Submission

Future Made in Australia: Unlocking Australia's low carbon liquid fuel opportunity

Submitted: 18 July 2024

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Introduction

Gas Energy Australia (GEA) is the national peak body representing the downstream gas fuels industry, encompassing Liquefied Petroleum Gas (LPG) and associated gases – including renewable low-carbon-liquid-fuel (LCLF) gases such as bioLPG, synthetic renewable LPG (rLPG) and renewable Dimethyl Ether (rDME).

The industry comprises major companies, medium and small businesses across the gas fuels supply chain including producers, refiners, fuel marketers, equipment manufacturers, gas transporters, consultants and service providers.

GEA welcomes the inclusion of Low Carbon Liquid Fuels (LCLFs) as part of the Future Made in Australia Act and recognises that many domestic and industrial Australian energy consumers require alternative options to the electricity grid – due either to restricted access to infrastructure, or specialised energy needs.

GEA supports an Australian energy transition to net-zero that is socially fair and just for all Australian consumers, and that LCLFs can provide economically equitable, accessible and low-carbon options for remote and specialised energy needs.

To this end, GEA urges close consideration of production capability to produce multiple forms of LCLF, acknowledging that the synchronized production of multiple fuel types strengthens the business case for all LCLF production, by diversifying the applications and sectors to which products can be supplied.

GEA has been encouraged through discussions with the Australian and State Governments – at both ministerial and departmental levels – noting that LPG can play a positive role via its renewable alternatives in residential, commercial, industrial (including agriculture) and recreational settings.

Executive Summary

LPG is relied on by more than 2,026,450 Australian households and around 130,000 businesses every day. This footprint has been growing year-on-year since 2008. Access for these homes and businesses to a reliable, familiar and renewable fuel will be critical to a just energy transition.

Our sector will transition to net zero over the same timeframe as set for electrification and, going further, is forecast to transition to actual zero from the mid-2030s,

LPG's unique opportunities to decarbonise should be seized upon as complementary to government policy and goals.

1. GEA notes the absence of bioLPG and renewable LPG (rLPG) in the consultation documents and urges their inclusion in this discussion as they are authentic, mature, compatible LCLF technologies which form an integral part of a sustainable LCLF production sector.
    - *Net zero* bioLPG is a by-product of biodiesel and sustainable aviation fuel production[1]. BioLPG has the potential to replace all conventional LPG use, abating up to 1.5 million tonnes of CO2-e each year. It will be available in Australia from as early as 2025-26.
    - *Actual zero* emission, renewable, synthetic LPG (rLPG) is derived from green hydrogen production. The only CO_2 expelled when it is consumed is directly equivalent to that captured when it is made – meaning it has a zero impact on the environment and, as such, requires no offsets.
    - BioLPG and rLPG are simple 'drop in' replacements for conventional LPG, requiring no additional capital costs as the same cylinders, pipes and appliances/equipment can be used seamlessly.
    - It is forecasted that rLPG will be available in Australia from the mid-2030s, and modelling predicts that by 2045 bioLPG and rLPG will have replaced all conventional LPG usage in Australia. By 2050, actual zero rLPG will have replaced all LPG uses.
    - By 2050, the LPG industry will have fully abated its current fuel emissions of 1.94 million tonnes CO2-e per year[2].
2. LPG from any production source [3]is a 'drop-in' fuel alternative to diesel fuel in all applications and offers immediate and significant GHG emission reductions.
    - GEA welcomes the utilisation of LCLFs not only in transportation (aviation, rail, maritime and heavy road transport) but also where "non-transport sectors such as mining, agriculture and construction, electrification and in some cases renewable hydrogen, are not an option".[4]

[1] Via hydroprocessing of vegetable oils and fats (HVO)..

[2] 32PJs [32x10^6 60.6kgCO2e/GJ*]

[3] Note that BioLPG, rLPG and LPG are molecularly identical propane, although the production source and relative carbon footprint vary.

[4] Low Carbon Liquid Fuels A Future Made in Australia: Unlocking Australia's low carbon liquid fuel opportunity Consultation Paper

- "Non-road diesel engines currently consume a volume of diesel that is comparable to that of diesel road vehicles, despite there being far fewer engines in use in the non-road sector" and accounted for around 5% of Australia's GHG emissions in 2018.[5]

- When compared to diesel, LPG offers significant emission reductions: on average, approximately 90% reduction in particulate matter, approximately 50% reduction in N_2O and approximately 15% reduction in CO_2.[6]

3. LPG as a maritime transport-shipping fuel

- In displacing diesel, emissions are reduced by 20% immediately by conventional LPG, this transitions to net zero as bioLPG and rLPG.

- Australia's most recent bulk-shipping fleet purchases include three vessels designed to run on LPG. LPG's transition to bioLPG and rLPG is seeing increasing uptake as a fuel, both overseas and in Australia.

- LPG is a non-toxic vapour when depressurised, and it is not a greenhouse gas – which means in the event of a fuel spill, LPG presents no environmental risk *unlike other liquid fuels.* It is significantly safer for the marine environment in event of shipping incidents.

- Presents a sovereign benefit by delivering domestic fuel security.

The key opportunities for these renewable LCLF forms of LPG in decarbonising include:

- Transitioning to replace conventional LPG use with net zero bioLPG, sourced as a by-product from domestic biodiesel and sustainable aviation fuel production, from 2025-26.

- Transitioning to phase-in renewable, actual zero synthetic LPG by the mid-2030s.

- Replacing all conventional LPG use with bioLPG and rLPG by 2045, and solely rLPG by 2050.

- Throughout this transition, replacing many uses of natural gas, including residential, commercial and industrial (including agriculture) with renewable and actual zero synthetic LPG.

- Replacing many uses of diesel, especially in regional and/or agricultural settings, with renewable and actual zero synthetic LPG.

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[5] DCCEEW (2022), Non-road diesel engines – cost benefit analysis: final report, Department of Climate Change, Energy, the Environment and Water, Canberra.

[6] Multiple sources including:
DCEEW (2023) Australian National Greenhouse Account Factors, Department of Climate Change, Energy, the Environment and Water, Canberra;
United States Department of Energy (nd), Propane Emissions, Alternative Fuels Data Centre. https://afdc.energy.gov/vehicles/emissions-propane;
United State Energy Information Administration (2023), Environment, Carbon Dioxide Emissions Coefficients by Fuel. https://www.eia.gov/environment/emissions/co2_vol_mass.php

The policy framework to enable this transition is critical.

- Governments should move to give the LPG industry and others confidence to invest in these new technologies, and
- To ensure Australia is ready to reap the benefits of the transition as soon as bioLPG becomes available over the coming few years.

Gas Energy Australia's engagement with Government

Having engaged directly with the Australian Government Department of Industry, Science and Resources, Department Climate Change and Energy, and the Department for Infrastructure and Transport, relevant Ministers and Shadow Ministers, as well as state and territory governments, GEA has provided seminal research undertaken by Frontier Economics on LPG's path to zero emissions.

This research has identified no fewer than eight pathways for LPG to decarbonise that are clear, commercially viable and relatively easy. This enables LPG to assume a unique position within the gas, and broader energy sector and, indeed, in comparison to many sectors.

LPG supply can begin this transition as soon as 2025-26, offering governments another important string in their bow to deliver on 2030 targets and beyond. We see these developments as complementary to government objectives in shifting to renewable energy, while offering customers diversity in choosing the zero energy sources that suit their settings.

As a distributed fuel, LPG is vitally important in regional areas and, therefore, the renewable gas alternatives detailed in this submission assume greater significance for regional and remote communities heavily reliant on distributed energy. In many instances electrification is not an option in these settings.

Importantly, we have made it clear to all governments – and do so again here – that *the LPG sector is not seeking any government funding*. That is, we require no subsidies, seed or project funding or the like to facilitate the transition.

We simply seek a level playing field. That is, recognition and inclusion of bioLPG, rLPG and rDME as renewable fuel technologies in the array of government considerations, programs and mechanisms so homeowners, businesses and industries can choose the path to zero best for them.

GEA has been, and remains, directly and positively engaged in development of Victoria's Gas Substitution Roadmap. We have taken heart from the positive inclusion of LPG in the December 2023 Update to the Roadmap and the Victorian Government's decision that the 1 January 2024 ban on natural gas connections in new residential and commercial sites does not apply to LPG.

Given LPG's demonstrable path to decarbonisation, LPG was expressly exempted from the ban. Further, the January 2024 announcement by the Victorian Government of levies for homeowners and businesses to instal natural gas in existing premises ($2,400 and $31,000 each, respectively) exempts LPG.

Our positive engagement with Victoria sees these developments as an 'open door' to LPG's unique proposition and applicability for homes, commercial and industrial businesses (including farms), as well as recreational uses.

Similarly, LPG is exempt from the ACT Government's announced ban on new gas connections in greenfield sites.

Pleasingly, work towards this recognition is also underway with GreenPower's Renewable Gas Certification scheme (i.e. the NSW Office of Energy and Climate Change). GreenPower advises that it is developing Stage 2 of the Renewable Gas Certification scheme with the live option of including bioLPG, rLPG and rDME.

GEA has been working, and continues to work, with NSW on developments, technologies, rules, carbon intensity and certificate trading mechanisms to this end.

GEA engaged in the development of Tasmania's Future Gas Strategy, with the Strategy recognising LPG's transition to renewable alternatives, as well as the important role and contribution LPG plays in that state with LPG having a higher presence in homes than natural gas.

BioLPG, rLPG and rDME are LCLFs

BioLPG, rLPG and rDME exemplify a production case in which multiple, renewable products, for different applications, can be produced through the same production facility.

These liquified gas products are *complimentary to the production of other LCLF fuels,* including sustainable aviation fuel (SAF), biodiesel, renewable kerosene, and biomethane.

These gases can be produced from the same feedstocks, in the same facilities alongside other LCLF fuels as deliberate and high-value byproducts suitable for sale to existing markets and for use in existing LPG gas equipment.

For example, bioLPG is a by-product of biodiesel and SAF production using the Hydrotreated Vegetable Oil (HVO) production method. This by-product represents 10% of total Biodiesel/SAF production. This represents the low-hanging fruit, in that, these will be major new industries for Australia and the by-product of bioLPG is a clear opportunity for Australia to responsibly capitalise upon.

As the CSIRO's *Sustainable Aviation Fuel Roadmap* (August 2023) makes clear, there is enough feedstock in Australia to supply approximately 5 billion litres of SAF production every year. This task, according to the CSIRO, would ultimately be shared among some 15 biorefineries producing bioLPG as a byproduct.

While Australia is late to the opportunities SAF provides, there has been a 33,000% increase in exports of Australian used-cooking oil over the last two years to service international SAF producers.

It is estimated that Australian airlines will need around 6 billion litres of SAF each year, while the local companies developing SAF will also be eyeing expansion into export markets. While the HVO process will not be the only means to produce SAF, Australia boasts ample feedstock that can be drawn upon, meaning there will be a lot of Australian-produced bioLPG over coming years.

Comparison of GHG emissions: diesel, biodiesel, LPG and bioLPG in non-transport applications

LPG has for many years been a viable alternative for diesel, with a significantly better emissions profile. Biodiesel and bioLPG have a similar relationship.

Nitrogen oxide compounds (NO_x) and particulate matter (PM) have been "recognised as the most important air pollutants associated with diesel engines, and many studies have quantified their health impacts."[7]

Biodiesel is considered to have lower CO_2 emissions than petroleum diesel (~70%), and is assumed by the Australian National Greenhouse Accounts Factors to provide zero CO_2 emissions (on balance), *however* when actually consumed, biodiesel "emissions of criteria pollutants, such as NO_x, are comparable to those of diesel". [8]

When compared to diesel (and thus biodiesel) in use, LPG (and thus bioLPG) offers actual emission reductions[9] of:

- >90% reduction in PM
- Approximately 50% reduction in N_2O
- Approximately 15% reduction in CO_2

BioLPG or rLPG is *molecularly* identical to traditional LPG, and can be produced from the same sources and facilities as biodiesel. It presents another production stream, both complimentary and alternative to biodiesel for transport or non-transport needs.

LPG Use in Australia

To appreciate the opportunities bioLPG, rLPG and rDME provide to homeowners, businesses and governments, it is important to understand how LPG is used in Australia today.

LPG use is, perhaps, more prevalent than many think. Looking at the baseline data provided by the Australian Bureau of Statistics' *Environmental Issues: Energy Use and Conservation, March 2014*, it showed that 1,775,000 homes (56% in regional areas) relied on LPG for indoor cooking, hot water and heating. This was the last time ABS reported the data.

However, as the state-by-state Tables from the Department of Industry, Science, Energy and Resources *2021 Residential Baseline Study* below show, demand for in-home uses of LPG has consistently grown year-on-year across all jurisdictions except Tasmania.

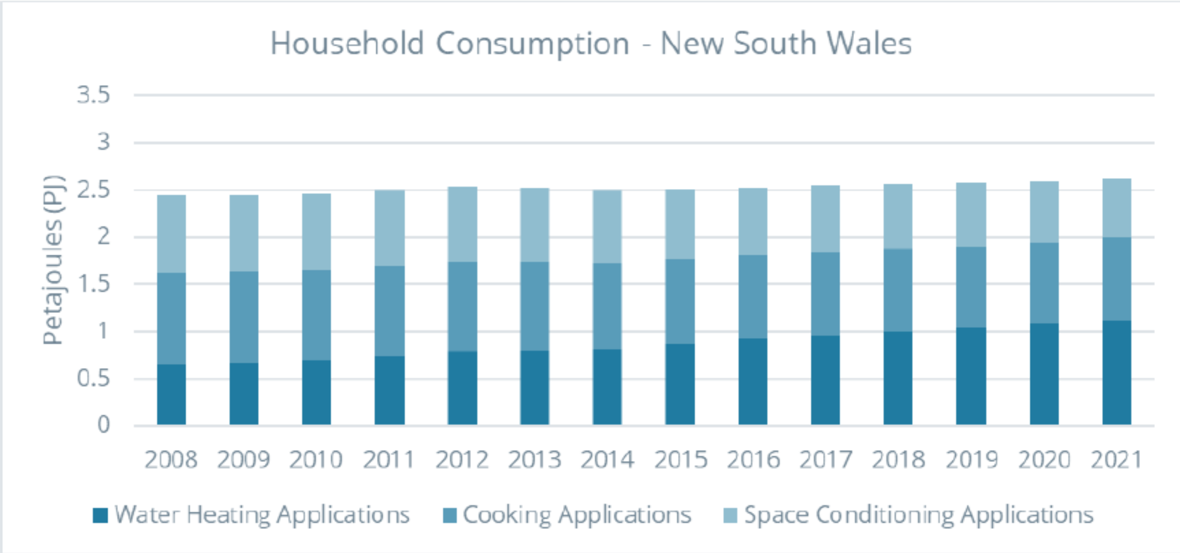
Comparing the average use by household in each jurisdiction to account for local demands, in 2021 more than 2,026,450 Australian homes relied on LPG for indoor cooking, hot water

[7] DCCEEW (2022), Non-road diesel engines – cost benefit analysis: final report, Department of Climate Change, Energy, the Environment and Water, Canberra.

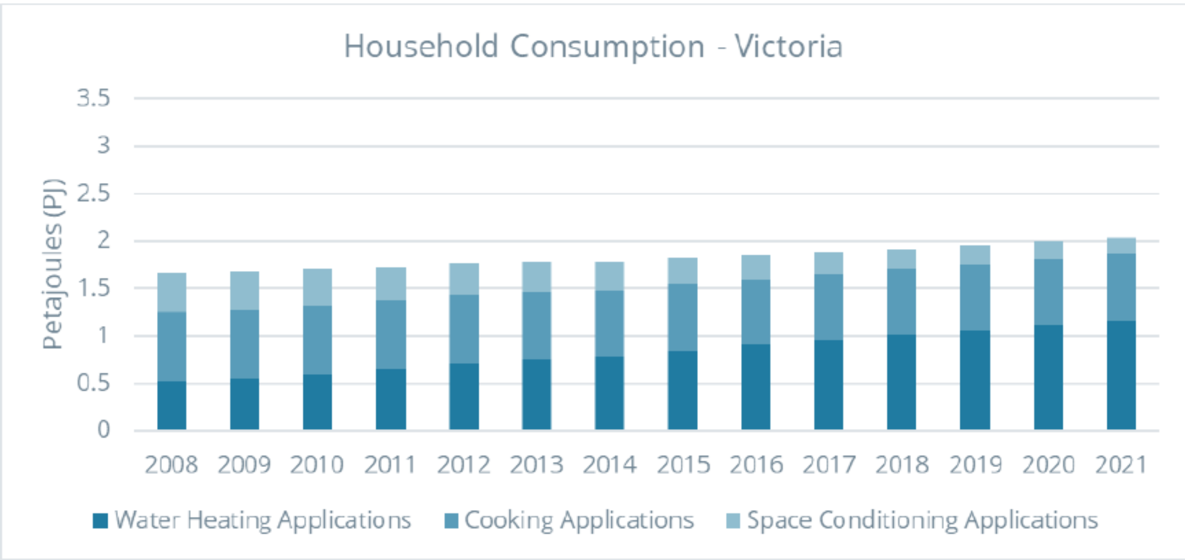
[8] Cummins Inc (2022) Comparing Emission Reductions Across Alternative Fuels, Global Power Technology Leader. https://www.cummins.com/news/2022/10/03/comparing-emission-reductions-across-alternative-fuels

[9] Multiple sources:
DCEEW (2023) Australian National Greenhouse Account Factors, Department of Climate Change, Energy, the Environment and Water, Canberra;
United States Department of Energy (nd), Propane Emissions, Alternative Fuels Data Centre. https://afdc.energy.gov/vehicles/emissions-propane;
United State Energy Information Administration (2023), Environment, Carbon Dioxide Emissions Coefficients by Fuel. https://www.eia.gov/environment/emissions/co2_vol_mass.php

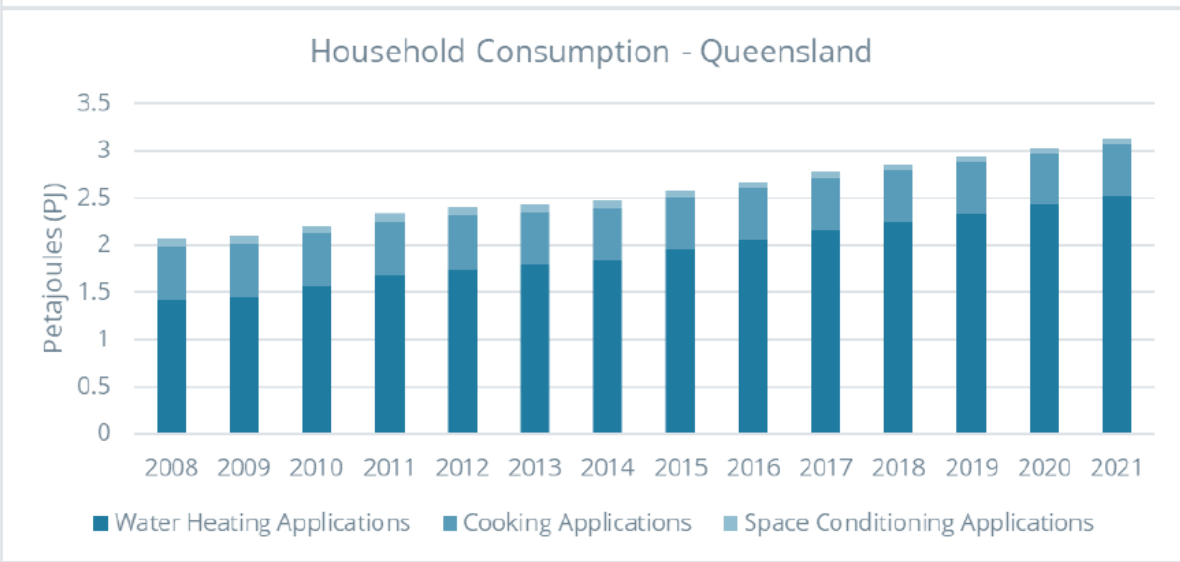
and heating. This does not include the ACT, which is omitted in the report due to the concentration of providers in that marketplace.



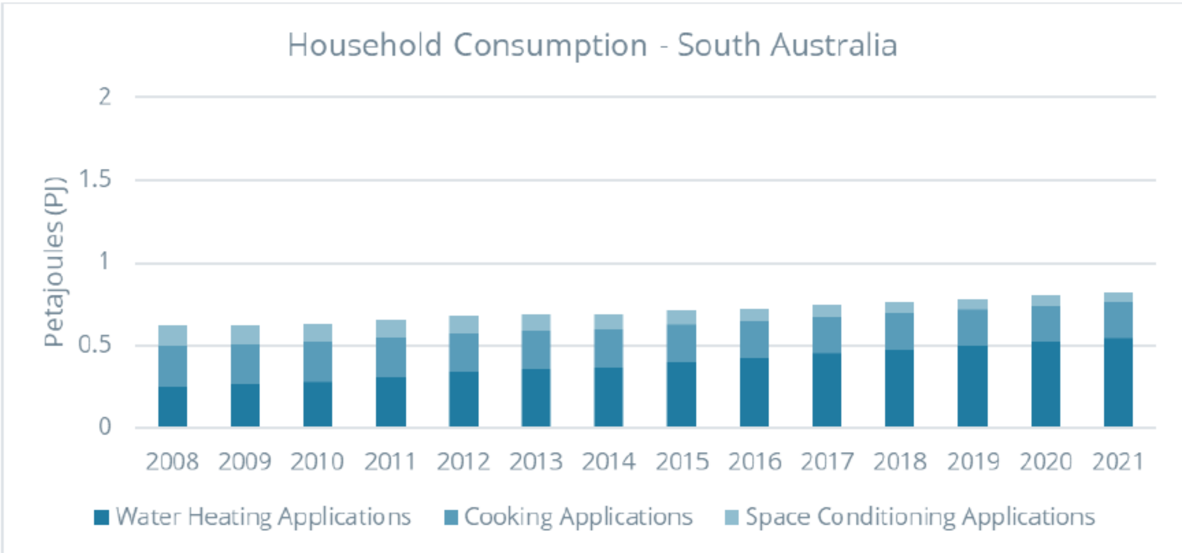
New South Wales: The reliance on LPG has grown steadily since 2008, with 532,000 households (almost 16% of all homes) now utilising it for in-home cooking, hot water, and heating. The continuous growth underscores the confidence placed in LPG as a dependable energy source across the state.



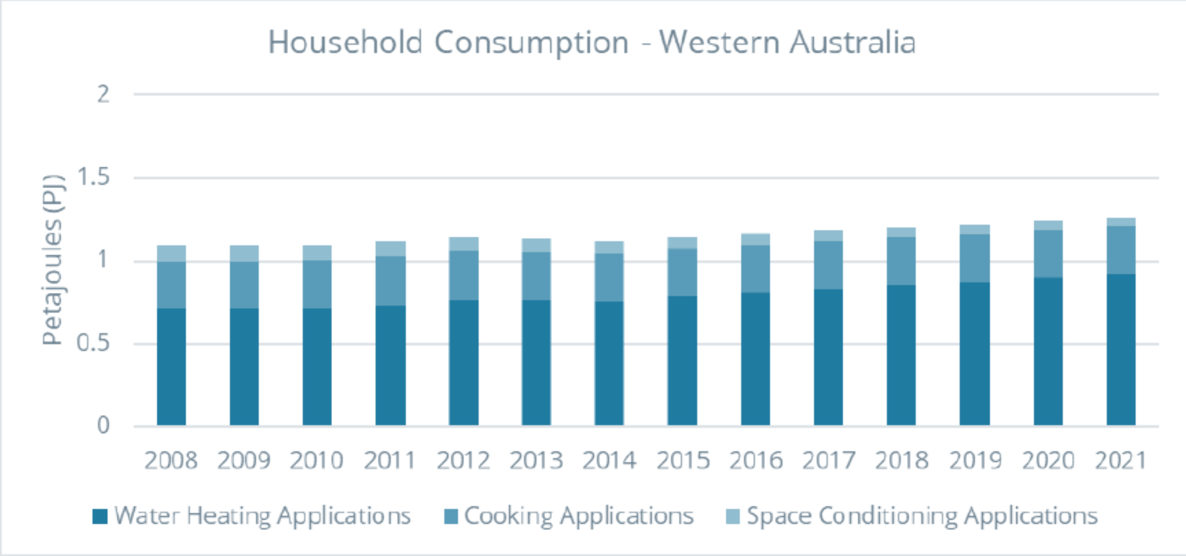
Victoria: In 2021, 356,600 Victorian households (more than 12.5% of all households) relied on LPG for indoor purposes. The widespread use of LPG has established it as a fundamental energy source, supporting various household needs.



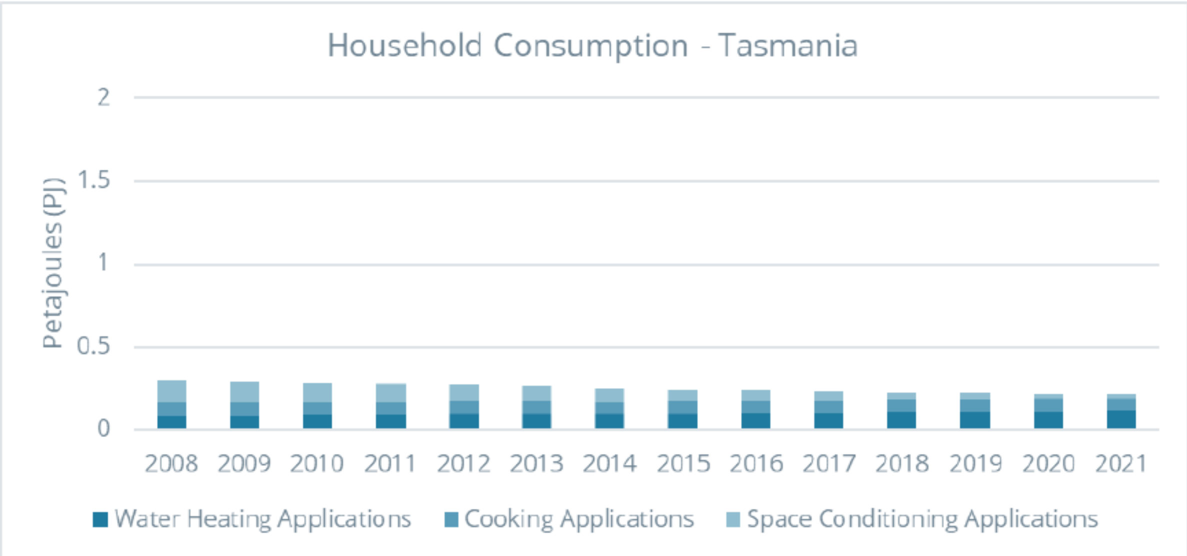
Queensland: Queensland boasts the highest reliance on LPG among Australian states, with 607,000 households (over 27.5% of all homes) embracing it for their energy needs. This demonstrates the integral role LPG plays in sustaining a significant portion of Queensland's households with reliable energy solutions.



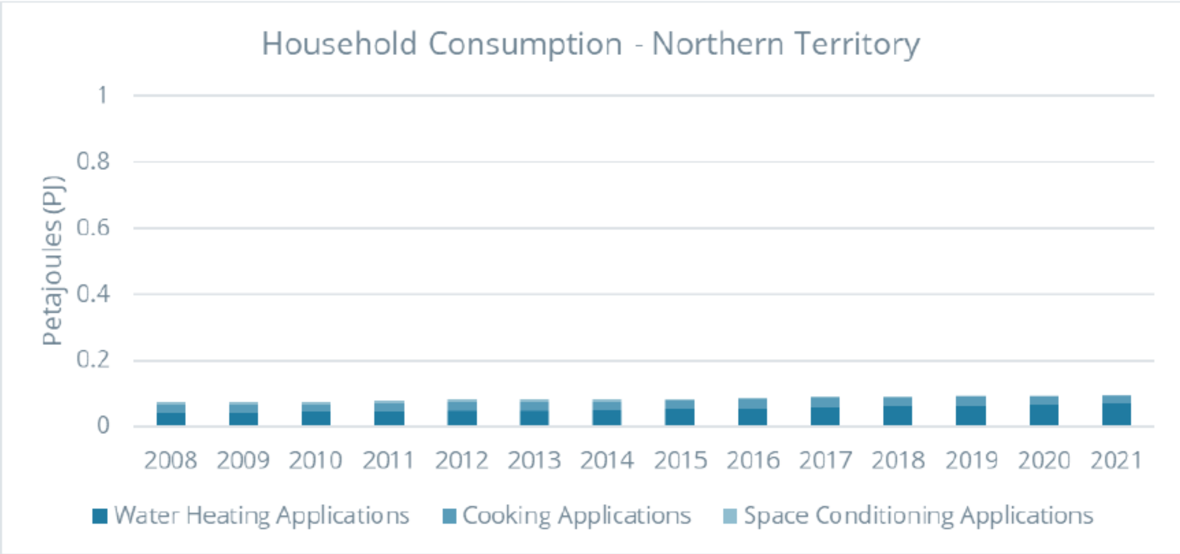
South Australia: LPG's versatility and efficiency are evident in South Australia, where 153,700 households (19% of all homes) benefit from its usage. This indicates a substantial portion of the population recognising and embracing LPG for its reliability in meeting various energy demands.



Western Australia: LPG is a prevalent choice, with approximately 327,000 households – or over 28% of homes – relying on it for their energy requirements. This significant number reflects a consistent upward trend in LPG adoption, highlighting its importance in the state's energy landscape.



Tasmania: Despite its smaller population, Tasmania showcases a notable presence of LPG usage, with 29,000 households (over 11% of all homes) depending on it for essential energy services. The utilisation of LPG in Tasmania underlines its role in catering to diverse household needs across different regions.



Northern Territory: 20,703 NT homes use LPG for in-home cooking and hot water – 21.5% of all homes across the Territory.

LPG is, typically, relied on due to the absence of mains natural gas and/or electrification not being applicable to needs. Further applications include:

- Commercial: space heating, water heating, commercial kitchens (restaurants, cafes, clubs, fish and chip shops), hospitals, schools, catering vans, and increasingly as shipping fuel.
- Industrial: process heat for manufacturing (ovens, furnaces) for metal processing, as well as feedstock (glass, plastic, metals, fertilisers, pharmaceuticals, to list just a few).
- Agricultural: power equipment (i.e. water pumps) and heating (crop drying, animal rearing, greenhouse heating).
- Recreational: 6 million BBQs, 72,000 campervans, 669,400 caravans, as well as camping equipment, boating, outdoor heating and hot-air ballooning.

In all, there are more than 20 million LPG cylinders in circulation across Australia, servicing these sectors every day.

All can easily be changed to bioLPG and/or rLPG as 'drop in' replacements for conventional LPG. That means no extra capital costs to homeowners, businesses or anyone using it. Existing cylinders, pipes and appliances require no changes.

Similarly, rDME can be blended with LPG, bioLPG or rLPG without any changes to equipment, providing another element of renewable flexibility.

LPG in the Australian Economy

Australia produced 6,234 million litres of naturally occurring LPG and 335 million litres of refinery-produced LPG in 2021-22. In the same year, Australia exported 2,577 million litres and imported 760 million litres of LPG.

Import and export terminals around the Australian coast support LPG trade into and out of Australia. Australia exported 80 PJ of LPG in 2021-22. The location of major LPG export facilities in Australia includes Westernport (Victoria), Port Bonython (South Australia), and Kwinana and Dampier (Western Australia). These facilities can handle Very Large Gas Carriers typically used for the international shipping of LPG.

A key piece of national infrastructure is The Cavern at Port Botany in NSW, which is located 130 metres below the surface and has storage capacity for 65,000 tonnes of LPG – enough to heat 350,000 homes for a year.

The Carven acts as an importer/exporter for the east coast of Australia. Through this facility Australia supplies New Zealand and the Pacific Islands nations with LPG. In addition to its import/export value to Australia, its storage capacity represents a vital energy security safeguard for Australia and the region.

While Australia produces more LPG than it can currently use, around 34 PJ of LPG was imported into Australia in 2021-22, mainly through the Port Botany facility.

With Australia being a net exporter and producing enough LPG to be self-sufficient, these imports occur due to the commercial costs associated with freighting LPG internally. In short, it is cheaper to import LPG than transport it across Australia.

LPG use by industry was 55 PJ in 2021-22. There are multiple uses for LPG in Australia, with traditional use the most prevalent, comprising residential (water heating, space heating and cooking), recreational, commercial (e.g. commercial kitchens, forklifts) and industrial uses (e.g. steam-raising, kiln firing and food processing).

LPG for the traditional market is mainly propane to meet domestic and industrial heating specifications.

It is also a growing part of the national economy. As reported in ACIL Allen's *Economic Contribution of the Australian Gas Economy 2021-22*, LPG drove over $5 billion in domestic economic activity (up from $3.6 billion the previous year), while supporting 20,516 Australian jobs (up from 16,154 a year earlier).

Examples for LPG to Achieve Net Zero & Actual Zero Emissions

BioLPG:

- Derived from plant and vegetable waste.
- Derives as a byproduct of biodiesel and/or SAF production using the HVO process.
- Identical to LPG. A simple ‘drop in’ replacement.
- Same storage, transport infrastructure and appliances. No change. No additional capital costs.
- Net zero as an 80% renewable gas.
- Potential to be actual zero as related sectors (i.e. transport) reduce their emissions.

rLPG:

- Synthetically produced from green hydrogen and CO_2 taken from the atmosphere.
- Identical to LPG. A simple ‘drop in’ replacement.
- Same storage, transport infrastructure and appliances. No change. No additional capital costs.
- Is an actual zero gas – that is, the only CO_2 expended in its use is what was captured in its creation. No offsets are required.

rDME:

- Derived from methanol.
- Chemically similar to LPG (propane and butane).
- Can be blended with LPG, bioLPG and/or rLPG with no change to appliances.
- Derived from gasification and catalytic synthesis or electrolysis (i.e. green H2) and catalytic synthesis.
- As described above, it is net zero, but can be actual zero as related sectors (i.e. transport) reduce their emissions.

Timeline for Transition

Internationally, the transition is already well underway.

Case Study 1: BioLPG Consumption - Europe

> Europe is by far the largest consumer of HVO in the world presently and it is forecast that demand for HVO will only continue to grow throughout the 2020s. A high proportion of demand is driven by the transport sector, with bioLPG being made available at petrol stations and bioLPG vehicles operating in a number of jurisdictions.

BioLPG is also increasingly being made available for purchase in cylinders for a range of off-grid leisure activities as well as industrial heating. In partnership with SHV Energy, Circle K in Sweden since mid-2020 has provided 100% bioLPG cylinders across all its stores.

Rural and regional homes and hospitality venues across the UK and Ireland are also increasingly adopting bioLPG for use in their kitchens as well as for water heating and space conditioning functions. Examples include Montalto Estate and BrookLodge & Macreddin Village in Ireland.

BioLPG has also emerged as an important energy source in the industrial sector. For example, La-Roche-Posay in France became the first industrial site in France to use bio-LPG in 2018. Since 2019, the facility now emits no greenhouse gas emissions, with the switch to bioLPG representing the last step towards carbon neutrality.

Source: Frontier Economics, Pathway to Zero Emissions for LPG, 2023.

Further, the emergence of Biodiesel and Sustainable Aviation Fuel (SAF) are growing internationally.

Technologies for LPG to Decarbonise

The modelling undertaken by Fronter Economics in *Pathway to Zero Emissions for LPG* (January 2023), details eight distinct paths for the LPG sector to decarbonise, charting a clear, commercially-viable and relatively easy transition to net zero renewable gas (over the short-term) and actual zero renewable gas (from the mid-2030s).

The technologies to achieve these outcomes are clear.

1. Hydrotreating. Converts vegetable oils (seeds and waste) to biodiesel, SAF and other hydrocarbons by combining them with H2. This process produces BioLPG as a by-product up to 10% of production volumes. A ready-made First-Generation replacement for cLPG.
2. Gasification and Fischer-Tropsch: Synthetic gas from H2 and organic carbon through a thermochemical process, converting syngas into liquid hydrocarbons – all from municipal waste, sewage, food waste, crop residues, waste water, straw and manure. This would typically be used for biodiesel and SAF – with up to 10% of output producing rLPG as the by-product.
3. Gasification with Methanation: Similar to gasification with F-T above, rLPG is produced from the production of syngas, sourced from bioenergy feedstock, for a liquid fuel. Methanation involves the reaction of H2 and carbon dioxide in syngas at high heat and pressure to produce water and hydrocarbons. Sourced from a range of waste streams, sewage, agricultural/municipal waste, food waste, crop residues, waste water, straw and manure.
4. Oligomerisation: Converting methane into hydrocarbons to produce BioLPG.
5. Digestion: Using the digestion of organic matter to produce biogas. Then apply the FT process to produce hydrocarbons to produce rLPG (propane and butane).

Sourced from a range of waste streams, sewage, agricultural/municipal waste, food waste, crop residues, waste water, straw and manure.

6. Pyrolysis: Similar to gasification, but at lower heats to produce bio-oil (not syngas). Hydrotreating the bio-oil produces liquid fuels, including bioLPG. Again, sourced from a range of waste streams, agricultural/municipal waste, food waste, crop residues, waste water, straw and manure.
7. Fermentation: Involves microorganisms fermenting sugars to produce bio-based isobutene, to produce a component of rLPG. Using sugars and starch from cellulose.
8. Power-to-X: producing green H2 using renewable power, then synthesizing the H2 with carbon dioxide (for instance using the F-T process) to produce liquid hydrocarbons, including rLPG. Sourced from renewable electrolysis (H2 from H2O) and CO_2 capture.

rDME Development

- Derived from methanol. Produced from a wide range of bioenergy and renewable feedstock – human and agricultural wastes.
- Chemically similar to propane and butane – same storage and transport infrastructure.
- Can be blended with LPG, bioLPG or rLPG with no change to appliances or equipment.

The assumed pathways to produce rDME include:

1. Gasification and catalytic synthesis: DME produced from syngas via two steps: methanol synthesis from syngas via hydrogeneration and the water-gas shift, followed by the dehydration of methanol to produce DME. rDME is produced when syngas comes from bioenergy feedstock.
2. Electrolysis and catalytic synthesis: Similar to the above, except methanol is produced from carbon dioxide and green H2 powered by renewable energy to produce rDME.

Both pathways have the potential to produce rDME with zero emissions. rDME has been commercially available in the US since 2021 and retailers since 2022.

Case Study 2: rDME in the United States

A world-first project, from mid-2021 Oberon Fuels began producing rDME in San Diego, California. RDME is now commercially available for consumption in the United States, with retailers such as Suburban Propane making rDME available to consumers since 2022*.

Update: Oberon is making rDME from renewable feedstocks, like biogas and organic wastes, supplying LPG firms worldwide. Using the Oberon process, and depending on the feedstock, they are delivering rDME fuel with a 60% lower carbon intensity (CI). However, they are also delivering negative carbon intensity (CI) rDME. The California Air Resources Board (CARB) estimated the Oberon process can make rDME with minus 278 CI.

**Source: Frontier Economics, Pathway to Zero Emissions for LPG, 2023*

LPG Path to Zero

Based on these technologies, there are many combinations for the LPG sector to pursue and achieve zero emissions.

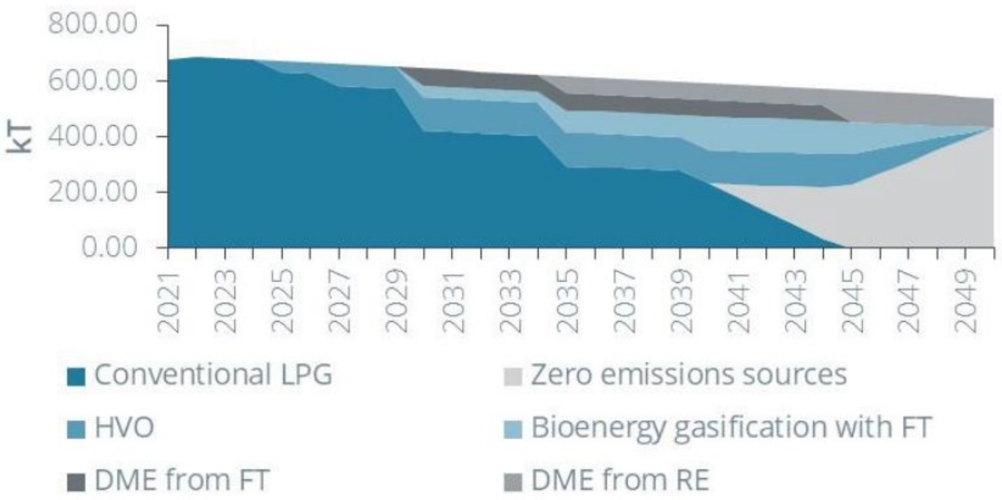
Typically, to achieve net zero energy requires offsets. However, these technology pathways show how LPG, as a closed loop process, can be actual zero. That is, capturing the same CO_2 in its production that is expended when it is used – meaning no offsets are needed.

The Frontier Economics modelling charts one credible path, comprising of:

1. BioLPG produced as a by-product of biodiesel or SAF through the hydrotreated vegetable oil (HVO) process – from 2025-26.
2. BioLPG produced as by-product of biodiesel or SAF through gasification with the Fischer-Tropsch process – by 2030.
3. rDME produced from biomass blended – by 2030.
4. rDME produced from renewable energy blended – by 2035.
5. rLPG produced through a Power-to-Liquids pathway – by 2035.
6. LPG phased-out and replaced by bioLPG and rLPG – by 2045.
7. Only rLPG in market by 2050.

The assumed transition pathway is illustrated in **Figure 1** below.

Figure 1: LPG transition pathway



Source: Frontier Economics, Pathway to Zero Emissions for LPG, January 2023.

First Cab of the Rank – Biodiesel/SAF from HVO:

Case Study 3: European HVO Production

As of 2021, pure HVO is available in 9 European countries: Belgium, Denmark, Finland, Estonia, Latvia, Lithuania, the Netherlands, Norway and Sweden. For off-road purposes it is also available in Germany, the UK and Switzerland.

In 2019, approximately 1.9 million tonnes of HVO was consumed across Europe where the biggest consumers were France, Norway, Spain and Sweden.

Standalone HVO production capacity is presently around 3.5 million tonnes across Europe, with new production plants and capacities proposed and forecast, this figure is expected to rise. The Netherlands currently has the largest HVO production plant (Neste, Rotterdam) with new production plants also proposed in the coming years in France, Italy, Sweden and Finland.

Co-processed HVO is also prevalent across the continent with a current production capacity of around 1.8 million tonnes (the majority of which is concentrated in Spain).

Source: Frontier Economics, Pathway to Zero Emissions for LPG, 2023.

In Australia, it is expected that bioLPG from the HVO process will come as a by-product of production of biodiesel and/or SAF, as is the case globally. Production and use of Biodiesel and SAF are likely to increase as part of the transition to net zero as transport industries seek to lower their emissions.

At the time of the release of the Frontier Economics modelling, there were two sizeable Biodiesel and SAF projects in the planning for Australia, including:

- **Sherdar Australia Bio Refinery (Qld)**: Sherdar Australia is currently proposing to develop Australia's first biodiesel refinery and storage plant. There is currently no location for the project, however the proposal would cost $600 million, and the site would be able to produce 500,000 tonnes per year of biodiesel and SAF upon completion. Proposed feedstocks for production at the site include animal fats, seed oil and waste greases.[10]
- **BP renewable fuel and green hydrogen project (WA)**: BP is currently proposing to establish a renewable fuel and green hydrogen site in the Kwinana industrial site in Western Australia. The project would involve repurposing a fuel import site to produce 8,000-10,000 barrels of biodiesel and SAF per day from products such as waste oil, tallow and used cooking oil.[11]

Under this assumed transition pathway, bioLPG from HVO becomes available from 2025-26, bioLPG from gasification with FT and rDME from biomass from 2030, rDME from green hydrogen and rLPG from Power-to-Liquids (or synthetic rLPG) by the mid-2030s.

10 Brelsford, *Plans launched for Australia's first renewable diesel, storage complex,* Oil & Gas Journal, 2021.

11 Lewis, *BP targeting renewable fuels and green hydrogen future for former Australian refinery*, Upstream Energy Explained, 2022.

The supply of conventional LPG is steadily phased-out in favour of these net zero and, ultimately, actual zero emission alternatives. All conventional LPG supply is phased-out entirely by 2045. By 2050, zero emission sources are the only sources of supply still in the market.

Since the release of the Frontier Economics modelling in January 2023, additional biodiesel and SAF projects have been announced for Australia. Notably, in March 2023, GEA Member AMPOL entered into a Memorandum of Understanding with ENEOS to explore the production of advanced biofuels at the Lytton refinery in Brisbane. Production has been announced from 2028.

In March 2023, Qantas, Airbus and the Queensland Government announced they will contribute to a $6 million feasibility study to explore the creation of a $400 million ethanol-based sustainable aviation fuel plant in north Queensland.

Clearly, the transition to SAF in Australia is in its infancy, however, the reality is it will grow to be major new domestic industry.

If this production grew to see bioLPG replace all conventional LPG, the abatement would be up to 1.5 million tonnes CO_2-e each year.

Again, as renewable actual zero rLPG replaces all LPG use, the abatement achieved is 1.94 million tonnes CO_2-e per year. Providing flexibility to families, businesses and governments, while alleviating pressure on the electricity grid.

Case Study 4: Teno Power Plant in Chile

The Teno Power Plant is a 45MW facility in Teno, Chile. It is a showcase project by Inersa utilising liquefied petroleum gas (LPG) for electricity generation. It underscores the benefits and significance LPG-powered projects.

LPG to Power projects, like the Teno Power Plant, enable swift deployment without relying on an extensive grid. The plant reduces CO_2 emissions and virtually eliminates SOx and PM emissions compared to traditional liquid fuels, ensuring a cleaner process.

These assume even greater significance as bioLPG and rLPG enter the mix as an alternative back-up to natural gas. But, like natural gas, LPG's flexibility allows for efficient adaptation to changes in the power grid, ensuring a stable energy supply.

Using LPG, the plant responds promptly to grid changes, while marking a transition toward a more sustainable energy future.

The research and development contract between Highly Innovative Fuels and Empresas Gasco is investing US $3 million over six years and has been producing carbon-neutral liquefied gas since 2022.

Source: Teno Power Generation Case Study (fliphtml5.com)

Residential LPG Modelling

Case Study 5: NSW Homes

Some 532,000 NSW homes use LPG for in-home use (cooking, heating and hot water). The modelling below assumes a 50% premium in the wholesale cost for bioLPG.

Here the Frontier Economics modelling looks at the relative cost and emissions profiles comparing those replacing their LPG appliances with high-efficiency electrical appliances or cheaper, less efficient electrical appliances.

Switching to High-Efficiency Electric Appliances: Considering energy bills and appliance costs, continuing to use LPG appliances remains lower cost for the representative household, in Dubbo NSW, until the 2040s, when using LPG appliances and using electrical appliances are very similar in cost.

This scenario shows total emissions are only marginally lower if using high-efficiency electrical appliances.

- Result: The household would incur $11,871 in upfront costs, save $649.36 on annual bills and reduce emissions by a mere 284kg per year (or 5.4kg per week, less than the volume of typical BBQ cylinder).

This means, if homeowners are prepared to pay for all high-efficiency electrical appliances in their home, it would take more than 14 years to get a return on investment, for a very small reduction in their CO_2 output.

Given switching to these electrical appliances only abates 2.84 tonnes of C02 over a 10-year period, the price of carbon abatement is $707.81 per tonne, which is 20-times higher than the average price per tonne of buying Australian carbon credit units.

It makes for very expensive and inefficient carbon abatement.

Switching to Cheaper, Less Efficient Electric Appliances: Faced with these costs, people might think if they opt for cheaper, though less efficient electrical appliances, they're still doing the right thing. But they'd be wrong. Emissions are actually lower if they stick with LPG appliances.

- Result: The household would incur $6,520 in upfront costs, save $347.41 on annual bills, while actually increasing their emissions by a substantial 640kg per year.

In this scenario, emissions from LPG appliances are significantly lower, which means switching to electrical appliances actually increases emissions.

Again, this scenario dispels the notion that electricity is, by default, cheaper and lower emitting than LPG.

The timeline covers the coming decade. However, with the emergence of actual zero emissions technologies for rLPG users replacing cLPG by the mid-2030s, gas can be lower emitting than electricity. That is, not requiring offsets.

The cost of switching to electrical appliances does not include the costs of likely power supply upgrades (from Phase 1 to Phase 3 wiring), which, depending on appliances can take total outlays up to $42,000 per premise. This was previously modelled by Frontier Economics *Cost of switching from gas to electric appliances in the home*, released in 2022.

An ACT family recently contacted GEA advising that when their ducted gas heater died, they sourced an electrical replacement and were quoted $20,000 to make the switch. They opted to simply replace it with a new ducted gas heater.

Commercial Modelling

Case Study 6: Commercial Applications

Here the Frontier Economics modelling looks at the ability for commercial enterprises to achieve actual zero emissions without replacing their LPG equipment/appliances.

1. Tomato Growers

Approximately 340,000 tonnes of tomato were produced in Australia in the 2020/21 financial year. Of these 340,000 tonnes, roughly 30% of this was grown undercover. That is, 30% of production was in greenhouses or artificially space conditioned structures. Part of the appeal of greenhouse cultivation of tomato is that it is, approximately, 4-times more productive than outdoor cultivation.

As well as sunlight, water and nutrients, optimal tomato growing also requires the right temperature and a supply of carbon dioxide to provide the optimal carbon dioxide levels inside the greenhouse.

Greenhouses for growing tomatoes are often located in regional and rural areas away from natural gas networks, and so rely on LPG for both heating and the supply of carbon dioxide. LPG is a preferred input for tomato growers because the boiler can be used to produce carbon dioxide, so that carbon dioxide does not need to be purchased from a third party.

Diesel boilers cannot be used to produce carbon dioxide for toxicity reasons. LPG is also a preferred input for tomato growers as a result of the lower cost of LPG compared to liquid fuels.

A typical commercial greenhouse growing tomatoes consumes 1,000 tonnes of LPG per year – 1,000 tonnes of LPG is equivalent to 47,519 GJ of energy.

Under the case with conventional LPG with no transition, this annual consumption of LPG results in approximately 3,364 tonnes of CO_2e per year. Extrapolated out over the modelling period and assuming constant consumption, this results in emissions of 3,364 tonnes of CO_2e per year every year over the modelling period.

With respect to the emissions under the LPG transition pathway case, emissions are also initially 3,364 tonnes of CO_2e per year. However, as low and zero emissions sources of LPG are integrated into the supply mix, the emissions intensity and consequently total emissions from LPG consumption for the tomato grower begin to decline.

By 2050, estimated emissions from LPG consumption for the tomato grower are zero, consistent with the transition scenario detailed in this submission, in which zero emissions sources are the only sources of supply in the market by 2050.

In the assumed transition path, these zero emissions sources are rDME produced from renewable energy blended with rLPG produced through a Power-to-Liquids pathway.

Figure 1 shows the relative emissions per year from LPG consumption for the tomato grower under the respective scenarios modelled.

Figure 1: Tomato grower – emissions per year (CO_2e)

Source: Frontier Economics, Pathway to Zero Emissions for LPG, 2023 – Commercial Case Studies.

Tomatoes are not the only agricultural good produced in Australia in greenhouses. Other popular, widely produced goods include cucumbers, leaved greens, mushrooms and capsicums.

Given LPG is a popular source of energy for greenhouse cultivation of these agricultural products, a feasible transition path for LPG to low and, ultimately, zero emissions are critical for enabling these industries to continue to exploit the benefits of LPG.

2. Regional Hospital

A common-use case for LPG by commercial customers is a regional customer that is using a 10 MW boiler for heating purposes. This could be for agricultural use, but we will consider a case of a regional hospital using the boiler for heating purposes.

Customers using LPG boilers for heating purposes are generally in regional areas in which natural gas is not available. In the absence of natural gas, customers would generally have chosen LPG for heating as a result of the lower cost of LPG compared to liquid fuels or electricity.

A 10 MW boiler operating at a capacity factor of 30% will consume close to 100,000 GJ of LPG each year.

Under the case with conventional LPG with no transition, this annual consumption of LPG results in approximately 6,835 tonnes of CO^2e per year. Extrapolated out over the modelling period and assuming constant consumption, this results in emissions of 6,835 tonnes of CO_2e per year every year over the modelling period.

With respect to the emissions under the LPG transition pathway case, emissions are also initially 6,835 tonnes of CO_2e per year. However, as low and zero emissions sources of LPG are integrated into the supply mix, the emissions intensity and consequently total emissions from LPG consumption for the regional hospital begin to decline.

By 2050, estimated emissions from LPG consumption for the regional hospital are zero, consistent with the transition scenario detailed in this submission, in which zero emissions sources are the only sources of supply in the market by 2050.

In the assumed transition path, these zero emissions sources are rDME produced from renewable energy blended with LPG produced through a Power-to-Liquids pathway.

Figure 2 shows the relative emissions per year from LPG consumption for the regional hospital under the respective scenarios modelled.

Figure 2: Regional hospital – emissions per year (CO_2e)

Source: Frontier Economics, Pathway to Zero Emissions for LPG, 2023 – Commercial Case Studies.

3. <u>Hospitality Business/Commercial Kitchen</u>

There is considerable heterogeneity within the hospitality sector with respect to the consumption of energy. The type of restaurant (e.g. restaurant, hotel) size of the enterprise (e.g. small café, large convention centre or hotel) and the climate all influence LPG consumption.

Commercial hospitality customers using LPG are generally in regional areas in which natural gas is not available. In the absence of natural gas, these customers would generally have chosen LPG either as a result of a preference for the quality of LPG cooking over electric cooking or as a result of the lower cost of LPG compared to liquid fuels or electricity.

For the purposes of this case study, it is assumed that the representative commercial business is a commercial kitchen that uses 100 GJ of energy from LPG per year.

This figure is derived from a recent report by Energy Consumers Australia examining the retail energy tariffs for small and medium enterprises in Australia (Alviss Consulting and Energy Consumers Australia, *Analysis of small business retail energy bills in Australia*, 2022).

Under the case with conventional LPG with no transition, LPG consumption equivalent to 100 GJ results in just over 7 tonnes of CO_2e emitted per year. Given consumption is assumed constant over the modelling period, this results in just over 7 tonnes of CO_2e emitted every year for the duration of the modelling period.

With respect to the emissions under transition with zero emission supply scenario, emissions are also initially just over 7 tonnes of CO_2e emitted per year, However, as the low and zero emission sources of LPG are integrated into the market, the emissions intensity and total emissions from LPG consumption for the commercial kitchen begin to decline.

By 2050, emissions from LPG consumption equivalent to 100 GJ per year results in zero emissions under this scenario, consistent with the transition scenario detailed in this submission. Under this transition path, zero emissions sources are the only sources of supply in the market by 2050.

In the assumed transition path, these zero emissions sources are rDME produced from renewable energy blended with LPG produced through a Power-to-Liquids pathway.

Figure 3 shows the results of this case study.

Figure 3: Commercial kitchen (hospitality business) – emissions per year (CO_2e)

Source: Frontier Economics, Pathway to Zero Emissions for LPG, 2023 – Commercial Case Studies.

LPG & Agriculture

Poultry farming is a sector that has always relied on LPG for its heating and lighting needs.

Chicken growing, fuelled by LPG, is expected to reach a revenue of $706.4 million in 2023-24 as reported by IBISWorld. With NSW (34%), Victoria (21%) and Queensland (21%) holding significant market share in these states.

Fruit and Tree Nut growing – specifically, grape growing, is also expected to see a rise in LPG usage as a result of climate variations and changing weather patterns. During the grape-growing season, LPG-powered heaters are used to regulate temperature and protect the crops from the frost.

According to the Australian Wine Industry, more than 90% of vineyards in the state use LPG for machinery and vineyard operations.

LPG is an essential fuel for sheep, beef and cattle, farming in Australia. It is used for livestock sanitation, irrigation, power generation and transport systems.

Grain and crop growing is a critical component of this $1.9 billion sector in Australia's hinterlands. Operators in the industry grow fodder crops such as hay (Cereal hay, Pasture Hay, Lucerne hay), silage and other niche crops, such as peanuts, ginger, coffee, chicory (grazing feed for dairy herds) and lavender.

LPG is used for crop drying, fuelling generators and engines powering irrigation systems, tractors, and other equipment.

Nursery and Floriculture - vegetable farmers (indoor and outdoor) use LPG to provide heat to greenhouses, power boilers and run heaters in individual greenhouses crop areas. The undercover grower's segment is dominated by tomato growers accounting for 83% of production. Some 30% of all tomatoes produced in Australia are via undercover growers.

Under Cover Vegetable Growing in Australia has been growing at an annualised 3.1% over the five years through 2022-23 – including an estimated 5.0% jump in 2022-23 – and is expected to total $960.1 million as reported by IBISWorld.

LPG agricultural applications include:

- Grain drying: high grade heat in large volumes to support post-harvest operations.
- Heating: large area space heating for nurseries, greenhouses, stables and sheds.
- Livestock farming: instantaneous hot water for sanitising livestock processing areas.
- Flame weeding: highly controlled, chemical-free weeding ideal for organic producers.
- Nurseries and greenhouses: CO_2 enrichment to maximise photosynthesis potential.

Clearly, the advent of bioLPG and rLPG represents a major boost to these sectors, enabling them to decarbonise to actual zero, while using the same gas, equipment and production techniques they rely on.

LPG as a Substitute

Displacing Natural Gas

Thus far in this submission we have covered the ability for bioLPG and rLPG to replace existing uses of LPG. This is a simple one-for-one replacement, requiring no additional capital costs for residential, commercial, industrial or recreational consumers.

But what of LPG (and bioLPG and/or rLPG) replacing natural gas?

Replacing natural gas with LPG is also relatively straight-forward and inexpensive.

For example, cooktops are really simple. Assuming pipes are compatible, which they typically are, it's a case of changing jets and rubbers. This represents an incidental change.

For converting natural gas heaters and hot water systems to LPG, again, it's typically not much more complex. But that can depend on the equipment in use:

- Converting jets is required.
- Converting the regulator is required.
- Each conversion is unique. Some may take 5 minutes… some a few hours. It depends on compatibility.
- Compatibility depends on the manufacturer of the heater/hot water system. If they have not allowed for LPG conversions, then there is the possibility of a new system being required. It's a case-by-case situation.
- As the Frontier Economics modelling shows, even if a full replacement is required it costs half as much as converting to electrical appliances (based on appliance and installation costs). Additionally, it saves homeowners potentially tens of thousands of dollars on upgrading to Phase 3 wiring.

As the Queensland Government Department of Natural Resources and Mine's Fact Sheet *Safely converting Natural Gas installations and appliances to LPG* (January 2014) makes clear:

> ***"Q: Can most natural gas appliances be converted to LPG?***
>
> *A. Yes: Most natural gas appliances can be converted but this work must be done by a licensed gasfitter. The gasfitter is responsible for making sure the appliance is suitable, including ensuring the appliance is certified for use on LPG. Some gas appliances are not designed or certified for use on LPG and cannot be converted to LPG."*

Further, the Grattan Institute's *Getting Off Gas* report (June 2023) states:

> *"Ending the widespread use of natural gas in pipelines need not mean an end to the great Australian barbeque. Most outdoor cooking is powered by LPG, which has the advantage of being portable. Continuing to use LPG for barbeques will have minimal impact on Australia's carbon emissions. Using a barbeque for three hours emits 13.4kg of greenhouse gases. To generate a million tonnes annually would require every household in Australia to hold eight barbeques every year. LPG could continue to be used in barbeques until a non-fossil substitute such as hydrogen or synthetic bioLPG is developed.* ***Governments should support LPG companies to develop these substitutes. Where natural gas from pipelines is used, it should be possible for equipment suppliers to develop and sell conversion kits to change these items to burn LPG****."*

We are already seeing this in practise.

Similar to Victoria, the ACT Government's impending ban on new natural gas connections in greenfield residential sites does not apply to LPG. Since the announcement of this decision by the ACT Government in November 2022, LPG in-home installations have gone in at the rate of six per week.

Displacing Diesel

The advent of bioLPG, rLPG and rDME enhances the desirability of consumer-led choice. These renewable gases have the capacity to replace diesel, especially where there is no other viable option, especially in rural/regional settings.

When consumed, LPG produces less particulate matter, and less CO_2, SO_x and NO_x pollutants than diesel. For many stationary engine applications where a diesel tank of fuel is required, LPG is a flexible and efficient energy source. Unlike diesel, LPG does not deteriorate in tanks and does not require water to be drained from the bottom of tanks over time.

Replacing diesel with bioLPG or rLPG has numerous benefits:

- Suitable for fixed diesel installations and vehicles.
- The rate of substitution is typically 30-35% and depends on engine size and application.
- A diesel substitution kit is fitted to the engine without the need to make any modifications.
- The kit can be easily removed and installed on another engine.
- Diesel Substitution Control Units ensure the optimum substitution rate.
- Engine monitoring and data logging systems continuously check engine performance and fuel consumption.

Displacing Marine Diesel

At the 2022 Federal Election, the then Labor Opposition pledged to rebuild Australia's coastal shipping fleet. What will power these vessels? There are two viable options – marine diesel or gas.

LPG yields an immediate 20% reduction in emissions compared to marine diesel. As renewable gases are developed over the next few years, those emissions will plummet to net zero (bioLPG) and, ultimately, actual zero (rLPG).

It has an instant positive impact in reducing emissions now, while preventing the inherent dangers posed by marine diesel ships. If a marine diesel ship were to run aground, collide with another vessel or sink in Australian waters it could be an ecological disaster without parallel for our pristine beaches, waters and the sea life they support.

It would likely have far-reaching and long-term ramifications for local businesses, fisheries, tourism operators, hospitality venues and a host of associated impacts. Such a catastrophe is entirely avoidable. Gas-fueled vessels are clean and, in the event of an incident at sea, the gas can be released, dissipating without environmental impact as it neither slicks nor sediments.

European nations and the US already provide incentives encouraging fuel switching from marine diesel to gas. Across the globe, gas-fueled ships have increased from 18 vessels in 2010 to 936 vessels currently in service and another 876 on order.

Perversely, this means Australia gets the world's clunkers – diesel-powered cruise and freight vessels – navigating through our waters to dock at our shores.

In Australia, three of the most recent acquisitions to the shipping fleet are powered by LPG. These vessels are purchased to be in operation for many decades, with LPG chosen as the fuel of choice given its immediate emissions reductions, but, equally, the ability to switch to bioLPG and, ultimately, rLPG as a 'drop in' replacement, requiring no additional capital costs.

All new vessels in Australian waters, including ferries, should be geared for gas. Supporting such a shift would set-up our maritime sector to achieve net zero in the short-term and actual zero longer-term.

It would also overcome our national reliance on imported diesel-oil, replaced with renewable gases that Australia can produce in abundance. This would deliver genuine fuel security and self-sufficiency, which underpins the point of having a sovereign fleet.

Decarbonising Other Sectors

In addition to LPG's ability to displace natural gas use in homes and general businesses applications, the advent of bioLPG, rLPG and rDME mean LPG can go a long way to helping Australian manufacturing to decarbonise.

<u>Plastics Recycling</u>

Pyrolysis involves heating plastic in an oxygen-free environment, causing the materials to break down to create new liquid or gas fuels (namely bioLPG) in the process.

According to the Australian Government Department of Climate Change, Energy, Environment and Water, one million tonnes of Australia's annual plastic consumption is single-use plastic – 84% is sent to landfill and only 13% is recycled.

Converting plastic waste into bioLPG provides a valuable source of green energy, while addressing the mounting challenges of plastic waste management. It represents a clear win-win for government, the environment and renewable energy generation.

<u>Electricity Generation</u>

Natural gas-fired electricity generation in Australia provides $5.591 billion in economic activity and supports 12,289 Australian jobs. Importantly, as intermittent generating renewables (solar and wind) are more relied on as coal exists the market, gas will become increasingly relied upon to fill the inevitable downtime gaps.

As the Teno Power Plant in Chile Case Study in this submission highlights, bioLPG and, ultimately, rLPG stand to play an important role in decarbonising this much-needed back-up facility.

Chemical Industry

As a feedstock (or ingredient) in modern Australian manufacturing, gas – predominantly natural gas – generates $7.538 billion in economic activity and supports 36,674 Australian jobs.

Gas is a vital and irreplaceable feedstock in the making of many things we need for everyday life, including plastics, fertilisers, pharmaceuticals, rubber, propellants, refrigeration, adhesives, cosmetics.

There is an opportunity for bioLPG and rLPG to replace natural gas in these processes, thereby, dramatically reducing the carbon footprint of manufacturing. These renewable alternatives can reduce reliance on traditional fossil fuels (including diesel), supporting more sustainable production methods.

Construction

Through high temperature manufacturing, gas contributes $5.792 billion in economic activity and supports 29,372 Australian jobs.

Gas – predominantly natural gas – is essential in generating industrial heat for manufacturing, including steel, glass, bricks, ceramics, cement... to list a few. In this process it is irreplaceable given electricity, regardless of how it is produced, cannot generate the 1,300 degree Celsius temperatures required.

The advent of bioLPG and rLPG can see these processes, including cement kilns and curing processes, replace natural gas to contribute to sustainable building practices across a plethora of industries and applications.

The versatile applications of bioLPG and rLPG make them pivotal components in transitioning various sectors toward cleaner energy alternatives, fostering a more sustainable and a low carbon future.

Carbon Abatement Certificates

The introduction of renewable gas certificates for bioLPG, rLPG and rDME enable the trading of carbon abatement certificates, is a significant step towards a more sustainable energy future and GEA fully supports this initiative for several compelling reasons.

The current scheme, as exemplified by Greenpower in NSW, injects renewable gas into the gas network and promotes transparency by requiring producers to submit evidence of gas injection or delivery to end customers, ensuring the legitimacy of Renewable Gas Guarantee of Origin (RGGO) creation.

In the case of bioLPG, rLPG and rDME there would be no difference in the certificate processing, and the concept of a virtual pipeline provided by the tanker and terminal logistics capability in the industry would seamlessly align with the existing framework.

However, GEA recommends a fundamental, logical change to the program. Rather than linking certificates to units of energy (i.e. kWh/GJ), they should be linked to units of carbon abated. The value of these certificates lies in their carbon abatement, not their energy value.

Given that they are traded independently of the energy molecules, it logically follows that certificates must be counted in terms of abatement, not energy. This shift will provide a fair and natural pricing mechanism for carbon emission reduction. Projects with lower carbon intensity (CI) will naturally produce more certificate units than those with higher CI, reflecting their superior environmental impact.

Furthermore, GEA strongly advocates the development of a robust federal scheme that supports bioLPG, rLPG and rDME abatement certificates that are recognised for customers to trade in the safeguard mechanism or any similar scheme. These certificates should be recognised not just for their environmental impact but also for their financial value as traded assets.

This sensible change will incentivise the development of cleaner and more efficient renewable gas projects, which aligns with the Future Gas Strategy and GEA goals of decarbonising the LPG industry. By linking certificates to carbon abatement, we create a clear pathway for carbon reduction, essential for a sustainable future.

GEA strongly supports the introduction of renewable gas certificates linked to carbon abatement units and the development of a federal scheme to recognise their financial value.

It also reduces the costly and time-consuming administrative mess of trading certificates with different values. By pricing a CI score based on quality of carbon units abated, this ensures easy trading.

This approach promotes fairness, environmental responsibility, and economic viability, representing a significant step towards achieving a prosperous and sustainable Australian LPG industry.

Conclusion

GEA’s hopes that, from this submission, there is greater understanding leading to recognition that LPG is different. LPG has a unique value proposition in the energy space, with a vital role to play as a renewable fuel source that can quickly and relatively easily fully decarbonise.

LPG presents a solution to the growing problem of coal-fired power coming out of production, at the same time as renewable sources like solar, wind, etc., struggle to meet expected targets.

While LPG is a relatively small part of the Australian gas landscape, its footprint across the nation is significant – encompassing over 2,026,450 homes, 130,000 businesses, millions of outdoor recreational users, as well as a major exporter – exporting 70% of current production.

LPG’s clear and commercially viable scope to provide flexible, reliable, affordable and secure energy for household, commercial, industrial (including agriculture) and recreational uses, while being net zero emitting and moving to actual zero emitting, is an opportunity.

It can also be a growing part of the national economy. As reported in ACIL Allen’s *Economic Contribution of the Australian Gas Economy 2021-22*, last year LPG drove over $5 billion in domestic economic activity (up from $3.6 billion the previous year), while supporting 20,516 Australian jobs (up from 16,154 a year earlier).

Based on current domestic demand, replacing all conventional LPG with synthetic actual zero rLPG by 2050 would reduce CO_2-e emissions by up to 1.94 million tonnes every year. It would take massive pressure of electricity supply and provide much-needed flexibility in meeting the future energy task.

This can be achieved while continuing to deliver families, businesses and industry the gas they know, trust, can afford and rely on. It also represents an opportunity via exports to assist our trading partners to decarbonise.

Finally, the LPG sector has undertaken to complete this transition without any call on government funding. However, the need for governments to recognise this transition is vital to giving the industry confidence to invest in these renewable technologies.

For More Information

Should you require more information, have questions or wish to discuss any elements arising from this submission, please contact:

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