9 JULY 2025

Interior of a data centre. Source: Equinix

ENERGY RESILIENCE

Platinum-based hydrogen fuel cells are providing power solutions for data centres, accommodating AI growth

According to the International Energy Agency, worldwide electricity demand from data centres is set to more than double by 2030 to around 945 terawatt-hours, more than the entire electricity consumption of Japan today. Artificial intelligence (AI) will be the most significant driver of this increase, with electricity demand from AI-optimised data centres projected to more than quadruple by 2030.

Yet the existing grid is struggling to cope with this additional demand, and the pace of AI adoption is driving a need for new power solutions, with a focus on energy resilience (including uninterrupted power supply) and low or zero-carbon energy options.

Increasingly, data centre operators are developing their own tailor-made energy systems designed to deliver power faster, and in a way that is both reliable and sustainable. Platinum-based proton exchange membrane (PEM) hydrogen fuel cells are increasingly being incorporated into these future-ready models.

Hydrogen fuel cells convert hydrogen gas into electricity through a chemical reaction with oxygen, producing only water as a by-product. PEM fuel cells are particularly well-suited for use in data centres because of their quick start-up times and high power density. They can provide reliable back-up power and are efficient in managing fluctuating energy demands.

Demonstrating viability

For example, global provider of critical digital infrastructure, Vertiv Infrastructure Solutions, has partnered with Ballard to develop, supply and install a zero-emission, uninterrupted power supply system for data centres using Ballard's PEM fuel cells. This back-up power application is scalable from 200kW to multiple megawatts.

Ballard has also worked with leading manufacturer of construction and mining equipment, Caterpillar, together with Microsoft, to successfully conclude a project to demonstrate the viability of using hydrogen fuel cells. The demonstration provided valuable insights into the capabilities of fuel cell systems to power multi-megawatt data centres, ensuring uninterrupted power supply to meet requirements.

Data centre, Silicon Valley, US. Source: Equinix

It was conducted in a challenging environment and validated the hydrogen fuel cell power system's performance at 1,855 m above sea level and in below-freezing conditions. The project simulated a 48-hour back-up power event at Microsoft's data centre in Wyoming, US. Elsewhere, Microsoft has collaborated with PEM fuel cell-provider Plug Power on a three-megawatt fuel cell designed for data centre use.

Meanwhile, cloud computing firm Equinix has evaluated the use of hydrogen and hydrogen fuel cells for sustainable data centre back-up power generation in a study with the National University of Singapore's College of Design and Engineering. Their analysis highlights PEM fuel cells as offering promising back-up power solutions.

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