



Towards mass production of carbon-free hydrogen

Production of carbon-free hydrogen - design of a pre-industrial demonstrator: electrolysis cell stacking.
A unique core technology for producing high-efficiency, low-cost hydrogen using high temperature electrolysis (HTE), with the added advantage of being reversible and therefore operable in solid oxide fuel cell mode (SOFC), generating both electricity and heat.

Carnot Energies du Futur Institute

Scientific / technological breakthrough

High temperature electrolysis (HTE) comprises a stack of ceramic electrolysis cells where hydrogen and oxygen are produced from steam at a temperature of 700°C. With much greater energy conversion efficiency than conventional electrolysis, this technology will make it possible to produce hydrogen at a competitive cost within a few years, and will help deploy carbon-free hydrogen production on a massive scale. The high-temperature electrolysis technology being developed in the Carnot "Energies du Futur" Institute labs is reversible, meaning that it can operate in fuel cell mode, generating both electricity and heat, not just from hydrogen, but from natural gas, biogas, ammonia, or a combination of all types of fuel, including liquid fuels.



Competitive advantage for the economic stakeholders

High-temperature electrolysis (HTE) with its high efficiency is the preferred solution for mass production of low-cost, carbon-free hydrogen. It is a key component in turning hydrogen into an industrial development vector. With its reversible feature, HTE provides an efficient means of storing and drawing on renewable energy. It also costs less than other hydrogen solutions as it replaces two objects (i.e., an electrolyser and a fuel cell) by a single one.