APA submission – Victorian Gas Substitution Roadmap Consultation Paper

6 August 2021

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Hon Lily D'Ambrosio MP
Minister for Energy, Environment and Climate Change
Minister for Solar Homes

Lodged online

6 August 2021

RE: APA Submission to Victorian Gas Substitution Roadmap Consultation Paper

Dear Minister,

Thank you for the opportunity to comment on the Victorian Government's Gas Substitution Roadmap (the Roadmap) Consultation Paper (Consultation Paper). We support the Victorian Government's consultative approach to determine how Victoria can meet its carbon emissions targets.

APA is an ASX listed owner, operator, and developer of energy infrastructure assets across Australia. Through a diverse portfolio of assets, we provide energy to customers in every state and territory on mainland Australia. As well as an extensive network of natural gas pipelines, we own or have interests in gas storage and generation facilities, electricity transmission networks, and over $750 million in renewable generation.

We support the global transition to a lower carbon future and are actively supporting the energy transition taking place across Australia. To that end, we announced our own ambition of net zero operations emissions by 2050 earlier this year, with a plan to publish interim targets later this financial year.

Our Victorian gas transmission infrastructure is relied on by millions of Victorian households and businesses every day and will play an essential role in helping Australia meet its net zero ambition targets into the future. We welcome the opportunity to participate in this important conversation and look forward to working with the Victorian Government as it develops its thinking in this important policy area.

If you wish to discuss our submission in further detail, please contact APA's Manager Policy, John Skinner, on 02 9693 0009 or john.skinner2@apa.com.au.

Regards,

Rob Wheals
CEO & Managing Director

APA Group

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1 Executive Summary

Key points

- APA supports the transition to net zero emissions. We recently announced our own ambition of net zero operations emissions by 2050.
- Through our Pathfinder Program, APA is supporting the drive to unlock the energy solutions of tomorrow, including through Australia's natural advantages in hydrogen.
- As recent experience in South Australia and Victoria has shown, gas infrastructure plays a critical role in helping maintain system security and will help unlock low-cost renewable generation capacity.
- Continuing to utilise gas infrastructure to support Victoria's decarbonisation can reduce emissions at a lower cost to Victorian consumers than electrifying the services provided by gas.
- Decarbonisation of the Victorian economy should be considered as a whole, rather than on an industry-by-industry basis.

APA is a leading Australian Securities Exchange (ASX) listed energy infrastructure business. Consistent with our purpose to strengthen communities through responsible energy, our diverse portfolio of energy infrastructure delivers energy to customers in every state and territory on mainland Australia.

Our 15,000 kilometres of natural gas pipelines connect sources of supply and markets across mainland Australia. We operate and maintain networks connecting 1.4 million Australian homes and businesses to the benefits of natural gas. And we own or have interests in gas storage facilities, gas-fired power stations.

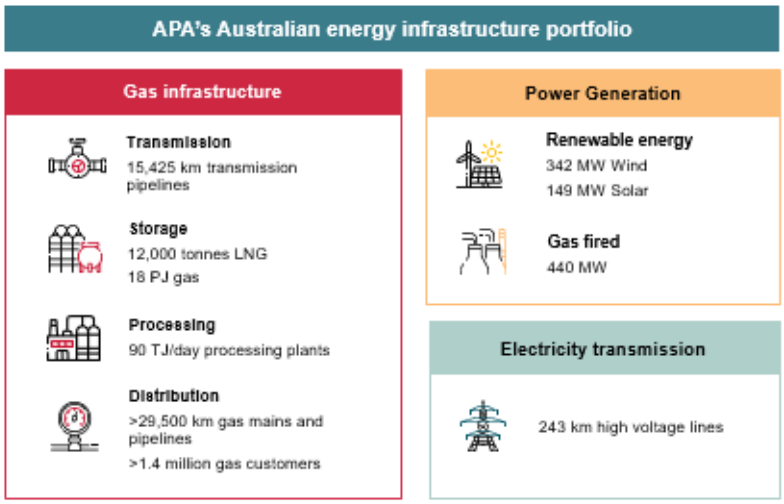

Figure 1

Our investments also include over $750 million in renewable generation, while our high voltage electricity transmission connects Victoria with South Australia and New South Wales with Queensland.

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APA is supporting the transition to a lower carbon future. Our ambition is to achieve net zero operations emissions by 2050. Through our Pathfinder Program, we are investigating how hydrogen and other technologies such as batteries and microgrids, can support a lower carbon future.

We support the Victorian Government's consultative approach to determine how Victoria can meet its carbon emissions targets and look forward to working to working with the Government as it develops its thinking in this important policy area. APA is actively involved in each of the deep dive investigations supporting the Roadmap, including the work being done by Infrastructure Victoria.

Victoria has a unique energy mix compared to the other states in Australia, given its reliance on gas. For many decades, gas has been the most affordable and reliable source of energy for many functions, including hot water heating, space heating and industrial uses. In the cold Victorian winters, for example, gas provides more than twice as much energy as electricity.

Gas infrastructure has an essential role to play in helping Australia meet its net zero ambitions targets. As the penetration of variable renewable energy sources, such as wind and solar, increase, and aging coal power stations retire, Gas Powered Generation (GPG) will play a critical role in meeting electricity demand and maintaining the security of the system.

Electricity generation accounts for approximately 45% of Victoria's overall net emissions, with 96% of electricity generation emissions coming from three brown coal power stations. Not only does GPG's flexibility make it a perfect complement to variable renewable energy, it also has the advantage of emitting approximately half the carbon emissions of brown coal.

Determining a pathway to a lower carbon future requires a consideration of many complex and interrelated issues. To ensure that the transition to a low carbon economy occurs at least cost, the Victorian Government should adopt an energy solutions agnostic approach. 'Picking winners' risks exposing Victorian customers to inefficient outcomes and higher costs on the long run. Given the costs of the proposed Roadmap may not fall equitably across the customer base, associated Government policies should be implemented to ensure the transition occurs in the most socially optimal way.

Our submission to the Consultation Paper is structured as follows:

- PART A contains the key issues we wish to raise, including the importance of gas in maintaining energy security and reliability.
- PART B contains answers to the detailed questions raised in the Consultation Paper.

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2 PART A – Overview

2.1 Natural gas is essential for energy security

The National Electricity Market is going through a period of fundamental change, with large volumes of VRE displacing aging thermal generation, mostly coal power stations, at great speed. This transition is not without its challenges.

Recent experience has demonstrated the critical role that gas plays in supporting renewables and providing a critical backup when large renewable generation such as wind and solar is not available.

The gas network is also a flexible, affordable and safe store of energy, making it ideal to help support energy supply during extreme weather or periods of reduced supply. The ability to locate GPG close to major demand centres also reduces exposure to transmission capacity constraints often experienced by the overconcentration of renewable generation in common areas of the grid.

The build out of renewable generation will require substantial increases in electricity transmission and related infrastructure costs with a consequential impact on household and industry electricity bills. Gas, on the other hand, can be sited in suitable grid locations and will not materially add to such costs.

2.1.1 Gas's role in complementing VRE

As recent experience in South Australia has shown, periods of low wind and solar availability require significant volumes of dispatchable resources to be available to support the reliability and security of the system. Similar issues are likely to be experienced in other states, including Victoria, as coal power stations retire.

For example, in the recent period from 8 July to 12 July 2021, Gas Powered Generation (GPG) was critical in keeping the lights on, due to periods of low wind and solar generation. On four out of the five days, GPG provided:

- over 75% of peak electricity consumption
- over 50% of total daily consumption.

These four days are shown in Figure 2, with the critical role of gas during the 6pm daily peak highlighted. These four days are not a unique occurrence. While the days in which SA is powered exclusively by VRE are well publicised, the days in which gas provides reliable, dispatchable generation do not get so much attention.

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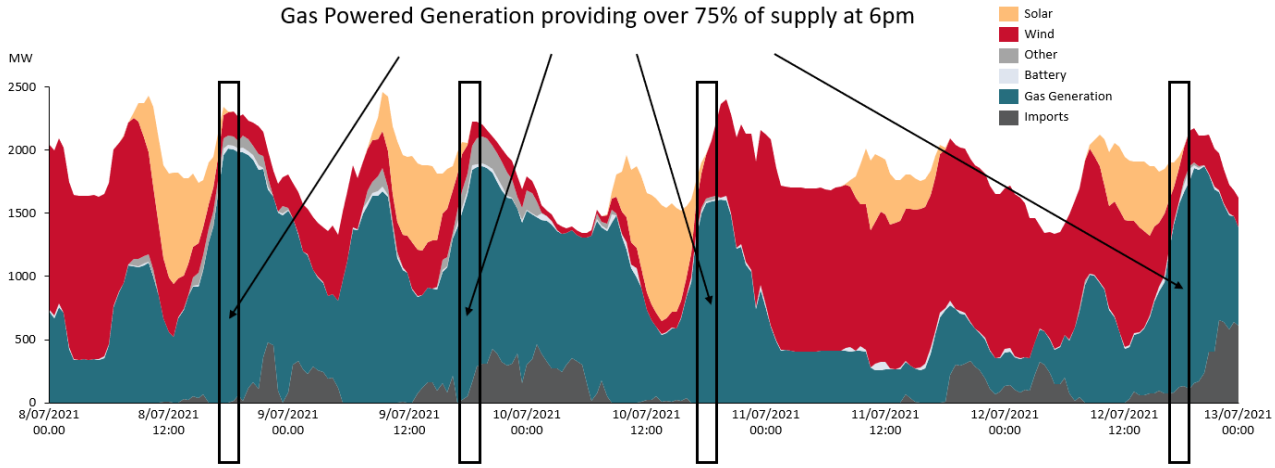
Figure 2: Case Study 8 to 12 July 2021 in South Australia



Source: APA analysis of OpenNEM data

The important role played by gas was recognised in a recent speech by the new AEMO Chief Executive Officer, Daniel Westerman, on 14 July 2021. Mr Westerman recognised that gas firming is invaluable, because it can be called on for short or long periods. Most importantly, Mr Westerman argued that gas is critical in supporting greater volumes of VRE:[1]

> *"… dispatchable generation like this unlocks many multiples of low-cost renewable generation capacity into the market, by providing the security for when the sun isn't shining, the wind isn't blowing, and other storage can't bridge the gap."*

The critical role that gas will continue to play into the future was also recognised by the Grattan Institute in its recent report *Go for net zero: A practical plan for reliable, affordable low-emissions electricity*.[2]

Grattan correctly identified that the economics of GPG make it ideal for providing backstop capacity in a system powered mostly by solar and wind. The main reasons for this include:

- in contrast to coal, gas turbines can ramp up and down quickly to balance fluctuations in demand;
- gas plants are cheaper to build;

1 AEMO, *A view from the control room,* CEDA keynote address, 14 July 2021
2 Grattan Institute, *Go for net zero,* April 2021, p30

- it is easier and cheaper to store gas and liquid fuels than electricity, which make them ideal for energy storage in case of a particularly challenging winter or summer; and
- Australia has substantial infrastructure for moving and storing gas.

The Victorian Government's Gas Substitution pathway must recognise the important role of GPG in providing Victorian customers with an affordable and reliable electricity supply.

2.1.2 *Gas's role in supporting the NEM*

Recent events in Queensland and Victoria have also demonstrated the flexibility and security offered by GPG:

- On 25 May 2021a failure of one of the generation units at Callide Power Station in Queensland caused 477,000 customers to lose power.
- In mid-June 2021, Yallourn Power Station in Victoria reduced electricity generation to approximately 20% capacity due to the threat of floodwater from the Morwell River. This was the second time Yallourn experienced a significant flooding event, with the Power Station shutting in 2012 when floodwaters entered the adjoining mine.

Following both these recent events, GPG stepped up to help provide crucial electricity generation in both Queensland and Victoria. GPG doubled its output while not increasing overall emissions. The ability of gas turbines to quickly ramp up and provide long term dispatchable generation shows they will be a critical part of the energy system for many years to come.

2.1.3 *The gas network is a vital energy store*

Due to their ability to compress and store gas, pipelines are ideally placed to help with energy supplies either during extreme weather or in the event of supply failure. In many respects they are just like big batteries capable of being turned on in minutes, and able to be sustained for days, offering a unique ability to deliver energy security when it's needed most. This was shown to be the case following the supply disruption at Longford.

In mid-July 2021, the Longford gas plant in Victoria suffered a reduction in production due to technical problems, significantly reducing the amount of gas being supplied to the Victorian market. This led to AEMO issuing a notice of threat to system security.[3]

In response to this event, it was the flexibility of APA's 7,500 kilometres of interconnected gas transmission pipelines that form East Coast Gas Grid that enabled

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[3] AER, *Weekly Gas Market Report, Weekly Summary,* 20-26 June

us to get gas from the north to the south, helping to rapidly address these shortfalls. APA utilised its substantial inventory position (known as 'linepack') on the Moomba to Sydney Pipeline (MSP) to support shippers supply through this event. A recent capacity upgrade of compression prior to this winter ensured flows from the MSP into the Victorian Transmission System (VTS) via the Victorian Interconnect at Culcairn. Further additional capacity was available during this event should the market have required it.

APA's Dandenong Liquid Natural Gas (LNG) facility also played an important role in supporting the VTS by injecting LNG at the Dandenong city gate, directly into the Melbourne metro area. The Dandenong LNG Facility was also available to inject additional volumes of gas should the market have required it.

Following this rapid response, AEMO subsequently removed the threat to system security.

2.2 Decarbonisation of the economy should be considered as a whole

The Consultation Paper identifies that the Victorian Gas sector contributes 15.8% of Victoria's total emissions which is around a third of emissions produced by Victoria's heavy reliance on brown coal for electricity generation[4]

The most recent *Victorian Greenhouse Gas Emissions Report,* published in 2020, provides a summary of where all of Victoria's carbon emissions come from (see Figure 3).

Electricity generation accounts for approximately 45% of overall net emissions, with 96% of electricity generation emissions coming from the three Victorian brown coal power stations.[5]

4 Victorian Government, *Gas Substitution Roadmap Consultation Paper,* p.10

5 Victorian Government Greenhouse and Energy Information by Designated Generation Facility, 2019-20

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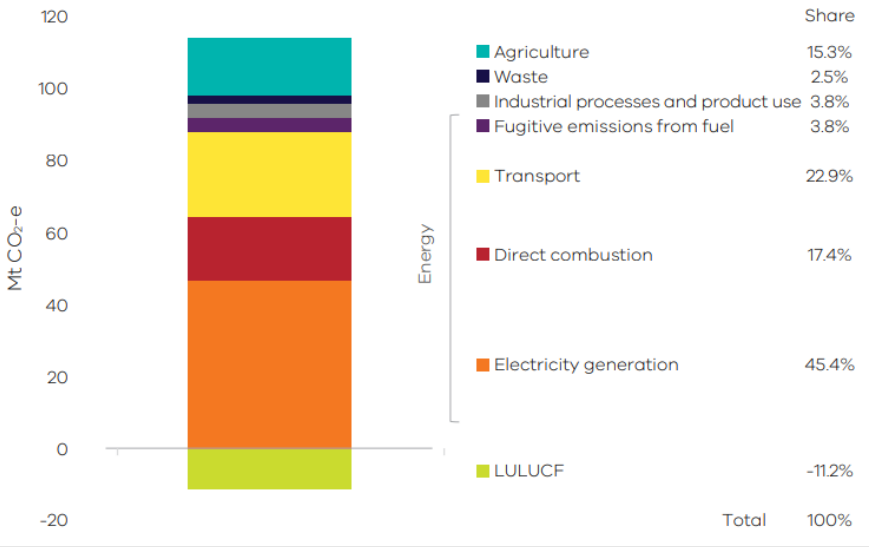
Figure 3: Victorian Emissions by sector 2018



Source: Victorian Government

One of the key risks associated with the Roadmap is that by focussing its attention on just one part of the economy, the Victorian Government risks 'picking winners' or choosing a pathway that may not be the most optimal way to lower carbon emissions at least cost.

In our view the decarbonisation of the energy system should be considered as a whole, rather than on an industry-by-industry basis. An emissions reductions pathway should focus on measures that achieve the maximum carbon reductions at low marginal abatement cost.

The existing electricity generation mix in the NEM, and in Victoria in particular, has a higher carbon profile than natural gas. Brown coal, the primary source of electricity in Victoria, has approximately double the carbon emissions intensity of energy produced by a combined cycle gas turbine (CCGT) (see Figure 4).

Any short to medium term electrification of gas demand risks increasing overall emissions, given the heavy reliance on brown coal to supply electricity. Should this eventuate, meeting Victoria's interim emissions reductions targets would become harder to achieve.

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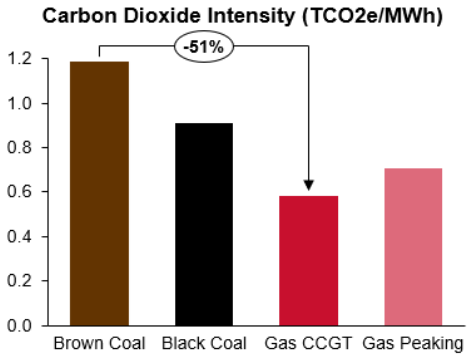
Figure 4: Carbon intensity of natural gas compared to coal

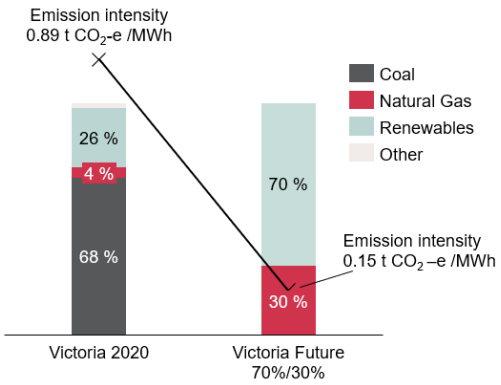


Source: APA analysis of OpenNEM emissions data from 16 May to 21 June 2021

The early retirement of brown coal is the biggest single emissions reduction initiative that Victoria could undertake and would increase the likelihood of Victoria not just meeting, but exceeding, its 2025 and 2030 emission reductions targets. This is clearly demonstrated below:

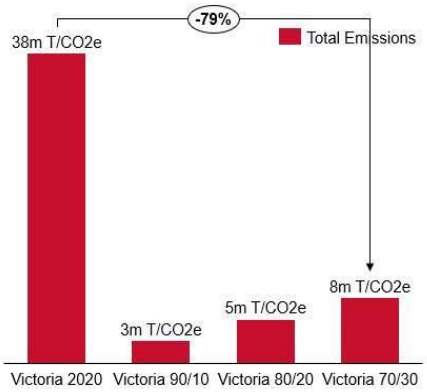
- Figure 5 shows that a future energy mix of 70% renewables supported by 30% gas could reduce the emissions intensity of Victoria's electricity generation by around 80%, from 0.89 TCO2e/MWh to 0.15 TCO2e/MWh.
- Figure 6 shows that this would result in annual emissions from electricity generation reducing by approximately 80% in the 70/30 energy mix. Given that electricity generation accounts for 45% of overall Victorian emissions, this would result in a large 36% reduction in overall Victorian emissions.

Figure 5: Emissions intensity of Victoria in 2020 compared with 70/30 scenario



Source: Carbon Dioxide Equivalent Intensity Index, AEMO
Table O, Australian Energy Statistics Update
DISER

Figure 6: Annual energy generation emissions in Victoria in 2020 compared with 70/30 scenario



Source: APA analysis based on 50/50 peak/baseload mix and AEMO data

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Businesses like APA wish to invest in long term energy projects that will support this low carbon future. This requires regulatory and policy settings that will encourage the necessary investment to take place.

In order to ensure that the Roadmap facilitates the most efficient decarbonisation of the Victorian economy, we recommend that any proposed pathways should:

- **Promote certainty and investor confidence** – if Victoria is to meet its carbon emission reduction targets, both customers and businesses need to invest in new generation and other energy infrastructure. Any proposed reforms should promote confidence in long term investment by avoiding the need for short term reforms or other intervention in the market.
- **Be technology neutral** – given the technology uncertainty, is unclear as to what mix of technologies will provide consumers with access to reliable energy at the lowest cost. We therefore support technology neutral reforms that do not discriminate against any particular form of energy source. This approach will provide customers with access to reliable energy at lowest cost.

2.3 The cost of electrification must be carefully evaluated

One of the key unknowns when developing the Roadmap is the potential cost of electrification. Using publicly available sources, it is possible to determine the magnitude of the task being considered.

In Victoria there is a significant difference between summer and winter energy use, as shown in Table 1.

Table 1: 2019 Maximum electricity and gas demand

2019	Winter	Summer
Electricity - maximum demand	7.6GW[6]	8.7GW[7]
Gas – Hourly peak day demand[8]	75 TJ/hr	25.4 TJ/h

It is possible to convert hourly gas demand into GW to compare how much energy the electricity and gas networks are delivering at their summer and winter peaks. This is achieved by multiplying the number of TJ/h by 0.27778 to determine the number of GW. For example:

$$75 \text{ TJ/h} \times 0.27778 = 20.8\text{GW}$$

[6] AER, Seasonal peak demand – regions: https://www.aer.gov.au/wholesale-markets/wholesale-statistics/seasonal-peak-demand-regions, Winter 2019, accessed 23 July 2021

[7] AER, Network performance report 2020, Electricity TNSP operational performance data 2006-2019

[8] AEMO, VGPR 2021, p.80

The resulting electricity and gas winter and summer maximum demand, expressed in GW, are shown in Table 2.

Table 2: 2019 Maximum electricity and gas demand expressed in GW

2019	Winter	Summer
Electricity - Maximum demand	7.6GW	8.7GW
Gas – Forecast hourly peak day demand in MW	20.8GW	7.1GW

Source: APA analysis of AEMO data

Recognising this is a simplistic comparison, it demonstrates that while the electricity and gas networks had a comparable peak demand on a summer day in 2019 (i.e., 8.7GW compared to 7.1GW) on a peak winter day the gas network delivered more than twice the peak energy demand of the electricity network (20.8GW compared to 8.7GW).

The fact that the gas network delivers over twice the peak energy demand of the Victorian electricity network is one of the key hurdles associated with the Roadmap.

Electrification of gas use is one of the proposed decarbonisation pathways identified by the Victorian Government. As the simple analysis above demonstrates, electrifying Victoria's winter gas load could require the electricity network to handle three times its current load. That is, instead of a peak demand of around 10GW, the electricity network would need to be able to carry a peak demand of around 30GW (10GW plus the additional 20GW from gas).

APA is studying entry to US energy markets to inform possible decarbonisation scenarios. 'Cold-climate' states in the US exhibit similar characteristics to Victoria, in that seeking to electrify the winter heating load is cost-prohibitive. Electrification also concentrates supply interruption risks to the electricity grid, which is subject to winter storm events.

Infrastructure Victoria's (IV) July 2021 Interim Report recognises that any shift towards electricity in place of gas will have a significant impact on Victoria's electricity network. Based on a Grattan Report, IV estimate that peak electricity use could increase by an estimated 40% compared with the current summer peak demand.[9] Grattan's analysis does not appear to be available on its website, but it is difficult to reconcile Grattan's 40% figure with the simple analysis above. Given its significant influence on the cost of upgrading the electricity network, the impact of

[9] Infrastructure Victoria, *Towards 2050: Gas Infrastructure in a zero emissions economy – Interim Report – July 2021*, p.19

electrification on peak demand must be investigated as part of the Roadmap development.

Estimating the cost of upgrading the Victorian electricity distribution and transmission networks to cater for additional peak demand is a very complex exercise. However, two important points should be highlighted:

- Any electrification pathway needs to consider the parallel electrification of another key energy source: liquid fuels for transport. The uptake of EVs for domestic, commercial, and public use is increasing rapidly. In the absence of price signals to encourage efficient use of the electricity distribution network, EVs are likely to place extra demands on electricity networks and generation.
- Victorian distribution networks are the most well utilised in the NEM.[10] Utilisation is derived by comparing maximum demand to the total capacity of the distribution network, at the zone substation level. In 2019, for example, Powercor, one of Victoria's electricity distribution businesses, had a network utilisation of 0.78. This shows that there is not significant 'headroom' on the electricity distribution network for any electrification of gas use.

It is essential that the cost and timeframe for upgrading the electricity distribution and transmission system is considered as part of determining the Roadmap. As experience in other jurisdictions has shown, rapid increases in capital expenditure can quickly flow through to network charges and therefore customer bills. There are also concerns across the NEM about the timeframes for connecting renewable generation to the grid and the slow speed in which transmission infrastructure is being built.

2.4 Utilising existing assets is a more efficient option

Electrifying Victoria's gas usage would result in peak electricity demand increasing substantially and shifting from summer to winter.

Not only would electrification of this shifting load be a very expensive exercise, it would also be an inefficient option:

- The electricity transmission and distribution network investment associated with electrification will have to be paid for by customers for 365 days of the year, for many decades to come. This is an inefficient and expensive use of resources given that the heating load is concentrated in a few winter months and much of any new infrastructure will be idle for most of the year.
- Large quantities of mainly renewable generation would be required to help meet winter demand. Much of this generation would be unused during the summer when peak demand is much lower. Excess renewable energy entering

[10] AER, *Network performance report 2020, Electricity DNSP operational performance data 2006-2019*

the system may also lead to other network problems, which would need to be managed.

Frontier Economics has investigated the potential for gas infrastructure to decarbonise the economy. In its September 2020 report, Frontier concluded that making continued use of existing gas assets wherever possible, including for the transport of hydrogen or biogas, can help avoid the material costs of investing in new assets to deliver energy.[11]

The main reason Frontier came to this conclusion was due to the significant cost of the electrification pathway, particularly for industrial energy load. Frontier also recognised that gaseous fuels are essential as industrial feedstock, and if gaseous fuels are not available, the industries that rely on this feedstock will not be viable.

Frontier Economics' conclusion is not surprising given the cost of delivering energy in Victoria and the investment made in the electricity and gas networks to date. Using publicly available AER data, Table 3 outlines the value of the gas and electricity networks (referred to as the Regulated Asset Base) and the amount customers paid in network charges in 2019 to transport energy using the respective networks.

The data shows that revenues earned from operating the Victorian gas transmission and distribution network costs are around a quarter of those to run the electricity distribution and transmission network. These revenues are paid for by customers through their electricity and gas bills.

Table 3: Victorian RAB, Revenue and Energy Delivered 2019

	Regulated Asset Base ($m)	Actual Revenue ($m)
Electricity distribution and transmission networks	17,329[12]	2,825[11]
Gas transmission and distribution networks	5,631[13]	774[14]

The efficiency of the interconnected gas system at delivering energy is further demonstrated by looking at the cost of delivering a unit of energy across the gas and electricity networks. As Table 4 shows, Victorian gas pipelines deliver:

- a GWh equivalent of energy approximately 6 times cheaper than electricity networks

[11] Frontier Economics, *The Benefits of Gas Infrastructure to Decarbonise Australia,* September 2020, p.9

[12] AER, *Electricity DNSP and TNSP network performance report 2020*

[13] AER, *APA VTS, Multinet, AusNet Services, Australian Gas Networks 2019 RIN data*

- A MW of peak demand load approximately 10 times cheaper than electricity networks.

Table 4: Energy delivered and maximum demand

	Actual Energy Delivered (GWh)	Average annual cost to deliver a GWh ($)	Maximum demand (MW)	Average cost to deliver a MW of maximum demand ($)
Electricity distribution and transmission networks	41,480[11]	68,115	8,684[14]	325,362
Gas transmission and distribution networks	64,722[15]	11,965	20,834[16]	37,171

As the numbers in Table 3 and Table 4 show, delivering energy through electricity networks is significantly more expensive than doing so through gas networks. Increasing the proportion of energy delivered to customers through the electricity network risks is likely to increase overall energy costs for customers.

In its *Towards 2050: Gas infrastructure in a zero emissions economy* consultation paper, Infrastructure Victoria is considering the future of gas infrastructure under a range of possible scenarios.[17] We expect that Infrastructure Victoria will examine the cost of electrifying gas use as part of its advice to Government in late 2021.

In its recent consultation paper, Infrastructure Victoria considered that the opportunity to repurpose existing gas infrastructure is limited.[18] It is important to remember that although many of the gas assets are 40 years old, pipelines are generally designed with 50 to 80 year asset lives. Older pipelines can have their design life extended with modern integrity measures such as pigging and recoating. Studies are also investigating how existing pipelines can be made 'hydrogen ready'.

In its annual *GenCost* report, the CSIRO investigates the cost of various generation technologies. In its 2021 report, the CSIRO acknowledged that significant investment is required to incorporate VRE in the energy system, including new transmission to

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14 AER, Network performance report 2020, Electricity TNSP operational performance data 2006-2019

15 AEMO, VGPR 2020 update, Table 1, 2019 Total Victorian Consumption of 233PJ converted into GWh

16 AEMO, VGPR 2021, p.80, Peak hourly demand of 75 TJ/hour converted into MW

17 Infrastructure Victoria, *Towards 2050: Gas infrastructure in a zero emissions economy,* July 2021

18 Infrastructure Victoria, *Towards 2050: Gas infrastructure in a zero emissions economy,* July 2021, p5

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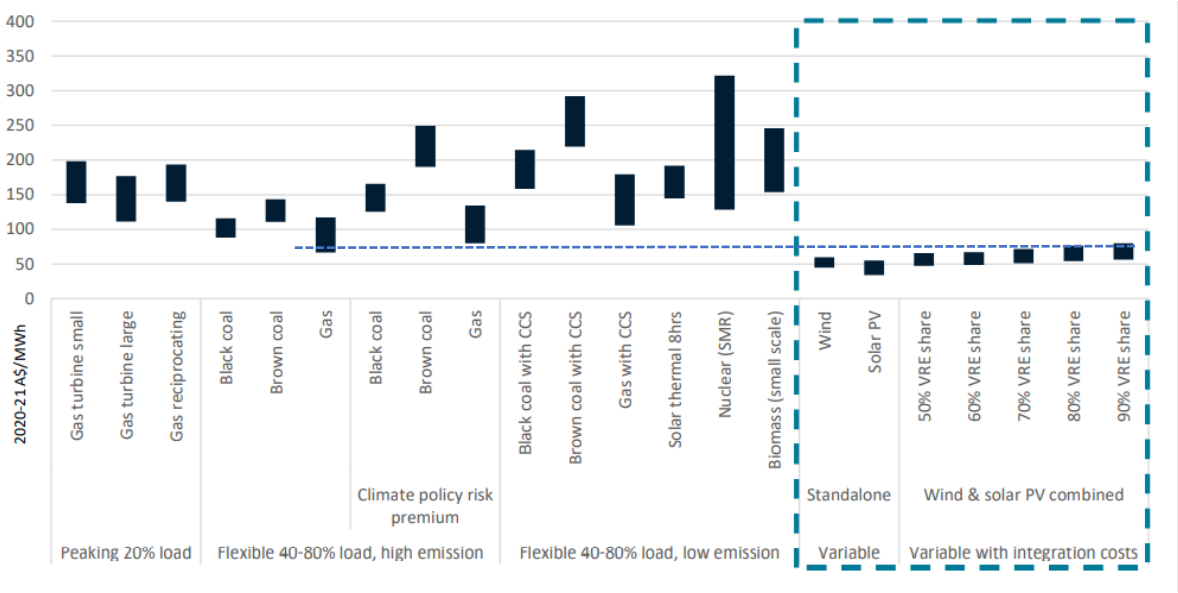
Renewable Energy Zones, additional transmission to strengthen the grid, and synchronous condensers to support system reliability.[19]

Recognising the significant additional costs associated with reaching 100% VRE, the 2021 GenCost report found that in 2030 the cost of gas electricity generation can match the cost of VRE up to a 70% or greater share of generation (shown in Figure 7 below).[20]

Figure 7: CSIRO Levelised Cost of Energy 2030



Source: CSIRO

Many overseas jurisdictions are evaluating the viability of hydrogen and other renewable fuels to help decarbonise economies. Here in Australia, APA is investing in projects to understand the potential for our own network of gas infrastructure to accommodate hydrogen. We have a pilot project currently underway on a section of our Parmelia Gas Pipeline which could see the pipeline become the first 100% hydrogen ready transmission pipeline in Australia.

For this reason, the electrification pathway should be carefully considered to ensure there are no unforeseen impacts on customers or businesses.

2.5 Intergenerational and social equity issues

Gas infrastructure owners have invested billions of dollars in long-lived assets to bring gas into Victoria and deliver it to over two million customers across the state. These assets are paid for by customers over many decades through network charges in their gas bills.

19 CSIRO, *Annual GenCost Report,* June 2021, pviii
20 CSIRO, *Annual GenCost Report,* June 2021, p.ix

The Victorian Government's Roadmap raises the prospect that some gas use will be electrified, thereby reducing the amount of gas used by customers. This raises both intergenerational and social equity issues:

- **Intergenerational equity** – existing gas networks have been built with a forecast number of customers in mind. Together, the customer base will pay for the cost of that investment, with today's customer base paying for their use of the network and future customers also paying a share. Any moves to limit the number of future gas customers will raise intergenerational equity issues as a smaller number of future customers will continue to pay for a disproportionate share of the network costs. This may impact low income and vulnerable households the hardest, particularly if they do not have the financial means to switch fuels.

- **Social equity issues** – the energy transition currently underway is allowing customers to take greater control of their energy use, as long as they can afford the solar PV, batteries, and home energy management systems that enable them to do that. If customers are required to electrify their gas use, energy inequality risks be exacerbated. This is because many customers will not have the opportunity, whether it be for financial or other reasons, to take control of their electricity use.

  Furthermore, any moves to remove a customer's choice to connect to the gas network is essentially mandating electrification and will close off the opportunity to repurpose the gas network in the years ahead for hydrogen or other renewable gases. History has shown that once the opportunity to lay gas mains is foregone at the time of initial development it is highly unlikely to be economically nor socially viable to retro-fit later.

2.6 Australia's natural hydrogen advantage

Australia has some of the world's best natural resources, such as wind and sunshine, for producing renewable energy. This is one of the key reasons why hydrogen has been identified as one of Australia's key comparative advantages and one of the logical options to help decarbonise the Australian economy.[21] The May 2021 Victorian Climate Change Strategy includes a five-point plan to cut emissions and developing a local renewable hydrogen industry is part of the innovation pathway.[22]

Complementing our natural advantage in renewable energy is the fact that Australia has one of the most extensive interconnected gas infrastructure networks in the world, with an expert workforce supporting it. It therefore makes strong sense for Australia to

21 Australian Government, *First Low Emissions Technology Statement – 2020*, p17.

22 *Victorian Climate Change Strategy, May 2021, p26.*

explore the opportunities to repurpose this existing infrastructure to support the transition to a low carbon economy.

To support the development of Australia's industry, we welcome commitments by Australian Governments to set hydrogen blending mandates, such as the Western Australian and NSW Government goals to blend 10 per cent hydrogen in gas pipelines by 2030, subject to ongoing assessment of technical feasibility. These are important steps to enable the commercialisation of hydrogen technologies and bring forward the work required to solve some of the regulatory challenges associated with the conversation of gas infrastructure.

2.7 APA's gas substitution pathway

As the International Energy Agency acknowledged in its recent report Net Zero by 2050, the gas sector is very well placed to accelerate the deployment of low emissions technologies, helping to steer the country's energy transition towards a net zero pathway.[23]

Much of APA's pipelines gas infrastructure is adjacent to some of the best geographical areas for hydrogen production in Australia. We are actively leading efforts to unlock the innovation and new technologies that will lead to the development of a new hydrogen industry in Australia.

As we look ahead to 2050 and beyond, consistent with the International Energy Agency's observations, the gas industry is well placed to diversify and deploy decades of knowledge, capability and critical infrastructure to play a leading role in developing the low emissions technologies of tomorrow, at scale, and to support our own ambitions for a net zero future.

2.7.1 Pathfinder Program

Our Pathfinder Program will be a key enabler in our pathway to our new ambition for net zero operations emissions by 2050. Through Pathfinder, we will help unlock energy solutions of the future and develop opportunities to extend our core business.

Pathfinder's initial focus will be on clean molecules, off-grid renewables and storage. Our first Pathfinder project is seeking to enable the conversion of around 43-kilometres of the Parmelia Gas Pipeline in Western Australian into Australia's first 100 per cent hydrogen-ready transmission pipeline and one of only a few existing gas transmission pipelines in the world, 100 per cent hydrogen-ready.

This project, which is being delivered in partnership with Future Fuels Cooperative Research Centre and Wollongong University, carries enormous significance for APA and the entire industry. It will create a significant opportunity for the development of a hydrogen hub in Western Australia, while the more broadly the results will support

[23] International Energy Agency, *Net Zero by 2050,* May 2021

decision-making as to the potential for APA's other gas infrastructure assets to be hydrogen-ready.

2.7.2 Renewable methane pilot

APA and ARENA have jointly funded a project by Southern Green Gas to develop a renewable methane demonstration plant at APA's Wallumbilla gas plant in Queensland. This carbon neutral project is investigating whether it is possible to create renewable methane from hydrogen that is produced using solar energy and water, converted to methane using CO2 extracted from the atmosphere.

Renewable methane is indistinguishable from the methane that currently fills our natural gas pipelines and therefore offers a potential low carbon alternative with the ability to use the existing gas infrastructure system.

The renewable methane created at Wallumbilla can be injected into the gas transmission network. The project will also generate cost and technical data to be used to assess the feasibility of a larger, commercial scale renewable methane concept.

3 PART B – Further responses to consultation questions

3.1 Pathway questions

Question	APA response for each pathway
What are the key benefits, risks, and potential impacts on various end-users, on energy affordability, safety, security, reliability and equity?	• **Improving energy efficiency –** energy efficiency measures are a 'no regrets' option that will not only reduce emissions but improve energy affordability. • **Electrification –** Refer to section 2.5. Electrification carries significant risks for both energy reliability, emissions, and affordability. In the short to medium term, any moves to electrify gas use will increase demand and emissions, given that Victoria's existing generation mix is heavily reliant on brown coal, which has a much high carbon footprint than natural gas. The cost of electrification must also be carefully considered, given that the gas network delivers over twice the peak energy demand of the Victorian electricity network. • **Substituting natural gas with hydrogen –** there are significant potential benefits, given that hydrogen can be used in place of natural gas for a range of uses. Hydrogen can be used for energy generation and as an alternative feedstock for heavy industry. APA is actively investing to support the development of a hydrogen economy in Australia • **Substituting natural gas with biogas –** there are significant potential benefits, given that biogas can be upgraded into biomethane which can be injected into the existing gas network. One of the key benefits is that any future capital investment needed to repurpose pipelines is minimised. • **Emerging technologies –** carbon capture and storage, if proven to be technically feasible at scale, provides an opportunity to accelerate the decarbonisation of the economy.

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	• **Addressing fugitive emissions –** APA's main source of fugitive emissions are pipeline leaks, flaring and venting. Reducing these fugitive emissions would help reduce Victorian emissions and have little impact on energy affordability or the reliability, safety or security of the pipelines.
What are the scale of opportunities and potential to accelerate uptake?	• **Improving energy efficiency –** there are significant opportunities to improve the uptake of energy efficiency measures. We support regulatory reform to increase the energy efficiency requirements for households and businesses. • **Electrification –** Refer to section 2.5. Before accelerating the electrification of gas use in Victoria, further work needs to be done to assess the potential cost of doing so (see section 2.5). Given the risks associated with electrification, in the short term, we consider there are limited opportunities to accelerate the uptake of electrification. • **Substituting natural gas with hydrogen –** Refer to section 2.1. Given the significant potential of hydrogen as a clean energy source, numerous trials are being conducted across Australia and the world. • **Substituting natural gas with biogas –** Refer to section 2.2. Considering that renewable methane is indistinguishable from methane that currently fills our natural gas pipelines, there are significant opportunities to quickly decarbonise the gas network should it become commercially viable to produce renewable methane. • **Emerging technologies –** Carbon capture and storage is a key enabler of blue hydrogen which delivers a cheaper pathway for hydrogen production until the cost of producing green hydrogen reduces.

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	• **Addressing fugitive emissions –** there are significant opportunities to reduce fugitive emissions and APA is investigating these under its Climate Change Management Framework. A key pathway is to invest in the improvement of measurement data to move the conversation about fugitive emissions beyond the National Greenhouse and Energy Reporting (NGER) methodologies.
What are the roles to be played by government, industry and how will consumers preferences be accounted for in the transition?	• The Government should ensure that the views of all stakeholders are considered when developing the Roadmap. The views of customers will be critical on issues such as: o hydrogen blending targets o the speed of the transition o how much additional cost they are willing to pay.
What are the likely timings of technical maturity and economic viability?	• Through our Pathfinder and renewable methane project, we are investigating the technical and economic viability of hydrogen and renewable methane.
What are the best ways to maintain social acceptability and consumer confidence?	• The 2021 Energy Consumers Australia Consumer Sentiment Report found that consumer confidence that the market is working in their long-term interests has more than has more than doubled since 2017. However, 62% of households and 71% of small businesses are concerned about the energy transition taking place, as reflected in responses to questions about affordability.[24]

[24] Energy Consumers Australia, *Energy Consumer Sentiment and Behaviour Survey*, June 2021

	• The report's findings demonstrate that maintaining social acceptability and consumer confidence will be heavily dependent on an affordable and reliable energy supply.
What are the inter-dependencies and trade-offs with other pathways (are pathways complementary or alternatives)?	• Most of the pathways are complementary. For example, improving energy efficiency, reducing fugitive emissions and projects to develop hydrogen and biogas capability can be progressed in parallel.
What are the key uncertainties and potential for unintended consequences?	• **Improving energy efficiency –** we do not see any major uncertainties or unintended consequences with this pathway. Ascribing a value to emissions as part of program design will ensure that the most efficient outcomes are chosen to help improve energy efficiency. • **Electrification –** Refer to section 2.5. The potential cost of electrification is one of the key uncertainties. Given the rapid pace of technology development, there is a significant risk of asset stranding should electricity networks be rapidly augmented to accommodate substituted gas use. Under this scenario, there is also the potential unintended consequence that gas could be replaced with the highest emitting source of energy i.e., brown coal. • **Substituting natural gas with hydrogen –** the timing of economic and technical viability are the key unknowns. • **Substituting natural gas with biogas –** the timing of economic viability is the key unknown. • **Emerging technologies –** the timing of economic and technical viability are the key unknowns.

	• **Addressing fugitive emissions –** current National Greenhouse Gas Emission Reporting (NGER) fugitive reporting emission methodologies do not allow for accurate reporting of actual fugitive emissions. This makes it difficult to accurately set baselines and measure improvements. Uncertain or low/no payback of capital invested in reducing fugitive emissions is one of the main barriers to investment.

3.2 Key issues questions

Question	APA response
Key issue 1: Maintaining electricity reliability with new sources of demand	
What policies are needed to ensure that the electricity network can reliably serve new sources of demand from hydrogen production, electric vehicles and electrification of gas demand?	• National and jurisdictional polices already exist to ensure customers receive a reliable energy supply: o The Australian Energy Regulator's Service Targets Performance Incentive Scheme (STPIS) and jurisdictional reliability standards ensure that networks are incentivised maintain a reliable energy supply for customers. o The National reliability standards, reviewed each year by the independent Reliability Panel, requires there to be enough generation available to meet forecast customer demand. Additional measures such as the Reliability and Emergency Reserve Trader (RERT) scheme provides additional measures to ensure supply.

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	• Any additional policies to maintain supply should be evaluated carefully to ensure they do not overlap with existing reliability measures and inadvertently introduce additional costs that will be passed on to customers.
What is the role for gas-fired power generation and hydrogen in maintaining electricity reliability?	• Refer to section 2.3. Gas generation is essential in maintaining electricity security and reliability.
Key issue 2: Transitioning to more sustainable gaseous fuels with minimal disruption to end-users	
What are the key technical challenges in converting existing gas networks to accommodate more sustainable gaseous fuels?	• Refer to section 2.2. There are technical challenges in converting gas networks to accommodate more sustainable fuels. APA is investigating these as part of its Pathfinder Program and this is an issue being solved by industry globally. It should be recognised that serious investigation of these issues has only commenced recently so prospects are high that comprehensive solutions will be available. APA is positioned to access solutions wherever they arise.
What are the potential costs and opportunities in switching to more sustainable gaseous fuels for consumers?	• Trials and studies across the world are investigating the potential costs and opportunities in switching to more sustainable gases. The potential costs are difficult to determine at present.
Key issue 3: Maintaining the reliability, affordability and safety of gas supply	
What are the affordability, reliability and safety considerations related to gas supply and gas infrastructure, both in the	• It is important to distinguish between the reliability of gas transmission and distribution networks and reliability of supply:

short term and during a long-term transition to a decarbonised gas sector?	• Network reliability relates to the ability of the transmission and distribution networks to safely deliver gas to customers. Because gas pipelines are underground, it is a very rare occurrence for network faults to disrupt customer supply. The fact that gas can be compressed and 'stored' in gas pipelines means that even during maintenance activities customers are rarely disrupted. • Gas transmission pipelines and distribution networks are not subject to formal reliability standards. One of the key reasons for this is that gas reliability is very good. The last gas distribution performance report published by the AER, for example, showed that the average Victorian gas customer had an outage once every 36 years. This contrasts with electricity networks where customers often experience outages due to storms taking down power lines or outages to conduct maintenance. • Given that timely investment in gas infrastructure has reliably delivered gas to customers where and when needed, we do not consider that additional network reliability standards are needed. • Gas supply reliability relates to the risk of retailers not being able to supply gas to their customers. APA does not have visibility or control over this issue, which involves the relevant parties ensuring that gas is injected into the network so that gas is available to customers when needed.
What policies are needed to ensure that the gas system continues to operate	• To date, the competitive forces which operate in energy markets have ensured that the necessary investment in gas infrastructure and exploration has delivered gas to customers when and where needed. For this reason, we

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reliably and safely and remain affordable for end-users during this transition?	do not consider that formal gas supply reliability standards are needed. Any additional regulatory obligations are likely to increase costs for gas suppliers, costs which will ultimately be passed on to customers.
Key issue 4: Supporting Victoria's workforce, industry and the institutions that support them	
What workforce skills and industry capabilities are required to transition to new and emerging energy sources?	• Australia has one of the most skilled gas workforces in the world. • These skills are transferable to low carbon alternatives such as hydrogen and biogas. • There is an obligation on industry, government, and tertiary institutions to work together to ensure that the existing workforce is supported through the transition and that we develop the capabilities needed to build and support the technologies of the future.
How can government, industry and unions best work together, including through the Victorian TAFE and Training system, to help to build these skills and capabilities, and support existing workers through the transition?	
How do we maximise local job opportunities, including for industry training centres such as that operated by the Plumbing Industry Climate Action Centre, to prepare workers for the future?	
Key issue 5: Managing uncertainty in the transition	
What key uncertainties should the Roadmap take into account, and what is	• There are many uncertainties associated with the energy transition. Key amongst these are changing consumer demands and expectations and uncertainty regarding changes in technology and costs.

the government's role in reducing these uncertainties?	• Government's role during this uncertainty is to create a stable policy and regulatory environment that supports private sector investment in new energy infrastructure.
Transitioning the Victorian economy efficiently and equitably	
How can we ensure that the costs of transition to lower emissions energy sources are borne equitably?	**Intergenerational equity** • Refer to section 2.7. In our conversations with stakeholders to date, there is broad agreement that neither customers nor investors should carry a higher share of costs in the event of decarbonisation induced demand reduction. • Different regulators are taking different approaches to dealing with this risk of asset stranding. These approaches generally involve a reduction to the remaining depreciable lives to allow the investor to recover its capital over a time horizon that reflects the impact of the decarbonisation initiatives. See, in particular, the AER's decision on EVOenergy and the Economic Regulation Authority of WA decision (from para 1354) on the Dampier to Bunbury Natural Gas Pipeline. • The acceleration of depreciation has received support from some consumer groups, with the reasoning that a small increase in tariffs today, while the system load is still large, is a better solution to significant increases in tariffs in future years when system usage has declined. **Social equity** • The energy transition is already raising social equity concerns given that access to solar PV, batteries and other energy efficiency measures is heavily

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	dependent on a customer's ability to afford them. Any measures introduced as part of the Roadmap will need to consider the impact on customers.
How can we help low-income and vulnerable households manage any upfront costs in changing energy sources?	• Government policies will be needed to support customers in managing any change in energy sources.
What are the barriers for households in improving the efficiency of their use of gas for heating, cooking and hot water and/or switching to solar/pump hot water in existing homes?	• Gas smart metering is not available in the same way that electricity metering is. It is more difficult for households to understand their gas usage profile. • Increased investment associated with solar / heat pump technology and additional operating cost provide a cost barrier for households to switch to this technology.
What are the opportunities for the Victorian Energy Upgrades program to incentivise efficient gas use, thermal upgrades of buildings (e.g. insulation) and electrification?	• Thermal building upgrades will support the more efficient use of natural gas (or electricity). • Incentives could be considered for businesses and households to implement such measures. Incentives should be based on actual emissions outcomes for upgrades to prevent perverse outcomes e.g., electrification of gas resulting in increased emissions.
What issues and elements do you see as most important to improve the energy and emissions performance of new homes?	• The development of improved energy efficiency standards is central to improving the energy efficiency of new buildings.

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