

## Submission to Victoria's Gas Substitution Roadmap consultation paper

August 2021

Thank you for the opportunity to provide a response to the Victorian Gas Substitution Roadmap.

Renew is a national, not-for-profit organisation that inspires, enables and advocates for people to live sustainably in their homes and communities. Established in 1980, Renew provides expert, independent advice on sustainable solutions for the home to households, government and industry.

The primary focus of this submission is the need for a just and inclusive strategy for residential gas substitution.

Technologies are already in place that make all-electric homes both accessible and financially appealing for many households. Upgrading homes or building new homes that are energy efficient and all-electric can save residents money through reduced energy bills, as well as improving health, comfort, and sustainability.

However, key legal, financial, and informational barriers risk preventing Victorians from accessing the benefits of the substitution of residential gas with all-electric homes. Government planning and action is needed to ensure that no Victorians are left behind in a market transition away from gas.

Victoria must build a strategy for residential gas substitution that includes:

- 1) A clear path to the cessation of new gas connections
- 2) Removing existing regulatory barriers to gas-free homes
- 3) Improving new home construction standards
- 4) Retrofit programs to support Victorian households with upfront costs
- 5) Addressing barriers faced by renters
- 6) A gas transition plan for social housing
- 7) Awareness of and coordination with the impacts of rapid uptake of distributed energy resources on electricity grids
- 8) Better consumer information and labelling

### Background

There is no pathway to meeting Victoria's ambition of net zero emissions by 2050 without the substitution of residential gas use.

As stated in the Roadmap, the residential and commercial sectors make up the majority of Victoria's gas usage, at 61%. The majority of this usage is in residential homes: in 2019, residential demand was 93.3 PJ, compared to 31.3 PJ for small commercial and 12.8 PJ for large commercial (AEMO / Northmore Gordon).

#### The economics of household fuel choice

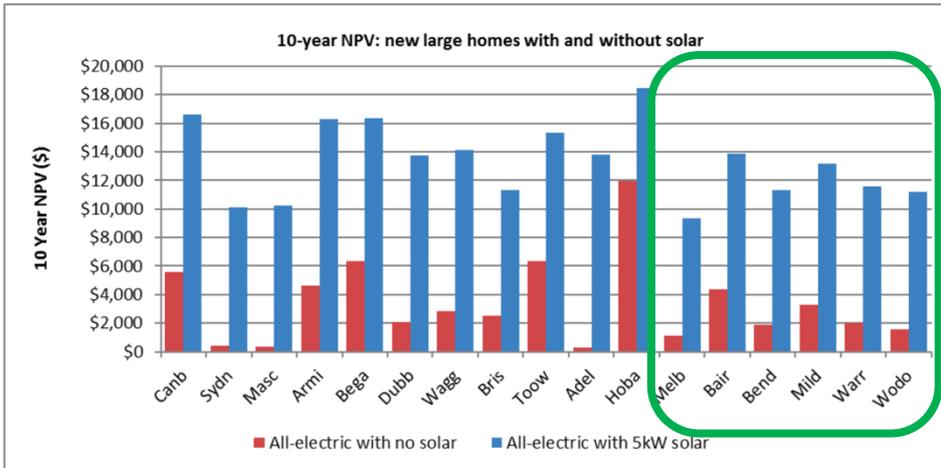
Electrification of homes is viable and cost-effective. Renew's analysis has consistently showed that energy efficient, all-electric homes are already more cost-effective than standard dual fuel homes, and that converting an existing dual-fuel home to all-electric is almost always an economic benefit for households.

Renew's report [Household fuel choice in the National Energy Market](#) outlines the economics of fuel switching at the critical point of major appliance replacement, and considers purchase, installation, and maintenance costs as well as running costs. Replacing end-of-life gas heating with reverse cycle air conditioners is always economically beneficial; while replacing gas cooking and hot water appliances with induction cookers and heat pump hot water systems usually requires leaving the gas network (and thus saving the daily fee) to be beneficial.

The following charts from the report give a good overview. More detailed results are available on request.

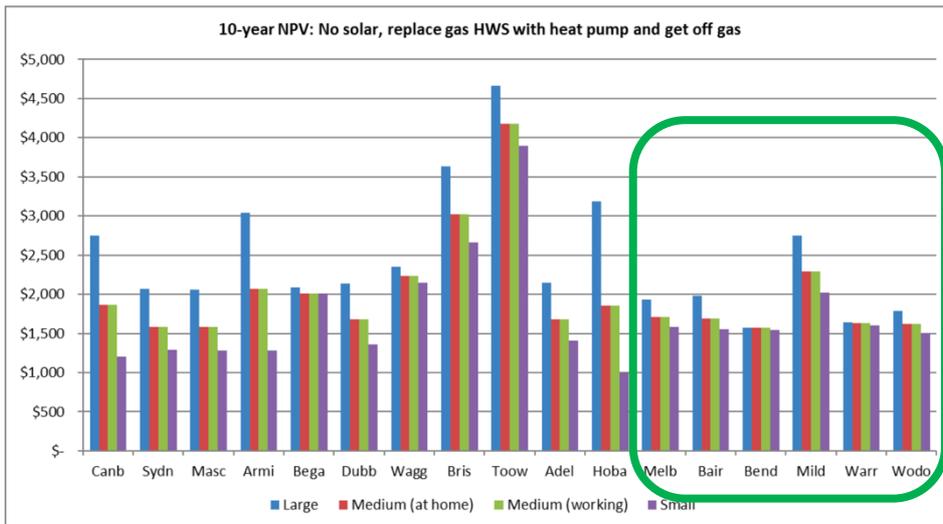
Firstly, new homes. Our analysis shows conclusively that building new homes as all-electric instead of dual fuel is always more cost-effective, everywhere in the NEM (though the benefits can be marginal in Sydney and Adelaide). Adding solar vastly increases the benefit.

Figure 1: New homes choosing all-electric over gas, with/without solar, 10-year NPV



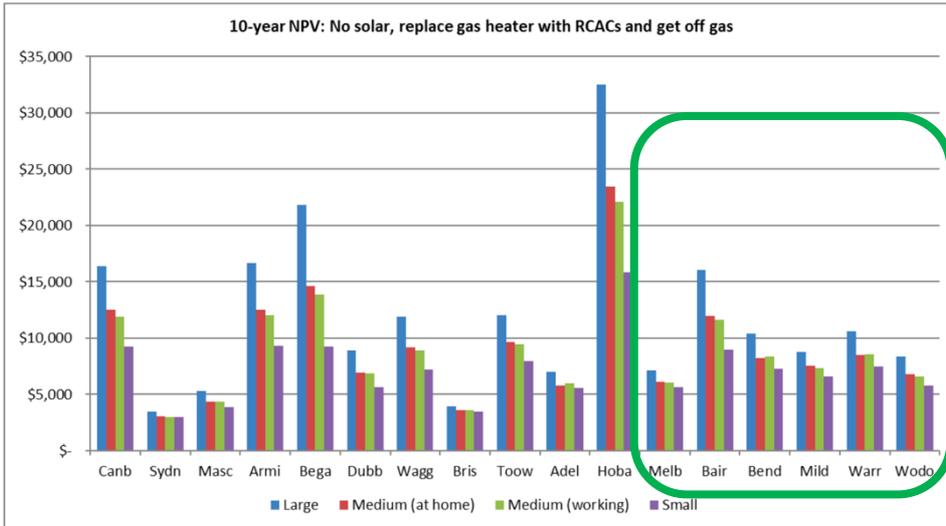
For existing homes with only one gas appliance, there is always an economic benefit in replacing them with efficient electric alternatives at end-of-life. Replacing gas hot water with a heat pump unit and getting off gas brings benefit of more than \$150 per year in Victoria

Figure 2: Existing homes replacing gas hot water with heat pump and leaving gas, 10-year NPV



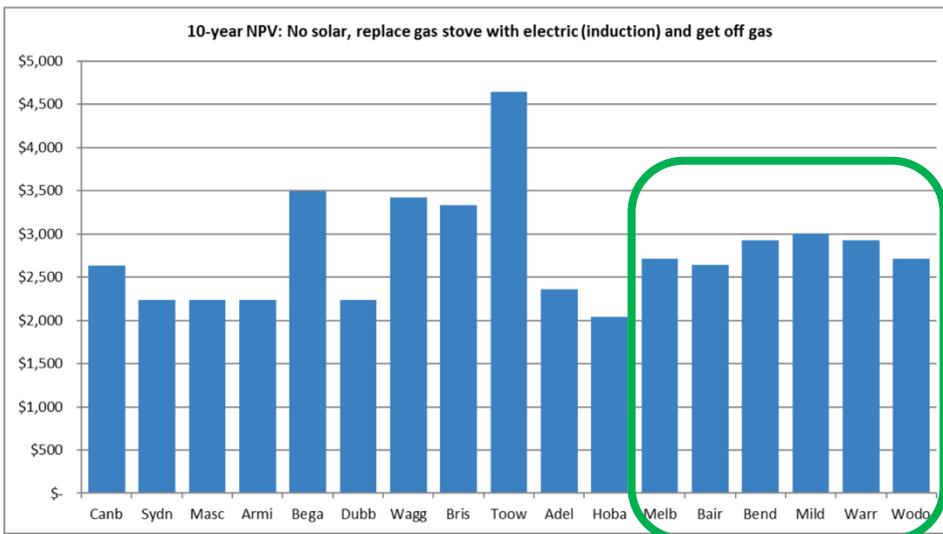
Replacing gas heating with heat pumps and getting off gas yields between \$500 and \$1000 per year for most places, and even more in Gippsland due to the cooler climate.

Figure 4: Existing homes replacing gas heating with heat pump & leaving gas, 10-year NPV



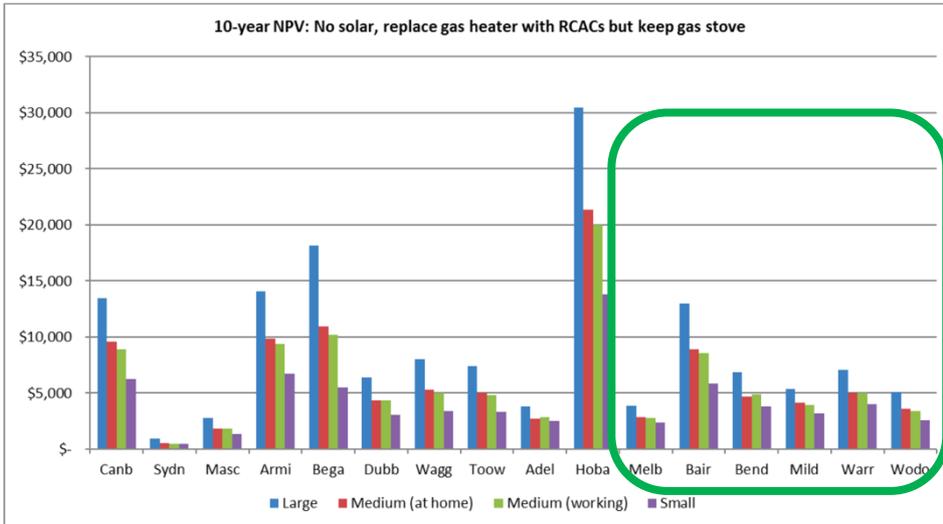
Even though induction cookers are more expensive to purchase and instal than gas stoves, the extra upfront cost is more than offset by the savings from ending the fixed cost of the gas connection, when a cooker is the only gas appliance.

Figure 5: Existing homes replacing gas cooktop with induction and leaving gas, 10-year NPV



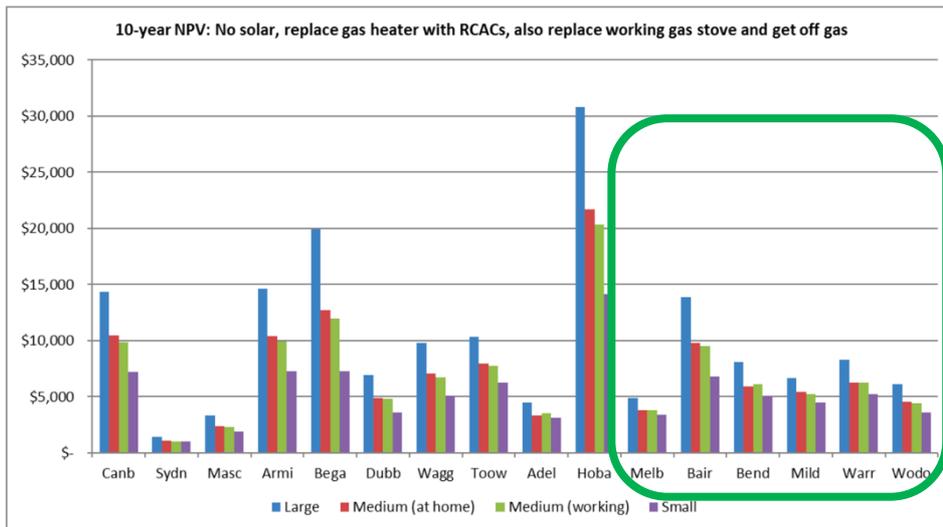
Of course, in Victoria it's more common for homes to have two or three gas appliances. For homes with gas heating and cooking, replacing the heating with heat pumps brings considerable benefit even when the gas stove (and thus gas connection) is retained.

Figure 6: Existing homes replacing failing gas heater with RCACS and keep gas stove, 10-year NPV



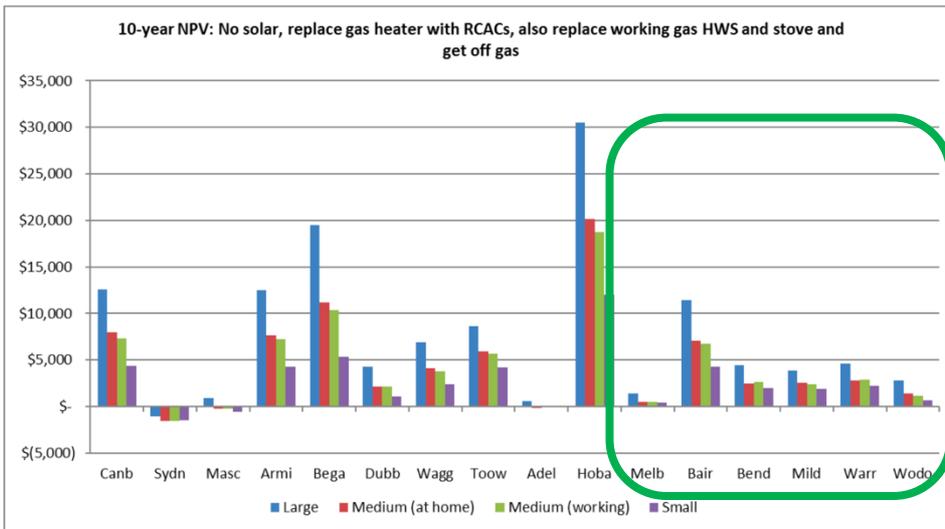
But the economic benefit is even higher when the opportunity is taken to also replace the gas stove and thus remove the gas connection.

Figure 7: Existing homes replacing failing gas heater & working gas stove with efficient electric, 10-year NPV



For homes with gas heating, hot water, and cooking (the most common combination in many parts of Victoria), replacing the latter two appliances before their end-of-life when replacing a gas heater in order to leave the gas network is still an economic benefit, albeit a marginal one (less than \$100 per year) for small and medium homes in Melbourne. However it should be noted that we have taken a conservative approach to these calculations: we fully depreciate end-of-life appliances but do not partially depreciate non-end-of-life ones. So in practice, results will usually be better.

Figure 8: Existing homes replacing failing gas heater, working gas hot water & stove with efficient electric, 10-year NPV

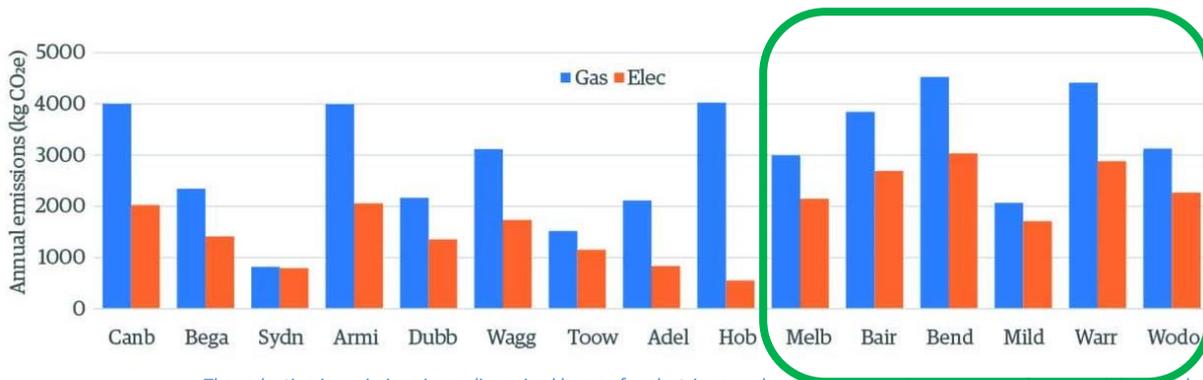


In all these examples, homes with solar PV get even greater economic benefit from electrification of these loads than shown because of the ability of solar to directly offset most hot water usage and some heating and cooking.

### The emissions impact of household fuel choice

Renew also examined the emissions impact of the same fuel choice scenarios that were examined for the report discussed above. While natural gas has lower emissions than electricity on a per-megajoule basis, the greater efficiency of heat pump technology means that in many cases the same use case for gas- and electricity-powered appliances leads to lower emissions from electricity. The emissions benefit of electrification will only increase in the future because of the ongoing reductions in the emissions intensity of the electricity grid and the steadily rising emissions intensity of the gas network (due to the increasing proportion of unconventional gas). It must also be noted that the emissions intensity of the gas network is widely believed to be understated, and the lack of transparency in measuring and reporting fugitive emissions makes it difficult to have confidence in reported figures.

Renews' [study](#) clearly showed that heating with heat pumps produces lower emissions than using gas heaters. This chart is for medium sized homes in 2019.



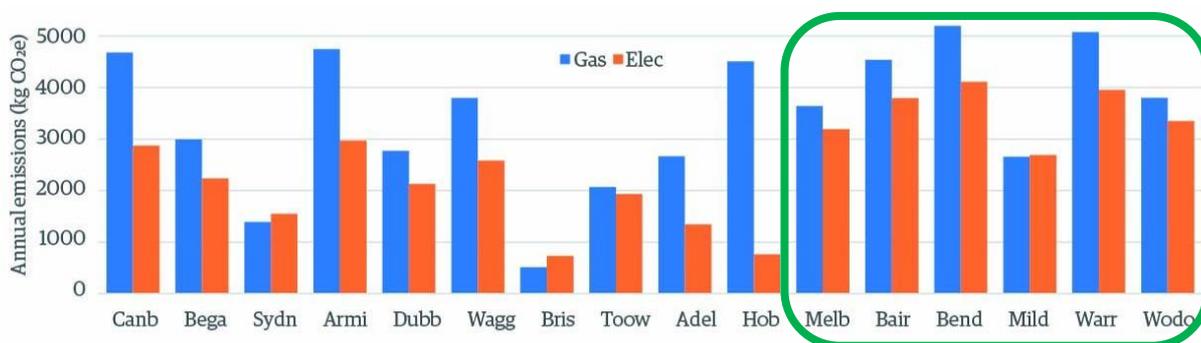
The reduction in emissions in medium-sized homes for electric space heating compared to gas is significant in all but one location (Sydney).

The emissions impact of water heating is slightly greater for heat pumps than instantaneous gas, though the difference is slight and likely to be reversed as the electricity grid becomes cleaner – as the results for Adelaide and Hobart indicate. Results for cooking are similar.



Differences in emissions for gas and electric water heating in medium-sized homes. Electric hot water gives a small emissions reduction in Adelaide and a significant one in Hobart, but a small or moderate increase in other locations.

But similar to the economic results, the benefits of electrifying heating are large enough to offset marginal disbenefits from the other appliances.



When combining electric space heating with any combination of electric water heating and cooking, there is a significant reduction in emissions impact in most locations. This graph shows the outcomes for medium-sized homes going all-electric for heating, water and cooking compared to the gas alternatives.

When it's also considered that the outcomes for cooking and hot water are likely to flip over the life of appliances installed today due to the ongoing reduction in electricity emissions and increases in gas emissions – and that the transition away from natural gas is likely to take longer than significant emissions reduction in the electricity grid – electrification when economically prudent makes sense.

Obviously, the development of the gas substitution roadmap itself is a response to the need to transition away from gas due to its emissions. Our purpose in highlighting the emissions implications of household fuel choice right now is to underline that electrifying household loads is a no-regrets action when it comes to reducing household emissions – and that by doing so we save space in the carbon budget for the more difficult transitions.

### A fuel of choice

This is not to say that households should be prohibited from gas-fuelled appliances. While much gas use is simply by default – because it is there – some consumers have a distinct preference for gas.

In many cases this is due to lack of understanding the alternatives. Many Victorians' knowledge of electric cooking is with ceramic resistive cooktops, and they are unaware of the nuanced and responsive temperature control of modern induction cooktops; and many Victorians' experience of electric heating is expensive-to-run portable resistive fan heaters, radiators or oil-filled column heaters, and they don't know that heating with reverse-cycle air conditioners is so much cheaper. Renew's experience with individuals upgrading their homes and appliances to be more efficient and produce fewer emissions is that once people experience modern efficient electric appliances they are usually very satisfied.

Still, there are some with an informed and conscious preference for gas, particularly for cooking. (In our experience, preference for gas for heating is usually a preference for ducted heating and influenced by the expense at the moment of ducted heat pump systems.) Because it is likely that there will always be an emissions-free gas industry to meet the needs of manufacturers that need thermal fuel for certain industrial processes, it is plausible that emissions-free gas will be available for domestic use. This does not need to be via

reticulated supply, and does not need to be subsidised by other households who just want to cook, have hot water, and be warm without concern for what fuel is used to do it.

## Barriers

As shown above, transitioning off the gas network to full electrification has financial benefits for Victorian households. But there are significant barriers excluding many Victorians from benefiting from the transition to all-electric homes – leaving vulnerable Victorians paying an unfair share of the cost and slowing down the Victoria's progress towards meeting its climate commitments. There are also some uncertainties and challenges associated with the electricity networks capacity to handle Victoria's significant winter demand for heating – though also noting that there are other factors (such as increased solar penetration and the imminent growth in electric vehicles) also driving distribution network capacity upgrades. Government action is needed to ensure that nobody is left behind in the energy transition.

## Recommendations

### 1. Develop a clear path to the cessation of new residential gas connections

There is simply no reason why new homes in Victoria should be connected to gas.

Maintaining extensive gas networks is a significant cost burden on Victorian households. This is not obvious to most households because it's encountered as an energy bill, and the retailer is seen to be responsible. But when the amenity provided by gas can be readily provided by the electricity network to which they are already connected, the additional cost is unnecessary. As Renew's analysis (above) shows, even when the fuel usage cost is cheaper for gas compared to electricity (e.g. instantaneous gas hot water vs electric heat pump hot water), the additional network service charge makes it more expensive.

Homes that are all-electric are already viable and cost-effective. Greenfield and brownfield developments connecting new homes to the gas network comes at a significant additional cost to residents, while locking in outcomes that are inconsistent with Victoria's climate commitments. Small-scale infill construction and development where reticulated gas exists can connect at minimal cost but maintain dependency on gas networks that is also inconsistent with climate commitments and the economic realities of managing a graceful exit from gas.

Renew suggests the Victorian Government articulate a clear plan toward a full cessation of new residential gas connections. This would deal separately but in a coordinated fashion with new developments (greenfields and brownfields), and small-scale infill construction.

The ACT is currently exploring a moratorium on gas connections for new housing estates. This can provide a clear model to Victoria for implementation.

Some Local Government Authorities (LGAs) in Victoria have sought to apply planning policies that would ban gas connections to new developments. The Victorian government should, at a minimum, allow these planning measures to be applied by LGAs.

Households in new gas-free developments with a specific preference for gas for particular loads can use non-reticulated gas for those purposes. This is already common in areas of the state where reticulated gas is not available.

### 2. Remove the Victorian variation of the National Construction Code (NCC) that requires new dwellings with a gas connection to install a solar-gas hot water service<sup>1</sup>

Victorians seeking to build new all-electric homes or retrofit existing homes to remove gas connections are frequently confounded by the requirement to install a gas-boosted solar hot water system (if they are unable or unwilling to install a rainwater tank) if reticulated gas is available.

Encouraging the installation of solar-gas hot water services made some sense in 2005; the goal was to encourage the use of gas (as a less greenhouse-intensive fuel than electricity at the time) to reduce residential emissions. However in 2021 the case for retaining this variation is much weaker. As renewables penetration increases at both ends of the distribution network, the carbon intensity of

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<sup>1</sup> This section drafted with assistance from prior work done collaboratively with Alan Pears AM and staff of the Energy Efficiency Council, Green Buildings Council Australia, and Faculty of Science, Engineering and Built Environment – Deakin University.

Victoria's electricity is decreasing rapidly. Indeed when paired with solar PV, a heat pump hot water system will in many cases be the less carbon intensive option – especially by virtue of providing additional value when electrifying other loads by enabling the gas connection and its associated fixed charge to be abolished.

Retaining this variation is problematic on a number of counts:

- It's out of step with other jurisdictions, increasing complexity for industry in complying with the NCC;
- It's inconsistent with the performance-based regulatory approach that is standard for the NCC and Victorian regulations more broadly;
- It's at odds with other Victorian Government initiatives to accelerate progress towards zero emission new homes, such as Solar Victoria's financial incentives for heat pump hot water systems installed in existing homes with rooftop solar, and the 2020 Budget initiative to support installation of low emission electric appliances;
- It creates barriers for consumers looking to adopt new technologies early, even when they have a better environmental outcome; and
- It creates barriers to transitioning from natural gas in the residential sector by preventing gradual decline in gas connections as existing houses are renovated or infill dwellings built and prevented from being all-electric due to this requirement.

With the ongoing delays in finalising the 2022 NCC, it is critical that the Victorian government remove this variation and allow homeowners to set themselves up for a lower cost and zero emission future by foregoing a gas connection.

Additional work should be done to ensure other relevant regulations that favour gas over efficient electric technology – such as incentives in programs connected with the Victorian Energy Efficiency Target, to ensure alignment with the goal of residential gas substitution and to ensure no barriers exist to ongoing residential electrification.

### 3. Actively support national efforts to improve the energy efficiency of new homes

The substitution of residential gas should take place alongside improvements in the energy efficiency and thermal comfort of homes. By reducing the amount of energy needed to heat and cool homes, potential pressure on the electricity grid is reduced while residents enjoy better health, comfort and lower energy bills.

Victoria should support and implement increases in the energy efficiency standards of new homes under the National Construction Code 2022, while continuing to work towards further stringency increases in future NCC iterations in line with the Trajectory for Low Energy Buildings.

Consideration is currently being given to increasing the minimum NatHERS energy efficiency rating of new homes from 6 to 7 Stars. In Melbourne, this improvement in standards would result in a 27% decrease in the amount of energy required to heat and cool new homes. Meanwhile, 7 star rated homes require 78% less energy to heat and cool than a typical 2-star rated older home in Melbourne. This reduction in energy requirements through better thermal efficiency has an important effect of minimising the additional pressure on the electricity grid caused by the electrification of appliances, and should be undertaken alongside gas substitution.

### 4. Introduce retrofit programs to address the upfront costs of fuel switching for low income and vulnerable Victorians

Government retrofit programs are required to address the structural problem of upfront costs to households of home gas substitution.

In the long term, residents stand to benefit from retrofits to replace gas with all-electric heating, cooling, cooking, and hot water. However, the upfront costs of retrofits mean that many Victorians are unable to access these benefits and long-term savings. Perversely, households on lower incomes are less likely to be able to meet upfront costs and are locked into higher bills on an ongoing basis due to poor thermal efficiency, inefficient appliances, and the duplicate connection fees incurred by dual fuel homes.

Large scale retrofit programs should be pursued to install energy productivity measures that would include (but not be limited to) reverse cycle air conditioners for heating and cooling, more efficient hot water (heat pumps), draught sealing, ceiling fans, efficient thermal building envelope, lighting and solar PV. The National Low Income Energy Productivity Plan (NLEPP)<sup>2</sup> estimates a cost of \$3,800

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<sup>2</sup> <https://renew.org.au/wp-content/uploads/2020/06/Economic-Stimulus-Healthy-Affordable-Homes-NLEPP-June-2020-Final-18062020.pdf>

per dwelling to invest in a combination of more efficient heat pump hot water, heating/cooling, lights, gap sealing and insulation (noting some houses will require slightly greater investment and some will require slightly less).

The Victorian government has already taken significant action through its commitment to rebates for heat pump heating and cooling for 250,000 low-income households, and energy efficiency retrofits of social housing homes. Appropriate evaluation of these programs should be undertaken and further programs considered to address remaining barriers to gas substitution faced by households.

## 5. Develop specific programs to address the barriers experienced by renters

According to the 2016 Census, 28.7% of Victorian households rented their home. This proportion is increasing, particularly among younger Victorians and those with young families.

Rental homes are, on average, less energy efficient than owner-occupied homes. A significant driver of poor rental energy performance is the 'split incentive' problem, in which energy bills are paid by renters while energy efficiency upgrades are paid for by landlords. In practice, many landlords do not choose to pay the upfront costs of energy efficiency upgrades, the replacement of fixed appliances or the installation of solar.

Specific strategies are required to ensure that renters are not left behind in the energy system transition. These include the continued strengthening of minimum rental standards to include energy measures such as insulation, efficient hot water, and increased efficiency levels of heat pump heating and cooling; these regulations should ensure that the replacement of fixed appliances is consistent with the goal of residential gas substitution. Further measures including rebates for efficient appliances and solar should be maintained and extended.

## 6. Develop a gas substitution plan for social housing

A specific gas substitution plan for public and community housing residents must be developed by the Victorian government.<sup>3</sup>

If residential gas substitution is left to market mechanisms based on the individual choices of households, public and community housing tenants risk being excluded from the transition. Like renters in the private market, social housing residents are in practice dependent on decisions of a landlord to spend money upfront on energy efficiency upgrades or the replacement of fixed appliances. Public housing tenants in some locations pay no gas connection fee and have constrained energy choices.

A statewide strategy must be developed for the substitution of gas in Victoria's social housing. This strategy should include energy efficiency retrofits, replacement of gas appliances with efficient, all-electric appliances, and access to renewable energy through measures such as community renewables, storage and PPEs. Newly constructed social housing should be all-electric, which will benefit residents while also using government procurement processes to build industry capacity.

## 7. Consider the interaction with growth in solar, batteries, and other distributed energy resources (DER)

Rooftop solar installations are progressing at a steady rate and show no signs of slowing despite the pandemic and the recession.

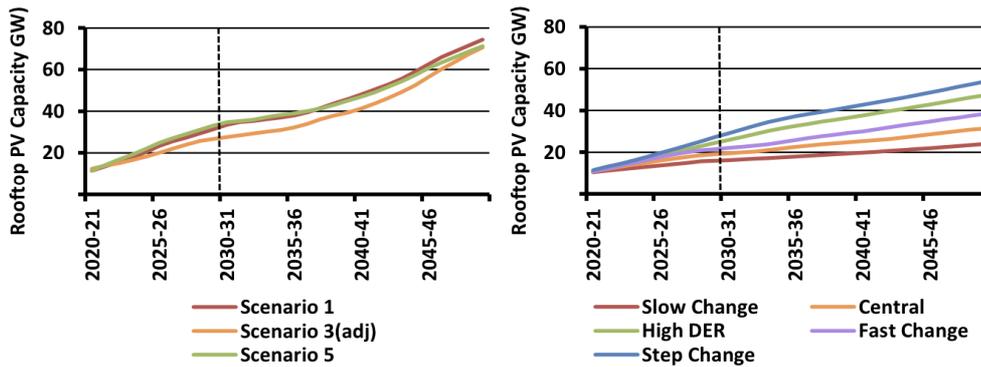
These charts from the penultimate draft of Energeia's DER Optimisation Report (currently a draft, prepared for Renew<sup>4</sup>) show expected rooftop solar uptake according to the Network Transformation Project (left) and AEMO's recent Electricity Statement of Opportunities (right). AEMO's Step Change scenario is already looking to be at best the status quo, if not a little conservative, as consumer preferences drive higher uptake than expected, supported in some states by generous solar subsidies.

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<sup>3</sup> See submission to Homes Victoria from Renew and Yarra Energy Foundation. <https://renew.org.au/advocacy/climate-resilient-homes/social-housing-energy-strategy/>

<sup>4</sup> Currently a draft, prepared for Renew as part of Renew's [DER Enablement Project](#) (Stage II) funded by Energy Consumers Australia.

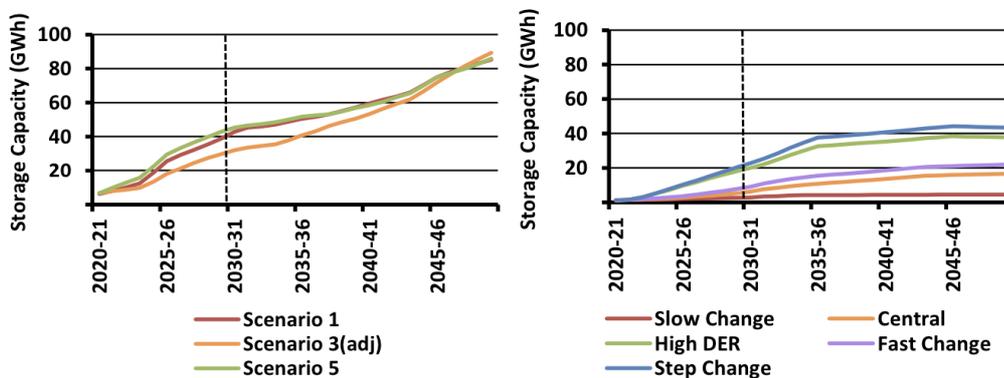
Figure 1 – CSIRO/ENA's (Left) vs. AEMO's (Right) Rooftop Solar PV Capacity Forecasts in the NEM



Source: ENA NTR (2016), AEMO Inputs and Assumptions to 2020 ESOO (2020)

Home battery installations are following a similar trajectory.

Figure 2 – CSIRO/ENA's (left) vs. AEMO's (right) Embedded Storage Capacity Forecasts in the NEM



Source: ENA NTR (2016), AEMO Inputs and Assumptions to 2020 ESOO (2020)

Electric vehicle sales have been slow to take off but as state governments get on board with appropriate incentives and complementary policy, most analysts expect them to follow similar trajectories.

More importantly, energy networks, retailers, and other energy businesses are rising to the challenges of integrating so much DER into the energy system with many and varied techniques to dynamically control solar exports and domestic loads, aggregate generation and storage to support grid stability, and other measures to increase the capacity of what is rapidly becoming a two-way network. Network businesses in particular are developing approaches to upgrade network infrastructure strategically in concert with dynamic control and incentives to accommodate the variability of DER. The whole-of-system modelling Energeia has undertaken a part of its work with Renew shows that increasingly in the future, solar will be dynamically curtailed when necessary and batteries aggregated and judiciously deployed to timeshift and redirect coincident over-generation to meet stochastic demand.

The relevance of all of this to the Gas Substitution Roadmap is that this will all be happening at the same time that electrified heating loads will be placing additional demands on distribution networks. The approaches taken to manage rapid growth in solar and slower but steady growth in electric vehicles will also put demands on the grid, that will be met with a combination of capacity upgrades and load shifting. The additional demand of electrified heating will be but one factor among others. This will certainly be a challenge and will lead to some costs; but it is a challenge we can't avoid, and will also yield benefits. The impact of electrification of heating in Victoria must be considered in concert with, not in isolation from, the impacts of these other changes.

## 8. Ensure accurate information and labelling for consumers

Clear and accessible information must be provided to Victorian households about their consumer options for home energy use.

While growing, there is still limited community understanding of the financial, health and environmental benefits of shifting to all-electric homes. Furthermore, many people buying or renting a home are unable to access information about the home's energy efficiency.

As part of a gas substitution plan for the residential sector, Victoria should ensure clear, evidence-based consumer information is available on energy choices. Victoria should furthermore continue to roll out the Residential Energy Efficiency Scorecard and work with other state, territory and Commonwealth governments to develop a nationally consistent scheme for the mandatory disclosure of home energy ratings.

Clear consumer information is needed about the benefits and costs of different fuels. Private advertising for gas appliances typically presents gas as a cheaper fuel than alternatives, however we are concerned that inappropriate comparisons are used in this advertising that lead to misleading conclusions.<sup>5</sup> Independent and accurate information should be provided to Victorian consumers.

### **Other matters**

We have focused on certain aspects of the issues. Lack of comment on other matters does not indicate our position on those matters.

Thanks for the opportunity to respond. If you have any questions or additional matters you'd like our view on, please contact me at [rob.mcleod@renew.org.au](mailto:rob.mcleod@renew.org.au).

Sincerely yours,

A handwritten signature in brown ink, appearing to read 'Rob McLeod', with a stylized flourish at the end.

**Rob McLeod**  
Sustainable Housing Advocate

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<sup>5</sup> For example, <https://www.canstarblue.com.au/electricity/whats-cheaper-electricity-or-gas/>.