

The role of the Victorian Energy Upgrades Program in tackling Victoria's energy and climate challenges

Prepared for the Energy Savings Industry Association

May 2026

Enlightening environmental markets



- This report examines the potential for the Victorian Energy Upgrades program to help address pressing energy policy challenges facing the Victorian Government and the community more broadly.
- Victoria faces serious challenges in terms of a rapidly diminishing supply of gas and heavy reliance on old coal generators that are due for retirement and likely to suffer deteriorating reliability. At the same time there are serious constraints hindering the energy supply industry's capability to bring on new sources of both gas and electricity generation supply fast enough to address supply shortfalls. It is also important that the state accelerates efforts to reduce its carbon emissions given it remains well short of its 2035 emission target.
- This means it is critical to look at options to address the problem at the source of demand by helping energy consumers to reduce their need for gas, improve energy efficiency and produce their own electricity via solar and battery storage. These hold the potential to get around major constraints which face large energy suppliers.
- The Victorian Energy Upgrades program is already structured to drive upgrades of energy equipment in these areas through provision of financial support that is tied to the amount of carbon emission savings these upgrades deliver. Reforms outlined in this paper could help the scheme to scale-up its contribution to addressing Victoria's energy challenges.
- This report finds that the Victorian Energy Upgrades program, in conjunction with other regulatory measures already underway, is capable of driving upgrades that could:
 1. Reduce Victorian gas usage by between 72 to 77 petajoules per annum by 2040. This is greater than the gas usage of the entire Victorian manufacturing sector and equal to around a third of Victoria's overall gas use.
 2. Reduce demand for electricity from large utility-scale centralised generators by between 8,922GWh to 10,651GWh by the year 2040, which is close to a third higher than the generation provided by the Yallourn Power Station in 2025.
 3. It will reduce the level of peak power demand by 3,543MW to 4,334MW and thereby reduce the extent of costly new power supply infrastructure that needs to be built in terms of both power plants and network capacity.
 4. Deliver a net reduction in consumer energy costs of between \$3.8 billion to \$6.5 billion over the modelled period of 2028 to 2040.
 5. Reduce greenhouse gas emissions by 4.1m to 4.6m tonnes of CO₂ per annum by 2040. This is equivalent to switching 2 million cars to zero emissions.
 6. Support households to undertake 3.5m energy equipment upgrades in their homes, such as more efficient heating systems, as well as over 100,000 upgrades in businesses, such as new solar and battery systems or more efficient boilers used in manufacturing processes.

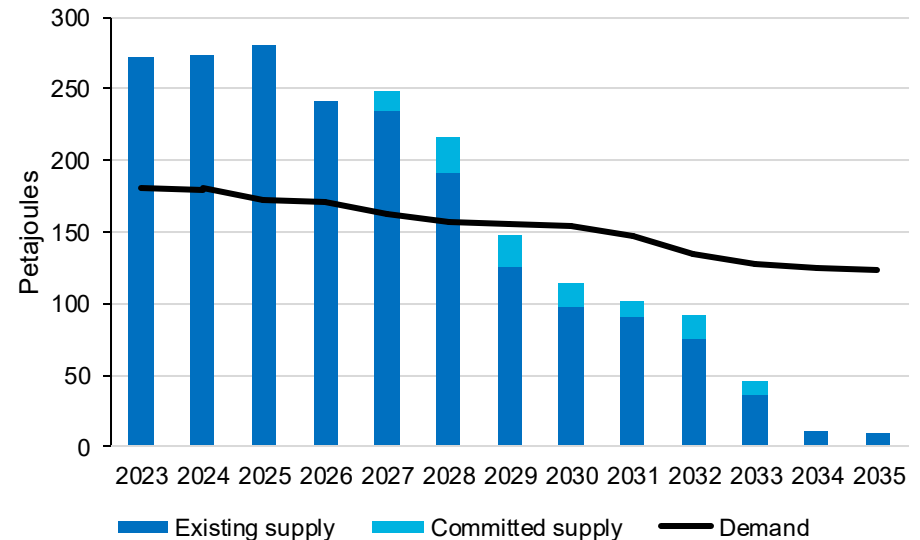
- The Victorian Energy Upgrades Scheme or VEU is one of the Victorian Government’s major energy policy instruments for helping energy consumers reduce their energy bills and also drive down carbon emissions. The scheme is targeted at providing financial assistance to energy consumers to subsidise the cost of them purchasing and installing equipment that enhances energy efficiency and allows consumers to generate their own electricity.
- The key advantage of this policy lies in its broad scope and flexibility to support any type of measure that will help energy consumers to reduce their use of grid supplied energy and greenhouse gas emissions. The government sets a target for emission reductions from energy saving technologies and then leaves it up to industry and consumers to then work out the most cost-effective way to deliver the target. This has enabled a very broad array of energy saving technologies in a wide variety of contexts. These have included helping households reduce draughts that make it harder and more expensive to heat their homes, replace inefficient light-bulbs, and in recent years replace gas central heaters with more efficient and cheaper to run reverse cycle air conditioners. It has also supported farmers, factories and warehouses to upgrade their lighting to energy efficient LEDs, install solar systems, and cut energy waste through reducing leaks in compressed air and steam systems amongst an array of other upgrades as well.
- This flexibility in technological options and contexts provides scope for innovations that may not be broadly appreciated in advance and can enable a scale and speed of roll-out in emission reduction technologies that government can struggle to achieve through more prescriptive regulatory approaches.
- In 2024 the Victorian Government announced it would undertake a strategic review of the VEU. In its subsequent discussion paper seeking stakeholder feedback it outlined why there was a need to undertake this review, stating,
 - ***“the operating environment for the VEU program has evolved significantly since its inception in 2009, with major developments in the energy sector and market as Victoria’s transition to clean energy, electrification and lower emissions gathers pace. Victoria is undergoing a once-in-a-generation energy transition away from coal-fired power and fossil gas to clean, diverse and reliable sources of renewable energy. This is occurring as coal-fired power plants age, become increasingly unreliable and approach their end-of-life, alongside a declining available supply of Victorian fossil gas.”***
- In February this year the Government announced it will unveil new legislation to amend the VEU with an eye towards enabling it to better support, “the government’s policy objectives on electrification, energy affordability, emission reduction targets and reliability.”

- This report was commissioned by the Energy Savings Industry Association to help assist the Victorian Government and other stakeholders in examining how the VEU could help address the policy challenges highlighted by the government.
- As the government has acknowledged, Victoria faces significant pressing energy policy challenges related to:
 1. Rapidly diminishing supplies of gas;
 2. A heavy reliance on very old coal generators for power supply which are likely to suffer significantly deteriorating reliability and need to be replaced;
 3. The need to significantly reduce greenhouse gas emissions in order to play our part in reducing the risks of dangerous climate change;
 4. And last but not least help improve the affordability of energy for consumers, which to a large degree can be addressed by also addressing the other three challenges above by helping consumers to reduce the amount of energy they need to purchase from energy suppliers.
- This report will firstly examine the challenges above as part of determining how the VEU could assist in addressing them.
- It will then outline a series of reforms to how the VEU operates that should assist the scheme in scaling up to better meet these challenges.
- And then it will detail economic modelling that has examined how a reformed VEU could drive increased energy upgrade activities as well as the costs and benefits of targets with varying timeframes for achieving savings in energy, emissions and peak demand capacity.

Challenge 1 - Address looming gas shortfalls

- Victoria's own supplies of gas are running out. Historically Victoria has had plentiful supplies of gas from Bass Strait which has allowed the state to meet not only its own gas needs, but also export gas to NSW, South Australia and even Queensland. However, as the AEMO analysis in the chart to the right illustrates, Victorian gas supplies will rapidly decline over the next decade. Even with new committed production coming online in 2027, by 2029 Victorian supply (the blue bars) will be insufficient to meet Victorian demand (the black line).
- Victorian annual gas production is forecast by AEMO to decline by 52.8% over the five-year outlook period, from 242 petajoules (PJ) in 2026 to 114 PJ in 2030, and to reduce to 9 PJ by the end of 2035.
- It is highly unlikely that other Victorian sources of gas supply will be found at the scale required to fill the looming shortfall.
- Alternative sources of supply from Queensland gas fields meanwhile are heavily tied-up in overseas export contracts. As has been documented extensively by the ACCC, domestic buyers have had considerable difficulty securing stable contracted supply from Queensland gas producers. Consequently, this source of supply will hinge on the implementation of an effective domestic gas reservation policy which is still in development, and it is not yet clear whether it will deliver sufficient supplies to fill shortfalls. Furthermore, pricing of gas could still remain closely linked to volatile international market prices.
- Irrespective, this Queensland supply will still require new, expensive gas pipeline infrastructure that would take several years to be planned and built. Plus given the long distances involved, Victoria will have to pay transport premium of several dollars per gigajoule that was not previously payable.

Victorian gas supply and demand



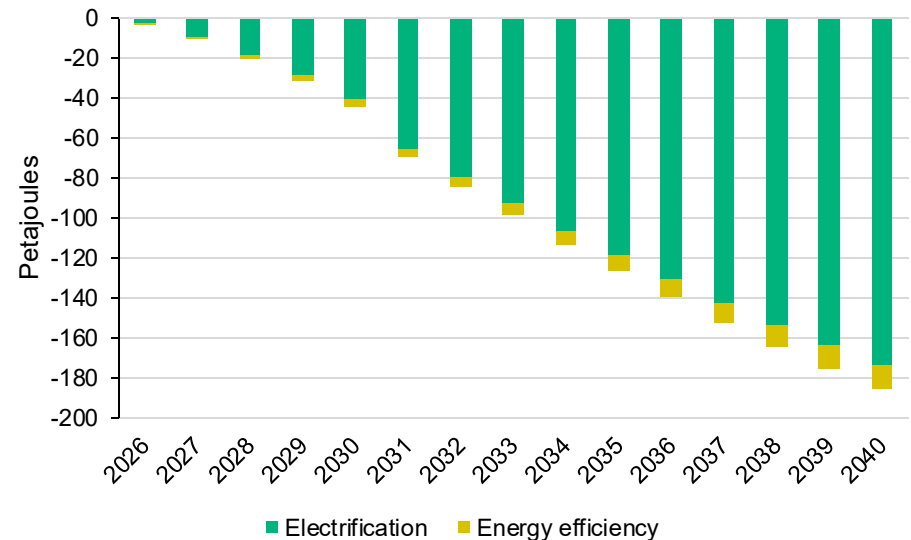
Source: AEMO (2026) Victorian Gas Planning Report Update

- The other option to fill the gap would involve importing gas from overseas via the establishment of new regasification import terminals, such as the one proposed at the Geelong oil refinery. This would be substantially more expensive than past domestic supply. Also, as recent history has shown with the 2022 withdrawal of Russian gas supplies and the closure of the Strait of Hormuz in the Middle East this year, such sources of energy supplies are vulnerable to extreme shocks that lead to severe price spikes and countries competing against one another in a scramble to secure supplies.

Reducing demand is an essential and cost-effective response to diminishing gas supplies

- AEMO forecasts indicate that to contain the risks of gas shortfalls it is essential that we replace gas appliances and equipment with electric-powered alternatives and enhance gas energy efficiency.
- AEMO's most recent Gas Statement of Opportunities, (this goes beyond the Victorian Gas Planning Report referenced in the prior page) which examines gas supply adequacy across not just Victoria but all states outside of Western Australia, envisages that even taking into account existing and committed supply, imports from Queensland will not be enough to avoid gas shortages across the states of NSW, South Australia and Victoria beginning in 2030 and growing by 2035 to a shortfall of around 100 petajoules by 2035. As some context 100 petajoules is equal to about 20% of total east-coast Australia gas consumption, or the entire gas consumption of Victorian households.
- While the risk of these forthcoming gas shortfalls has been well reported in the media, what is often missed is that these shortages will be far worse if we fail to implement an ambitious strategy to replace gas appliances and equipment with electric-powered alternatives.
- The chart to the right illustrates the reductions in gas consumption AEMO currently assumes in its forecasts. For such large reductions to be achieved requires a major concerted policy push to replace gas appliances and equipment with electric-powered alternatives. By 2035 AEMO's planning assumes we will have avoided 130 petajoules of gas consumption in that year due to electrification and energy efficiency. If we don't implement this assumed strategy, then the gas shortfall would be around double what AEMO forecasts.

Reductions in gas demand assumed by AEMO across NEM states & NT from efficiency & electrification



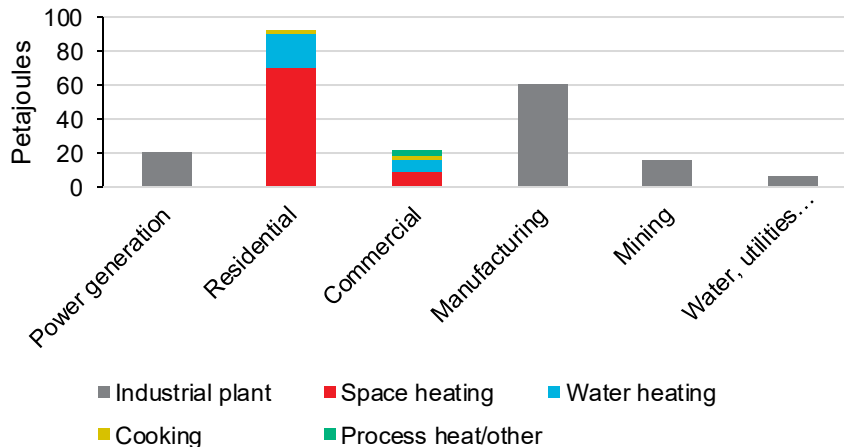
Source: AEMO (2026) Gas Statement of Opportunities – Step Change Scenario

- So while we will need new supplies of gas, if we don't simultaneously also act to reduce demand for gas then the challenge is vastly greater.

Reducing demand is an essential and cost-effective response to diminishing gas supplies

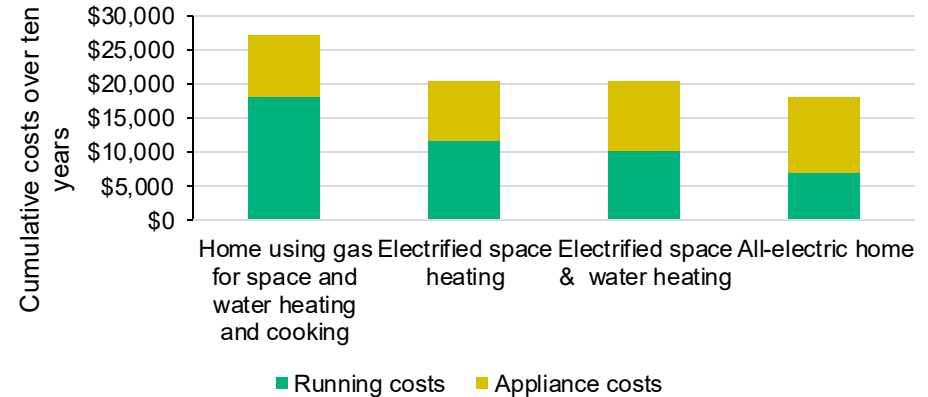
- The residential sector is the largest consumer of gas in Victoria. Commercial services, which includes offices, retail, education and healthcare, is the third largest, greater than mining and power generation. Together they represent around half of Victoria's overall gas consumption. This is important in terms of addressing forthcoming gas supply gaps because both these sectors have technologically proven options to switch out of gas to electric appliances for space and water heating as well as cooking that can deliver net financial savings to households and businesses.
- Research by the Grattan Institute, and the Institute of Energy Economics and Financial Analysis (IEEFA) finds that one of the most economical options to contain forthcoming gas shortfalls is to replace household gas appliances with electric-powered alternatives.

Victorian gas consumption by sector



Source: Australian Government (2025) Energy in Australia; Northmore Gordon (2020) Victorian Gas Market – Demand Side Measures to Avoid Forecast Supply Shortfall

All electric homes deliver lower lifetime costs



Source: Jay Gordon (2023) Managing the transition to all-electric homes

- IEEFA analysis detailed in the chart above indicates that households would be \$10,000 better off over a ten year period by shifting from gas to electric appliances.
- The Victorian Government has sought to take advantage of this opportunity through regulations ensuring newly built homes are all-electric, phasing out gas water heaters at end of life, and requiring upgrades of rental properties to install efficient electric heating.
- However, the largest opportunity for cost effective gas savings in Victoria is replacement of gas space heating with efficient reverse cycle air conditioners in existing, owner-occupied homes. Addressing this area will hinge on the effectiveness of the Victorian Energy Upgrades program.
- The VEU will also be important to encouraging replacement of gas appliances before their end of life and reducing the capital expense of complying with new regulations that will improve their social acceptance.

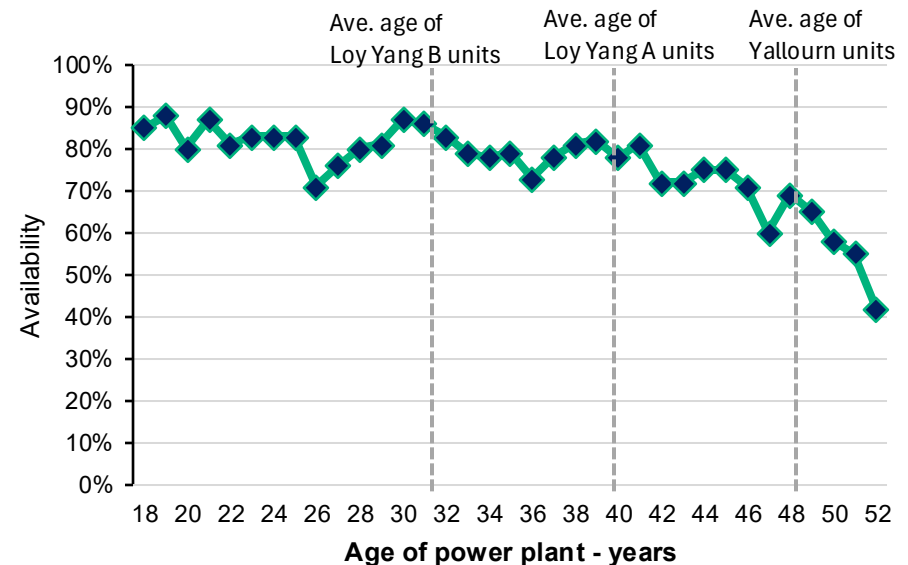
Reducing demand is an essential and cost-effective response to diminishing gas supplies

- The introduction of regulations to phase out inefficient use of gas has also stopped short of addressing gas use in existing commercial buildings and left other non-residential sectors untouched. Gas use in these sectors can often involve bespoke or less standardised equipment and applications where there isn't a straightforward, bolt-in electric alternative that is conducive to a one-size fits all regulatory mandate.
- Again, this is an area where the Victorian Energy Upgrades scheme will be vital to driving change. This is particularly the case across businesses which fall below the threshold for inclusion in the Federal Government's Safeguard Mechanism, which requires facilities to progressively reduce their carbon emissions. No commercial sector facilities are captured by the Safeguard Mechanism. In addition, no Victorian mining facilities and only 8 manufacturing facilities are covered by the Safeguard Mechanism.
- However, in order for the VEU to do a better job of reducing gas usage and improving energy-efficiency outside the residential sector, there is a need to reduce the administrative complexity of creating certificates in these sectors. Energy saving activities in these sectors currently heavily rely on the Project Based Activity method for determining eligibility for certificates. So far this method has been a very modest source of certificates, which has fallen well short of its potential.
- Government needs to look at ways that it could reduce the administrative burden involved in creating VEECs from non-residential sectors.

Challenge 2 - replace aging coal power plants

- Victoria's coal power plants, which provide a large proportion of the state's electricity and dispatchable, on demand capacity are reaching an age where reliability of coal power plants tends to rapidly deteriorate.
- The chart to the right, based on analysis by economic consultants – Baringa Partners – details the reliability of Australia's coal power plants (based on availability) based on their years of age. This illustrates that after around 40 years of age, the reliability of coal generators tends to rapidly decline. While Loy Yang B still has several years until it reaches this danger point, the far larger Loy Yang A has reached 40 years average age across its generating units and Yallourn's units have an average age of 48 years.
- Research by IEEFA (2025) found that the typical age that Australian coal power stations have been retired in the past is 42 years. Critically, in the years leading into their retirement they suffered from high rates of outages.
- To minimise the risks of declining electricity supply reliability we need to urgently replace the generation and capacity currently provided by Yallourn and Loy Yang A which generated 22,000GWh last year and represent 3,690MW of capacity.
- Further increasing the challenge is that AEMO is forecasting that electricity demand will grow by 13,000GWh between now and 2035.
- Construction of new wind and solar farms and utility-scale batteries as well as the transmission to connect them to the network will be essential to replace aging coal plants.
- However, the rate at which we have been able to bring on new wind and solar farms has fallen short of what is needed.

The reliability of coal power plants relative to age



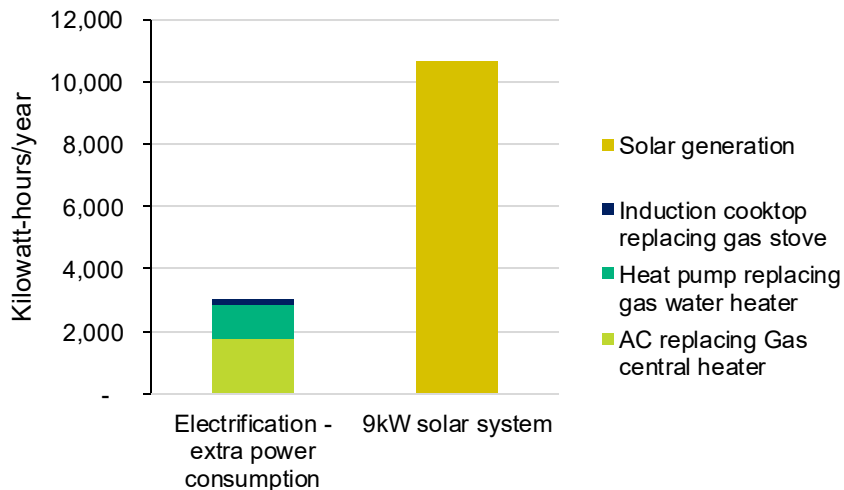
Source: Baringa Partners (2024) *The challenge of ageing coal generators and the growing role of storage in grid reliability*

- A key factor slowing down progress is that new transmission infrastructure is required, and getting such large and heavily regulated infrastructure, designed, approved and built takes many years.
- Off-shore wind faces even greater time frame challenges. These wind farms are more difficult and costly to build than onshore wind. To construct the offshore platforms and very large turbines will require a range of new infrastructure and dedicated assets such as ports and barges, as well as skilled personnel which Australia doesn't currently possess.

Consumers can also play key role in replacing coal

- Energy efficiency and distributed energy technologies can play an important complement to construction of new large-scale power plants to help fill the gap left by retiring coal.
- While the replacement of gas appliances with electric alternatives will increase electricity demand (all else being equal), we can roll-out solar and battery capacity at a rate that can comfortably exceed the extra demand created by electrification. The chart below illustrates the extra electricity that a household is likely to consume in electrifying gas appliances relative the amount of electricity generation a household could obtain from an 9kW solar system – which is in line with the average system being installed today.

Extra electricity needed to replace household gas with electric vs energy from household solar system



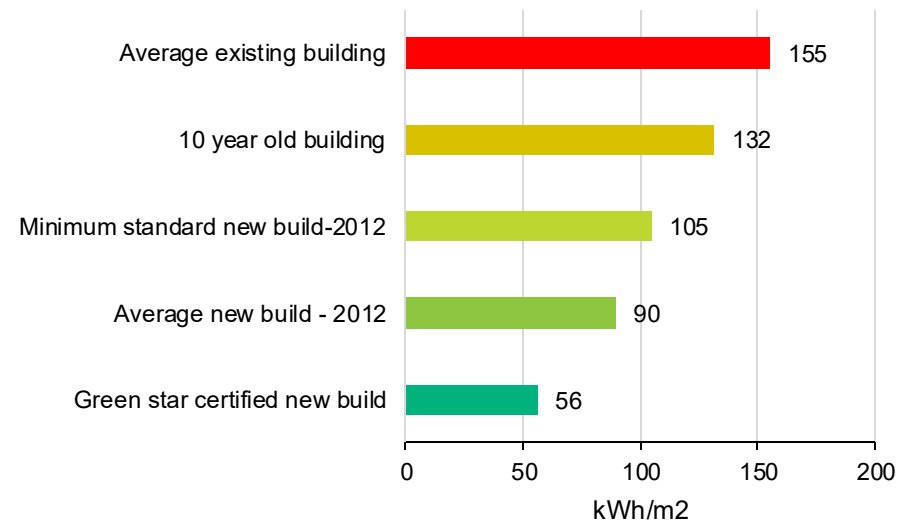
Source: Green Energy Markets Analysis

- Even though the task to replace coal with low emission alternatives remains considerable, Federal Government policy support for rooftop solar is being rapidly phased out.
- The Small Scale Renewable Energy Scheme (SRES) has been the main policy driver for residential solar and also more recently has driven a surge of residential batteries, via provision of a rebate tied to the generating capacity of a system. However, the value of this rebate drops each year and will be entirely phased out by the end of 2030. This is even though it represents a very cost effective form of carbon abatement at its current levels. Also the Victorian Government's Solar Homes rebate is due to end in 2028.
- The other main policy driver for large rooftop solar on business premises has been the Large-Scale Renewable Energy Target. However, this too will cease to operate after 2030 and because this scheme's target has already been met, it provides an almost inconsequential level of financial recognition to generation for being zero emissions (LRET certificates have fallen from around \$40-\$50 per MWh two years ago to now trade at about \$2 per MWh).
- In terms of larger rooftop solar systems on business premises, the VEU has already begun to step into the breach left behind by the phase out of the Large Scale Renewable Energy Target, and is playing an important role in driving installations in this area. But it could also help fill the gap left by the premature phasing down of the SRES.

Consumers can also play key role in replacing coal

- There are also a range of other opportunities for improved energy efficiency to help fill the gap left from retirement of coal.
- The vast majority of existing Victorian homes were built prior to the 2004 introduction of the 5 Star Energy Efficiency Building Standard. This means a substantial proportion have quite poor levels of insulation and weather sealing. Upgrades that improve insulation and weather sealing can have meaningful impact in reducing the amount of energy required to keep these homes warm in winter and cool in summer.
- In terms of commercial buildings there are also large gaps between the energy efficiency performance of most existing buildings and what existing best practice technology can deliver. As an example, analysis by ClimateWorks, illustrates in the chart to the right that if the average existing office building could be brought up to simply the minimum standard for new buildings introduced back in 2012 it could deliver a 33% reduction in energy consumption. If it could be upgraded to what new build offices typically achieved in 2012 then it would deliver a 42% reduction in energy consumption.
- The scope for retrofit upgrades to deliver energy savings with reasonably short paybacks is considerable. For example, Sustainability Victoria's Buildings Tune-up Program managed to achieve 29% reductions in energy consumption with an average of a three-year payback period.

Energy intensity of existing old stock of buildings relative to newer standards of performance



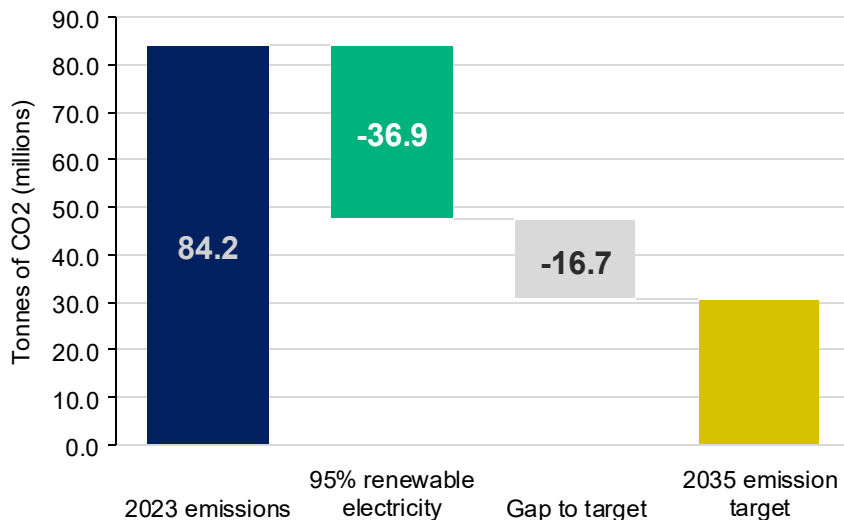
Source: ClimateWorks Australia (2013) *Tracking progress towards a low carbon economy - buildings chapter*

- The industrial and mining sectors also have scope of significant energy savings through such options as reducing steam and compressed air leaks; better insulating pipes carrying hot water and steam; installing variable speed drives and use of better control systems.

Challenge 3 – Meeting emission targets requires more renewable energy plus a whole lot more

- The Victorian Government has committed to reducing economy wide emissions by 75% to 80% below 2005 levels. To achieve this target will require a major transformation of the electricity sector to be largely supplied from renewable energy. However further emissions cuts will need to be achieved in other sectors as well.
- The chart outlines that if the Government was to achieve its 2035 target for 95% of electricity to come from renewable energy it would deliver emission reductions of almost 37 million tonnes compared to emissions back in 2023. However, to achieve it's minimum 75% emissions cut the Government needs another 16.7 million tonnes of emission reductions.

To achieve 2035 emission reduction targets will require 95% renewable electricity and lots more



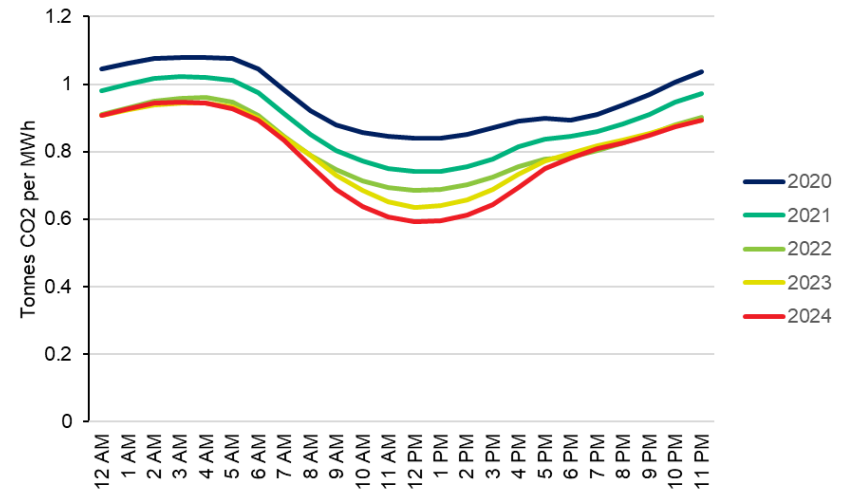
Source: Victorian Government (2025) Climate Change Strategy and Green Energy Markets analysis of Clean Energy Regulator and AEMO data

- Transport, which represented 22 million tonnes of Victoria's emissions in 2023, will be an important part of bridging this abatement gap. However, even with the recent rise in electric vehicle sales they still only represent 16.4% of new car sales (based on April 2026 VFACTS data). Further progress towards electrification will undoubtedly unfold but because motor vehicles have long lives of 10 to 15 years, the shift out of petroleum fuels and into low emission electricity will take considerable time even with significant growth in the share of electric vehicles in new car sales.
- There is essentially no feasible pathway towards achieving Victoria's emission reduction targets without making significant progress in reducing the 14.1 million tonnes of CO2 emissions from stationary fossil fuel use, which is mainly from use of gas. Thankfully, as the preceding pages have outlined, this is likely to deliver significant energy security and economic benefits to households and the business community.
- At the same time a major expansion in the use of renewable energy in our electricity supply means it will become increasingly valuable for us to be able to flex demand around in time, given the inherent variability of wind and solar power.

Reforms to scale up the VEU to tackle Victoria's energy challenges

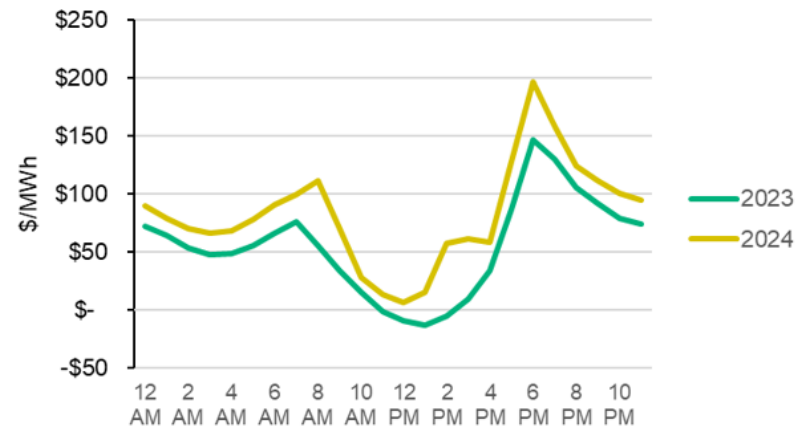
- Because of its broad scope and highly flexible, market-based model, the Victorian Energy Upgrades program provides the government with a powerful policy instrument to address the critical challenges of reducing gas usage, replacing output from retiring coal and reducing carbon emissions.
- However, effectively addressing these challenges will require the VEU scheme to recognise the increasing importance of the time when energy is saved or consumed. The rapid rise of solar PV panels is leading to plentiful supplies of low cost, low emissions electrical energy in the middle of day. However, overall demand for electricity tends to peak in the afternoon and early evening between around 3pm to 8pm.
- If we shift a large amount of current gas and petrol usage over to electricity we ideally need any increased grid-drawn electricity usage to be shifted outside this 3pm to 8pm window.
- This will be important for containing emissions because emissions from electricity supply are lowest in the middle of the day as illustrated in the top right chart.
- And it will also be important for containing costs by reducing the need to upgrade electricity network infrastructure and allow us to make the best use of increasingly plentiful and low cost solar and minimise the use of expensive gas-fired generators. This large time of day differential in cost between midday solar and more expensive gas in the evening peak can be seen very clearly in wholesale electricity market spot prices shown in the chart to the bottom right.

Emissions intensity of Victorian electricity by hour



Source: GEM Analysis using NEM Review and Clean Energy Regulator data

Victorian average wholesale electricity spot prices by hour of day



Source: GEM Analysis using NEM Review

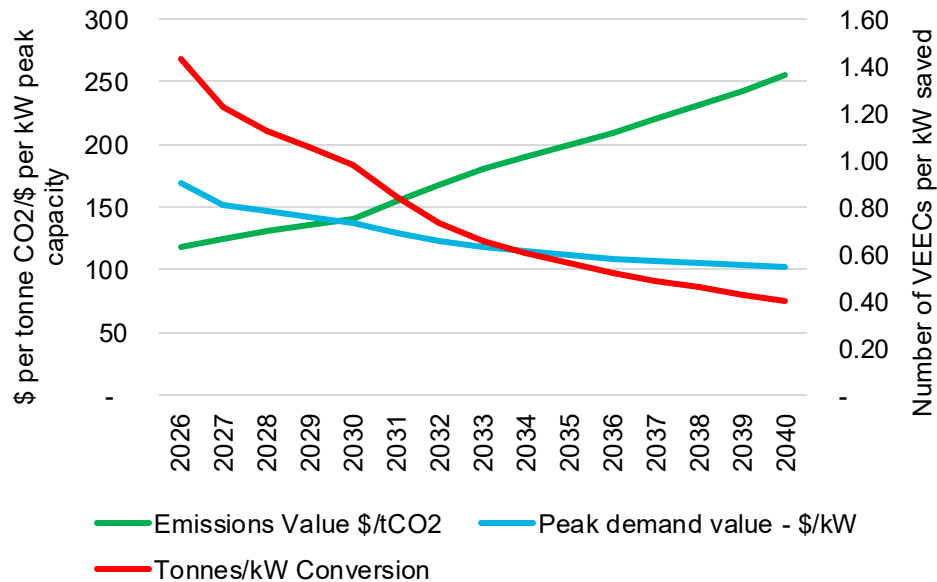
Reforms to scale up the VEU to tackle Victoria's energy challenges

- The increasing need to be able to flex electricity demand around in time is something the Victorian Government has recognised in its Strategic Review
- In the VEU Strategic Review's discussion paper the government stated,
“Homes and businesses switching from gas to electricity will contribute significantly to greenhouse gas emissions reductions, but the switch will increase the overall consumption and demand on the electricity network. Maximising electricity efficiency gains is critical in managing this increased consumption and demand. The rollout of flexible demand technologies can improve grid stability and efficiency, particularly as electrification scales up. Measures that mitigate growth in peak demand will reduce the need for expensive infrastructure upgrades, while reduced overall demand can keep electricity prices lower, benefiting all Victorians – not just VEU program participants.”
- More recently the government announced that it will draft legislation to adjust the VEU to ensure the program can better support upgrades that will enable more flexible demand, not just the CO2 abatement currently recognised under the scheme.
- At this stage the government is still to outline how it would like to adjust the structure of the VEU to encourage flexible demand. But it has stated that, unlike the NSW Government, it does not wish to establish a separate certificate scheme to encourage reductions in peak demand. Instead, it wishes to expand the scope of the VEU to encourage flexible demand while keeping with one single tradeable certificate and one single target for retailers to achieve.
- At the moment VEU tradeable certificates are denominated in terms of a tonne of CO2 abated. A single scheme and certificate that seeks to cover both CO2 emission reductions and also reductions in peak demand will require a way to convert demand flexibility gains into CO2 denominated certificates in a manner that is objective, predictable, as well as economically sensible such that it doesn't crowd out cost-effective emission abatement activity.
- One way is to apply a financial value to each type of benefit and use this to determine equivalence between CO2 savings versus demand flexibility/peak demand reductions.
- For the financial value of CO2 we can use the Victorian Government's estimate for the societal value of avoided CO2 which was detailed in the Government's Building Electrification Regulatory Impact Statement from 2025.
- For the financial value of avoided peak demand we can use the cost of building new supply to meet a kilowatt of increased peak demand. The electricity industry would likely employ a four hour utility-scale battery to meet this increased demand into the future. CSIRO provides a projection of the cost for this technology in its annual Gencost publication it prepares for AEMO's planning processes.

Reforms to scale up the VEU to tackle Victoria's energy challenges

- The chart below maps these two reference cost factors against each other. The green line shows the value of a tonne of CO2 over time based on the Victorian Government's Building Electrification Regulatory Impact Statement. The blue line shows projected cost per kilowatt of capacity for construction of a four hour battery (amortised over 10 years) over time according to CSIRO's Gencost publication.
- The red line then shows the value ratio between a tonne of CO2 and a kilowatt of peak demand capacity on the right hand axis.

Ratio between dollar value of avoided CO2 compared to cost to supply peak demand determines certificate allocation factor



- This red line would be the basis for determining how many certificates are awarded to an activity per kilowatt of peak demand capacity reduced.
- For the purposes of modelling detailed in this report, we have assumed that the Victorian Government would implement the peak demand certificate conversion factor via an averaged rate across the years covered by a given VEEC target period, rather than changing this value each year. For example, the next target is due to be set for the years covering 2028 to 2030. The average ratio between the value of a tonne of CO2 and a kilowatt of peak demand during these years is 1.05. The next target is due to be set for the five year period of 2031 to 2035 and under the costings used for this chart the conversion factor would average 0.68.
- Providing an averaged peak demand conversion factor over the entire period of set target, rather than one that is revised each year, would enhance the predictability of the scheme's operation. This will make it easier for businesses participating in the scheme to plan, invest and contract.

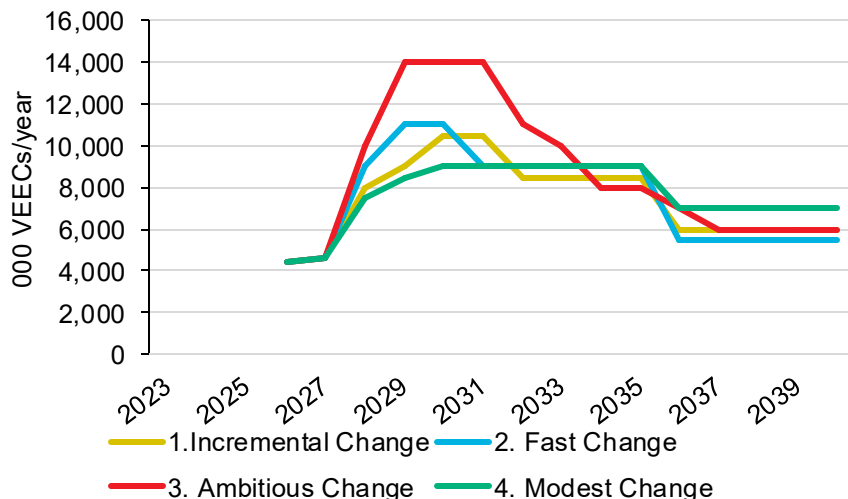
Reforms to scale up the VEU to tackle Victoria's energy challenges

- As part of ensuring the VEU can maximise its effectiveness in addressing Victorian energy and emission challenges, our modelling analysis of the scheme has assumed the following elements are part of the scheme:
 1. **Recognition given to time of use emission benefits.** Energy upgrade activities which shift electricity demand into the middle of the day, and in particular make better use of rooftop solar, need to be recognised for their greater contribution to CO2 abatement than the 24-hour averaged electricity emissions intensity factor currently used. For example, a heat pump water heater that replaces a gas heater and is installed in a house with a solar system and timed to operate off the generation from that solar system will be close to zero emissions. It should receive an amount of certificates aligned with this outcome.
 2. **Expansion into batteries and demand shifting technology.** The technology which has the greatest potential to reduce electricity peak demand while maximising the utilisation of solar energy is battery energy storage. While battery systems of 50kWh or smaller capacity already receive support via the Federal Government's SRES program, this is being rapidly phased out and will be gone after 2030. The VEU can also fill the gap for storage systems larger than 50kWh, while also ensuring the level of residential storage installations is maintained at the rate needed to help cover the exit of coal and increased power demand from electrification, even as the SRES fades away. Activities will also need to be rapidly added to the scheme to recognise devices that can shift demand outside of the peak demand period.
 3. **Expand eligibility for VEECs to upgrades in all businesses outside the Federal Safeguard Mechanism.**
 4. **The Project Based Activity is streamlined.** As noted earlier, there are a range of opportunities to reduce energy usage and electrify away from gas in business premises, but which have trouble accessing the VEU due to administrative complexity involved in the way the Project Based Activity operates. If this could be simplified and/or streamlined to make measurement and verification of certain upgrades easier this would increase the extent of upgrades taking place in businesses.
 5. **Expansion of eligibility to residential solar.** The VEU already plays an important role in supporting the installation of larger solar systems on business premises but residential solar remains ineligible under the scheme. This made sense in the past as residential solar received significant policy support from the SRES and the Victorian Solar Homes Rebate Program. However, the Solar Homes Program is due to close in 2028 and the SRES is being steadily phased down. With the rise of affordable battery storage, rooftop solar remains a very important part of the solution for the cost effective and timely replacement of aging coal generators and would warrant inclusion within the VEU.
 6. **VEU plays a supporting role to rental and hot water system regulations.** The Government has moved to phase out gas hot water systems at their end of life and will also be requiring insulation upgrades and installation of efficient electric heating in rental properties. While these are mandated changes, the Victorian Government has indicated it would like these to remain eligible for support under the VEU. This will encourage replacement earlier than end of life and also reduce the capital expense of complying with new regulations which will improve the social acceptance of these significant regulatory changes.

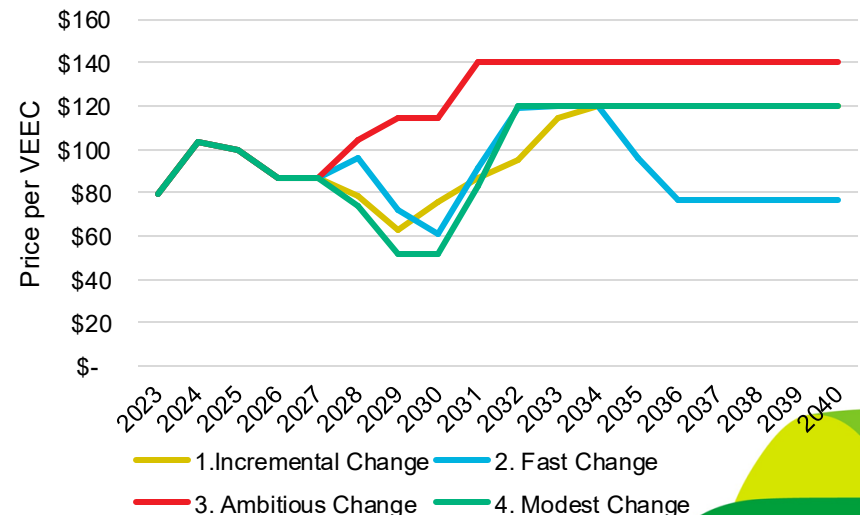
Target options for a reformed VEU

- Our analysis of the potential role of the VEU in addressing key policy challenges has examined four alternative options for how the target could be set.
- The annual levels of these four alternative targets are detailed in the chart below and all represent a significant increase relative to the 4.4m target currently set for 2026 and 4.6m for 2027.
- The most ambitious target we analysed, shown in red, was calibrated relative to the supply of certificates we estimate is likely to be available at a VEEC price no higher than \$140. This would entail an increase in the penalty price compared to where it is currently set.
- The other scenarios were constrained by the existing level of the shortfall penalty price cap (but assume penalty would be adjusted for inflation over time).
- These other targets seek to examine the impacts of adjusting the speed at which government might wish to achieve emission savings and electricity peak demand reductions.
- Note that across all of the scenarios the level of the target drops away in the back half of the trajectory. This is because of two reasons relating to diminishing supply over time. The first is that the electricity system is assumed to become largely decarbonised by 2035 so the amount of carbon abatement VEECs delivered by electrical efficiency falls over time. The second reason is that over time the potential number of customers left remaining to switch over from gas to electric becomes quite small.
- Projected VEEC prices under each of the target scenarios are shown below.

Alternative target trajectories analysed in modelling



Price of VEECs under different target trajectories



Outcomes under different targets

- All of the target scenarios analysed are projected to deliver economic benefits that exceed costs as shown in the table below. This table provides a summary of costs and benefits (NPV basis discounted at 5%) as well as some of the key physical metrics associated with each option such as energy and emission savings.
- The Fast Change target trajectory delivers the highest net benefit at \$12.9 billion to 2040 and also delivers the highest benefit to cost ratio at \$2.82 of benefit to \$1 of cost.
- The Ambitious Change target trajectory delivers the lowest net economic benefit of all the scenarios analysed. However, it is important to note that benefits still significantly exceed costs, with a net overall benefit of \$11 billion, and \$1.93 in benefit for every \$1 in cost.
- It is important to note that in spite of a significant substitution of gas equipment and appliances with electricity under this modelling, the VEU still delivers substantial net savings in grid electricity requirements. In the year 2040, electrical energy efficiency gains plus extra rooftop solar capacity is expected to reduce the need for centralised generation by 9,049GWh under the Fast Change scenario and by 10,651GWh under Ambitious Change, after accounting for the extra power consumption from electrification.
- Also due to the scheme's expected support for flexible demand technologies such as batteries, it is estimated that by 2040 our need for large centralised generation will be between 3,543 to 4,334 megawatts lower during peak demand periods.

Summary of modelling results for each target trajectory option to 2040

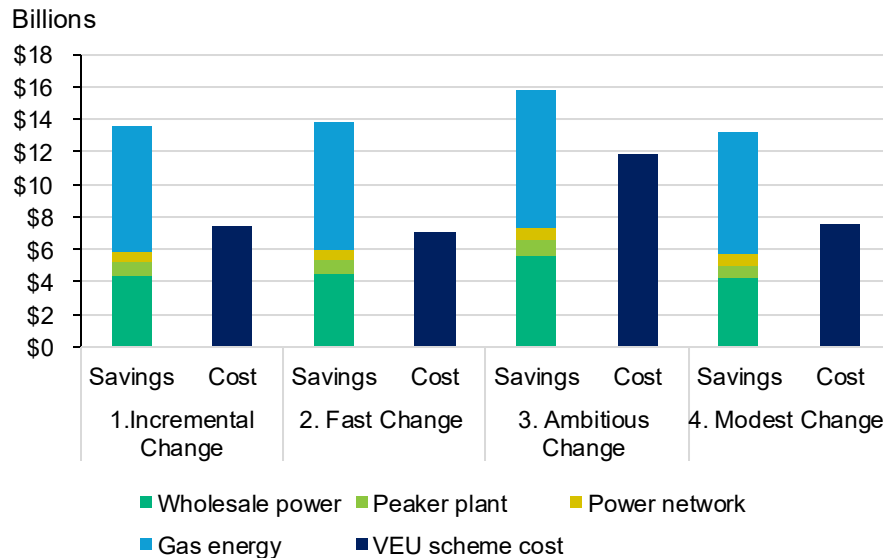
	1.Incremental Change	2. Fast Change	3. Ambitious Change	4. Modest Change
Economic Costs (\$m)	\$7,466	\$7,076	\$11,858	\$7,602
Economic Benefit (\$m)	\$19,543	\$19,958	\$22,867	\$19,023
Net Economic Benefit (\$m)	\$12,077	\$12,882	\$11,009	\$11,421
Benefit to Cost Ratio	2.62	2.82	1.93	2.50
Cumul. 2040 Residential Installs	3,445,174	3,376,743	3,702,918	3,420,247
Cumul. 2040 Business Installs	125,609	125,219	141,082	124,554
Electricity savings 2040 GWh/a	9,038	9,049	10,651	8,922
Gas Savings 2040 TJ/a	73,578	72,421	77,283	72,968
Emission Reductions 2040 ktpa	4,381	4,316	4,635	4,086
Demand Savings 2040 MW	3,596	3,543	4,334	3,553
Emission Reductions 2035 ktpa	3,808	3,878	4,322	2,821
Demand Savings 2035 MW	2,303	2,400	3,041	2,255

- In evaluating the different target options, it is important to not rely on the net benefit result alone, but also recognise there are trade-offs between speed, cost and risk. In order to make quantitative analysis tractable and manageable some simplifications need to be made in the model that mean these trade-offs are not necessarily transparent in the economic valuation of the costs and benefits.
- The Ambitious Change scenario involves higher costs because it delivers a greater number of energy upgrades and delivers them in faster timeframe. An assumption in the model is that equipment costs decline at a uniform rate across all scenarios which is a function of time rather than the Victorian volume of installations. So a faster rate of installs incurs higher costs per install in the model.
- The higher cost of the Ambitious Change option needs to be balanced against the fact that the challenges facing the Victorian Government and community need urgent resolution. Substantial progress needs to be made on addressing gas shortfalls, the closure of coal generators and emission targets within the timeframe of 2030 to 2035. The Ambitious Change scenario delivers 11% greater emission reductions in 2035 than Fast Change and 27% more peak demand megawatts.
- The potential value of this faster delivery of results isn't comprehensively addressed in the cost-benefit analysis outside of the discount rate used of 5%. Instead, we have used a simplified approach of valuing each type of benefit across the scenarios at the same amount. We didn't account for the fact that scenarios which are slower to deliver outcomes carry greater risks in terms of energy supply reliability and potential cost shocks.
- For example, the cost of avoided electricity consumption is valued at the same amount across all scenarios, which was \$100/MWh. This value is set based on CSIRO Gencost estimates of new entrant renewable electricity generation with firming. However, the longer we wait to replace coal generators, the poorer the level of reliability they are likely to experience which is a key driver of significant wholesale electricity market price spikes. So there may be reliability and lower electricity supply costs from the Ambitious Change scenario which are not captured in the cost-benefit results.
- The cost of avoided gas consumption was also valued at the same amount across scenarios at \$20/GJ. While this is higher than current wholesale gas prices in Australia, it is substantially below current prices being paid by Asia Pacific LNG importers, with the Japan- Korea Marker (JKM) reference price being closer to \$29 per GJ. If Victoria was to become dependent on LNG import terminals then prices would likely reflect levels similar to those reflected by the JKM. JKM prices have varied markedly over time but usually reflect a significant premium over historical Australian domestic gas prices, hence the reason behind our use of a price premium relative to current Australian wholesale gas prices. In addition, customers should ultimately benefit from a saving on pipeline transportation costs over the long run from switching away from gas which are over and above the wholesale value. However just like in electricity, the slower the rate that we move to reduce our dependence on gas, the greater the vulnerability to price shocks as we will have to adapt to LNG imports, or force in extra gas supplies from the big 3 Queensland suppliers.

Energy bill impacts

- Across all the target options analysed energy consumers would see lower energy bills on average over the period to 2040. While the energy bill cost associated with an expanded VEU scheme is significant in all cases, it is considerably exceeded by the savings in reduced wholesale electricity purchases, reduced peaking plant and network capacity capital costs as well as very significant savings in reduced gas purchases.
- The net reduction in energy costs varies from \$3.8 billion under Ambitious Change to a maximum of \$6.5 billion under Fast Change.

Energy bill savings vs costs delivered by VEU scenarios (cumulative savings and costs to 2040)

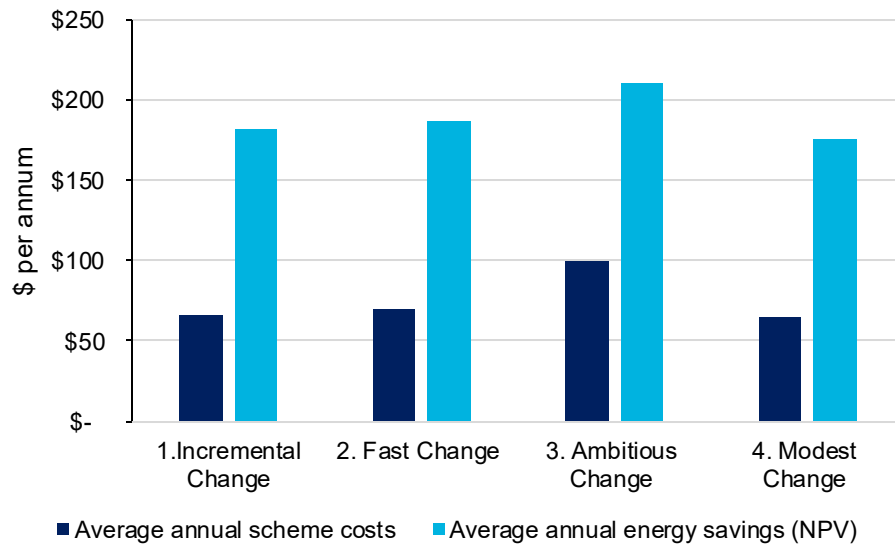


- These calculations do not incorporate any potential savings that might unfold through energy saving activities leading to enhanced competition and lower prices in the wholesale electricity market.
- Also, the energy bill savings illustrated here are not based on retail delivered pricing, as they exclude most of the savings on electricity and gas network costs that consumers can obtain by undertaking energy upgrade activities supported by the VEU. Instead, we assume that both electricity and gas network companies manage to recover most of their lost revenue from reduced energy volumes through increasing charges elsewhere.
- Benefits to consumers could be significantly greater if energy regulations were reformed so that energy network shareholders were treated like most other businesses in economy, where companies face declines to revenue as a consequence of declining demand for their products or services.
- Further benefits to society as a whole are delivered by the VEU through the climate change and health benefits that flow from reduced pollution. These are reflected in the overall economic net benefit calculations detailed earlier in this report.

Energy bill impacts

- The chart below provides a further breakdown of how these energy bill costs versus savings would be apportioned to the average residential household per year.

Annual average energy bill savings vs costs per household

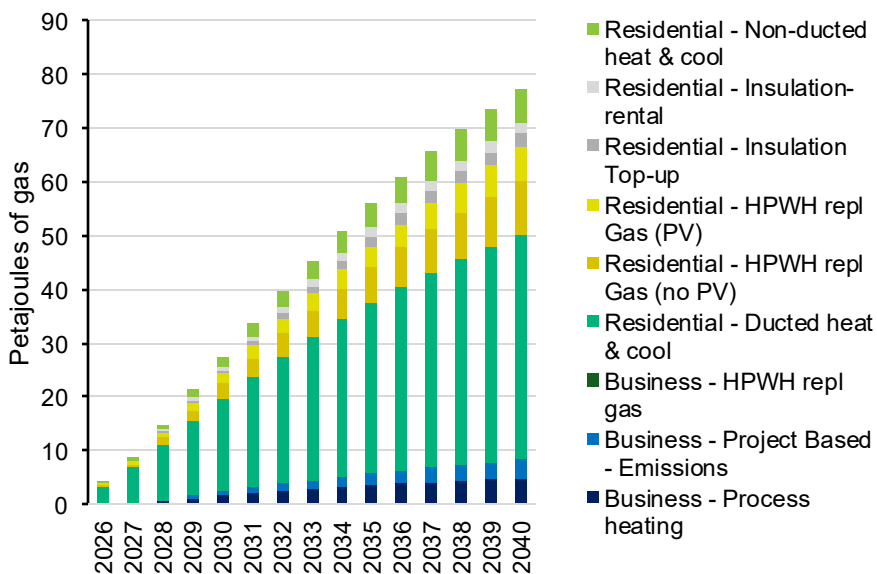


Detailed results under Ambitious Change

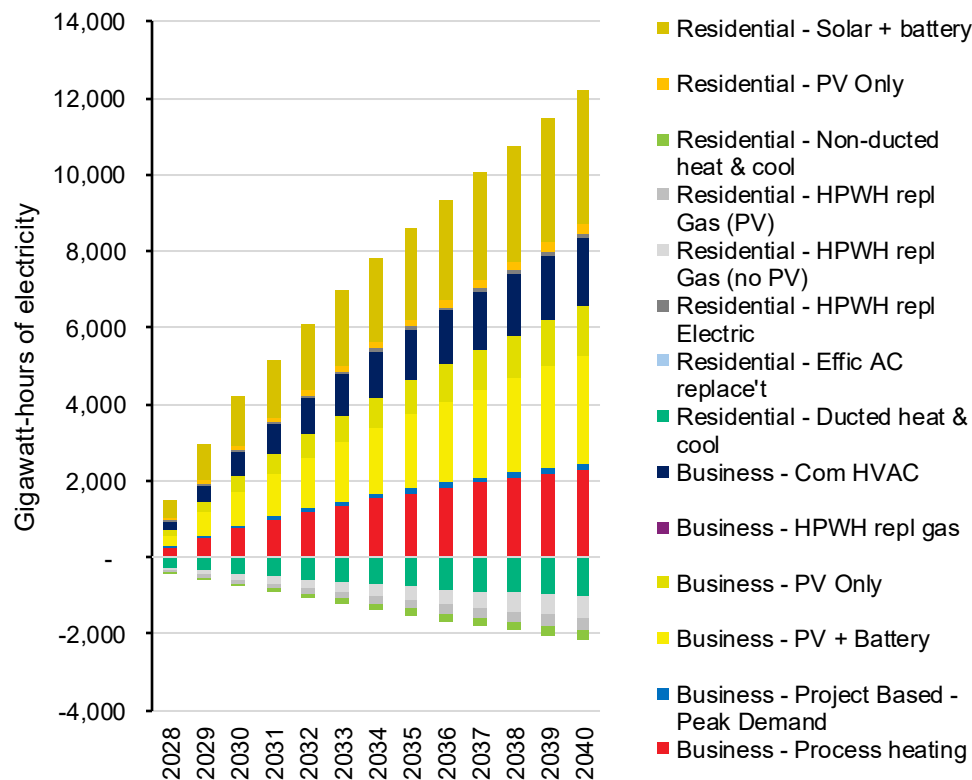
Drivers of energy savings

- To help better understand how an enhanced VEU is likely to drive energy upgrades, over the subsequent pages we have provided a detailed break-down on the nature of activities we project would unfold under Option 3 – Ambitious Change. Option 3 delivers a greater scale of activities and energy savings in the short term, but we see a similar range and balance of activities under the other options, it's just they come on stream more slowly.
- The chart below illustrates the activity breakdown for how gas savings are projected to be delivered. The vast majority of the savings come from residential households switching from ducted central gas heaters to electric reverse cycle space heating. Heat-pump water heaters (HPWH) are another significant source of gas savings.

Annual gas savings by activity



Annual reductions in centralised electricity demand by activity



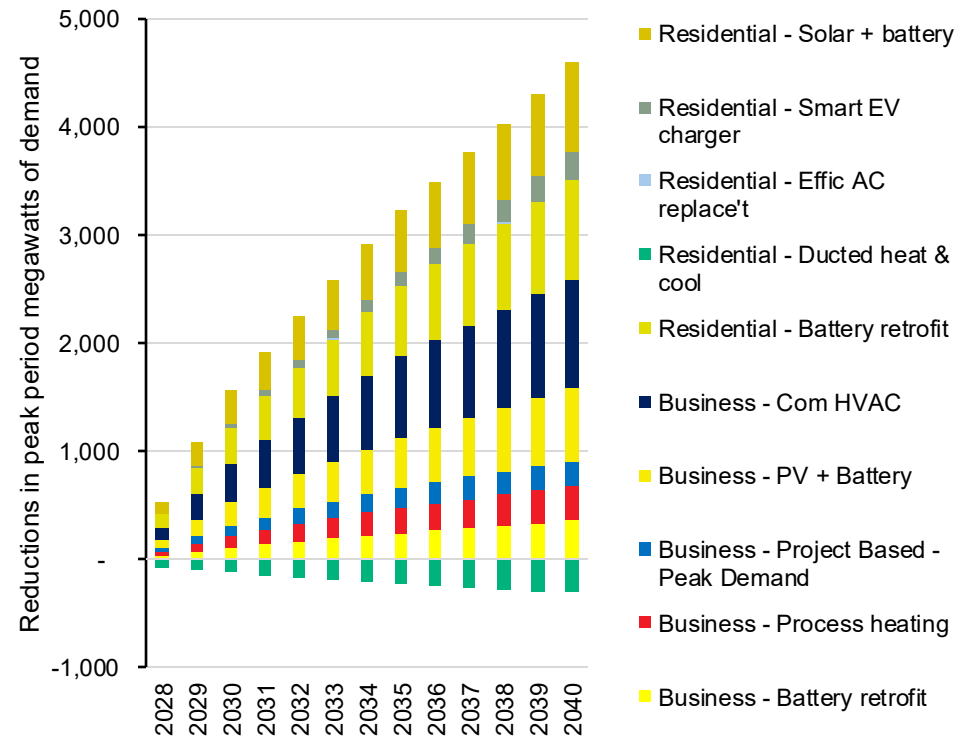
- In terms of electricity, the greatest gains in the chart above are delivered from solar PV installations shown in yellow. Note that the negative values in the chart above represent expected increases in electricity consumption from the switch-over from gas space and water heating to electric appliances.

Detailed results under Ambitious Change

Drivers of energy savings

- The chart to the right illustrates the reductions in megawatts of electricity peak period demand projected under the Ambitious Change option.
- In this case batteries (shown in yellow) are expected to be the predominant source of reductions in peak demand.
- Improvements to commercial heating, ventilation and air conditioning are also projected to deliver significant reductions in peak demand.
- The negative values shown in green indicate that replacement of gas heating with electric reverse-cycle air conditioners is expected to increase power demand during the peak demand period. However, it is important to recognise that air conditioners have already been installed across a majority of homes in Victoria. This moderates the extent to which the roll-out of air conditioners to replace gas heaters will increase peak demand over the summer period – which remains noticeably higher than system-wide peaks in demand over winter.

Annual reductions in centralised electricity demand by activity



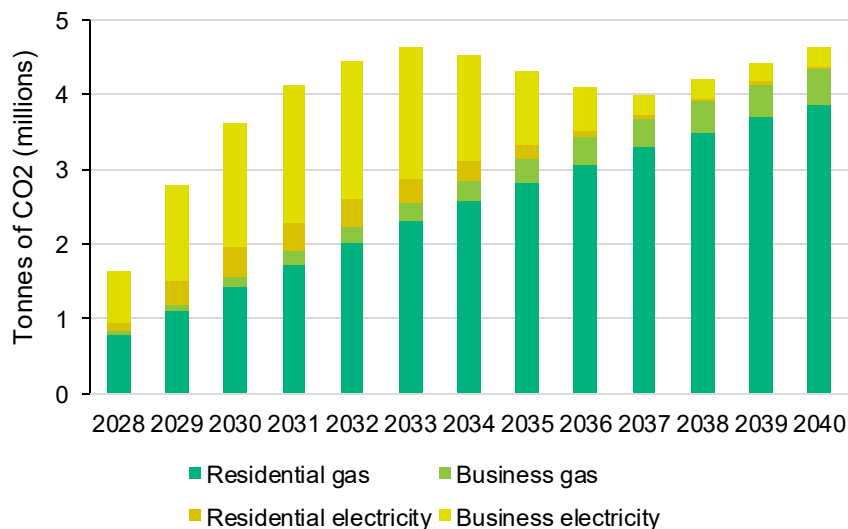
Note: A simplification in the model was that insulation upgrades would reduce gas use for heating rather than electricity, which also means any reduction in peak electricity demand was not calculated. In practice insulation would likely also reduce electricity peak demand.

Detailed results under Ambitious Change

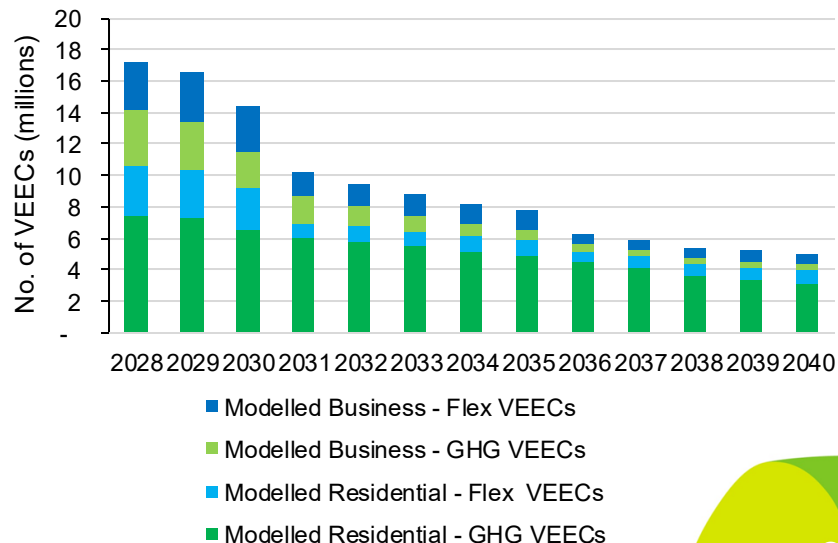
Emission reductions

- The chart below illustrates annual emission reductions achieved under the Ambitious Change Scenario segmented by residential versus business upgrades and by energy source.
- Interestingly, while annual energy savings delivered under this scenario steadily build over time as the installed stock of upgraded equipment accumulates, annual emission reductions peak in 2033 before slightly declining to 2037 and then rising again to 2040.
- This is because the emissions saved per megawatt-hour of electricity saved (or generated in the case of solar) dramatically falls over the period to 2035 based on an assumption that renewable energy's share of electricity supply rises rapidly to eventually reach 95% share (although slightly later than the government's 2035 target date).
- Consequently, the emission reductions delivered by electrical energy efficiency and solar fall to modest levels by 2040, and reductions in gas usage become the overwhelmingly dominant source of carbon abatement under the VEU scheme.
- Another factor influencing scheme outcomes is that it is assumed activities can create VEECs for reductions in peak demand from 2028. As detailed in the blue sections in the chart below, we project flexible demand will make an immediate impact on supply once it becomes eligible in 2028, representing around a third of supply in that year. This acts to compete with activities that reduce carbon emissions (although some activities deliver both abatement and peak demand reductions). For the remainder of the projection demand flex represents between a fifth to a third of certificate supply.

Annual emission reductions by sector and energy source



Supply of VEECs – split between CO2 and flexible demand

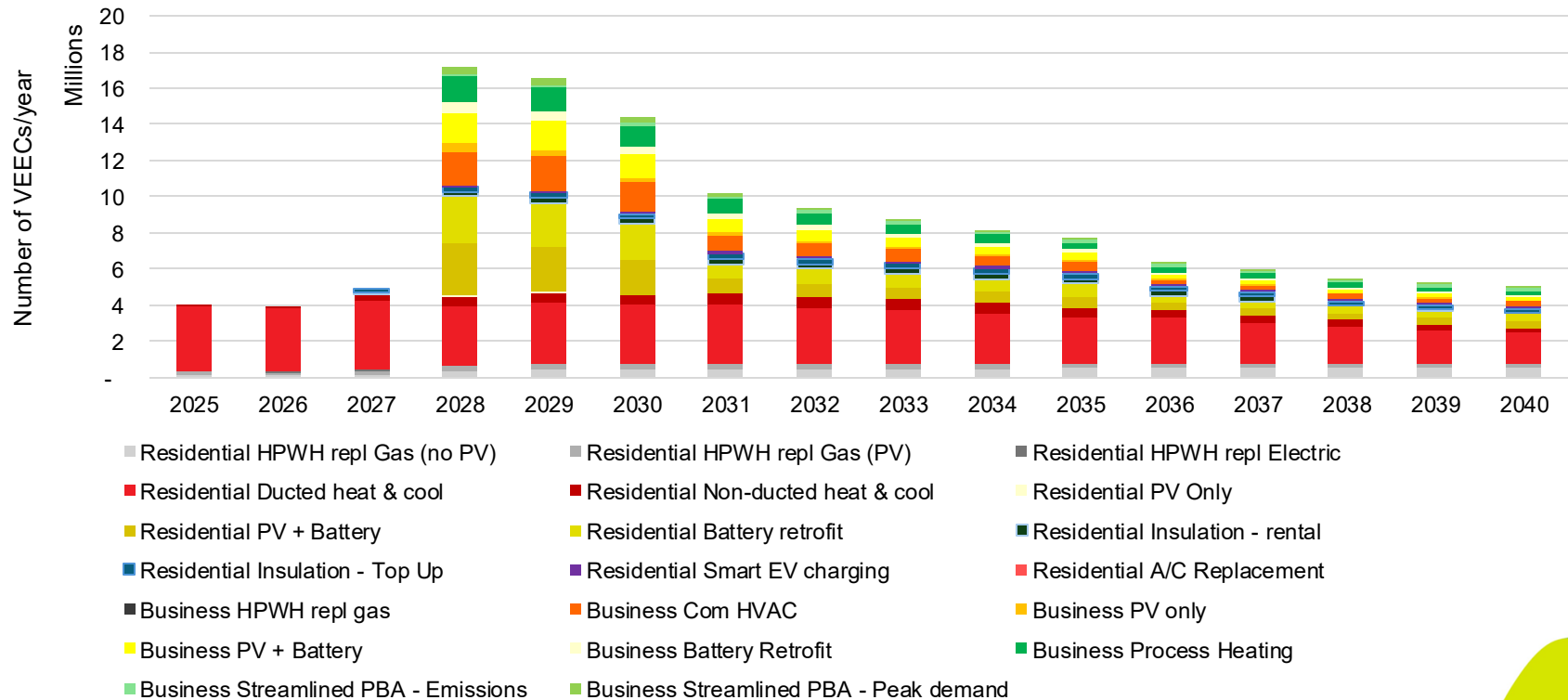


Detailed results under Ambitious Change

Sources of certificate supply

- The chart below illustrates the number of VEECs that are projected to be created by upgrade activity.
- The large lift in 2028 co-incides with our assumption that changes are introduced in this year to enhance the VEU and make peak demand reduction activities eligible for support.
- The red and orange bar sections represent upgrades related to space heating and ventilation.
- The yellow bars represent solar and battery upgrades.
- Grey bars cover the installation of heat pump water heaters.
- Green reflects upgrades distinct to businesses.
- Blue covers the installation of insulation.

Projected number of VEECs per year by activity type

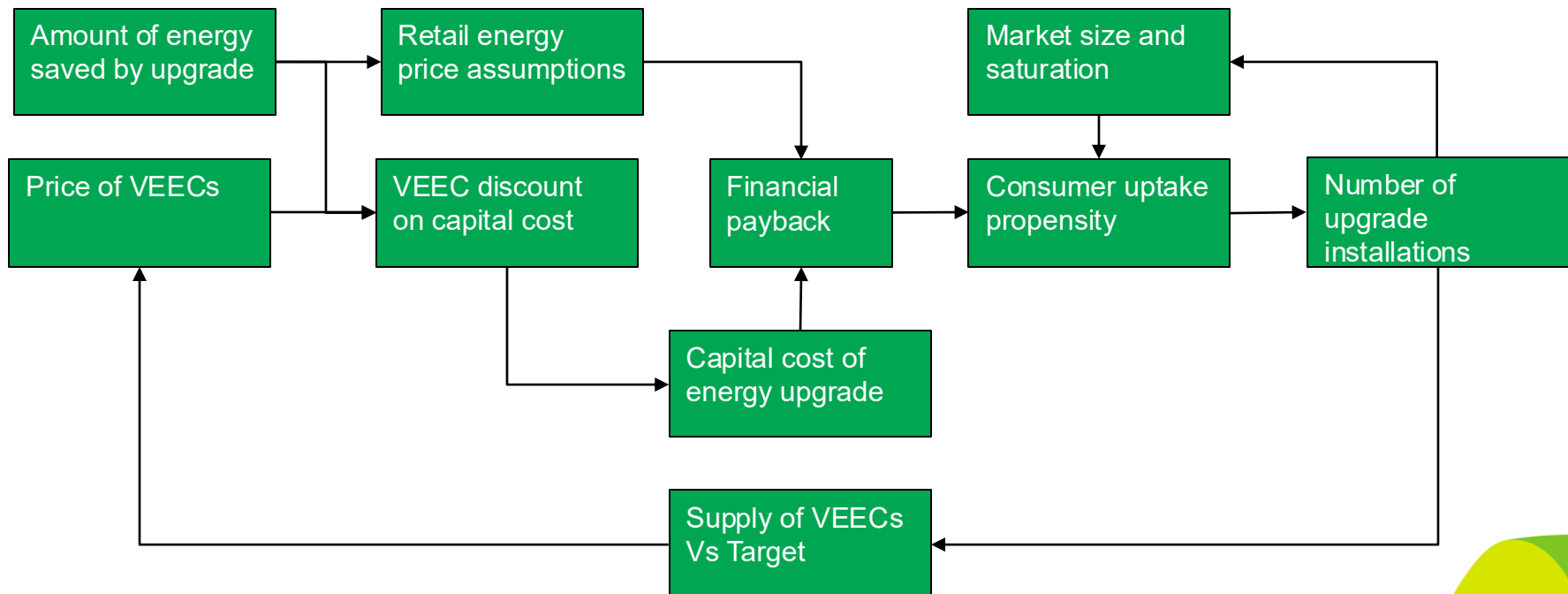


- Victoria faces significant energy policy challenges in terms of a rapidly approaching large shortfall in gas supply, the need to replace aging coal generators and a substantial carbon abatement gap to bridge to reach emission targets – all while seeking to address elevated community concerns about the cost of living.
- Energy equipment upgrades on consumer premises could make a meaningful contribution to addressing all four of these challenges simultaneously.
- The Victorian Energy Upgrades program with its broad scope and flexibility to support a wide range of energy upgrades options could play a critical role in driving energy equipment upgrades that could make a major impact in addressing the need to reduce gas use, while also helping to replace coal generators and reduce emissions.
- This report has examined how a reformed VEU might be scaled up to address Victoria's energy challenges, including modelling four alternative options how the VEU's target might be expanded.
- This modelling indicates that the VEU, in conjunction with other regulatory measures, could reduce Victorian gas usage by between 72 to 77 petajoules per annum by 2040. This is a considerable amount of gas, greater than the gas usage of the entire Victorian manufacturing sector and equal to around a third of Victoria's overall gas use.
- All of the target options modelled would also deliver significant reductions in the need for centralised grid generation (relative to no change) even though the model also incorporates a significant substitution of gas appliances with electric-powered alternatives. Reductions in demand for centralised generation were between 8,922GWh to 10,651GWh by the year 2040, which around a third higher than the generation provided by the Yallourn Power Station in 2025. They would also reduce the strain on our electricity system by reducing peaks in demand by between 3,543MW to 4,334MW.
- Across all the target options analysed energy consumers would see lower energy bills on average over the period to 2040 taking into account extra certificate costs under the VEU program. The net reduction in energy costs varied from \$3.8 billion under Ambitious Change target scenario to a maximum of \$6.5 billion under Fast Change.
- A broader economic assessment taking into account environmental and health care benefits, indicates that all four target options would deliver benefits exceeding costs of between \$11 billion to \$12.9 billion over the period to 2040.
- A critical component of the benefits is a large reduction in greenhouse gas emissions. Under the most ambitious target analysed, 4.3m tonnes of CO₂ would be avoided in the year 2035 and 4.6m tonnes of CO₂ in the year 2040. Under the scenario with the most favourable net economic benefit – Fast Change – the CO₂ savings were 3.9m tonnes CO₂ in the year 2035 and 4.3m in 2040.

Appendix – About the model

- The analysis in this report employs Green Energy Markets' Energy Appliance and Equipment Payback and Uptake Model. This is an extension of the model originally developed for projecting solar and battery uptake that has been used for preparing projections for the Australian Energy Market Operator and the Clean Energy Regulator.
- The model estimates payback for a wide range of energy saving upgrade investments.
- The level of payback, mediated by existing levels of market saturation for that upgrade, then determines the proportion of the applicable market that will adopt that upgrade in a given year based on a consumer uptake propensity demand curve.
- The model will keep increasing the VEEC price until enough upgrades are installed to create enough VEECs to satisfy the required target plus a surplus equal to the size of the subsequent year's target, so as to ensure sufficient market liquidity.

Components of Green Energy Markets' Energy Appliance and Equipment Payback and Uptake Model.



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