BLOGS

Are batteries running out of juice? Hydrogen and the problem of renewables intermittence/energy storage.

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The global rush to reduce carbon emissions continues to accelerate. The power sector has not just been impacted, but it has been transformed beyond recognition. Falling cost of renewable technologies have made sure the process is widely self-fueling and does not need government intervention, if not to accelerate the process of substitution of fossil fuels. Coal is a dying technology, nuclear is fading away and natural gas is rapidly becoming obsolete.

Such a rapid transformation has left strains in the system, and the issues will continue to compound in the near future. The process of building renewables has been very fast indeed, especially in the world of utilities where power-generating assets have lifespans that easily

go beyond half a century. Renewables are established and continue to produce new solutions that mature over ever-shorter timeframes, including wind, solar, offshore wind and, in the near future, floating offshore wind.

Electric systems must be balanced at all times and supply dispatch has traditionally tracked demand needs. Renewables produce electricity when sunshine and wind cooperate - for example, solar produces energy during the day but the peak consumption is just after the sun sets and all are back home from work, turning on devices in their homes.

Today the balancing is achieved by dispatching gas fired turbine units but in a decarbonized electricity sector the unbalance will need a different source of electrons.

Batteries have been tested as a solution to store electricity and are becoming a common feature of solar and wind projects to smooth electricity delivery. Batteries seem a good way to provide short-term balancing of grids but they seem unable to store large quantities of power and therefore be able to provide load centers with electricity for prolonged a period of time.

While stationary applications (for utilities) face the issue of the sheer amount of batteries needed to provide backup, the weight of batteries is the main obstacle to full electrification of the transportation sector.

In fact, transportation is the second largest emitter of carbon in modern economies and the electrification of transport is a reality that is accelerating to unprecedented speed. Automotive companies are launching hundreds of electric and hybrid plug-in vehicles in the next few years and battery electric vehicles (BEV) are becoming widely accepted by consumers.

Infrastructure to support millions of electric vehicles in our streets is still lacking, but it is under deployment and the reality of a decarbonized personal transportation is rapidly becoming a reality.

But batteries are heavy; their energy density is much lower than gasoline and powering large commercial vehicles, construction equipment, agricultural equipment, ships and, tomorrow, airplanes represent a technical challenge that relies on batteries developments breakthrough to become feasible.

Heavy batteries would crowd out valuable freight from commercial vehicles, add the slow battery charging speed and the resulting total cost of ownership, the equation is very difficult for businesses that operate on thin margins. Special applications sure, but mass adoption for commercial vehicles will be complicated.

Enters hydrogen.

Hydrogen is nothing new, and has been extensively used in chemical processes, refineries and in vehicles, e.g. forklifts have been used for decades.

Today it is produced from natural gas in relatively small quantities and is quite expensive for mass applications like trucking, etc. Hydrogen made from natural gas is known as grey hydrogen, while making hydrogen with natural gas and sequestering the CO_2 released by the process results in blue hydrogen.

Green hydrogen is instead produced by electrolysis using renewable electricity to break up water and release oxygen. No CO_2 emissions created whatsoever, and the oxygen can be used as a valuable byproduct.

Hydrogen can be transported by pipelines, can be liquified, can be stored in cans and, with its own specific differences, has a flexibility of use and distribution similar to natural gas. The weight/energy ratio is much more favourable than current batteries and, therefore, hydrogen is a much better solution for heavy machine/vehicles.

Hydrogen can then be a medium to store intermittent renewable electricity *and* to provide energy to heavy duty applications. Obviously not all is perfect with hydrogen, and there are issues that need to be overcome, but the prospects are encouraging. Perhaps the main issue is cost, but like any other renewable technology before, it is just a matter of time for the cost issue to be solved with mass production of hydrogen equipment and technological/engineering improvement in the process.

The European Union has launched a hydrogen program to kick-start the technology into mass markets and initiate the virtuous cycle of decreasing cost with higher volumes. In the U.S. a coalition of 20 companies ranging from oil to automotive, utilities and tech have published a roadmap for the adoption of hydrogen in the U.S. economy. We believe that

hydrogen is part of the solution for a decarbonized economy and will show an accelerating adoption trajectory beyond current forecast. Batteries will not be displaced by hydrogen and instead, the two ways to store energy will co-exist and complement each other.

There is a lot of hype around hydrogen and lots of investors' attention has concentrated on a few companies that are active in this market. Signature has been investing in many utilities that have large exposure to renewables and are moving into hydrogen. Iberdrola of Spain and Nextera in the U.S. are building integrated plants to provide green hydrogen to fertilizer producers. The few pure plays in industrial are very expensive and we are monitoring them for an entry point. Conglomerates are positioning for hydrogen growth and we believe that emerging the hidden value in large companies will be a theme for the upcoming years.

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