

Submission on the Gas Substitution Roadmap

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Jim Crosthwaite worked over many years as an economist for the Victorian Government and for national R&D programs. His focus was on strategies, programs and tools for environmental management, especially biodiversity, water, forestry and agriculture. He has also written about manufacturing and energy, and for some time managed the Manufacturing section in the Australian Bureau of Statistics (Vic Office).

After the following key points, see tables with responses to questions in Chapters 3 & 4.

1. Accelerating demand-side action. The Victorian Government is to be congratulated on its demand-side measures. *If continued, expanded and supplemented*, they will be sufficient to meet net zero targets while critical to resolving the gas supply, pricing and affordability issues.

Action on demand is unequivocally supported by work undertaken for the Gas Infrastructure 2050 inquiry by Doris Engineering. [Their report](#) concludes that only Scenarios A & B, which are based on electrification (A, B) are justified. Scenario C based on hydrogen in the grid is unproven, technically difficult and costly for users. They also say biogas and CCS in Scenario D should not play a major role.

2. Choosing no regrets. In 10 years, Victorians will **regret lock-in** to an energy system in which:

- gas companies have been encouraged to invest in gas infrastructure
- consumers are bearing the capital costs of converting 1,900 km of gas transmission pipelines and 32,009 km distribution in Victoria to take a fuel mix with 10-15% hydrogen
- methane still is over 80% of the piped gas to our households, institutions and businesses

3. Boosting energy efficiency. The Roadmap correctly emphasises energy efficiency as number 1 pathway to replace gas. If the Roadmap is to include the findings from its inquiry, Infrastructure Victoria should be asked to redo their Scenarios A & B to capture accelerated energy efficiency measures especially in existing dwellings and industry, institutions (hospitals, schools, child care) and other commercial premises.

Immediate action - ensure that the follow-up analysis being commissioned by Infrastructure Victoria from Doris Engineering probes a radical scaling up of energy efficiency measures.

4. Evaluating pathways. The Outcomes Framework in the Roadmap needs to be clearer, in order that due recognition is given to the pathway of energy efficiency.

Immediate action - create a simple spreadsheet-based multi-criteria analysis to help decision-makers compare the Pathways, with transparent assumptions and weightings that can be tested for robustness with basic sensitivity testing.

5. Other key points

- Electrifying hot water – a major opportunity as HWS break-down on average in 12 years.
- Households need trusted and reliable information *at key decision times*
- Price of energy through gas pipelines will remain high under all pathways
- Workers across the gas industry deserve support as Victoria moves away from gas. In a [book chapter](#), I discuss these workers and policy options for achieving a just transition.ⁱ
- Economic goals of the Victorian Government can be met while rapidly exiting from gas.

Outcomes Framework – and multicriteria analysis (end of Chapter 4)

I start with the Outcomes Framework as it is critical to the whole exercise.

<p><i>Do the range of outcomes measures identified above adequately cover key considerations for assessing the costs and benefits of options and strategies to decarbonise the use of gas in Victoria?</i></p>	<p>There are biases implicit in the framing of outcome measures. Each measure needs to look at the <u>impacts of continuing gas use, not just the alternatives</u> that displace gas.</p> <p>Multi-criteria analysis with explicit assumptions and weightings for comparing the different pathways is essential. I recommend doing so with an EXCEL spreadsheet, once agreement is reached on weightings for each category and sub-category.</p> <p>For government decision-makers, it is especially important to have a framework that allows energy efficiency to be treated as a pathway, and compared to others. Note that the Gas Infrastructure 2050 draft report uses multicriteria analysis, but <u>does not</u> include energy efficiency as a separate scenario.</p> <p>For clear and transparent evaluation, the outcomes measures should be grouped into a few key categories and sub-categories. This has been done in the Doris Engineering report for the Gas Infrastructure 2050 inquiry, which uses 4 categories of environmental, economic, social and technical.</p>
<p><i>What would be appropriate metrics through which to measure these outcomes?</i></p>	<p>Highest weighting should be given to the two 'non-negotiable' outcomes - emissions reduction (under environment) and energy security/reliability (under social and economic). Other issues are important, but receive lesser weighting.</p>

PATHWAYS - DECARBONISATION PATHWAYS FOR THE GAS SECTOR (Ch3)

I have only addressed three pathways. The first two will feasibly and realistically decarbonise Victoria. The third may be technically possible, but is addressed critically here given that it is a major ambition outlined in the strategic plan of the gas industry [Gas Vision 2050](#). About the other pathways, biogas may be regionally important, emerging technologies have an uncertain place, and tackling fugitive emissions will help somewhat.

	Improving energy efficiency	Electrification	Substituting natural gas with hydrogen
What are the key benefits, risks, and potential impacts on various end-users, on energy affordability, safety, security, reliability and equity?	<p>Less demand on the system, freeing gas for critical uses.</p> <p>It will help low-income households</p> <p>It will lower operating cost for business</p> <p>There is a risk that increased efficiency will lead to an overall increase in energy use (known as the Jevons Paradox) – see role of government below.</p>	<p>Cheap ongoing sun & wind power from first-rate equipment, once capital costs paid for.</p> <p>Low risk if national system is balanced well and redundancy built in.</p>	<p>Little benefit to households, commercial premises or institutions compared to electrification.</p> <p>Higher costs to the above if appliances (heating, cooking, hot water) need replacing and if monopoly-owned pipelines and distribution networks have to be refitted (as is almost certainly the case)</p> <p>Green hydrogen generated onsite or delivered through dedicated pipelines is potentially very important in ensuring reliable cheap energy supply for industrial processes requiring high temperatures.</p>
What is the scale of the opportunities and potential to accelerate uptake?	<p>Research shows big potential for industry to save on energy costs.</p> <p>Huge opportunities in saving on heating and cooling costs given how leaky Victorian dwellings, businesses and institutions are compared to Europe.</p>	<p>Electrification of space heating offers the most potential – in residences, offices, warehouses, institutions (hospitals, schools, aged care, childcare etc.). <i>Northmore Gordon</i>ⁱⁱ determined that electrification especially of</p>	<p>Scale of opportunity in future use of hydrogen relative to the current total Victorian use of gas is relatively low. The exception is large industrial users.</p> <p>Assuming only green hydrogen is</p>

	<p>Opportunities can be quickly accelerated through focused and well-resourced government programs, especially Victorian Energy Upgrades (VEUs) and Victorian Energy Efficiency Certificates (VEECs)</p>	<p>space heating could avert Victoria's winter gas shortages. Revised VEUs and VEECs could rapidly accelerate this.</p> <p>If 10% of hot water services (now mostly gas) break down each year, there are huge gains if they are all replaced with heat pumps. As capital costs are higher, financial assistance, especially to low-income households, could accelerate this. Note ABS ⁱⁱⁱ in 2014 found 3,388,300 HWS Australia-wide, while the <i>E3 Hot Water Systems Roadmap 2018</i> ^{iv} say 55-65% of replacements are 'emergency ones'. See also my full analysis of this issue.^v</p>	<p>considered, potential to accelerate depends on learning from pilot hydrogen projects locally and around the world, and on progress in scaling them up and in modifying industrial processes to the new fuel source.</p>
<p>What are the key technical, regulatory and economic barriers?</p>	<p>Upfront cost and expertise are big barriers.</p> <p>Lack of technical and management skill retards small businesses from measures like improving boiler efficiency.^{vi}</p> <p>Regulation still hinders replacing gas hot water with heat pump.</p>	<p>Upfront capital cost.</p> <p>Skilled businesses and workforce.</p> <p>Competition from gas service providers prepared to offer low prices to keep customers</p>	
<p>What are the roles to be played by government, industry and how will consumers</p>	<p>Policies should be designed with the Jevons Paradox in mind, and <u>also</u> target reducing overall energy use in Victoria in total, per capita and by sector.</p> <p>Mechanisms like VEUs and VEECs are</p>	<p>If not already applicable across all gas users, VEUs and VEECs should be expanded to all those listed above.</p> <p>A similar campaign and services</p>	<p>Government needs to resist industry pressure for regulatory change to allow hydrogen into the gas pipeline system, as this is clearly aimed at perpetuating the gas industry (as the</p>

<p>preferences be accounted for in the transition?</p>	<p>critical.</p> <p>Government needs to be the driver, fostering new abilities in the private firms and foundations delivering energy efficiency services. Subsidising the cost of the services to end users is likely to be warranted.</p> <p>Government needs to resource huge education campaigns and information services (e.g. directly or via Energy Foundations). Success in this regard will require consumer preferences to be central to the rollout.</p>	<p>as for energy efficiency.</p>	<p>industry's <i>Gas Vision 2050</i> makes clear). Government should not be prepared to indirectly underwrite the value of assets owned by gas businesses, or to delay meeting and going beyond Victoria's climate targets.</p> <p>Government should support, though not pay for, dedicated hydrogen pipelines to manufacturers if onsite making of hydrogen is not feasible.</p>
<p>What are the likely timings of technical maturity and economic viability?</p>	<p>Systems are mature now for business and households.</p> <p>Economic viability varies greatly – small business are likely to find it harder to investigate, introduce and manage complex technical change. They are more likely to continue to run down fixed assets, and not invest in efficiency. Without incentives (positive or negative) from government, many will not change.</p>	<p>As for energy efficiency</p>	
<p>What are the best ways to maintain social acceptability and consumer confidence?</p>	<p>Showcase the best examples for each type of gas user.</p> <p>Certify all relevant service providers</p> <p>Provide 'call centre' type advice covering both appliances and service providers</p>	<p>As for energy efficiency</p>	<p>Community concern about fossil fuels is very high, and this will increasingly apply to 'natural gas', with or without hydrogen mixed in.</p>

TRANSITION - GAS INDUSTRY TRANSITION ISSUES AND CHALLENGES (Ch4)

<p>Key issue 1: Maintaining electricity reliability with new sources of demand</p> <ul style="list-style-type: none"> • <i>What policies are needed to ensure that the electricity network can reliably serve new sources of demand from electrification of gas demand, hydrogen production and electric vehicles?</i> • <i>What is the role for gas-fired power generation and hydrogen in maintaining electricity reliability?</i> 	<p>It would help to group the measures under the following four broad policy approaches. Evidence is increasingly available that each of them can make a major difference if they are pursued vigorously.</p> <ul style="list-style-type: none"> • Boosting storage – batteries, electric vehicles, pumped hydro etc • Demand management and shifting time of use • Energy efficiency of <u>new</u> appliances, equipment and dwellings • Demand reduction measures <ul style="list-style-type: none"> a) Within the DELWP portfolio, targeting households, commercial & businesses b) Cross-portfolio, targeting transport, urban footprint and so on <p>Limited gas-fired power generation will be needed for firming, but less and less.</p>
<p>Key issue 2: Transitioning to more sustainable gaseous fuels with minimal disruption to end-users</p> <ul style="list-style-type: none"> • <i>What are the key technical challenges in converting existing gas networks to accommodate more sustainable gaseous fuels?</i> • <i>What are the potential costs and opportunities in switching to more sustainable gaseous fuels for consumers?</i> 	<p>Consultants Doris Engineering evaluated this as Scenario C for the Gas Infrastructure 2050 draft report by Infrastructure Victoria. It was essentially ruled out as a large-scale solution on technical, safety and cost grounds.</p> <p>A 'no regrets' policy would exclude this. Investments are likely to be stranded. Costs for gas users will be high.</p>
<p>Key Issue 3 Reliability, affordability and safety of gas supply</p> <p><i>What are the affordability, reliability and safety considerations related to gas supply and gas</i></p>	<p>These are important considerations – as part of planning for Victoria to speedily and safely reduce use of gas. The language in the Roadmap should more strongly emphasise the acceleration off gas and planning to avoid adverse impacts on users.</p>

<p><i>infrastructure, both in the short term and during a long-term transition to a decarbonised gas sector?</i></p> <p><i>What policies are needed to ensure that the gas system continues to operate reliably and safely and remain affordable for end-users during this transition?</i></p>	<p>These are not reasons to delay or slow action – at best that can only serve vested interests in the gas industry. Impacts on the industry, especially its workers, need to be sincerely addressed but not at the expense of rapid action.</p> <p>The provision of products by large industrial users of gas is important, but the private interests of the firms should not be paramount. We need a <u>social</u> cost-benefit analysis of the different pathways, not an analysis that privileges private interests of these firms, their shareholders and managers. By contrast, the interests of consumers, workers and the community are paramount.</p>
<p>Key issue 4: Supporting Victoria’s workforce, industry and the institutions that support them</p>	<p>I encourage you to read my book chapter on workers and policy options for achieving a just transition.</p>
<p>Key Issue 5 Managing uncertainty in the transition</p> <p><i>What key uncertainties should the Roadmap take into account, and what is the government’s role in reducing these uncertainties?</i></p>	<p>The future behaviour of private operators within the gas system is a key uncertainty – what investment decisions will they make, what innovation will they undertake, how will they raise capital, what could company takeovers and mergers involve, how will they use their market power, how will they set prices, will they game the system, and will they rehabilitate polluted sites? The ACCC has been wrestling with some of these questions after the international gas market began to affect the south-eastern gas system from 2015.</p> <p>Is it enough for authorities to tinker with the rules of the market? Arguably, this approach has led to the most complex set of regulations imaginable. Note that eminent Australian economist John Quiggin argues that the complex problems in the national electricity system are significant enough to warrant re-nationalising it!</p> <p>Finkel’s 3 key pillars could be a starting point for thinking about the role of government in designing a gas substitution roadmap that rapidly reduces use of fossil fuels while providing for energy security. The Finkel review of the electricity market emphasised:</p> <ul style="list-style-type: none"> • an orderly transition • system planning • stronger governance <p>All three need to be robust in the face of uncertainty about how the private sector might operate, with government being prepared to take a much stronger role than currently.</p>

	<p>The discussion paper endorses a no-regrets approach (Key Issue 5 Managing uncertainty in the transition). This approach is welcome, but needs to be clearly defined. Possible regrets that have high uncertainty should be made explicit. Here are two:</p> <ul style="list-style-type: none"> - locking in domestic and commercial gas use and supporting infrastructure, controlled by a few large companies, when feasible alternatives are known and can be vigorously pursued now. - locking in hydrogen as the future fuel source for households and commercial premises when its technology, safety and cost are all uncertain. All the evidence points instead to electrification of space heating, cooking and hot water. Government should strenuously resist pressure from businesses that identify this pathway as a profit earner in the short and medium term. Victoria can generate future economic activity in many other ways, and government policy should be directed to them.
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ⁱ Crosthwaite, Jim (2020) Just transition to a sustainable future without 'fossil' gas. In Washington, H., Lawn, P., Blackwell, B. *Ecological Economics: Solutions Now and in the Future*. Sydney: ANZSEE.

ⁱⁱ <https://environmentvictoria.org.au/2020/06/03/victorian-gas-market-demand-side-measures-to-avoid-forecast-supply-shortfall/>

ⁱⁱⁱ ABS (2014) *Environmental Issues: Energy Use and Conservation*. Australian Bureau of Statistics. Cat. 4602.0.55.001. Data Cube, available at <https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4602.0.55.001Main+Features1Mar%202014?OpenDocument> (accessed 26 June 2020).

^{iv} <https://www.energyrating.gov.au/document/e3-hot-water-systems-roadmap-12-november-2018> (Accessed: 17 July 2021).

^v <https://crosthwaite.squarespace.com/s/Gas-hot-water-in-the-household-v3a.pdf>

^{vi} On this and previous point, see the [Australian Manufacturing: Gas Efficiency Guide](#).