Back to Article

Hydrogen Economy: Real or Hyped? - By Ken Silverstein

U.S. and European officials met to add momentum to the hydrogen economy, a concept that within two decades would replace dirty power plants and combustion engines with clean burning fuel cells. Energy Secretary Spencer Abraham called for an international effort that would produce hydrogen with energy provided from a host of sources that include not just fossil fuels and nuclear energy but also from wind, solar and biomass.

As policy makers globally wrestle with the issues of fuel shortages and geo-political skirmishes that could cut into oil and gas supplies, they are pressed to look for innovative solutions. Fuel cells powered by hydrogen are hardly new. But as the technology matures and gains economies of scale, it becomes inevitable that cheaper and more advanced iterations will emerge that will have an indelible affect on the power business.

Hydrogen fuel cells are “perhaps the most significant game-changing endeavor the energy sector will see in our lifetime,” Abraham said in speech this week Brussels, Belgium. "We intend that all our hydrogen eventually be produced using emissions-free technologies," which includes coal. Natural gas is the most common fuel source used today to make the hydrogen that is consumed by fuel cells to produce electricity.

The European Union (EU), which has set a goal of producing 22 percent of its electricity from renewable energy by 2010, has expressed concern that U.S. efforts would focus on creating hydrogen from natural gas and coal while neglecting green power sources. But the administration says that nearly half of its $39 million allocation toward hydrogen research in fiscal year 2004 goes to renewable technologies. By comparison, natural gas gets $12 million and coal and nuclear combined get $9 million.

In the U.S., hydrogen-based fuel cell technology got a boost after President Bush touted it during his State of the Union Address last January. Through a public-private partnership, the technology could become a mainstream facet of our lives by 2020, he said, noting that his administration would commit $1.2 billion over five years. The EU, meanwhile, would give 2 billion Euros, or roughly $2.36 billion, to the effort.

Hydrogen is abundant, renewable and non-polluting. While it is one of the most plentiful elements in the earth's surface, it is found mostly in water. To be useful in energy applications such as fuel cells, however, a pure hydrogen source is required. If the hydrogen economy is to become a reality, then cheaper and more efficient methods of stripping the hydrogen from water must be developed. Today's technologies are costly and tend to consume large amounts of energy in the process.

An advisory committee of the European Union released a report at the Brussels' conference held this week that acknowledged—in the immediate future—that fossil fuels would play a key role in the development of hydrogen, and it furthermore implied that nuclear energy would also be a critical source. In the longer term, however, it called renewable energy “the most important source for the production of hydrogen.”

The Pitfalls

By 2004, the market for fuel cells worldwide is expected to be $850 million for electric power generation, $750 million for motor vehicles and $200 million for the aerospace industry, according to studies by the Business Communications Co. In the auto sector, 4 percent of all cars will run on fuel cells by 2010, says Allied Business Intelligence. If market penetration reaches 10 percent, it says that regulated pollutants would drop 1 million tons a year and greenhouse gas emissions would decline by 60 million tons. Oil imports could then be cut by 800,000 barrels a day.

Meanwhile, the current $40 million stationary fuel cell global market used for on-site generation will grow to more than $10 billion by 2010, says Allied. That's a jump from a generating capacity of 75 megawatts today to 15,000 megawatts by 2011.

Obstacles do abound. The latest one that proponents of the hydrogen economy must overcome is a study from the California

Institute of Technology that appeared recently in the journal *Science*. Hydrogen is so small that it is bound to leak from storage and transport containers, it says. If those deposits accumulate, then it would work to erode as much as 10 percent of the ozone layer.

The physics researchers admit that scientists don't fully understand the hydrogen cycle, pointing out that man-made hydrogen could be absorbed in the soil instead of the atmosphere. Still, critics say that because hydrogen is hazardous, any leakage could be highly explosive. Moreover, some say that the amount of energy used to make hydrogen is more than the amount of power produced by fuel cells. If fossil fuels are extracted to make the hydrogen, then more pollutants would be released.

“This hydrogen economy is not the answer or the quick fix that we are being told by bureaucrats,” says Trevor Hicks, who developed fuel cell technology for NASA. “There are better options to this fuel cell hype.”

To overcome those roadblocks, more research must be done and the field has to attract additional participants. Concerns over atmospheric damage and explosions as a result of leakage, for example, can be addressed, says David Munoz, a professor at Purdue. Because hydrogen is liquid at extremely low temperatures, any storage container must be well insulated and utilize materials that would not crack from thermal stresses, he writes on the Department of Energy Website.

Concerted Effort

The will does exist to make the hydrogen economy a reality. Every major automaker is investing in fuel cells not to mention the major fuel cell makers: Ballard, FuelCell Energy, Siemens-Westinghouse and International Fuel Cells. Right now, more than 200 phosphoric acid fuel cells using hydrogen as a fuel source are operating worldwide and reducing energy bills by between 20-40 percent annually, says the Energy Department.

Vancouver, Canada-based Ballard Power Systems, for example, recently unveiled a pre-commercial 1 kilowatt combined heat and power fuel cell generator to be used in the residential market in Japan. At 100 percent capacity, it has a 34 percent fuel to electricity efficiency rate, although that can be as high as 92 percent assuming the heat can be captured and re-used. By comparison, modern combined cycle power plants have a 50-55 percent efficiency rate while coal-fired plants are about 30-40 percent.

Hydrogen-powered fuel cells will not be a magic bullet that solves the world's energy and environmental problems in the near term. But they will over time become a significant component of the international picture. Additional research is necessary to spur commercialization, particularly for technologies that utilize renewable energy forms. It's a risk worth taking and one that could pay big dividends for both the economy and the environment.

Issue*Alert* Archive

Click here to receive UtiliPoint's daily Issue*Alert* via e-mail.