PORT PHILLIP EMERGENCY CLIMATE ACTION NETWORK

VICTORIA'S - GAS SUBSTITUTION ROADMAP

PECAN - Who we are

The Port Phillip Emergency Climate Action Network (PECAN) is an environment group established within the City of Port Phillip in 2019. Its core membership comprises representatives from 12 environment groups within the municipality:

1. Australian Conservation Foundation Macnamara
2. Australian Youth Climate Coalition
3. Bayside Climate Crisis Action Group
4. Community Alliance of Port Phillip
5. Elsternwick Park Association
6. Elwood Floods Action Group
7. Extinction Rebellion Port Phillip
8. Locals Into Victoria's Environment
9. Port Phillip Alliance for Sustainability
10. Port Phillip EcoCentre
11. Stop Adani Macnamara
12. unChain St Kilda

Introduction

We note the work commissioned by Infrastructure Victoria and undertaken by Doris Engineering Consultancy, in which four scenarios, A, B, C, and D, are examined as routes which could be taken to enable zero net emissions by 2050. The four scenarios examine a range of admixtures of renewables, natural gas, biogas, hydrogen, energy storage and offsets, and identify the Environmental, Social, Economic, Technical/Reliability, and Safety characteristics within each of the scenarios. The report provides valuable assessments of each of these characteristics, but its scope does not deal in detail with a critical component of the Roadmap, energy efficiency measures except in broad terms. Energy efficiency measures for example are described as Moderate in Scenarios A and C, and Small in B and D. As these measures will be critical in reducing the task of reaching net zero it seems important that more work is carried out on determining the speed, impact and cost of the very many energy efficiency components which will be involved.

Victoria's Carbon Budget

Before discussing the many issues raised in the Roadmap, it is important to consider it in terms of Australia's and Victoria's Carbon Budgets.

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In 2014 the Commonwealth Government's Climate Change Authority calculated Australia's emission reduction targets that should be adopted to stay within the 2˚C ceiling by 2050.

The CCA calculated the world carbon budget at that time and assigned Australia's fair component to be 0.97% of this budget.

It set a target for Australia to remain within that Budget, by achieving between 45% and 65% emissions reductions by 2030. The Paris Agreement was completed in 2015, with Australia adopting a target of between 26 – 28% reductions by 2030. But the government has never enabled the CCA to update the emissions targets. Recognizing that Australia will be expected to bring a stronger 2030 target to COP26 in November, a group of experienced climate scientists, together with John Hewson, formed the independent Climate Targets Panel to update the CCA's work, using the same assumptions and methodology. The Panel comprised Prof Will Steffen from the ANU, Prof Lesley Hughes from Macquarie University, Assoc Prof Malte Meinshausen, founding Director of the Climate and Energy College at Melbourne University, and John Hewson AM.

The Panel developed short and long term targets consistent with the dual temperature goals of keeping global warming well below 2˚C above pre-industrial levels, and preferably, 1.5˚C above the same levels. Its first report published in January this year found that it is not possible to maintain the current 2030 target, coupled with a zero emissions target at 2050, without significantly exceeding the 2˚C target. Australia has used up so much of its budget that to be consistent with the 2˚C target, a 2030 reduction of 50% would be needed, reaching 67% reduction by 2035 and net zero emissions by 2045.[1]

The CCA had calculated that Australia's 2013 – 2050 Budget was 10,100 MT Co2e and the Panel, using updated figures, determined that that figure should be recalibrated to 10,400 MtCO2e. Between 2013 and 2020 Australia emitted 4,237 MtCO2e, leaving a remaining budget of 6,161 MtCO2e between 2021 and 2050 if Australia is to remain within the 2˚C limit.

To limit warming to 1.5˚C or less, the task is much greater, requiring a reduction of 74% by 2030, and net zero by 2035. In budget terms, between 2013 and 2050 the available budget is 3,521MtCO2e. Averaging that over 37 years requires that annual emissions be reduced from 538.9 MtCo2e (produced in the year ending March 2019) to 95.2 MtCo2e (note that this is a straight line calculation of the average annual reduction– reductions should be higher for near-term years, tapering to zero by 2050). Victorian emissions in 2019 were 17.25% of Australia's[2]; that leaves a total annual budget for Victoria of approximately 16.42MTCo2e between 2021 and 2050. In 2019, the last year for which figures are available Victoria's emissions were 91.3 MtCo2e, falling from 94.60 MtCo2e in 2018[3].

The significance of these figures is twofold. First, Victoria's current level of annual emissions is over five times its allowable budget for the 1.5˚C ceiling. Second, it is not sufficient to simply set a 2050 zero emissions target, if along the way emissions cumulatively exceed the Budget ceiling. And International, Australian (assuming zero emissions by 2050) and Victorian targets are all well in excess of this ceiling. Australia's current trajectory will lead to well over 3˚C, and Victoria's target of

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[1]https://www.climatecollege.unimelb.edu.au/files/site1/docs/%5Bmi7%3Ami7uid%5D/ClimateTargetsPanelReport.pdf

[2] https://www.industry.gov.au/data-and-publications/national-greenhouse-accounts-2019/state-and-territory-greenhouse-gas-inventories-data-tables-and-methodology

[3] ibid

between 45% to 50% reduction by 2030 would mean that it is still producing approx. 60MtCo2e[4] annually by then – well above the 16.42MtCo2e allowed by the 1.5˚C budget.

Improving Energy Efficiency

Energy efficiency measures are usually considered the low hanging fruit in decreasing electricity or gas consumption, but anticipated benefits are not always achieved, and in many cases cannot be quantified.

Over 40% of Australia's domestic gas use occurs in Victoria, where the cold winters have created a strong demand for space heating. Historically this was provided through gas heaters built into the fireplace opening, then came gas ducted heating, and now gas powered hydronic heating. Many Victorian households use gas for hot water, cooking and space heating, and there is a strong inbuilt culture which will be hard to shift. In addition gas has been portrayed by producers and retailers as clean energy; the combination of liquefaction and transport losses together with fugitive emissions of methane mean that gas is invariably more polluting than claimed and in some cases may have almost as much warming effect as burning coal. In May this year the United Nations Environment Program (UNEP) released a Global Methane Assessment report in which Inger Andersen, Executive Director of UNEP said: "Cutting methane is the strongest lever we have to slow climate change over the next 25 years and complements necessary efforts to reduce carbon dioxide"[5]. There is limited awareness of the health issues associated with domestic gas use – how can 'clean' gas be considered unhealthy?

The costs and availability of efficiency measures can also be a barrier. The great majority of Victorian houses have single glazing and no ready-made double glazing solution is available. Reverse cycle air conditioners are very efficient but are not widely seen as effective replacements for gas heating, especially hydronic. In Europe it is possible to buy a wide range of heat pumps designed specifically for hydronics, but this is not yet the case here. And similarly with cooking - one of our members tried to replace a 90cm freestanding oven with a gas cooktop with an all electric induction top – there were only 3 models available and the preferred one, over two thousand dollars dearer than the gas equivalent, required a three phase power upgrade estimated by his electrician at costing around $15,000.

A further issue with efficiency measures is that it is hard to calculate or measure the benefits obtained from upgrading household appliances. In the digital age communicating appliances displaying energy usage in real time should be available without excessive additional cost. The smart home is apparent but has not yet arrived, but full electrification will require better management of electricity demand and usage.

An additional issue concerns the occupational resistance which can be anticipated from the thousands of plumbers and gasfitters licensed in Victoria. At present the replacement of gas cooking, heating and hot water appliances must be carried out by a plumber, with the electrician making the final connection to the main. There will still be demand for plumbers, but not on the present scale.

Gas prices have increased significantly over the last decade; with most Australian gas producers focused on export sales to SE Asia and with no domestic reservation policy in place on East Coast markets, they are able to take advantage of world parity pricing. But cheap conventional gas won't

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[4] https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0026/504188/Victorian-Greenhouse-Gas-Emissions-Report-2018a1.pdf p11

[5] https://unfccc.int/news/global-assessment-urgent-steps-must-be-taken-to-reduce-methane-emissions-this-decade

continue to be available and Australian exporters will face increasing pressure over the near future to offset their Scope 1 and 2 emissions; allied with increasing production costs domestic prices could be expected to keep rising. Over recent months, commercial and industrial users have been facing increased electricity prices and again manufacturers are complaining that prices are unsustainable. In an early phase of the Gas Led Recovery Andrew Liveris stated that a domestic price of $4 per GJ was essential to a manufacturing renaissance in Australia; in early July spot prices reached $58 GJ.

If efficiency measures are to achieve sufficient penetration across the Victorian community, a number of critical measures will be required, in the following areas:

Sustained community, commercial and industrial education – the why and the how of degasification will need to be driven home to consumers, retailers and importers/distributors, and manufacturers, with continued focus on cost, environment and health outcomes. There is a considerable level of confusion about the assistance and subsidies available for energy efficiency and appliance upgrades;

There will need to be incentives /subsidies across a wider range of appliances and upgrades than is currently the case; there is little incentive for landlords to upgrade properties when the tenant is the main beneficiary:

Manufacturers and retailers will need to introduce smarter and more efficient appliances, and increasingly there will be a need for friendlier software to enable widespread uptake of manageable systems which can integrate rooftop solar with efficient electricity usage and will depend on smart grids;

Regulatory measures will need to be strengthened, as more households retire their gas appliances and gas retailers become predisposed to increase connection charges, with most impact on poorer households. More demanding standards for appliances need to be introduced. And it may become necessary to develop some form of accreditation for commercial entities marketing efficiency upgrades.

Electrification

The four scenarios developed by Doris Engineering have differing pathways in getting to zero emissions by 2050, with varying mixes of renewables, natural gas, green and brown hydrogen, biogas and carbon capture and storage (CCS). All share energy efficiency measures for residential and commercial buildings through insulation, ground source pumps and the installation of smart grid systems.

Scenario A involves maximum renewables, no natural gas by 2050 and no CCS. Energy gas demand will be met by biogas and green hydrogen. Energy efficiency measures are described as Moderate. Carbon emissions at 2030, 2040 and 2050 are 59, 20 and - 8 MtCo2e respectively.[6]

Scenario B is described as partial electrification, limited gas and CCS, with a limited amount of natural gas being used through to 2050 in plastics and alumina production, as well as a firming mechanism to balance variable renewable loads; biogas and green hydrogen are also in the mix. Its defining characteristic is that it relies on existing gas infrastructure. Energy efficiency measures are described as Small. Carbon emissions at 2030, 2040 and 2050 are 59, 23, and - 5MtCo2e respectively.

[6] P12, https://www.infrastructurevictoria.com.au/wp-content/uploads/2021/07/DORIS-Gas-Infrastructure-Advice-Scenario-Analysis-I-Study-Report.pdf

Scenario C gets to zero emissions before 2040, with green and blue hydrogen with offsets, electrification and no natural gas in 2050 and no CCS. Most energy gas demand is provided through green Hydrogen, with blue hydrogen production scaled to balance Victorian natural gas production through its natural decline, and offset by agro-forestry and Carbon trading certificates. Despite its apparent advantages, it is an untested technology which is being proposed, with inherent technical complexity in a context where absolute reliability is required. Further, the cost of upgrading distribution networks will likely be passed on to consumers. Energy efficiency measures are described as Moderate. Carbon emissions at 2030, 2040 and 2050 are 28, -6 and – 56 MtCo2e respectively.

Scenario D is described as large brown hydrogen with large CCS and no natural gas by 2050. It proposes the highest proportion of energy gas , based on domestic use and export of brown hydrogen derived from Victoria's brown coal deposits, and some combination of biogas and green hydrogen; large CCS required. Carbon emissions at 2030, 2040, and 2050 are 366, 565, and 715MtCo2e respectively.

It will be apparent that behind these limited descriptions there are major implications for electricity grid infrastructure upgrades, and in respect of gas, upgrading distribution networks for the very different infrastructure required for hydrogen. It should also be kept in mind that there are major differences in reliance on predominantly gas or predominantly electricity between the various scenarios.

The report goes on to weight the Scenarios for Environment, Social, Economic (including jobs) , Technical/Reliability and Safety factors. Scenario D can be excluded from closer examination, given its emissions and cost factors. Scenarios A, B and C have similar cost structures, but are distinguished by differing energy balances between electricity and gas. A and B both have a relatively high proportion of zero emissions electricity generation and emissions profiles; B retains a relatively small amount of natural gas beyond 2050 to provide grid firming and for difficult abatement in manufacturing applications. Scenario C gets to zero 10 years earlier than A or B, creates nearly 50% more jobs, and produces less emissions. It is able to achieve net zero significantly earlier than 2050 given the relatively high proportion of zero and negative emissions electricity and gas in the mix from renewables and biogas. However it depends strongly on green hydrogen and requires rebuilding pipeline infrastructure at a level that is 5 times greater than for Scenario B; the reliance on yet untried hydrogen is assessed as inherently more risky than for Scenarios A and B. In addition Scenario C also depends on the scaled up development of biogas at an early uptake point in the transition process.

Degasification – Substituting natural gas with hydrogen

The first reaction to this concept is that substituting natural gas with hydrogen is the logical pathway for Victoria to move to a low emissions economy for both industrial and domestic energy use and distribution. Victoria has an extensive gas distribution network and a reducing natural gas resource. It would seem the distributed natural gas can be supplemented and eventually changed completely to hydrogen.

However, this is misleading. It is often stated that adding hydrogen to the natural gas supply without having to modify or replace existing equipment is limited to no more than 10 to 20%. The problem is that the 10 to 20% is by volume, not heat content. The lower heating value of natural gas is 36.6 MJ/m^3 and for hydrogen is 10.8 MJ/mf^3 [7]. Therefore the 10 to 20% that is often stated, is really only

[7] https://www.engineeringtoolbox.com/heating-values-fuel-gases-d_823.html

between 2.95 to 5.9 % of total natural gas and hydrogen mixed gas heat capacity – less bang for the consumer's buck, and it will certainly cost more. This pathway now starts to look a lot less attractive. The basic issue is that the density of hydrogen gas is much lower than natural gas - H_2 0.09 and NG 0.8 kg/m^3.

In addition the infrastructure required for hydrogen is quite different than is used for natural gas and biogas – they require totally different distribution infrastructure, despite the confidence some politicians are expressing about using the same distribution network.

Apart from the above limitations of supplementing natural gas with hydrogen, it will be much better to reduce the demand for natural gas by initially encouraging big users of natural gas to electricity and/or renewable hydrogen generated at the user's site. Large Victorian industrial users would include cement, fertilizer, brick and glass manufacturing - these could use green hydrogen generated on site. Large commercial and municipal users would include heating office blocks, halls and swimming pools - these would be converted to electricity, in most cases using heat pumps.

Confusion about blending hydrogen with natural gas is not accidental. The gas and pipeline associations are promoting blending renewable hydrogen up to the feasible limit of 15% to 20% with natural gas and using descriptors like "clean" and "renewable"[8]. *Gas Vision 2050* outlines the process in a glossy document that fails to mention the CO2 produced by combusting the 85% of methane. The objective is clearly apparent, to maintain the existing natural gas infrastructure indefinitely.

The ACT has removed a planning requirement that all new housing must incorporate gas connection, and has a climate strategy which calls for cessation of gas usage by 2045. In the US major cities like San Francisco and Seattle have banned new natural gas connections and in the EU a similar process is underway.

A problem with the Gas Substitution Roadmap is that first, to be properly comprehended it must be read in conjunction with Infrastructure Victoria's *Toward 2050: Gas infrastructure in a zero emissions economy*, and in turn the study it commissioned by Doris Engineering, referred to earlier. And of the four scenarios Doris examined, only two enable the full and unambiguous retirement of domestic natural gas in Victoria.

Assessing the Scenarios

Scenario D can be put aside immediately due to emission levels and costs.

Scenarios A and B both rely on primarily on electrification, using technologies already in use and which are well understood in the community broadly and in depth by the regulatory bodies, especially AEMO and the Energy Security Board. In a context where outages quickly become outrages, these two Scenarios provide the least risky pathways.

Scenario C is very attractive on paper, but depends on four technologies embodying significant risk/uncertainty elements. Green Hydrogen will certainly be viable and extensively used at some point but there are uncertainties about when, and how much it will cost. It will require new transmission and distribution technology and costs will certainly be passed on to consumers.

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[8] https://www.energynetworks.com.au/resources/reports/gas-vision-2050-hydrogen-innovation/

Biogas can provide negative emissions but is not a well developed technology – most current generation comes from landfill and a large part of it is flared. Its use would depend on developing feedstock at an industrial level and surmounting a variety of regulatory hurdles.

Blue Hydrogen involves reacting natural gas with high-temperature steam to release the hydrogen, with CO2 being released in the process and dealt with by CCS or offsets.

Scenario C also proposes Pumped Hydro for storage , but states that there is likely to be strong community reaction to damming rivers and that implementation of this storage measure would be problematic.

For all these reasons, together with the issues concerning the continuation of the gas distribution network through the industry marketing described above and outlined in *Gas Vision 2050,* Scenario C cannot be supported.

Just Transition

It is not within the scope or capacity of this submission to make detailed proposals about transitional arrangements for workers and companies affected in the transitioning, but clearly it is essential that the Victorian government develops effective transitioning measures, which involve workers, unions, companies and industry associations, and TAFE facilities.

The government has a successful model in the case of the Hazelwood closure, where the Latrobe Valley Authority was established to assist the affected workers and the region more broadly.

The difference in the gas case is that the affected workers are more dispersed across Victoria and the impact of closures will take place over an extended period. It is important that transitional arrangements are in place and well understood when major policy announcements are being made.

Recommendations

- Scenarios A and B should be clearly preferred as they focus strongly on electrification and in the case of B maintain only a residual role for gas in relation to grid firming and in limited industry applications where practicable alternatives are unavailable.
- The modelling carried out by Doris Engineering needs to be reworked to comprehensively incorporate the full suite of available energy efficiency measures in Scenarios A and B.
- The Victorian government should make the earliest possible announcement about the State's transition away from gas and incorporate the consequential planning measures in the State Planning framework.
- This must be accompanied by the introduction of a more comprehensive energy efficiency program directed at both residential and commercial users. Space heating and HWSs should be at the centre of this program. Domestic gas HWSs are usually replaced within a day or two of breakdown with a similar type of gas heater. It would be useful to supply all households and licensed plumbers with information about the range of subsidised heat pumps, their environment and cost benefits, and to keep this information updated.
- The versatility of reverse cycle air conditioning, its efficiency and cost benefits are not widely understood. Even less understood are the benefits of air source and ground source heat pumps. Given the scale of the transformation necessary, widespread community awareness of both the contours of the climate challenge and the beneficial options available is crucial to the undertaking. A well devised and

resourced, strong and continuing, community education program therefore is necessary. This should be undertaken through all media channels (public broadcasting and social media) and information should also be readily available through local government, utilities, and retailers about subsidies and environmental and running cost benefits.

- A strong and continuing community education program should provide information through local government, utilities and retailers about subsidies and environment and running cost benefits
- The State government should work with manufacturers and major importing companies to introduce and promote more efficient appliances; there is a strong case to restrict the import of cheap appliances which do not meet threshold efficiency standards.
- The most disadvantaged households are most in need of upgraded appliances, and an enlarged Victorian program must continue to focus strongly on these households.
- The full benefits of more efficient appliances are lost without the provision of better draftproofing and insulation; these measures must be at the heart of the energy efficiency program.

The State Government must develop a comprehensive and long-term program to assist workers and companies affected in the transition.

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