2022 Australasian Fleet Conference & Exhibition
AND FLEET AWARDS
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ROSEHILL GARDENS RACECOURSE SYDNEY

Plenary Session – Hydrogen: Hope or Hype

General Information

Whilst the session was audio recorded, the panel was not able to respond to every question. Below is a list of all questions including those discussed during the panel discussion. Further, below is a link to various general resources and links to the organisations the speakers represented.

General links

1. Australian Hydrogen Council: - about Hydrogen

   https://h2council.com.au/about-hydrogen

2. CSIRO Hydrogen Mission:

   https://www.csiro.au/en/research/environmental-impacts/fuels/hydrogen

3. Federal Government – Australia's National Hydrogen Strategy

   https://www.industry.gov.au/data-and-publications/australias-national-hydrogen-strategy

Company Links for Panel (in order of stage appearance)

1. Hyundai: https://www.hyundai.com/au/en
2. Foton Mobility: https://fotonmobility.com.au/
3. H2X Global: https://h2xglobal.com/
4. Ampol: https://www.ampol.com.au/

Session Outline

The Australian Government is investing $1.4 billion in building a hydrogen industry, developing a National Hydrogen Strategy which plans to grow this industry and position Australia as a major player by 2030.

Hydrogen is also acknowledged as an essential element for Australia's decarbonisation and for it to achieve its net zero emissions ambitions. As a fuel, it produces no carbon emissions, only water and can be used to fuel cells that generate electricity to power cars, trucks, buses, and trains.

Not all hydrogens are created equal. Hydrogen itself is a clean fuel, however manufacturing hydrogen is energy-intensive and has carbon byproducts. The Australian Government is hedging its bets by supporting brown, grey and green hydrogen however there's little doubt brown and grey hydrogen are not clean!

Join our expert guests who'll explain what hydrogen is, its various colors, its benefits & barriers and explore how it is likely to be adopted in Australia for transport.

Session Speakers

Patrick Luxton, GM of Hydrogen, Ampol
In this role Patrick is responsible for developing Ampol's Hydrogen business. With over 80,000 business customers, Ampol recognises there will be a need for a variety of offers for its customers to decarbonise and hydrogen has a key role to play in the future energy mix.

Neil Wang, CEO, Foton Mobility
Kaiyuan(Neil) Wang, Experienced sales manager, CEO and team leader. 14 years' experience in Australia bus market, delivered more than 1100 buses into Australia market. CEO of Foton Mobility. Distributor of Foton New Energy Vehicle, Winline DC Charger and SnowSource Electric AC(Vehicles) in Australia.

Tony Blackie, Vice President, Corporate Relations, H2X Global Ltd
H2X Global Ltd, Australia's hydrogen fuel cell powered vehicle company. He is former journalist with The Age, Australian Financial Review BRW and the ABC. Tony established and operated one of Australia's largest independent marketing communication consultancies and has held several senior management positions in the Australia Public Service including within the Public Service Board in the Department of Prime Minister & Cabinet.

Scott Nargar, Director, Australian Hydrogen Council and Manager of Future Mobility & Government Relations, Hyundai Motor Company Australia
Scott has over two decades of experience in the motor industry in technical, media, product planning and technology advocacy roles. At NRMA Scott worked in vehicle inspection, judging and writing on Australia's Best Cars Awards and as a member of the Technical Working Group with the Australasian New Car Assessment Program (ANCAP).

Session Question & Answers

1. **What is hydrogen?**
   Tony
   - Hydrogen is the most abundant element in the universe. Interestingly it is oderless, tasteless, colourless and as the people on board the Hindenburg found, it is highly combustible.

   Neil
   - Hydrogen is the way to store and transport electricity.

2. **How will hydrogen storage look and work around Australia?**

   Neil
   - As the information we received from our hydrogen partner, hydrogen fuel station will just like fuel station. People can just drive in and refuel their hydrogen vehicles.

3. **When will hydrogen take over electricity as a main energy for passenger vehicles**

   Patrick

- The use of Battery Electric Vehicles (BEV) or Fuel Cell Electric Vehicles (FCEV) will depend on the customers' operations – there will be applications that will suit one over the other and hence both types of zero emissions vehicles have a role to play in decarbonizing the transport sector
- In a decarbonized future state the IEA predicts that Hydrogen will meet approximately 20% of the World's Energy needs

Tony

- In South Australia the new state government have commissioned the development of a Hydrogen fired power plant, throughout China and Europe hydrogen is becoming a major energy source for buses, trucks and some passenger vehicles – as to when it will become the main energy for passenger vehicles, we don't know.

Neil

- When most fuel station have hydrogen refueler. Or when hydrogen cylinder super light and people can "Swap and GO"

4. **Is hydrogen safe?**

Tony

- If stored correctly, it is safe. Of course, no combustible fuel is completely safe, in an enclosed area escaping hydrogen can cause dangers by displacing the oxygen making it difficult to breathe

Neil

- As safe as petrol. As danger as LPG and CNG.

5. **What is the energy conversion vs petrol vs li-on?**

Patrick

- Simple economy metrics
    - Light passenger car uses ~1kg/100km
    - Passenger Bus uses ~6kg/100km

Neil

- Around 55kw electricity to make 1 kg hydrogen. 1kg hydrogen can produce 17kw electricity through our TS-60 fuel cell engine.

6. **For the amount of $ being spent on EV. Surely that investment is better spent in making hydrogen the actual solution. EV seems like just a band aid fix?**

Patrick

- To decarbonize the transport sector there will need to be both BEV and FCEV applications, the vehicle best suited will depend on the nature of the customers' operations

Tony

- Answered during the conference, refer to audio file.

Neil

- Not at all. EV will also have its application and have good market share for long time.

7. **How would you provide confidence to business in EVs with Hydrogen solutions lurking around the corner?**

Neil

- For some business, yes. When you have challenge with your EV project, such like short driving distance, not enough grid capacity to install all chargers, don't have enough space to install chargers, charging window is not long enough, then Hydrogen maybe the right solution.

8. **What distance does a hydrogen vehicle travel?**

Patrick

- Subject to conditions and load factors the following distances are guides only

- Passenger Cars ~600km
- Passenger Bus~
- Trucks ~350-400km

Tony

- H2X vehicles will have an average range of 600-700 km, this could be improved with the adaption of a light weight chassis currently being developed in a joint project with global motorcycle and motor vehicle manufacturer KTM. Additionally other innovations including the use of liquid hydrogen will improve range.

Neil

- Such like iBlue EV truck. 4.5T/6T dual GVM. The EV version with 83kw battery pack can travel around 200km-250km. But the hydrogen version can do 400km.

9. **There is a lot of hype about electric vehicles but in Australia we rely on coal to charge and make the batteries. How does the production of hydrogen compare?**

Patrick

- Hydrogen production has two main sources; natural gas or using electricity to split water. Natural gas is converted to hydrogen via Steam Methane Reforming (SMR), this leaves the carbon to be emitted or captured. Electrolysis is the process of splitting water to create hydrogen and oxygen. If the electricity is sourced from renewable energy then the hydrogen can be considered renewable, if the electricity comes from other sources then the hydrogen created will have its own carbon intensity.

Tony

- We can't speak for others, however, it is H2XGlobal's stated policy to become a zero emissions company through the full range of our supply chain.

Neil

- Green hydrogen could be by solar farm or wind farm. We believe use the off peak capacity of wind farm or solar farm is the cheapest way to make green hydrogen.

10. **Is there a market for hydrogen and electric? Will this slow infrastructure for both?**

Patrick

- Not seen as competing, but rather complementary to achieve the decarbonization of the transport sector. There will be significant investment required in the electricity generation and grid for both

11. **What is hydrogen? Gas or liquid?**

Patrick

- Gas at ambient temperature, turns to liquid at approx. minus 253 Co

Tony

- Both

12. What's the power loss associated with hydrogen?

Tony

- None there is in fact a gain.

Neil

- Based our vehicle design, the hydrogen engine makes electricity and charge the onboard battery, then the battery drive the motor. So I can't feel the power loss.

13. **Is hydrogen more viable for heavy vehicles and transport logistics with EV technology more for passenger vehicles, or is there a space for both in both areas?**

Patrick

- There is a place for both and the vehicle type will depend on the application. Generally, light passenger will better suit BEV and heavy trucks will be better serviced by FCEV

Tony

- There is at this time, space for both. Obviously from our perspective (H2XGlobal) we see the market as encompassing all vehicles. We have on the drawing board SUV's small to medium vans all the way up to heavy trucks, boats/ferries, yachts etc, trains, plans and automobiles.

Neil

- As start, hydrogen city bus make sense. Large amount of consumption in a single location make the investment easy.

14. **What is required to fast track the infrastructure**

Patrick

- Infrastructure is being planned and will be delivered with Government support broadly in line with the deployment of a larger number of vehicles

Tony

- Clear government policy to embrace renewables and transition to a clean green environment. We have seen other countries do that, Germany for example, and we would urge legislators to look to that model.

Neil

- Large amount consumption in a single location will speed up hydrogen infrastructure.

15. **For low use / standby vehicles, is hydrogen suitable for long term on board storage?**

Patrick

- There is no constraint to storing hydrogen on board for long durations

Tony

- Yes, storage technology is such that longer term static capability is available. H2XGlobal produced a range of generator sets many of which will be used for emergency power. These generators may stand idle for some time before use.

Neil

- No. The best solution for this kind of vehicle is EV.

16. **Does the ICE ban in global markets include heavy commercial?**

Tony

- There are differing rules in different areas but 2035 is the prevailing cut off for ICE production.

Neil

- It will.

17. **Is hydrogen the climate change troglodytes "greenwash" go to?**

- No responses to this question.

18. **Why does government quote H2 at $2/kg when in reality prices are much higher?**

Patrick

- This is an ambitious target that has been used as a long term number, the cost of hydrogen in the near term is well above this, but will come down as production scales up

Neil

- This is only a target. Also, I believe $2/kg is only the "production cost" not include transportation cost and refueling cost.

19. **What changes are needed to petrol engines to make them run on hydrogen?**

Tony

- It is possible to upgrade an ICE to hydrogen (as we did with LPG) but really it is not the most efficient outcome, electric is the future and the best option for an upgrade.

Neil

- Most hydrogen vehicle we are taking now is hydrogen electric vehicle. We don't want to burn them.

20. **Will hydrogen be a fuel for our electricity generation so EVs will stay around?**

Patrick

- It is more efficient to go directly from battery storage to use in a BEV, rather than conversion via hydrogen. However, there maybe instances where hydrogen's storage potential means it is suitable for electrical generation.

Tony

- Yes, as earlier noted, SA will build a Hydrogen powered power station and they see Battery EVs as a major market for their power. Time will tell if that is the long term option for consumers.

Neil

- This is one of the possibilities, especially in the remote area.

21. **Why can't Japan and others make their own hydrogen? Why is this an export market for Australia?**

Patrick

- Australia has vast amount of uninhabited land, very high sunshine hours, coupled with good wind dynamics that all combine to make it very low cost renewable energy generator, other countries do not have the same natural resources.

Tony

- Australia has a chance to become an energy giant, to produce and export hydrogen, there are major companies producing hydrogen like Pure Hydrogen who are providing for the domestic and international markets. Our ability to make green hydrogen on a large scale means other countries which don't have our geographic and climate advantages will buy from us.

22. **How will it be economical when 1kg of Hydrogen requires 50-55kWh of electricity to produce, plus storage and transport fees?**

Neil

- Again, think Hydrogen as the way to store and transfer the electricity. It is much easier and cheaper than battery, right?

23. **When will Australia start to see hydrogen trucks given, we don't have the infrastructure to adequately support hydrogen yet**

Tony

- We already have numerous hydrogen truck entering the market. The fast tracking of hydrogen hubs and the commitment of State governments to provide support for hydrogen supply on major traffic routes, will see many more trucks on our highways in the coming 24 months.

Neil

- I know some companies will release their hydrogen truck early 2023.

24. **Doesn't the fact that it takes so much energy to extract the hydrogen from the atmosphere make it counter intuitive as a "green" energy source"**

Patrick

- See generic material for resources on hydrogen production

Tony

- No, question covered during the conference, refer to audio files

25. **We are seeing the emergence of viable hydrogen combustion solutions; a good example is JCB in the UK. What does the panel think of H2 combustion?**

- No response to this question.

26. Is the ultimate position to use renewable (solar/wind) energy to power hydrogen farming and store hydrogen for fuel reducing requirements of batteries?

Patrick

- Note: it is far more efficient to use electricity stored in batteries than to create hydrogen to turn it back into electricity. However, there will be applications where batteries are not able to provide sufficient energy over a long enough duration, so there is potential to use hydrogen as long term storage for electricity.

Tony

- I would say yes, as hydrogen provides a cleaner (throughout the life and production chain) power than batteries. End of life disposal of batteries is an issue not to mention the production process.

Neil

- I believe "yes".

27. Where will light commercials sit? Vans and twin cabs. Hydrogen or electric?

Tony

- We at H2XGlobal see vans and light commercials as a large part of our target market. We have a range of vans in design and we believe that the fuel cell option and back to base capability will mean that hydrogen will be the option of choice for these vehicles in fleet management.

Neil

- I believe EV will take large marker share in light commercial market.

28. Wouldn't hydrogen/plug in EV hybrid be more practical than just plug in EV? And are there plans for developing this type of hybrid mobility?

Tony

- There are some organisations that are looking at this option and it will be interesting to see whether consumers pick up on this capability.

29. What benefits does hydrogen offer around refueling patterns and payload for heavy vehicles and/or light passenger vehicles?

Patrick

- Hydrogen refueling is very similar to diesel refueling in time duration

Tony

- Covered during conference, refer audio files.

Neil

- Lighter than EV and quick to refuel.

30. What's happens with the disposal of EV batteries at the end of their life?

Tony

- This is an issue for the Battery EV market and certainly one that needs urgent attention. Battery life is relatively short and while there is some reuse, landfill would appear to be the solution for some.

Neil

- We have 10-12 years to solve this problem. At the moment, we use them as energy storage.

31. Where is solid state battery technology at?

- No responses to that question

32. What is the CO2 emission with production? Be transparent please

Patrick

- This will depend on the source of the hydrogen – refer to generic links for details on hydrogen production and how it can be linked to renewable energy.

33. **Are there any synergies / overlap between green hydrogen production (use of electrolysis) and EV infrastructure upgrades to support both applications?**

Neil

- Not really. We have to build chargers at where we use the EVs. But we can make hydrogen anywhere.

34. **Is producing green hydrogen for transport industry scalable/ deliverable**

Patrick

- There are active projects that are focused on producing green hydrogen for the transport sector – with enough demand these projects should be viable

Tony

- Yes, see earlier answers.

35. **Which country currently has the most hydrogen vehicle use per capita?**

Tony

- Good question, I don't have definitive data but I would imagine that it would be Germany.

Neil

- China. They have "10 cities, 10,000 hydrogen bus" project.

36. **In the absence of federal govt energy policy can business and the market lead the change we need?**

Patrick

- There is a lot that industry can do to introduce new vehicles and understand the benefits of zero emissions vehicles. Initially Government funding will be required to establish the necessary infrastructure to support the introduction and uptake.

Tony

- We have done so thus far

37. **We know Hydrogen is the cleanest operational energy source, how could the collective fleet industry influence the Gov to invest more to the infrastructure?**

Tony

- A lobby approach from the fleet industry would be good.

Neil

- Buy more hydrogen vehicles. Or request more hydrogen vehicles from GOV.

38. **What are the circumstances in those countries with govt policies to encourage EVs and hydrogen vehicles and do these exist in Australia?**

Tony

- Australia is currently about 10 years behind the leaders in the developing a renewable/hydrogen economy due to a lack of vision in this area. State Governments have been generally strong supporters of all forms of renewable energy development and that can be seen on the ground with individual programs. It would be a shame to see Australia fall back to differing state based plans on what should be a national approach.

39. **If there was no government funds would the whole thing fold?**

Patrick

- Any industry requires scale to be competitive and any new transport offer is competing against a well established very mature industry that has been around for over 100yrs. It therefore will require Government support to get established
- Worth adding comment about new vehicles and availability of ICE

Tony

- No, business and industry will drive ahead, the rest of the world is progressing and eventually there will be no ICE production so unless we adopt a Cuban approach all sectors will have no choice but to accept the new paradigm.

Neil

- Not for hydrogen city buses.

40. **Is the govt funding just tokenism to look like they are doing something when they prefer to hold onto status quo?**

Tony

- I couldn't really comment on that Minister.

41. **Question for Scott. How many vehicles can Hyundai's hydrogen station continuously fill?**
    - No response to this question.

42. **How will hydrogen be distributed to the places where it is used? Tanker trucks or pipelines? What will that distribution add to the cost?**

Patrick

- Hydrogen is distributed today around Australian in tube trailers – stacks of pressure cylinders on the back of a truck trailer. This will continue to be the case as the transport sector grows, with a move to liquid hydrogen transport
- Hydrogen distribution by pipeline will initially start with gas pipeline blending and existing gas pipeline operators
- Over time there maybe development of dedicated hydrogen pipelines for industrial users

Tony

- In the same way that fuel is distributed now, tankers, pipelines etc.

43. **Does Ampol have a timeline infrastructure plan for service stations across AU and what is it**

Patrick

- Ampol is actively selecting sites in its network that will be suitable for hydrogen refueling stations

44. **Can the fairly redundant LPG network be converted to Hydrogen at fuel stations?**

Patrick

- The LPG assets will not be suitable for hydrogen storage due to the different characteristics of the gas

45. **What is sad is we want to get there just our current federal Govt doesn't. How can we change their attitudes, or do we have to vote them out?**

Tony

- Good question, in two weeks we will have the answer to that question.

46. **Looking forward to securing Australia's energy future by producing our own renewable energy instead of relying on foreign oil imports with only a 2-week supply**

Patrick

- The expansion of renewable energy and related hydrogen production is a great opportunity for Australian to broaden its sources of energy and increase its energy resilience.

Tony

- Yes indeed.