

Is the “Hydrogen Highway” Already Here?

Frank Zammataro is the CEO and Founder of HydroCosm which provides sustainable, hydro-powered hydrogen electrolyzer systems for deployment in fleet depot applications. These integrated systems are located where pressurized water infrastructure exists, to provide the electrical load and water required to create “just-in-time-hydrogen™” for H₂ dispensing for fuel cell electric vehicles (FCEV).



HydroCosm is a recent spin-off from my Company, Rentricity Inc. (www.rentricity.com) which recovers energy from pressurized, solid pipe water operations to create clean energy. I was very lucky to have participated in the 2019 Colorado Cleantech Industry Association (CCIA) Fellowship Program. After seeing the hydrogen laboratory at our National Renewable Energy Laboratory (NREL) in Golden, Colorado, I was inspired to explore the integration of



hydrogen technology with in-pipe hydropower systems. I recall looking at hydrogen in the early 2000's, when only early lab prototypes were in development. Fast forward almost 20 years and things have unquestionably advanced. Historically, it takes about 15 to 20 years, and two waves in a given technology field to mature it to commercial readiness, especially in Cleantech. Cleantech is complex. It is not a dot.com business where you can build and scale instantly. Rather, it is a capital intensive, nuts-n-bolt challenge to create clean energy technology and the infrastructure to allow its dissemination into the everyday lives of people. That is what is happening with hydrogen!

Today we see the killer apps like zero emission fork lifts emerge as we build more and more product distribution sites for on-line retailers across the United States. As the European Union (EU) enforces more clean standards, marine applications are rapidly growing requiring large container ships to reduce emissions with hydrogen. California is showing leadership in exploring new hydrogen infrastructure for the over 7,000 H₂ vehicles operating in the state. And now, the newly formed Colorado Hydrogen Network, is blazing new trails to link Colorado to the hydrogen highway emerging across the country.



Hydrogen applications will continue to emerge as the world continues to seek environmental and socially beneficial technologies. State and Federal agencies will continue to create programs to spark entrepreneurs and innovation. Regardless of background, mechanical, electrical, chemical, business, or finance, hydrogen will provide a multitude of areas to be innovative. It has horizontal application across many industries. Even today, we see the convergence of the electric vehicle market with fuel cell electric vehicle market being discuss as one on CNBC. But let's look back at a gem from Jeremy Rifkin's book, *"The Hydrogen Economy" circa 2002.*

"If hydrogen is going to become less and less expensive to produce, and eventually will become an "almost" free resource, but if the smart networks that it runs on are going to be costly to build and maintain, then we need to think seriously, at the beginning of the hydrogen age, about the kind of institutional framework to put in place that best reflects the character of the energy source we are using. The hydrogen energy webs (HEW) and the hydrogen economy built from it require a radical new kind of architectural design that brings private and public, profit and non-profit ways of doing business into a symbiotic relationship that reflects both the proprietary and public aspects of the new energy regime. "

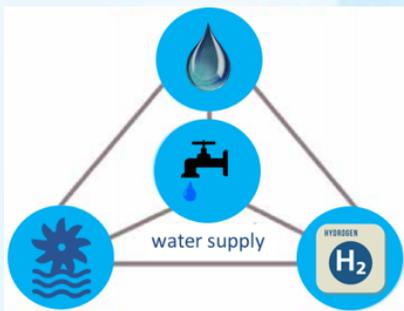
This quote suggests innovation opportunities in infrastructure development. As we rebuild roads, bridges, tunnels, and water systems, can we do it in a smart and sustainable way? That is Mr. Rifkin's challenge.... new designs, new business models, new kinds of public-private finance partnerships all building towards new infrastructure and perhaps for me, the use of one of our most precious infrastructure resources water!

Mr. Rifkin continues:

"Distributed generation and the HEW are in the very early stages of development, much like the Internet was in the late 1980s. The way that distributed generation is structured during the takeoff stage in the next five years will likely determine the energy infrastructure that eventually evolves and matures ten to fifteen years from now."

When "The Hydrogen Economy" was published almost 19 years ago, the basics of solar, wind, electric vehicles and advanced energy storage systems were still in their infancy. Today they offer incredible leverage opportunities, creating a new supply chain of clean and green distributed generation and the possibility to produce what is now called "green hydrogen." The second wave of hydrogen innovation is happening now. And it may be the tsunami that reinvents the energy business once and for all. It just may be the wave that brings a flood of innovation and focus, new government programs, university and national labs invention, entrepreneurial start-up and most importantly economic development.

As I said earlier, I was lucky to have participated in the CCIA Fellowship Program, but sometimes



you have to make your own luck or maybe it wasn't luck at all. Maybe the hydrogen highway has already been built? Perhaps it's been in existence for the past 150 years, right under our noses or should I say feet. Perhaps it's under the ground in the very same pipes that have been laid to deliver water to people and industry across the United States! Maybe the real hydrogen innovators are the hundreds of thousands of water operators, that have built and secured our water infrastructure, preparing it for a new generation of

entrepreneurs in this third millennium who will use it in a new, different and sustainable way!