

Hydrogen Facts



Sources of Hydrogen

Hydrogen is the simplest and most common chemical element on earth. It can be extracted from many sources, including water or fossil fuels such as natural gas or coal. The Hydrogen Energy California (HECA) Project will be extracting hydrogen from a blend of coal and petroleum coke, a refinery by-product.

HECA will not burn the petroleum coke and coal. Through a chemical process called gasification, the fuels will be broken into their component parts, including hydrogen, carbon, and sulfur. If the coal or coke were burned in a traditional way, its carbon would be released into the atmosphere as carbon dioxide (CO₂), the greenhouse gas believed to contribute to global climate change. In addition, traditional coal and coke combustion results in sulfur dioxide (SO_x) emissions that contribute to acid rain and respiratory problems. With gasification, these environmentally harmful components can be captured and contained instead of being released into the air while at the same time, clean-burning hydrogen-rich fuel can be produced to be used to generate electricity.

Hydrogen as a Fuel

The project's electrical generator will be a Combined Cycle Gas Turbine, very similar to the type of equipment used in natural gas power production. These are essentially jet engines, similar in operation to those in commercial aircraft. They turn a turbine that produces electricity. They also produce hot air which is used to power a steam generator, producing more electricity.

When used as a fuel, hydrogen is similar to natural gas, except that it does not contain carbon, as natural gas does. At HECA, carbon in the form of CO₂ will be captured from the syngas prior to combustion and thus the project will prevent CO₂, a greenhouse gas pollutant, from being emitted into the atmosphere. However, limited amounts of other pollutants associated with hydrogen fuel combustion will be emitted. These emissions will meet or exceed all of California's stringent air quality standards, including the Air Pollution Control District's BACT (Best Available Control Technology) standards.

Hydrogen Safety

Hydrogen is a basic element with tremendous potential. When oxidized, or combined chemically with oxygen, its only by-products are heat and pure water. This is why hydrogen bears so much promise as a source of clean energy.

At normal temperatures, hydrogen exists in a gaseous form. It is handled in a similar fashion to natural gas. And, since hydrogen has long been a component of the petroleum refining process and is being used more and more frequently as a fuel, techniques for the safe handling and storage of hydrogen are well established.

Like other common gaseous fuels, such as natural gas, oxygen is required for combustion of hydrogen gas. It cannot burn when contained by itself in a tank or a pipeline due to the lack of oxygen. Hydrogen also has certain properties that make it advantageous with respect to safety. For example, it is nontoxic – harmless to people and the environment. It is also the lightest element on earth, twice as light as helium. Thus, in the rare event that hydrogen is released into the air, it disperses very quickly, reducing the potential for unwanted or accidental combustion.

A New Hydrogen Energy Economy

In the face of global climate change, a growing consensus – including environmental organizations, the U.S. Department of Energy, major automobile companies, public utilities and power companies – is looking toward hydrogen as the viable alternative to standard fossil fuel energy. Already, there are hundreds of miles of hydrogen pipeline in the United States. Hydrogen fuel cell powered cars have been tested successfully under accepted consumer conditions, and in Iceland and Norway, fleets of city buses run on hydrogen.

This all suggests that the emergence of a new, hydrogen-based economy is a viable approach to solving today's energy and air quality problems. Taking advantage of hydrogen's clean burning properties is a way of addressing the global climate change challenge. In addition to providing clean power to over 160,000 homes and over 1 million tons per year of low-carbon fertilizer, HECA may produce sufficient supplies of hydrogen fuel to be used in other applications such as transportation.

For more information please visit our website at www.heca.com

