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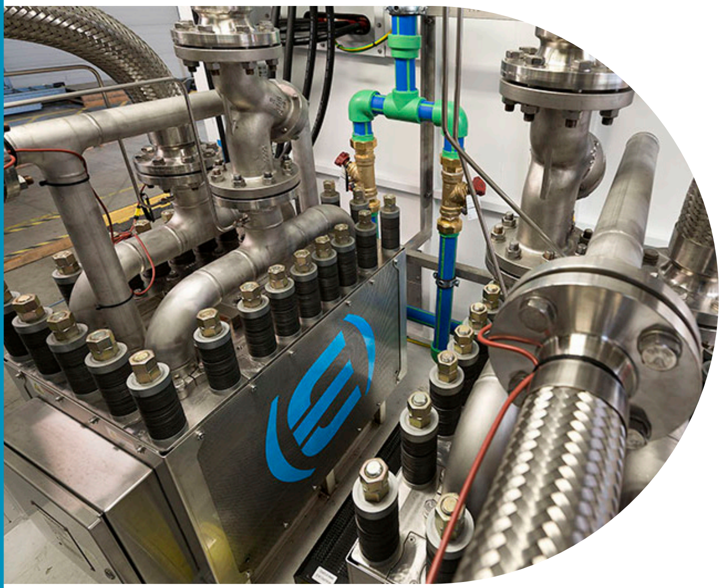
HyLYZER® PEM electrolyzer. Picture credit: Cummins



PLATINUM POWER

Growth of renewable electricity supply is being unlocked by platinum-based proton exchange membrane technology

Renewable energy, such as wind, solar photovoltaic and hydropower, is the fastest-growing energy source globally and is central to global net zero initiatives. It is estimated that, for the objectives of the Paris Agreement to be met, 90 per cent of electricity will need to come from renewable sources by 2050*.

Integrating a higher share of renewable technologies into power systems is essential for decarbonisation, but the inherently variable nature of this type of energy poses challenges when delivering a reliable power network that can consistently meet growing demand. As a result, the need to resolve the grid stability and power storage issues associated with renewables is becoming increasingly critical.

Proton exchange membrane (PEM) electrolysis has the ability to convert variable renewable energy sources to emissions-free green hydrogen, the so-called 'power-to-hydrogen' solution that holds the key to achieving sustainable and dependable power sector transformation. By producing hydrogen through electrolysis, any excess energy from renewables can be stored for days, weeks or even months at a time.

Highly-dynamic PEM technology utilises a platinum-based catalyst. According to Siemens Energy, PEM electrolysis is ideally suited to harvesting variable energy generated from wind and solar power as it achieves: high efficiency at high power density; high product gas quality, even at partial load; and low maintenance and reliable operation. It is also free of hazardous substances.

PEM electrolysers can effectively support the integration of renewables into the electricity system, ensuring that excess renewable energy can be stored for later use to provide the necessary grid balancing, offering a flexible load that provides additional power at peak times. Conversely, at times of lower demand, excess renewable energy can be stored as hydrogen and then converted back to electricity when required.

In Germany, the Energiepark Mainz is a joint research project exploring the power-to-hydrogen concept. Picture credit: Siemens Energy

Power-to-hydrogen also has the potential to provide renewable energy across regions and to areas where it would have previously not been available due to lack of proximity to a renewable energy site.

In Canada, the US-based global power leader, Cummins, operates North America's first multi-megawatt power-to-hydrogen facility in a collaboration with Enbridge, a leading energy delivery company. The renewable hydrogen storage facility features Cummins' next-generation PEM electrolyser technology and is dispatched to help manage real-time supply and demand imbalances for Ontario's electricity grid, ensuring its reliable operation. Every two seconds the plant adjusts immediately to the signal setpoint with a new load level within its operating range, and it is never limited by a fixed state of charge — it can run at any setpoint indefinitely.

New opportunities

The ability to store excess energy through the production of green hydrogen also creates a way for utilities to engage in new market opportunities outside their main power supply activities. For example, excess hydrogen can be sold to industry or used in refuelling networks for fuel cell electric vehicles.

*International Energy Agency: 'Net Zero by 2050'

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