

## Is Hydrogen the Future of Energy?

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The commercial real estate (CRE) industry is facing a wide range of challenges as owners and managers work to operate buildings profitably in uncertain economic and regulatory environments. For example, state and local governments continue to consider mandating EV charging stations in parking structures and lots but they have not made the investment in the grid infrastructure needed to support the corresponding demand. A movement toward electrification of the built environment has escalated the problem by increasing demand for electricity while banning most on-site generation.

Hydrogen may be an answer. Hydrogen is the simplest and most common element in the universe, and it holds exciting potential as a low carbon source of energy. But where does hydrogen come from? How is hydrogen delivered? How can hydrogen benefit the CRE industry?

### What is Hydrogen Fuel?

Hydrogen is a single element (H<sub>1</sub>) that is present in fuel such as natural gas, fossil fuels and biofuels. To use hydrogen as fuel, it must be isolated from the other molecules. This is achieved by super-steam heating an original fuel source (natural gas, petroleum, biofuel), which causes separation from other elements, isolating the hydrogen molecule. This process releases carbon as it separates hydrogen, however refiners apply sequestration technology to avoid the release of carbon into the atmosphere. Carbon can be pumped into the ground, eliminating the impact on the atmosphere. Refined hydrogen can then be burned as fuel to generate heat, in turn generating electricity within a fuel cell. When hydrogen is consumed as fuel its produces only water as an emission.

Hydrogen, once isolated and processed into a fuel, can be used in almost any application. Currently the most widespread use is in industrial applications. For example, hydrogen is the main fuel source in many heat-intensive industries like steel and chemical manufacturing. It is also used in power generation, trucking, automobiles and as an energy source to refine other fossil-based fuels, such as turning crude into gasoline.

However, there is much more research and development needed in hydrogen technology to fully realize the benefits of this energy source. Specifically, investments in carbon sequestration are needed to reach the full potential of hydrogen processing, ensuring that carbon reduction goals are met. Development of new equipment, particularly small-scale generation technology, could work together with electrification policies to maximize renewables without eliminating on-site generation.

One of the most important aspects of hydrogen is fuel delivery. According to the International Energy Agency (IEA), hydrogen is principally compatible with existing natural gas infrastructure, reducing the cost of delivering low-carbon energy sources. In transportation, hydrogen can be distributed within the existing petrol station networks, eliminating the need for costly development of EV charging stations.



## How Can Hydrogen Benefit CRE?

A refocus to hydrogen as fuel, particularly in on-site generation and transportation, could have a significant, positive impact on the commercial real estate industry and lead to substantial reductions in carbon emissions.

Across the globe, national and local governments have increasingly focused on the concept of electrification. The idea is that on-site generation, oil-fired heating systems, and natural gas generators should be replaced with energy from the grid that is ideally generated from some type of renewable. However, this does not always lead to decarbonized energy but rather shifts the energy source for the facility to the grid, where electricity is often generated from fossil-fuel. It also places pressure on the grid system, which in many countries around the world is overburdened and in disrepair. The potential outcome is that emissions are not reduced, infrastructure fails, and costs are shifted to the public.

Allowing for on-site generation using hydrogen would provide many benefits to the industry. First, it is possible to install hydrogen generation system in the existing footprint of most buildings' existing gas or oil-fired generators. More important, advances in technology show that hydrogen equipment continues to decrease in size, making it feasible in more sites. Finally, the most significant issue is the reduction in demand for grid energy. In many countries, particularly in the United States, grid maintenance, development and expansion has been neglected, creating a situation where additional pressure on the grid is likely to create rolling brownouts and even complete failure.

For the last several decades, automobile and truck manufacturing has focused on shifting to electric vehicles powered by batteries. This has led to enormous pressure on the CRE industry through regulatory mandates for charging station and upgrades to buildings to support this policy direction. A policy shift to hydrogen transport technologies could answer many of the challenges faced by CRE, specifically the cost burden as state and local governments mandate that building owners install stations at their expense. This is no small mandate--EV charging stations cost more than \$20,000 per station, and increase energy demand in the building and on the grid. However, hydrogen is easily transported to any fueling site and is compatible with the current filling station model. On the consumer side, it eliminates the "range anxiety" that goes along with plug-in automobiles because hydrogen refueling would be like petrol refueling.

## The Future

The CRE industry is faced with a wide range of challenges in pursuing building operations that are efficient and profitable. If governments mandate building electrification and plug in-automobiles, or select generation technology, this does not allow for the innovation needed to reduce emissions globally. We must encourage our political leaders to recognize all types of alternative energy, including hydrogen, tidal and thermal, if they are better suited for reaching zero-emissions goals.

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