathe the room in colorful light) max out at around 7%. On their own these aren't huge figures, but on a larger scale — every window in a house or office block — the numbers quickly add up. And while we're probably not talking about a technology that can keep your smartphone or tablet running indefinitely, replacing your device's display with a TLSC could net you a few more minutes or hours of usage on a single battery charge.

"It opens a lot of area to deploy solar energy in a non-intrusive way," Lunt said in an <u>interview</u> with Michigan State's Today blog. "It can be used on tall buildings with lots of windows or any

kind of mobile device that demands high aesthetic quality like a phone or e-reader. Ultimately we want to make solar harvesting surfaces that you do not even know are there."

The researchers — and Ubiquitous Energy — are confident that the technology can be scaled all the way from large industrial and commercial applications, down to consumer devices, while remaining affordable. So far, one of the larger barriers to large-scale adoption of solar power is the intrusive and ugly nature of solar panels — obviously, if we can produce large amounts of solar power from sheets of glass and plastic that look like normal sheets of glass and plastic, then that would be incredible.