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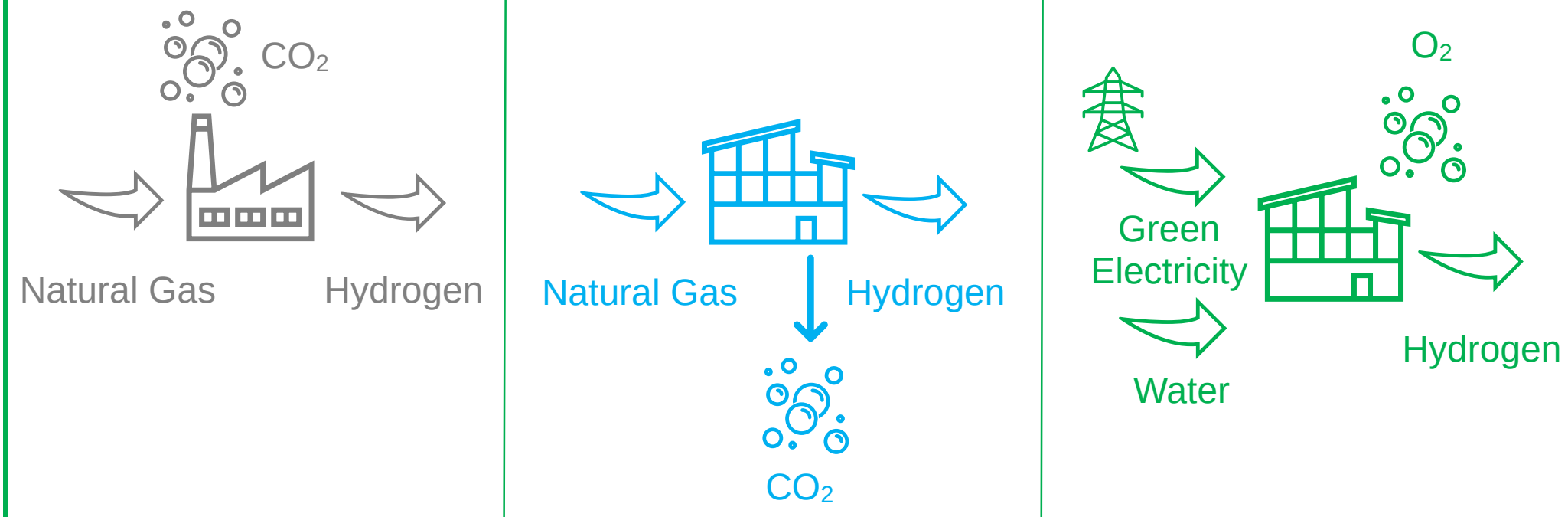
# Fact Sheet – Hydrogen Production (Overview)




## What are the main Hydrogen types?

- Grey Hydrogen : This is the most common form of hydrogen where hydrogen is produced from fossil fuels and the process releases carbon dioxide which is not capture nor stored. Grey hydrogen production is highly unsustainable and is not a preferred long-term solution.
- Blue Hydrogen : Blue hydrogen production is similar to Grey Hydrogen, however, the difference is that carbon dioxide is captured and stored. Blue hydrogen is much more environmentally friendly, but it is also high in cost.
- Green Hydrogen : Green Hydrogen is produced using electricity from clean energy sources (electrolysis using renewable energy). Green hydrogen is considered low or zero emission primarily because the energy sources used do not release greenhouse gasses when generating electricity.

## Why Hydrogen ?

Hydrogen is the most common element in the universe and almost all chemical fuels are based on hydrogen – although they may exist in a bound form either as hydrocarbons or other hydrogen compounds.

Hydrogen energy is currently and will continue to be a major demand for the following technologies / sectors :

- Fuels for transportation - cars, trains, trucks, and ships
- Generating electricity
- Heating buildings

Reason why hydrogen is a preferred energy solution is because hydrogen is a colorless and clean fuel that emits only water when burnt or oxidized.

## Limitation/cons of Hydrogen

- Grey Hydrogen : Very high carbon emissions – almost 10kg of $CO_2$ released in the atmosphere for every 1 kg of Grey Hydrogen produced.
- Blue Hydrogen : Although Blue hydrogen is the most current attractive hydrogen production solution due to its lower $CO_2$ emissions, it does not eliminate carbon emissions into the atmosphere entirely. (cont)

  It is also arguably seen as a blanketing technology which goes against the principles of net-zero.
- Green Hydrogen : In terms of technology, green hydrogen will require electrolysers to be built on a large scale. But the main challenge for green energy is the high cost and electricity required for production. Producing green hydrogen will require huge amounts of electricity which means an additional increase in the current supply of renewable energy.

## Other types of Hydrogen

- Black Hydrogen : Produced from black coal (bituminous coal)
- Brown Hydrogen : Produced from brown coal (lignite)
- Red Hydrogen : Produced from Biomass
- Pink Hydrogen : Produced via electrolysis from Nuclear Energy
- Yellow Hydrogen : Produced via electrolysis from a mix of solar power and energy sources from the electrical grid.
- Turquoise Hydrogen : Produced from Methane pyrolysis
- White Hydrogen : Naturally occurring geological hydrogen.

## References/Further Reading


https://energyeducation.ca/encyclopedia/Types_of_hydrogen_fuel

https://www.worldenergy.org/assets/downloads/WEInsights-Brief-New-Hydrogen-economy-Hype-or-Hope-ExecSum.pdf

https://energyeducation.ca/encyclopedia/Hydrogen_as_an_energy_currency

https://www.eia.gov/energyexplained/hydrogen/use-of-hydrogen.php#:~:text=Hydrogen%20fuel%20cells%20produce%20electricity%20by%20combining%20hydrogen%20and%20oxygen,a%20wide%20range%20of%20applications.

https://www.weforum.org/agenda/2021/07/clean-energy-green-hydrogen/