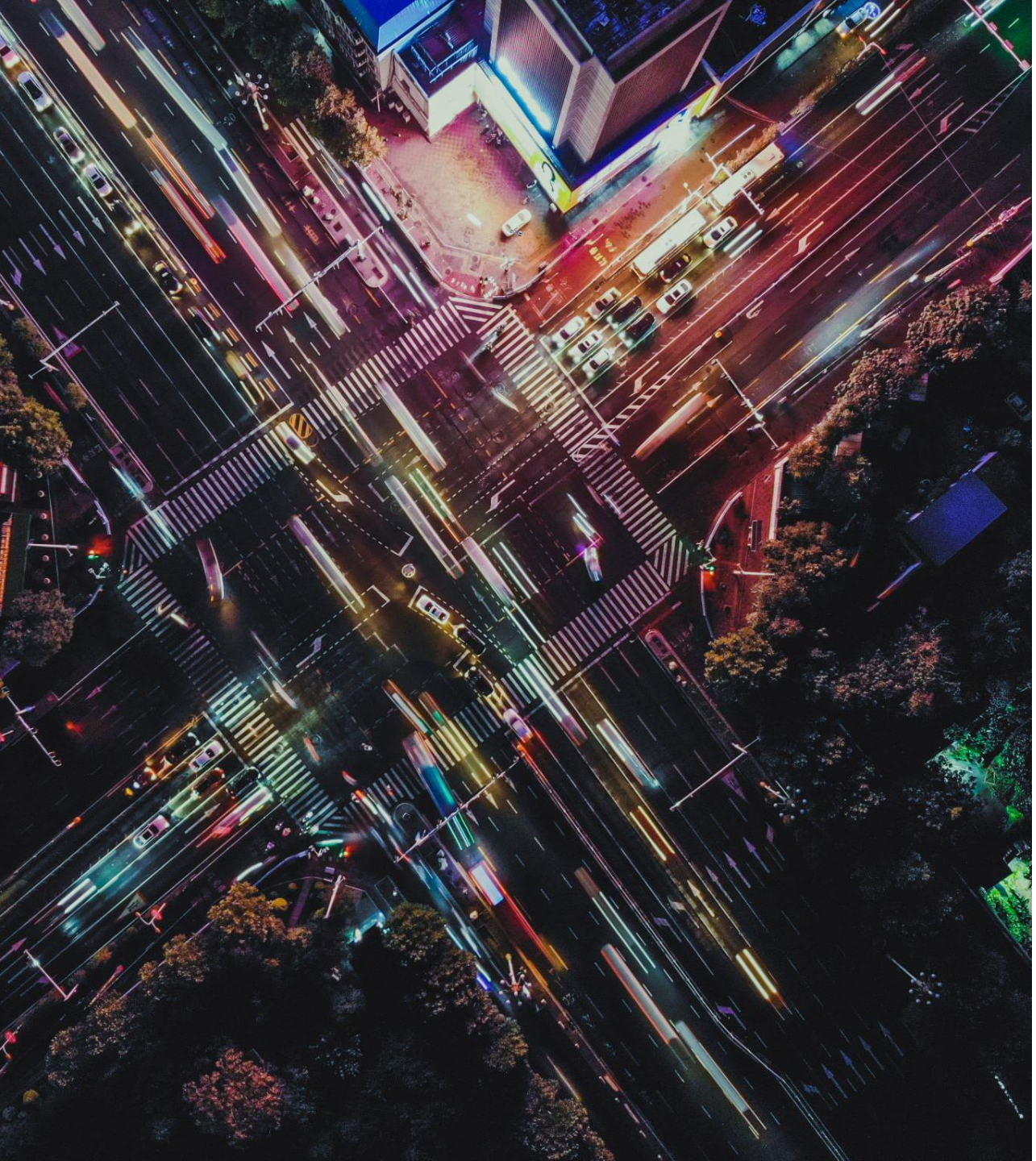

2024 Australasian
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The Role of Hydrogen in Decarbonising Transport

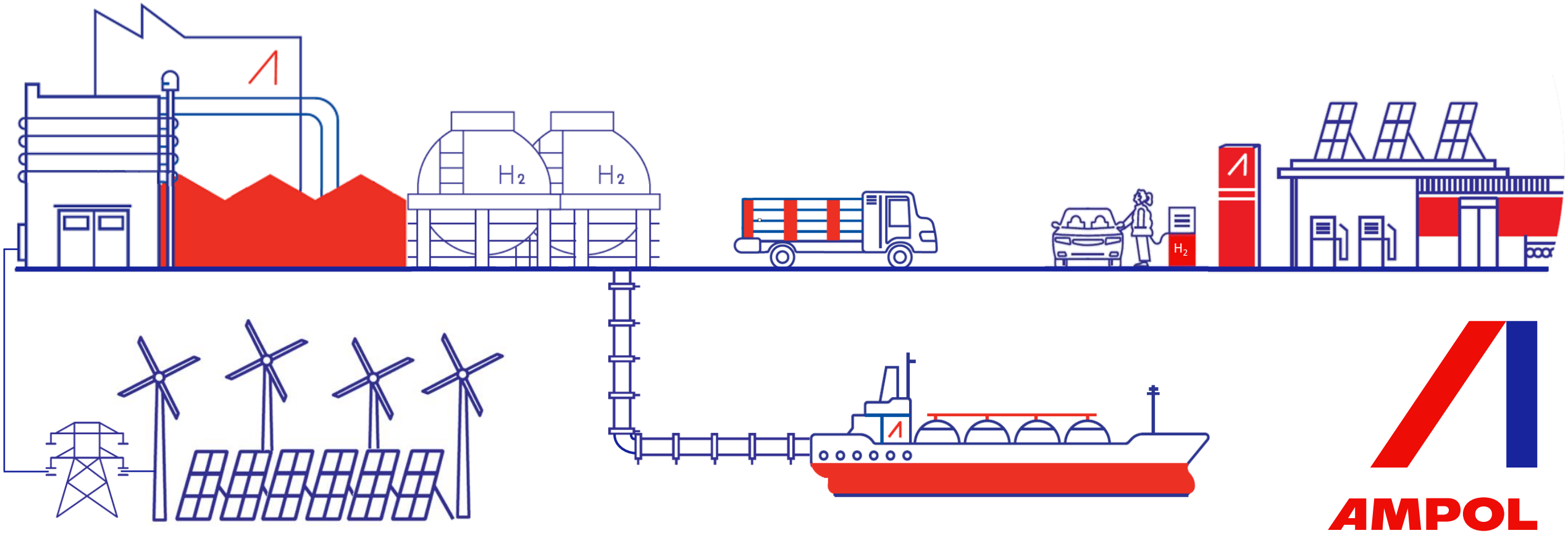
GEMMA HARRISON

Hydrogen Business Development Manager

AMPOL AUSTRALIA

The Role of Hydrogen in Decarbonising Transport

Australasian Fleet Conference & Exhibition
24th May 2023



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What do you think of when you hear the word hydrogen?

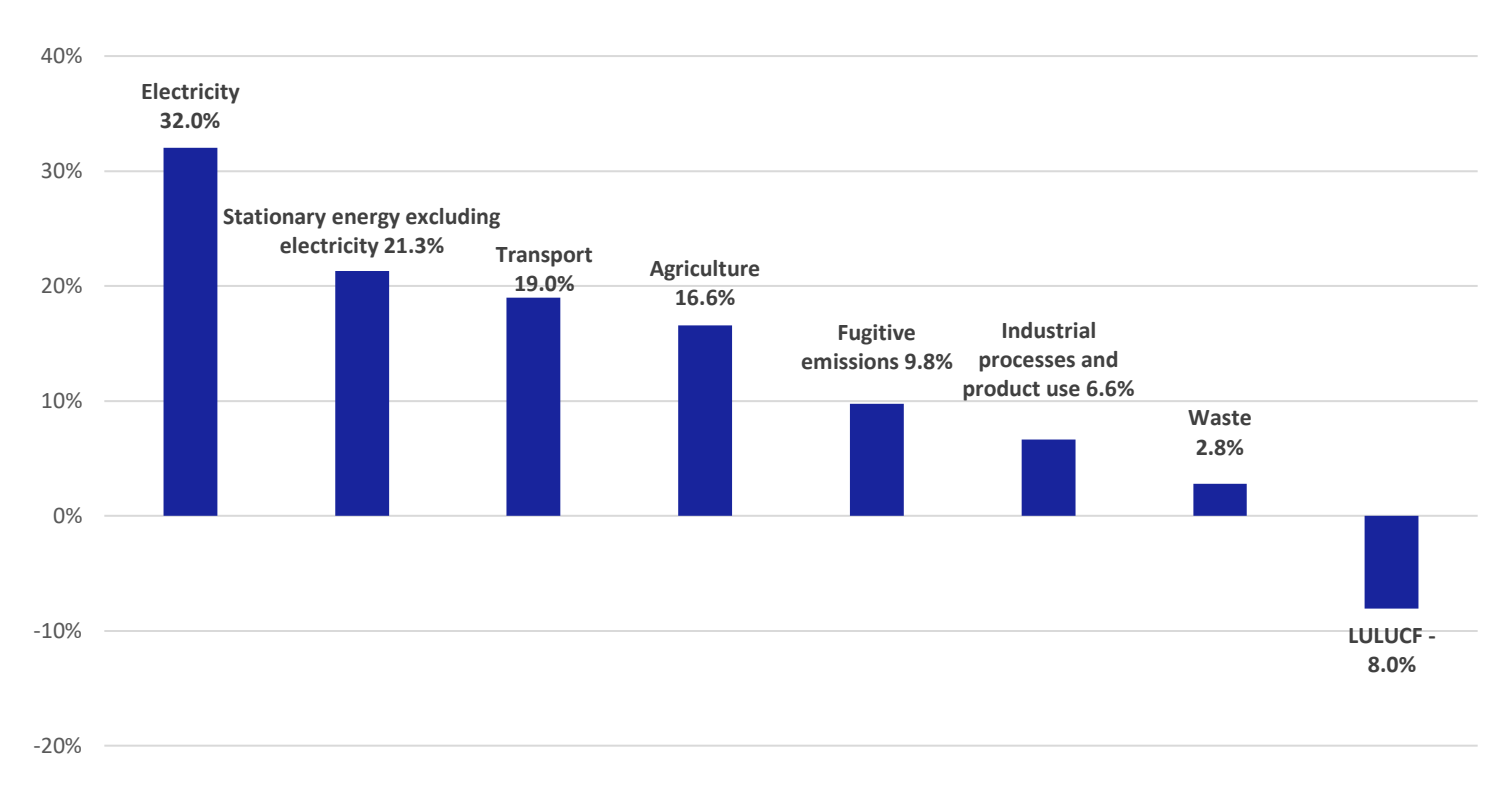
Wordcloud Poll | 20 responses | 17 participants

Agenda for today

1. Introduction to hydrogen
2. The role of hydrogen in Australian fleets and emissions reductions
3. Overview of global trends
4. Opportunities & challenges
5. Q&A.

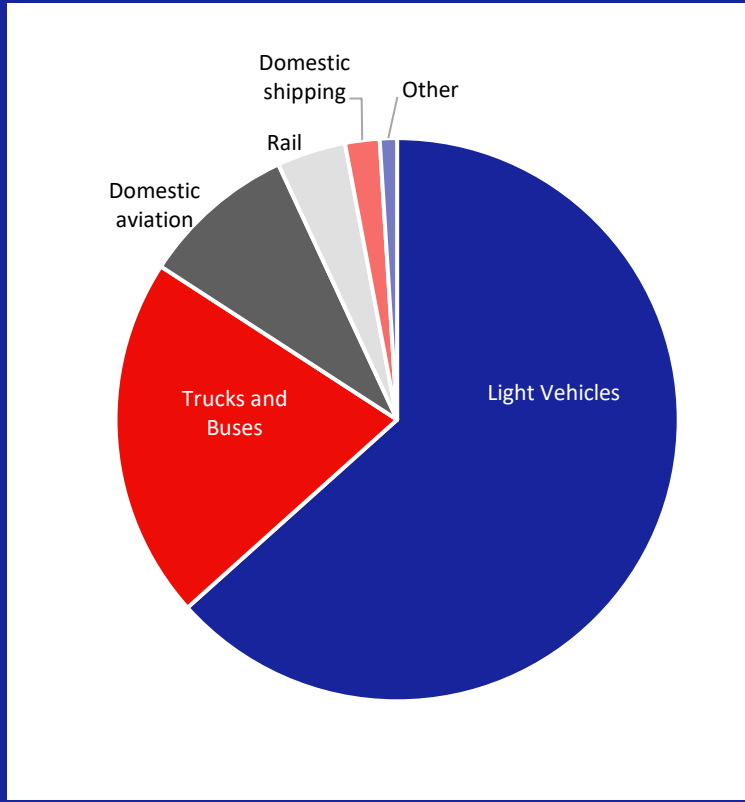
Australia's transport emissions

Share of total emissions by sector, for the year to September 2022



Source: Department of Industry, Science, Energy and Resources –link-

Transport Emissions



Source: Climate Change Authority - Feb 2021

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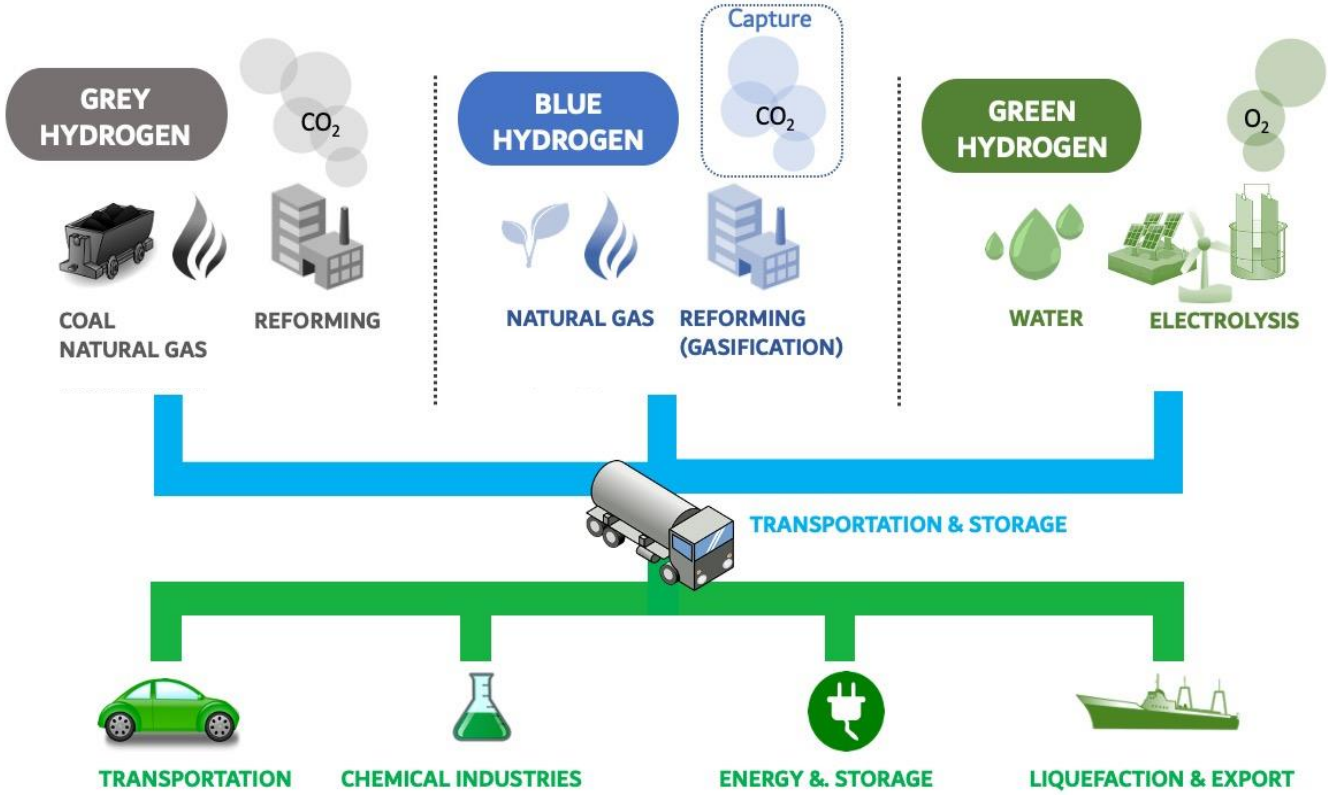
What is Hydrogen?

Hydrogen is most abundant element in universe but is rarely found in its pure form, it needs to be extracted from other compounds using energy.

Hydrogen is an energy carrier, not an energy source. Think of it like a battery that you need to charge before it's useful.

Hydrogen can be combusted, or used in a fuel cell to generate electricity and in these processes produces no CO2 emissions, only water.

Hydrogen has been used in industry for many years, historically produced using fossil fuels.



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Hydrogen v Battery Electric (BEV)

Hydrogen

BEV

No one winner! The transition requires a combination of technologies

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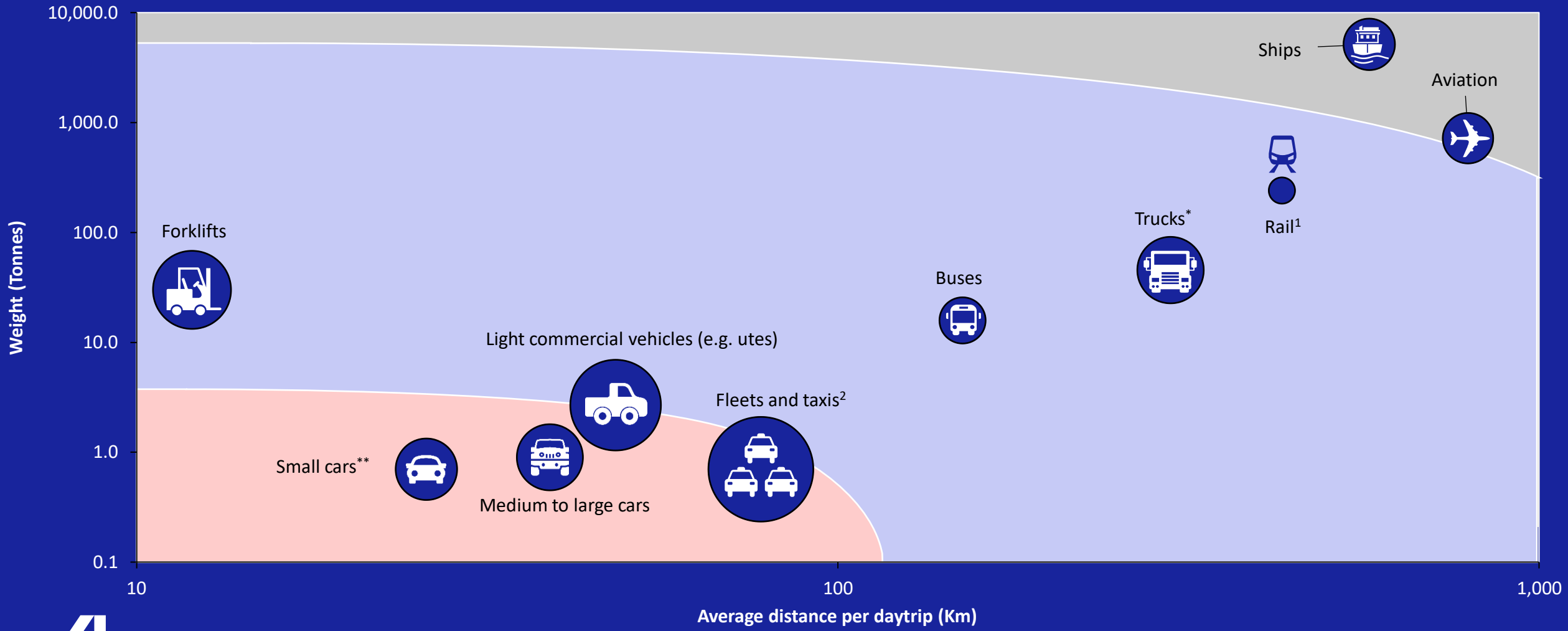
Potential H2 Applications in Australian Transport Sector



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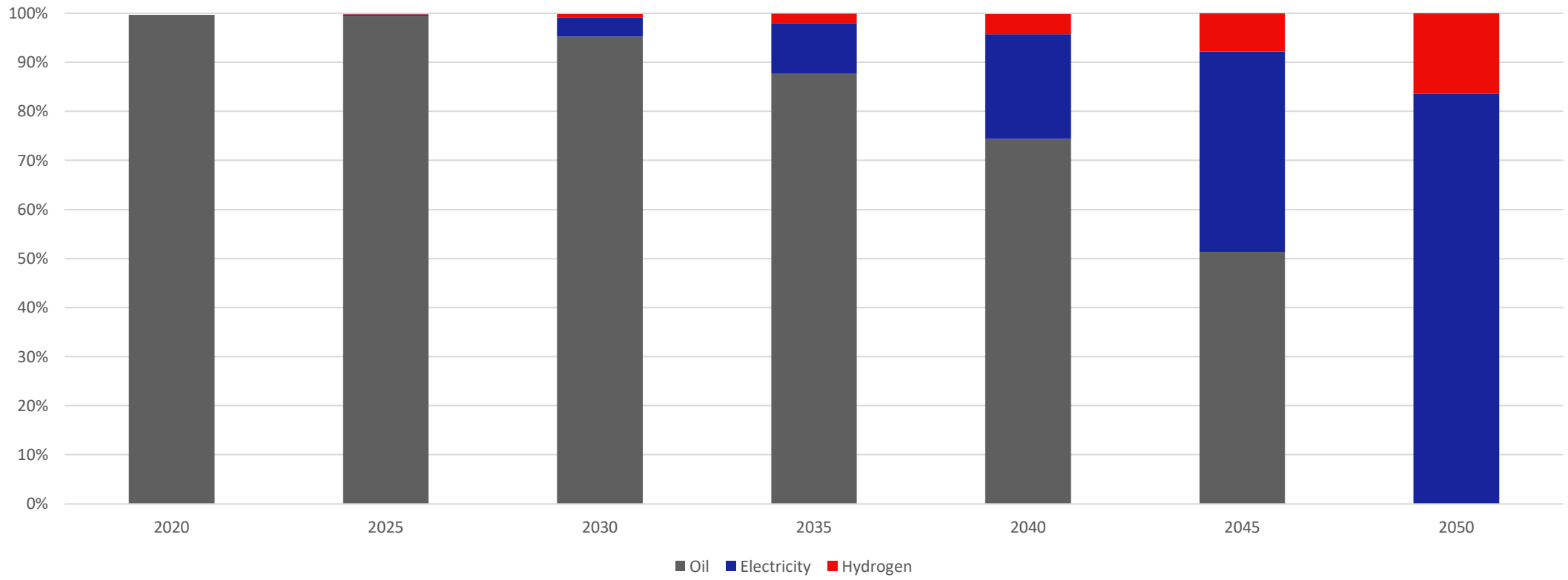
The Role of Hydrogen in Reducing Transport Emissions in Australia



Ampol's proprietary climate modelling. The 2 degree scenario is shown on this slide for illustrative purposes and represents the combined view of energy transition for both passenger car and commercial vehicle fleets.

Vehicle Technology Timeline

Hydrogen vehicle technology is commercialising

2020

2023

2025

2027

2030

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Global trends

Australia

- $2bn “Hydrogen Headstart” for large scale renewable hydrogen projects
- $38.2m Guarantee of Origin scheme for low emissions products

USA

- Inflation Reduction Act
  - Directs nearly $400bn to clean energy & manufacturing

EU

- Alternative Fuels Infrastructure Regulation (AFIR)
- Changes to fuel standards and zero emission fuel targets

Japan

- Allocated ¥270bn to establish large scale H2 supply chain in 2021
- Targeting 320 hydrogen refuelling stations by 2025, 900 by 2030
- Targeting 800,000 hydrogen cars and 1,200 buses by 2030

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Opportunities and Challenges

Opportunities

- Emissions reductions
- Localised production
- Domestic fuel security
- OEM backing

Challenges

- ADR approvals
- Technology hurdles
- Infrastructure cost
- Local policy

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The establishment of a hydrogen industry

- Early adopters in the transport sector likely to be "back to base"
- Current cost differences are material
- Government support will play a role in accelerating establishment
- Safety and reliability are critical success factors

"Hydrogen has a role to play in the decarbonisation of Australia's transport sector"

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Thank you

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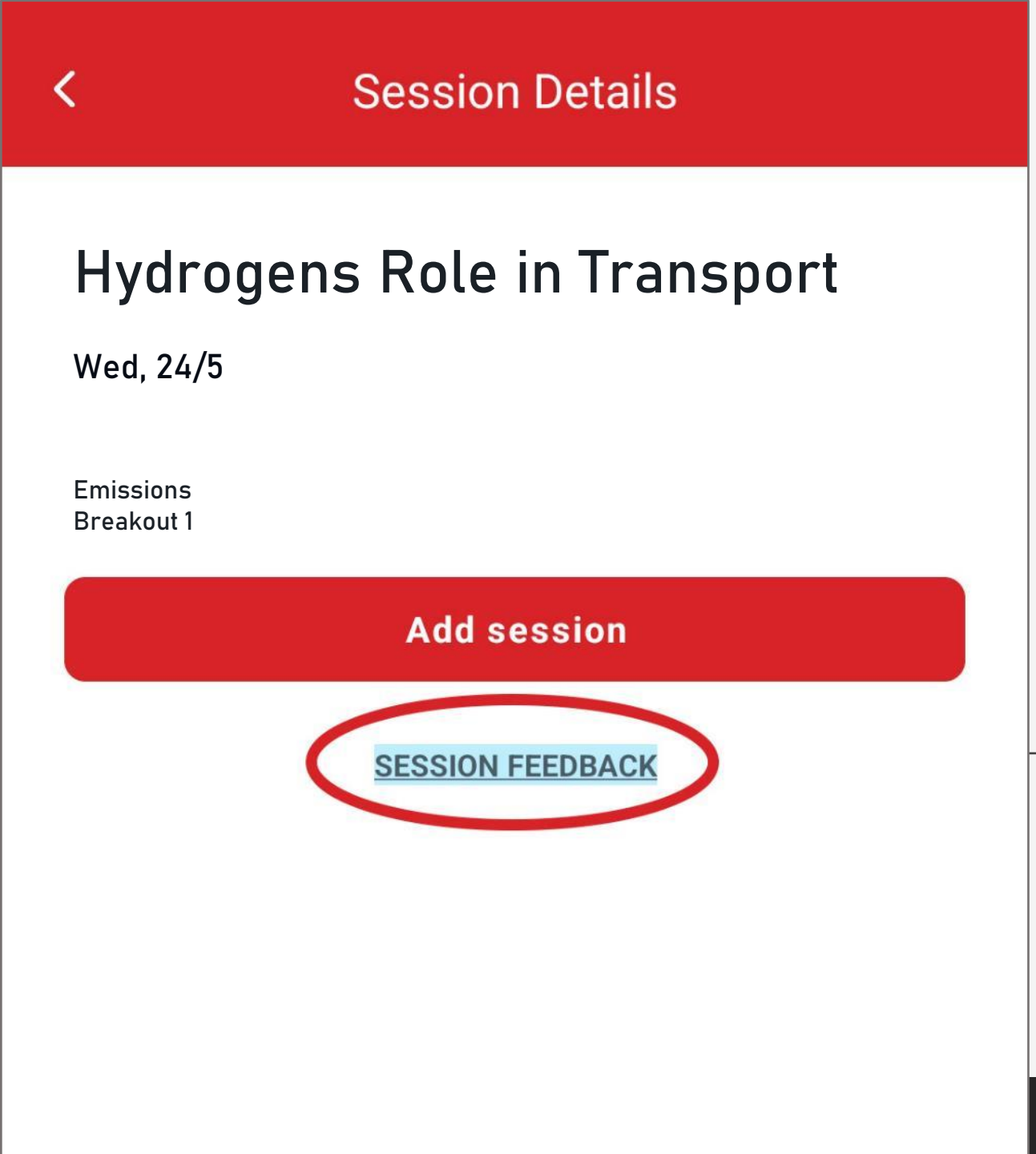
Audience Q&A Session slido

- How can hydrogen be incorporated into vehicles and fleets safely?
- Is there a considerable weight difference between BEV and onboard storage of hydrogen?
- What price of hydrogen (production) is required compete with BEV on cost?
- If water is the output of hydrogen, then could that have an environmental impact as hydrogen is scaled?
- When will the cost of hydrogen vehicles come down?
- Are all H2 Refueller's green hydrogen?
- How safe is hydrogen in a vehicle as a fuel cell?
- Has Ampol committed to building any Hydrogen service stations?
- With 75% efficiency wouldn't it be better to use the original electricity in first place?
- Have you noticed an acceleration on technology available, or slowing down considered focus on BEV?
- Does Ampol expect to sell Hydrogen to the market in 2023 or 2024?
- What hydrogen production method is best in Australia?
- How is the hydrogen superhighway trial along east coast of Australia going? Would appreciate any info/insights on this.
- What lifespan does the fuel cell have? Does it degrade with use and time like a battery?
- How economically beneficial and environmentally friendly is it to generate H2 through electrolysis?
- Is hydrogen combustion also zero emission or only FCEV? Will we see hydrogen combustion in Australia?



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