

Hydrogen is more than just energy storage, renewable hydrogen is the solution towards an energy transition



Energy systems across the globe are undergoing a fundamental transformation to increase the quality of air and to decrease their dependency on oil, coal and gas as a primary energy source. Driven mainly by a political vision to decrease the negative impacts of climate change and decarbonize the power sector, wind and solar technologies have emerged as key renewable technologies. While the cost of renewable technology has decreased much faster than expected, integrating these intermittent energy sources into the power grid is highly challenging due to the increasing need for grid flexibility and energy storage solutions. This is where Hydrogenics, a global hydrogen technology company, is leading the way in delivering a clean and everlasting solution to the renewable energy equation. With over 60 years of experience, Hydrogenics is the world leader in creating hydrogen using

electrolysis and implementing hydrogen fuel cell solutions.

Electrolysers offer a multi-megawatt solution

Water electrolysers use electrical power to split water (H₂O) into hydrogen (H₂) and oxygen (O₂). Thanks to Hydrogenics' focus on continuous innovation, our elec-



trolsers are capable of modulating their electrical energy input very rapidly (less than 1 second) over the total power range, making them a very attractive solution for grid balancing services to the power sector in the MW-scale range. Hydrogenics' electrolysers are 'plug

and play' units, safely and reliably producing very pure hydrogen in continuous or dynamic operation modes.

Hydrogen is used in a wide range of applications

Hydrogen is often seen as the glue in maximizing renewable energy with the industrial and transportation sectors. Hydrogenics has delivered hundreds of electrolyser systems for every industry, including ammonia production plants (fertilizers), oil refineries, industrial manufacturing plants (steel, float glass, semi-conductors), power plants (generator cooling) and for the hydrogenation of oils in the food industry. In addition, Hydrogenics has supplied electrolysis technology to over 60 hydrogen refuelling stations worldwide where hydrogen is used as a fuel for fuel cell electric vehicles.

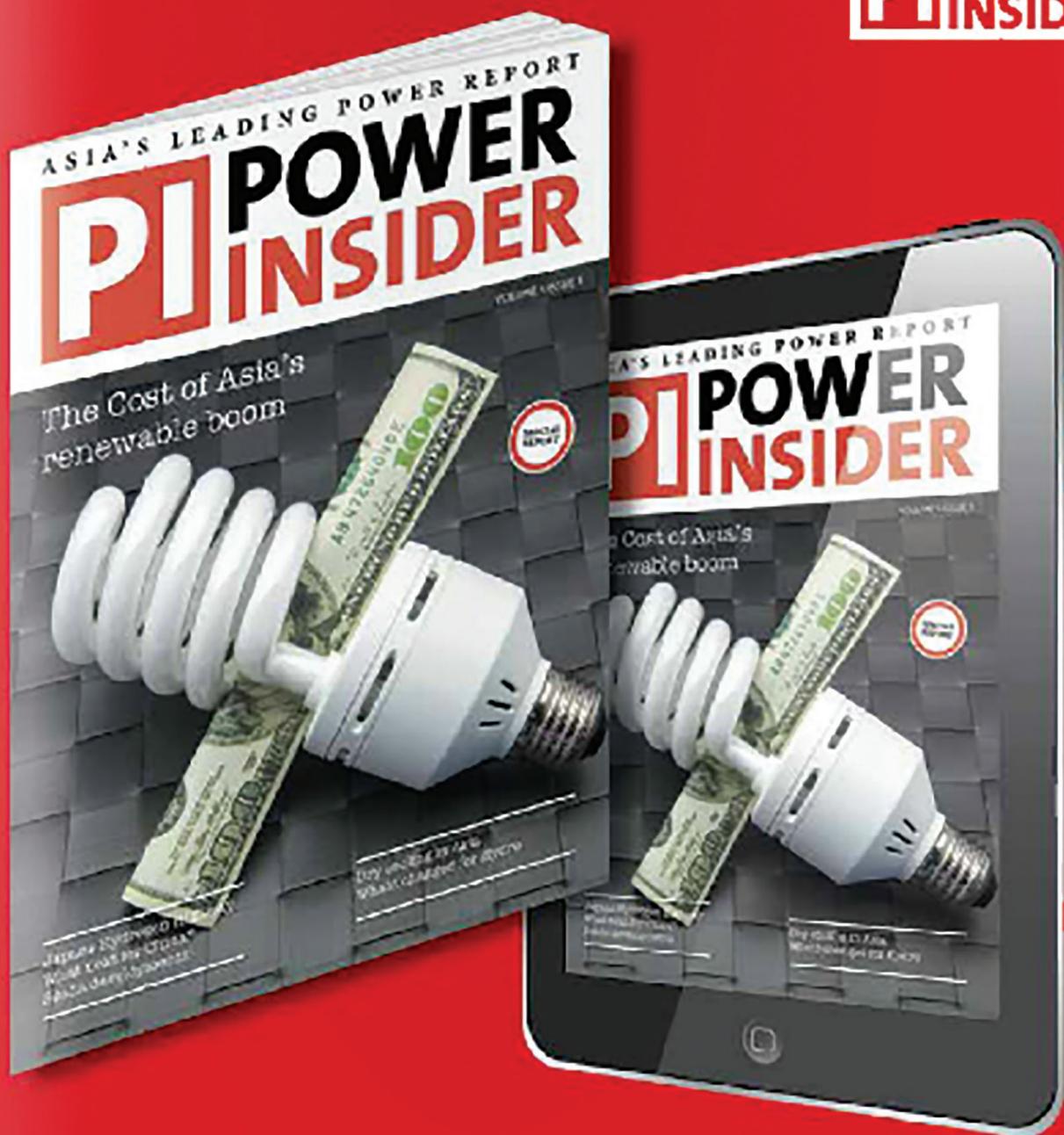
Integrating Renewables for grid flexibility

Power-to-Gas is a highly effective way of integrating renewables. It can provide a rapid, dynamic response to the Independent Grid Operator's signal to adjust to the variations in renewable generation output. The siting of a Power-to-Gas facility is not restricted to any geologic formation; it can be deployed wherever the power and gas grids intersect.

Power-to-Gas is a scalable technology. It provides unparalleled energy storage capacity in the TWh range for seasonal storage capability. It can charge energy for several days, or even consecutive weeks, without needing to discharge the stored energy.

Unlike other energy storage technologies,





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Power-to-Gas provides the means to both store and transport energy. By storing hydrogen or substituting natural gas in the existing natural gas pipeline network and associated underground storage facilities, the stored energy can be discharged where and when it is needed most. This results in higher overall integrated system efficiency.

Renewable hydrogen as a Solution for Transportation, Storage, Power and Blending of Gases

Hydrogenics is leading the industry in renewable hydrogen projects where electrolyzers are used to store renewable wind and solar electricity into hydrogen. Once the renewable hydrogen is produced, there are several ways to commercialize it in the energy system. Hydrogen can be re-electrified via a fuel cell to deliver power when needed (power-to-power). Hydrogen can be directly injected into gas grids (power-to-gas) or combined with carbon dioxide (CO₂) to produce synthetic methane (CH₄). Hydrogen can also be used in industrial applications (power-to-industry), in fuel production (power-to-fuels) for fuel cell vehicles like buses and cars, and at refineries or in the production of methanol.

Hydrogenics has done over 30 projects using these technologies and applications by converting mostly excess renewable energy to Hydrogen, for a range of applications as noted.

When produced from renewable power, hydrogen offers the capability to significantly decarbonize the power, gas, transport and industrial sectors, by substituting oil, coal and natural gas. In this case, hydrogen acts a 100% renewable energy vector, connecting these sectors to renewable power.

Per Daryl Wilson, Hydrogenics President & CEO, “With over 20 megawatts of energy storage plants commissioned or being built around the globe, Hydrogenics is clearly leading the Power-to-Gas market.”

A fast growing market with game changing potential

It is clear that hydrogen technologies will be at the core of our new decarbonized energy system. Whether it’s for transportation, fuel production or energy storage, major companies around the world are strategically transitioning to renewable hydrogen to help reduce their carbon footprint.

Hydrogenics technology is being used in over 100 countries, with varied solutions in power, transport, industrial and gas blending applications.

Hydrogenics: the leading provider of renewable hydrogen solutions

Hydrogenics is the global innovation leader with over 60 years of experience in

designing, manufacturing and installing industrial and commercial hydrogen systems around the world.

Hydrogenics’ electrolyzers deliver pure hydrogen solutions for industrial processes, renewable hydrogen projects and hydrogen refuelling stations. Hydrogenics also designs hydrogen fuel cells for light and heavy fuel cell electric vehicles including urban transit buses, commercial fleets, utility vehicles and trains, as well as for stationary applications such as critical power and hydrogen power plants. Hydrogenics currently has lead the global market in Hydrogen energy storage with the vast majority of large projects completed or under contract in Europe and North America, while soon expanding those initiatives in the Asia Pacific region. Hydrogenics has production sites in Canada, Belgium and Germany and sales offices in select locations around the world. Hydrogenics is publicly listed on the NASDAQ (HYGS) and TSX (HYG) and is the only global company to produce both water electrolyzers and PEM fuel cells, making it the leading company in clean hydrogen technology.

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