THE ABUNDANT POWER OF HYDROGEN

By embracing hydrogen, you hold the power to reduce the carbon emissions of your power plant and contribute to a more sustainable planet. Whether you're operating new gas turbines or have existing ones in the field, you can integrate hydrogen as a fuel source.

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BREAKING BONDS:
A path towards cleaner energy

Hydrogen is the most abundant element in the universe and is typically found in bonds with elements such as oxygen and carbon. This means that to use hydrogen, we must extract it or separate it from these chemical bonds.

Currently, most of the world's hydrogen supply is derived from fossil fuels and is separated from carbon via methane reforming.

As we venture into a cleaner, more sustainable era, we're breaking free from the bonds of fossil fuels and shifting towards innovative methods of hydrogen production.

Watch the video to hear from our emerging technologies expert, Dr. Jeffrey Goldmeer.

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DECODING THE HYDROGEN RAINBOW

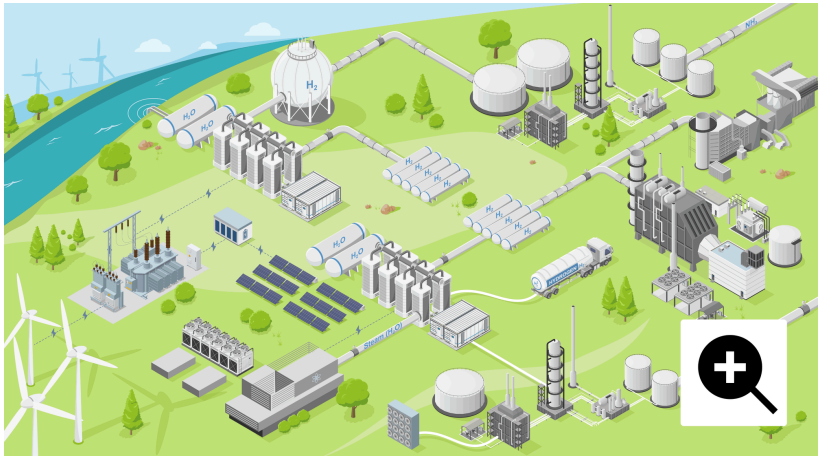
The beauty of the hydrogen rainbow lies within its ability to embrace a multitude of feedstocks, the raw materials used for production. Just as a rainbow reflects a spectrum of colors in light, the hydrogen rainbow showcases the distinct types, differences, and characteristics in feedstocks and lets us embrace opportunities to tailor hydrogen production to specific contexts and requirements.

HYDROGEN PRODUCTION PATHWAYS & CARBON INTENSITY

LOWER CO_2 INTENSITY

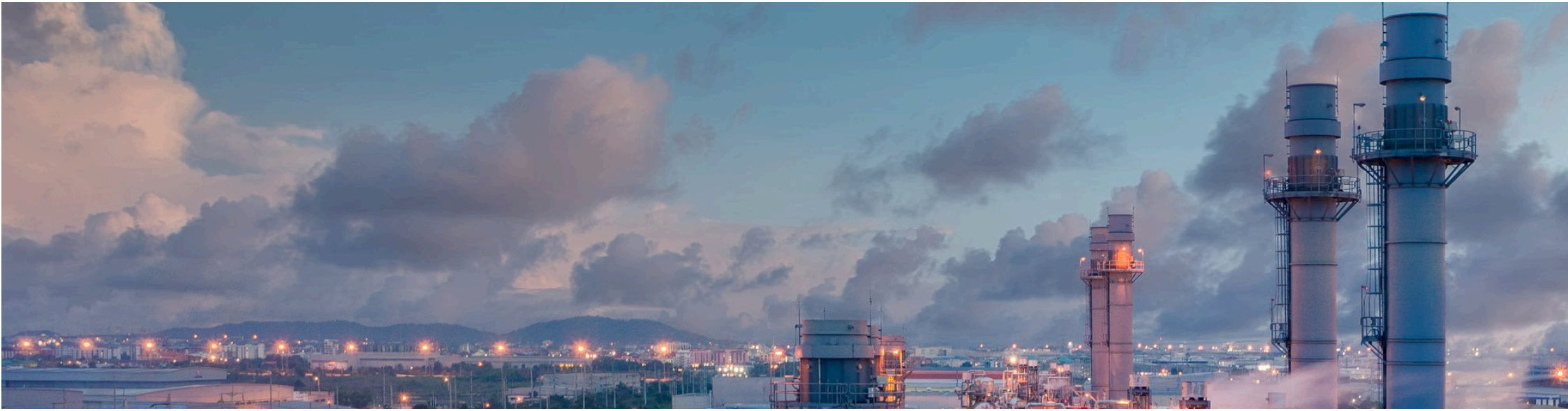
HYDROGEN COLOR	CARBON INTENSITY kg - CO2/kg - H2	TECHNOLOGY READINESS
GREY/BLACK: Unabated fossil fuel	~9.5 to ~25.7 Lower bound – natural gas SMR Upper bound – coal gasification	Mature, today's standard
BLUE: Fossil fuel abated with CCS	~0.7 to ~8.0 Lower bound – partial oxidation, 99% capture Upper bound – SMR, 60% capture	Available today at limited scale
GREEN: Electrolysis + renewables	~0.6 to ~1.4 Lower bound – onshore wind Upper bound – solar PV	Available today at limited scale
TURQUOISE: Methane pyrolysis	~0.2 to ~23.5 Lower bound – nuclear power Upper bound – grid connected	Pilot plants in operation
RED/PINK: Electrolysis + nuclear	~0.2 Nuclear power	Mature with commercially available electrolyzers; high temp steam-based electrolysis systems in development
GOLD: Naturally occurring hydrogen	~0.2 as extracted	Limited availability; full scale of available reserves not known
WHITE: Biomass	~(-21.70) to ~3.63 Lower bound – with CCS Upper bound – without CCS	Scale of production based on availability of feedstock

Assumptions:
1) Turquoise min assumes all nuclear power and max assumes max level for grid
2) White H2 data source: https://www.sciencedirect.com/science/article/pii/S254243512300274X



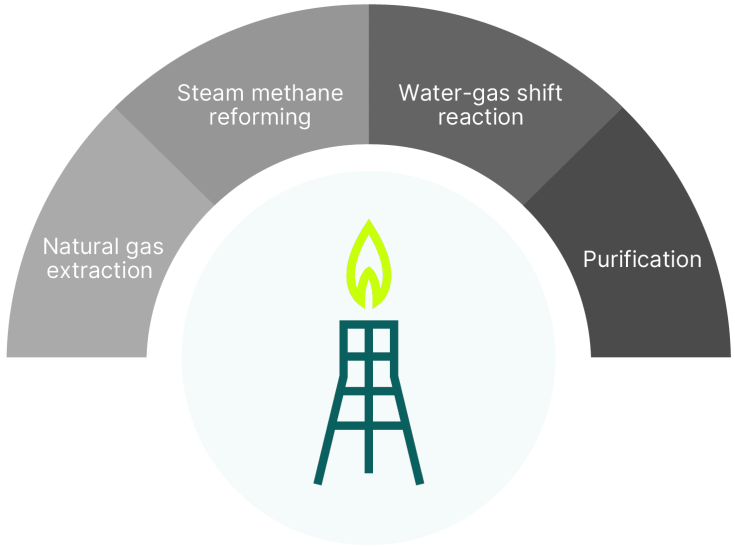
H2 value chain: Where it stands today

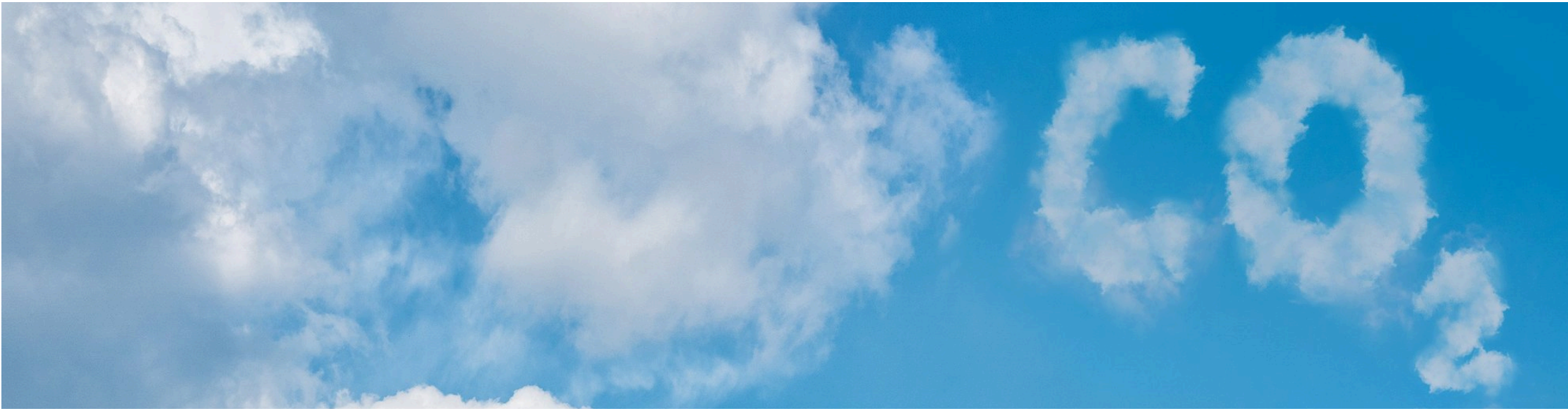
While the complexity of the hydrogen value chain may seem intimidating, GE Vernova is ready to demystify this multifaceted ecosystem. As GE Vernova businesses come together, we continue to collaborate and support our customers in unpacking the challenges surrounding integration, infrastructure, microgrids, and the increased demand driven by green hydrogen production. Watch the webinar to learn more!



GREY/BLACK HYDROGEN

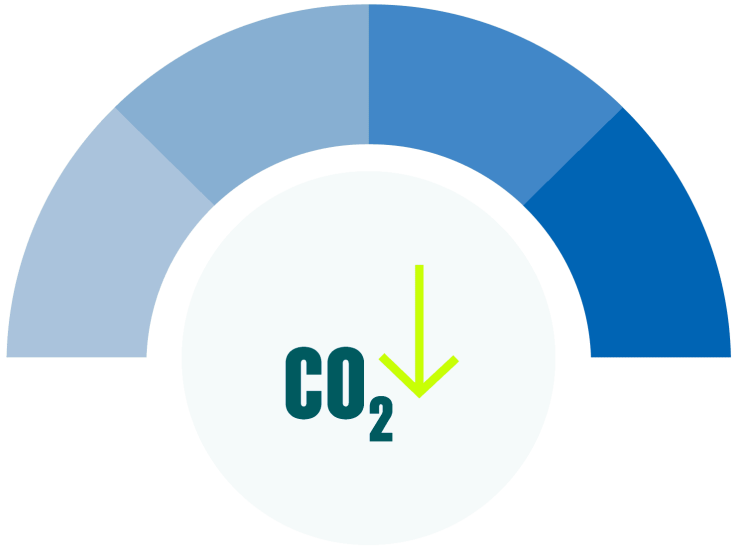
This is the most prevalent form of hydrogen production today. It shares similarities with blue hydrogen, as both are derived from natural gas or coal using steam methane reforming. However, grey hydrogen lacks the crucial element of carbon capture and storage, resulting in the release of greenhouse gases during the production process.

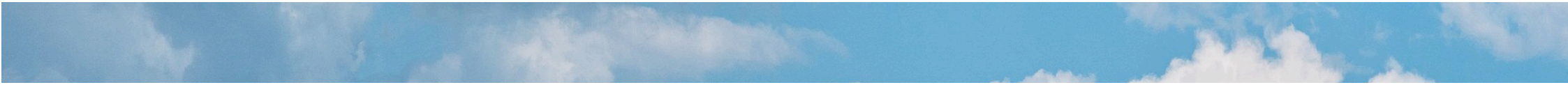




BLUE HYDROGEN

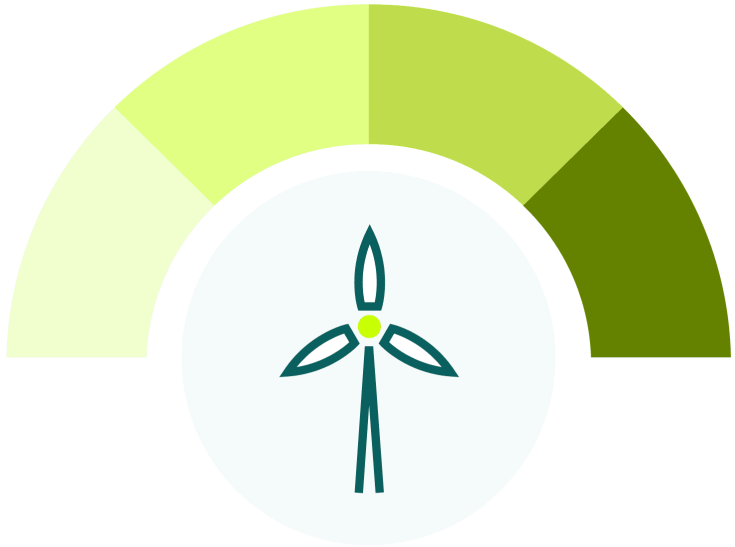
Like grey hydrogen, blue hydrogen uses steam methane reforming to produce hydrogen. However, blue hydrogen integrates carbon capture and sequestration (CCS) technology to capture and store the resulting carbon emissions.





GREEN HYDROGEN

Green hydrogen is produced through electrolysis where renewable energy sources—including wind, solar, and hydroelectric—are used to split water into hydrogen and oxygen. This production method does not generate carbon emissions*.



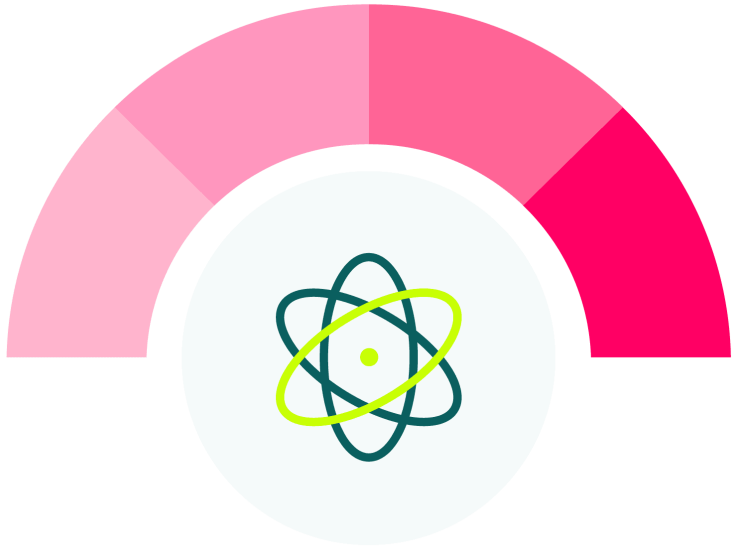
*Zero carbon emissions refers to the hydrogen production process. There is a lifecycle GHG emission for this technology that is based on raw materials, manufacturing, and transportation, etc.

TURQUOISE HYDROGEN

Turquoise hydrogen is produced by the pyrolysis, or thermal decomposition, of methane which isolates hydrogen and produces solid carbon as a by-product.

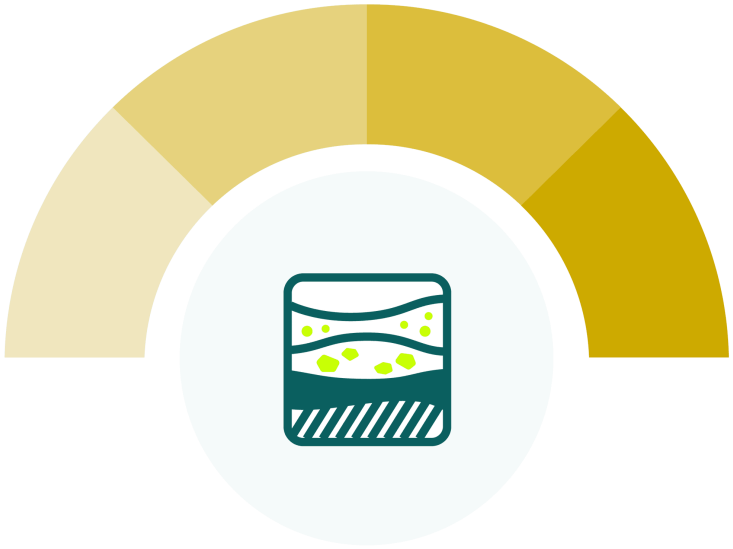
RED/PINK HYDROGEN

This class of hydrogen is produced using electricity generated via nuclear power. In this process, nuclear-fission based power plants generate electricity that drive electrolysis in which water molecules are split into hydrogen and oxygen.



GOLD/WHITE HYDROGEN

Gold or white hydrogen is a naturally occurring form of hydrogen that could be extracted through a well from underground sources where iron-rich rocks interact with water. There are questions on the potential (available) volumes of naturally occurring H2, and where these pockets exist. The U.S. government has announced funding for research into extraction technologies.

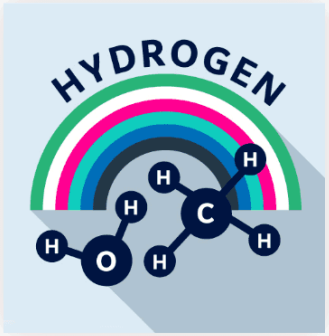


A HYDROGEN FUTURE

Today, GE Vernova is at the forefront of addressing the challenge of affordable, reliable and sustainable renewable energy production. With one of the broadest power and electrification portfolios in the industry, together we can paint a future where hydrogen production is as dynamic as the colors of the rainbow, empowering us to create a sustainable and vibrant energy landscape for the future.

LEADING A NEW ERA OF ENERGY

Interested in learning more? Hear from our experts.



Episode 1:

The Hydrogen rainbow

Decarbonizing many sectors of the economy, including transportation and power, may require low or zero carbon fuels. Hydrogen is a popular favorite, and there are multiple technologies available that produce hydrogen for power generation applications. They are typically described by a color (grey, blue, green, red, pink, turquoise, white) instead of the actual production method. Jeff and Brian discuss these production pathways along with their challenges and requirements.

Listen now →

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