

HOW VIABLE IS THE HYDROGEN ECONOMY: THE CASE OF ICELAND

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Overview

The vision of a hydrogen economy could become a reality within the next four to five decades with Iceland already leading the way to become the world's first fully-operational hydrogen economy. Iceland even cherishes the dream of becoming the "Kuwait of the North", a major source of energy in a world where all nations followed Iceland's path. Icelanders even dream of exporting hydrogen and creating a booming new industry (though first they will have to figure out a way to get it there).

A hydrogen economy is a hypothetical economy in which the energy needed for transport or electricity is derived from reacting hydrogen with oxygen. While the primary purpose is to eliminate the use of fossil fuels and thus reduce carbon dioxide emissions, a secondary goal is to provide an energy carrier to replace dwindling supplies of crude oil.

The vision of a hydrogen economy in Iceland is to take all of Iceland's cars and fishing trawlers and gradually replace their gas combustion engines with electric motors run on hydrogen-fuel cells, just like American space shuttles. Meanwhile, harness Iceland's abundant geothermal and hydro-energy resources to begin producing hydrogen gas on a mass scale.

Iceland is a model in the making. With a population of only 290,000 people and with its abundant hydro-energy and its geothermal energy, Iceland has already started the transformation into a hydrogen economy. For a number of years, public transport buses in Reykjavik, the capital, have already been running on hydrogen-powered fuel cells. The next step is the introduction of hydrogen fuel cell cars for private transport. Eventually the entire Icelandic fishing fleet will be gradually replaced by hydrogen fuel cells.

Most hydrogen on Earth is bonded to oxygen in water. Hydrogen is presently most economically produced using fossil fuels. More expensively it can also be produced via electrolysis using electricity and water, consuming approximately 50 kilowatt hours of electricity per kilogram of hydrogen produced. Nuclear power can provide the energy for hydrogen production by a variety of means, but its wide-scale deployment is opposed in some Western economies while it is embraced in others. Renewable energy is being used to produce hydrogen in Denmark and Iceland.

With the expected decline in the global production of oil together with increasing demand, renewable energy sources like biomass, hydropower, wind, wave energy, tidal energy, geothermal energy and solar energy are going to become increasingly important.

Methods

The author will use his own research and collate it with research from the University of Iceland and other credible sources in order to present a well-balanced analysis of the viability of the hydrogen economy and its eventual impact on the global oil demand and the environment.

Results

This paper will outline the components of a sustainable hydrogen economy. It will argue that Iceland's gradual transformation into a hydrogen economy is a viable proposition given its abundant hydro-power and geothermal energy. The paper will also argue that such a transformation, however, can't be replicated anywhere else yet without the massive use of fossil fuels, something that the hydrogen economy is trying to leave behind. It will maintain, however, that with steady progress and a few significant technology breakthroughs, the world will start to make a committed switch to a hydrogen economy –over the next several decades a confluence of events will mark a steep increase in hydrogen energy development. By that time, hydrogen production costs will be lower, the basic components of a hydrogen storage and distribution network will be in place, and hydrogen-powered fuel cells, engines, and turbines will be mature technologies that are mass produced.

Conclusions

The paper will conclude that a hydrogen economy is destined to become a reality sometime during the twenty-first century and that hydrogen will become the “fuel of Choice” and will be available for every end-use energy need in the economy, including transportation, power generation and portable power systems. The paper will also conclude that at the time the vision for a hydrogen economy becomes a reality, several decades from now, hydrogen will still be produced from fossil fuels, but also from biomass and water using thermal, electric and photolytic processes. Hydrogen produced from water will be a cost competitive alternative to hydrogen made from hydrocarbons.

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