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Transportation of hydrogen from production to distribution is costly.

David W. **Keith**, Dept. of Engineering and Public Policy at Carnegie Mellon University and Alexander E. **Farrell**, with the Energy and Resources Group at the University of California Berkeley, July 18, **2003**, “Rethinking hydrogen cars” *Science*, Vol. 301, Issue 5631, p315

The introduction of any new transportation fuel is a rare, difficult, and uncertain venture — it demands a linked introduction of a new fuel distribution system and new vehicles, because neither is useful without the other. Although technically feasible, a hydrogen refueling infrastructure would be expensive: initial cost would likely exceed \$5000 per vehicle even if one assumes large economies of scale. The cars themselves will also likely be expensive. If hydrogen cars are ever to match the performance of current vehicles at a reasonable cost — particularly fueling convenience, range, and size — technological breakthroughs in hydrogen storage and energy conversion will be required. Like electricity, hydrogen is an energy carrier that must be produced from a primary energy source [HN3]. Today, hydrogen is produced from natural gas on a large scale and at low cost: hydrogen production consumes 2% of U.S. primary energy, and at the point of production, it costs less than gasoline per-unit of energy. Although hydrogen production is simple, as a low-heating-value, low-boiling-point gas, it is inherently expensive to transport, store [HN4], and distribute — all strong disadvantages for a transportation fuel.

Hydrogen power still decades away.

**Worlds News Digest** (*December 31, 2004*) Energy: Panel Urges Conservation, New Sources; Other Developments.

[http://150.147.23.35:9797/com/2facts/?MuseHost=www.2facts.com&MuseSessionID=52abe8e585890d46077e48d9ed1d2dd&MuseFirst=1&MusePath=%2Fstories%2Ftemp%2F1771temp2004337330.asp#d2004337330\\_2](http://150.147.23.35:9797/com/2facts/?MuseHost=www.2facts.com&MuseSessionID=52abe8e585890d46077e48d9ed1d2dd&MuseFirst=1&MusePath=%2Fstories%2Ftemp%2F1771temp2004337330.asp#d2004337330_2)

Researchers at the Idaho National Engineering and Environmental Laboratory, a government nuclear laboratory, and at Salt Lake City, Utah-based ceramics maker Ceramtec Inc. December 2 announced the discovery of a new technique to produce hydrogen from water, which used far less energy than earlier methods. However, some experts said fuel-cell-powered cars were still decades away because of the difficulty in shipping and storing hydrogen power. Widespread use of the new hydrogen-generating technique would also require construction of a new kind of nuclear reactor that used hotter water.

A hydrogen economy is a debilitating diversion.

David **Morris**, *VP of the Institute for Local Self-Reliance*, February 24, **2003**, AlterNet., <http://www.alternet.org/story/15239/>

To understand why, we need to start with the basics. Hydrogen is the most abundant element on the planet. But it cannot be harvested directly. It must be extracted from another material. For the fossil fuel industry, not surprisingly, hydrocarbons will provide most of our future hydrogen. They already have a significant head start. Almost 50 percent of the world's commercial hydrogen now comes from natural gas. Another 20 percent is derived from coal. What does all this mean? A hydrogen economy will not be a renewable energy economy. For the next 20-50 years hydrogen will overwhelmingly be derived from fossil fuels or with nuclear energy. Renewables are poised to rapidly expand their presence. A hydrogen economy would be a potentially debilitating diversion.

Hydrogen is unsuitable with the energy market.

David **Morris**, *VP of the Institute for Local Self-Reliance*, February 24, **2003**, AlterNet., <http://www.alternet.org/story/15239/>

There is another energy-related problem with hydrogen. It is the lightest element, about eight times lighter than methane. Compacting it for storage or transport is expensive and energy intensive. A recent study by two Swiss engineers concludes, "We have to accept that [hydrogen's] ... physical properties are incompatible with the requirements of the energy market. Production, packaging, storage, transfer and delivery of the gas ... are so energy consuming that alternatives should be considered."

Hydrogen economy intensifies pollution.

David **Morris**, *VP of the* Institute for Local Self-Reliance, February 24, 2003, AlterNet., <http://www.alternet.org/story/15239/>

Not only will a hydrogen economy do little to expand renewable energy, it will increase pollution. Making hydrogen takes energy. We are using a fuel that could be used directly to provide electricity or mechanical power or heat to instead make hydrogen, which is then used to make electricity. Back in 1993 William Hoagland, senior project coordinator at the National Renewable Energy Laboratory's hydrogen program, prophetically told Time Magazine, "I can't see why anyone would invest in additional equipment to make hydrogen rather than simply putting the electricity on the grid." Converting natural gas into hydrogen and then hydrogen into electricity increases the amount of greenhouse gases emitted.