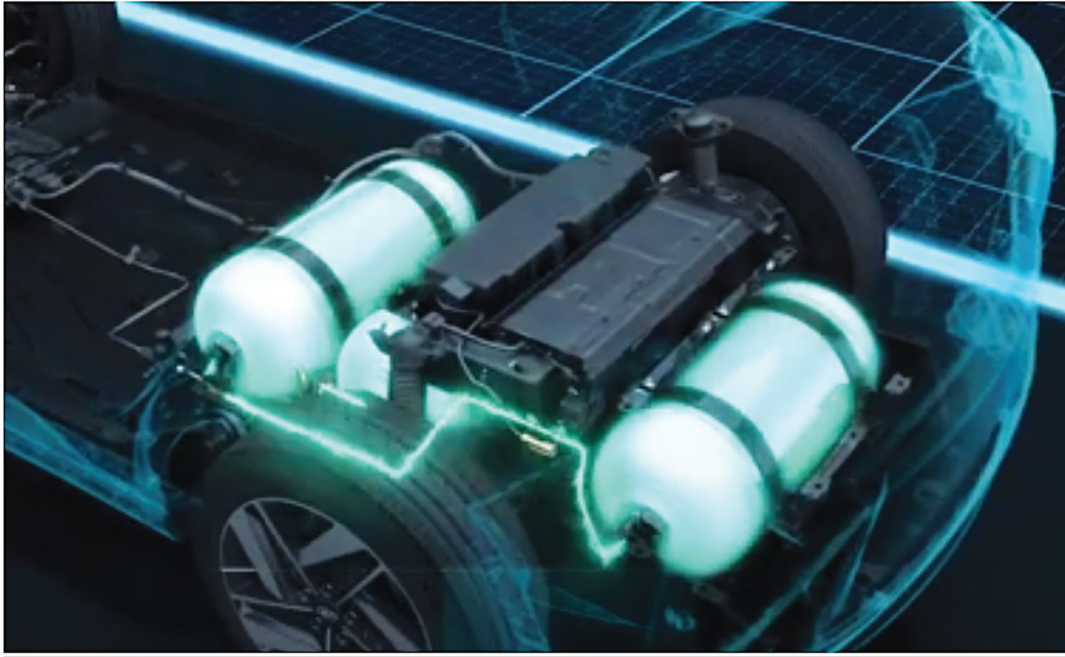


TECHNICAL REPORT



FUEL CELL ELECTRIC VEHICLES (FCEV)

- THE “OTHER”
ALTERNATIVE FUEL
VEHICLE TECHNOLOGY



Several previous technical articles have detailed electric vehicle technologies, the various categories, and in particular, safety. Recent years have seen most vehicle-makers release electric vehicles as “stand- alone” models, or as options within their conventional platforms line-up.

Predominately, vehicle-makers electric vehicle technology advancements have come from one, or more of the following main categories: -

- **EV / BEV** - Electric Vehicles or Battery Electric Vehicles
- **HEV** - Hybrid Electric Vehicles
- **PHEV** - Plugin Hybrid Electric Vehicles

All of these categories incorporate an HV traction battery and at least one electric motor. Storage battery electrolyte is predominately Lithium-ion, with a variety of electrode materials that enhance function & performance. Electrical current generation is provided either by direct electrical charging from a power supply (**BEV**), by an internal combustion engine (**HEV**), or both (**PHEV**).

Resene

Automotive & Light Industrial

Coatings Experts at your door

0800 108 008 | reseneauto.co.nz

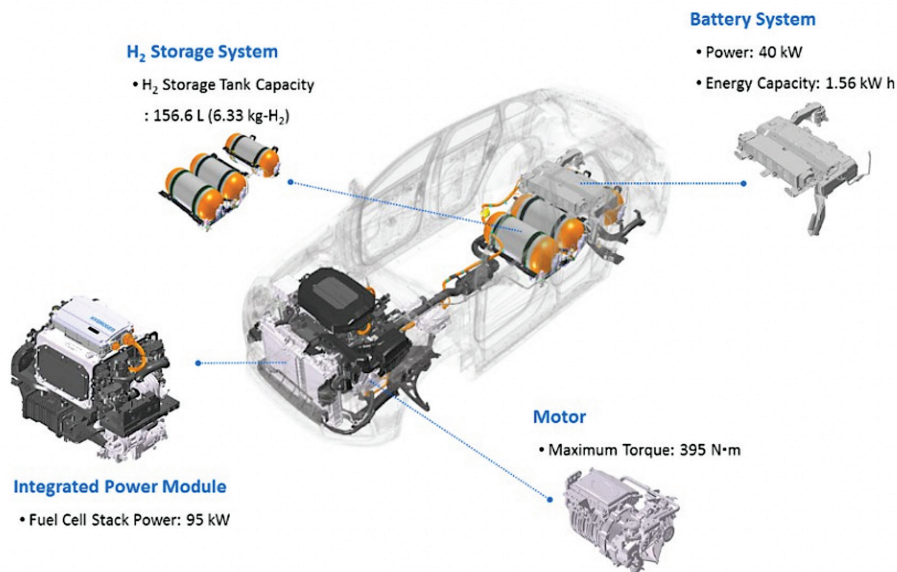


TECHNICAL REPORT



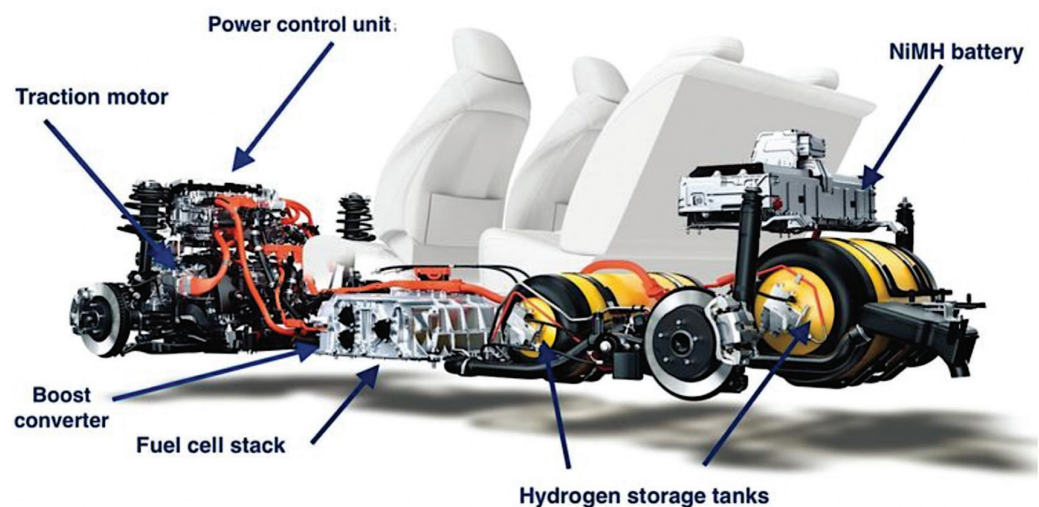
In light of recent advertising by Hyundai in New Zealand for the Nexo Hydrogen powered model, where a running vehicle has its tailpipe immersed in water, we thought it would be a prudent to provide some background into how these alternative fuel vehicles operate

HYUNDAI NEXO HYDROGEN- POWERED VEHICLE – MAIN COMPONENTS: -



The fourth, lesser known (and arguably, least understood) category of electric vehicles is **FCEV** – Fuel Cell Electric Vehicles. This category of electric vehicle differs from the others, in that Hydrogen stored in high pressure tanks is supplied to a fuel cell stack that, via a chemical reaction with oxygen, generates electrical current to supply the electric traction motor and help charge the HV traction battery.

Courtesy of Toyota: -



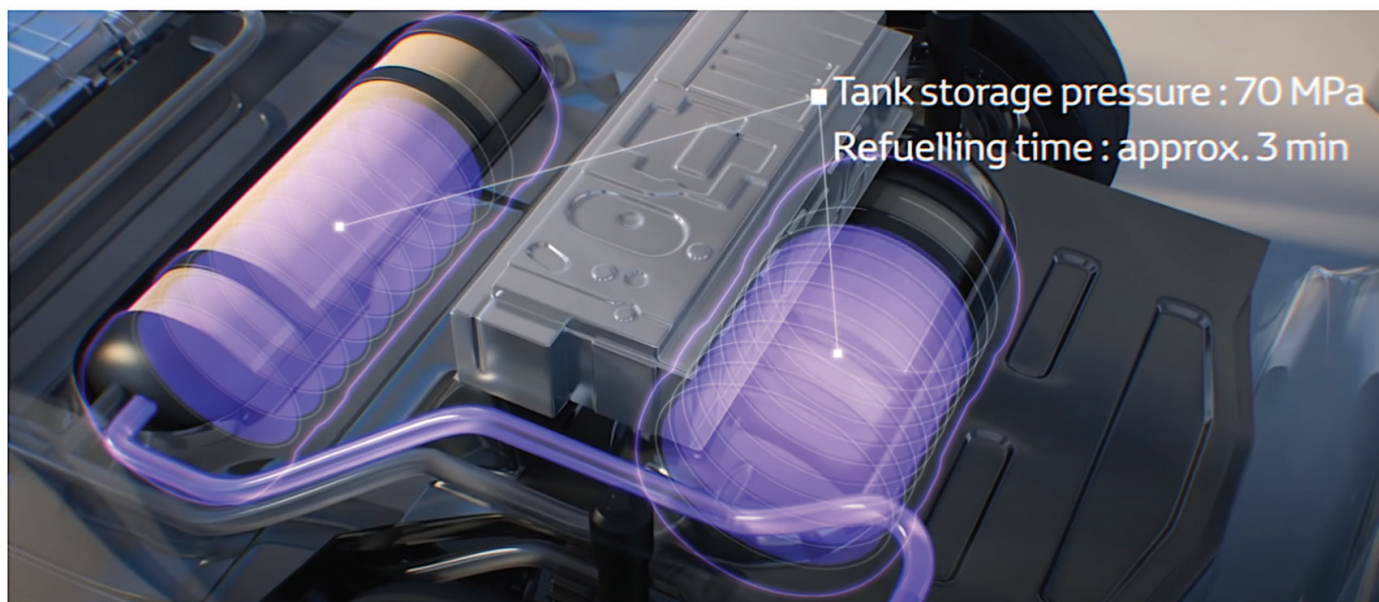
Resene
Automotive & Light Industrial

Coatings Experts at your door
0800 108 008 | reseneauto.co.nz

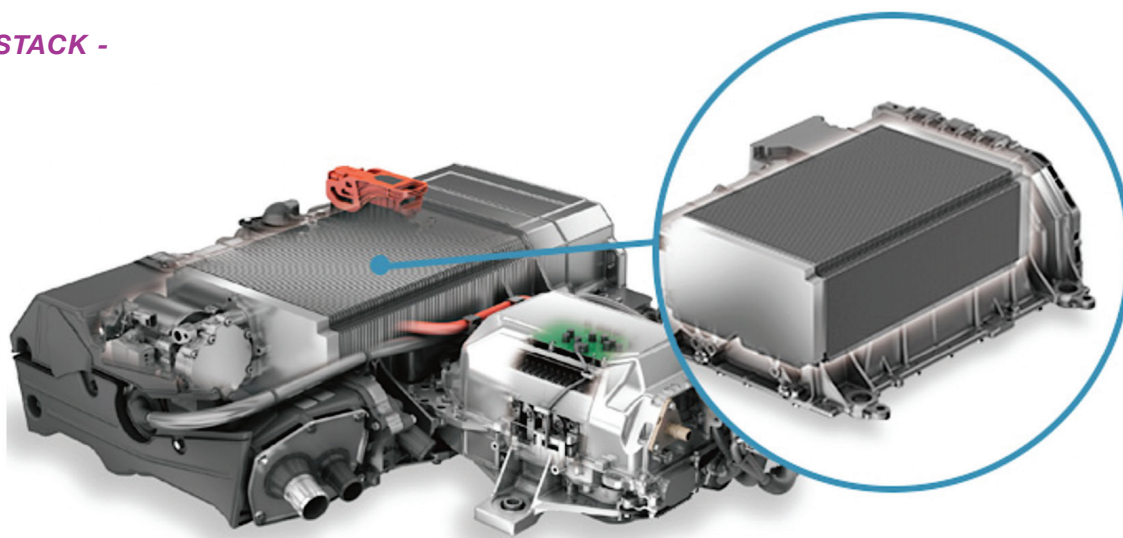


TECHNICAL I-CAR[®] NEW ZEALAND REPORT

HYDROGEN STORAGE TANKS -



FUEL CELL STACK -



Resene

Automotive & Light Industrial

Coatings Experts at your door
0800 108 008 | reseneauto.co.nz

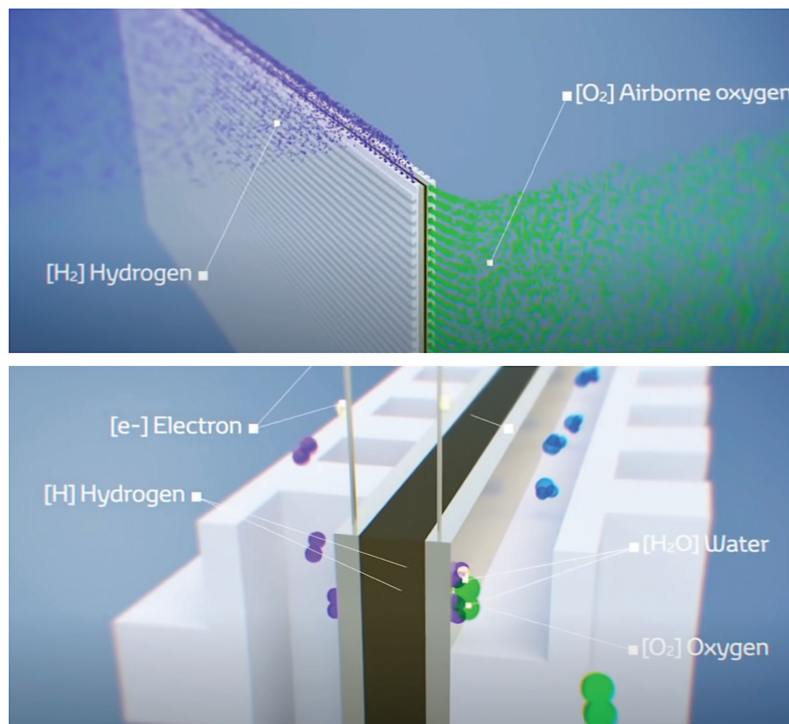


STANDOX

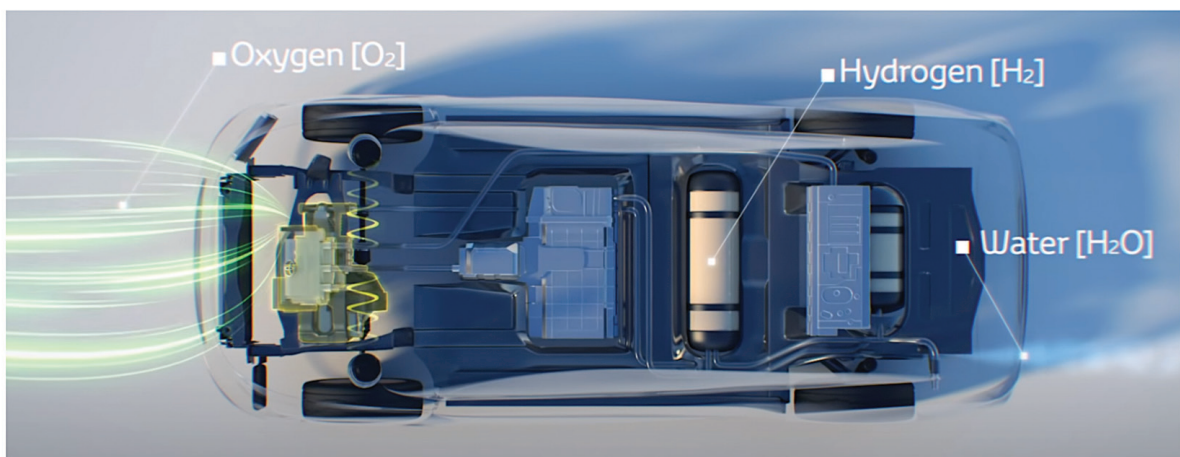
TECHNICAL REPORT



The chemical reaction that generates electrical energy in the fuel cell stack – Hydrogen [H_2] – from the storage tank, combined with Oxygen [O_2] – from the outside air, creates electrical energy / current that can be supplied directly to the drive motor or sent to the HV traction battery, via the control unit



This is where promotional material from vehicle-makers highlights the fact that the only emission at the tailpipe is **water**.



Resene
Automotive & Light Industrial

Coatings Experts at your door
0800 108 008 | reseneauto.co.nz

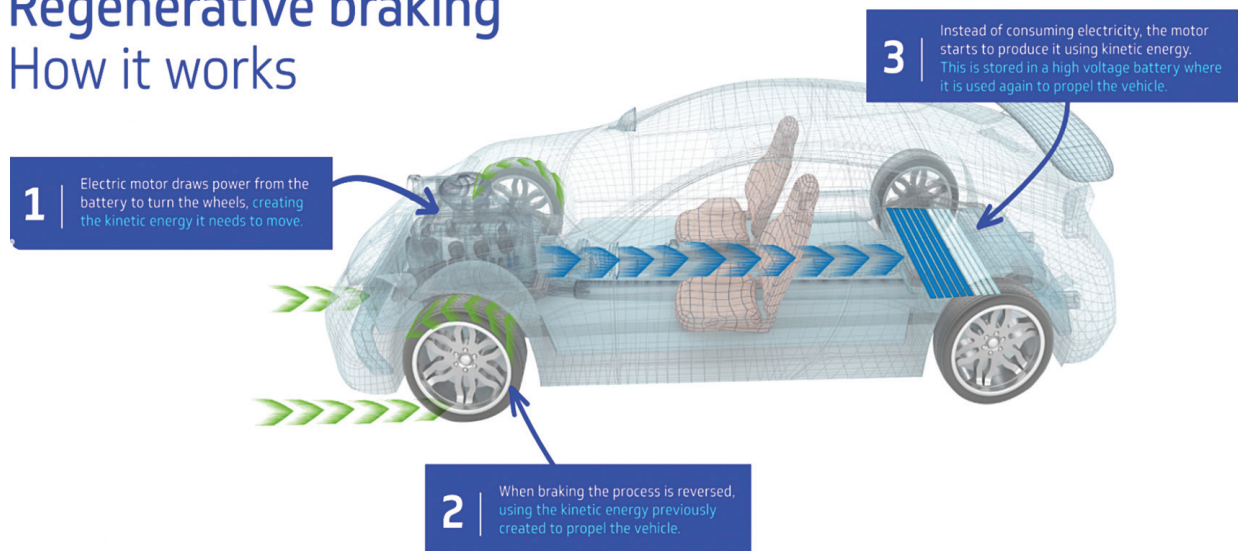


TECHNICAL REPORT



Like the other electric vehicle categories, FCEV's utilize "regenerative" braking to capture additional energy that would otherwise be lost.

Regenerative braking How it works



Global opinion on the future of FCEV's is rather polarizing: -

Advantages of Hydrogen fuel cells: -

- **A very abundant earth element**
- **Zero emissions when "burnt"**
- **A non-toxic substance**
- **Has far better fuel efficiency - compared to Internal Combustion Engines (ICE) - Diesel and Petrol**
- **Is completely renewable**
- **"Recharge" time is relatively short (compared to charging an HV battery)**

Disadvantages of Hydrogen fuel cells: -

- **Expensive to produce – Hydrogen is found as a compound (requiring separation from other elements)**
- **It is difficult / impractical to transport and store**
- **Lack of infrastructure and availability to the motoring public**
- **Is highly flammable**
- **The processes to produce hydrogen often involve non-renewable resources like coal, oil and natural gas**

Resene

Automotive & Light Industrial

Coatings Experts at your door

0800 108 008 | reseneauto.co.nz



TECHNICAL REPORT



While there are a number of OEM's that are researching or investigating the viability of FCEV vehicles in the future, there are currently only three major vehicle-makers that sell FCEV passenger platforms commercially: -

- **HYUNDAI NEXO**



- **TOYOTA MIRAI**



- **HONDA CLARITY**



Industry experts suggest that by and large, FCEV passenger vehicle sales volumes are unlikely to increase dramatically in the near future (globally or locally) - both because of the lack of supporting infrastructure (Hyundai NZ's own Hydrogen filling station in Mt Wellington is the only one operating in New Zealand at present), and the initial purchase cost.

These articles have been written by Martyn Lane: I-CAR Instructor, Weld Test Administrator and Technical Specialist to the auto body industry