Hydrogen hits the road

The Hyundai NEXO fuel cell electric vehicle has arrived

FOLLOWING MORE THAN 20 YEARS OF RESEARCH AND DEVELOPMENT BY HYUNDAI MOTOR GROUP, NEXO IS THE FIRST HYDROGEN-POWERED VEHICLE TO BE CERTIFIED FOR SALE IN AUSTRALIA. WE FIND OUT WHAT IT'S ALL ABOUT.

Designed from the ground up as a production FCEV, NEXO showcases a series of innovations and refinements from Hyundai's first-generation mass-produced hydrogen fuel cell vehicle, the ix35 FCEV. The result is NEXO, a comfortable and enjoyable driving experience typical of Hyundai's conventional vehicle range, with industry-leading hydrogen powertrain technology seamlessly at work.

The arrival of NEXO coincides with the opening of Australia's first public hydrogen refuelling station, in Canberra, which provides the fuel for the deployment of the first 20 road-registered NEXO FCEVs as government fleet vehicles for the national capital.

The station, located at a facility owned by local utility ActewAGL in Canberra, was opened by ACT energy and emissions reduction minister Shane Rattenbury, who said the refuelling station would allow the ACT government to finally deploy the 20 newly acquired Hyundai NEXO hydrogen vehicles as part of the ACT government's fleet. "The ACT continues to lead the EV revolution in Australia, and this station will allow fuel cell electric vehicles on our roads alongside battery electric vehicles, forming a strong pathway to zero emissions transport in Canberra."

Rattenbury said there are many benefits of hydrogen fuel cell vehicles, such as short refuelling times, the ability to be powered by hydrogen made from renewable energy, and because they also purify the air as they drive, it will help remove harmful particulates produced by petrol and diesel vehicles. He added that there had been a substantial amount of interest amongst ACT government departments to use the Hyundai vehicles.

"There's quite a few of our public servants who are keen to have these vehicles, and there's even been some competition between the agencies. Whether its nurses or education department staff getting around and doing their jobs on behalf of the community in Canberra, using these vehicles becomes a great advertisement because the community will see them out and about and will begin to understand the technology."

"The arrival of NEXO on Australian roads as an ADR-approved production vehicle is a landmark in Hyundai's ongoing commitment to green mobility and to hydrogen fuel cell electric vehicle technology," said Jun Heo, CEO Hyundai Motor Company. "The hydrogen NEXO SUV is a cornerstone in the Hyundai portfolio, complementing our hybrid, plug-in hybrid and battery electric vehicles, the IONIQ and Kona Electric. NEXO is also a sign of things to come, as Hyundai continues in its long-term drive towards leadership in eco-friendly vehicles."

Efficiency and safety

NEXO is available in one highly equipped grade that showcases Hyundai's leading edge, eco-focused technology and the latest comfort and convenience features. At the heart of NEXO is a long-range – 666km (WLTP) – zero-emission hydrogen fuel cell powertrain featuring a 120kW, 395Nm electric motor drive and a lithium-ion polymer battery, with Shift by Wire gear selection and paddle shifter control for the regenerative braking system.

Interestingly, an Australian team driving a NEXO has recently broken the world record for the longest distance travelled in a hydrogen-powered vehicle on a single tank. Beginning at Melbourne's Essendon Fields the team drove through Broken Hill and on past Silverton, to complete a total distance of 887.5km, according to the NEXO's own trip computer, exceeding the previous world record of 778km. During the trip the NEXO consumed 6.27kg of hydrogen, at a rate of 0.706kg/100km, and purified 449,100 litres of air on the journey (enough for 33 adults to breathe in a day). It emitted only water, and of course zero CO2, where a standard internal combustion engine vehicle would have emitted approximately 126kg of CO2 over the same distance.

An extensive standard SmartSense safety suite in NEXO includes forward collision avoidance

NEXO's distance world record.

assist (FCA), driver attention warning (DAW) and a radar-based blind-spot collision avoidance assist (BCA-R) system. There are also lane keeping assist (LKA), rear cross-traffic collision avoidance assist (RCCA) and smart cruise control (SCC) with Stop & Go.

Eco-friendly powertrain

Fuel cell electric vehicles are a type of electric vehicle, and are driven by an electric motor that is powered by electricity generated by an on-board fuel cell, using hydrogen as fuel.

Hydrogen gas from the high-pressure fuel tanks flows into the fuel cell stack, where it is met with oxygen from the atmosphere. The hydrogen and oxygen react across a catalyst membrane, combining to form water and electricity that is harnessed to power the vehicle's motor. Pure water and purified air are the only exhaust emissions.

Excess electric energy – and electric energy recuperated during braking – is stored in a high-voltage battery to be deployed when needed. While conventional battery electric vehicles typically take an extended time to fully recharge, FCEVs can be refilled at the hydrogen refuelling station in a matter of minutes.

NEXO powertrain components

The innovative hydrogen fuel cell system and powertrain defines NEXO, making it the ultimate "green machine", capable of delivering the longest hydrogen-powered range of any mass-produced vehicle while emitting only water and purifying the air as it drives.

Three high-pressure hydrogen fuel tanks are cleverly packaged in the rear of NEXO, with a combined 156-litre capacity and the ability to hold up to 6.33kg of hydrogen at a pressure of 700 bar. These high-strength, lightweight advanced carbon composite tanks are tested to ensure they maintain structural integrity in the most challenging conditions, such as in collisions.

A cleverly integrated lithium-ion polymer battery provides the source of high and low voltage power in NEXO. The 240V, 1.56kWh battery can act as ballast for excess and recuperated energy from the powertrain and redeploys this energy to power the vehicle, including on-board 12V systems. NEXO also boasts class-leading cold-start capability, reaching operational temperature from -29°C within 30 seconds.


Minister Rattenbury takes control of the NEXO.

The hydrogen refuelling station in Canberra.

The smooth, near-silent power is provided effortlessly by NEXO's electric motor, which is paired to a single-speed gearbox. With maximums of 120kW of power and 395Nm of torque available on demand, NEXO feels far more spirited than its eco-friendly credentials might suggest. The electric motor also brings the ability to decelerate NEXO while generating electricity that is then stored in the high-voltage battery.

Chassis and platform

Efficiency and safety were the primary focuses for NEXO's ground up FCEV platform development, which delivers a no compromise product through innovative design and use of advanced materials in construction.

The extensive use of bio-plastics throughout NEXO's cabin contributes to a 12kg reduction in CO2 produced during manufacture. In total, 34kg of bio-based interior parts are applied in the form of the trims, carpet, headliner, door trims, seats and console. Vegetable oil-derived bio-paints are also used throughout the cabin, along with bio-fibres made using corn and sugarcane waste material.

NEXO was developed across the full spectrum of challenging Australian city, highway, country and gravel roads. The local chassis tune, developed by Hyundai Motor Company Australia's ride and handling team, leverages NEXO's advanced platform design and lightweight suspension components to deliver Hyundai Australia's signature flavour of supreme comfort with surprising dynamic capability.

In addition, reducing noise levels in the cabin was a significant focus as part of the NEXO chassis tuning program. "The challenge in tuning NEXO was to reduce NVH to a level that matched the almost-silent powertrain," said Tim Rodgers, Product Planning and Development Specialist, Hyundai Motor Company Australia.

"We've come out of the R&D process with a refined suspension that matches quite nicely with acoustic levels in the cabin. Beyond achieving this, the tuning program targeted the normal ride and handling benchmarks to give NEXO the same style of body control we tune into all our cars, and the same level of competency on Australia's notoriously challenging back roads."

How safe is the technology?

A great deal of work has gone into ensuring safety information is shared across the Hyundai network, including dealerships, Fire and Rescue and the motor clubs such as the NRMA, who will provide roadside assistance. If ever there was a scenario that further supports a ban on grey imports, it's the rapidly increasing technology in the vehicles of today and tomorrow.

Scott Nargar, Senior Manager, Future Mobility and Government Affairs, Hyundai Australia said: "Training and development of the network will be critical, and in the first instance the vehicle will need to go back to the dealer to have the hydrogen gas evacuated, with the right equipment, procedures and training. We, like several other manufacturers of hydrogen vehicles, do this throughout the world, where we have dozens of dealerships, so we know what we are doing."

With the opening of the ACT hydrogen refuelling station, the focus now turns to both Brisbane and Melbourne where plans are in place to open similar facilities in the foreseeable future. Hyundai will control the roll out of the vehicles as the infrastructure is installed to provide the necessary support.

And finally, the implications for collision repairers

According to Hyundai, the key will be training. As Nargar has previously stated: "We will continue to work with TAFE and other RTOs to develop the understanding of this new technology. In the last decade, Hyundai has donated almost 70 vehicles to TAFEs, trade training schools, medical research and to Fire and Rescue for research around Australia to ensure they are all working with the latest technology."

Hyundai is all too aware that there are several EV training courses available today, and they are looking at developing hydrogen fuel cell courses in the coming years to ensure they prepare tomorrow's technicians for this cutting-edge technology.

Editor: Once again, Hyundai demonstrates its technological capabilities with the introduction of this cutting-edge technology onto Australian roads.

Refuelling the NEXO couldn't be easier.

The hydrogen fuel cell powertrain.