# Victorian Gas substitution roadmap.

I congratulate the Victorian government on their commitment to net zero emissions by 2050. Methane based fuels are incompatible with the target due to unavoidable fugitive emissions and combustion emissions/particulates. So we need the proposed substitution roadmap, I thank you for the consultation.


1. Benefits – lowers cost and energy required. Risks- low. Impacts – increased comfort, wellbeing. Very important but does not "get you" to net zero.
2. Scale of the opportunity – Large, though politicised in Australia.
3. Barriers – high initial outlay, safety of workers.
4. Government should and does incentivise.
5. Already mature
6. Maintain acceptance and confidence - Long term policy frameworks
7. No trade-offs.
8. Unintended consequences – compromised safety of workers.


9. Benefits – lowers cost and energy required. Risks- low. Impacts – lower cost, better health. Very important does "get you" to net zero.
10. Scale of the opportunity – Large.
11. Barriers – high initial outlay.
12. Government should and does incentivise.
13. Already mature.
14. Maintain acceptance and confidence - Long term policy frameworks
15. No trade-offs.
16. Unintended consequences – none.


There are two possibilities here, hydrogen being added to existing gas distribution (5-10% max) and fully replacing gas with Hydrogen. I will assume the later, because gas with a little Hydrogen doesn't get you there.

17. Benefits – lowers emissions. Risks- not currently technically possible to distribute Hydrogen through a piped distribution system. Impacts – when becomes possible, may need to build new parallel gas distribution network. Would "get you" to net zero.
18. Scale of the opportunity – Large.
19. Barriers – very expensive.
20. Government would have to fund
21. Not mature
22. Maintain acceptance and confidence - Long term policy frameworks
23. Cheaper to electrify and just have remaining gas requirements covered by trucked bio-methane or trucked Hydrogen and stored in tanks.
24. Unintended consequences – result of large Hydrogen gas leaks.


1. Benefits – lowers emissions, BAU for customers.
   Risks- burning gas in the home is linked to health problems, Carbon monoxide poisoning also possible. Bio-digesters need to be ran and fed constantly, to stop the bacteria dying. Need to be careful where the organic material comes from ie. not forests. Inefficient energy yield.
   Impacts – will be costly. Would not "get you" to net zero. (fugitive emissions)
2. Scale of the opportunity – Medium. Would require thousands of plants or mega plants to produce enough.
3. Barriers – very expensive. Burning things can never be 100% efficient. Refrigerant technologies are at least 400% efficient.
4. Government would have to fund, at least at the start. Biomethane is more expensive than LNG.
5. Not mature
6. Maintain acceptance and confidence - Long term policy frameworks. No plant mishaps or explosions.
7. Cheaper to electrify and just have remaining gas requirements covered by trucked biogas or Hydrogen.
8. Unintended consequences – biogas leaks are still greenhouse gas emissions.


CST

1. Benefits – lowers emissions, BAU for consumers. CST gives day long storage.
   Risks -
   Impacts – Would "get you" to net zero.

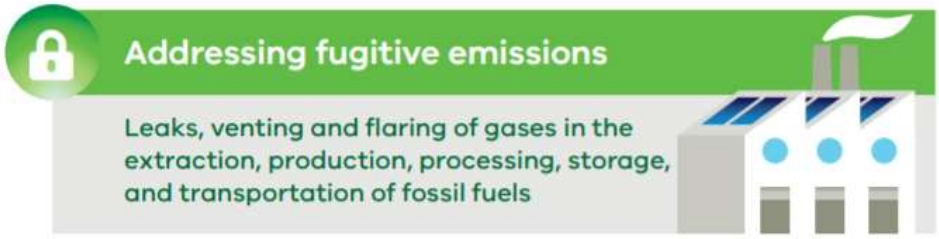
2. Scale of the opportunity – Small, will be a part of the electricity generator mix.
3. Barriers – Transmission/distribution connection.
4. Government – remove the barriers to investment.
5. Mature – lots of working plants around the world.
6. Maintain acceptance and confidence - Long term policy frameworks.
7. Inter-dependencies and trade offs - none
8. Unintended consequences – have been reports of birdkills.

CCS – There are several options here, planting forests/seaweed, air capture and tech in exhaust stacks from generators eg. coal fired power stations. There isn't enough land available for forests to help us long term. I will assume air capture as there is promising technology emerging for this.

1. Benefits – sequesters emissions, BAU for consumers.
   Risks – might not work at an appropriate scale, or be too expensive.
   Impacts – Would "get you" to net zero.
2. Scale of the opportunity – Enormous
3. Barriers – Cost. Technology.
4. Government – Must be transparent and realistic about the prospects of this technology. Would need to drive r&d and largely fund it.
5. Maturity – Not mature.
6. Maintain acceptance and confidence - Long term policy frameworks. Requires regulation of carbon accounting.
7. Inter-dependencies and trade-offs - none
8. Unintended consequences – Products may be burnt again. Products stored underground could leak out again.

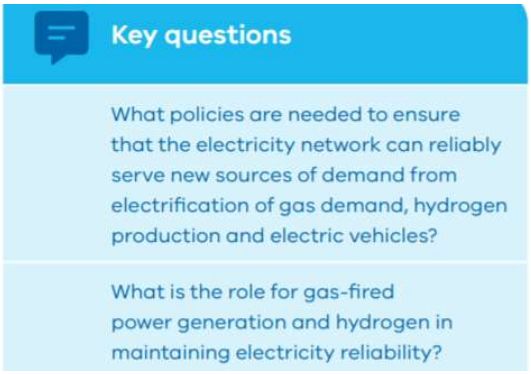
CCS must not be used to enable fossil fuels to continue as usual. It's entire capacity must be grown purely to draw down all of the emissions since the industrial revolution.

Geothermal – limited opportunity for geothermal in Victoria.



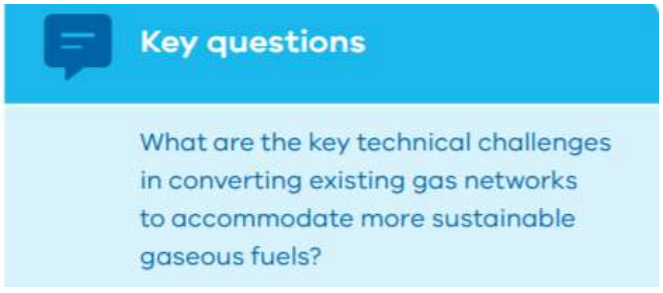

1. Benefits – would reduce emissions of some very potent green house gases.
   Risks – Fugitive emissions can not be reduced to an acceptable level. Companies responsible for fugitive emissions lie about the rates or do not seek out the true rates.
   Impacts – Would not "get you" to net zero.
2. Scale of the opportunity – Medium
3. Barriers – Cost. Hard and expensive to police.
4. Government – Use satellite imagery and other measurement technology to locate leaks and prosecute offenders. Pursue renewable electricity alternatives to gas. No subsidies for gas exploration or extraction.
5. Maturity – Not mature.
6. Maintain acceptance and confidence – Transparency about fines being given and requirements for rectification by offenders.

7. Inter-dependencies and trade-offs – will always be fugitive emissions until you cap the wells, and shutdown the distribution.
8. Unintended consequences –

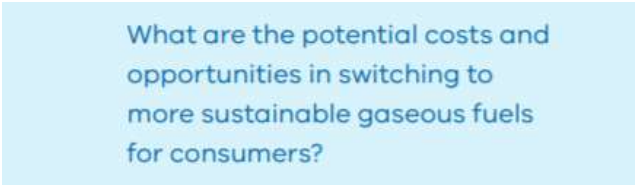



-1. TOU tariffs to encourage load shifting (Vic has the advantage of already having smart meters rolled out). Keep encouraging installation of DER. 2. Increasing building efficiency minimum standards is good, but there is no inspection that wall/ceiling/floor insulation has been installed correctly. This must be introduced. 3. Keep encouraging REZs and Electrolysers. 4. Reduce barriers to solar and wind farm connections. 5. EV subsidies are good, but there should be levels, a condition of the higher levels must be that the EV have V2G capability and it be utilised. EVs must play an important role in grid stability. 20-200kWh of storage per vehicle is an opportunity that must not be missed. 6. DRED (demand response enabled devices) finally be legislated that they be connected, so a 'relevant agent' can control the appliance up or down as required by the grid. 7. Dynamic operating envelopes be implemented for DER, so a 'relevant agent' can control the DER up or down as required by the grid.

- Gas-fired power generation will have a very short term role (10 years) in maintaining electricity reliability. Resource will be too scarce and expensive soon and the alternatives will be cheaper and more desirable. Hydrogen and batteries will take over the role of gas-fired power generators for maintaining reliability.

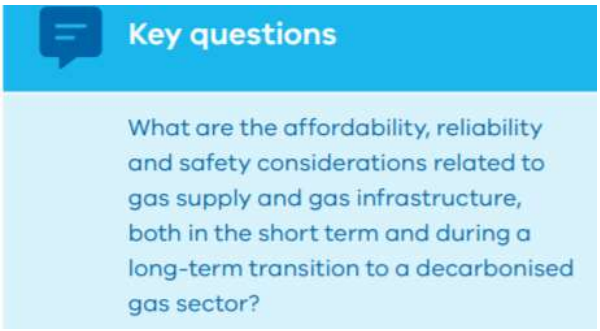



Hydrogen must be at high pressure to be distributed in pipelines at any reasonable density. Most of the transmission pipes are not the right material for H2, this would need to be entirely replaced which would be extremely costly. H2 is a very small molecule so can escape relatively easily. The existing gas network is already full of holes, the amount of Hydrogen that would leak through that sieve would be a travesty.



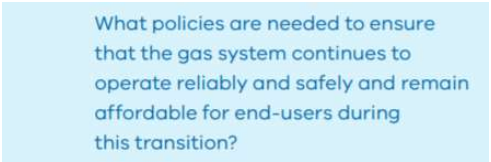
Costs – High.  May need to swap appliances.  Still have fugitive emissions.  More sustainable gas fuels can never be as efficient as electric in energy yield to do work.

Opportunities – Lower emissions than LNG.

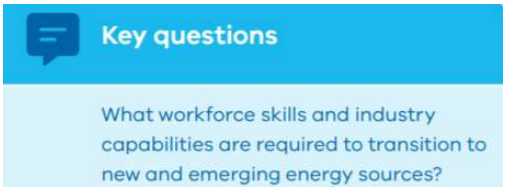



Affordability – Will go from expensive to more expensive.  You can't offset gas costs with renewables, like you can electricity.

Reliabilty – Scheduled interruptions due to transition

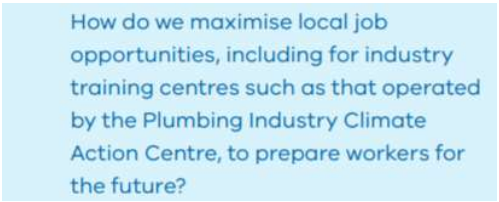



Policies – Be implemented to encourage consumers away from gas.




More electrical apprentices and more training of electricians.  Re-skilling gas fitters into refrigeration mechanics and Hydrogen.


Consult to get the syllabus written, experts employed to deliver content and provide incentive for people to take the courses.

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**Key question**

What key uncertainties should the Roadmap take into account, and what is the government's role in reducing these uncertainties?

Consumer preferences – Start educating the benefits of alternatives to gas and that we can't continue to use that fuel.

We have the technology – we must use the proven technologies that we have now to do what must be done. The aforementioned burgeoning technologies will play their role, as soon as and not before they are proven.

Particular challenges include:

- The extent to which the upfront cost of switching from gas to electric appliances are a barrier to the uptake of more sustainable technologies, notwithstanding the longer-term emissions and running cost benefits.

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If policy is strong and well communicated, everyone knows the direction we're headed and what must be done. If for example, home gas appliances are banned from being replaced when they reach end of life, the "upfront cost of switching" is vastly reduced. The consumer was going to have to replace the thing anyway, so then just a small added cost of changing the infrastructure around the appliance remains.

**Key questions**

How can we ensure that the costs of transition to lower emissions energy sources are borne equitably?

Keep existing schemes that subsidise solar and efficient electric appliances for low-income households. Write legislation that requires landlords to make efficient electric choices for their tenants or introduce incentives.

Introduce small export fees (~$100pa) for DER owners to be able to export as much as they can into the grid (Subject to dynamic operating envelope). This money can be used to support the grid and lower prices for those who cannot own DER. Those not wishing to pay the fee to export, are given a small maximum export amount (eg. 1.5kW)

How can we help low-income and vulnerable households manage any upfront costs in changing energy sources?

Introduce rebates.

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?

Efficiency of use – complacency and indifference to the cost/emissions savings they could make from switching to electric. Lack of education.

Switching – It is very difficult to find a tradesperson who will help consumers make an efficient electric choice. They mostly just want to replace what's there because that is easiest.

Emergency situations like when a hot water system fails, if people are not prepared, they end up making a poor decision under the pressure. The good trade companies are booked out for weeks with government rebate work (eg. heat pump hot water) and don't have the spare appliances for emergency work.

What are the opportunities for the Victorian Energy Upgrades program to incentivise efficient gas use, thermal upgrades of buildings (e.g. insulation) and electrification?

Gas use should never be incentivised.

Thermal upgrades is a big opportunity but is still politicised because of the poor behaviour of some of the participants in the 'pink batts' scheme. "blow-in" insulation for walls is a low risk option. Under floor insulation work is lower risk. Gap sealing is the biggest opportunity (caulking and door/window seals). Incentives for double glazing (windows - the second biggest leaking point or buildings) could help (should be for Aus made windows only).

Electrification – Expand subsidies for Reverse Cycle Air conditioners to be installed. So long as there is DRED control installed as well. Increase subsidies for Aus made heat pump hot water systems. Introduce subsidies for induction cook tops. If house holds end up with only one or two gas appliances left, it becomes silly to continue to pay the $1 a day service fee to have the gas service.

What issues and elements do you see as most important to improve the energy and emissions performance of new homes?

Mandatory inspections for insulation installed in new homes at frame stage, right before sheeting.

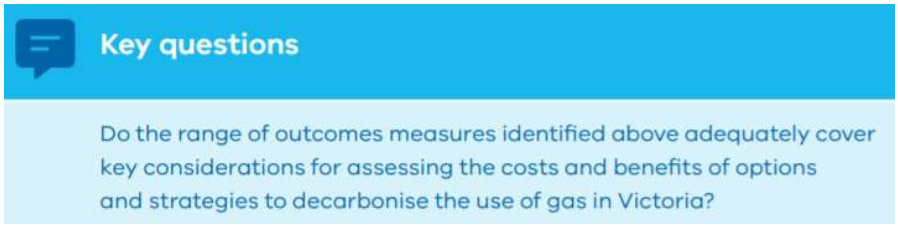
New homes/builds should all be designed with a minimum North facing wall quotient to allow passive solar thermal gain.

Concrete should be lower emission concrete and all slabs must be insulated, at least on the sides (80% energy loss at sides of a slab).

Introduce minimum solar size.  All new builds must have solar systems and solar access.

Reduce points available for solar hot water systems (especially gas boosted) – these barely work in Victorian winter.  Work very well in Summer but so does the solar, so roof space would be better utilised for solar systems for the Winter time.

Reduce points available for dark roofs – These barely help elevate inside temperatures in Winter and make it unbearable in Summer.




The cost of not decarbonising the use of gas in Victoria and not reaching net zero by 2050 is what really needs to be considered.  Once you see the cost of that, the cost of investing now to mitigate some of that cost sees any doubt diminish.

What would be appropriate metrics through which to measure these outcomes?

Emissions reduction – Tonnes of CO2

Energy security and reliability – number of price hikes due to supply per year.

Affordabilty and equity – AUD.  Efficiency of electric appliances versus gas.

Safety – Number of accidents and number of deaths.

Market viability – profits of suppliers and retailers in AUD.

Social licence – Number of consumers switching

Economic impacts – output – GDP. Employment – job numbers

Environmental impacts – Number of storms, number of floods, number of bush fires.  Will level off if we manage to reach net zero globally by 2050.

In conclusion –

Consumers can be electrified relatively easily and cheaply, and they will see myriad benefits from it.

There are fundamental problems with gas that mean you do not invest in that technology any longer, in the interest of not throwing good money after bad.

- Gas can never be efficient at heating (Hydrogen too, whereas heat pumps can be 400%+ efficient)
- Gas cost can never be offset by renewables (eg. solar)
- Gas can never be without fugitive emissions
- Gas in the home is linked to health problems
- Gas is a finite resource
- Gas as a feedstock has emissions

- Gas is explosive and a foul-smelling trace must be added to it.

Hydrogen will be too expensive to bother with distribution. Hydrogen costs cannot be offset with renewables with current technology (anyway why would you? If you have electricity, just use that).

For these reasons, disconnecting the gas distribution network is a 'no regrets' policy.

For the so called 'hard to abate' sections of industry that is left over, trucked in biogas or Hydrogen should be used.

$1 spent on climate mitigation today saves $6 in the long run.

Michael Shaughnessy