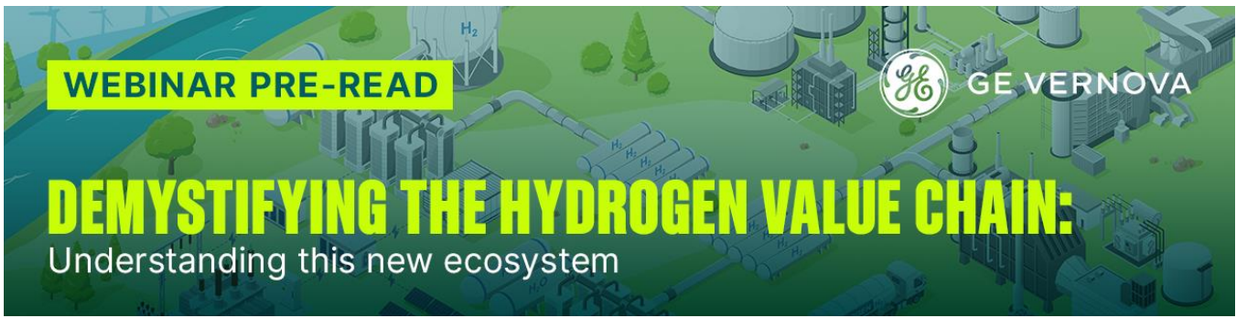

This document will help prepare you to get the most out of our upcoming webinar.

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THE HYDROGEN VALUE CHAIN: LET'S BREAK IT DOWN

The hydrogen value chain represents the process of producing, transporting, storing, and using hydrogen in various applications.

PRODUCTION

It begins with hydrogen production, usually through a reforming process[1] or electrolysis. If producing the hydrogen via electrolysis, this process requires electricity which could be taken from the grid, or if a lower carbon intensity[2] is required, from a renewable power source (i.e., wind, solar, or hydro) or a nuclear power plant.

Producing hydrogen using a reforming reaction (e.g., steam methane reforming or autothermal reforming) or methane pyrolysis requires methane typically provided as natural gas. The use of steam methane reforming or autothermal reforming would also require carbon capture and sequestration (CCS) to mitigate carbon emissions[3].

TRANSPORT AND STORAGE

Once produced, hydrogen is typically compressed for transport or storage. The process results in either hydrogen gas under high pressure or a cryogenically cooled liquid hydrogen. Transportation of hydrogen can be done via pipelines (compressed gas) or trucks (compressed gas or liquid).

Storage can occur in a variety of forms, from underground salt caverns to high-pressure tanks installed above or below ground. Depending on the type of tank, hydrogen could be stored as a gas or liquid (in salt caverns it is stored as a gas).

[1] Today, more than 95% of all hydrogen production is based on reforming coal or natural gas.
[2] Additional information on the carbon intensity of hydrogen production pathways is available from the International Energy Agency via a 2023 report titled, "Towards hydrogen definitions based on their emission intensity".
[3] Additional information on CCS is available online at https://www.ge.com/gas-power/future-of-energy.

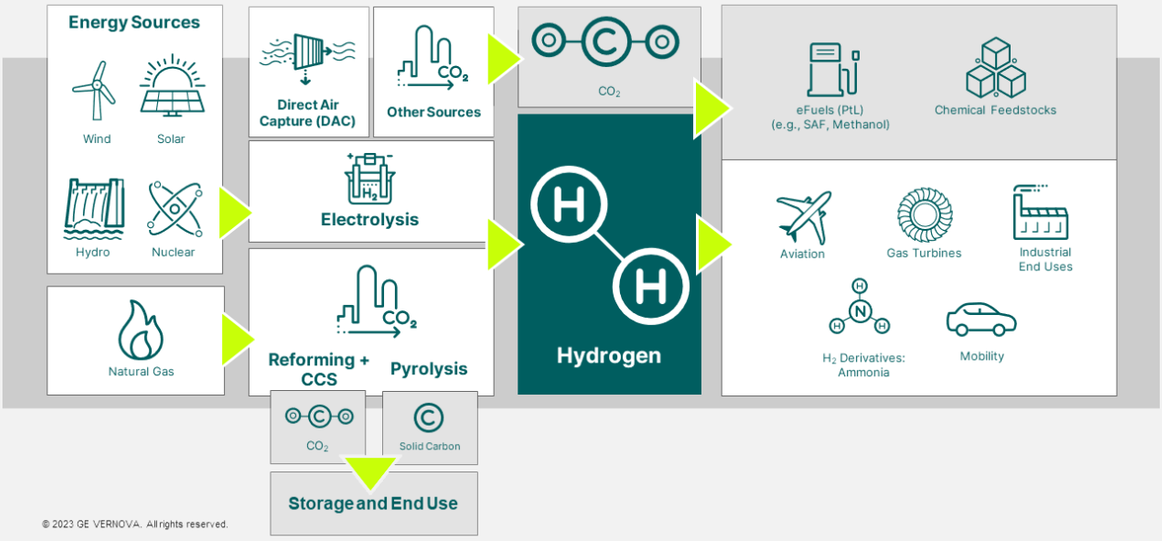
END USE

Finally, hydrogen could be used in a multitude of applications, ranging from fuel cells for vehicles to heating and power generation. Hydrogen is also used as feedstock in the production of multiple chemicals including ammonia (NH_3) which is used to produce fertilizer. There is also growing interest in using ammonia as a hydrogen energy carrier or even as a zero-carbon fuel.

Hydrogen can also be used to produce fuels like methanol (CH_3OH), sustainable aviation fuel (SAF) or potentially synthetic gasoline or diesel. Production of these synthetic fuels will also require carbon as these are hydrocarbons. The carbon could come from biogenic (i.e., natural) sources, but long-term may have to be pulled from the atmosphere using direct air capture (DAC).

HOW DO WE VISUALIZE ITS POTENTIAL?

Below is a simple layout of the hydrogen value chain. We'll dive into this more during the webinar, but here you can see examples of its flow from the original energy source all the way to the end use.



WHY DOES IT MATTER?

Hydrogen is now widely considered an essential part of the energy transition as we work to reduce carbon emissions worldwide. Given the potential for hydrogen to be used to help decarbonize multiple end-use applications, it is important to understand the global and regional trends that will impact the growth of this new economic sector.

Understanding the hydrogen value chain is a crucial step in enabling these end use applications (including power projects), investment, and policy that can accelerate our transition to cleaner energy.

As GE Vernova businesses come together, we continue to collaborate and support our customers in unpacking the challenges surrounding integration, infrastructure, microgrids, and the increased demand driven by green hydrogen production from the original energy source all the way to the end use.