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Solving the energy storage dilemma

We can’t quit fossil fuels completely until we work out how to store renewable energy – and therefore supply it on demand. Maddyness looks to companies at the venture stage for answers.

Oil and gas have two major – interlocking – advantages over wind and solar. They have high energy density, important in sectors like aviation and shipping, with oil offering twenty quadrillion times more power per cubic metre than solar. They’re also readily available, while specific weather conditions are needed to produce energy from the sun and the wind – which can’t yet feasibly be stored.

At the moment, if you press a light switch, you know – pretty much come hell or high water – a light will come on. With the renewables currently established in the market, you can’t always be so sure. On the flipside, on a particularly sunny or windy day, a country might produce way more energy than it needs. In this scenario, the grid can become overwhelmed and prices can go negative – meaning people essentially get paid to use power.

Renewable energy in itself used to be prohibitively expensive – but we’ve finally moved past this. The next challenge will be developing and scaling storage solutions, which are *still* prohibitively expensive. At the moment we’re using fossil fuels to plug the gap, but this can’t and won’t go on for long.

Bill Gates talks about something called the ‘Green Premium’ – ‘the additional cost of choosing a clean technology over one that emits a greater amount of

greenhouse gases'. Gates co-runs Breakthrough Energy – a venture capital and policy unit for net-zero solutions – and has circled energy storage as a focus area for investment.

Funding energy storage projects requires patient capital – something that's opening up as investors come to understand the urgency, and opportunity, of supporting the next wave of energy companies. Already prices are dropping – with lithium-ion battery cost in the USA falling by circa 80% in the years 2015-20 – but there is ample room for ideas and companies with the tenacity to take them to market.

Up-and-coming solutions

According to Lee King, founder of Hydro Wind Energy, one of the World Economic Forum's Top 100 startups shaping the fourth industrial revolution, "there's a lot being developed." "Concentrated solar power, wave energies – although they're a bit of a let-down because they haven't really been commercialised, they're still in the development stages. There's no commercialised wave technology and there has been a lot of investment."

"In terms of wind, there is kite technology, which converts kite/wind energy directly to electrical energy," Lee continues.

> *"I think it's going to be a mix of technology that solves it."*

He is clear, however, that "the most successful energy storage technology we have now is hydropower." Essentially, "running water […] turns a turbine and generates electricity. Then you can pump that water back and do the same thing."

Lee's own solution, Hydro Wind Energy's OceanHydro Wind technique, is "a form of hydropower, turned into a hybrid system, connected to offshore wind." The company was formed to create water desalination devices, in response to the growing threat of water insecurity. Then, Lee realised some of his and his team's findings could be applied in the energy field.

“In a very simple way, we discovered how to harness wind, offshore, at altitude; store the energy sub-sea, and release it on-demand as electrical energy”, Lee explains. Wind power is captured using kites and stored with the help of subsea pressure, meaning it can be released as and when needed.

The future for Hydro Wind Energy

“It is a gamechanger”, says Lee – careful to emphasise to me that he’s being as unbiased as possible. “It really has the potential to alter the entire dynamics of the energy market this century and beyond.”

Of course, at this comparatively early stage, a lot is still to play for. The OceanHydro Wind method has been granted a patent and validated by the Wolfson Unit at Southampton University. It’s at the early stages of Technology Readiness Level 5 – according to TWI, this means ‘technology validated in relevant environment’ – with 9 being total readiness.

> *“Over the next 12 months, we’re going to be testing this offshore as an integrated system – with the kites and also with a vertical access wind capture mechanism.”*

“Anything you deploy offshore is extremely challenging”, admits Lee. On top of this, innovation and technology will not solve all our woes. “We need more than just the private companies developing the technology. We need policy support, regulatory support and funding. With energy it’s long timelines in terms of commercialisation, so it needs patient capital.”

Eventually, the Hydro Wind Energy team will be going after the kind of patient capital offered by Breakthrough Energy Ventures. “This is the type of really strategic investor we want to get on board in the next equity fundraising round”, says Lee. Similar companies already on BEV’s funding roster are Form Energy, which is developing a new kind of battery, and Natel Energy, which generates hydropower with a low impact on surrounding ecosystems via its Restoration Hydro Turbine.

For now, Hydro Wind Energy is still reeling after a very successful start to the

year; it conducted a convertible Seedrs campaign that aimed to raise £200K and ended up with just shy of £700K. Still yet to embark on a fully-fledged equity funding round, these rounds are crucial in increasing the company's value prior to what will be a very ambitious raise.

"We're not going to go for £500K-£1M. We're aiming to go for £30-40M", Lee concludes, "because that's the type of money needed."

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