



Hydrogen Makes Cleaner Air

Replacing fossil fuels with hydrogen reduces the amount of carbon dioxide released into our atmosphere.

For every metric ton of hydrogen used, carbon dioxide emissions can be reduced by:

- **9.3 metric tons** when used instead of natural gas.^[1]
- **Up to 43 metric tons** when used instead of coal.^[1]
- **23.9 metric tons** when used instead of gasoline.*

Power-to-gas provides a clean source of hydrogen that does not have any of the carbon dioxide emissions associated with other hydrogen-forming technologies.

It's a win-win for you and the environment!

Oregon State University: Cascades

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Power to Gas

The Future of Clean Energy

Citations

- [1] G. Villaverde, J. Speaks, Z. Taie, and Z. Lavrich, "Hydrogen for Heat," 2018.
- [2] "M Series | Hydrogen Generation Systems." [Online]. Available: <http://www.protononsite.com/>

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Hydrogen Design Contest

POWERING THE FUTURE

Energy generation is shifting toward renewable sources, but supply doesn't always line up with demand. When supply is too high, clean energy is wasted and when it is too low, we make up the difference with fossil fuels.

Power to gas offers a unique solution to this problem by using the excess energy from renewable sources to produce hydrogen. The hydrogen can then be stored and converted back into electricity when needed.

Power-to-gas paves the way to a renewable future!

WHAT IS POWER TO GAS?

Power to Gas uses electricity to create hydrogen which can then be used for a variety of purposes, including:

- ◆ *Energy storage*
- ◆ *Electricity generation*
- ◆ *Heating homes*
- ◆ *Fueling cars*
- ◆ *Industrial processes*
- ◆ *Even space travel!*

Did you know?

When burned, hydrogen has zero emissions. It produces only water vapor which makes it the cleanest possible option to replace fossil fuels.

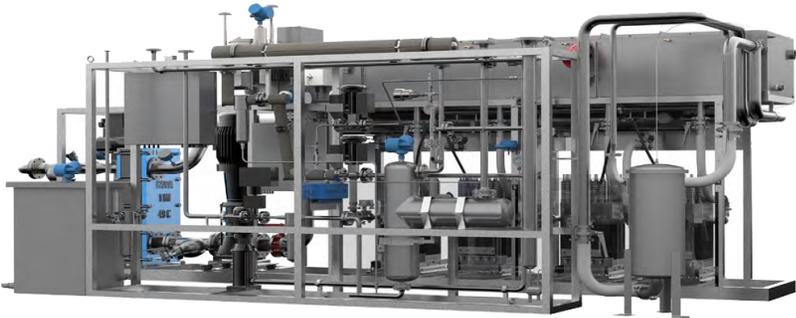
ELECTROLYSIS

Electrolysis works by separating water molecules into hydrogen and oxygen gas. The oxygen is released into the air while the hydrogen is ready to use right out of the machine. It can be stored in fuel tanks, or injected directly into the natural gas grid for easy transportation.

TYPES OF ELECTROLYZERS

There are two types of electrolyzers commercially available at this time, each with their own unique benefits:

- ◆ **Proton Exchange Membrane (PEM)**
 - Quick start up time
 - Can run on demand
 - Lower operating risks
 - Low impurities
- ◆ **Alkaline**
 - Made to be ran continuously
 - More efficient than PEM
 - Lower initial cost



PEM electrolyzer image source: Proton On-Site^[2]