

Hydrogen, the ultimate clean energy: from demonstration projects to networked station development



According to the International Energy Agency, the transport sector accounts for [approximately 23%](#) of global CO₂ emissions, a figure likely to [grow 20%](#) by 2050. To achieve the objectives of the Paris Agreement and limit global warming to a 2°C increase, the sector's CO₂ [emissions must fall by 90% by 2050](#).

Hydrogen is a low-carbon alternative energy that can significantly reduce transport-related air pollution. Its sole byproduct is water. It limits pollutants and CO₂ emissions, and allows for silent, rapid refuelling, making it suitable for long-distance trips. Hydrogen powers fuel-cell vehicles, now in use in a growing number of sectors. It also has advantages for heavy and light mobility, captive fleets such as taxis, maritime transport and railways.

In 2022, as geopolitical events triggered a steep rise in energy prices, particularly natural gas,

hydrogen demonstration projects proliferated. The number of countries working on hydrogen-refuelling stations continues to grow. By 2030, the European Union aims to have [one station every 200 kilometres](#) along its entire road network. Hydrogen power has the potential to address environmental concerns and provide clean energy into the future.

Hydrogen: the alternative energy for the transport sector

The 'chicken-and-egg' paradox has long constrained the development of the European hydrogen sector. With few hydrogen-powered vehicles on the market, few refuelling stations are needed. Yet precisely this lack of stations forms an obstacle for the development of hydrogen-powered fleets.

That situation is now changing – for the better. France, for example, was home to [400 hydrogen-powered vehicles](#) and 29 hydrogen stations in 2022. By 2030 the country is expected to have 450,000 vehicles and [1,000 to 1,700 hydrogen stations](#). The recent launch of the [European Hydrogen Bank \(EHB\)](#) to boost development in the sector may put an end to the chicken-and-egg situation once and for all.

With the costs of hydrogen production measuring up well against traditional fuel-production costs, more and more companies are turning to this environmentally friendly solution to decrease their CO2 emissions. As costs shrink further still thanks to production through wind and solar power, hydrogen is becoming an increasingly attractive option, especially for heavy and long-range transport.

Hydrogen subsidies and investments for the future

The energy crisis has accelerated the search for alternative and renewable energies. In September 2022, the European Union unveiled [REPowerEU](#): a €3 billion investment plan to finance and scale up hydrogen projects in the bloc. The new European Hydrogen Bank will roll out an initial investment of over €800 million in renewable hydrogen production, with plans to increase this amount in the near future.



In March 2023, the EU identified 26 alternative energy projects to receive in excess of €188 million in development funding. Of these projects, 10 will establish hydrogen-refuelling stations in countries such as France, Spain and Sweden. By 2050, hydrogen-related investments are set to surpass a [dozen trillion euros](#). This will demand a great deal of cooperation between the many players involved in R&D, projects and agreements.

The year 2050 may feel distant. These initiatives show, however, that many different players are committed to developing this alternative energy with an eye to the future.

The potential of hydrogen: cross-energy applications

Hydrogen is a viable source of energy for heavy-duty vehicles, especially over long distances. The production process results in zero CO2 emissions, unlike that for petrol and diesel vehicles. Refuelling times are almost equivalent, however, and hydrogen-powered vehicles can drive thousands of kilometres before requiring refilling, giving them an edge over electric trucks. Moreover, electric vehicles need to account for the size and weight of their batteries, while hydrogen-powered lorries can carry the same load as traditional fuel trucks.

Why use hydrogen as a green energy source?

- **Low-carbon alternative:** *when produced from renewable sources, such as solar or wind power, its only emission is water*
- **One size fits all:** *hydrogen is suitable for various modes of transport, from heavy mobility to shipping*
- **Rapid refuelling:** *hydrogen refuelling is as fast as filling a traditional fuel tank*

A hybrid approach can unite both types of energy while the possibilities of hydrogen continue to unfold. Hydrogen can serve as the primary energy source to reach distribution centres, when vehicles need sufficient power to cover longer distances. The shorter remaining journey – from the distribution centre to the city, for instance – can then be made by e-trucks or even biogas-powered vehicles, thus complying with increasingly strict CO2 emissions regulations.



Hydrogen plants for diverse applications

Until recently, hydrogen projects were limited to small-scale infrastructure for demonstrations. Large, robust installations betting on the future promise of hydrogen are now becoming more common.

Currently, there are two main ways of distributing hydrogen. The first is the low-capacity station, which delivers less than 100kg of H₂ per day. These stations can be mobile, and may be used on construction sites to refill large pieces of equipment. Beyond that, they serve demonstration purposes, showing the potential applications of hydrogen before users decide to invest in greater capacity.

The second means of distribution is the large-scale hydrogen station, which supplies one to two tons per day and serves fleets of lorries, buses and other heavy-duty vehicles that have switched to hydrogen as their primary energy solution.

Different applications require different business models. As fossil fuels are phased out, station owners face the challenge of offering multiple sources of energy, including electricity, CNG, LNG, biogas and hydrogen. Although liquid hydrogen is still not widely available, some station owners are even starting to evaluate this option.



Station owners who do offer hydrogen also have to ensure that it is readily available (>98%). As the next hydrogen station will be some distance away, access to preventive and curative maintenance is crucial to guarantee stable operations.

TSG - your partner for the development and expansion of hydrogen applications

Several major oil companies (MOC) have selected European TSG teams to perform station maintenance in the Benelux and Germany. Offering fully trained professionals and a 24/7 service centre, the TSG Group collaborates with well-known original equipment manufacturers (OEM) on equipment installation.

TSG is continuously developing expertise in the maintenance of hydrogen sites. It can perform studies and design, install and commission hydrogen stations of different sizes to meet specific needs. With a central team of dedicated specialists and representatives in all countries, TSG advises companies on compression size, storage and the number of dispensers required by different hydrogen infrastructures.

TSG is the European leader in responsible mobility solutions, making it a key facilitator of the energy transition. Offering full-service project management and the best total cost of ownership, TSG is the preferred partner for tailored hydrogen solutions in the transport sector.

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