

The image shows the rear view of a dark-colored vehicle, possibly a truck or bus, with its taillights illuminated. The text is centered on the rear panel. The background is dark, and the ground shows a reflection of the lights.

ARCC

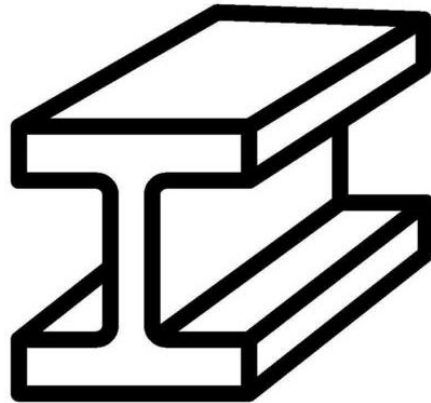
Hydrogen Fuel Cell
Electric Vehicle
Performance Review

OVERVIEW

Australian Owned,
Designed and Built



Aluminium
Extrusion Bolted
Chassis and Body



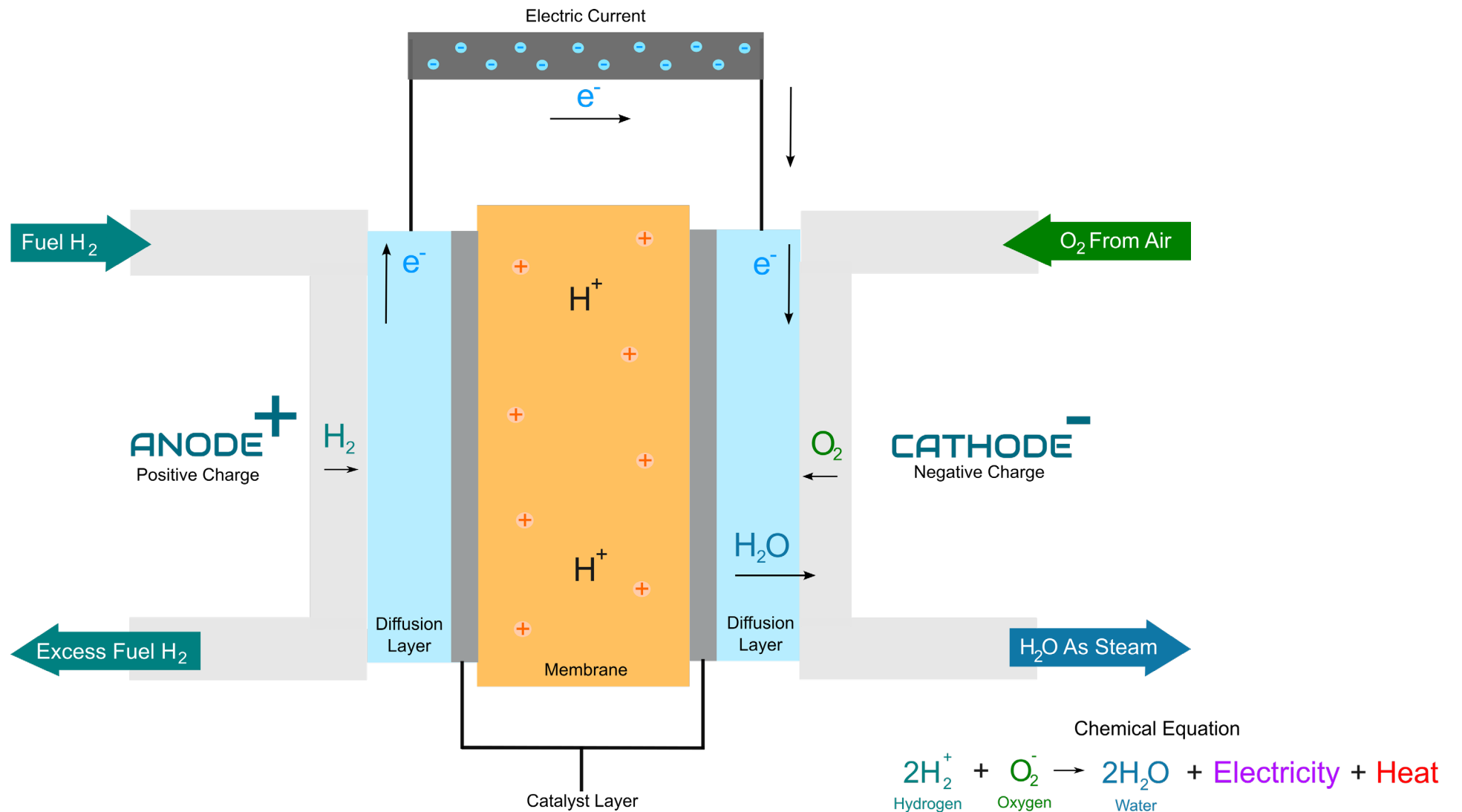
Hydrogen
Fuel Cell
Electric Vehicles



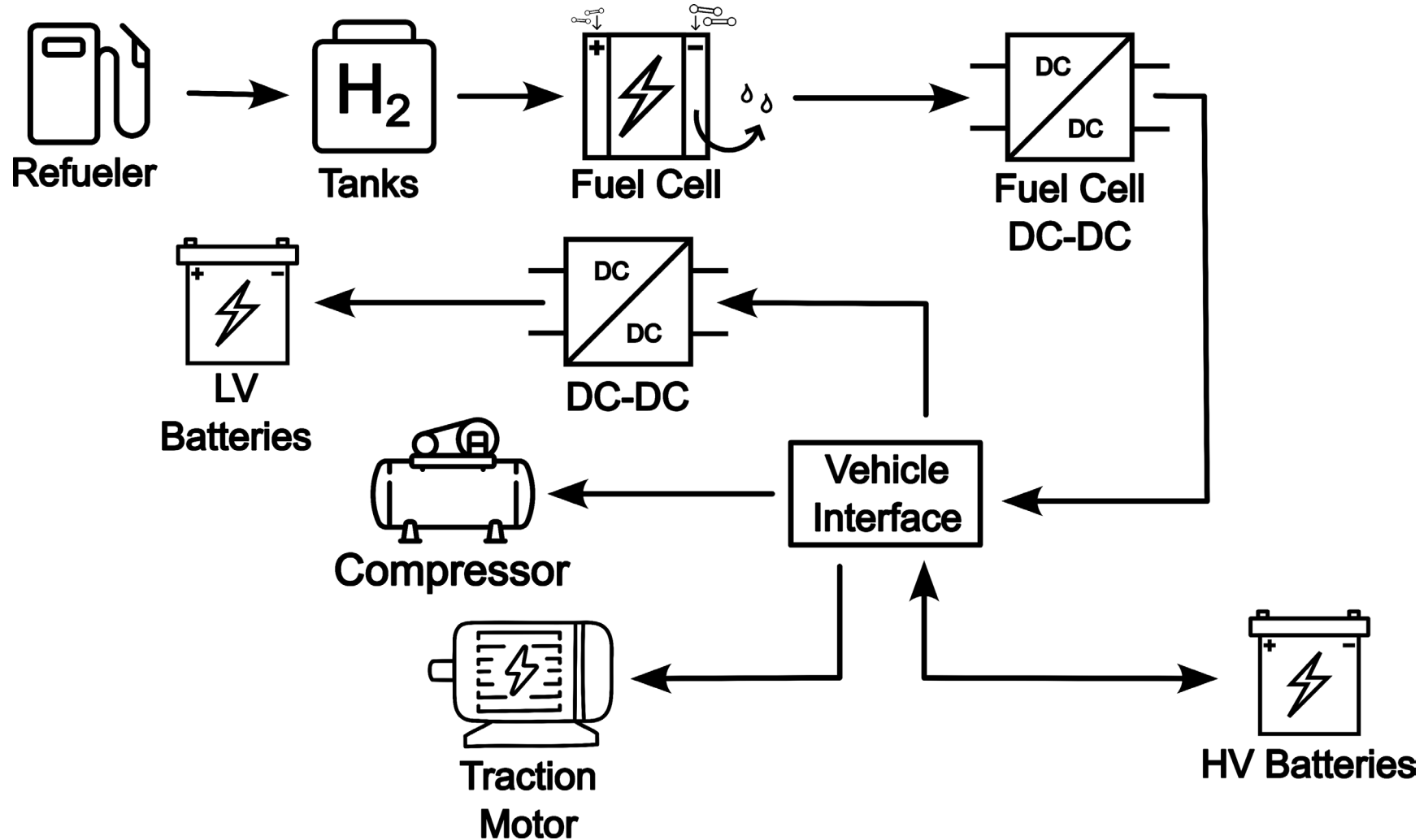
Battery Electric
Vehicles



Hydrogen Fuel Cell – Proton Exchange Membrane (PEM)



Fuel Cell Electric Vehicle (FCEV) Energy Flow





ARCC LAF

Length	12.5 m
Vehicle Height	3.35 m
GVM	16,000 kg
Tare Mass	11,920 kg
Passenger Capacity	46 Seated + 14 Standees 60 Total
Peak Motor Power	350 kW
Peak Motor Torque	3500 Nm
Peak HFC Power	60 kW
Hydrogen Capacity	38 kg
Hydrogen Pressure	35 MPa (350 bar)
Battery Chemistry	Microvast MpCO
Battery Capacity	111kWh (190 Ah)
Hydrogen Economy	16.0 km/kg

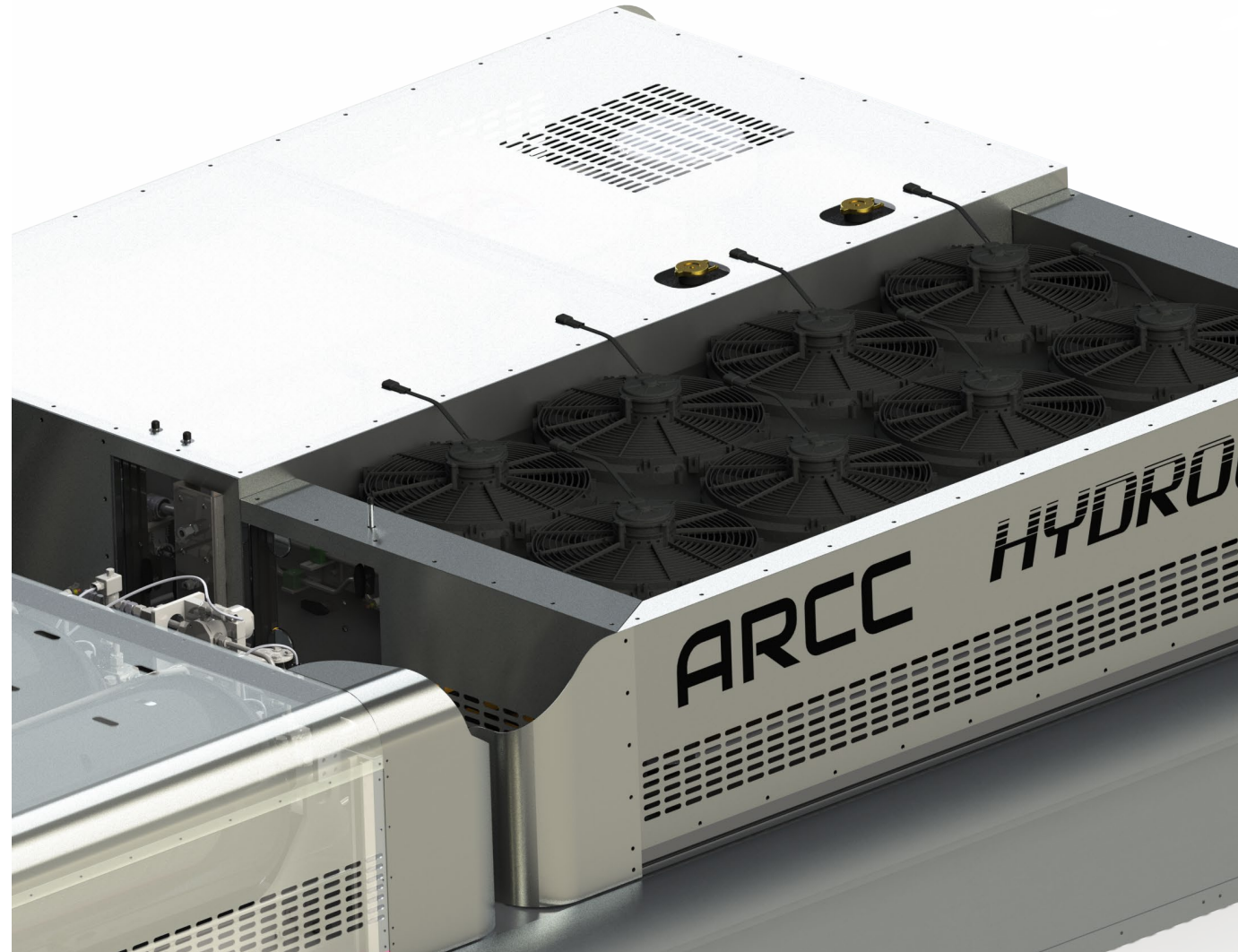


ARCC LONGREACH

Length	12.5 m
Vehicle Height	3.35 m
GVM	18,000 kg
Tare Mass	11,770 kg
Passenger Capacity	43 Seated + 35 Standees 78 Total
Peak Motor Power	250 kW
Peak Motor Torque	2645 Nm
Peak HFC Power	70 kW
Hydrogen Capacity	31 kg
Hydrogen Pressure	35 MPa (350 bar)
Battery Chemistry	Microvast MpCO
Battery Capacity	111kWh (190 Ah)
Hydrogen Economy	18.5 km/kg

Operational Benefits of Hydrogen Vehicles

- Similar advantages to BEV
- FCEV able to utilise higher speed routes
- Less downtime via refuelling
- Less infrastructure vs BEV
- Greater energy density = longer range
- Technology more applicable to heavy vehicles



Hydrogen Vehicles in Australia

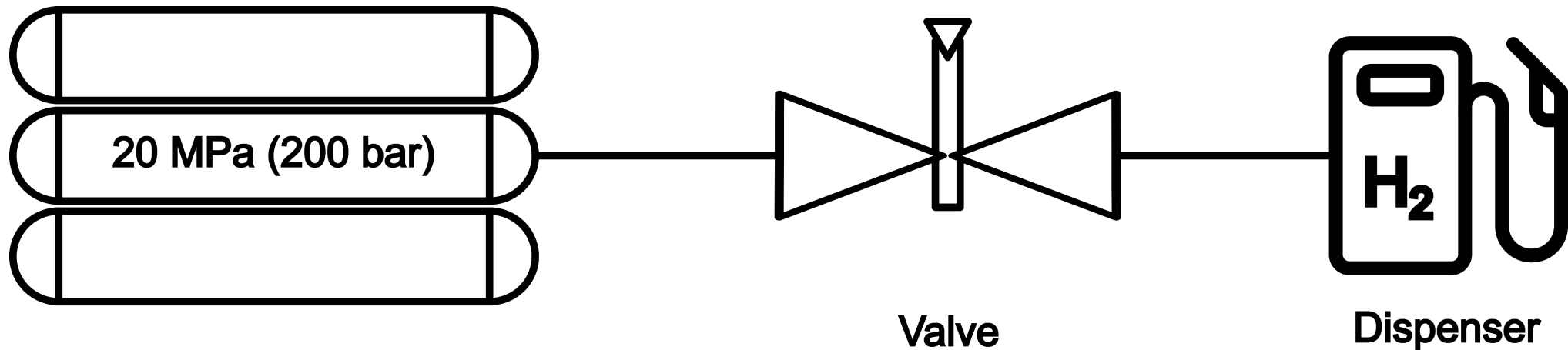


- Higher speed routes
- Large rural centres – inadequate infrastructure for BEV
- High HVAC usage
- Reliant on Heavy Vehicles – Trucks
- Lifetime requirements for vehicle
- Majority of depots lack infrastructure capability to support BEV fleet.

Stage-1 Cascade Refuellers

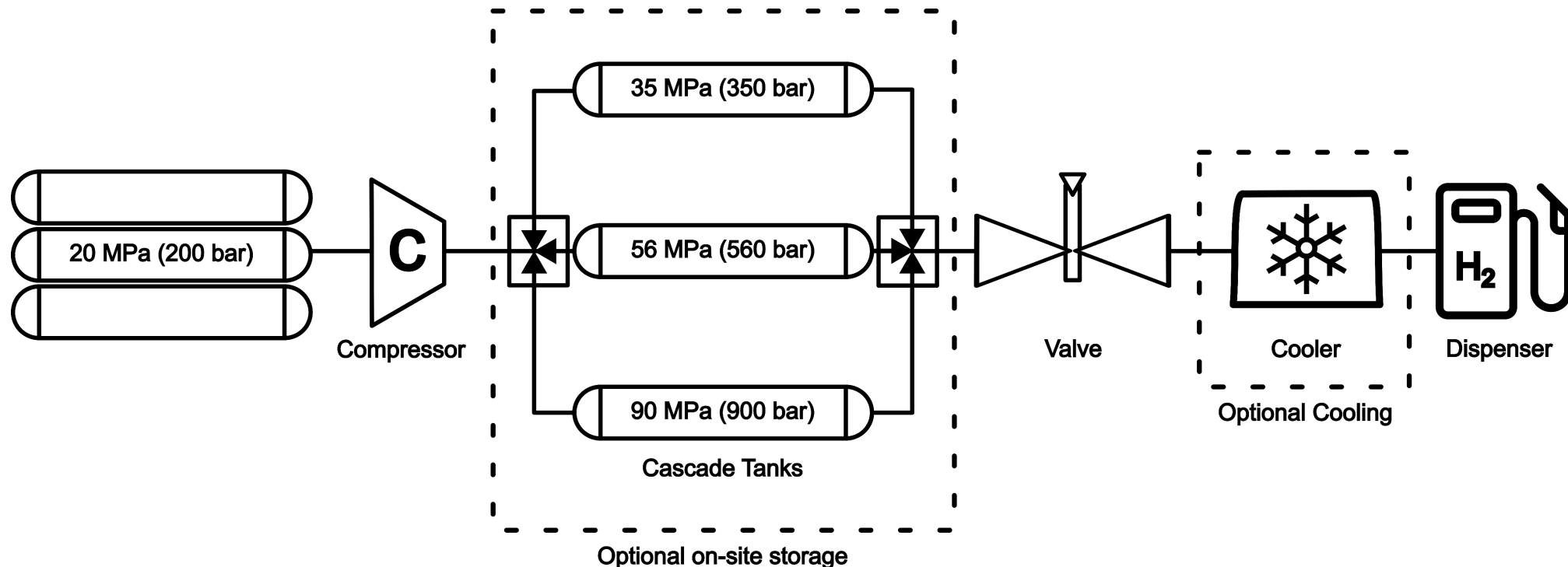
- Equalises or “cascades” with the supply pressure from the tube trailer/packs
- All refuellers utilise stage 1 cascading

- Reliable, cost-effective and simple to operate.
- Not as economic
- Slow



Stage-2 Boost Refuellers

- Introduces compression towards the vehicle directly or onsite gas storage.
- Multiple compression phases
- Compression is slow (<10g/s), requiring constant use to fill onsite storage



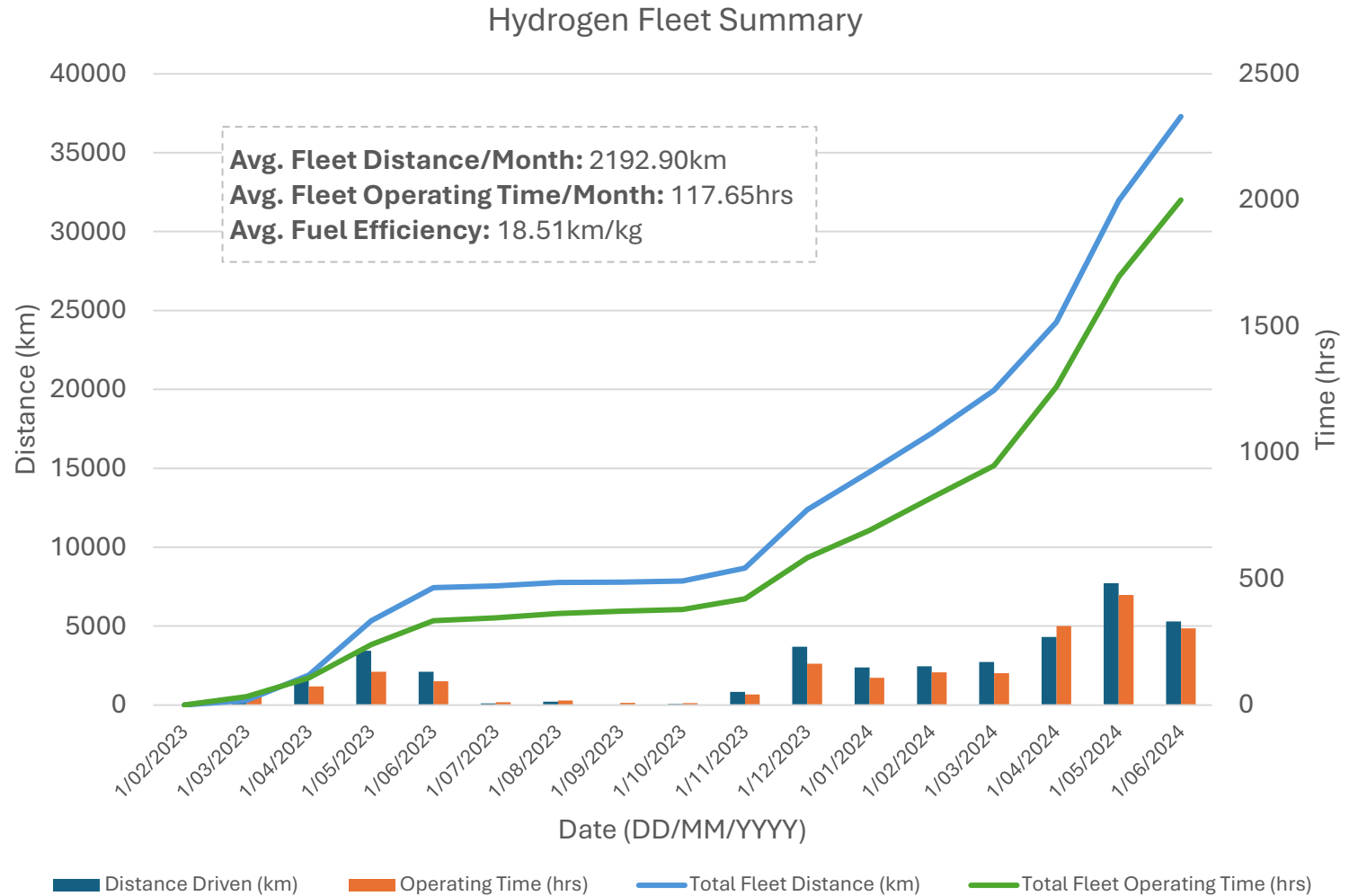
Fleet Summary (Distance & Operating Hours)

1-Year of Hydrogen Trial Data

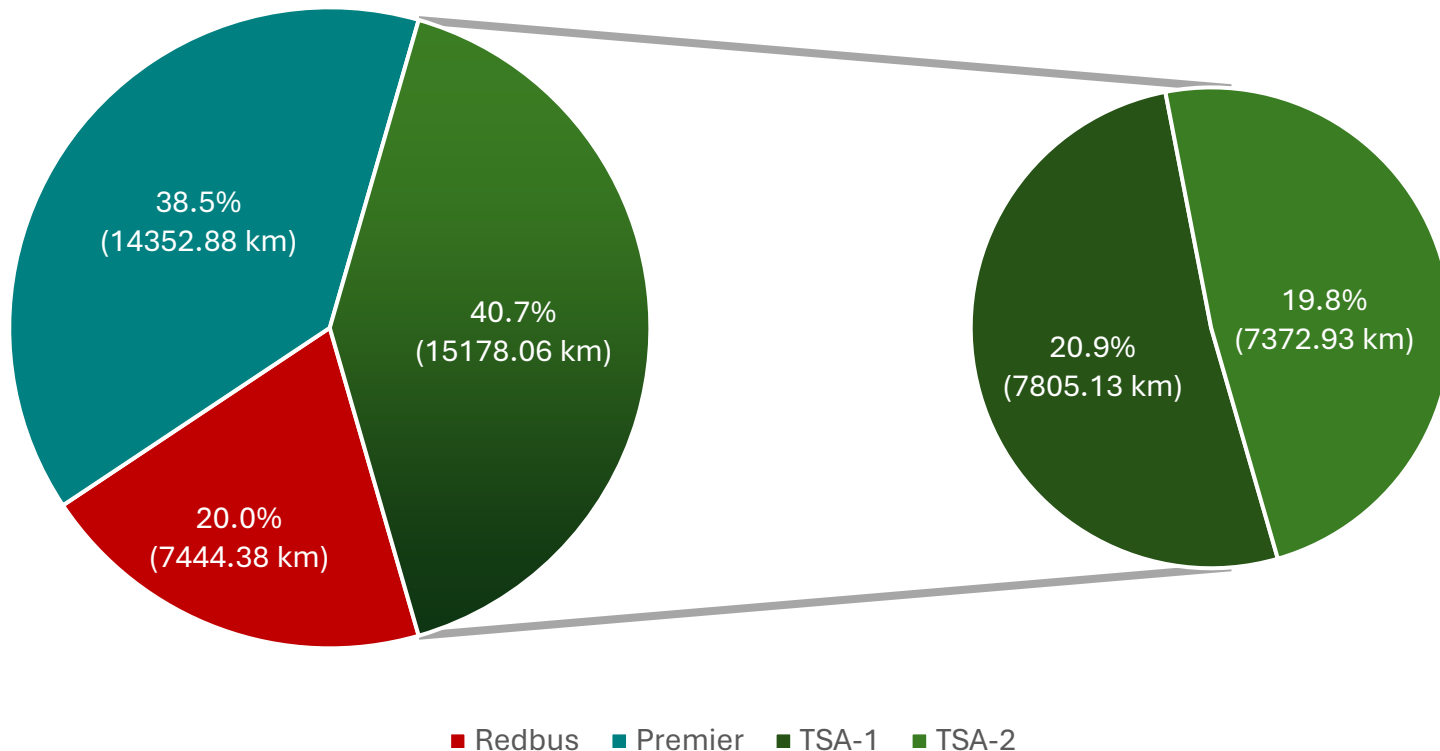
The ARCC Hydrogen fleet has collectively driven:

- **37,279 km** across **2000 hours** in service
- With an average fuel efficiency of **18.51 km/kg** (5.4kg/100km)

Delivered vehicles for 3 government trials across 2 states (NSW & VIC)



Fleet Summary (Distance & Operating Hours)



Data Distribution

- Distance driven in service evenly split between NSW & VIC (Following initial trial)
- Large variety of driving profiles (Suburban, Urban, Heavy-Urban, Highway)
- Data collected around HVAC usage across all seasons



Bateau Bay (Central Coast)

Operator	Vehicle(s)
Redbus Services	1
Distance Driven	7554 km
Operating Time	344 hrs
H2 Consumed	393 kg
Time Refueling	100 hrs



Wollongong

Operator	Vehicle(s)
Premier Illawarra	1
Distance Driven	14,352 km
Operating Time	549 hrs
H2 Consumed	897 kg
Time Refueling	22 hrs



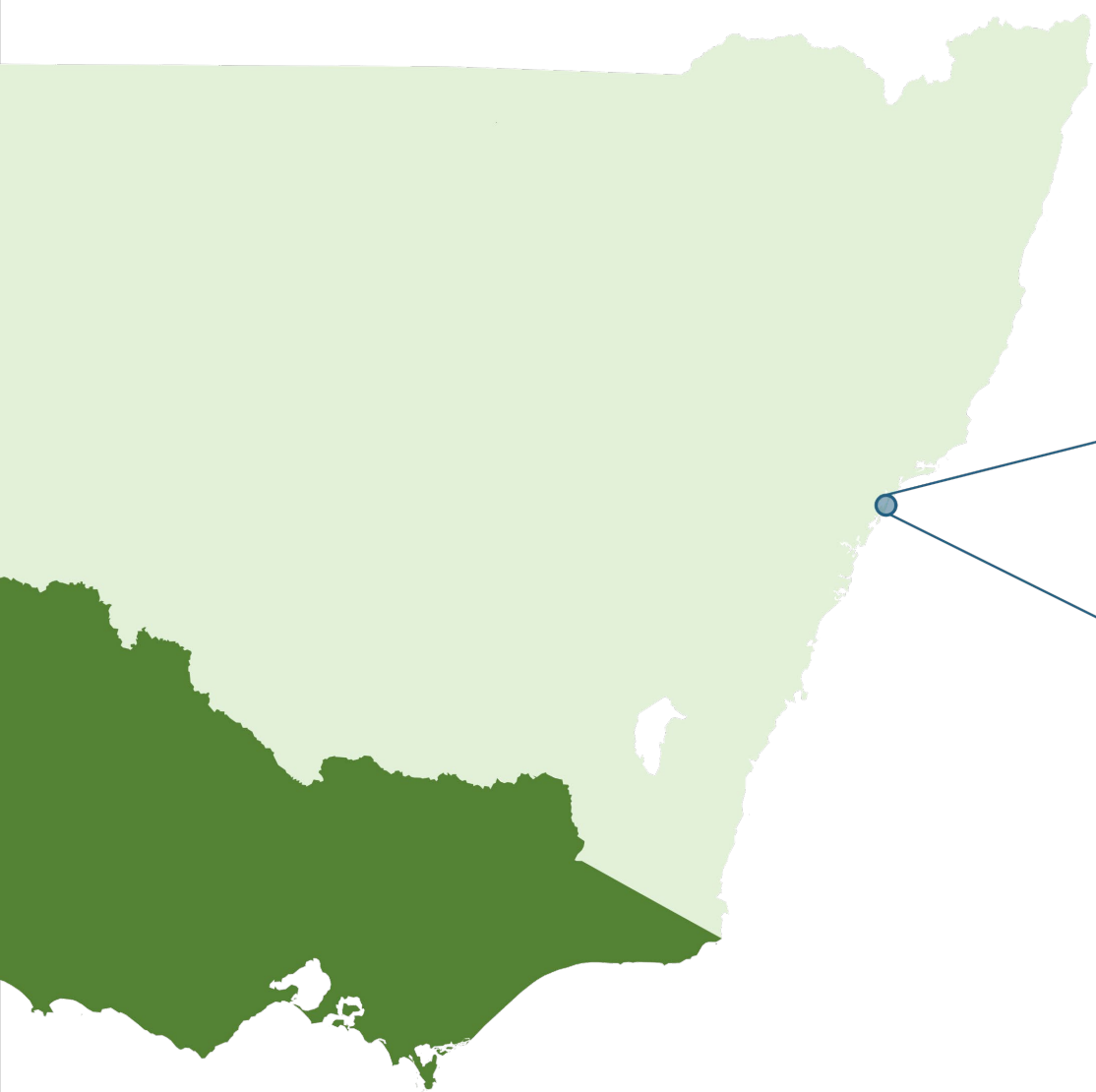
West Footscray (Melbourne)

Operator	Vehicle(s)
TSA	2
Distance Driven	15,178 km
Operating Time	1081 hrs
H2 Consumed	713 kg
Time Refueling	316 hrs



Geelong

Operator	Vehicle(s)
CDC Victoria	2
Commencing Q4 2024	
<i>Part of the New Energies Service Station Project</i>	




Bateau Bay (Central Coast)

Operator	Vehicle(s)
<i>Redbus Services</i>	<i>1</i>
Distance Driven	<i>7554 km</i>
Operating Time	<i>344 hrs</i>
H2 Consumed	<i>393 kg</i>
Time Refueling	<i>100 hrs</i>

Hydrogen Projects to Date

Red Bus Services – Bateau Bay, NSW

March 2023 – June 2023

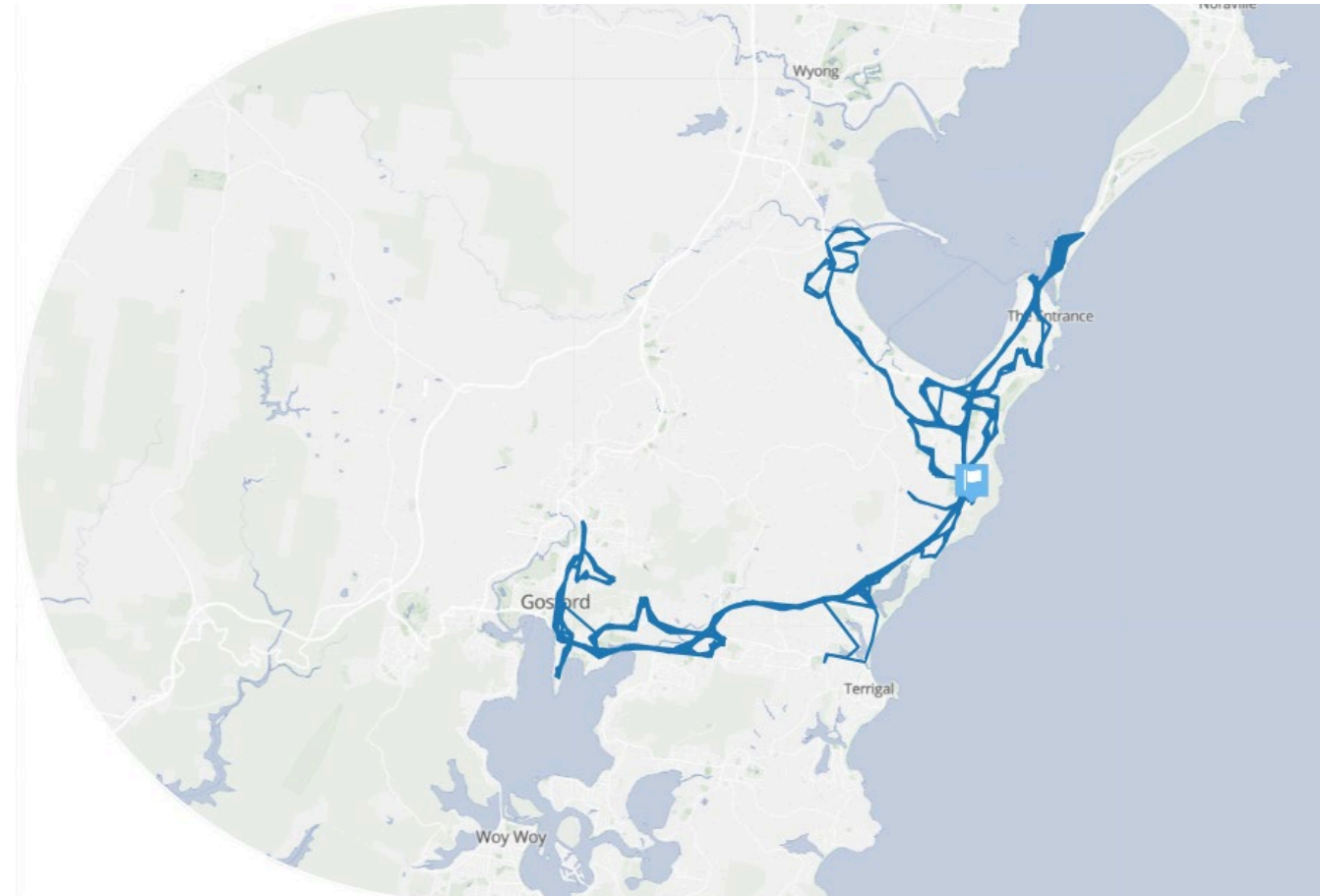


Bateau Bay (Central Coast)	
Operator	Vehicle(s)
Redbus Services	1
Distance Driven	7554.38 km
Operating Time	344.88 hrs
H2 Consumed	393.10 kg
Time Refueling	100.47 hrs

1st Stage of NSW FCEV Trial

A 4-month trial beginning in March 2023, with a focus on detailed data collection around:


- Vehicle capability
- Route optimisations
- Operational requirements around refuelling.
- Low-Traffic/High Speed application



Hydrogen Projects to Date

Red Bus Services – Bateau Bay, NSW

March 2023 – June 2023



Bateau Bay (Central Coast)	
Operator	Vehicle(s)
Redbus Services	1
Distance Driven	7554.38 km
Operating Time	344.88 hrs
H2 Consumed	393.10 kg
Time Refueling	100.47 hrs

Hydrogen Supply - Coregas

Hydrogen 4.0 Tube Trailer

- Type 1 Tanks – **Grey Hydrogen**
- **~300 kg @ 20 MPa (200 bar)** on delivery

Refuelling Infrastructure – H2H

Gateway Refueller

- Manually operated Stage-2 refueller
- Boost phase capable of **1-2 g/s**



Hydrogen Projects to Date

Red Bus Services – Bateau Bay, NSW

March 2023 – June 2023

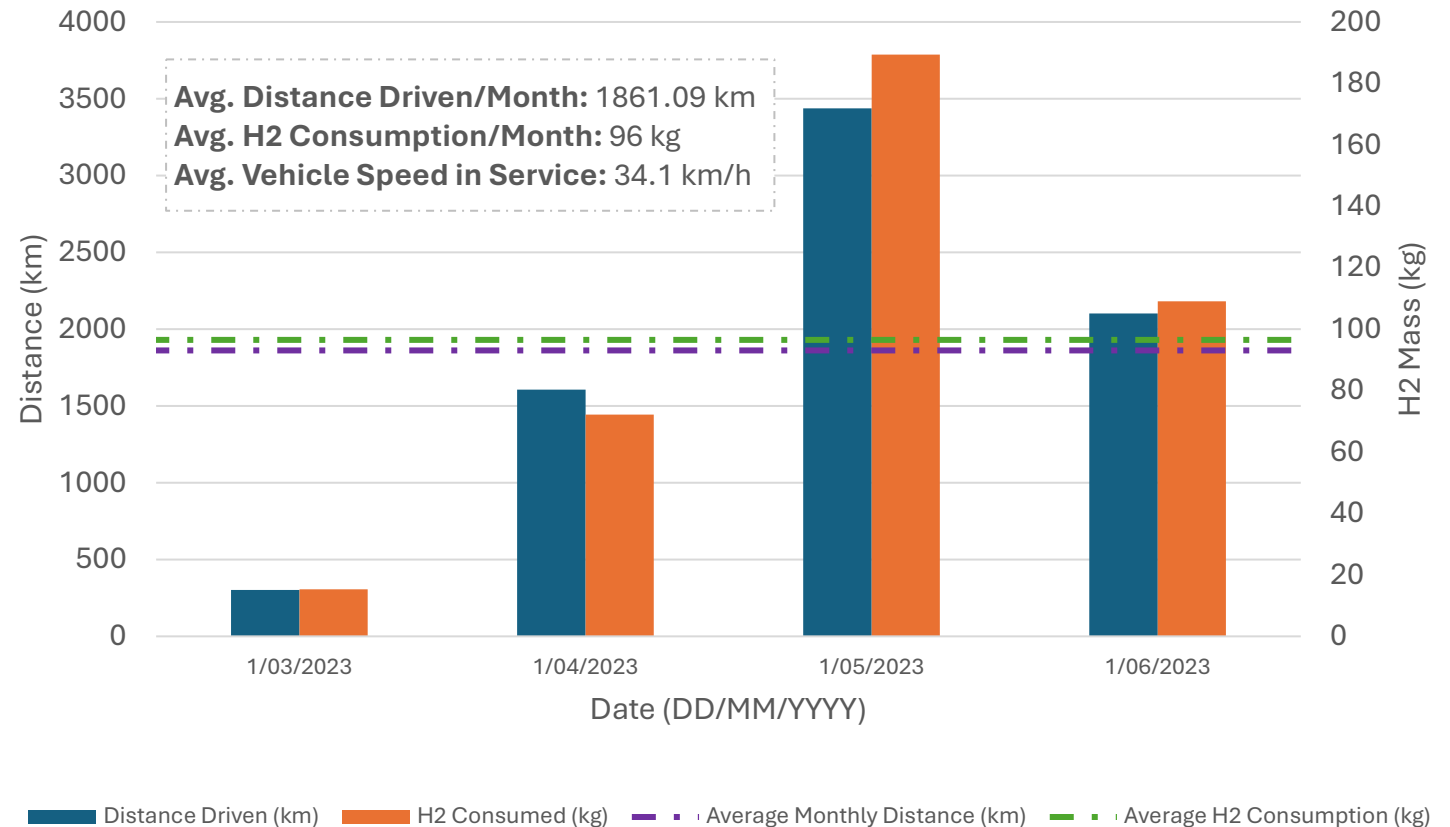
Bateau Bay (Central Coast)	
Operator	Vehicle(s)
Redbus Services	1
Distance Driven	7554.38 km
Operating Time	344.88 hrs
H2 Consumed	393.10 kg
Time Refueling	100.47 hrs

Trial Results

Following initial issues with the on-site compressor preventing refuelling in March, the trial commenced in full force.

- Average efficiency of **19.38 km/kg (5.15 kg/100 km)** with an average route speed of **34.1 km/h**
- Average refuelling time of **4.37 hours**

Red Bus Trial - Fleet Distance and H2 Usage





West Footscray (Melbourne)

Operator	Vehicle(s)
TSA	2
Distance Driven	<i>15,178.06 km</i>
Operating Time	<i>1081.85 hrs</i>
H2 Consumed	<i>713.49 kg</i>
Time Refueling	<i>316.37 hrs</i>

Hydrogen Projects to Date

Transit Systems Victoria – West Footscray, VIC

November 2023 – Present



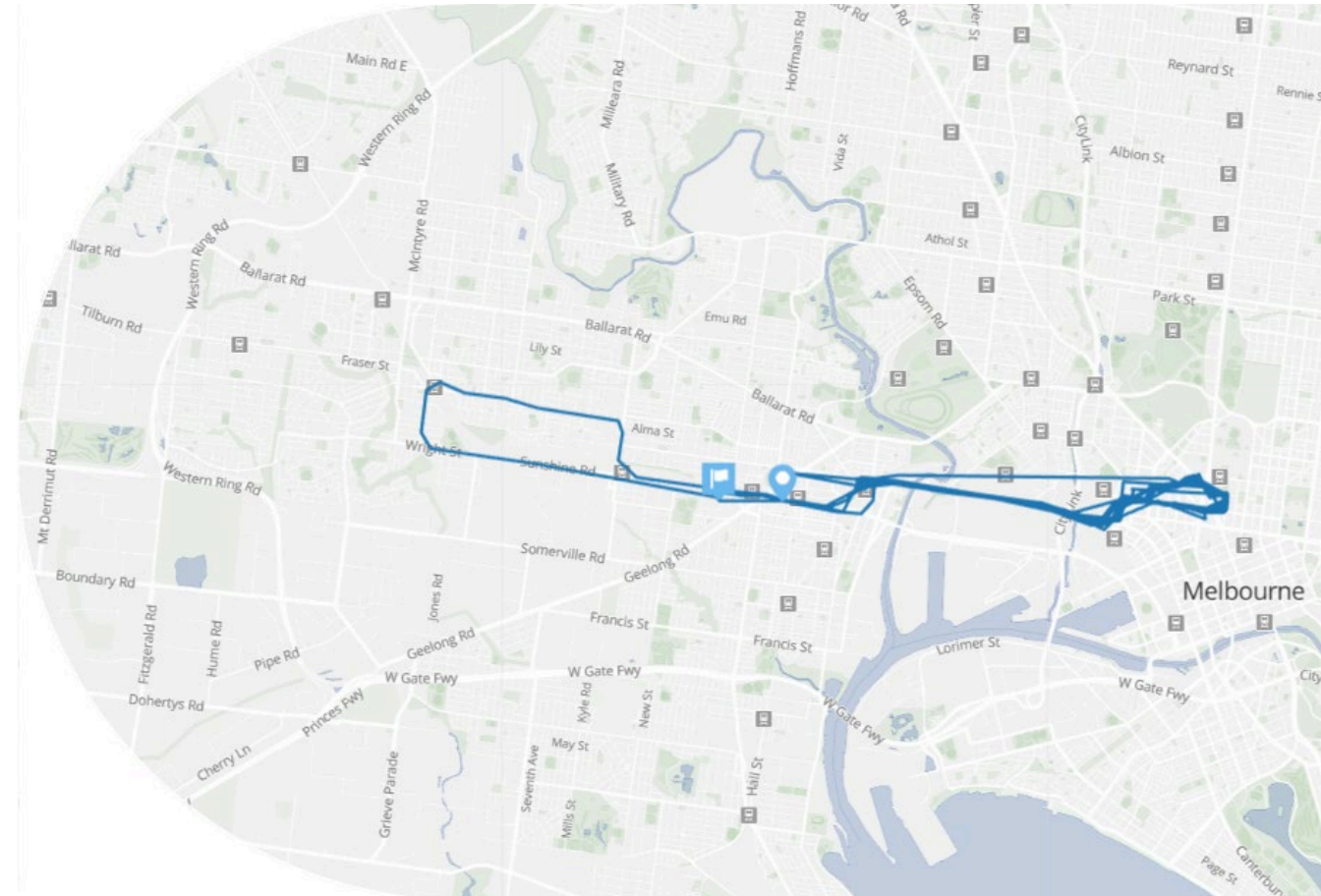
West Footscray (Melbourne)

Operator	Vehicle(s)
TSA	2
Distance Driven	15,178.06 km
Operating Time	1081.85 hrs
H2 Consumed	713.49 kg
Time Refueling	316.37 hrs

Victorian FCEV Trial

A long-term trial beginning in November 2023


- Part of a larger 52 Zero-Emission Bus Trial by the Victorian Government
- Added complexity of multiple vehicles
- Operating largely in Melbourne CBD (Heavy-Urban)



Hydrogen Projects to Date

Transit Systems Victoria – West Footscray, VIC

November 2023 – Present



West Footscray (Melbourne)	
Operator	Vehicle(s)
TSA	2
Distance Driven	15,178.06 km
Operating Time	1081.85 hrs
H2 Consumed	713.49 kg
Time Refueling	316.37 hrs

Hydrogen Supply - BOC

Hydrogen 4.0 Tube Trailer

- Type 1 Tanks – **Grey Hydrogen**
- **~200 kg @ 20 MPa (200 bar)** on delivery

Refuelling Infrastructure – H2H

Gateway Refueller


- Manually operated Stage-2 refueler
- Boost phase capable of **1-2 g/s**



Hydrogen Projects to Date

Transit Systems Victoria – West Footscray, VIC

November 2023 – Present

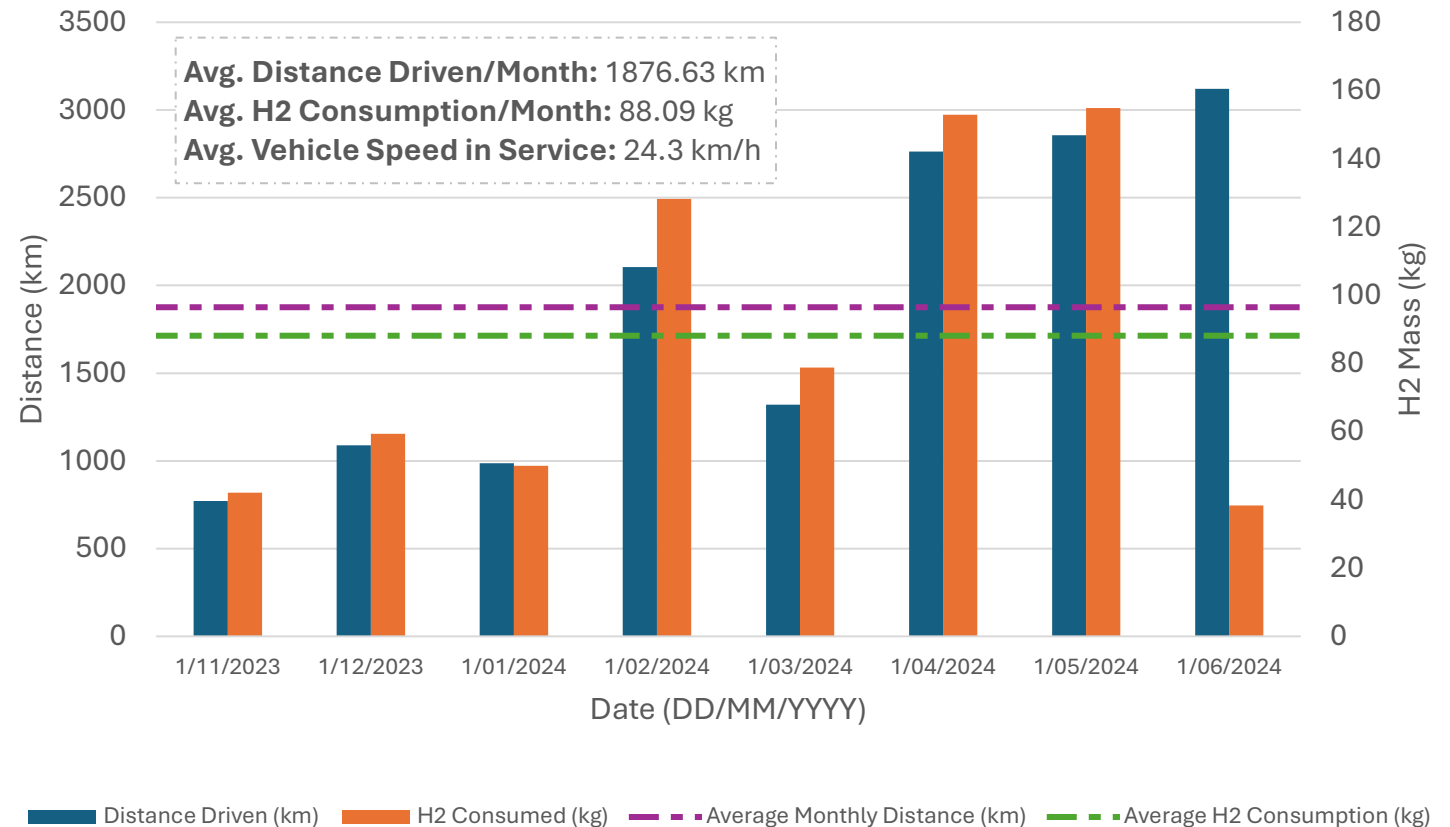


West Footscray (Melbourne)	
Operator	Vehicle(s)
TSA	2
Distance Driven	15,178.06 km
Operating Time	1081.85 hrs
H2 Consumed	713.49 kg
Time Refueling	316.37 hrs

Trial Results

- Average efficiency of **21.3 km/kg (4.69 kg/100 km)** with an average route speed of **21.3 km/h**
- Average total refuelling time of **5.59 hours**
- Average per vehicle refuelling time of **3.56 hours**


TSA VIC Trial - Fleet Distance and Operating Hours



Hydrogen Projects to Date

Transit Systems Victoria – West Footscray, VIC

November 2023 – Present



West Footscray (Melbourne)	
Operator	Vehicle(s)
TSA	2
Distance Driven	15,178.06 km
Operating Time	1081.85 hrs
H2 Consumed	713.49 kg
Time Refueling	316.37 hrs

Trial Learnings

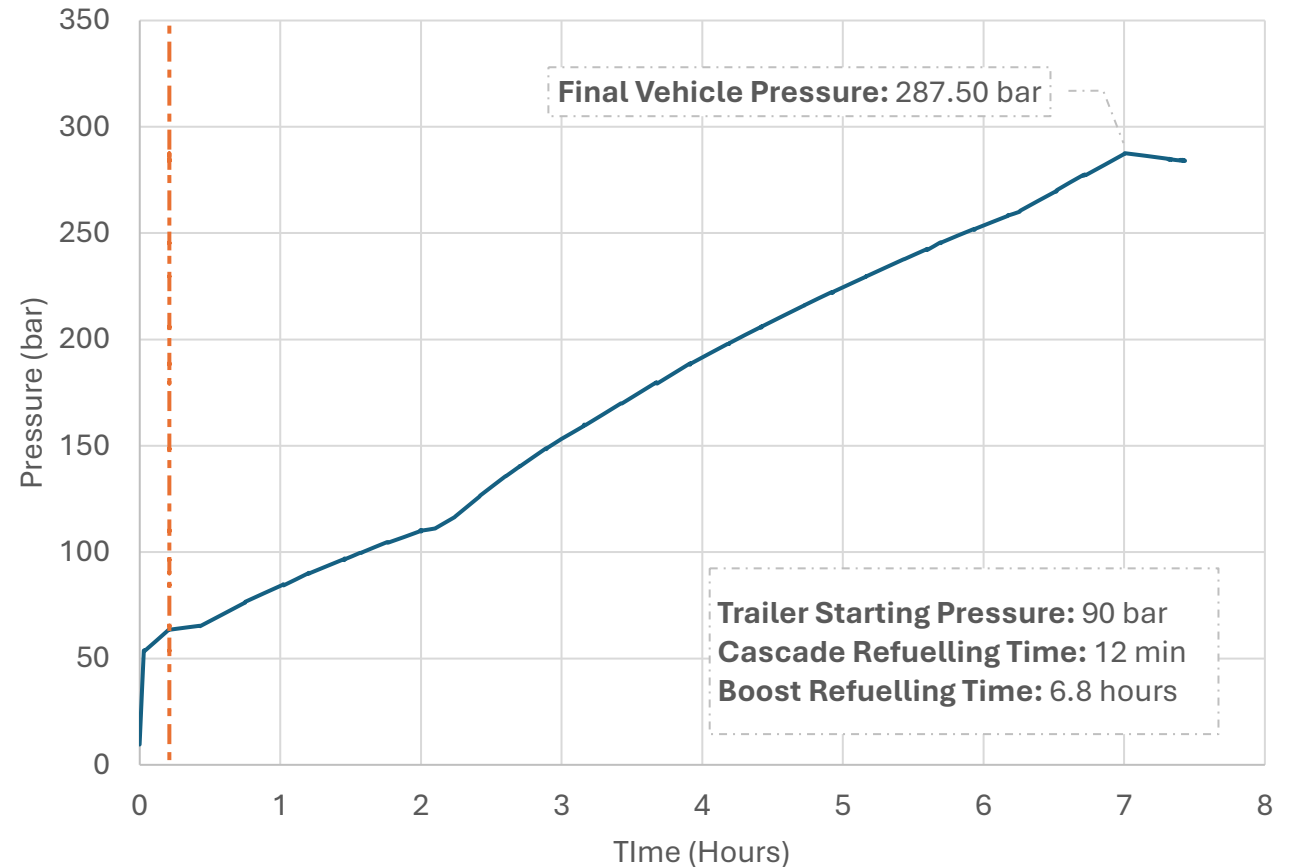
Operating behaviour largely dictated by refuelling infrastructure

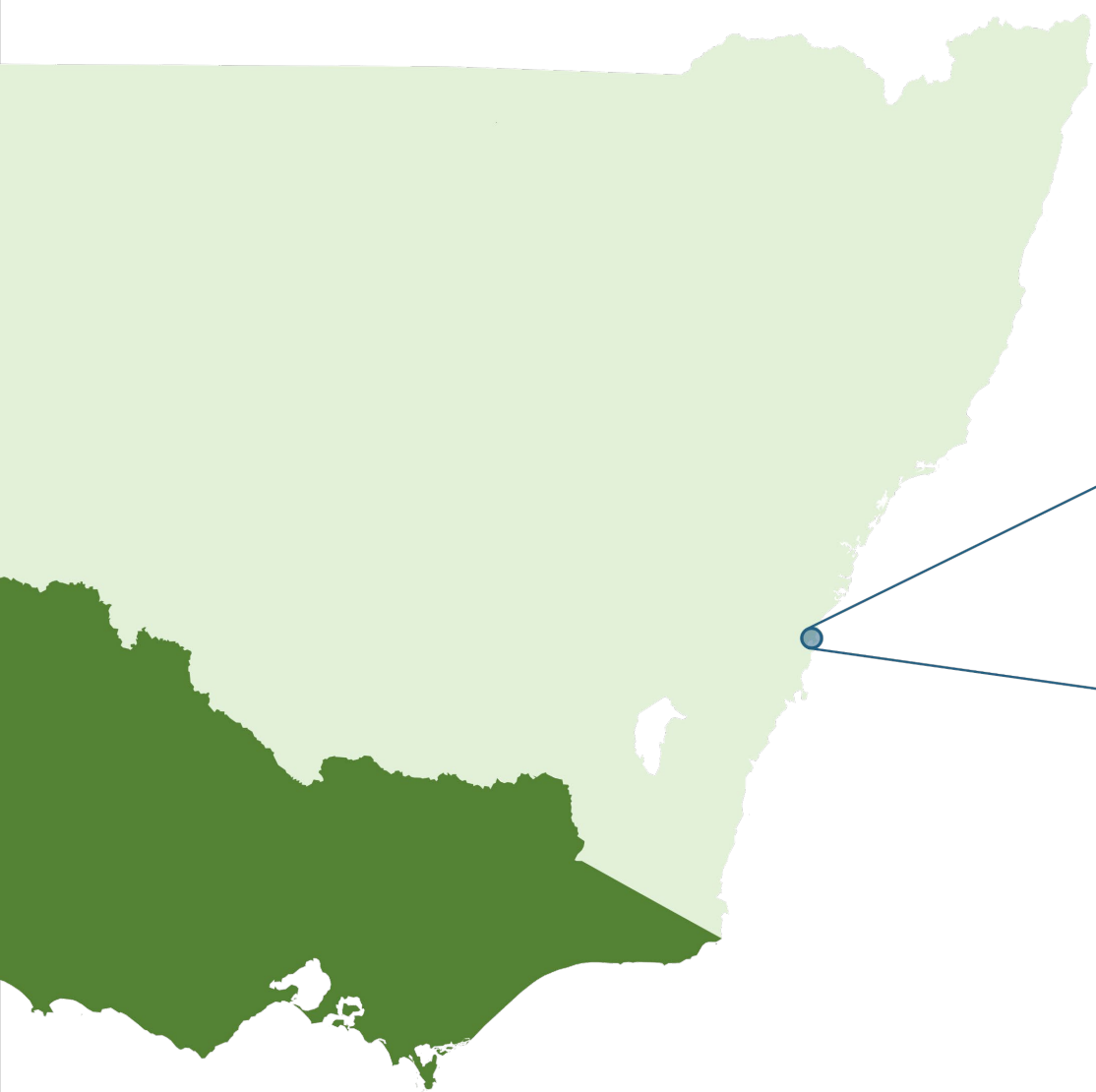
Nominal tank pressure heavily dictates refuelling speed

Tank pressure decreases as refuelling occurs

Tank capacity determines the rate with which pressure drops (and refuelling time increases)

Refueling Snapshot (23/12/2023) - Gateway Refueler






Wollongong

Operator	Vehicle(s)
<i>Premier Illawarra</i>	<i>1</i>
Distance Driven	<i>14,352.88 km</i>
Operating Time	<i>549.95 hrs</i>
H2 Consumed	<i>897.17 kg</i>
Time Refueling	<i>22.03 hrs</i>

Hydrogen Projects to Date

Premier Illawarra– Wollongong, NSW

December 2023 – Present



Wollongong	
Operator	Vehicle(s)
Premier Illawarra	1
Distance Driven	14,352.88 km
Operating Time	549.95 hrs
H2 Consumed	728.77 kg
Time Refueling	22.03 hrs

2nd Stage of NSW FCEV trial

Commissioned as a 6-month trial beginning in December 2023.


- Partnered with Coregas, making use of the high speed refueler at the Port Kembla Hydrogen Hub
- Extended to 1 year, continuing from the success of the initial trial.



Hydrogen Projects to Date

Premier Illawarra– Wollongong, NSW

December 2023 – Present



Wollongong	
Operator	Vehicle(s)
Premier Illawarra	1
Distance Driven	14,352.88 km
Operating Time	549.95 hrs
H2 Consumed	728.77 kg
Time Refueling	22.03 hrs

Hydrogen Supply - Coregas

On-Site Storage/Production

- **Grey Hydrogen** – Offset using biomethane
- **400kg @ 50 MPa (500 bar)**

Refuelling Infrastructure – Haskel

H2 Station


- Automatic Stage-2 refueler – external on-site storage
- Refuelling speeds of **15-20 g/s**



Hydrogen Projects to Date

Premier Illawarra– Wollongong, NSW

December 2023 – Present

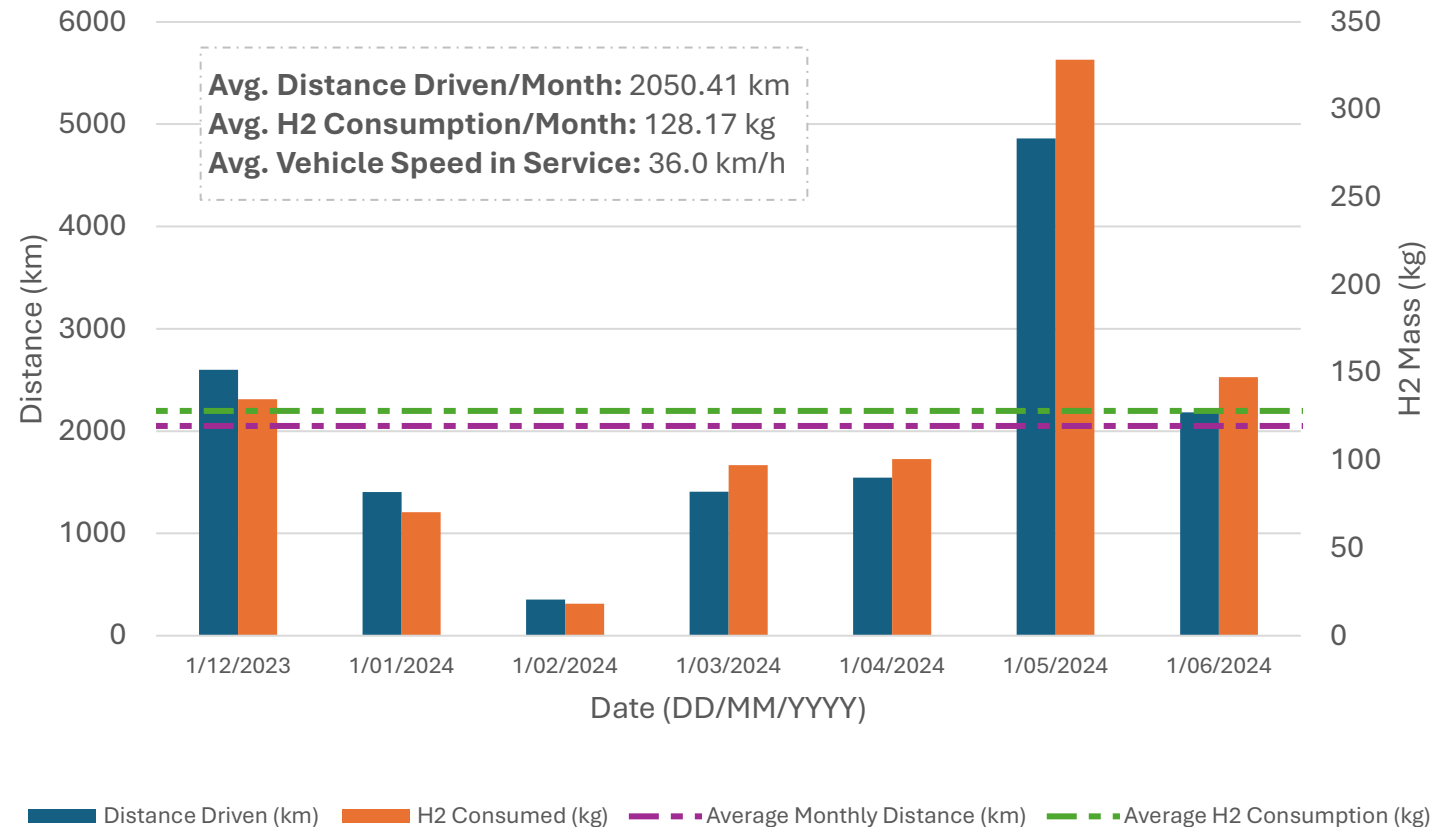


Wollongong	
Operator	Vehicle(s)
Premier Illawarra	1
Distance Driven	14,352.88 km
Operating Time	549.95 hrs
H2 Consumed	728.77 kg
Time Refueling	22.03 hrs

Trial Results

- Average efficiency of **15.99 km/kg (6.25 kg/100 km)** with an average route speed of **36 km/h**
- Average total refuelling time of **24 minutes**
- Drop in efficiency due to high speed/high patronage usage and blocked hydrogen filter unit on fuel cell (rectified in service)


Premier Trial - Fleet Distance and Operating Hours



Hydrogen Projects in Development

CDC Victoria – Geelong, NSW

November 2024



Geelong	
Operator	Vehicle(s)
CDC Victoria	2
Commencing Q4 2024	
Part of the New Energies Service Station Project	

Hydrogen Supply

- **Green hydrogen** produced on-site
- 2.5 MW Electrolyser
- 1000 kg per day production

Refuelling Infrastructure

- Refuelling capable of 10 consecutive heavy vehicles
- Expected refuelling speeds of **32-42 g/s**

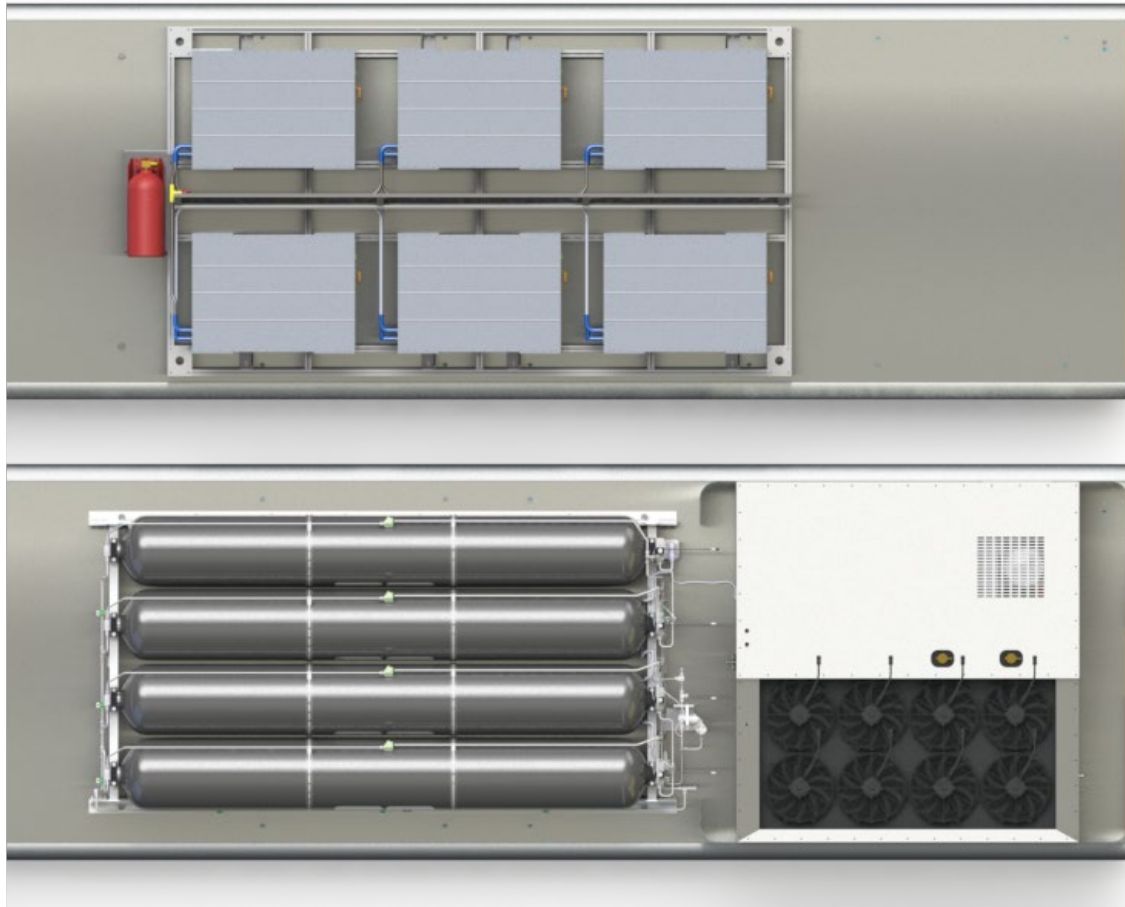


ARCC *enableRFS*

- Stage 1 Refueller
- Designed to upscale into stage 2 booster system
- Fuels 35 MPa (350 bar) systems
- Max input pressure 52 MPa (520 bar)
- Designed for use with high pressure, high-capacity hydrogen trailers
- Refuels ARCC Longreach from empty to full in under 15 minutes (stage 1)
- Australian Owned and Made



ARCC Futureproofing



- ARCC's design futureproofs depots wanting to invest in zero-emission vehicles.
- ARCC BEV is designed to convert into the ARCC FCEV.
- Enables hydrogen adoption without creating redundant assets