Submission on "Towards 2050: Gas infrastructure in a zero emissions economy"

Lighter Footprints is a community-based group that aims to influence Australian local, state and national decision makers to take the action necessary to halt global warming as a matter of urgency. For over a decade, we have educated, advocated and brought people together in Boroondara and surrounding suburbs to inform the community and promote a clean energy future. We have over 2,500 people on our mailing list.

Lighter Footprints welcomes the opportunity to respond to Infrastructure Victoria's interim report on '**Gas infrastructure in a zero emissions economy**'.

Our submission is structured as follows:

This submission has been authorised by:

[redacted]

Michael Nolan

Co-Convenor

Lighter Footprints Inc

[redacted]

[redacted]

David Strang

Convenor

Energy Transition Group

Lighter Footprints

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EXECUTIVE SUMMARY

The Victorian Government requested advice on the nature and timing of decisions regarding Victoria's gas transmission and distribution networks in a future where:

- Victoria's carbon emission reduction targets are achieved.
- sufficient and suitable energy and chemical feedstocks are available for domestic, commercial and industrial use, and
- an option is available for hydrogen and/or biomethane to be part of the future energy mix.

It is our opinion that the advice and timing of decisions should be based on proven technology, speed of implementation and cumulative emissions.

Detailed Submission

We have structured this submission referring to the Infrastructure Victoria's 'submission template' that asks nine (9) questions. However, given the number of figures and references we are presenting this submission as a document rather than filling in each response question by question online.

Q1. Do you have any further information, evidence, or concerns that you wish to raise in relation to the scenario design and analysis?

We have a number of points to raise on this subject:

1. Further information required from DORIS Engineering

In the executive summary of the DORIS Engineering report it states:

"As the analysis progressed, opportunities for refinement of the scenarios were identified and, as results and outcomes became available, elements of a potential "hybrid scenario" were identified that may deliver improvements over the base scenarios in affordability and reliability of energy whilst achieving a Net Zero Emissions position by 2050. The analysis of the "hybrid scenario" was beyond the scope of the study."

While we understand that analysis of the hybrid was beyond the scope of the project, we believe that DORIS Engineering should be allowed to further develop the "hybrid scenario"

2. Recommendations should be based on proven solutions

It is our opinion that any solution that relies on unproven technology should not be prioritised over proven low carbon solutions in planning. We are referring to the broad global themes and global efforts that are prioritizing electrification, energy efficiency, digitisation of energy data, and co-benefits (e.g. rooftop solar and EV's, heat pumps).

The risks of relying on unproven technologies (such as CCS and Hydrogen to residential sector) are too high. These risks include:

- It almost always takes years to demonstrate technology, then run 'pilots', then evaluate all outcomes including un-foreseen consequences. During these elapsed years, alternate proven technologies do not get implemented as quickly as they otherwise would. So-called 'no regrets' may well be regrets, as the reductions trajectory (not the zero emissions end date) is paramount to reducing cumulative emissions.
- Losing the advantage of getting decarbonisation momentum on cumulative emissions
- Dissipating effort and resources at government and industry levels
- Failure to build accelerated global expertise in above broad themes
- Failure to realise development of key co-benefits

3. **Recommendations should take into account the risk of non-delivery**

Each of the options identified require considerable change. While some of this change is manageable some of the change requires consumer action which cannot be controlled. Where possible the analysis should take this risk into account.

In particular we consider option B as high risk as it maintains the gas network delivering natural gas. This will make compliance and alignment with the transition less likely.

4. **Offsetting actions such as agroforestry should not be used to support an option**

Use of such offsetting actions implies that the solution does not meet net zero.

Those offsetting actions will become highly valued as we progress on the road to zero and it cannot be clear that the offsets will continue to be available in the future at reasonable costs with reasonable permanency.

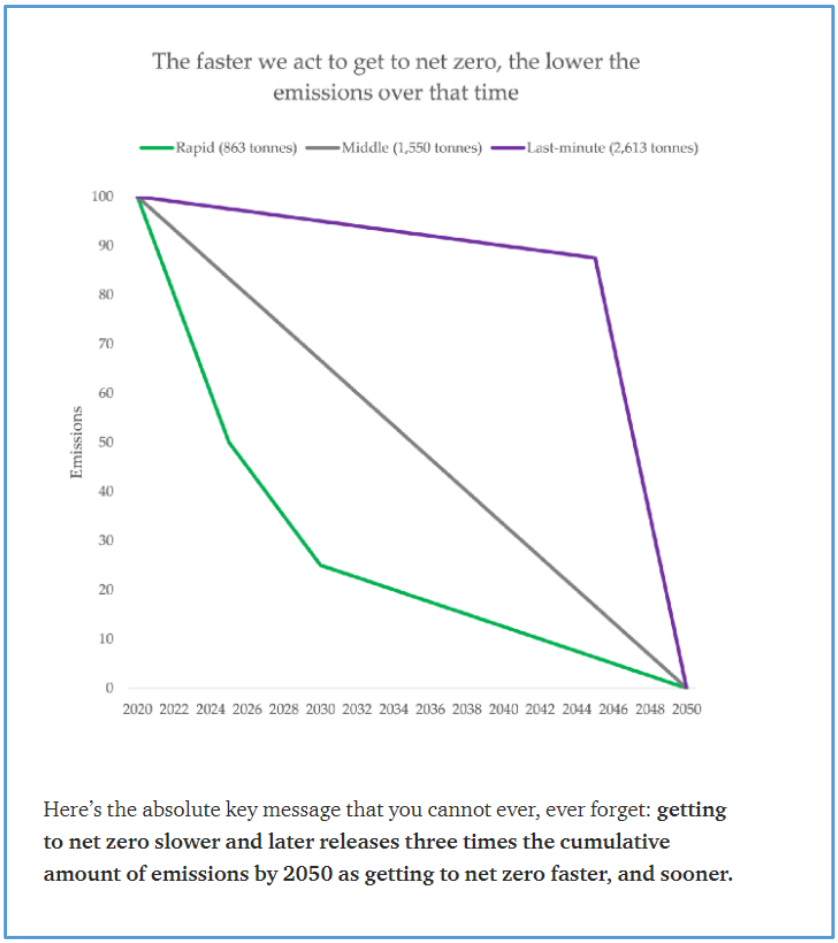
5. **Higher Weighting should be given to the speed of carbon reduction and cumulative emissions**

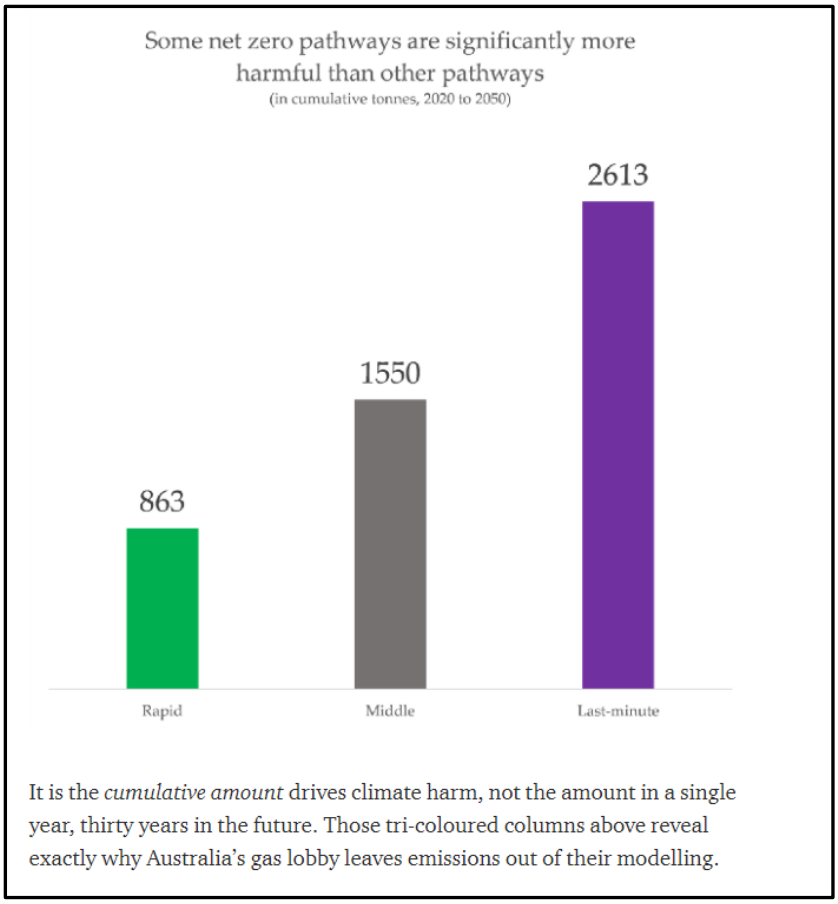
It is important that we have a fast transition away from natural gas – the trajectory of transition is as important if not more important than setting the date of 2050 for zero emissions.

IPCC's recently released report notes that global temperature increase correlates closely to cumulative emissions, not annual net emissions. The speed of emissions reduction matters – a lot!

Ketan Joshi's graphs starkly the difference in total emissions between Rapid, Middle, and Last-minute approaches[1]. "getting to net zero slower and later, releases three times the cumulative amount of emissions by 2050 as getting to net zero faster, and sooner". Refer line graph and bar graph on the next page.

[1] The gas war part 2: The Australian gas industry and their anti-electrification campaign | by Ketan Joshi | LobbyWatch | Medium





For this reason, we recommend that scenario analysis should take into account the speed of implementation / decarbonisation. Cumulative emissions by 2030, 2035, 2040 etc should take centre-stage over "zero emissions by 2050".

6. Blue hydrogen should not be considered

Cornell and Stanford Universities warn that blue hydrogen is a terrible intermediate step[2], with hidden "fugitive emissions" involved that make it actively worse for the atmosphere in certain applications than legacy options like burning coal.

"the greenhouse gas footprint of blue hydrogen is more than 20% greater than burning natural gas or coal for heat and some 60% greater than burning diesel oil for heat, again with our default assumptions"

Q2. Do you have any further information or evidence that can help identify an optimum scenario for a net zero emissions gas sector in 2050?

The Doris Engineering Report highlights four scenarios that measure annual emissions at 2030, 2040, and 2050.

When we assess the scenarios against the objectives of rapid reduction by 2030 etc, culminating in net zero by 2050 and referencing a fast rate of decarbonisation using proven technology we find:

Option A, full electrification meets all of the criteria. The speed of decarbonisation will depend on how fast we roll-out existing technology.

Option B is a high-risk strategy as it maintains the gas network which may mean slower decarbonisation and it relies on offsetting carbon emissions achieved by a combination of Carbon capture and storage, and agroforestry.

Carbon Capture and Storage is an unproven technology despite many years of investment and relying on improvements in forestry means that the gas industry is not meeting the net-zero target. Any improvements in emissions reduction through forestry management should not be used to offset emissions from the continued use of natural gas.

Option C cannot be considered at this point in time as it must be considered still unproven technology and it requires a radical investment approach. This cannot form part of the initial strategy but could be considered at a later date if it is based on Green hydrogen (rather than Blue or Gray).

Much more feasibility work needs to be done, to check the implicit radical changes - socially, safety-wise, and commercially - to decommission the existing gas network, build a completely new Hydrogen network, and roll out household conversions. The concept as presented in the Doris Report would deliver the greatest number of jobs at the lowest cost.

- The Scenario C foresees Hydrogen greater than 10% in a partial new network by 2030.
- It foresees Scenario C can meet net zero by 2040.

We would need to see more on these costing assumptions and calculations, as well as cumulative emissions at key dates such as 2030, 2035, etc (see points in next paragraph.

Also, before we can contemplate this alternative, we must do more detailed feasibility and evaluate the economics and safety of a hydrogen network including:

- Cost to build the network
- Cost to maintain the network
- Cost of green hydrogen as a fuel
- Suitability of green hydrogen for use in the home:
    - Performance
    - Attractiveness
    - safety
- Conversion costs
- Network safety issues

We believe that it would make sense for government and the gas industry to undertake this analysis - while we pursue the electrification process.

If, at some time in the future, a new hydrogen network is proven to be economically viable, then building a hydrogen network can be then planned, when there is much greater certainty.

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[2] https://onlinelibrary.wiley.com/doi/full/10.1002/ese3.956

Option D is summarised as "large brown Hydrogen / large CCS / no natural gas (by 2050)". This is high risk as:

- It relies on CCS which is an unproven technology.
- According to forecasts it will be more expensive to produce than green hydrogen.
- The world will not want to buy brown hydrogen.

In summary our view is that we should pursue Option A establishing a fast full electrification program. If a viable green hydrogen network can be demonstrated to be viable in a few year's time it may be appropriate to amend the full electrification strategy. Keeping the door open to a green hydrogen network should not be used as an excuse to delay the electrification program.

Q3. What policies and/or regulations, if any, are needed to support the development of low carbon pathways such as biogas, green hydrogen, and carbon capture and storage?

Hydrogen:

We should adopt regulations ensuring that all major gas equipment and installations such as gas-powered generation are capable of running on green hydrogen. We should also have a policy of banning the use of other fossil fuel derived hydrogen (unless they can be demonstrated to be zero-emission hydrogen) after 2035.

Carbon, capture storage (CCS):

We should set minimum standards for CCS and explain that energy production and / or use by industry will not be acceptable past 2035 unless the required level of CCS is met. All new development would have to accept the requirement before being Approved.

Q4. What is your view on the best ways to maintain the reliability and affordability of Victoria's gas supply if natural gas use declines?

We have undertaken analysis to see if there are any gas supply issues. In our view there are no supply issues (see below). Given the fact that there are no supply issues we do not see any reliability or affordability issues.

Victoria's Gas Supply-Demand Analysis

Summary:

Analysis of AEMO gas forecasts show there are no supply-demand issues out to 2035. There will be sufficient gas for the Winter peak in 2023 with existing ('available') supplies and the additional supply announced by APA (ASX Media Statement) 5th May 2021, from Moomba into the Victorian Northern Interconnect.

Beyond 2023, the combination of demand-side measures such as switching existing households from gas to electric heat pumps and ceasing gas to new households places Victoria in a great position. Increased storage depth built by 2029, means Victoria's gas supply is assured to 2035.

We also note that if the Port Kembla import terminal proceeds, along with the pipeline upgrade, then though it is not essential, it will provide additional supply and storage redundancy and cost pressure.

Will there be a gas shortfall in Victoria?

We have looked in detail at the adequacy of gas supplies in Victoria. Our analysis draws heavily on the following documents:

- The Australian Energy Market Operator (AEMO) Gas Statement of Opportunities (GSOO); and
- The AEMO Victorian Gas Planning Report (VGPR) 2021

We also reference the announcement by APA in May 2021 of an upgrade to the MSP pipeline:
Link: APA commences 25% Expansion of East Coast Grid, Enters into agreement with Origin Energy | APA Group

Based on our analysis we conclude that:

- There is no gas shortage in Victoria's gas supply out until around 2029, assuming the APA's MSP pipeline upgrade goes ahead as announced 5th May 2021.
    - There is sufficient gas available to meet demand
    - Winter peaks can be met
- Extra 'Storage depth' by 2029 then enables sufficient supply to 2035
- An increase in contracted inventory of LNG is required at Dandenong in order to provide more resilience to the supply system (e.g. supply disruption)
- Ceasing gas connection to new Victorian households would increase gas supply resilience (and from other reviews, lower total cost of energy to households, contribute to Victoria's emissions reduction targets, mean less stranded assets in a carbon constrained future). There is a precedent for this, namely the recent approach adopted by the Australian Capital Territory (AEMO GSOO March 21).
- Port Kembla and the EPG (gas pipeline Vic to NSW) works are not required but would provide more gas into the supply market.

The overall east coast analysis shown below looks at the times when supply might be constrained. The solid orange line shows supply with Port Kembla import terminal, but it looks like APA's MSP announced upgrade in May 2021 will be sufficient instead of relying on the Port Kembla go ahead.

The threat of winter gas shortfalls prior to 2025

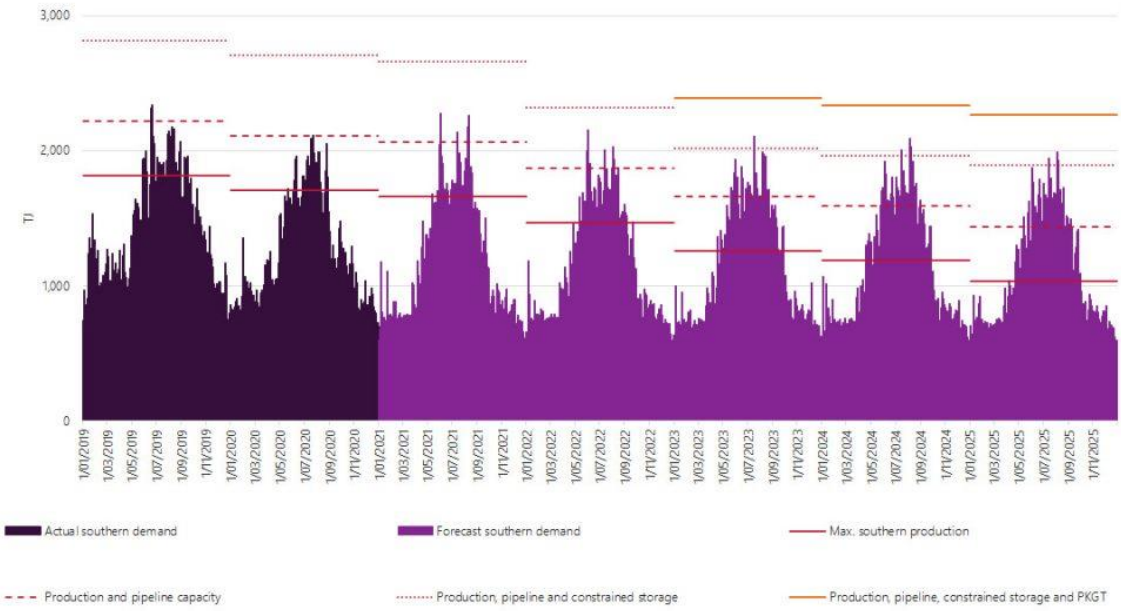


Figure 1 - Actual daily southern gas demand since January 2019, and forecast to 2025, showing seasonality, peakiness, southern production, and total system capacity available to meet southern demand using existing and committed projects (TJ) *Source:* AEMO GSOO March 21 page 6

We can also see that supply exceeds demand when we look at annual gas volumes for Victoria

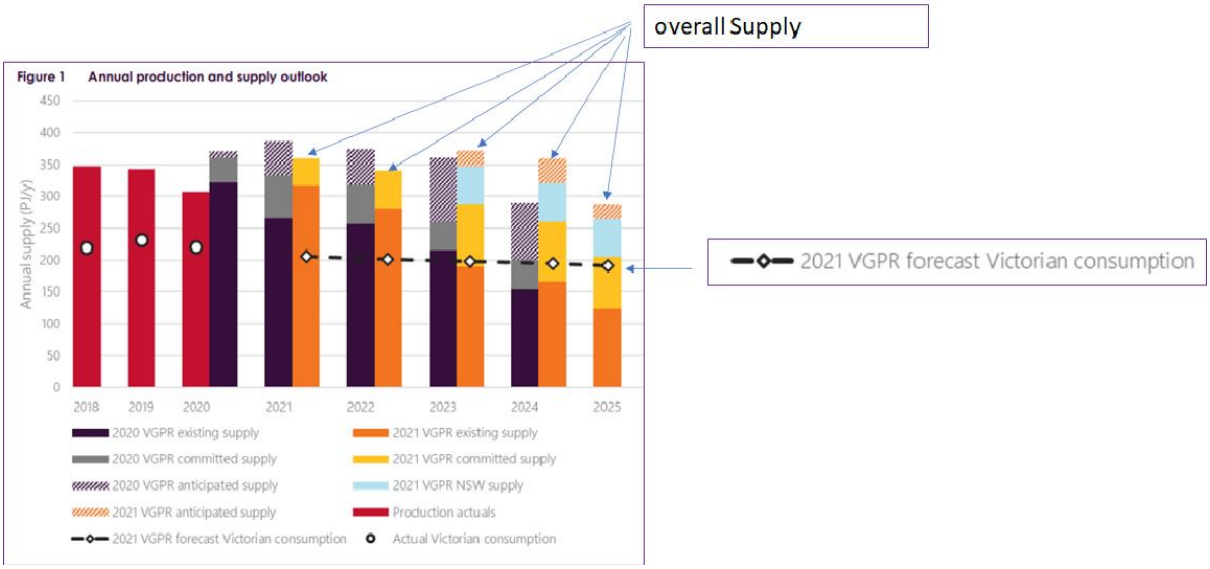


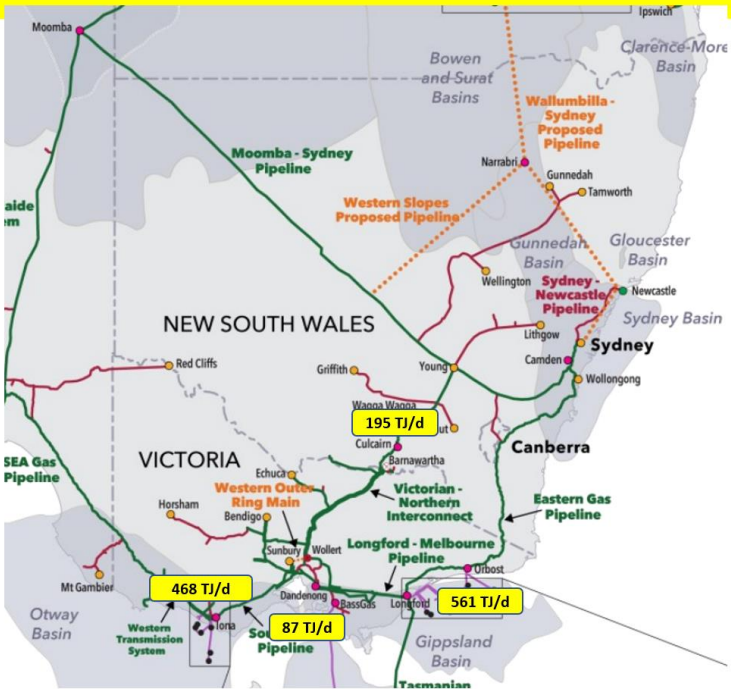
Figure 2. Supply exceeds Demand – annual gas volumes - (Victoria). Source AEMO VGPR, March 2021, *page 5*

This analysis is supported by one of the key findings from the AEMO Victorian Gas Planning report 2021 stating that:

"The threat of winter gas supply shortfalls from winter 2024 that were forecast in the 2020 VGPR, Update1, are expected to be addressed through the commitment from Australian Industrial Energy (AIE) to proceed with the construction of the 500 terajoules per day (TJ/d) Port Kembla liquified natural gas (LNG) import terminal in New South Wales and Jemena's commitment to modify the Eastern Gas Pipeline (EGP) to enable reverse flow from Port Kembla into the DTS. AIE and Jemena have advised that these projects will be completed ahead of winter 2023. This will cover the identified supply gaps provided that all construction and commissioning is completed, and that shipping schedules provide reliable cargoes during the winter months." Source: AEMO VGPR, March 2021, page 3.

NOTE: The graph has been superseded now by APA's announcement. What has happened since the AEMO VGPR and GSOO reports in March 2021, is that APA announced an upgrade of the Moomba to Sydney pipeline in May 2021. This pipeline connects to the Victorian Northern Interconnect pipeline at Culcairn. So this project alone ensures Victorian gas supply needs will be met without the Port Kembla supply to Victoria. (Yellow boxes added in AEMO schematic below.)

Gas pipeline Moomba gas field connected to Victoria already, and to be upgraded by APA to 195 TJ/day
(page 46, AEMO GSOO March 2021)



Another of the key conclusions from our analysis of the VGPR is that Victoria's Gas Supply can be extended out to 2035 without imports.

Conclusions

- There will be sufficient gas for the Winter peak in 2023 with existing ('available') supplies and the additional supply announced from Moomba into the Victorian Northern Interconnect (VNI).
- Beyond 2023, the combination of demand-side measures such as switching existing households from gas to electric heat pumps and ceasing gas to new households places Victoria in a great position. Increased storage depth built by 2029, means Victoria's gas supply is assured to 2035.
- With increased storage depth by year 2029, there are no supply-demand issues for Victoria as far as AEMO forecasts out to 2035.
- We also note that if the Port Kembla import terminal proceeds, along with the pipeline upgrade, then that provides additional (but not essential) supply redundancy during any transition.
- By ceasing gas to new households (and switching existing households from gas to electric heat pumps) over the next 15 years, resilience will be improved, and supply-demand dates extended past 2035.

Q5. What else can you tell us about the implications of decarbonisation pathways for the electricity generation, transmission and distribution networks?

Electrification will place additional demand on the networks which will require innovative solutions. Some of this demand will be met by distributed resources and some by additional generation coupled with investment in the network.

Time-of-use (TOU) is a critical development as well, to ensure transmission and distribution networks are optimised economically. For example, heat pumps can heat hot water in daytime hours away from evening times and peak-use; batteries can be deployed throughout Victoria (and Australia) to soak energy generation outside of peak hours and then deliver in peak hours; electric vehicles will at some point be used in significant ways grid-to-vehicle and vehicle-to-grid, in order to shift electricity time-of-use and help moderate generation and transmission peaks and troughs.

All of this will be decentralized to some extent into REZ's (renewable energy zones) to ensure electricity transmission costs are optimized, and to spread generation from east to west to capture differences in the sun's movement and differences in weather patterns.

The ESB and AEMO can produce and promote plans for the electricity networks once an option has been chosen.

Currently there is no alternative to electrification and energy efficiency. If the hydrogen network opportunity is proven it will then be time to evaluate whether we are better off reinforcing the electricity network or building a new hydrogen network.

Q6. How can the use of Victoria's existing gas infrastructure be optimised during the transition to net zero emissions, over the short (10 years), medium (20 years) and long-term (30+ years)? How can the Victorian Government assist in this?

Unless the existing gas infrastructure can be used for near 100% hydrogen, which it cannot, optimising the use of the existing infrastructure can only be achieved by prolonging the use of natural gas with negative effects on cumulative emissions. As explained earlier, this scenario is not preferred.

Q7. What principles should apply or what measures will be needed to manage the impacts of gas decarbonisation on households and businesses?

Transition assistance should be provided to businesses and to households.

Q8. What polices, programs and/or regulations should the Victorian Government consider or expand to encourage households, commercial buildings and small businesses to reduce their gas use?

A comprehensive, integrated energy/decarbonisation government program is needed to meet globally recognized imperatives. A full range of policy tools should be combined to support the transition. A combination of timely information, incentives and regulatory measures can work together. Each decision-maker must experience signals that shift them towards making appropriate choices that support electrification, energy efficiency, decarbonisation, and overall welfare. Key consumer issues such as split incentives, contractor standards, consumer protection, and lack of timely and actionable information must be addressed.

Q9. What policies, regulations or other support, if any, do you think are needed to support industrial users to switch from natural gas to lower emissions energy sources or chemical feedstocks?

Transition assistance should be provided to businesses and to households.