HYDROGEN

Customers drive TC Energy's hydrogen initiatives

TC Energy aims to be the premier supplier of low-carbon energy for North America's industrial, oil and natural gas industries. As a successful power and energy leader, the company is developing hydrogen production hubs for long-haul transportation, power generation, large industrials and heating customers, allowing them to meet their decarbonization objectives.

Hydrogen is an energy carrier that provides an emissions-free fuel source

When it comes to hydrogen, our goal is to help customers achieve sustainability goals via diverse feedstocks and new technologies to produce hydrogen from renewable power (electrolysis), renewable natural gas derived from biomass (methane-sourced hydrogen), and natural gas coupled with carbon capture.

Hydrogen is used as fuel and feedstock for large industrials such as steel and fertilizers. Compressed and liquefied hydrogen can be used to fuel trucks and planes where traditional batteries have limitations. Hydrogen may also be blended in natural gas systems for use in power generation and home heating.

Types of Hydrogen

Green Hydrogen

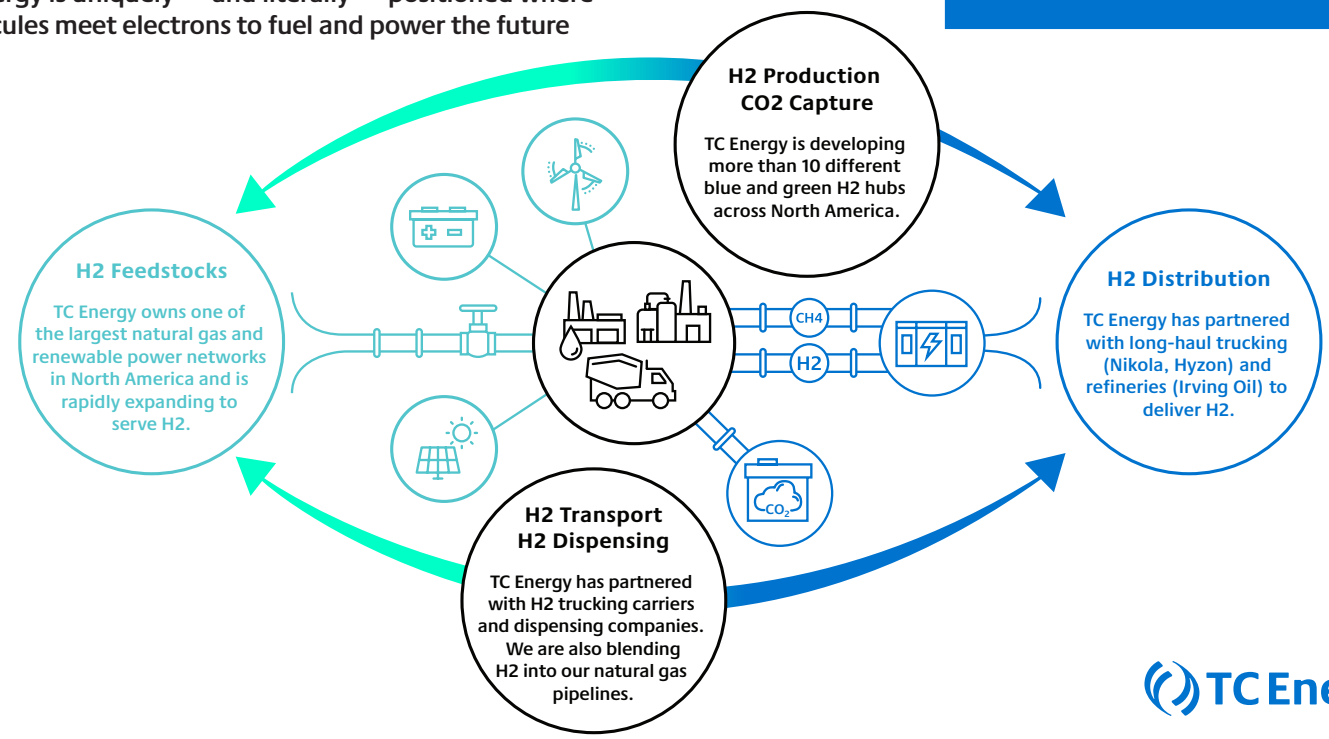
Green hydrogen is generated either from renewable power by separating water into hydrogen and oxygen (electrolysis) or from renewable natural gas (reforming process).

Blue Hydrogen

Natural gas is reacted in a chemical plant to separate hydrogen and carbon dioxide. The CO2 generated during this process is captured and sequestered, lowering the emissions to meet clean-energy standards.

We are a leader across the hydrogen value chain

TC Energy is uniquely — and literally — positioned where molecules meet electrons to fuel and power the future



Planning for safe hydrogen production

Hydrogen is non-toxic and one of the most-abundant elements on Earth. As the production system is designed, assessments will be completed to account for optimal transport due to elevated leak and ignition potential.

With experience in highly regulated industries, such as pipelines and nuclear power production, TC Energy expects to lead by developing appropriate technical and operational knowledge. Commitments to first responder training, center for hydrogen safety, knowledge transfer among peers, public engagement, and a measured pace of development scaling are all paramount in the pre-development phase.

Safety is our highest priority

TC Energy has an excellent track record of safe, sustainable operation of facilities and equipment that handle hazardous materials and stored energy. Producing hydrogen has many similar inherent handling and management needs as other materials, with some specific considerations. Hydrogen is used daily and safely in refineries and fertilizer plants across North America.

TC Energy

HYDROGEN

TC Energy's proposed network of sites and facilities represents the first commercial-scale hydrogen-based ecosystem to catalyze rapid transition to a clean energy economy in North America.

HOW HYDROGEN REDUCES LONG-HAUL VEHICLE EMISSIONS

ESTIMATED ANNUAL REDUCTIONS:
>60M gallons (273M litres) of fossil diesel fuel and 715K tons CO2, 534 tons CO, 1,307 tons NOx

Assumptions: ~ 88 lbs/day (40 kg/d) refuelling, 100K miles/yr (161K km/yr) and 2010 ICE Truck Baseline Average 6.1 mpg (38.6 L/100 km)

Hydrogen Production Hubs

Hydrogen production hubs can be strategically placed along large industrial demand centers and key trucking corridors to fuel zero-emission, heavy-duty fuel cell electric vehicles, power generation, large industrials and heating customers.

Anticipated Plans

Our team of energy problem solvers are dedicated to creating energy solutions that will meet society's needs for decades to come. When it comes to hydrogen, we are evaluating several blue and green hydrogen hubs across North America and partnering with end-use customers, adding capabilities into the partnerships. In most cases we are the lead developer — we're putting together coalitions with organizations that have upstream and downstream capabilities to make sure we de-risk effectively.

Helping customers achieve their decarbonization goals

Producing H_2 from renewable power via **electrolysis** ("green" hydrogen)

Methane-sourced hydrogen, from renewable natural gas derived from biomass ("green" hydrogen)

And "blue" hydrogen from natural gas with **carbon capture**

How can our customers use hydrogen fuel and decarbonize their operations?

It can be used in place of **various industrial fuels and chemical feedstocks**.

Compressed and liquefied hydrogen can **fuel trucks and planes** where traditional batteries have limitations.

It can be **blended in natural gas systems**, including fired heaters/generators.

TC Energy