Low Cost Perovskite Solar Cells Breathing Down The Neck Of Coal, & Fossil Gas, Too

July 16th, 2020 by **Tina Casey**

Solar cells weighed in at an eye-popping $300 per watt when they first popped on the scene back in 1956. Who woulda thunk those pricey baubles would some day drop into the single digits and chase mighty king coal out of the energy generation market? Well they are, and fossil gas is the next planet-killing domino to fall. Anyone who still thinks gas has a chance should take a gander at the latest news about low cost perovskite solar cells.

Perovskite solar cells hit another milestone with new record-setting conversion efficiency over a large surface (photo cropped, via NTU).

What Is This About Perovskite Solar Cells?

To put things in perspective, solar panels alone cost **$300 per watt** when the first commercial version hit the shelves in 1956, and that was just for the panel. Installing them someplace cost extra.

Now, 74 years later, solar panels cost as low as 50 cents per watt, and can you can pepper your whole roof with them for an average cost of **less than $3.00 per watt**, fully installed. That includes the solar panels and all the other hardware, and the grid

connection and whatever permits apply, plus your installer's costs for labor, marketing, administration and what-not.

At 50 cents per watt, one would think that solar cells can take a breather from becoming even more inexpensive. However, the "hard" cost of a solar installation still accounts for about 35% of the total. Getting solar cells down to the cheapest level possible is still a brass ring worth reaching for in terms of where the R&D dollars are going.

So far, all of this cost-dropping action has taken place on the back of silicon technology. However, silicon is a difficult material to work with on the manufacturing side, and the finished product is stiff, heavy, and bulky.

That's where **perovskite solar** comes in. Perovskite refers to a class of crystals that can be grown synthetically, involving **relatively low costs**. In addition, a perovskite solution can be sprayed or printed onto a thin, flexible, lightweight surface, which means that the manufacturing process can deploy roll-to-roll printing and other conventional, low cost methods.

This also means that perovskite solar cells can provide for a much broader range of applications including **building integrated solar** as well as the emerging field of **vehicle integrated solar**, among other uses.

The Latest News About Perovskite Solar Cells: Size Matters

If you know your perovskites, you know that perovskite technology still has some major hurdles to overcome. *CleanTechnica* has been following the **perovskite stability** issue, but we somehow missed the problem of size, and that's where the latest research comes in.

As described by a team of scientists at Nanyang Technological University in Singapore, so far the research efforts have focused on **setting performance records** at a scale of "much less" than one square centimeter. The solar cells lose efficiency at a larger scale.

So, the NTU team tried something different. Instead of using a conventional spin-coating method to fabricate their new perovksite solar cell, they deployed another coating method called thermal co-evaporation, which is commonly used in a wide range of products including organic LED televisions.

The result was a mini-module of 21 square centimeters with a conversion efficiency of 18.1%, a record-breaker at that scale according to NTU.

They also achieved 19% at the smaller scale of one square centimeter, and did even better at 20.28% for 0.16 of a square centimeter.

For bonus points, they also found that they could fabricate the new solar cells in different colors without loss of efficiency, which would give architects and car designers a whole new range of options to choose from.

You can get all the details from the journal *Joule* under the title, "***Highly Efficient Thermally Co-evaporated Perovskite Solar Cells and Mini-modules.***"

Solar Cells Breathing Down The Neck Of Natural Gas, With Wind Power

Another angle to consider in the perovskite solar cell field is the technology's potential role in building **hybrid wind-solar power plants**. Though tricky to engineer, the wind-solar combo takes full advantage of daytime sun and night-time wind, while minimizing the cost of energy storage.

The idea is starting to catch on here and there. A first-of-its-kind project is under way in Minnesota, and a similar **wind-solar hybrid power plant** is taking shape in Oklahoma.

If all goes according to plan, both of those projects will demonstrate that renewable energy can compete against fossil gas on cost, in addition to smacking down coal.

Both projects are also under the wing of utilities that come under the rural electric cooperative umbrella, which is not a coincidence. Because of their unique regulatory status, RECs have **more flexibility to innovate** when there is a benefit to their ratepayers.

So, here's where it gets interesting. Although many RECs cover a substantial amount of urban and suburban areas, they also include large swaths of open space and farmland, which brings up the issue of competing land uses for the solar industry.

The emerging field of agrivoltaics can help resolve that problem in part. It involves raising rows of **conventional solar panels** off the ground a few extra feet, to enable grazing, pollinator habitats, and other agricultural uses underneath.

With lightweight perovskite technology, the options for solar arrays could be shifted out of arable land altogether, and onto built elements on farmland including barns and silos.

Wind turbine towers, are becoming a familiar element on farms all over the country, so that could be another option for perovskite application.

In fact, it seems like only yesterday that we took a trip out west to view GE's **"Space Frame" wind turbine tower**, which was an updated version of the old fashioned lattice-work approach to building tall towers, like the Eiffel tower.

The Space Frame approach resolved some technological issues with lattice construction. GE also covered the whole thing with lightweight cladding, to improve aesthetics and also to prevent birds from perching on the lattice work.

The overall aim of the Space Frame was to build the kind of tall, taller, tallest wind turbine towers that can enable the turbine to reach optimal wind resources high up off the ground.

Add a coating of perovskite solar cells to all that cladding and Bob's your uncle.

Oh wait, that trip was back in 2014. How time flies. The next year, GE gilded the **energy conversion** lily by covering the nacelle and the inner lengths of the turbine blades with cladding as well.

So, more opportunities for a perovskite coating.

The Space Frame and the nacelle cladding haven't crossed the *CleanTechnica* radar since then, and there's not a peep from **the GE website** either. If they shelved the ideas, perhaps now would be a good time to dust them off.