Transport and Infrastructure Net Zero Consultation Roadmap

Take the survey

Department of Climate Change, Energy, Environment and Water

Response received at:

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1 Confirm that you have read and understand this privacy notice.

Yes

2 Please indicate how and if you want your submission published.

Public

3 Published name

TfA Project Group

4 Confirm that you have read and understand this declaration.

Yes

5 First name

Keith

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9 Who are you answering on behalf of?

Organisation

10 Organisation name

TfA Project Group

11 What best describes you or your organisation?

Other: "Consulting Engineers"

12 What sector do you represent?

Other: "Fuel infrastructure"
Heavy road vehicles (trucks, buses etc.)
Light road vehicles (cars, utes etc.)
All transport
Infrastructure
Rail
Maritime
Public transport

13 What state or territory do you live in?

Queensland

14 Postcode

4006

15 What area best describes where you live?

City

16 1. Do you support the proposed guiding principles?

Yes

17 1.1 Please add details to your response.

We believe electrification alone is insufficient and low carbon fuels has a key role in decarbonisation of all transport

18 2. Do you support the use of the avoid-shift-improve framework as a tool to identify opportunities for abatement?

Yes

19 2.1 Please add details to your response.

Not answered

20 3. Do you agree the development of a national policy framework for active and public transport will support emissions reduction?

Yes

21 3.1 Please add details to your response.

Not answered

22 4. What should be included in a national policy framework for active and public transport and how should it be developed?

Not answered

23 5. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the movement of people contributes to transport emissions reduction?

Not answered

24 6.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure that the movement of goods contributes to transport emissions reduction?

Not answered

25 6.2. How would these actions address the identified challenges and opportunities for emissions reduction in the movement of goods?

Not answered

26 7. Do you agree with the proposed net zero pathway for light road vehicles?

Yes

27 7.1 Please add details to your response.

Broadly yes, but low carbon liquid fuels and hybrids are critical to meeting our climate change commitments

28 8. The Australian Government is currently developing an Australian New Vehicle Efficiency Standard and has already begun to implement actions in the National Electric Vehicle Strategy.8.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce light vehicle emissions?

Hybrids should be encouraged and included in the emission plan

29 8.2 How would these actions address the identified challenges and opportunities to reduce light vehicle emissions?

low carbon liquid fuels and hybrids can achieve similar LCA emission reductions to electric vehicles in a much faster timeframe and are critical to meeting our climate change commitments

30 9. Do you agree with the proposed net zero pathway for heavy road vehicles?

No

31 9.1 Please add details to your response

we believe the timetables for hydrogen and electrification are unrealistic

32 10. The proposed pathway for heavy road vehicles relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels.Rank from 1 to 3, the order in which these should be prioritised for emissions reduction.

1: Low carbon liquid fuels
2: Battery electric
3: Hydrogen fuel cell

33 10.1 Please add details to your response. Why did you rank them in that order?

LCLF can be implemented now in all vehicles. Electrification has weight and recharging time / limited power infrastructure issues with existing technology. Hydrogen is a long way from viable until a national network of hydrogen production and refuelling facilities are in place.

34 11. What role should low carbon liquid fuels play in the heavy vehicle decarbonisation?

Critical role over the next thirty years

35 12. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce heavy vehicle emissions?

Mandate all fuels to have a minimum LCLF component linked to a minimum LCA emission savings. Percentage to be be increased over time but technology agnostic.

36 13. Do you agree with the proposed net zero pathway for rail?

Yes

37 13.1 Please add details to your response.

Not answered

38 14. The proposed pathway for rail relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels.Rank from 1 to 3, the order in which these should be prioritised for emissions reduction.

1: Low carbon liquid fuels
2: Battery electric
3: Hydrogen fuel cell

39 14.1 Please add details to your response. Why did you rank them in that order?

With 2000 locomotives in Australia, it will take many years to convert the fleet to electric. LCLF is the only technology that can make a real emission reduction across the fleet in the next twenty years.

40 15. What role should low carbon liquid fuels play in rail decarbonisation?

Immediate during the transition

41 16. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce rail emissions?

Mandate renewable diesel percentage in diesel fuel

42 16.1 How would these actions address the identified challenges and opportunities to reduce rail emissions?

Established long term demand will provide certainty for private investors to build LCLF plants

43 17. Do you agree with the proposed net zero pathway for maritime?

Yes

44 17.1 Please add details to your response.

Not answered

45 18. The Australian Government is engaging in consultation as part of the development of the Maritime Emissions Reduction National Action Plan and those consultations will also inform the final Roadmap and Action Plan. 18.1 What additional actions by governments,

communities, industry and other stakeholders need to be taken now and in the future to reduce maritime emissions?

Mandate renewable diesel in fuel

46 18.2 How would these actions address the identified challenges and opportunities to reduce maritime emissions?

Not answered

47 19. Do you agree with the proposed net zero pathway for aviation?

Agree SAF is the only viable technology. The timetable for Hydrogen planes and infrastructure is not evidence based and purely speculation.

48 19.1 Please add details to your response.

Not answered

49 20. The Australian Government has already engaged in consultation on aviation decarbonisation through the development of the Aviation White Paper and those consultations will also inform final Roadmap and Action Plan.

Not answered

50 20.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce aviation emissions?

Not answered

51 21. Do you agree with the proposed net zero pathway for transport infrastructure?

Yes

52 21.1 Please add details to your response.

Not answered

53 22. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce transport infrastructure emissions and ensure that transport infrastructure is ready for and enables low-emission transport modes?

Not answered

54 22.1 How would these actions address the identified challenges and opportunities to reduce transport infrastructure emissions?

Not answered

55 23. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the energy mix is ready to support transport emissions reduction?

Not answered

56 24. How should the use of low carbon liquid fuels (LCLFs) be prioritised across different transport modes over time to achieve maximum abatement?

LCLF should be prioritised across all sectors if we are to meet our climate change commitments and net zero by 2050

57 25. What are the best ways for the Australian Government to work collaboratively with industry, business, governments and communities to implement the proposed pathways?

establish long term offtake demand for LCLF by modifying the fuel standard specification

58 25.1 What are good domestic or international examples of partnership and collaboration on transport and transport infrastructure emissions reduction that could inform the final Roadmap and Action Plan?

Brazil, USA, European Union

59 25.2 What opportunities can Government leverage to show leadership

in Australia and internationally?

establish long term offtake demand for LCLF by modifying the fuel standard specification

60 26. What measures and metrics should be used to evaluate the final Transport and Infrastructure Net Zero Roadmap and Action Plan?

Growth of EV sales, hybrd sales and LCLF sales volume

61 26.1 What other data and evidence could governments use and how could this offer further insights on the pace, scale and location of transport emissions reduction pathways?

Not answered

62 27. Do you have any feedback on the proposed review process?

Not answered

63 28. Do you have any further feedback on the Consultation Roadmap and proposed pathways?

Not answered

64 28.1 Is there anything missing? Are the sections appropriately integrated? Is the Roadmap appropriately ambitious?

Not answered

65 29. Is there any further information or documentation that you wish to be considered with your submission?

Not answered

66 Would you like to upload a document?

Yes

67 Have you removed any identifying information from your submission?

Yes

68 Upload a submission

TfA Project Group Submission Transport and Infrastructure Net Zero Consultation Roadmap Rev A.pdf

69 Upload a submission

Not answered

70 Upload supporting file

Not answered

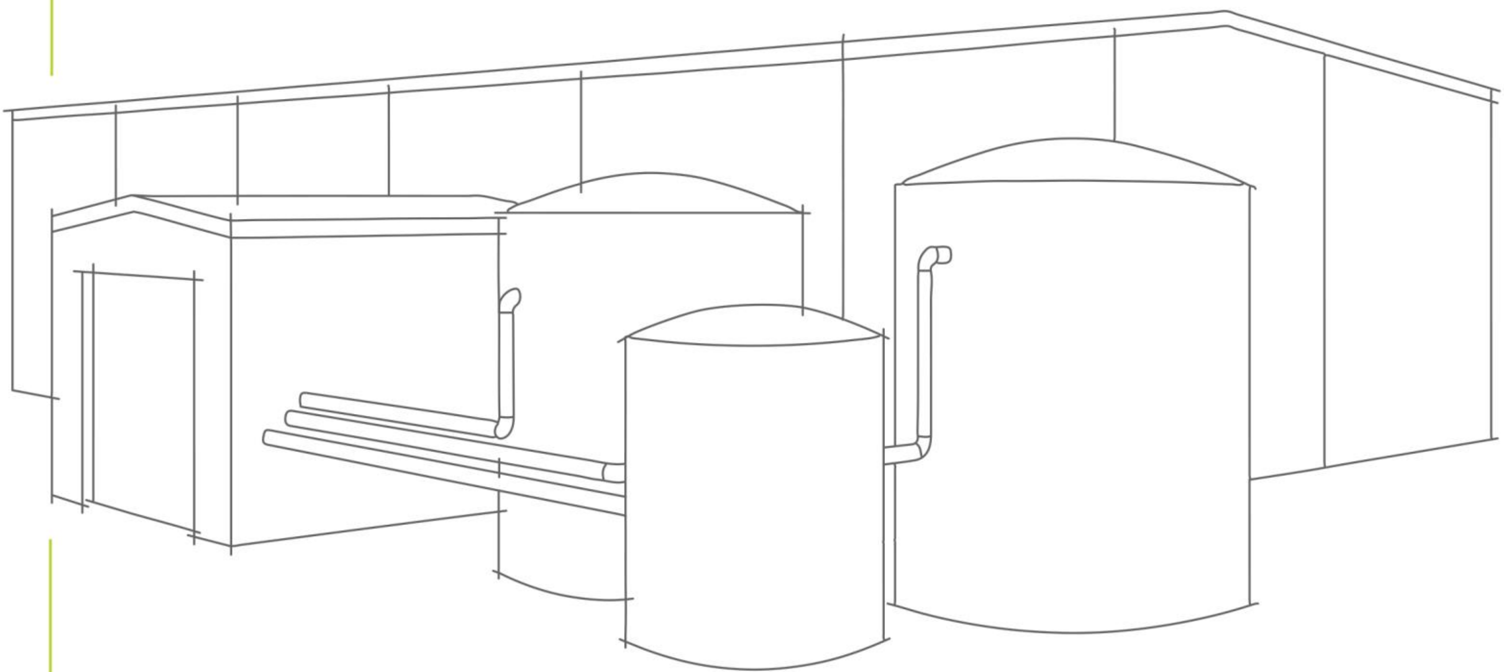
71 Upload supporting file

Not answered

SUBMISSION

AUSTRALIAN GOVERNMENT 2024 ISSUES PAPER

TRANSPORT AND INFRASTRUCTURE NET ZERO CONSULTATION



TfA Project Group

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PROJECT MANAGERS | PLANNERS | DESIGNERS | ENGINEERS

SUBMISSION

Transport and Infrastructure Net Zero Consultation

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Document Control

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1.0 INTRODUCTION

TfA Project Group (TfA) are recognised Hazardous Industry experts specialising in fuel storage and distribution infrastructure. For over thirty years we have been trusted by all major oil / energy companies in Australia to design over 1,500 service stations, numerous fuel farms, oil terminals, airport fuel depots and refuelling facilities and many mine fuel farms.

We are currently involved in the role out of electric vehicle recharging infrastructure and also projects involving hydrogen refuelling at service stations.

TfA are also Australia's most experienced engineering consultant in the renewable liquid fuels industry and the only company to have implemented an ethanol biorefinery project in Australia over the last 25 years. TfA's role as owner's engineer for the Dalby Biorefinery included technology evaluation, feasibility studies and budget estimates to support the business case and culminated in the project implementation performing detailed design and procurement support.

TfA have prepared feasibility studies for numerous proposed biorefinery projects over the last 20 years, including for Jet Zero in 2023. We have travelled extensively visiting existing Biorefinery plants, attended international Ethanol industry conferences and investigated a variety of renewable liquid fuels feed stocks including Wheat, Sorghum, Sugar Cane, Cassava, second generation cellulosic technologies using sugar cane bagasse and waste fibre, and carbon dioxide for E-fuels.

TfA Engineering Manager, Keith Sharp, is a regular speaker at Bioenergy Conferences, including Bioenergy Strong, NSW Bioeconomy Summit, Bundaberg Bioeconomy Summit and All Energy Australia.

This combination of experience enables TfA to offer a unique insight into the Transport liquid fuels sector and the potential implementation of electric vehicles, hydrogen and sustainable liquid fuels into existing infrastructure. Subsequently this submission offers our observations on the Transport and Infrastructure Net Zero Consultation paper.

Thank you for the opportunity to provide this submission.

2.0 GUIDING PRINCIPLES

Australia has accepted targets of 43% CO2 reduction on 2005 levels by 2030 and net zero by 2050.

We are a world leader in the adoption of wind and solar to improve power generation emissions, however we have made very limited progress on transport emissions which are now predicted to become our highest single source of emissions by 2030.

Whilst battery electric vehicles are being encouraged and currently represent 8% of light vehicle sales, their growth is slow, and we are a long way from converting the fleet of 21 million light vehicles. In terms of heavy vehicles, rail, marine and aviation, there has been virtually no progress on decarbonisation.

Consistent with global trends, we believe electrification needs to be supplemented with a broad approach using multiple technologies to achieve Australia's climate change objectives within the proposed timetable.

Many other countries have electric vehicles policies but have also implemented other technologies to make significant progress in transport whilst Australia has in many respects gone backwards. Over sixty countries have adopted biofuels and low carbon liquid fuels mandates with countries such as the USA, the European Union, Brazil and Thailand establishing substantial industries.

Low carbon liquid fuels (LCLF) have the benefit that they can be used in the existing transport fleet across all classifications to achieve immediate greenhouse gas reductions. They are not dependent on consumers having to replace their existing vehicles bearing significant additional cost for new electric vehicles. Internationally, the industry and technology is well established with hundreds of plants and 175 billion litres per annum of production.

Whilst Australia lags behind global trends, the IEA still sees a strong long-term role for renewable fuels. The most recent IEA Renewables 2023 Analysis and Forecast to 2028 published in 2024 [1] states:

"Biofuel demand is set to expand 38 billion litres over 2023-2028, a near 30% increase from the last five-year period. In fact, total biofuel demand rises 23% to 200 billion litres by 2028, with renewable diesel and ethanol accounting for two thirds of this growth, and biodiesel and biojet fuel making up the remainder."

This is supported by Government commissioned modelling by Ernst & Young [2] which predicts a long-term demand for liquid fuels in Australia beyond 2050. Subject to the rate of investment and step change, it is predicted that there will still be a demand for 20 – 40 billion litres of transport liquid fuels in 2050 (50-90% of 2021 demand). Significantly this is not just jet fuel, but also petrol and diesel, representing 50-60% of total transport fuel demand.

Carbon capture and sequestration has been described as an essential ingredient for many existing manufacturing industries with existing emissions. However, the technology has suffered technical failures and is not viable in many locations due to a number of factors:

- Lack of suitable geological storage caverns suitable for high pressure storage.
- Technical and corrosion issues such as experienced by the Chevron Gorgon CCS project leading to poor performance [3].
- Proximity of artesian water basins. The Queensland Government has just indicated a ban on CCS for the entire Great Artesian Basin in Queensland. [4]

E-fuels and low carbon liquid fuels that utilise carbon dioxide as a feedstock offer an alternative to recycle carbon dioxide emissions from existing essential industries that cannot be reduced by process optimisation or captured and sequestered using CCS.

Hydrogen is a key input for many LCLF technologies. Australia has a significant policy in place to encourage hydrogen hubs. Fast tracking LCLF production will help establish a base offtake market to enable hydrogen production hubs to become established and lower production costs.

3.0 NATIONAL POLICY FRAMEWORK

As stated above, we believe a broad approach using multiple technologies will be required to achieve Australia's climate change objectives within the proposed timetable. Hybrid vehicles and low carbon liquid fuels (LCLF) have a key role to play in meeting net zero by 2050.

Australia has a poor record in supporting the development of biofuels with much of the heavy lifting left to the State Governments. Whilst Queensland and NSW have adopted mandates, these have never been enforced and proven to be ineffective.

Existing practice across the world has demonstrated that the most effective way to develop low carbon liquid fuels is to modify legislated fuel standard specifications with a minimum LCLF percentage which is indexed upwards overtime.

Combined with certification systems for LCLF emission reductions and feedstocks, and Future Made in Australia policy, this promotes, fuel security in Australia, economic growth and jobs and allows the market to develop the most suitable cost-effective options for Australia to achieve significant emission reductions.

In addition to changes to the fuel standards, there are a number of simple measures for the Government to help develop an industry would be to establish base demand.

- Defence force to seek and commit to renewable diesel and sustainable aviation fuel procurement agreements similar to many other countries.
- Government owned businesses, such as Australia Post, to seek and commit to renewable diesel procurement agreements.
- Public buses – all purchases to be 100% biodiesel compatible available from Scania / Volvo minimal cost. Supply contracts to be issued for 100% biodiesel or renewable diesel.

4.0 LIGHT VEHICLES

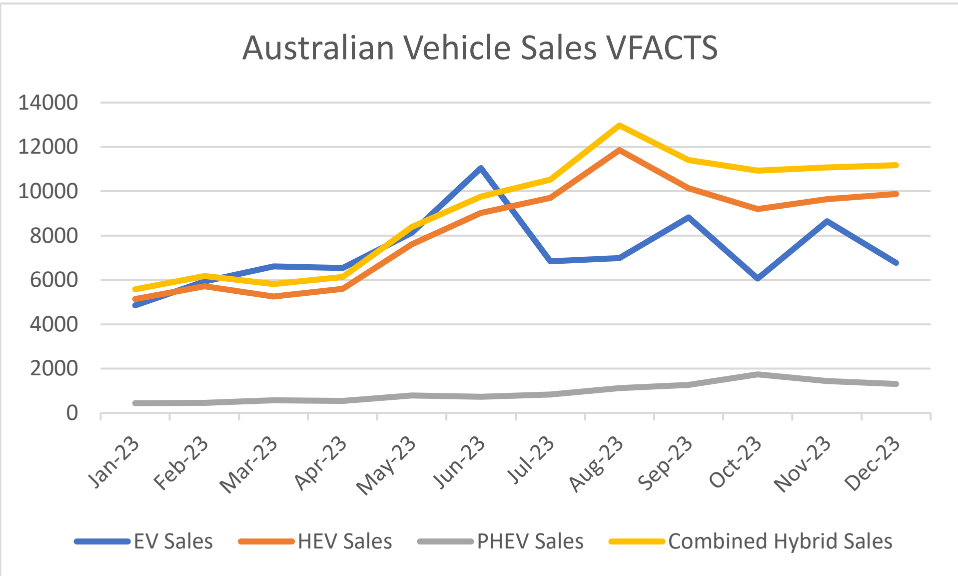
Whilst we recognise that electric vehicles are the future of light passenger vehicles, we believe they may not be implemented quickly enough to achieve our 43% emission reduction target by 2030 and may not even achieve 100% conversion of the Australian fleet by 2050.

The roadmap states in section 3.1 that EV sales are mirroring global trends and exceeded hybrid sales in Australia in 2023, however the electrification trend appears to have slowed down globally and in Australia since the paper was drafted with changes in consumer attitudes and buying patterns.

According to the IEA [5], 95% of electric vehicle sales are in China the USA and Europe with 60% alone in China.

- Europe has a high population density and smaller travel distances which makes it more suitable for EV usage and comprises 25% of global sales. However, [6], electric vehicle sales at 13.2 % are less than half that of hybrids (28.9%) with plug-in-hybrids making up an additional 7.3%.
- The USA (with 10% of global sales) has a similar demographic to Australia in terms of land area and distances travelled. In 2023, electric vehicle sales increased by only 0.1% compared to 53% for hybrid vehicle sales and 59% for plug-in-hybrids [7].

In Australia, the EV market share also stalled in 2023 growing only marginally from 7% in February 2023 to 7.2% in December 2023. Sales in the first half of 2024 in Australia have fluctuated averaging 7.9%.



Over the last 12 months hybrid vehicle sales have outsold electric vehicles by 43% with the gap widening. This increases to 59% if you include plug in hybrid vehicles.

- In April 2024, hybrid sales represented 18% of all sales [5], an increase of 138% over the last 12 months and notably over 50% of Toyota total vehicle sales for the first time.
- Over the first five months of 2024, hybrid sales were 67% greater than EV.

Additionally in order to achieve net zero, not only does the fleet need to be electrified, but the source of power for recharging also needs to be renewable. Notably most EV owners recharge their vehicles overnight when solar power is unavailable. In Tasmania where hydro power is available all day, LCA greenhouse gas reductions of 74% can be achieved [9] , however in Victoria, NSW and Qld (covering 77% of the population) where coal and gas are still a major source of supply emission reductions can be reduced by only 10-30% [8].

Whilst the paper quotes an IEA study highlighting the existing environment benefits of electric vehicles, Australia specific studies [8] estimate that the effective emission reduction today is only in the order of 10-30% due to the source of power generation. This is consistent with the original chart in the IEA reference when looking at the range bars reflecting the range of values for electricity generation carbon dioxide emissions. Live data off https://app.electricitymaps.com/ indicates power generation in Queensland, NSW and Victoria is currently at the top of this range overnight fluctuating from 700 – 800 gCO2-eq/kWh.

The net zero pathway for light vehicles in Figure 9 of the roadmap describes a scenario from 2040-2050 where "fossil fuel demand decreases until it is only used in very specific circumstances". This appears to contradict Government commissioned modelling by Ernst & Young [2] which predicts a long-term demand for liquid fuels in Australia beyond 2050. Subject to the rate of investment and step change, it is predicted that there will still be a demand for 20 – 40 billion litres of transport liquid fuels in 2050 (50-90% of 2021 demand). Significantly this is not just jet fuel, but also petrol and diesel, representing 50-60% of total transport fuel demand.

The inclusion of a timetable for light vehicle passenger vehicle rollout for 2030-2040 Hydrogen fuel cell adoption and 2040-2050 Hydrogen fuel cell where electrification is not feasible is not consistent with the latest international trends. The roll out of hydrogen is far more difficult than electrification. Consumers can recharge a BEV at home, but there are virtually no hydrogen refuelling stations installed for light vehicles in Australia. Hydrogen refuelling facilities are expensive and cannot readily be retrofitted to existing metropolitan service stations due to safety separation distances. Additionally, there is no business case for industry to provide such facilities without any hydrogen fuel cell vehicles on the road. Conversely, without refuelling infrastructure consumers will not buy the vehicles. The United States DOE 2023 National Blueprint for Transportation Decarbonization fact sheet [9] does not predict any role for hydrogen in light vehicles in the future.

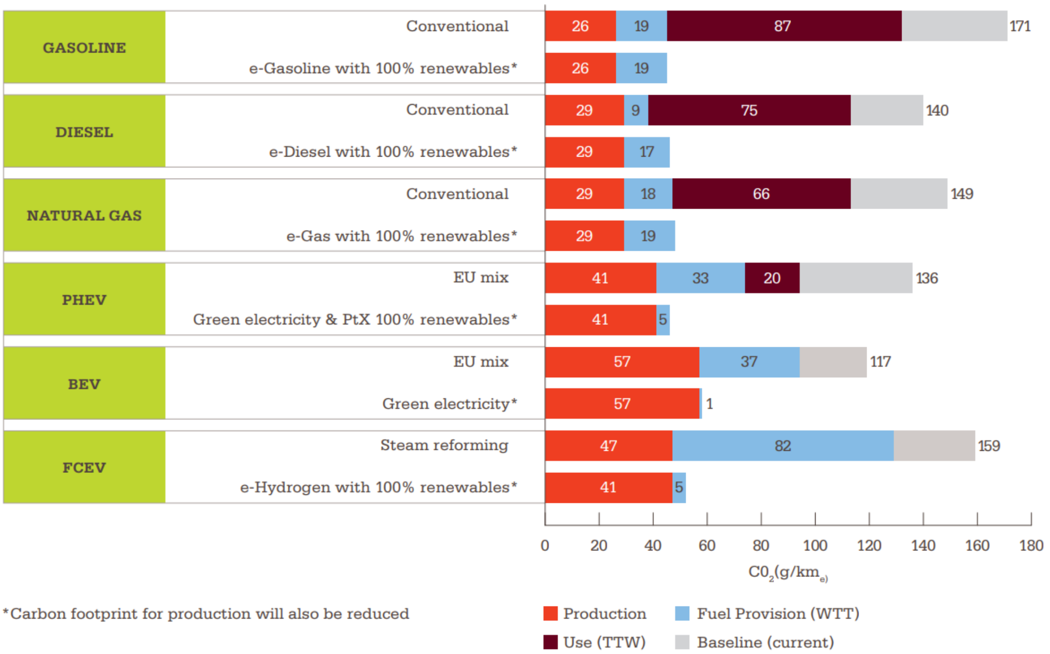
Recent media articles [10] have highlighted the trend in hybrid vehicles and cast doubt on the ability of Australia to meet our climate commitments without electric vehicles. We believe this is a very narrow view and does not consider the impact of low carbon liquid fuels. As an example of US Transportation Decarbonization fact sheet predicts an integrated strategy combining electric vehicles and low carbon liquid fuels for passenger vehicles.

Critically e-petrol (e-gasoline) and renewable diesel can reduce the life cycle emissions of existing internal combustion vehicles equivalent to electric vehicles. HIF Global are already progressing the first e-petrol plant in Burnie Tasmania with a well to wheel greenhouse gas emissions reduction in the order of 90–108% versus conventional petrol [11]. Fast tracking low carbon liquid fuels will facilitate broad emission reductions across all passenger vehicles.

We believe the government should support all manufacturers to offer hybrid models in Australia. Consumers adoption of hybrid vehicles offers not only a 30-50% fuel consumption reduction but importantly a similar emission reduction [5] compared to a conventional internal combustion engine vehicle, no matter where they live.

Hybrids combined with low carbon liquid fuels can have a key long-term role in the decarbonisation of passenger vehicles with greenhouse gas benefits equivalent to electric vehicles charging on 100% renewable electricity [12].

Figure 5: Life-cycle analysis of typical C-segment passenger vehicle in 2030 (sum of coloured bars) compared to current (grey bars) for different conventional and renewable fuels by life-cycle phase



*Carbon footprint for production will also be reduced

08 Accelerating Road Transport Decarbonisation: A Complementary Approach Using Sustainable and Low Carbon Fuels

Notably, in contrast to electric vehicles, hybrid vehicles uniquely tick all of the five guiding principles boxes today.

4.1 Maximise emissions reduction.

Actual emission reduction achieved with hybrids on average today would be greater than that with electric vehicles.

Existing incentives are already sufficient to promote hybrid vehicle sales, which are growing even faster than EV vehicles, overtaking EV sales in 3Q of 2023 and are now consistently outselling EV by over 60%.

When combined with low carbon liquid fuels effective emission reductions could be achieved must faster which is essential for Australia to meet our current commitments.

4.2 Value for money

Hybrids are already considered better value for money by consumers with a 10% premium versus 100% for an equivalent electric vehicle. Toyota has recently announced [13] that the RAV4, Kluger and Corolla SUV models will only be available as hybrid vehicles due to consumer demand.

Electric vehicles are still much dearer than conventional vehicles and existing substantial government subsidies and commitments are insufficient to accelerate sales. It will take many years for the price of electric vehicles to become comparable in cost and the cost to government will be substantial to subsidise the cost difference. However, setting standards to encourage hybrid vehicles is a low-cost pathway to immediate 30-50% emission savings on new vehicles. Notably combining this with incentives for low carbon liquid fuels will realise emission reductions across the entire existing light vehicle fleet.

4.3 Maximise economic opportunity.

Global growth of electric vehicles does provide an opportunity for the mining of rare earth minerals such as lithium, however recently a number of proposed projects have failed as many countries try to take advantage of the opportunity. Electric vehicle sales are currently struggling and government incentives to increase sales will be expensive.

Charging these vehicles also adds additional load onto the electricity grid which already needs substantial investment to become renewable. Critically with most consumers charging at night this would increase the investment required further for energy storage options that can provide power overnight such as hydro storage and generation facilities.

Conversely hybrid vehicles offer the opportunity, to develop low carbon liquid fuels. These new manufacturing facilities would support farmers and industry, processing waste biomass or carbon dioxide emissions, to make renewable fuels creating regional jobs and generating income tax and GST revenue.

E-fuels production also requires green electricity and hydrogen as an input to the process. Australia has a significant policy in place to encourage hydrogen hubs. Colocation with an e-fuels plant would help establish a base offtake market to enable hydrogen production to become established and lower production costs.

4.4 Inclusive and equitable

Today most electric vehicles are purchased by consumers with the purchasing power to afford a more expensive car. Cost of living pressures limit those on lower incomes from affording more expensive electric vehicles, particular in a size suitable as family cars.

Hybrids are available in almost all light vehicle configurations and carry only a small premium. Toyota supplies 20% of all light vehicles in Australia with over 50% of sales already being hybrid. Their announcement [5], to phase out conventional vehicles in favour of hybrid vehicles will reduce the cost premiums improving affordability for all consumers.

4.5 Evidence-based

At the current time hybrid vehicles have a number of advantages apparent to the consumer:

- Affordability, only 10% dearer than conventional vehicles.
- Quick return on additional investment with 30-50% fuel savings [5].
- Fast and convenient refuelling and the predictable long range of conventional internal combustion vehicles.
- Immediate GHG emission reductions proportional to their reduction in fuel consumption.

With twenty-one million light passenger vehicles in Australia and annual EV sales in the order of 87,000 in 2023 (7.3%), total conversion of the fleet is still many years away and subject to the rate of investment by consumers. However, this does not prevent substantial mitigation of transport emissions. Combined with renewable liquid fuels similar GHG emission reductions can be achieved to an EV charged with renewable electricity in a much faster time frame.

Consistent with the above EV sales figures, Government commissioned modelling that there will still be a demand for 20 – 40 billion litres of transport liquid fuels in 2050 (50-90% of 2021 demand) appears quite feasible.

There are numerous studies in addition to the Institution of Mechanical Engineers above documenting the well to wheel and life cycle analysis of e-petrol, e-diesel, biodiesel and renewable diesel and the ability of hybrid (HEV) and plug in hybrid (PHEV) vehicles to achieve equivalent emission reductions to electric vehicles, including:

- US DOE Cradle-to-Grave Lifecycle Analysis of US Light Duty Vehicle Fuel Pathways Figure ES-1 [14]

- “Comparison of Advanced Fuels—Which Technology Can Win from the Life Cycle Perspective” – figure 11.15 [15]
- Frontier Economics The overall CO2 impact for drive technologies in individual transport today and in the future Figure 26 / 28 [16]
- UChicago Argonne, LLC. Operator of Argonne national laboratory. Published by American Chemical Society Life Cycle Analysis of Electrofuels: Fischer−Tropsch Fuel Production [11] .

Given the above context, we believe the existing paper significantly understates the essential long-term role of hybrid vehicles and renewable liquid fuels to meet Australia’s emission reduction commitments.

We also support plug in hybrid vehicles as the best of both worlds at a much lower cost than pure battery electric vehicles. They are much faster to charge at home in electric mode and offer the backup of conventional fuel operation.

We strongly support government support to increase the supply of hybrid and plug in hybrid vehicles to the Australian market.

5.0 HEAVY VEHICLES

We agree that the high upfront cost of switching to low and zero emission heavy vehicles will remain challenging.

TfA have designed many Truck stops around Australia and have a sound understanding of heavy vehicle refuelling and utilisation. Whilst the government is working on mass limits, electric heavy vehicle recharging will be extremely challenging. Heavy vehicles have very high utilisation and truck stops are strategically placed to fit in with mandatory 5 hourly breaks for drivers. There are peak periods during the day which are common for driver meal breaks where they refuel, have a shower and eat a meal all within twenty to thirty minutes and get back on the road. Many truck stops refuel six trucks at once with each truck refuelled in 5-10 minutes.

With current technology charging electric trucks in this timetable is simply unachievable and would create a serious disincentive for drivers. Along with "as yet" undeveloped battery technology, substantial power supply infrastructure will be required near truck stops throughout the nation to support quick megawatt supercharging for many trucks at once. Without this in place, regional heavy vehicles transport operators are unlikely to adopt electric vehicle technology.

Given the challenge to implement heavy vehicle electrification we believe fast-tracking support for a LCLF industry is critical to meet our climate commitments. Australia has substantially lagged behind the rest the Western world in the development of renewable liquid fuels. Internationally, the industry and technology has been well established for over twenty years with hundreds of plants and 175 billion litres per annum of production.

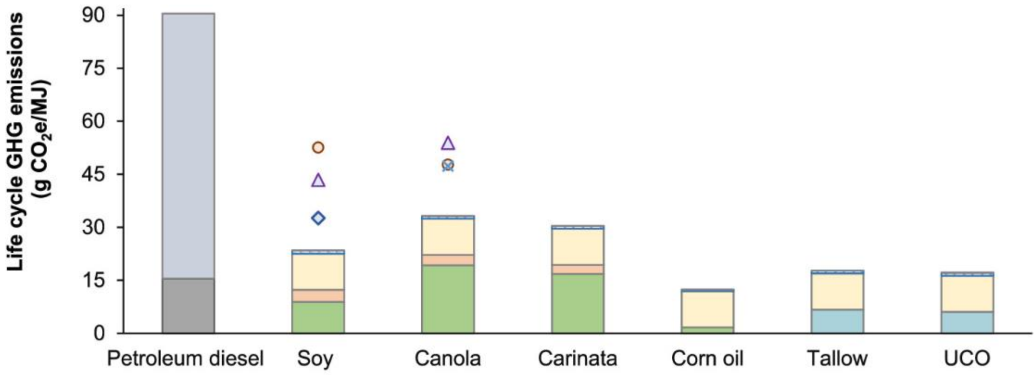
We consider that the proposed timeline for the adoption of Hydrogen is aspirational but not supported by any planning or evidence.

- The Australia Hydrogen Roadmap was released in 2018.
- Over the last six years, the CSIRO HyResource page [17] indicates that a total of 6 operating green hydrogen refuelling stations have been established in Australia with five under construction. Notably none of the existing sites have the capacity to produce enough hydrogen to refuel more than a couple of heavy vehicle trucks per day. Of the proposed sites, the largest by far is the Viva Geelong project, proposed to produce up to 1,000kg of hydrogen per day, sufficient for approximately 15-20 truck and / or bus refuelling's per day.
- Hydrogen prime movers are in limited supply and very expensive with very few operating in Australia. Long distance road transport companies are unlikely to procure hydrogen vehicles without an established network of green hydrogen manufacturing and refuelling facilities.
- Private industry is unlikely to fund and develop hydrogen infrastructure without an established existing market. Green hydrogen is expensive to manufacture, store, handle and distribute, so local electrolysis is often required which adds to capital cost.

On the above basis, the proposed decarbonisation hydrogen pathway for the acceleration of Hydrogen fuel cell vehicles between 2030-2040 and mass market adoption of hydrogen vehicles from 2040-2050 appears highly ambitious and challenging given the lack of industry progress in the last six years.

Heavy vehicles have long working lives and travel many more kilometres than light vehicles, often in excess of one million kilometres in less than ten years. This is an area where low carbon liquid fuels can address Australia's 2030 and 2050 targets effectively.

Lifecycle GHG emissions reductions for producing renewable diesel can achieve GHG reductions of 66% to 86% lower than petroleum diesel [18].



Renewable diesel produced via the gasification of waste biomass feedstocks can achieve life cycle GHG emissions reductions up to 96% [19].

Low carbon liquid fuels tick all of the five guiding principles boxes today.

5.1 Maximise emissions reduction.

Electrification of heavy vehicles has significant challenges with battery weight a disincentive reducing cargo weight and recharging time delays reducing vehicle utilisation. Hydrogen use is only in its infancy with virtually no hydrogen trucks in operation or hydrogen refuelling stations and has not real impact in the foreseeable future.

Low carbon liquid fuels such as renewable diesel are the only realistic option in the 2050 timeframe to achieve effective emission reductions in all vehicles. It is also complimentary with SAF production where all SAF technologies also produce renewable diesel.

5.2 Value for money

All vehicles can operate on renewable diesel and 100% biodiesel heavy vehicles are available at similar pricing. No other technology can be rolled out as quickly or economically.

Mass production is required to bring down the price of renewable diesel and biodiesel. The Government is in a unique position to drive this with incentives for low carbon liquid fuels which will realise emission reductions across the entire existing fleet.

5.3 Maximise economic opportunity.

Alcohol to Jet fuel technology and E-fuels production both require hydrogen as an input to the process. Australia has a significant policy in place to encourage hydrogen hubs. Colocation with a low carbon liquid fuels plant would help establish a base offtake market to enable hydrogen production to become established and lower production costs.

5.4 Inclusive and equitable

The Australian economy depends on heavy transport to distribute goods nationally. The 2021 ABS census stated there are 660,000 registered trucks in Australia. It would place a substantial cost impost on industry to replace all these prime movers with more expensive electric or hydrogen alternatives. In addition, regional mass charging or substantial hydrogen refuelling infrastructure would require to be in place.

LCLF can be used in existing vehicles without the need to replace existing prime movers with FCEV vehicles.

5.5 Evidence-based

As stated above, Government commissioned modelling by Ernst & Young [3] predicts demand for 20 – 40 billion litres of transport liquid fuels in 2050 (50-90% of 2021 demand) with petrol and diesel representing 50-60% of total transport fuel demand.

There are numerous studies documenting the well to wheel and life cycle analysis of e-diesel, biodiesel and renewable diesel.

Greenhouse gas and sustainability footprints of emerging biofuels for Queensland
Undertaken by Lifecycles For Department of Environment and Science 4th September 2018

Table 1 Percentage reduction in impact of biofuel replacing fossil fuel.

	Climate change	Fossil energy depletion	Eutrophication	Particulate matter	Land use	Water scarcity
RD.forestry resid. pyrolysis	76	138	0	82	161	118
RD.cane trash pyrolysis	82	143	18	88	165	126
RD.wheat straw pyrolysis	83	141	25	90	163	120
RD.prickly acacia pyrolysis	80	142	3	85	164	125
RD.tyres destruc. distill.	18	255	187	233	261	390
RD.wood waste cata. depoly.	-18	38	11	47	96	18
RD.green waste cata. depoly.	35	34	-76	5	81	-82
RD.forestry res. cata. depoly	39	40	-64	33	88	-9
RD.food waste cata. depoly	35	34	-76	5	81	-82
RD.tyres. cata. depoly.	-29	64	-7	110	103	161
RD.MSW gasification FTP	593	-28	-401	-18	135	-478

Note: The table colour gradations are from green (better for biofuel) through to red (better for fossil fuel) and orange are to close to call either way. For global warming the tipping point is set as 20% benefit while all other indicators the tipping point is set at zero.

6.0 RAIL

Recent presentations by Aurizon indicate the low utilisation of freight locomotives makes them suitable for electrification and that the industry is moving this way. However, the TRAIN11 June 2024 report states there are approximately 2,100 operating locomotives in Australia. Given the operating life of locomotives, this is likely to take many years to convert to electric only stock.

We consider the establishment of a renewable diesel industry, as detailed above, would make substantial emission savings during the transition.

7.0 MARITIME

Electrification and hydrogen are currently not viable in the foreseeable future for shipping and the shipping industry is looking into multiple liquid fuel alternatives including methanol.

Given Australia imports 90% of our fuel, and the remoteness of Australia, it makes sense for domestic production to be incentivised to enable Australia to gain economic benefits from local manufacturing.

8.0 AVIATION

It is well documented that sustainable aviation fuel is the only viable option to decarbonise the aviation industry in the foreseeable future.

Australia's remoteness, and affinity for travel, means that we have a comparatively high demand for Jet fuel (over 8.5 BL in 2023 [1]). IATA has set targets for the adoption of sustainable aviation fuel (SAF) by all airlines progressively increasing to 65% by 2050. Qantas have already started procuring SAF and it is in Australia's interest to improve fuel security with a local source of supply given we currently import 90% of our liquid fuels.

Many Western countries are subsequently adopting SAF mandates such as the European Union, United Kingdom, USA, Japan and Singapore. This demonstrates that aviation emissions are not being ignored by our trading partners purely because they are discharged in international waters. We suspect Australia will need to put in place similar policies to maintain international trade relationships and competitiveness.

Given Australia imports 90% of our fuel, and the remoteness of Australia, it makes sense for domestic production to be incentivised to enable Australia to gain economic benefits from local manufacturing. Importantly Australia has sufficient biomass, waste residues and non-food feedstocks to manufacture all our Jet fuel needs as sustainable aviation fuel (SAF) [21].

9.0 TRANSPORT INFRASTRUCTURE

Transport infrastructure is a major consideration for the rollout of electric and hydrogen vehicles.

Whilst significant progress has been made on charging infrastructure for light vehicles, minimal infrastructure exists for heavy vehicles. Electric heavy vehicles are far more challenging as truck stops positioned strategically to accommodate mandatory driver breaks often have very high occupancy. Many are designed to refuel up to 6 trucks at the same time in 5-10 minutes. This is currently unachievable with electric technology both from an electrical supply perspective and battery technology.

The establishment of a regional hydrogen refuelling network will not occur unless it is fully funded by Government. Private industry is unlikely to fund and develop hydrogen infrastructure without an established existing market. Conversely industry will not procure hydrogen vehicles unless the infrastructure in place.

Six years after the release of the Australian Hydrogen Roadmap, Australia does not have any public heavy vehicle hydrogen refuelling facilities.

New transport infrastructure is going to take a long time to put in place based on government funding alone. However fast tracking LCLF production provides a decarbonisation option that will provide immediate emission reductions in all modes of transport and help grow Australia's hydrogen industry.

Whilst LCLF within the report is considered a medium-term solution, there is no alternative today for aviation or shipping. It is likely SAF, and renewable diesel will be required long beyond 2050 providing a stable investment environment for private investors.

Heavy vehicles are likely to also require LCLF in the long term due to Australia's long distance freight routes and existing liquid fuel refuelling infrastructure being difficult and costly to replace with alternate options.

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