Hydrogen: Reliable Fuel for the Renewable Revolution

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As the United States is looking to move from fossil fueled power plants to cleaner sources of energy, hydrogen is increasingly being recognized as playing a critical role in our nation's energy transition. As the country continues to expand its renewable energy resources, due to their inherent intermittency electric grid operators are increasingly concerned with pathways to maintain continuous power. If the United States is going reach net zero carbon emissions by 2050, we're going to need new means to solve these problems. Hydrogen and fuel cells offer a significant opportunity to provide both large-scale and long-term energy storage, as well as address resiliency concerns while bolstering the grid and providing clean reliable power.

Hydrogen is clean, producing only water and heat as a byproduct when used in a fuel cell. Hydrogen can be created from a wide variety of sources, including natural gas, wind, solar, nuclear, and many other feedstocks. The hydrogen produced by electrolyzers and powered by renewable energy is completely carbon neutral, and hydrogen produced by fossil fuels can utilize carbon capture and sequestration technology to dramatically reduce carbon emissions.

Hydrogen is a portable low-to-no carbon fuel source that can be used to directly support the electrical grid to avoid intermittency from renewable energy. For example, a common problem associated with solar energy is how once the sun goes down, energy will stop flowing to the grid when demand is highest at night, commonly known as the "Duck Curve". Hydrogen is a solution to this problem, as excess hydrogen can be produced during times of renewable abundance when it is not needed and stored for later use.

On a longer timescale, hydrogen is also essential for seasonal energy storage. While battery storage systems are effective for hourly or daily energy storage needs, as renewables increase in deployment, weekly and monthly storage will become more and more necessary. In these long-term, large-scale energy needs, hydrogen is broadly viewed as the only viable solution.

Several promising projects in varying stages of deployment have sprung up across the United States. Over the past couple of years, significant hydrogen storage projects have been announced in Texas, Utah, and Mississippi. Each of the above projects utilize or plan to utilize large underground salt deposits, which are ideal for storing hydrogen and

withdrawing it when necessary. There is a huge potential across the country for converting large salt deposits, caverns, or depleted oil and gas sites to store immense amounts of hydrogen energy. Hydrogen can also be stored via ammonia, which can be utilized in alkaline fuel cells to provide backup and off-grid power solutions.
Another area where hydrogen can help is by providing power more efficiently, replacing diesel generators in microgrids, to reduce local air and noise pollution, as well as carbon emissions. In the United States, there are already over 550 MWs of fuel cells deployed across thousands of sites for back-up and primary power generation. Included in these deployments are dozens of fuel cell-powered microgrids that are providing primary power for hospitals, universities, grocery stores, and much more.

Big data companies like Microsoft have already begun testing using hydrogen instead of diesel generators to power their data centers due to the extremely high reliability and low emissions of hydrogen systems, with successful tests up to 3GWs announced this summer. These same solutions have a proven track record of providing much needed power during extreme weather events, serving as emergency shelters for communities when power is unavailable elsewhere.

Hydrogen can also relieve pressure on the grid due to increased demand for charging plug-in electric vehicles. The time flexibility of hydrogen allows customers to charge from either stationary or mobile locations, without straining utility power providers directly.
“Transitions” explored this opportunity for hydrogen in depth earlier this year, with many FCHEA members actively involved in supporting this necessary transition.

As hotter summers and extreme weather puts pressure on the electrical grid, hydrogen offers solutions to a number of reliability problems facing the sector. We have the technical solutions to the problems facing the electrical grid, all we have to do is invest in hydrogen, and by extension, our future.