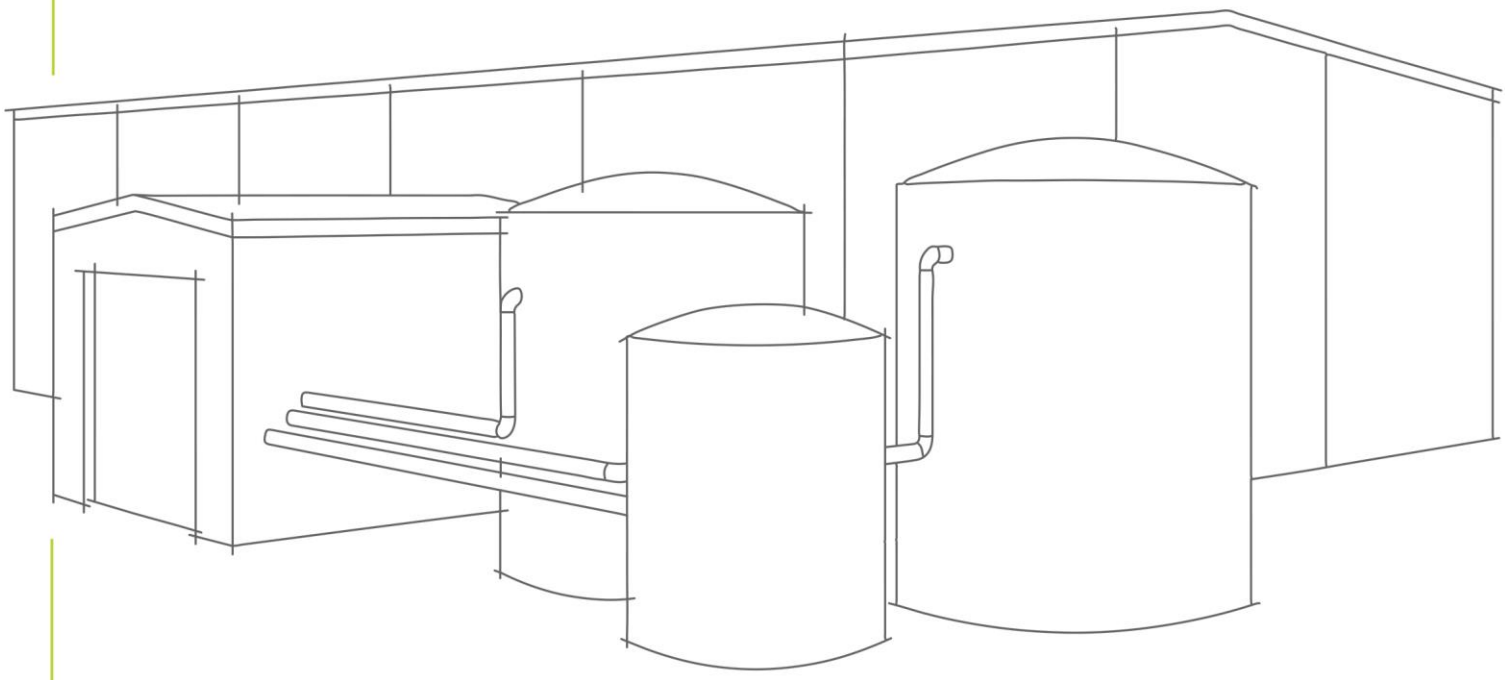
SUBMISSION

CLIMATE CHANGE AUTHORITY 2024 ISSUES PAPER

TARGETS, PATHWAYS AND PROGRESS



TFA Project Group

CREATE · PLAN · DELIVER

PROJECT MANAGERS | PLANNERS | DESIGNERS | ENGINEERS

SUBMISSION

Transitions, Pathways and Progress

Public comment submission

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TABLE OF CONTENTS

1.0 INTRODUCTION

TfA Project Group (TfA) are recognised Hazardous Industry experts specialising in fuel storage and distribution infrastructure. For 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 owners 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 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 Climate Change Authority Targets, Pathways and Progress paper.

Thank you for the opportunity to provide this submission.

2.0 GENERAL COMMENTS

2.1 Transport

Whist the paper discusses government future emission trend predictions for Electricity and energy, it does not address emission trends for other sectors. Unlike the electricity sector, Transport emissions have been steadily growing and are predicted to become the largest single source by 2030 in the baseline scenario [1]. Even in the additional measures scenario Transport is line ball with Stationary Energy as the highest source of emissions, both of which are predicted to be 2.5 times greater than Electricity and Energy by 2035.

The main approach identified within the paper for Transport is electrification. Critically this approach is consumer driven and the rate of transition is subject to a number of factors:

- Affordability, the ability and readiness of consumers to pay roughly twice the price of a conventional vehicle to buy an electric vehicle.
- Range anxiety and the inconvenience of slow recharging times.
- Higher insurance premiums.

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 commonly 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 where coal and gas are still a major source of supply emission reductions can be reduced by only 10-30% [2].

Whilst electric vehicle sales reached 8.7% of light passenger vehicle sales in the first quarter of 2024, minimal progress is being made with heavy transport, light commercial vehicles, heavy duty trucks and buses, motorcycles and off-road transportation, aviation, shipping, and rail.

An additional complication to the rate of change is the role of hybrid vehicles. 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.

Notably hybrid vehicle sales are growing even faster than EV vehicles, overtaking EV sales in 3Q of 2023 and are now consistently outselling EV by over 50%. This is despite lead times of 12 months to 2 years for popular models such as the Toyota Rav 4 and Camry [4]. 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.

With fifteen million light passenger vehicles in Australia and annual EV sales in the order of 87,000 in 2023, 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 scenario, Government commissioned modelling by Ernst & Young [3] 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, with petrol and diesel representing 50-60% of total transport fuel demand.

Given the above context, we believe the existing paper significantly understates the essential long term need for renewable liquid fuels to meet Australia's emission reduction commitments.

Drop in replacement renewable fuels 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.
We note that the paper references an early 2023 quote from IEA to exclude renewable diesel. However, this does not reflect the latest thinking from IEA on the role of renewable fuels. In fact the most recent IEA Renewables 2023 Analysis and Forecast to 2028 published in 2024 [12] 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*."

Whilst international aviation does not directly impact Australia's emissions, it is already being identified as a factor influencing business and tourism travel to Australia. A recent presentation by Margy Osmond from the Tourism and Transport Forum Australia at the Renewable Fuels Conference in Canberra highlighted the economic impact of the GHG emissions footprint of long-haul travel. Major business events which have an economic benefit to the economy in the order of $17B pa [15] are now at risk due to perceived GHG emissions from international travel to and from Australia.

2.1.1 Transport Technologies

TfA have released several white papers addressing electric vehicle [4] , hydrogen [5] and renewable fuels technology [6] over the past 18 months. Whilst electric vehicles are the future of light passenger vehicles, we believe the transition will be too slow to achieve net zero by 2050.

We believe hydrogen will not dramatically impact light passenger vehicles. Green hydrogen requires three times the amount of renewable electricity per km than that used to recharge electric vehicles. It is also expensive to transport and store due to its low density and high pressures. The US Department of Energy transport decarbonization technology solutions fact sheet [11] states that hydrogen does not have a future role in light passenger vehicles or medium short haul heavy trucks and buses. Whilst heavy transport could have a role, our long distances and lack of refuelling infrastructure currently prohibits growth in the sector. Transport operators are unlikely to purchase vehicles that cannot be refuelled in regional areas. Conversely, without vehicles on the road, building costly hydrogen production and refuelling infrastructure has no return on investment and is unlikely. Hence our opinion is that that hydrogen is likely to have a limited role in transport in the net zero by 2050 timeframe.

Renewable liquid fuels are a proven technology that can be implemented now to achieve emission reductions in all transport vehicles. There is a myriad of technically ready, commercially demonstrated technology available much of which is reviewed in our white paper [9]. Numerous technologies are available for waste biomass feedstocks and the conversion of CO_2 and other industrial emissions to renewable petrol and diesel and sustainable aviation fuel. Renewable liquid fuels also deliver a high abatement potential with some achieving emission reductions > 90% [9] [11] [12]. In the current Australian renewable electricity supply environment they achieve better results than electric vehicles.

Many countries such as the USA, Brazil and Europe have established substantial biofuels and renewable fuels industries via fuel specification mandates over the last 50 years. Globally over 64 countries have biofuels or renewable fuels mandates.

A number of projects are currently under consideration for a variety of these technologies.

- BP Kwinana HEFA Renewable Diesel and SAF.
- Ampol Lytton ENEOS Renewable Diesel and SAF.
- Jet Zero Australia Alcohol to Jet Renewable Diesel and SAF.
- HIF Global biomass gasification to petrol.

Most notably, at the time of this submission, none of these projects have reached financial investment decisions, and hence government needs to support development of the industry.

2.2 Resources Industry

The resource industry uses very large volumes of diesel for mining operations. We note the paper proposes fuel switching from diesel (for mining haulage and equipment) and natural gas (for the extraction and production of domestic gas and LNG) to lower carbon alternatives, such as renewable electricity or hydrogen.

The paper recognises the substantial barriers to implementing such significant changes but does not identify credible mitigation measures to overcome these challenges within the 2050 timeframe;

- High upfront capital costs, possible production downtime and asset replacement cycles.
    - Large haul trucks cost in the order of USD 5 million each and have a working life of over 20 years. With many mines having over 20 such vehicles in their fleet their replacement cost could well be in excess of $150 million. Refuelling or electric charging technology for new hydrogen or electric vehicles would also incur very substantial capital investment in additional infrastructure.
    - TfA have designed refuelling facilities for over 45 mines throughout Australia. Notably haul trucks have very high utilisation operating 23 hours per day. All trucks are typically refuelled within an hour by a team of operators. Logistically this is not possible with electric charging technology and logistically challenging. Mines are unlikely to accept substantial downtime on these assets.
- The lack of maturity of some potential technology solutions in terms of meeting safety or operational performance standards is a barrier, such as battery or fuel cell electric haulage in mining.

Renewable diesel is a solution that can be implemented today with a high abatement potential of up to 80% depending on the feedstock [13].

2.3 Feedstocks

A central takeaway from the authority's 2023 consultation was a call for a phase out of fossil fuels, including exports.

Australia is in a unique position with substantial and varied feedstocks to support self-sufficiency to produce enough renewable liquid fuels to replace all fossil fuel needs. We already export substantial quantities of Tallow and canola as feedstocks for the production of renewable fuels overseas. TfA's white paper on renewable fuels technology [8] specifically addresses the availability of potential feedstocks such as waste biomass, MSW and industrial emissions such as carbon dioxide. Our paper identifies that existing waste feedstocks are more than sufficient with a variety of non-food alternatives.

The paper recognises existing substantial greenhouse emissions with Australia's five highest emitting industrial facilities in 2021-222 emitted 32 Mt CO_2-e in aggregate CER 2023 (Four LNG projects and one steelmaking facility) and Australia's net domestic emissions of 461.5Mt CO_2-e (2022). Whilst emissions are predicted to reduce over time many industrial emissions come from established industrial manufacturing and LNG sites that will continue to operate in the long term. Whilst CCS is an option, there have been many failures internationally and success is subject to underground geological conditions. Chevron Gorgon, the world's largest CCS project, has still not achieved design performance five years after commissioning.

As stated in the technology section above, CO_2 is also a feedstock for renewable fuels, commonly referred to as e-fuels. In contrast to CCS, industries that convert their CO_2 emissions into renewable fuels have the opportunity to gain an income stream. Australian annual emissions are predicted to be in the order of 300 Mt CO_2-e in 2035. In context, with existing technology 100 Mt of CO_2 per year combined with green hydrogen could provide 40 BL per annum of liquid fuels, enough to meet Australia's predicted liquid fuel demand for transport in 2040 [5]. Notably e-fuels have high GHG abatement potential more than 90%.

It should be noted that renewable fuels technology is moving quickly and more alternative, plentiful sustainable feedstocks are being identified. Hydrothermal liquefaction, pioneered by Licella in Australia, has now been adapted by Firefly [9] to produce renewable crude oil from sewage sludge. They have recently announced plans to construct their first plant in the UK at Harwich to produce SAF from sewage with a life cycle greenhouse gas saving of over 90%.

2.4 Aviation and Shipping

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 have 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.

Importantly Australia has sufficient biomass, waste residues and non-food feedstocks to manufacture all our Jet fuel needs as sustainable aviation fuel (SAF) [10].

2.5 Stationary Energy, Industry and Waste

Emissions from Australia's stationary energy, industrial processes and waste sector are difficult to mitigate as they are associated with manufacturing. As stated above, they will become a close second to Transport as the largest source of emissions by 2030. We agree that material substitution, electric or hydrogen kilns, and Carbon Capture Utilisation and Storage (CCUS) are all key technologies.

Combining renewable hydrogen and utilising CO_2 emissions as feedstocks offers an opportunity to produce renewable fuels from existing industries. This sector is still predicted to produce 114 Mt of CO_2-e emissions in 2035.

3.0 QUESTIONS

The following section provides a response to some of the questions posed in the Issues Paper.

3.1 Question 3:

How can Australia further support other countries to decarbonise and develop sustainably?

Australia has a challenging task to replace our existing fossil fuels demand with renewable liquid fuels. We believe this should be our focus as there is a long term demand for our domestic consumption.

Once this is addressed, there is an opportunity to supply renewable fuels to regional neighbouring countries.

3.2 Question 4:

What technologies are important for each sector's pathway to net zero and why?

We believe the most significant net zero progress in Transport can be achieved by encouraging the adoption of more efficient hybrid vehicles combined with renewable liquid fuels. Drop in renewable fuels are available to suit all existing vehicles and can achieve LCA greenhouse gas savings in the order of 70-95%. Combined with hybrid electrical vehicles, the LCA reductions can exceed 90%.

We believe there is not a single technology solution. Australia has numerous feedstock options including:

- Tallow
- 90 million tonnes of waste biomass and residues
- Municipal solid waste
- Industrial waste gas and carbon dioxide emissions
- Sewerage
- Non-food crops suitable for arid non-arable land such as Pongamia and Agave

Technologies to process these feedstocks will include:

- Hydrogenated vegetable oils -renewable diesel (RD) and sustainable aviation fuel (SAF)
- Ethanol from first and second generation technology and CO_2 gas fermentation. Then Alcohol to jet technology (RD and SAF)
- Gasification and Fisher Tropsch (RD and SAF)
- Pyrolysis (RD)
- E-fuels e-Petrol / SAF
- Hydrothermal Liquefaction (HTL) synthetic crude for processing in conventional refineries

3.3 Question 5:

How can governments use mandates, rules, and standards to accelerate Australia's decarbonisation? Is more planning by governments needed? If so, how should this be coordinated and how can this be done while making the transition inclusive, adaptive, and innovative?

Many countries have tried numerous policy incentives to establish biofuels and renewable fuels over the last 50 years, however most countries with successfully established renewable fuel industries have adopted modifications to national fuel standards with mandated, progressively increasing percentages of renewable fuel. Brazil mandates a minimum of 27% ethanol in their petrol and 10% biodiesel in the Diesel, the USA has the renewable fuel standard and California Low Carbon Fuel Standard and Europe has the RED and RED II programs.

Numerous countries including Europe, UK, Japan and Singapore have announced SAF mandates with many more exploring their implementation.

In our experience the number one impediment to the development of a renewable fuels project is a long term offtake agreement. Establishing a small mandate and progressively increasing the percentage over time gives business certainty that they can commit to the procurement of renewable liquid fuels, allowing business to invest with confidence that the market will be long term.

3.4 Question 8:

What further actions can be taken by governments (e.g. through public funding), the private sector and households to accelerate emissions reductions, including in relation to the deployment of technologies and access to new opportunities in the transition to net zero? What barriers stand in the way and how could they be overcome?

We believe incentives to support the adoption of hybrid vehicles are one of the most cost effective methods of achieving immediate GHG reductions in the order of 30-50% over conventional internal combustion vehicles.

Combined with the introduction of renewable liquid fuels GHG emission reductions equivalent to our better (in the short term) than EV are achievable.

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