



**PORT KEMBLA
HYDROGEN HUB**

**H2 TRAINING + SAFETY
DAY #3**

16 November 2023



www.portkemblahydrogenhub.com.au

H2 Training + Safety Day #3 Program


- 16 Nov 2023

2.00pm	Welcome + Intro	Nigel McKinnon (Chair) Dept of Regional NSW
2.05pm	Hydrogen Refuelling Station - Safety	Wodek Jakubik Coregas
2.15pm	Vehicle and Refuelling - Safety	Hugh Robinson Fire and Rescue NSW
2.30pm	Hydrogen MicroSkills Training - Refuelling Hydrogen Vehicles	Lisa Rodrigues TAFE NSW
2.40pm	Hydrogen Heavy Vehicle - Safety Features	Ben Kiddle HDrive International
2.55pm	Wrap	Nigel McKinnon Dept of Regional NSW

We are recording today's event, please mute your microphone and turn off your camera

Presentation will be sent to all participants and be uploaded to Port Kembla Hydrogen Hub webpage

Leanne Smith will check chat area for any questions

A decorative border surrounds the central text, featuring traditional Aboriginal art motifs. On the left, there are patterns of orange and brown with white dots, and a group of emus. At the top, a dark blue night sky contains white stars, a crescent moon, and a map of Australia. On the right, there are blue and green wavy patterns representing water, with a white whale. At the bottom, there are green grass-like patterns and a blue fish.

The Department of Regional New South Wales acknowledges that it stands on Country which always was and always will be Aboriginal land. We acknowledge the Traditional Custodians of the land and waters, and we show our respect for Elders past, present and emerging. We are committed to providing places in which Aboriginal people are included socially, culturally and economically through thoughtful and collaborative approaches to our work.

H₂ PORT KEMBLA HYDROGEN HUB

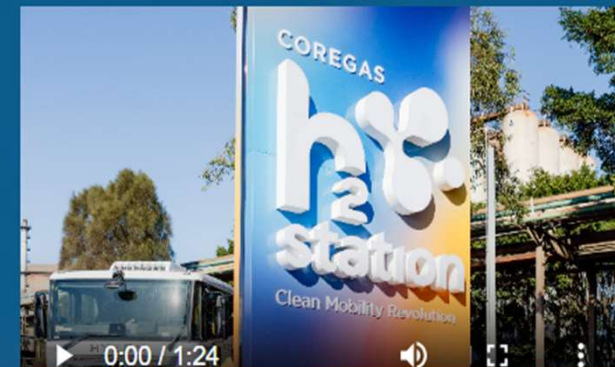


▼ Investment Prospectus

▼ H2 Future Mobility Days

▼ H2 Training + Safety Days

▼ Hydrogen Hub Update Newsletters



iW Wollongong: an emerging ...





COREGAS

h₂ station

Clean Mobility Revolution

OFFICIAL OPENING - 28 JULY 2023

WWW.COREGAS.COM.AU

Zero-emission hydrogen powered waste collection truck starts work in the Illawarra

REMONDIS Australia // 17 October 2023





WWW.COREGAS.COM.AU



COREGAS

h₂ station

Clean Mobility Revolution

Refuelling Station Safety

AUSTRALIA'S FIRST HEAVY TRANSPORT REFUELLER

CHANGING GASES CHANGING LIVES

H₂ is a solution for hard to abate areas



H₂ FOR HEAVY VEHICLES

Burns to form water (not CO₂)
Much lighter than batteries
Refuels like diesel

“...Electricity works when you need to cover short distances, but we need a different solution for heavy, long-haul vehicles

BILL GATES
SEPT 2020



Zero emission
Payload
Time & Utilisation

H₂ CHALLENGE:

**cost & technical
difficulty**

Hydrogen – H2Station update

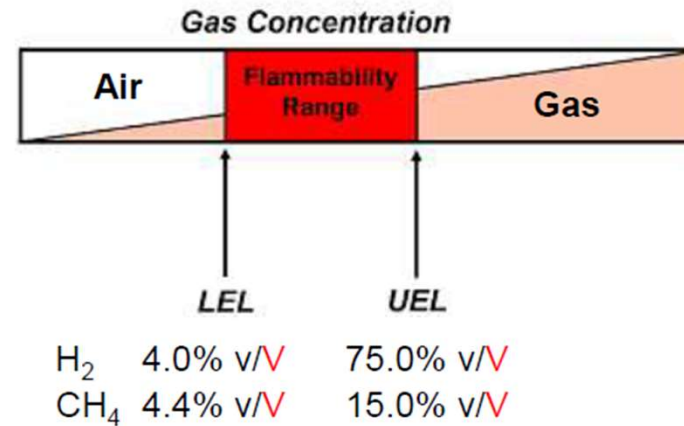
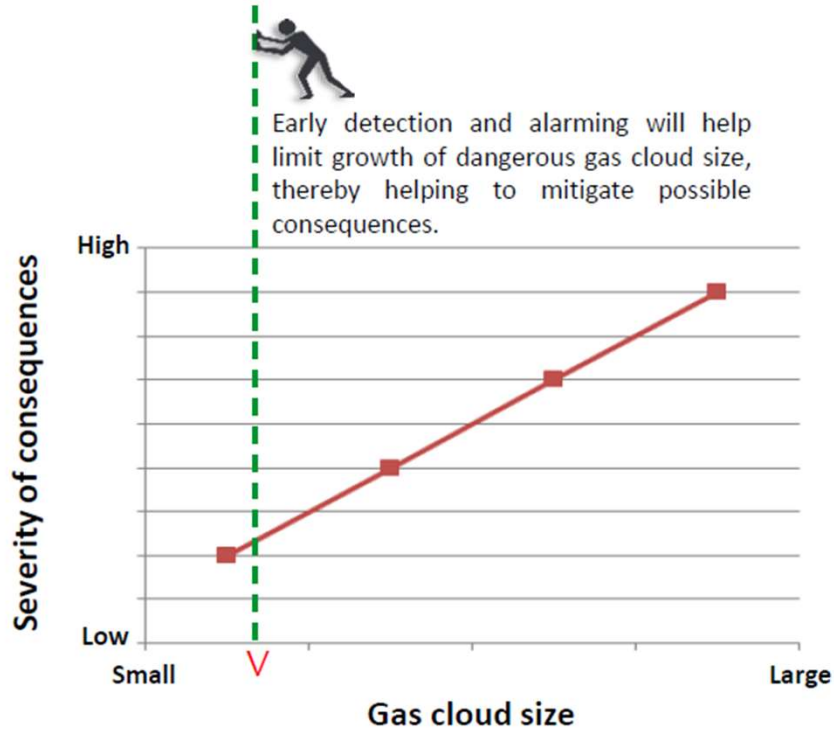
- Remondis, first Australian refuse truck in regular service in Wollongong
- Plenty of spare capacity
- Safety top priority
 - Design
 - Processes
 - Inspections & testing
 - Maintenance
 - Site induction
 - Hydrogen training
 - Hydrogen Fundamentals
 - Fuel Cell Electrical Vehicles
 - Refuelling
 - Emergency response



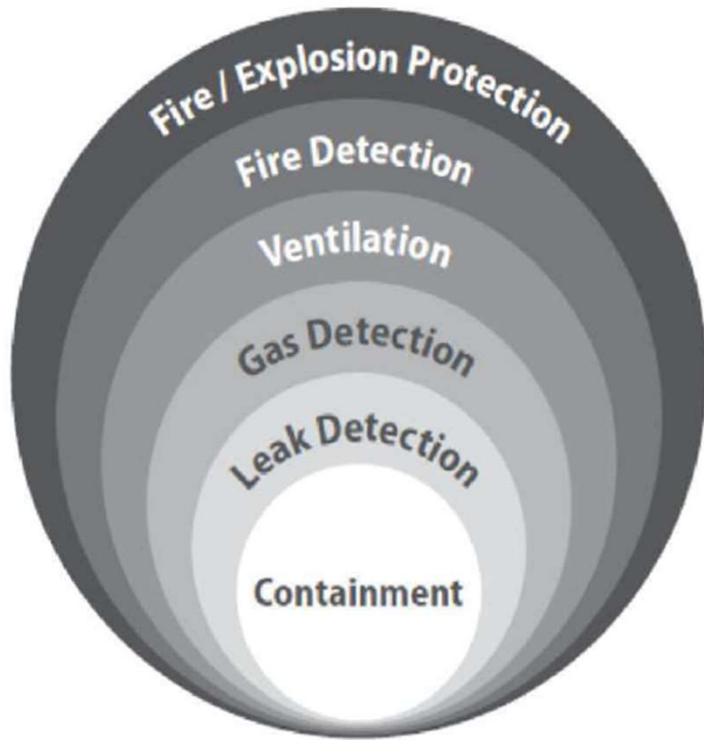
What is gas detection scope?

What gas detection scope is?

Early gas detection and alarming is critical for lowering risk (consequence).



Protection Layers



Fire Detection Layer

Undetected hydrogen leak can result in fire and explosions



Gas Detection Layer

Conventional gas detection technologies help mitigating risks

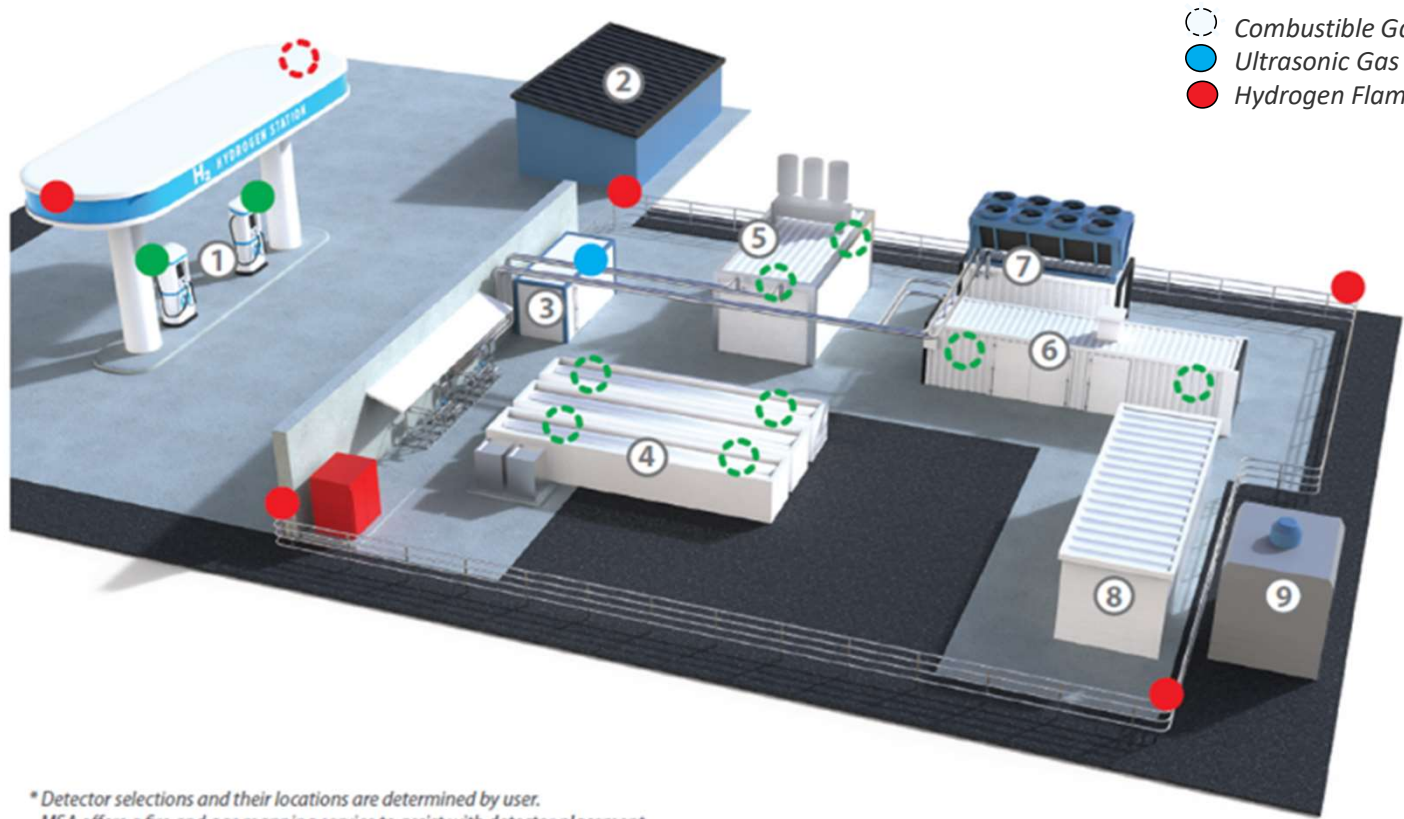





Leak Detection Layer

Ultrasonic gas detection ensures the earliest possible response



Detector location



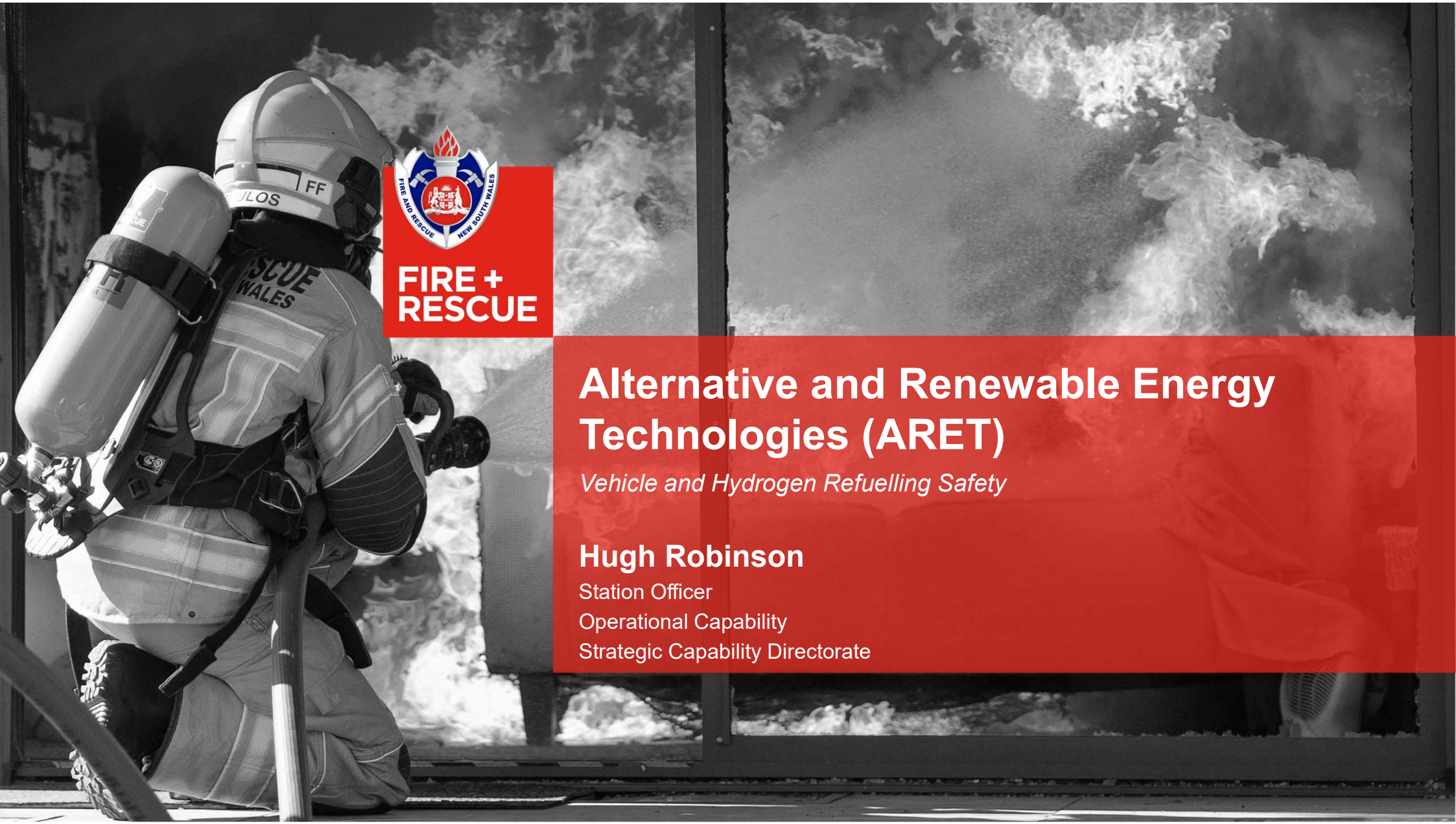
-  Combustible Gas Detector
-  Ultrasonic Gas Leak Detector
-  Hydrogen Flame Detector

1. DISPENSERS
2. CONTROL ROOM
3. INSTRUMENT & ANALYSIS ROOM
4. STORAGE
5. COMPRESSION
6. ELECTROLYSER
7. ELECTROLYSER ANCILLARIES
8. ELECTRICAL SUBSTATION
9. POWER TRANSFORMER

** Detector selections and their locations are determined by user.
MSA offers a fire and gas mapping service to assist with detector placement.*



THANK YOU



**FIRE +
RESCUE**

Alternative and Renewable Energy Technologies (ARET)

Vehicle and Hydrogen Refuelling Safety

Hugh Robinson

Station Officer

Operational Capability

Strategic Capability Directorate

Properties of hydrogen

- Lower Explosive Limit (LEL) – Upper Explosive Limit (UEL)
 - Flammability range in air of 4% - 75%
 - Compare LPG 2%-10% or Petrol 1.5% - 7.5%
- Relative to other fuels
 - Very low ignition energy
 - Flame is invisible (flame/heat detection required)
- Density
 - Much lighter than air, rapidly dissipates in open air. Can collect in roof voids
- Storage pressures
 - Storage up to 1200 bar for onsite refuelling
- **Since hydrogen has a very wide flammability range and low ignition energy, it should be assumed that any hydrogen leak or release is likely to result in hydrogen fire.**



Vehicle hazards and safety measures

- Stored hydrogen in tanks on vehicle (and pipework)
 - 350 bar for heavy vehicles – 700 bar for passenger vehicles
- Li-ion batteries
 - HFCEVs are electric vehicles, hydrogen is just the fuel source
- Recognising vehicles and emergency response training
 - Emergency services being trained to identify HFCEVs
 - Firefighting organisations are developing operational procedures to respond to potential incidents
- ANCAP app – working with vehicle manufacturers to get Emergency Response Guides (ERGs) and rescue sheets added to ANCAP safety app.



Types of hydrogen refuellers

- Onsite production to demand (used on Central Coast bus trial)
 - Slow refuel time
 - Minimal stored hydrogen onsite
- Onsite production and storage (ActewAGL/Hyundai refueller)
 - Electrolyser and compression equipment
 - High pressure storage onsite



Types of hydrogen refuellers

- Onsite storage (transported)
 - Most common overseas model
 - Similar to existing petrol stations
 - Onsite storage
 - Mix with other fuel storage
 - Transport of hydrogen on road network
- Port Kembla refueller
 - Hydrogen production for other industrial purposes
 - Within industrial site, not publicly accessible
 - Onsite safety and emergency response personnel



Refuelling incidents

- There have been several refueller incidents overseas (US and Europe)
- Most significant recent fire in Bakersfield CA in July 2023
- Bus completely destroyed by fire during refuelling cycle
- Cause not yet fully confirmed but initially blamed on failure/leak in hydrogen tank valve assembly



Refuelling incidents

- Incidents during transport



- Australia has a good record of hydrogen transport safety, however increasing transported volume and transport vehicle movements will inevitably lead to incidents.



FIRE + RESCUE NSW emergency response and hydrogen

- Awareness of hazards.
 - FRNSW is proactively engaging with hydrogen stakeholders to gain awareness of new projects to allow for specific training of local crews.
 - Developing operational procedures to enable crews to act effectively at incidents to manage risks to community.
 - Rolling out Operational Bulletins to all FRNSW crews to inform them of hazards and upskill them with appropriate response procedures.





**FIRE +
RESCUE**

***“There’s a misconception that fire services are afraid.
It’s not fear, it’s a commitment to doing things right.”***

- Dr Damien Reid, QFES, IFE Hydrogen Safety Forum 2023

ARET@fire.nsw.gov.au

Hugh.Robinson@fire.nsw.gov.au



Hydrogen Microskills Training

TAFE NSW Microskills



Accelerating skills in priority areas

- ✓ Partnering and collaborating with industry
- ✓ Industry led skills needs and gaps
- ✓ Focus on latest shifts and innovations
- ✓ Industry driven promotion and integration in the market

Ensuring educational quality

- ✓ Industry generated course content, guided discovery sessions and SME process
- ✓ Industry validation of course material and user insight testing
- ✓ Continual cycle of continuous improvement to reflect industry changes

Delivering exceptional learning experiences

- ✓ Efficient development processes that evolve to meet industry needs
- ✓ Integration of industry specific media, technology innovation
- ✓ Design of courses tailor made for target audience, ensuring engagement and flexible delivery

Partnering to deliver agile, innovative solutions

- ✓ Agile project management with industry partners
- ✓ Collaborative review stages throughout product development
- ✓ Rapid build learning design, speed to market
- ✓ Bespoke platform and product end to end solution

TAFE NSW Microskills

The courses to be rolled out over the next six months include:

- Emergency Responder Electric Vehicle Incident and Emergency Response
- Introduction to fuel-cell electric vehicles
- Contextualised fuel-cell electric vehicle
- Hydrogen Energy Fundamentals
- Electric Vehicle Charging station baseline knowledge
- Refuelling fuel-cell electric vehicles
- Prepare to work in the renewable energy sector
- Introduction to wind farms

Chris Minns, Premier Of New South Wales:

"The National Skills Agreement will pave the way in supporting the people of NSW to gain the skills they require for emerging industries,

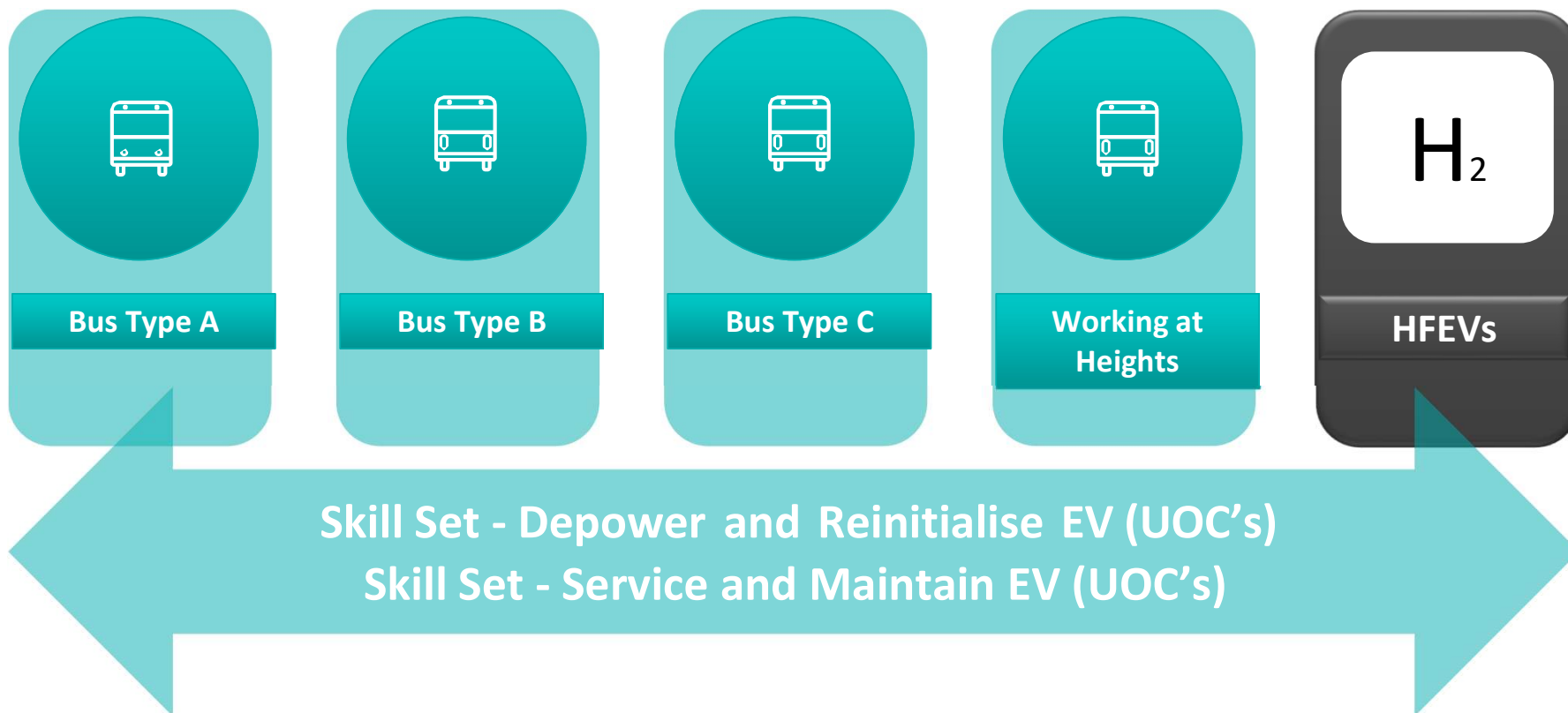
"These courses are an example of where funding from the NSA can be utilised to ensure TAFE NSW accelerates skills training in renewable energy through collaboration with industry and government.

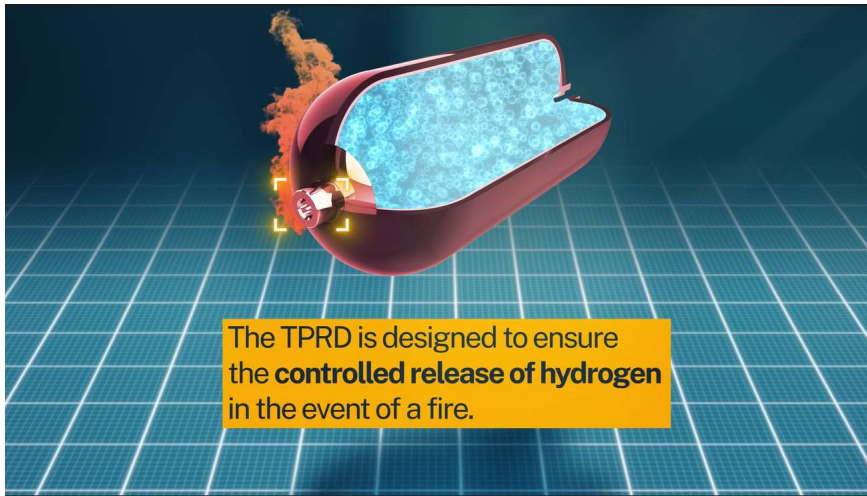


Product Update

Products		Estimated	Launch Date
Hydrogen Energy Fundamentals	Learners to: <ul style="list-style-type: none"> Identify hydrogen as a fuel source, including its properties, benefits, and challenges. Identify the diverse range of applications where hydrogen is suitable for use. Identify potential risks and hazards associated with the use of hydrogen. Know how to act safely when interacting with hydrogen 	1 hour	FEBRUARY
Introduction to Fuel Cell Electric Vehicles	Learners to: <ul style="list-style-type: none"> Identify the key components of a fuel cell electric vehicle. Identify high voltage systems and components. Locate the critical safety features of a fuel cell electric vehicles. List the steps to park a fuel cell electric vehicle in a safe state. Assess the work that can be conducted in a commissioned and decommissioned state. 	2 hours	LAUNCHED
Refuelling Fuel Cell Electric Vehicles	Module to contains: <ul style="list-style-type: none"> Refuel and decanter Safety precautions Best practice Emergency response considerations Standards and how they affect the operator Future technologies 	2 hours	MARCH
Contextualised Fuel Cell Vehicle	Module covers: <ul style="list-style-type: none"> The key components of make/model fuel cell electric bus The specific battery arrangement includes the number of batteries, their location, and capacity The main traction drive components on the make/model Fuel cell system for the make/model The specific decommissioning process for this make/model What vehicle-specific variances make make/mode different to others in the Australian market Maintaining rechargeable energy storage systems. 	2 hours	LAUNCHED
*Get to know the Foton FTH12 Hydrogen City Bus			

Contextualised Microskill





TAFE NSW Microskills



Electric Vehicle: Bus Training

The TAFE NSW Electric Vehicle Training Solution is a future focused industry collaboration, addressing the bus industry skills challenges relating to replacement of the NSW bus fleet with zero emission buses.

[Learn more >](#)



Hydrogen Fuel Cell Electric Vehicle Training

Explore the future of Fuel Cell Electric Vehicles with TAFE NSW. Industry-aligned training tackles hydrogen technology challenges, equipping you with essential skills, safety knowledge, and industry recognition.

[Learn more >](#)



Construction

In partnership with Construct NSW, a TAFE NSW construction Microskills course will build on existing skills and knowledge to ensure your industry expertise stays on point.

[Learn more >](#)



Accounting and Finance

The fastest, most cost effective way to sharpen existing skills while contributing to Continuing Professional Development (CPD) hours is with a focussed Microskills course, offered in partnership with AccountingPod.

[Learn more >](#)



Financial Reforms

Give yourself the best chance of passing your FASEA exam with a TAFE NSW FASEA exam preparation Microskills course. Ensure your knowledge meets current FASEA requirements.

[Learn more >](#)



Liquor & Gaming NSW

Liquor and Gaming NSW has joined with TAFE NSW to deliver the RSAT training to address the risk of minors or intoxicated people accessing alcohol through sales and same day delivery services in NSW.

[Learn more >](#)

Thank you

Want to partner with TAFE NSW Microskills:

- IndustryInnovationSpecialists@tafensw.edu.au

Interested in purchasing and accessing volume pricing:

- support.training@tafensw.edu.au

Visit TAFE NSW Microskills for more information

- <https://store.training.tafensw.edu.au/product-category/microskills/>





New Energy - Safety

November 2023

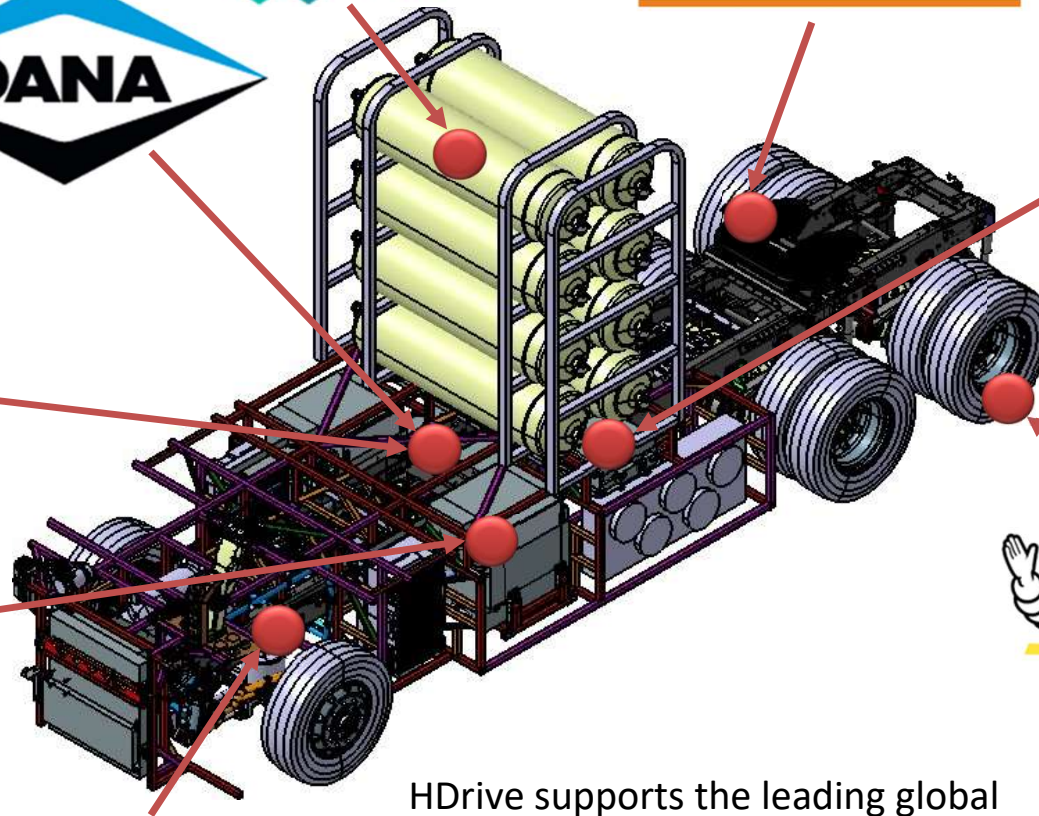


Pictured: H-Drive's FCEV Prime Mover, destined for trial with PepsiCo in Brisbane Queensland

HIGH QUALITY COMPONENTS



see. think. act.



SMART TECHNOLOGY
FOR SMARTER MOBILITY



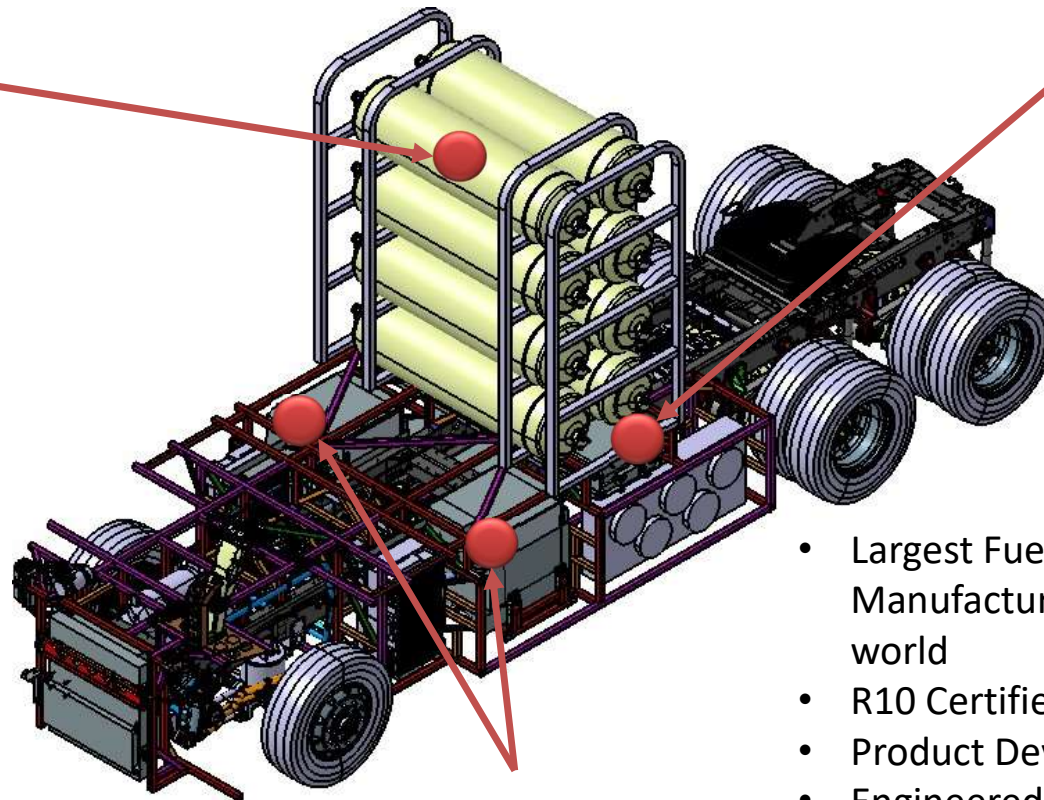
HDrive supports the leading global component suppliers, with growing support of Australian product development and assembly.



NEW ENERGY SYSTEMS



- R134 Tested
- Globally recognised
- Engineered Safety

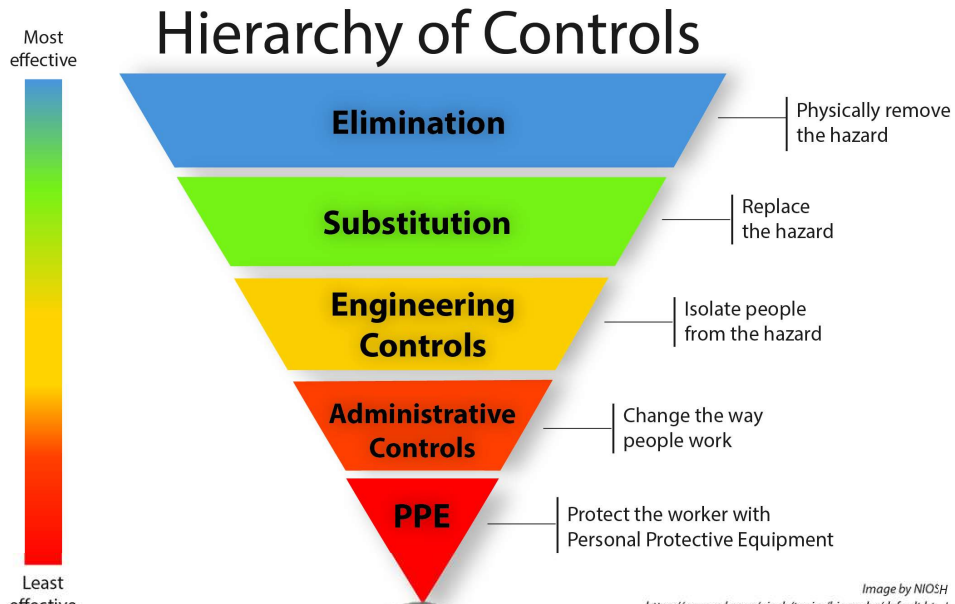


- Largest Battery Manufacturer in the world
- Battery Testing
- Product Development
- Engineered Safety
- R100 Compliant



- Largest Fuel Cell Manufacturer in the world
- R10 Certified
- Product Development
- Engineered Safety

HEIRARCHY OF CONTROLS – FUEL CELL

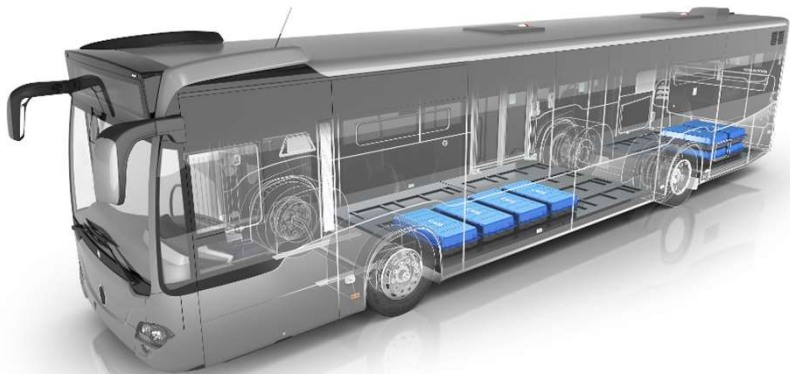
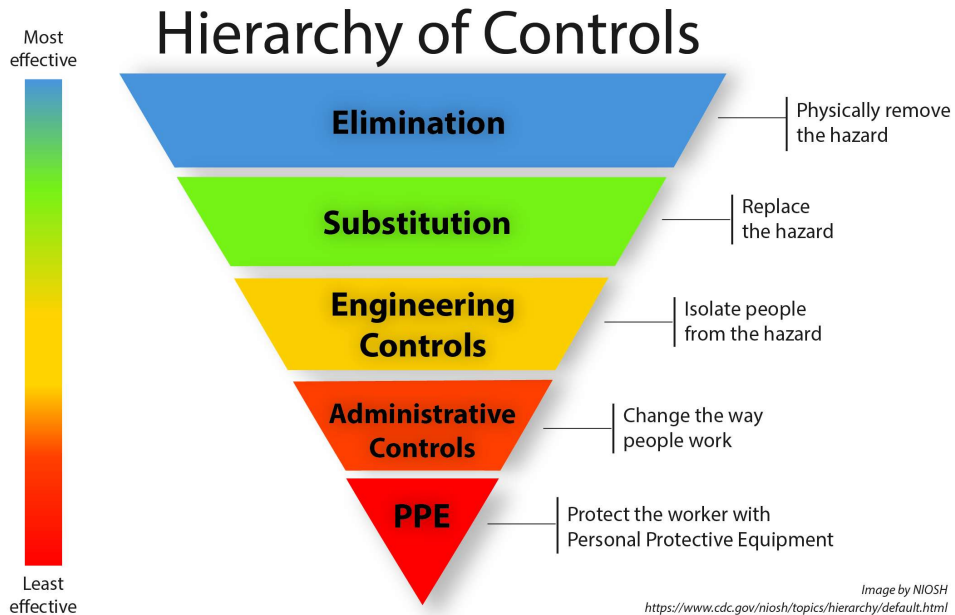


Engineering Controls

- Purge Systems
- Self-Metered shut off
- Thermal Protection
- Leak Detection
- IP Rating
- Crash Protection
- Roll Over Protection
- ADR110 (DRAFT)
- ISO 6469-2:2009, ISO 6469-3:2011, ISO 23273:2013, SAE J2578, UN ECE Reg 10, ECE/Trans/180/Add.13, REACH



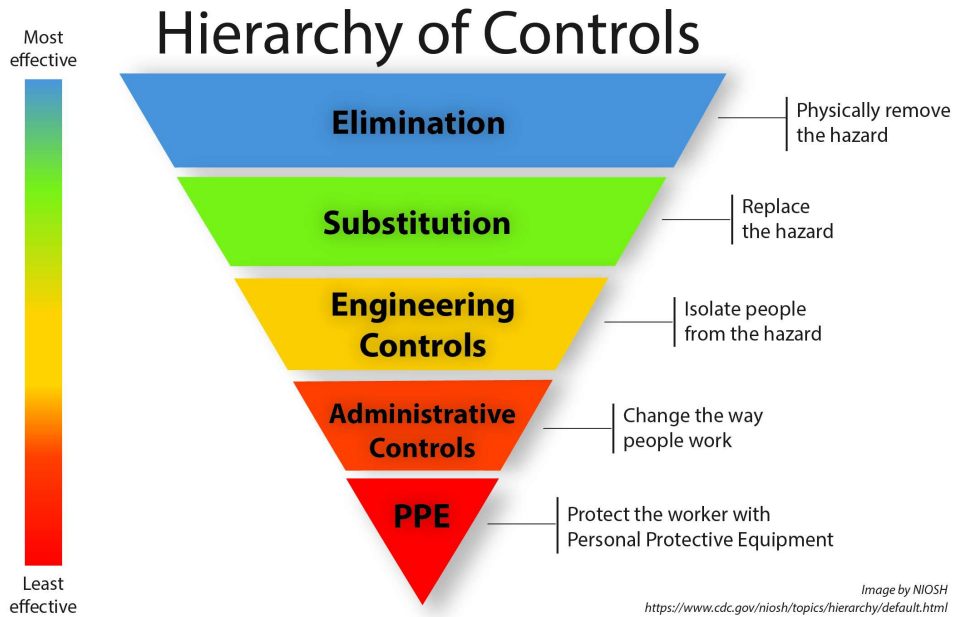
HEIRARCHY OF CONTROLS – TRACTION BATTERIES



Engineering Controls

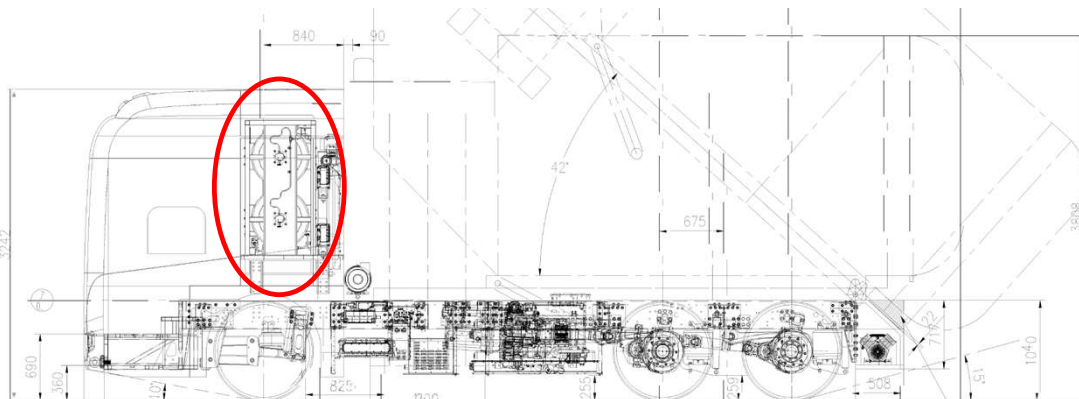
- Penetration / Destructive testing
- Earth Leakage Monitoring
- Thermal Protection
- Fire Suppression
- IP Rating
- Crash Protection
- Roll Over Protection
- ADR109 (DRAFT)
- UNECE R134
 - Vibration Testing (9A)
 - Thermal Shock and Cycling Test (9B)
 - Mechanical Shock - Accident (9C)
 - Mechanical Integrity – Collision (9D)
 - Fire Resistance (9E)
 - External short Circuit Protection (9F)
 - Overcharge Protection (9G)
 - Over-Discharge Protection (9H)
 - Over Temperature Protection (9I)
 - Over Current Protection (9J)

HEIRARCHY OF CONTROLS – FUEL CYLINDERS

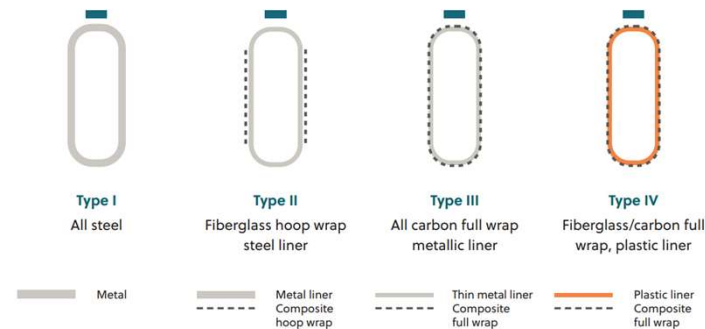


Engineering Controls

- Destructive testing
- Thermal Protection
- Overpressure Protection
- Fire Suppression
- Leak Detection
- Lock Off Valves
- Roll Over Protection
- Engineered Crash Protection
- UNECE R134



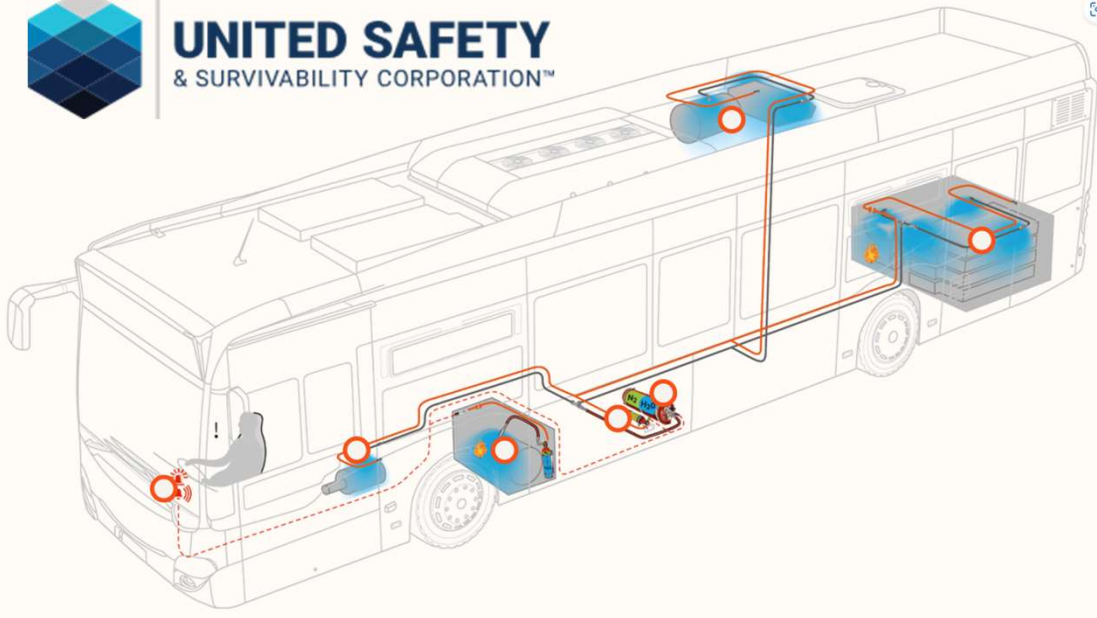
Types of high-pressure cylinders



OCCUPANT SAFETY– FIRE SUPPRESSION



UNITED SAFETY
& SURVIVABILITY CORPORATION™



- Fire suppression will extinguish or suppress fire at the source
- Risk assessments made to ensure high risk areas covered
- PMARK Certified
- Driver warning and manual activation system on board
- Providing valuable time to evacuate vehicles



NEW ENERGY SYSTEMS - OEM TRAINING



High Voltage Traction System Awareness

HDrive – Driving a Greener Future

Contents

- 1. Safety and High Voltage (HV) awareness2
- 2. Personal Protective Equipment (PPE).....2
- 3. Disconnection / De-energise HV Systems3
- 4. Disconnection / De-energise Traction Batteries5

1. Safety and High Voltage (HV) awareness

!
Work performed on this vehicle is only to be completed by a suitably qualified and trained personnel. Failure to isolate this vehicles HV systems and safely test that systems are suitably discharged may result in injury or death.

!
The correct Personal Protective Equipment (PPE) **MUST** be used when performing any work on HV systems.

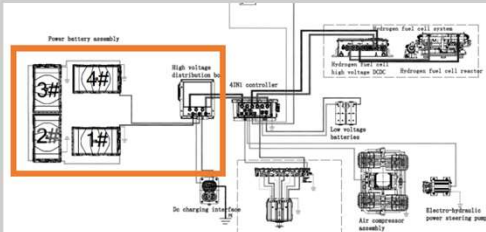
Work area must be suitably quarantined or barriered to ensure that the risk of injury is eliminated when HV systems are energized and de-energized

2. Personal Protective Equipment (PPE)

!
It is important that the correct PPE is worn when disconnecting and testing the HV systems. PPE can only be removed once a qualified and trained technician has properly isolated and proven that a system is safe to work on.



1
The MSD can be disconnected once the vehicle has been parked and the Low Voltage isolators have been in the "OFF" positions (please refer to the driver's manual for the location and operation of these switches).



MSD Location

The MSD can be removed by depressing the pink tab (a) and then pulling the green lever outward (b). Once removed, the HV distribution power to all HV auxiliary equipment will be isolated. It is important to then check each system is de-powered by using a multi-meter on the correct setting and capable of checking up to 1000v DC. Once the MSD is removed, you can test at each of the auxiliary units at the main connection plugs, provided the correct PPE is worn.

4

!
It is recommended that whenever maintenance is carried out on the vehicle, that the **Manual Service Device (MSD)** is removed.



The correct PPE must be used when validating power is isolated in the HV system. PPE must always be used until the system has been proven to be de-energized. Ensure the system is tagged and mechanically protected to eliminate the risk of the system being re-energized whilst being worked on.

!
The drive motor and controller will require a **10–15-minute** period with the MSD removed to self-discharge. **DO NOT** attempt to work on the HV system until it is proven that there is no residual power in the circuit. Further information can be found in the component manufacturers repair procedures.

2. De-energise Traction Batteries

Traction batteries must be disconnected if work is to be performed on the battery circuit. The traction batteries are connected in series through the HV distribution box (where the MSD is housed). The batteries can each be isolated by removing the main battery fuse or battery connector.



!
The MSD must be disconnected prior to removing traction battery fuse or battery connectors. This will eliminate the risk of arc damage or injury being caused due to a HV load being placed on the circuit. Please refer to the component supplier for further information on the removal and replacement of the fuses and battery connectors.



5



Future Mobility Day #5
7 December 2023

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www.portkemblahydrogenhub.com.au

Questions?

