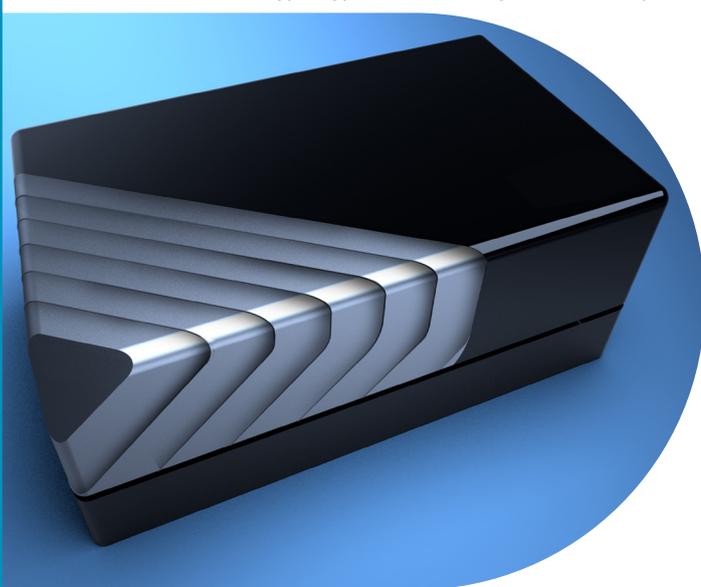


Fuel cell module horizontal type (Type II). Source: Toyota Motor Corporation



It is widely accepted that for hydrogen to fulfil its potential in enabling the clean energy transition, collaboration is essential. A recent report by the Hydrogen Council* talks of the need to accelerate product and solution development, while acknowledging this will require new partnerships and ecosystem building, with both businesses and governments playing important roles.

Toyota Motor Corporation, which already allows royalty-free use of its fuel cell electric vehicle (FCEV) patent licenses, has demonstrated how this might work in practice. Leveraging off the knowledge and expertise it has cultivated through its decades-long development of FCEVs, including the Mirai passenger vehicle and the SORA bus, the automaker has developed a product that packages a fuel cell system into a compact module. It plans to begin selling the module later this year in a bid to promote and scale-up hydrogen use and help the world achieve carbon neutrality goals.

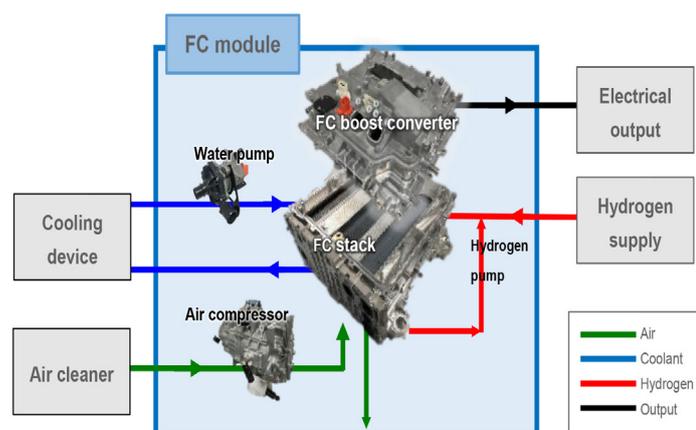
As a leader in hydrogen fuel cell technologies, Toyota identified a growing demand for 'off the shelf' fuel cell systems that can easily be adapted by companies across a wide range of industries for use in their own products. Its new hydrogen fuel cell module packages individual fuel cell system-related elements from the second-generation Mirai. These include the

STACKS OF EXPERIENCE

Automakers are using their know-how to accelerate the uptake of platinum-based fuel cell systems

fuel cell stack and components for air and hydrogen supply, cooling and power control. The module can be easily used in many different applications, including mobility – buses, trucks, trains and ships – and stationary generators. Modularisation significantly improves convenience, while the new system offers world-class, top level output density per unit volume while only needing relatively simple and infrequent maintenance.

Similarly, Hyundai Motor Group is also taking proprietary hydrogen fuel cell know-how to the market through its 'HTWO' (derived from 'H₂' or 'Hydrogen and Humanity') fuel cell system brand.



Schematic example of connecting the Toyota fuel cell module to an external device. Source: Toyota Motor Corporation

Launched at the end of last year, HTWO aims to facilitate Hyundai's global fuel cell business and grow the hydrogen ecosystem.

In addition, the Volvo Group and Daimler Truck AG are collaborating to develop, produce and commercialise fuel-cell systems for use in heavy-duty trucks, as well as other applications, through the formation of a joint venture to be named 'cellcentric'. The ambition of both partners is to make the new company a leading global manufacturer of fuel-cells, and thus help the world take a major step towards climate-neutral and sustainable transportation by 2050.

Platinum in fuel cells

Automotive hydrogen fuel cells in FCEVs are almost always proton exchange membrane (PEM) fuel cells

which contain platinum catalyst layers. Targeted growth in the total number of FCEVs on roads in China, the US, Europe and Japan — cumulatively and inclusive of commercial and passenger vehicles — is expected to rise from tens of thousands in 2020 to over 11 million by 2030.** Demand for platinum in FCEVs based on this growth is expected to increase annual platinum demand in 2030 by well over one million ounces (31 tons), or over ten per cent of current annual demand.

*Hydrogen Insights 2021: A Perspective on Hydrogen Investment, Deployment and Cost Competitiveness' authored by the Hydrogen Council in collaboration with McKinsey & Company

**'Fueling the Future of Mobility Hydrogen and fuel cell solutions for transportation' white paper authored jointly by Deloitte China and Ballard

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