

# Hydrogen: The Future Fuel

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## Situation

- The world consumes a total of 94 million barrels of oil per day [1]
- The global demand for oil is increasing exponentially while the remaining supply has been decreasing at a faster rate as shown in Figure 1.
- Burning of fossil fuels produces greenhouse gases that are responsible for global warming, the melting of the icecaps and the degradation of the Ozone layer.
- By the year 2050, emissions from our vehicles will make up to 50% of the total worldwide emissions [2]

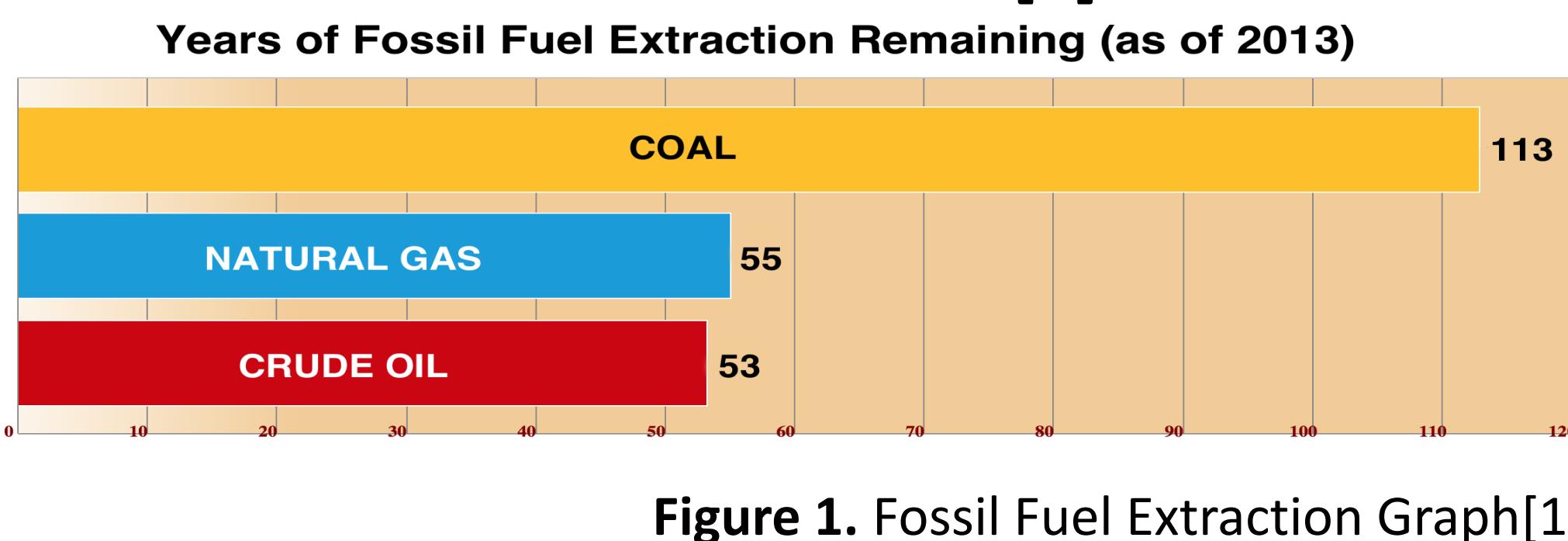


Figure 1. Fossil Fuel Extraction Graph[1]

## Problem

### Extraction of Hydrogen

- Pure Hydrogen can be obtained through **electrolysis**, however, this is energy inefficient as the Hydrogen produced will generate less energy when burned compared to the energy we supplied to the initial system.
- Natural gas reforming and gasification methods use natural gas and fossil fuels as a source of heat to obtain Hydrogen. 20% of the input energy would be wasted through this process. [3]

## Solution

- To minimize the emission of carbon dioxide, **carbon trapping** (shown in Figure 3) can be implemented.

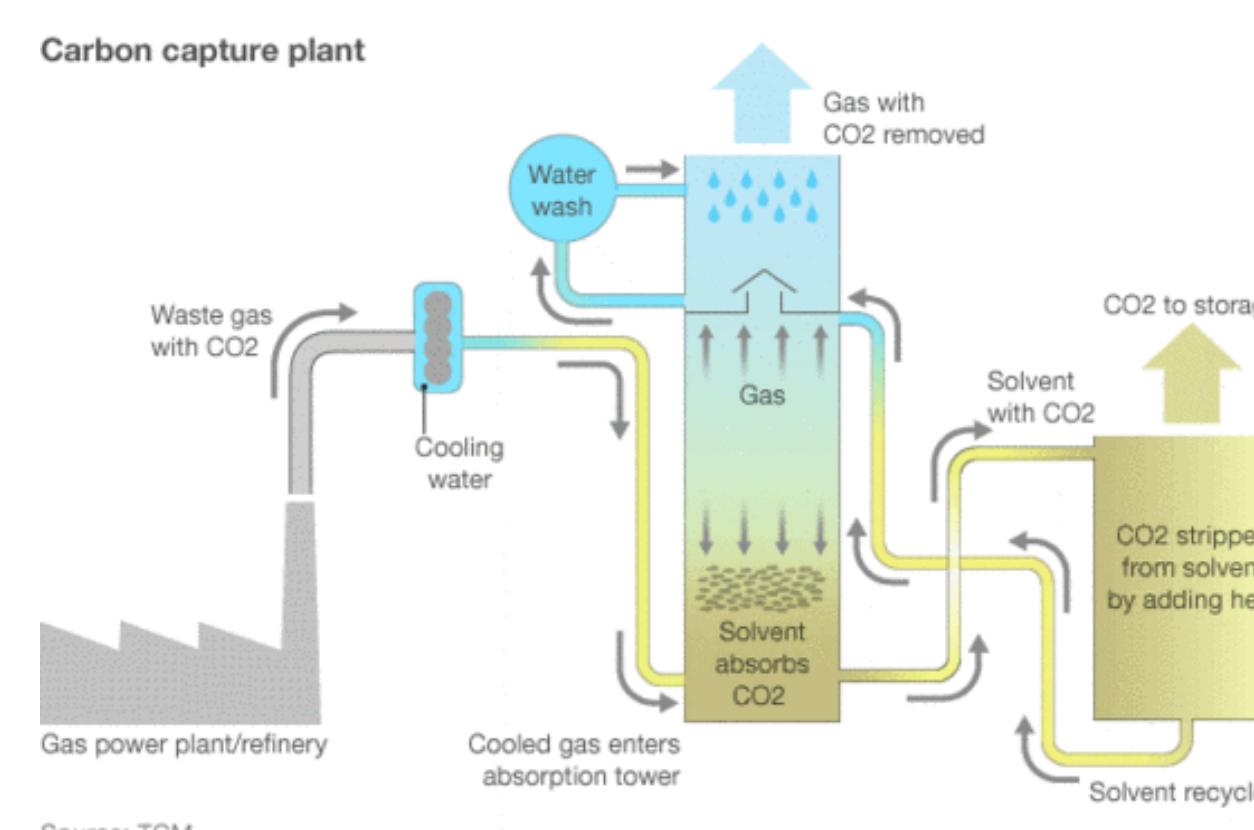


Figure 3. Carbon Trapping System [6]

- Investing in **renewable energy** such as wind and solar energy as a source of energy for a more eco-friendly way to extract and store hydrogen.
- Implementing **onboard processors** in vehicles in order to separate and break down Methane into Hydrogen and Carbon Dioxide. This will cost less and be eco friendly. [6]

## Storage of Hydrogen

- Hydrogen is **flammable** and highly reactive and thus is dangerous to transport.
- High pressure is required to compress the gas into liquid in order to supply it to the automobiles and to the pipeline systems as shown in Figure 2. [4]

### Running Cost

Hydrogen as a fuel will be much more **expensive** in comparison to oil unless appropriate enforceable solutions are implemented. [5]

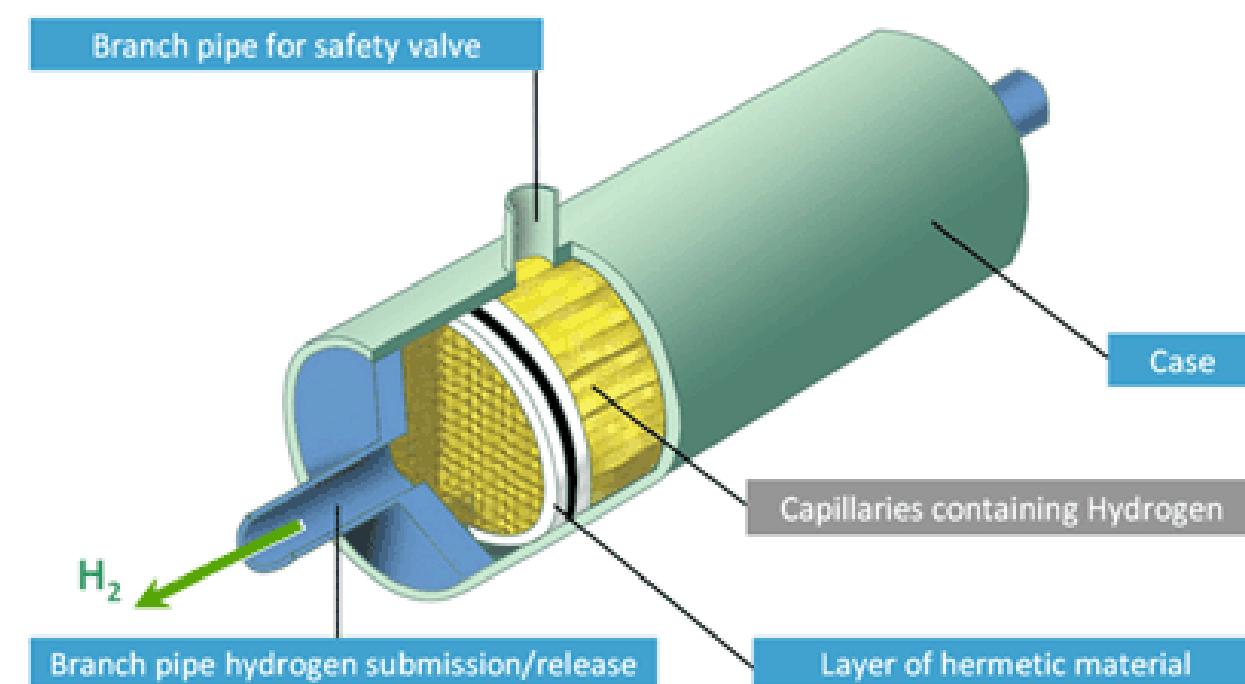


Figure 2. Hydrogen Storage Tank [6]

## Evaluation

- Hydrogen fuel in cars produces more energy compared to electric cars and can be a good substitute for fossil fuels in the future.
- The cost of extracting and storing hydrogen will be expensive when initially set up, however cheaper and more efficient in the long run. For solar rays, wind and water energy are free.
- Storage of hydrogen after extraction can be useful to provide fuel for other transportation, particularly for ships and airplanes.
- Hydrogen is a convenient fuel that doesn't take long to refill.

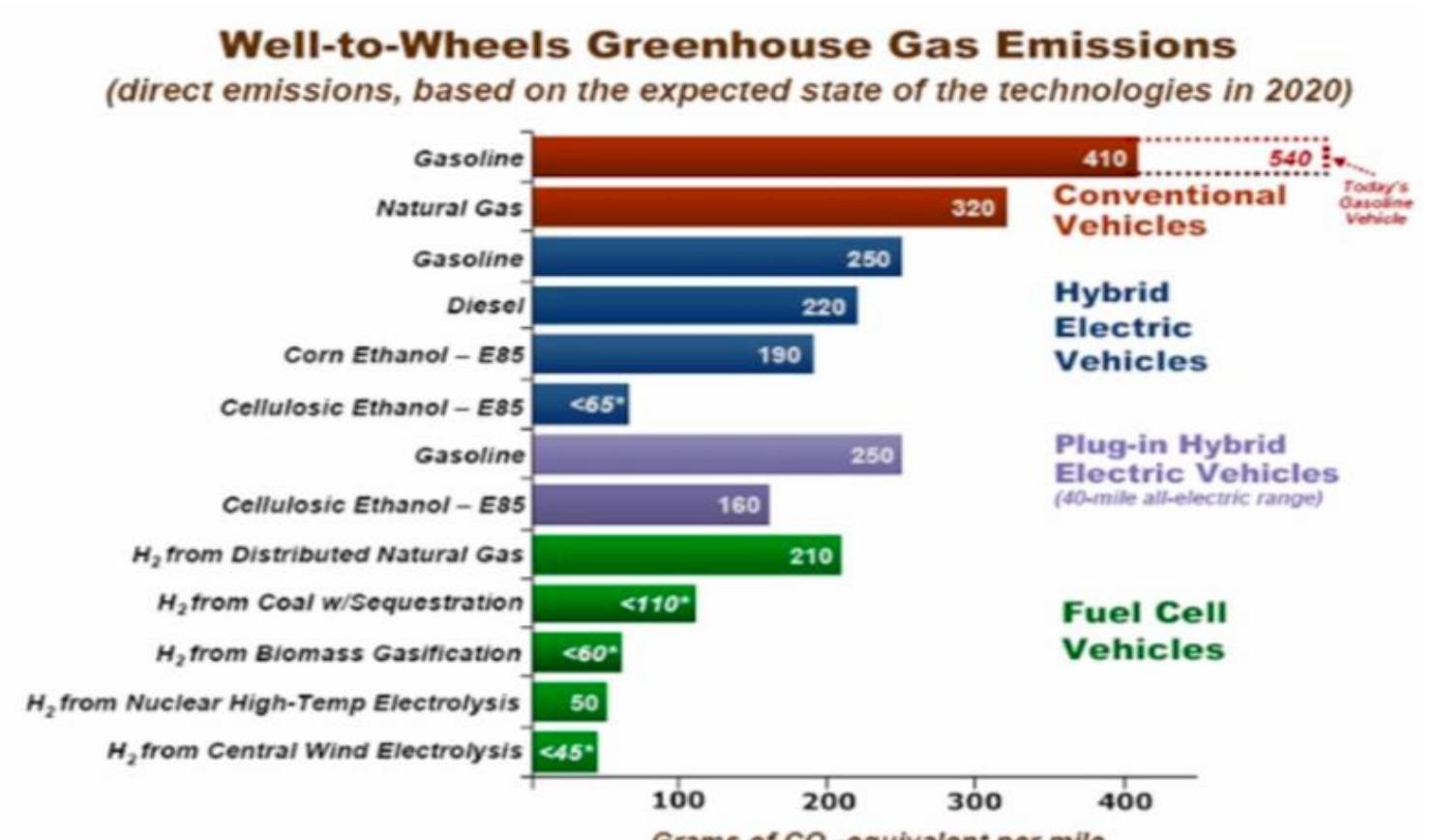


Figure 4. Green House Emissions Table [5]

## References

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- [2] Greenpeace International, "What is the share of cars in climate change?", 17 March 2008.
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