

# Silicon fires up renewable energy revolution

Large blocks of silicon storing wind and solar power as heat are the latest innovation in the battle to replace all fossil fuels with renewable energy.



Silicon could help store energy from wind turbines when power demand is low at night. Image: Aaron Crowe, CC BY-NC-ND 2.0

Finding a cheap way of storing surplus electricity produced from wind and solar farms is the current preoccupation of the renewable energy industry and governments worldwide.

If it can be done on a large scale, then coal-fired electricity generation – a major cause of climate change – can be phased out entirely, and gas will also soon have a diminishing role.



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**Battery technology** is currently attracting most interest, partly because governments are pressing ahead with introducing electric cars, but also because it is now possible to use large batteries for storing surplus wind and solar power for use at peak times.

But there is increasing interest in storing energy as heat, which can be used for district heating schemes or for creating steam to turn turbines and make electricity when demand is high.

## Cheap silicon

Up to now, one of the best ways of storing heat is with molten salts of various kinds. But cheap and readily-available [silicon could now provide a game-changing solution to the problem](#).

Silicon is the world's most abundant substance, after oxygen. It can also be heated up to 2000° C – three times that of molten salts.

Its other advantage, apart from its \$2 a kilo price, is that to store the same amount of heat a silicon block would be one-tenth the size of a tank of molten salt.

Among those investing in research is the European Union, which has a [€3.3 million research budget for the Amadeus project](#). This is led by the [Solar Energy Institute at the Technical University of Madrid](#) (UPM), which is hoping to have a small-scale silicon storage prototype up and running by 2019.

The university is so confident the use of silicon will work that it has already [set up a commercial company, Silistore](#), to exploit the technology.

Molten salts is currently the favoured method for use with concentrated solar power, [using mirrors to heat up a liquid in a tower to generate electricity](#).

## You can keep re-using the silicon. It's pretty much unlimited.

Kevin Moriarty, chairman, 1414 Degrees

The salts enable surplus heat to be stored in massive tanks at temperatures as high as 600°C, and then used at night to generate electricity. Already, 17 commercial systems are being built around the world to make it possible to provide electricity well after the sun has gone down and, in some cases, 24 hours a day.

Thermal energy storage makes these concentrated solar power projects a good bet for countries that have fairly constant sunshine, and so can provide a reliable supply of electricity.

But thermal storage is not so practical in places using solar panels or wind energy, where the supply of electricity can be sporadic or, in some cases, excessive. If the wind is blowing strongly in the middle of the night when the electricity is not needed it is extremely wasteful if an economic way cannot be found to store it.

Several countries are exploring [using surplus electricity to make hydrogen](#) that can be used to power vehicles, turn turbines, or be added to gas pipelines.

But using silicon to store heat could be the breakthrough that will change the world of energy storage.

Alejandro Datas, a UPM research scientist, believes that because the silicon system uses fewer materials, and is smaller and simpler, its cost will be far below that of molten salts.

“We are currently seeking industrial partners,” Datas says. “With the proper financial support, we could probably build the first commercial prototypes before 2019 and see the first systems in operation in 2020.”

But the Europeans will have to hurry. An [Australian company called 1414 Degrees is already developing silicon technology](#), which it claims can store thermal energy 10 times cheaper than lithium batteries.

The company name comes from the Centigrade melting point of silicon. It claims its patented system would convert surplus electricity from wind and solar into usable energy at competitive rates.

## Target markets

Dr Kevin Moriarty, the company's executive chairman, has two current target markets. One is a 10 megawatt electrical storage unit for industrial sites. And a second, much larger system of 200 megawatts, is aimed at solar and wind farms so they can store their surpluses when production exceeds demand and sell the electricity back to the grid at peak times.

He told [Renewable Energy World news network](#) that the problem in Australia, for example, is that wind farms are “roaring away at 3am, when nobody needs the power.

“That problem is huge in Europe as well. You need to match the demand to the generation, and that's not going to be met by lithium. It's too expensive, and you just need vast quantities to handle it.”

Moriarty says his company's system offers clean, cheap heat. “We don't have any dirty emissions like you do from gas or coal, so basically the heat comes out as hot air and can be used for all sorts of things.

“Also, you can keep re-using the silicon. It's pretty much unlimited.”

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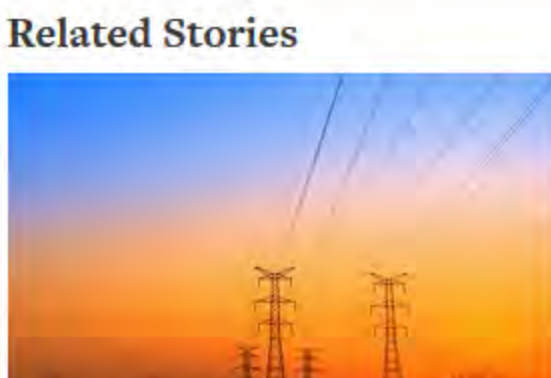
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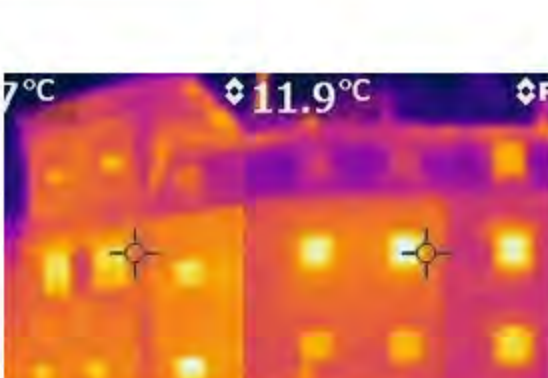


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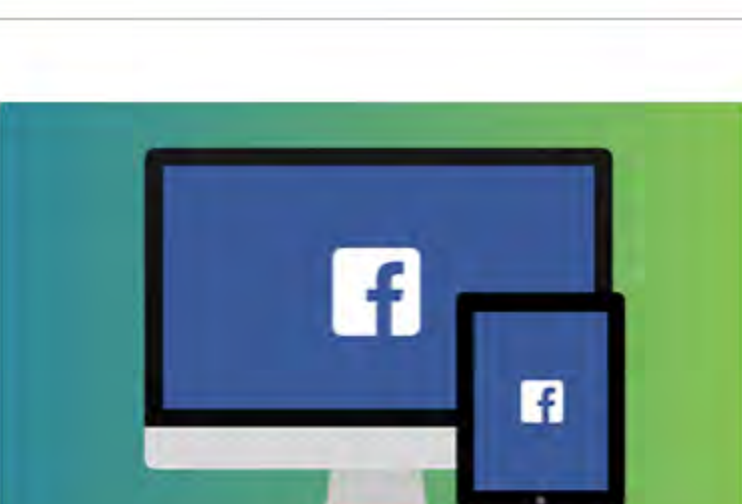
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