GREEN HYDROGEN

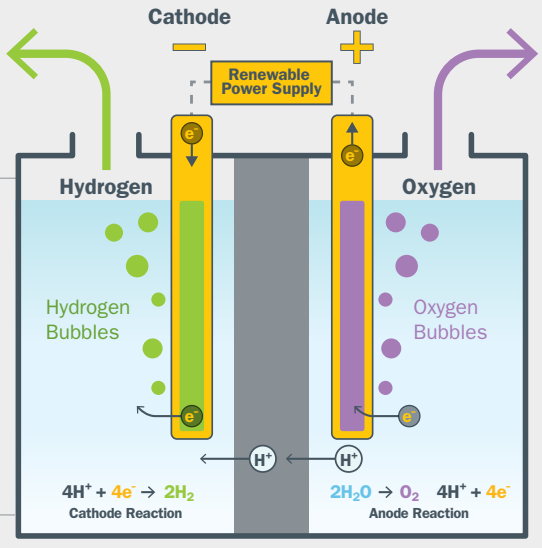
Green hydrogen has great potential as a low or no carbon fuel – either in its pure form or blended with natural gas. Hydrogen is not a greenhouse gas (GHG), nor does it produce GHGs when it is burned, making it an attractive fuel for reducing the carbon intensity of other energy sources.

WHAT IS GREEN HYDROGEN?

The green hydrogen manufacturing process emits zero carbon and produces very pure hydrogen. Furthermore, hydrogen can be methanized, via power-to-gas (P2G) technologies by combining it with carbon dioxide (ideally carbon from captured emissions, for example from a brewery or other processing facility). This fuel can be directly fed into the natural gas system and is considered carbon neutral and may even be considered carbon negative.

$$H_2O \xrightarrow{electricity} H_2 + \tfrac{1}{2} O_2$$

Green hydrogen is produced using renewable electricity, in a process called electrolysis, during which water is split into hydrogen and oxygen. This green hydrogen conversion method is not new, and there are different electrolysis technologies in varying stages of development and implementation. While alkaline electrolysis is a commercially mature technology for use in the production of green hydrogen, alternative technologies such as polymer-electrolyte membrane (PEM) and solid oxide electrolysis cells (SOEC) offer increased flexibility and efficiency improvements.



Images source: US DOE

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BENEFITS OF HYDROGEN

Both green hydrogen and P2G fuel can be used immediately or stored. Unlike other forms of renewable energy, both fuels can be stored for years at a time without losing energy. As a fuel, hydrogen can be used in a pure form or blended with natural gas.

Using electricity generated by wind and solar, green hydrogen can be produced with surplus renewable power. Currently, wind and solar energy are often curtailed when they cannot be fully utilized on the grid, reducing the overall efficiency of renewable sources. The development of green hydrogen leverages the expected rise in renewables generating assets to maximize their productivity. Renewable generating assets can also be dedicated to produce hydrogen.

CURRENT AND EMERGING USES FOR HYDROGEN

While nearly all the hydrogen consumed in the United States is used by industry, there are several emerging uses of hydrogen that include the transportation sector, with hydrogen used as a primary fuel for light and heavy duty vehicles, as well as a carbon-reducing fuel additive for diesel engines. In the building sector, several local gas companies are piloting using hydrogen, in its pure state and blended with natural gas. In the power generation sector, there are pilots for using hydrogen as an energy storage medium for the electric grid. The overall demand for hydrogen is expected to grow at more than 7 percent per year for the next decade.

CHALLENGES OF GREEN HYDROGEN

To realize hydrogen's full potential, several economic and technical challenges will need to be addressed. The cost-competitiveness of green hydrogen is highly dependent on access to cheap electricity and electrolyzer cost and efficiency improvements. However, P2G processes and electrolysis technologies are rapidly maturing and scaling. Since 2000, more than 200 electrolytic hydrogen production projects have been commissioned.

It will be important to ensure that our infrastructure is equipped and prepared for the transmission, delivery and storage of hydrogen in a cost-effective, safe, and reliable manner.

Multiple demonstrations are underway, with more starting soon. The Gas Technology Institute and Electric Power Research Institute are developing a $100 million, 5-year Low-Carbon Resources Initiative to advance hydrogen and address low-carbon fuel challenges.

GREEN HYDROGEN IN THE WASHINGTON GAS CLIMATE BUSINESS PLAN

Based on hydrogen's potential benefits and promising research and development, AltaGas predicts that green hydrogen will be a cost-effective, sustainable supply source to help reduce GHG emissions associated with the use of gas. With the necessary government policy and regulatory support, Washington Gas anticipates that carbon free green hydrogen, both as pure hydrogen and as a P2G fuel, will account for about 16 percent of customer deliveries by 2050.

The Climate Business Plan incorporates conservative cost and market share. It assumes a cost of $20 per MMBtu, by 2050, with methanized hydrogen available at $2 more per MMBtu. In contrast, Bloomberg News estimates production costs of $6 per MMBtu by 2050.[1]

The Climate Business Plan also conservatively limits the use of pure green hydrogen to 10 percent, whereas some external estimates have ranged much higher.

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1 Utility Dive, "Green hydrogen gets real as utility business models and delivery solutions emerge", March 2, 2020.