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Battery storage is set to transform renewables industry

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Tesla's Powerwall

About half of the 50 homes in the rural Bavarian village of Moosham have a solar panel on the roof. As in many other communities in the photovoltaic belt of south Germany, the PV panels generate more power when the sun is shining than can be consumed locally, while at other times residents have to draw in electricity from the grid. Indeed the local grid transformer in Moosham, which handles the imbalance between intermittent PV generation and fluctuating demand for electricity, is operating at its limit — blocking further development of solar systems in the village.

Moosham exemplifies a global problem as the world seeks to make the most of renewable energy sources: how to convert the intermittent and often unpredictable output of solar and wind generators into a reliable and affordable supply for consumers. Part of the solution will involve managing demand to minimise electricity use when supply is scarce. But the largest contribution is likely to come from storing energy in batteries when supply is plentiful — when the sun is shining and wind is blowing — and releasing it when needed.

Moosham is a test bed for community-based energy storage. Its "Energy Neighbor" project, developed by the Technical University of Munich's EEBatt programme in collaboration with battery manufacturer Varta and with funding from the Bavarian government, is about to go online.

The eight-tonne Energy Neighbor, containing 192 lithium-ion battery cells, has 250 kilowatts of electrical power and 200 kilowatt-hours of storage capacity. "In our field test we intend to gather insight from actual operation," says Andreas Jossen, project leader.

As a community scheme, Moosham occupies the middle ground between battery storage

for individual households and businesses, exemplified by thePowerwall produced by Tesla, and large grid-based systems installed by utility companies, which range in output from 100kW up to 100MW.
Lux Research estimates the installed base of grid storage in October 2015 to include 841 projects worldwide, with a total of 1,788MW in power — equivalent to a large nuclear station — and 3,460MWh in stored energy. Annual growth rates since 2011 have been 33 per cent in power and 20 per cent in energy.

"Although there is still one quarter left in the 2015 calendar year, it has already been a monumental year for energy storage," says Dean Frankel, analyst at Lux Research. Complementary research by Frost & Sullivan values the global market for utility-scale, grid-connected storage at $460m in 2014 and estimates that it will reach $8.3bn in 2024. "Battery storage has the ability to import flexibility to the grid in a variety of applications," says Ross Bruton, analyst at Frost & Sullivan.

The home storage market is growing particularly fast, says Lux Research, with nearly 14,000 battery units installed in the first nine months of 2015 — more than double the annual number of residential units deployed in 2014. Tesla will begin to ship its Powerwall before the end of this year, and Lux expects Tesla to overtake all other residential storage suppliers, with 29,000 home units to be installed during 2016.
Australia will be one of the biggest markets for battery storage, according to the country's Climate Council, due to its high cost of electricity and the large number of households installing solar panels. It expects half of all Australian homes to adopt PV systems with battery storage, on the basis of battery systems costing A$10,000 each, with a payback of 10 years. That could result in the market eventually growing to A$24bn, says the Climate Council, an independent non-profit organisation.
Lithium-ion batteries dominate the market today and are likely to remain dominant for the next few years, as the electric vehicle and consumer electronics markets help to propel their development and cut their costs.

But analysts also see niches for competing technologies such as molten salt, lead-acid and flow batteries, as well as supercapacitors and flywheels.

Meanwhile Sara Bell, chief executive of Tempus Energy, an innovative UK electricity supplier, points out that flexible demand management can also help to accommodate fluctuations in supply.

An example is a seafood processing plant in Scotland. It uses cheap electricity, when the

local wind generators are in action, to overchill its freezers. This builds up a cold reserve for release when the wind drops.

There is a lot of scope for using “innate thermal storage” in this way in both heating and cooling applications, Ms Bell says: “It is sensible first to make the most cost-effective changes by managing demand and then move to battery storage.”