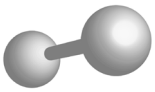
Hydrogen

On Sept. 1, 2023, hydrogen regulation was added to the **BC Energy Regulator (BCER)** portfolio, granting us authority over facilities for manufacturing hydrogen from petroleum, natural gas, water or other substances. We're making preparations to receive applications for new hydrogen projects, such as meeting with other regulators and holding discussions with proponents of prospective projects.

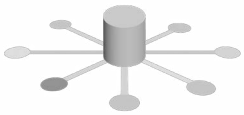


What is hydrogen?

Hydrogen is the lightest and most abundant element in the universe and is found in compounds such as water (H_2O) and the methane in natural gas (CH_4). When hydrogen is split from water or released from organic material, it becomes a versatile energy carrier that can be used in energy systems to generate electricity and heat.

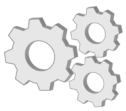
Decarbonization Potential

Hydrogen's decarbonization potential is garnering significant global interest. Hydrogen has the highest energy density per mass of any fuel - approximately three times that of gasoline - and can be produced using renewable electricity. Moreover, Hydrogen does not produce greenhouse gases, black carbon, particulates, sulphur oxides, or ground-level ozone at the point of use (although there can be nitrogen oxides emissions).



Challenges

Cost-effective storage and distribution is a challenge and cost-competitiveness when compared to other conventional fuels will be key to wide scale adoption. There might be potential for blending hydrogen into B.C.'s natural gas network but the capital costs required for upgrades will need to be considered against the overall greenhouse gas emissions reductions and impacts to downstream customers.



Uses

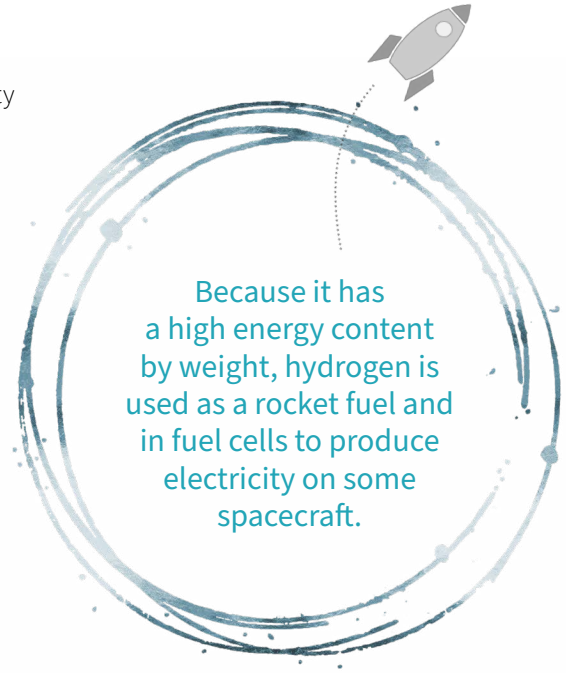
Hydrogen has the potential to play a critical role in hard-to-decarbonize sectors where direct electrification is not practical, such as heating and power, medium and heavy duty transportation and industrial processes like steel manufacturing.

Worldwide, it is estimated hydrogen will contribute between 12-22 per cent of energy supply by 2050.

Clean hydrogen has the potential to provide up to 30 per cent of Canada's end use energy by 2050 and abate 190 megatonnes of CO_2 equivalent.

Canada is currently one of the top 10 global producers of hydrogen.

B.C. is well positioned to be a leader in low carbon intensity hydrogen production given our abundance of low-cost natural gas, geological capacity for carbon capture and storage and abundance of clean and renewable energy.



Because it has a high energy content by weight, hydrogen is used as a rocket fuel and in fuel cells to produce electricity on some spacecraft.

BRITISH COLUMBIA ENERGY REGULATOR

Public Concerns and Complaints
1-250-794-5200 (24-hour public number)
1-877-500-BCER (2237) (24-hour toll free)
Report concerns such as odours, spills or noise.

Incident Reporting for Industry
1-800-663-3456 (24-hour emergency number)
Report oil and gas related incidents.

September 2023

Hydrogen "Pathways"

The carbon intensity of different hydrogen pathways can vary significantly depending on the "feedstock" (energy source and material input), manufacturing method, and whether "capture" of by-product emissions is employed. The following are a few of the possible hydrogen production pathways that may be viable in the British Columbia context.

① One promising low carbon intensity pathway - owing largely to the abundance of renewable hydro power in B.C. - is the manufacture of hydrogen via electrolysis, by which electricity is used to split water (H_20) into hydrogen (H_2) and oxygen (O_2).

② Hydrogen can also be produced from hydrocarbon-based sources, such as the methane in natural gas, the primary hydrocarbon resource in B.C. One common method for manufacturing hydrogen from methane is steam methane reforming, by which methane (CH_4) is forced to react with steam (H_2O) under pressure in the presence of a catalyst, producing hydrogen, carbon monoxide (CO), and carbon dioxide (CO_2). The degree to which the carbon gas by-products are "captured" - and stored underground, for example - versus emitted into the atmosphere determines the carbon intensity of this pathway.

Pyrolysis is another methane-based manufacturing process that involves the decomposition of methane through the application of extreme heat to yield hydrogen and solid carbon.

(See the **B.C. Hydrogen Strategy** for a summary of other hydrogen production pathways and their relative greenhouse gas emissions intensities).

③ Once isolated, hydrogen can be stored as a compressed gas or a liquid at very low temperatures. It can also be stored in liquid chemical carriers, such as ammonia, or by bonding to toluene, where high densities of hydrogen can be stored at lower pressures. It can then be distributed via pipelines or mobile transport. Hydrogen can also be blended with natural gas to reduce the carbon emissions of end-use gas applications.

④ The hydrogen can then be used as fuel for shipping and transportation, to power and heat industry and buildings, or sold to the export market.