



## QSI-Nano™ Science Chat

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### What Is the Hydrogen Economy?

As gas prices soar above \$3.00 per gallon, there is increasing public interest in the Hydrogen Economy as a potential alternative to our current fossil fuel based economy. As the name implies, it is focused around the production, storage, and use of hydrogen and electricity *in lieu* of fossil fuels and seeks to resolve two major problems:

- Reduction or elimination of dependence on foreign oil
- Reduction in environmental pollution

### Hydrogen Production

To shift away from the fossil fuel economy, new technologies and a significant amount of development must occur before true commercialization of the Hydrogen Economy. Unfortunately, hydrogen is not prevalent as H<sub>2</sub> gas in the environment, but rather a component of other molecules, such as hydrocarbons. Typically this hydrogen is released from hydrocarbons in a process called steam reformation. While this process is inexpensive, it releases a large amount of carbon dioxide. Additionally, hydrocarbons are derived from fossil fuels, so the steam reformation process undermines the purpose of the Hydrogen Economy. Ideally, hydrogen from non-fossil fuel sources will be derived from the splitting of water into hydrogen and oxygen. The energy needed to complete this reaction would come from solar, nuclear, or wind power. QuantumSphere is actively investigating water electrolysis using its cost-efficient nanometal catalysts ([click here for details](#)).

### Hydrogen Storage

Perhaps the most obvious method of storing hydrogen gas is in highly pressurized cylinders. A large amount of research has been conducted for safe pressurized storage, as hydrogen is explosive in air under certain conditions. Hydrogen can also be stored as a liquid. However, the energy required for the conversion and maintenance of the liquid severely undermines energy efficiency. More recently, the promise of storing hydrogen as a solid has come into the limelight, with the ability of producing "hydrogen on demand." Hydrogen can be stored in solids such as chemical hydrides, which can then be released by heat, electricity, or chemical reaction. Many metals (ideally, very small particles so the surface area is larger) are capable of absorbing hydrogen as well.

### Hydrogen Use

To date, hydrogen fuel cells have achieved an efficiency of over 90% when matched with an electric motor. Over time, these cells will become more cost efficient, as lower cost catalysts are developed ([click here for details](#)).

