FE–V

Future of Electricity Vietnam

DISCUSSION PAPER

Future Demand

Australian experience and reflections for the Energy Transition in Vietnam

June 2023

Australian Government

About Future of Electricity Vietnam (FE-V)

Australia and Vietnam are neighbours and peers, facing the same regional challenges and sharing the same aspirations for sustainable, secure, and fair electricity services as the basis of prosperity and economic growth. Our power sectors: share many legacy issues on how energy is generated and transmitted; are blessed with high renewable energy (RE) potential and some of the fastest rates of RE deployment in the world; and are undertaking (or have recently undertaken) major structural reforms to the markets, governance arrangements and infrastructure that underpin the sector in order to take advantage of the opportunity presented by a sustainable energy transition.

Future of Electricity Vietnam (FE-V) is a science-to-policy program made up of policy dialogues aimed at leveraging the Australian experience in energy transition to support Vietnam in exploring practical and feasible interventions for a decarbonised, reliable and affordable power system.

Recognising 50 years of diplomatic relations between Australia and Vietnam, FE-V is an initiative of the Australian Embassy in Hanoi bringing Australian and Vietnamese experts together to share experiences and to co-develop knowledge products of prioritised topics relating to 5 main dimensions of the power sector (generation, fuels, consumption, grid and market) with the Central Economic Commission of the Communist Party of Vietnam (CEC), a strategic dialogue partner. The FE-V initiative is divided into two phases. The first phase focuses on providing high-level inputs for an energy transition strategy, including a review of the 3-year implementation of Resolution 55 which CEC is carrying out.

FE-V is delivered by Australia's Partnerships for Infrastructure (P4I) and the Australia - Mekong Partnership for Environmental Resources & Energy Systems (AMPERES) together with the Australian National University (ANU) and Commonwealth Scientific Industrial Research Organisation (CSIRO). P4I is an Australian Government initiative partnering with Southeast Asia to drive sustainable, inclusive, and resilient growth through quality infrastructure. Led by the Australian Department of Foreign Affairs and Trade, P4I is implemented by EY, Adam Smith International, The Asia Foundation and Ninti One.

Authors

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Photo: People in Son La in the first day of national grid installment. Photo courtesy of EVN.

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AMPERES

Partnerships for INFRASTRUCTURE

CSIRO

Australian National University

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List of Abbreviations

Abbreviation	Full name
ACCUs	Australian Carbon Credit Units
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AER	Australian Energy Regulator
ARENA	Australian Renewable Energy Agency
BOT	Build–Operate–Transfer
CBAM	Carbon Border Adjustment Mechanism
CfD	Contracts for Difference
DEECA	Department of Energy, Environment and Climate Action
DEIP	Distributed Energy Integration Program
DER	Distributed Energy Resources
DNSPs	Distribution Network Service Providers
DOEs	Dynamic Operating Envelopes
DRSP	Demand Response Service Provider
E3	Equipment Energy Efficiency
EE	Energy Efficiency
EECP	Energy Efficient Communities Program
EEHP	Energy Efficient Homes Package
EMRG	Energy Market Ready Grants
EPT	Environmental Pollution Treatment
EPTC	Electric Power Trading Company
ERF	Emissions Reduction Fund
ERL	Energy Rating Label
ESCOs	Energy Service Companies
ESS	Energy Saving Scheme
ETS	Emission Trading Schme
EV	Electric Vehicle
EVN	Vietnam Electricity
EVSE	Eletric Vehicle Supply Equipment
FDI	Foreign Direct Invesment
FIT	Feed-in-Tariffs
GDP	Gross Domestic Product
GEMS	Greenhouse and Energy Minimum Standards
GHG	Greenhouse Gas
GW	Gigawatts
HEP	High Energy Performance
HIP	Homeowner Insulation Program
IETS	Industrial Energy Transformation Studies
ISP	Integrated System Plan
JICA	Japan International Cooperation Agency
LEDs	Light-emitting Diode
LGCs	Large-scale Generation Certificates
LRET	Large-scale Renewable Energy Target

MEPS	Minimum Energy Performance Standards
MOF	Ministry of Finance
MOIT	Ministry of Industry and Trade
MONRE	Ministry of Natural Resources and Environment
MRET	Mandatory Renewable Energy Target
MRV	Measurement, Reporting, and Verification
NABERS	National Australian Built Environment Rating System
NatHERS	Nationwide House Energy Rating Scheme
NCC	Nationwide Construction Code
NEG	National Energy Guarantee
NEM	National Electricity Market
NEPP	National Energy Performance Plan
PM&C	Department of the Prime Minister and Cabinet
PRCs	Peak Reduction Certificates
PSB	Power Saving Bonus
PV	Photovoltaic
REC	Renewable Energy Certificate
REPS	Retailer Energy Productivity Scheme
RTS	Rooftop Solar
SMEs	Small and medium-sized enterprises
SOEs	State-owned Enterprises
SRES	Small-Scale Renewable Energy Scheme
TWh	Terawatt hours
UNFCCC	United Nations Framework Convention on Climate Change
UTP	Uniform Tariff Policies
VEU	Victorian Energy Upgrades
VRE	Variable Renewable Energy

A. Thematic Setting

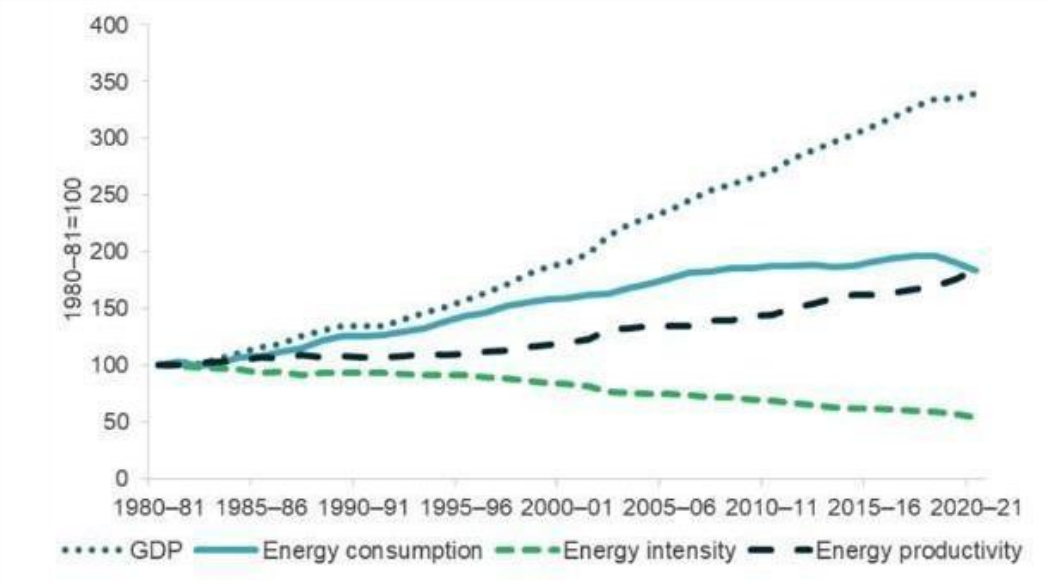
A1 - Overview and evolution of the theme

Trends in consumption and demand in Australia

Over the past few decades, economic growth in Australia has outpaced growth in energy consumption.[1] The Australian economy has trended towards lower energy intensity and higher energy productivity, as outlined in Figure 1 below. These trends reflect cumulative improvements in energy efficiency which have been achieved through innovations in heating and cooling technology, building design, and the transition to more efficient renewable energy sources, as well as responses to higher energy prices.[2] The improved energy productivity is also a result of a shift in the Australian economy away from industries such as manufacturing and agriculture which are highly energy-intensive, towards less energy-intensive industries such as services.[3]

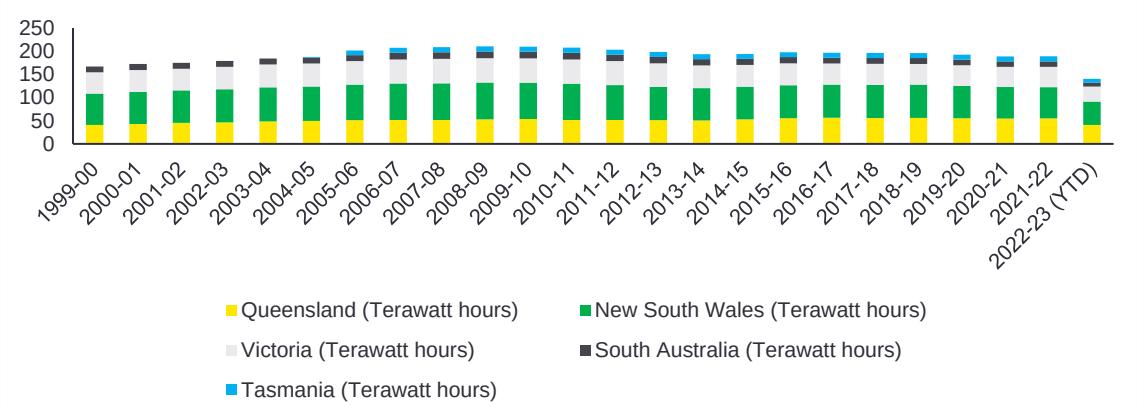
As can be seen from Figure 1 below, Gross Domestic Product (GDP) began to outpace growth in energy consumption in Australia in the mid-1990s. Australia now uses 22% less energy per dollar of economic output than it did a decade ago. Significant improvements to standards for building energy performance were introduced in 1993 which is likely to have led to some of these improvements. The *Renewable Energy (Electricity) Act 2000* set the framework for the Mandatory Renewable Energy Target (MRET) which later evolved into the 'Renewable Energy Target', comprised of two large-scale and small-scale renewable schemes. This transition to more efficient renewable energy sources also impacted the trend in energy intensity as shown in Figure 1 below.

Figure 1 | Australian energy intensity and energy productivity[4]



[1] Department of Climate Change, Energy, the Environment and Water. (2023). Australian energy intensity and energy productivity. Accessed here on 3 March 2023.
[2] Department of Climate Change, Energy, the Environment and Water. (2022). Australian Energy Update 2022. Accessed here on 3 March 2023.
[3] Parliament of Australia. (2020). Employment by industry statistics: a quick guide. Accessed here on 3 March 2023.
[4] Department of Climate Change, Energy, the Environment and Water. (2023). Australian energy intensity and energy productivity. Accessed here on 3 March 2023.

Figure 2 | Electricity consumption in the National Energy Market (TWh)[5]



As outlined in Figure 1 and Figure 2, there has been consistent growth in the Australian economy, but electricity consumption in the National Energy Market (NEM) has generally declined from a peak in 2008-09.[6] A portion of this reduction is likely to be as a consequence of the impacts of the COVID-19 pandemic. As can be seen in Figure 2 above, the largest consumers of electricity in the NEM are the states of Queensland and New South Wales. This is due to a combination of reasons. New South Wales is Australia's most populated state, with over 8m residents. The reason for Queensland's large consumption is mainly due to its large industrial base.

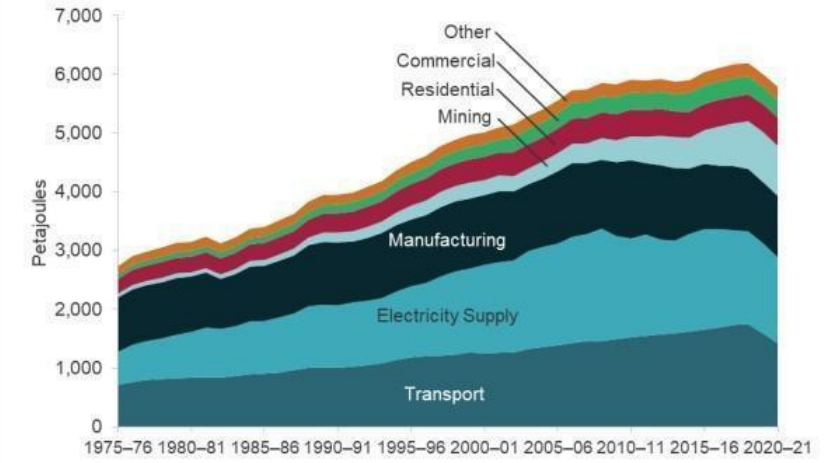
Figure 3 below illustrates how energy consumption across sectors has changed over time. The electricity supply, transport and manufacturing sectors collectively accounted for almost 70% of energy consumption in 2020-21, compared to 80% in 1990-91. Reductions in consumption in these sectors in recent years is mainly due to the transition to more efficient renewable energy sources for electricity supply, reduced usage of transport during the COVID-19 pandemic, and consequential impacts to the manufacturing sector. Energy use in the petroleum refining sector fell sharply, by 25% in 2020–21. This decline occurred partly as a result of the decline in demand for transport fuels under pandemic conditions. Additionally, the first of two scheduled refinery closures took effect in March 2021[7].

[5] Australian Energy Regulator. (2023). *Annual electricity consumption – NEM*. Accessed here on 3 March 2023

[6] The impacts of COVID-19 are included in the statistics. This largely impacted the transport sector's consumption.

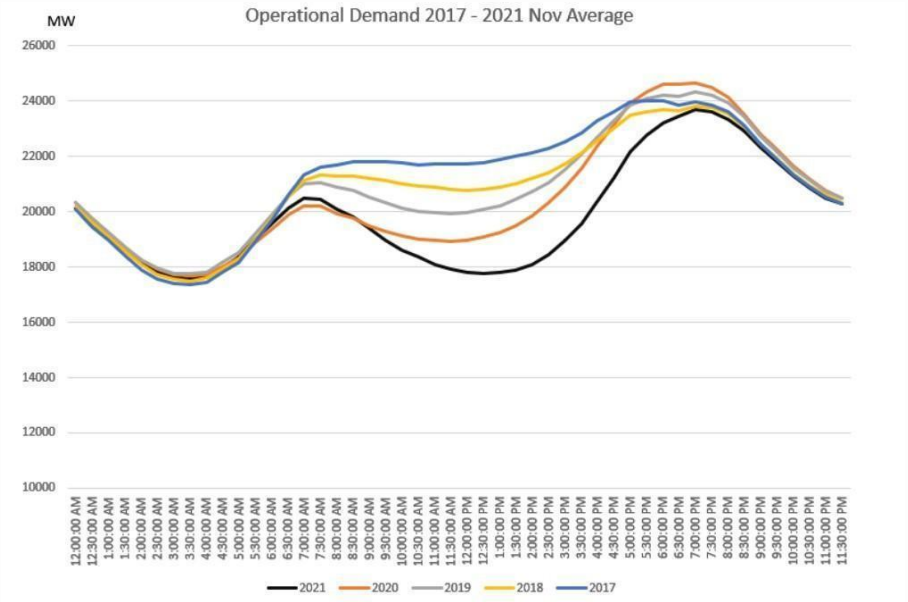
[7] Department of Climate Change, Energy, the Environment and Water (2022), Australian Energy Statistics, Table E. Accessed here on 20 April 2023.

Figure 3 | Australian energy consumption by sector over time[8]



The demand profile in Australia has also changed over time. The increased penetration of rooftop solar photovoltaic (PV) systems in recent years has led to reduced operational demand in the middle of the day when solar generation is at its peak. The acceleration of electric vehicle (EV) adoption in Australia is also likely to influence the demand profile. Figure 4 below illustrates the impact of solar PV and EVs on the demand profile. As solar production ramps up with the sunrise it brings net demand down. Peak solar production occurs around midday, resulting in minimum net demand from the electricity network. As solar production decreases as the sun sets, demand from the network increases. This change in demand throughout the day is referred to as the "duck curve", due to the profile it creates, as seen in Figure 4 below. Over time, as additional solar PV is added to the network, the duck curve gets more and more pronounced, as additional solar PV increases the minimum demand issue during the day.

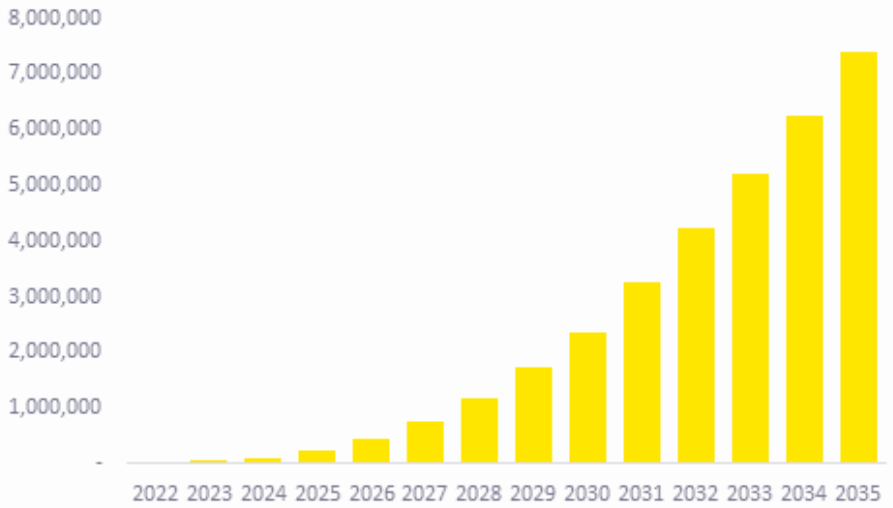
Figure 4 | Solar PV demand duck curve[9]



[8] Department of Climate Change, Energy, the Environment and Water (2022), Australian Energy Statistics, Table E. Accessed here on 20 April 2023.
[9] Australian Energy Council (2022), *Solar Report*. Accessed here on 21 April 2023.

While current EV market penetration in Australia is low, the number of EVs on Australian roads is expected to increase to over 7 million by 2035 as projected in Figure 5 below.

Figure 5 | Australia EV uptake forecast 2022-35[10]



While electricity consumption from the grid has been declining, despite growth in GDP, the energy transition is main driver for the expected growth in consumption in future due to the need to the electrify Australia's economy (including the transport sector, increased use of technology, etc.). This is discussed further in the following section. As patterns in consumption and demand continue to fluctuate, the need for managed electricity use and export of rooftop solar becomes more critical to maintain the stability of the system. As a result, there has been a continued push to embed price signals in tariffs and incentivise the adoption of technology improvements to manage demand and energy consumption.

Forecast energy consumption and demand

Energy consumption is likely to increase significantly in the next few decades as Australia increasingly electrifies its economy as it works towards achieving its net zero targets of reducing greenhouse emissions to 43% below 2005 levels 2030 and zero by 2050.[11]

The Australian Energy Market Operator (AEMO) releases an Integrated System Plan (ISP) every two years that details the required energy transformation in Australia over a 20 year horizon. The most recent ISP was released in 2022.[12] This report outlines the plans to switch to renewable energy, double capacity to power transport and industry, and to provide consumers with reliable, secure and affordable power. The key components of the ISP that will directly impact on energy consumption and demand are the forecast increases in electricity usage, distributed solar PV and storage capacity.

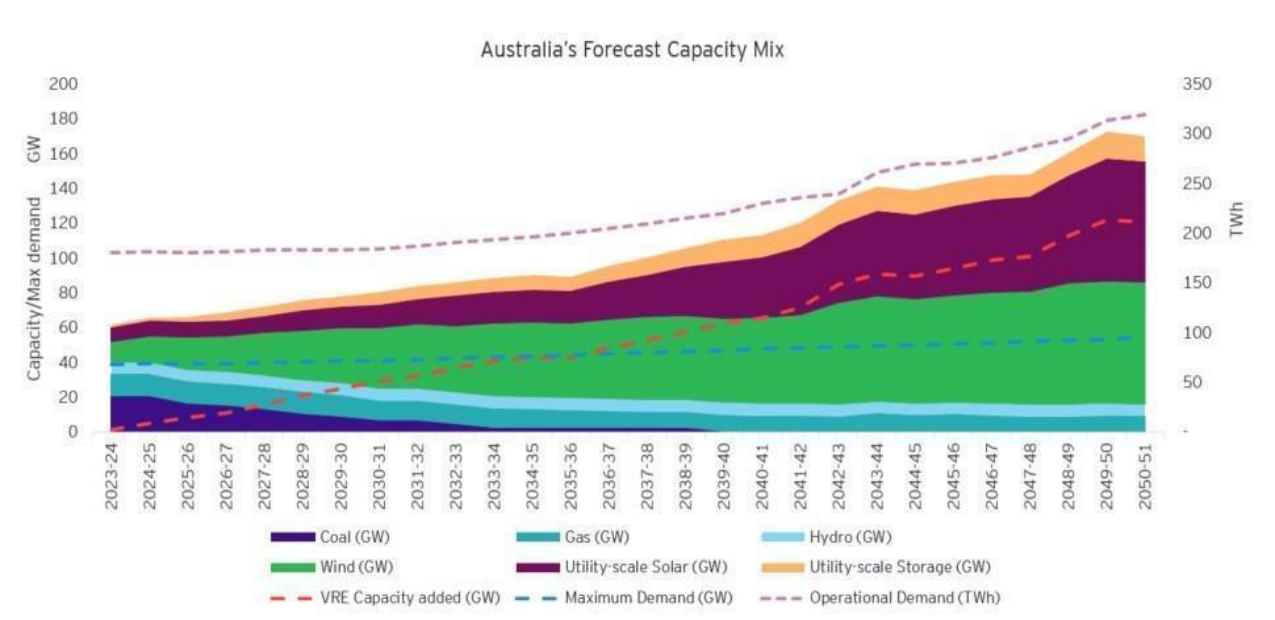
[10] Based on EY analysis.
[11] Department of Climate Change, Energy, the Environment and Water. (2023). National Energy Performance Strategy. Accessed here on 3 March 2023.
[12] Australian Energy Market Operator. (2022). 2022 Integrated System Plan. Accessed here on 3 March 2022.

Electricity usage from the grid is forecast to nearly double from 180 terawatt-hours (TWh) in 2022 to 320 TWH in 2050.[13] Electrification of transport, industrial processes, heating and cooling processes, as well as the anticipated increase in green hydrogen production in Australia will likely be the major drivers of the forecast increase in energy consumption.[14] Figure 6 below illustrates the overall capacity mix and demand out to 2050.

Similarly, distributed solar PV capacity is set to increase five-fold from 15 gigawatts (GW) in 2022 to 69GW in 2050. Currently, approximately 30% of detached residential homes in the NEM have rooftop solar PV and it is projected that over half of the homes in the NEM would have rooftop solar PV by 2032.[15] A large increase is also expected for commercial and industrial solar PV. Successful integration of these DER into the NEM will depend partly on the effectiveness of economic incentives such as tariffs, and technology and communication standards.

With electricity from Variable Renewable Energy (VRE) sources replacing a large portion of gas, petrol and other fossil fuels currently consumed in Australia, and the increase in DER, storage capacity will also have to grow to cater for this increased energy consumption and provide stability for the system as synchronous generation is removed from the system. The storage capacity required is forecast to increase from 2GW in 2022 to 61 GW in 2050.[16]

Figure 6 | AEMO's forecast capacity mix, including the increased VRE capacity, maximum demand and total output to 2050[17]



[13] Australian Energy Market Operator. (2022). 2022 Integrated System Plan. Accessed here on 3 March 2022.
[14] For details on the forecast methodology, see the 2022 Integrated System Plan. Accessed here on 3 March 2022.
[15] Australian Energy Market Operator. (2022). 2022 Integrated System Plan. Accessed here on 3 March 2022.
[16] Australian Energy Market Operator. (2022). 2022 Integrated System Plan. Accessed here on 3 March 2022.
[17] Australian Energy Market Operator. (2022). *2022 Integrated System Plan*. Accessed here on 3 March 2022.

The role of price signals in consumption and demand

The energy sector in Australia is vertically separated into generation, transmission, distribution, and retail.[18] Due to natural synergies between retail and generation, the main energy retailers also own generation assets (i.e., are vertically integrated). However, the electricity supply chain is largely disaggregated, and as a result, retail electricity bills generally comprise of four key components:

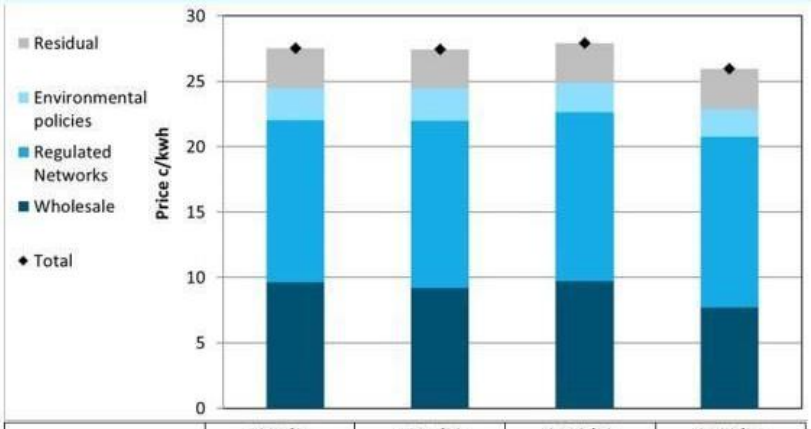
- Wholesale costs related to electricity generation (and related wholesale market fees).
- Network costs related to transmission and distribution networks, regulated by the Australian Energy Regulator (AER).
- Environmental policy costs, such as the cost to comply with mandatory energy efficiency schemes and compliance costs associated with renewable energy targets.[19]
- Retail/residual costs related to retail operating activities such as billing and marketing.

Figure 7 below outlines the actual and forecast trends in national supply chain costs from FY21 to FY24 from a report by the Australian Energy Market Commission (AEMC) published in November 2021. While costs related to transmission and distribution were forecast to increase as networks get built out to cater for greater renewable generation sources and two-way electricity flows, there was a projected decrease in environmental costs. This forecast was driven by a decrease in Large-scale Renewable Energy Target (LRET) costs, which stems from a reduction in the cost of Large-scale Generation Certificates (LGCs).[20,21] However, more recent trends have seen an increase in LGC prices, indicating that prices may hold up more strongly than expected.[22]

These supply chain components reflect the changes in costs, but these costs do not represent the end bill amount for customers, due to other factors that influence bills such as retailer charges and differences between retail offers.

[18] Supply chain applies to electricity, gas and to liquid fuels to some extent. It is segmented here to demonstrate how energy pricing is composed in Australia. The regulation of transmission and distribution pricing is undertaken by the Australian Energy Regulator (AER). Retail pricing is largely determined by the competitive market. More broadly, in terms of the governance of the energy sector in Australia, the operation of the NEM is performed by the Australian Energy Market Operator (AEMO). It is regulated by the AER and policy is determined by the Australian Energy Market Commission (AEMC). The oversight of the NEM is currently performed by a joint body made of representatives from AEMO, AER and AEMC, known as the Energy Security Board (ESB). Outside the NEM, policy is determined by government and an economic regulator regulates monopoly energy service providers.
[19] See section 'Other policies impacting demand' of this paper for more details on the types of energy efficiency schemes that industry participants must comply with.
[20] Australian Energy Market Commission. (2021). Residential Electricity Price Trends 2021. Accessed here on 6 March 2023.
[21] LRET is a certificate scheme that 'incentivises the development of renewable energy power stations in Australia through a Renewable Energy Certificate Market for the creation and sale of certificates called LGCs'. Refer to Australian Government Clean Energy Regulator. (2022). Large-scale Renewable Energy Target. Accessed here on 11 March 2023.
[22] Australian Clean Energy Regulator. (2023). Large-scale generation certificates (LGCs). Accessed here on 17 April 2023.

Figure 7 | Trends in Australian supply chain components[23]



	2020/21 Base Year		2021/22 Current Year		2022/23		2023/24	
	c/kwh	$/year	c/kwh	$/year	c/kwh	$/year	c/kwh	$/year
Environmental policies	**2.45**	**$122**	**2.45**	**$123**	**2.24**	**$113**	**2.10**	**$106**
LRET	0.65	$32	0.49	$25	0.37	$19	0.29	$15
SRES	1.00	$50	1.11	$55	0.98	$49	0.93	$46
Jurisdictional Schemes	0.59	$30	0.63	$34	0.62	$33	0.61	$33
Efficiency Schemes	0.21	$10	0.21	$10	0.27	$13	0.28	$13
Regulated Networks	**12.43**	**$603**	**12.81**	**$622**	**12.93**	**$628**	**13.05**	**$634**
Transmission	2.07	$101	2.28	$111	2.34	$114	2.41	$117
Distribution	9.50	$460	9.70	$471	9.75	$473	9.81	$476
Metering	0.85	$42	0.82	$41	0.83	$41	0.84	$41
Wholesale	**9.61**	**$467**	**9.19**	**$448**	**9.71**	**$469**	**7.69**	**$375**
Residual	**3.02**	**$150**	**2.98**	**$145**	**3.03**	**$147**	**3.09**	**$150**
Total	**27.51**	**$1,342**	**27.43**	**$1,338**	**27.92**	**$1,357**	**25.94**	**$1,265**

Another key aspect of electricity bills are tariffs. Consumer bills reflect retail tariffs as well as network tariffs. Tariffs are methods of charging customers for the costs associated with supplying their energy and are designed to ensure full cost recovery to the extent possible. Cost-reflective network tariffs for Distribution Network Service Providers (DNSPs) have been effective in most states of Australia. Notable exceptions to this is the application of Uniform Tariff Policies (UTP) to rural areas such as regional Queensland and Western Australia, where electricity prices are subsidised by government and so these customers do not face the true cost of providing electricity to these remote and regional areas.[24] DNSPs in the NEM are required to submit an annual pricing proposal to the AER.[25] Within the proposal, DNSPs typically present their tariff classes and assignment policies, tariffs structures and charging parameters, approach to setting tariffs, and indicative pricing schedule for the regulatory period. These proposals are approved by the AER if they are compliant with rule requirements and any applicable distribution determination made by the AER, and if all forecasts within the proposal are deemed reasonable.[26] Retailers then include the network tariff in the retail offer but are not required to reflect the underlying cost-reflective network tariff. The rationale for this being that retailers should have the flexibility to design offers for customers that best suit their needs, considering a wide range of factors and consumer preferences.

[23] Australian Energy Market Commission. (2021). *Residential Electricity Price Trends 2021*. Accessed here on 6 March 2023.
[24] The UTP ensures that customers in regional and remote areas in the same customer class as their urban counterparts, face uniform tariffs. The additional cost to serve regional and remote customers is funded by government.
[25] Australian Energy Regulator. (2023). Pricing proposals & tariffs. Accessed here on 4 March 2023.
[26] Australian Energy Regulator. (2023). Pricing proposals & tariffs. Accessed here on 4 March 2023.

There are a number of distribution network tariffs and tariff structures in operation, and these vary across each DNSP. For example, Ausgrid that operates the network in urban New South Wales has low voltage, high voltage, sub-transmission, unmetered, and transmission tariff classes, while AusNet Services in Victoria offers tariff classes for residential, and small industrial and commercial customer classes.[27,28] Smart meters have enabled a wider range of tariffs compared to those available using a traditional meter, due to their ability to provide accurate real-time information about electricity usage. For example, CitiPower, a DNSP serving urban Melbourne, commenced trials on EV tariffs which involve critical peak pricing and time-of-use, and neighbourhood battery tariffs including a local network tariff that applies to energy exchanged in the local network.[29] However, only the state of Victoria has fully adopted smart meters with an average level of smart meter penetration of 25% in all other states in 2021.[30]

Each customer is assigned to a tariff class based on eligibility criteria determined by each DNSP. Price signals are embedded into network tariffs to ensure the tariffs are cost reflective and incentivise customers to use energy at certain times of the day (either to reduce peak demand or to address minimum demand). A key challenge is that most retailers in Australia predominantly offer a flat tariff structure to residential customers, which dampens these price signals and limits their impact on energy demand during the day.[31]

Overview of relevant policies

Many policies in the energy sector in Australia are considered through the lens of the 'energy trilemma', which consists of energy affordability, energy security and sustainability concerns. Policies aimed at energy efficiency and demand management (that is, reducing or increasing demand at specified times upon request) in Australia have historically been focused on providing reliable and affordable energy to consumers while maintaining comfort and economic participation. In more recent times, energy efficiency measures have been identified as key levers in addressing the third limb of the trilemma - achieving sustainability and net zero goals.

Policies targeting reliability and affordability

Early energy efficiency policies were initially targeted at improving the efficiency of small household appliances and improving the energy efficiency of the built environment. Policies in this area were later expanded to incorporate demand management (that is, reducing or increasing demand at particular times upon request). Table 1 below outlines some examples of key policies currently in place.

[27] Ausgrid. (2019). Ausgrid's Regulatory Proposal 2019-24 – Attachment 10.01 – Tariff Structure Statement. Accessed here on 7 March 2023.
[28] Ausnet Services. (2021). Electricity Distribution Annual Pricing Proposal 2021-22. Accessed here on 7 March 2023.
[29] Citipower. (2021). 2021/2022 Pricing Proposal. Accessed here on 21 March 2023.
[30] Australian Energy Market Commission. (2021). Review of the regulatory framework for metering services. Accessed here on 11 March 2023.
[31] Australian Energy Regulator. (2020). Understanding the impact of network tariff reform on retail offers. Accessed here on 8 March 2023.

Table 1 | Example Australian Energy Policies

Category	Policy/ Scheme	Overview of policy/scheme	Timeline
White certificate schemes[32]	New South Wales Energy Saving Scheme (ESS)[33] (previously called the Greenhouse Gas Reduction Scheme)	• Provides financial incentives to install energy efficient equipment and appliances in households and businesses. • Targeted towards generators, large to small enterprises and residential consumers.	Ongoing since 2009
	Victorian Energy Upgrades (VEU) Program[34]	• Provides financial incentives to install energy efficient equipment and appliances in households and businesses. • Targeted towards residential consumers and small to medium enterprises.	Ongoing since 2009
	Retailer Energy Productivity Scheme (REPS)[35] (previously called the Residential Energy Efficiency Scheme)	• Supports households and businesses in South Australia to reduce energy costs through activities such as installing energy efficient lighting, or water efficient shower heads. • Targeted towards residential consumers and small businesses. • Updated on 1 January 2021 to include incentives to support energy demand management and demand response.	Ongoing since 2009
Housing stock and built environment	Nationwide House Energy Rating Scheme (NatHERS)[36]	• Measures the energy efficiency of homes by providing a star rating between 0 and 10 which signifies its thermal performance.	Ongoing since 1993
	Nationwide Construction Code (NCC) - Residential and commercial energy efficiency provisions[37]	• Enhanced residential energy efficiency provisions were introduced in the National Construction Code in 2022. • Changes to provisions include mandating minimum level of thermal performance to the equivalent of 7 stars under NatHERS and a new annual energy use budget.	Ongoing since 2022
	National Australian Built Environment Rating System (NABERS)[38]	• Provides ratings for buildings that assist in measuring, understanding, and communicating the environmental performance of the building. • Recently, NABERS has been expanded to include warehouses and cold stores, schools, and aged care facilities.	Ongoing since 2005
Grants program	Energy Efficient Communities Program[39]	• A grants program to assist businesses and community groups to lower energy bills, including grants for equipment upgrades and investment in energy and emissions monitoring and management systems.	2020 – 2022
	Energy Efficiency Grants for Small and	• A grants program to assist small and medium businesses in improving energy efficiency, including grants for installing heat pumps and lighting upgrades.	March 2023 – April 2023

[32] White certificate schemes generate tradable certificates from the implementation of energy-efficiency measures. Energy retailers are required to purchase a certain number of certificates each year and surrender these to the regulator in order to reach a target of emission reductions.
[33] NSW Government. (2023). Energy Savings Scheme. Accessed here 9 March 2023.
[34] Essential Services Commission. (2023). About the Victorian Energy Upgrades Program. Accessed here 9 March 2023.
[35] Government of South Australia. (2022). Energy efficiency assistance. Accessed here 9 March 2023.
[36] Commonwealth of Australia. (2022). About NatHERS. Accessed here 9 March 2023.
[37] National Construction Code. (2022). Overview of changes – energy efficiency and condensation. Accessed here 9 March 2023.
[38] NABERS. (2023). What is NABERS? Accessed here 9 March 2023.
[39] Department of Climate Change, Energy, the Environment and Water. (2023). Energy Efficient Communities Program. Accessed here 9 March 2023.

	Medium Enterprises Program[40]		
	Industrial Energy Transformation Studies (IETS) Program[41]	• A grants program to assist feasibility and engineering studies and associated metering that help identify opportunities to improve energy efficiency.	Ongoing since 2021
Appliance standards	Greenhouse and Energy Minimum Standards (GEMS) Act 2012[42]	• Outlines a national framework for minimum energy efficiency standards and energy efficiency labelling requirements for equipment and appliances.	Ongoing since 2012
Demand management	Wholesale Demand Response Mechanism[43]	• Introduces a new market participant category in the NEM – a demand response service provider (DRSP). • Enables consumers to sell demand response in the wholesale market either directly or through specialist aggregators for the first time.	Ongoing since 2021
	Business Recovery Energy Efficiency Fund[44]	• Offers capital works and energy demand management grants. • Available to business to support the installation of energy management systems, energy assessments and implementation of demand management solutions.	2020 - 2022
	Peak Demand Reduction Scheme[45]	• Sets a peak demand reduction target for retailers and large users. • Peak Reduction Certificates (PRCs) can be bought or created for eligible activities that reduce energy usage during hours of peak demand.	Ongoing since 2022 (will end in 2050)

Improving energy performance and demand management has become increasingly important for businesses and consumers due to rising energy prices. Over the last decade, both prices and price volatility have increased, with the second quarter of 2022 including the first-ever suspension of the NEM wholesale market. These wholesale market conditions have persisted and impacts on energy prices have been compounded by recent economic, political, and weather-related events. The increase in the default offer prices compared to the previous year in the state of Victoria, New South Wales, Queensland, and South Australia in the 2022-23 period is outlined in Table 2 below.[46] The ranges signify the variation in price increases across distribution zones in each state.

[40] Commonwealth of Australia. (2023). Funding to purchase energy efficient equipment upgrades for small and medium businesses. Accessed here 9 March 2023.
[41] Australian Renewable Energy Agency. (2023). Industrial Energy Transformation Studies (IETS) Program. Accessed here 11 March 2023.
[42] Energyrating.gov.au. (2023). Greenhouse and Energy Minimum Standards Act. Accessed here on 30 March 2023.
[43] Australian Energy Market Commission. (2020). National electricity amendment (wholesale demand response mechanism) rule 2020. National energy amendment (wholesale demand response mechanism) rule 2020. Accessed here on 9 March 2023.
[44] State Government of Victoria (2020). Business Recovery Energy Efficiency Fund. Accessed here on 11 March 2023.
[45] NSW Government. (2023). About the Peak Demand Reduction Scheme. Accessed here on 21 March 2023.
[46] Default offer prices are the maximum prices that retailers can charge electricity customers on default contracts known as standing offer contracts. Refer to Australian Energy Regulator (2022). Default market offer prices (2022-23). Accessed here on 21 March 2023.

Table 2 | Nominal default offer price increases in 2022-23[47] [48]

State	Residential	Small business
Victoria	1.2% - 9.2%	1.6% - 10.4%
New South Wales	8.5% - 18.3%	10.0% - 19.7%
Queensland	11.3% - 12.6%	12.8%
South Australia	7.2% - 9.5%	5.7%

These market conditions pose a significant challenge for network and retail businesses when setting tariffs as it is becoming increasingly difficult to achieve full cost recovery while maintaining affordability for end-consumers.

The AER is responsible for setting the default offer prices in the NEM. In Victoria, the default offer is set by the economic regulator, the Essential Services Commission. These default offers apply if a customer has not actively sought a better retail market offer. Retail market offers are not subject to regulation. The application of default offers is relatively new. When retail competition was first introduced, retailers were allowed to determine prices, as competition between retailers for market share would drive efficient pricing outcomes for customers. But in 2019, government-initiated reviews into high conditional offers for residential and small business customers led to default offers being introduced, to protect customers that couldn't or chose not to engage in the retail market.[49]

The inclusion of emissions reduction in the role of energy efficiency policies

In recent years, the focus of energy policies in Australia has broadened from a focus on energy efficiency for appliances and the built environment in the mid-1990s, and incorporating demand management to manage costs to the energy system, to energy performance in other sectors of the economy, like manufacturing, agriculture, and transport, in order to align with sustainability goals more recently (i.e. 2021-22). For example, the Australian Government is currently developing a National Energy Performance Strategy. The strategy will establish a framework to lower energy demand and increase energy performance and help to prioritise, coordinate, and harmonise government, industry, and household efforts to improve energy performance across the economy.[50] The strategy contemplates the development of national energy performance targets across the economy and establishing appropriate national policies for energy performance in residential, commercial, and industrial sectors and in supply chains.

This strategy is being developed alongside reforms to the Safeguard Mechanism. The Safeguard Mechanism was first introduced as part of the

[47] Australian Energy Regulator. (2023). *Default market offer prices 2022–23 Final determination.* Accessed here on 11 March 2023.
[48] Essential Services Commission. (2022). *Victorian Default Offer 2022–23 Final decision.* Accessed here on 11 March 2023.
[49] For further information on these retail reviews, see the AEMC's 2019 Retail Energy Competition Review, accessed here on 21 April 2023, and the Victorian Independent Bipartisan Review of Electricity and Gas Retail Markets (2017).
[50] Department of Climate Change, Energy, the Environment and Water. (2022). The National Energy Performance Strategy: Consultation Paper. Accessed here on 10 March 2023.

Emissions Reduction Fund in 2015. More details of this policy can be found in Issue 4 – B2 of this paper. Under the Safeguard Mechanism, the largest greenhouse gas emitters in Australia are required to keep their net emissions below an emissions limit (a baseline).[51] However, the Safeguard Mechanism policy currently has some limitations in its original design which has diminished its effectiveness on reducing carbon emissions in Australia. For example, it has only applied to the electricity sector as whole, which means that individual electricity generators do not face facility level baselines. For other sectors, the Safeguard Mechanism has only applied to facilities that individually produce more than 100,000 tonnes of CO_2-e per annum. This means large emitting sectors, such as the ground transport sector consisting of individual cars, buses, and trucks, have not covered by the policy. The Safeguard Mechanism also uses an emissions intensity baseline which is adjusted to the production levels of each Safeguard Facility. This allows facilities to increase production or invest in new fossil fuel mines without exceeding their baselines.[52] As a result, these facilities are not incentivised to reduce production to meet emissions target. To address these issues, major reforms have been recently approved and will come into effect on 1 July 2023. These changes are outlined in detail in Issue 4 – B2 of this document.

At a state level, white certificate schemes like Victoria's VEU Program have been identified as major levers for emissions reduction. In Victoria's Energy Sector Emissions Reduction Pledge, it noted that the VEU Program is one of the two major levers to achieving Victoria's emission reduction ambitions of 2.2 Mt CO2-e in 2025 and 3.7 Mt CO2-e in 2030.[53]

Other policies impacting demand

Many state and territory governments have introduced a range of incentives to increase the uptake of DER, such as solar PV. These have included direct rebates for solar PV installation as well as generous feed-in tariffs (FiTs). In addition, solar PV installations were also awarded certificates under the Small-Scale Renewable Energy Scheme (SRES) which further increased their attractiveness to consumers.

Under the SRES, a customer with solar PV is awarded a certificate for every megawatt hour of electricity generated. Certificates are then purchased by electricity retailers and submitted to the Clean Energy Regulator to meet the retailers' legal obligations under the Renewable Energy Target. This creates a market which provides financial incentives to for owners of solar PV energy systems.[54] These incentives fuelled the uptake of solar PV across Australia.

In June 2020, the AEMC introduced a new wholesale market demand response mechanism to the NEM. This mechanism is designed to enable large energy users to participate directly in the wholesale market and be rewarded for the value they provide to the system. Under the mechanism, large energy users register with the market operator to receive dispatch instructions where they can

[51] Department of Climate Change, Energy, the Environment and Water. (2023). Safeguard Mechanism. Accessed here on 11 March 2023.
[52] Australian Government Productivity Commission. (2023). 5-year Productivity Inquiry: Managing the climate transition. Inquiry report – volume 6. Accessed here on 20 March 2023.
[53] Department of Environment, Land, Water and Planning. (2021). Energy sector emissions reduction pledge 2021-2025. Accessed here on 14 March 2023.
[54] Clean Energy Regulator, History of the Scheme, accessed here on 21 April 2023.

offer to reduce load or export behind-the-meter generation, for which they would be paid.[55]

A2 - Importance of energy efficiency and demand management to the Australian electricity industry

As noted above, energy efficiency measures reduce energy costs for consumers and lower emissions, without compromising on comfort and economic participation. Policies targeting demand management can manage costs to the system and subsequently, reduce energy costs faced by consumers. In the current context of high inflation, high energy costs and the increasing importance of climate action, these policies have even more important.

As the responsibility for energy policy is shared across national and state level in Australia, policies addressing energy efficiency and demand management have been introduced at both a national and state level.

On 12 August 2022, Commonwealth, state and territory Energy Ministers agreed to establish a new National Energy Transformation Partnership. The partnership is a framework for national alignment and cooperation by governments to support the smooth transformation of Australia's energy sector.[56] The partnership includes Commonwealth and all state and territory governments. Until recently, the ambition of some state and territory governments for action on climate change and accelerating the energy transition was much higher than it was at the federal level. This resulted in a divergence in energy policy, which led to weakened investment signals and increasing compliance costs for businesses operating nationally. The federal election in 2022 brought about a change of government, and with it, a mandate to accelerate action on climate change. With this change, the ambitions between state, territories and the Commonwealth governments became more aligned, leading to the new era of cooperation under the partnership.
The partnership has identified a number of priority themes for collaboration over the next 12-18 months. One of these priority themes for collaboration is energy efficiency. As a result, greater alignment between national and state policies in relation to energy efficiency and demand management are expected in the short and medium term. Alignment between national and jurisdictional policies is preferred by industry, as it reduces compliance costs associated with multiple schemes and obligations.

Policies relating to emission trading schemes to drive greater energy efficiency in large energy users have traditionally been a contentious issue in Australian politics. However, the recent amendments to the Safeguard Mechanism, as noted previously, are an important step forward, although some important details regarding the specifics of implementation that will determine its effectiveness are still to be determined (as at the time of writing).

A3 - List of key issues

While many energy policies to incentivise energy efficiency and improve demand management are operating effectively, there are still challenges to

[55] AEMC (2020). Wholesale demand response mechanism, Rule determination, 11 June 2020.
[56] Department of Energy, the Environment and Climate Change (2022). *National Energy Transformation Partnership*. Accessed here on 30 March 2023.

resolve and certainly there are lessons that can be learned from. Some of the most significant learnings with respect to the Australian experience include those related to:

1. The important role of price signals in managing demand.
2. Using market-based and information disclosure schemes to address energy efficiency, such as appliance labelling and white certificate schemes.
3. The importance of managing the integration of DER on the electricity network so that they can become system assets rather than system risks.
4. Implementing an effective national carbon market or emissions trading scheme to incentivise industry decarbonisation.
   These issues are explored in further detail in Part B of this document.

A4 - Relevance to Vietnam

For much of the past 20 years, electricity consumption in Vietnam has grown at almost twice the rate of GDP growth. In fact, Vietnam has increased its electricity generation output by nearly ten times in the twenty years between 1999-2019, much faster than the rise in real GDP, which grew by 3.6 times.
Staff of international development banks operating in Hanoi have noted anecdotally that they doubt that Vietnam will be able to meet projected demand for power under these growth constraints given also the slow pace of project permitting and construction.

Demand management could help to reduce or delay the need for new sources of electric power. Resolution 55 has called for a reduction of energy intensity to between 420 and 460 kgOE (kilograms of Oil Equivalent) per $1,000 USD of GDP by 2030. In 2019, Vietnam's energy intensity was 470 kgOE/$1,000 USD. In 2015, it was 408 kgOE/$1,000 USD.[57] Using data from the World Bank, Le Viet Phu noted that in 2015 Vietnam's energy intensity (MJ/GDP) was 5.94, slightly lower than China (6.69), whereas it was much higher than other ASEAN countries such as Malaysia (4.68), Indonesia (3.53), and the Philippines (3.12).[58] The same data set for 2019 shows a major decline in Vietnam's energy intensity to 4.92 MJ/GDP (PPP), which is lower than China (6.31), but higher than Malaysia (4.25), Indonesia (3.16) and the Philippines (2.68).[59] This means that Vietnam, despite improvements in energy efficiency, is using more energy per unit of economic output than other countries in the region.

Developing countries will have a high rate of growth in electricity consumption relative to economic growth as households increase their use of energy and the early stages of development encourage the growth of energy intensive industries. However, this does not explain why Vietnam's energy intensity has been high for so long. As pointed out by L. V. Phu (2019) and P.D. Hien (2019),[60] the main cause of Vietnam's high levels of energy intensity is its low electricity tariff for the manufacturing sector. Dr. Hien has pointed out that this is an outcome of export-oriented industrialization policies that have encouraged the growth of energy intensive industries. Vietnam's economic structure does

[57] Thống kê Năng Lượng Viêt Nam 2020. Figures are in $PPP.
[58] Journal of Economic Structures (2019), Energy demand and factor substitution in Vietnam: evidence from two recent enterprise surveys. Accessed here on 27 April 2023.
[59] The World Bank. Accessed here on 27 April 2023.
[60] Ibid. and https://doi.org/10.1016/j.enpol.2019.04.025

include heavy industries such as iron, steel, and cement that are energy intensive. However, Dr. Hien points out that from 1994 to 2014, the industrial sector in Vietnam consumed ten times more electricity than the service sector but generated less GDP value added (Hien 2019). Phu (2019) has also pointed out that the low cost of electricity has encouraged a substitution of energy for capital investments in energy efficiency. That is, the low cost of energy incentivizes manufacturers to retain less energy efficient equipment or less energy efficient manufacturing processes rather than purchase newer more energy efficient equipment or develop more efficient processes. This then questions the value of Vietnam's policy of low energy tariffs. In sum, what has the policy of low energy tariffs for the manufacturing sector achieved?

The Vietnam Business Forum has advocated for a gradual increase in tariffs for the majority of consumers, but especially the manufacturing sector, for many years. This approach was the focal point for energy efficiency policies in the Made in Vietnam Energy Plan 2.0, which also included cross-subsidies for energy users in the lowest tariff bands. Such an approach would be a key element in policies that lead to Vietnam Electricity (EVN) reaching cost recovery and profitability. Cost recovery, is however, a sensitive issue as subsidies from the state budget are not immediately transparent in EVN's balance sheet and financial statements. The World Bank, Asian Development Bank, International Finance Corporation, and many other development finance institutions have urged for reform in energy pricing, pointing out that subsidising electricity encourages waste, results in the need for additional energy sources, and has not led to increased foreign direct investment. This is well understood by energy planners within MOIT and EVN. The question is how to increase tariffs, especially following the economic crisis caused by the COVID-19 pandemic. During the Covid 19 pandemic, EVN applied electricity tariff and electricity bill discounts for both businesses and residentials with a total amount more than VND 16,950 billion.[61] The in 2022, the costs of power generation went up nearly 21.5%, due in large part to increases in the price of domestic coal (up by 34-46%) and imported coal (up by 163%).[62] These factors led to a loss of about $1.2 billion in 2022 and is expected to result in the loss of another $2.7 billion in 2023.[63]

Retail cost recovery is a critical enabler of tariff reform. The Vietnam National Power Development Plan #8 (PDP8) was officially approved on 15 May 2023. PDP8 includes a commitment to improve the price management mechanism so that "electricity price ensures full cost recovery, reasonable profit, attracts investment in electricity development, encourages competition in the stages of production, transmission, distribution, retail, electricity use, and waste prevention." In order to achieve this, Vietnam will need to determine the true cost of supply and map a realistic pathway for tariffs from where they are today to where they need to be in future.

Promoting energy efficiency technologies and demand management programs is also specified in PDP8. Specially, a commitment to "encourage investment in and use of energy-saving technologies and equipment; strengthen energy

[61] https://en.evn.com.vn/d6/news/EVN-continues-to-implement-the-5th-electricity-tariff-and-electricity-bills-discount-for-customers-affected-by-the-COVID-19-pandemic-661422471.aspx#:~:text=Regarding%20the%20electricity%20tariff%20discount,the%20end%20of%20November%202021.

[62] https://e.vnexpress.net/news/companies/evn-reports-1-5b-loss-in-2022-4588187.html

[63] https://vietnamnet.vn/en/evn-could-lose-more-than-3-92-billion-in-2022-2023-2115978.html

audits; promote the deployment of the model of energy service companies." These solutions are expected to further drive reduced consumption, incentivise the uptake of rooftop solar, and manage demand from the grid, in combination with tariff reform.

Vietnam currently has around 16.5 GW of grid connected solar and 4,126 MW of grid connected onshore wind. Due to curtailment issues, solar facilities are operating at around 60% of their potential, leading to the need for some solar facilities to cover their costs through sale of Renewable Energy Certificates on international markets. The rapid increase of solar in 2020-2021 resulted in a physical imbalance of supply and demand, with supply located in low demand areas that lacked grid capacity to reach high demand areas.

Since 1 January 2021, EVN has not allowed any new rooftop solar connections to the grid until further guidance from the government. Installations of commercial and industrial solar have continued, however, as Energy Service Companies (ESCOs) offer long-term contracts that reduce the cost of power to these high energy users. Typically, these lease-to-own contracts are funded by the ESCOs on 12-year contracts to supply power at a 10% reduction in the cost of power provided by EVN utilities.

For EVN, refusal to allow grid connection of new RTS is a form of demand management. Since surplus power cannot be offloaded by these behind the meter installations, all must be used on site. Surplus power is typically generated during the daily peak when employees are on their lunch break. PDP8 includes this focus on promoting distributed generation for self-consumption through a commitment to "encourage people and businesses to invest in the development of rooftop solar power, self-generating and self-consuming electricity."

The Ministry of Finance is now assessing the feasibility of an economy wide carbon tax. Carbon taxes are often based on the social cost of carbon, a number that is growing and will continue to grow as the climate crisis escalates. The intent of the tax is to signal true cost and therefore reduce demand. We do not recommend this approach in Vietnam. Rather, we would follow recommendations of the World Bank to base a carbon tax on the fossil fuel components of the existing Environmental Protection Tax. The World Bank estimates the weighted average of EPTs for coal, diesel, and gasoline at about $12 USD per ton of carbon equivalent emissions. At tax starting at this rate would not cause any additional burdens on the economy, and though it would cause some changes in administration, it would be largely invisible to consumers.

In addition, The MONRE has begun the development of a national emissions trading system (ETS). A GHG baseline inventory of businesses that fall within the 3,000 tonnes CO2e mandate has already been built with JICA support, as required by Decree 06. This is the system that is required for sectoral level MRV and the functioning of the ETS. Once the threshold is set, and the list of participating entities is confirmed, the government will need to set the cap.

A5 - Recommendations to Vietnam

As noted in the generation discussion paper, price discovery is the key to increasing efficiency and lower cost for power. MOIT has prepared a strategy for

the development of a wholesale energy market whose key reform is elimination of the Electric Power Trading Company's monopoly and transition of all generators to an open market. But if tariff ranges are not widened then trading ranges will be limited and price signals to consumers will not be clear. Since EVN has a chartered mandate to serve social development goals, ending cross subsidies between higher use residential consumers and manufacturers will take time. National Assembly Members will need to be convinced that higher tariffs will not harm lower income users or reduce FDI. We also need to recognize that SOEs in steel, cement, fertilizer and other heavy energy users have a compelling interest in lower tariffs.

To achieve the objective of PDP8 to map a pathway to cost recovery and improve energy efficiency outcomes, we recommend that the true cost of supply is established in the first instance. Once the true cost of supply is understood, consideration can be given to the way in which it can be recovered from different customer cohorts.

As Phu found, enterprises will respond to higher energy prices and invest in efficiency if credit is available. We would recommend that revenues collected through the carbon tax be used to fund a green finance facility. The Asia Foundation has already worked with the state bank of Vietnam to describe how this fund would operate as an independent entity with a CEO, board, and independent auditors and risk managers. A fund based on similar principles could be used for transition, including upgrading of SOEs and SMEs, thus allowing for tariffs on manufacturers to gradually increase without a high social cost on domestic enterprises.
As the share of industry demand will be consistently high in the energy sector outlook, varying from 55% in 2020 to 63% in 2040 and decrease by 58% in 2050, DER system at industrial zones should be promoted.[64] The market forces will continue to put pressure on businesses to use renewable energy or purchase RECs to increase their competitiveness including using cleaner technologies to reduce energy intensity.

To future-proof the efficient operation of the grid, Vietnam may wish to consider how it can gain visibility of where DER is installed, as it promotes behind the meter solutions for self-consumption. This will enable easier management of the grid in future, should network improvements allow for exports to the grid at a later date. Having that visibility, and access to data on consumption from the grid over time at that connection point, will allow the market operator to better balance supply and demand in an environment where exports are enabled.

Even though residential use and transportation play a smaller role in total energy demand compared to industrial use, it is worth to promote energy efficiency (EE) at these two sectors because forecast of the scenario for EE measures are the lowest cost according to the Vietnam Energy outlook 2021. Retail electricity price in Vietnam remained unchanged since 2019 at 1,864.44 per kilowatt-hour which is 50% lower than Philippines and also lower than Indonesia and Thailand. Changing the price bracket is recommended to impact residential's energy demand. The current price bracket with six scales does not create enough disincentive between high and low electricity consumption. In addition, using behavioural economics insights to nudge people in reducing energy

[64] https://ens.dk/sites/ens.dk/files/Globalcooperation/vietnam_energy_outlook_report_2021_english.pdf

consumption and created conservation habits has been proven it effectiveness in both OECD and developing countries.[65,66]

[65] https://www.nudgeproject.eu /
[66] https://publications.iadb.org/publications/english/viewer/Using_Behavioral_Economics_in_The_Design_of_Energy_Policies.pdf

B. Issues exploration

Issue 1 - Importance of price signals in managing demand

B1 - Problem context and strategic setting

Price signals are an essential tool to incentivise energy consumer behaviours that minimise impacts to the network that can drive up costs.

Large energy users face stronger price signals than small energy users, such as residential customers. Large commercial and industrial customers are generally charged time-of-use demand-based tariffs. These demand-based tariffs involve a measure of the largest amount of electricity the business uses at a point in time, during set hours, days or months to determine the appropriate tariff. Further, to encourage large electricity users to improve their energy efficiency, kVA tariffs have been introduced across the NEM to incentivise large energy users to install more energy efficient equipment (by improving the power factor of their equipment).[67] Offering tariffs that send strong price signals to large energy users is an accepted practice in Australia, as it is assumed that these businesses are able to negotiate the best deal for themselves and have access to options to respond to the price signals being sent. This is not the case for smaller customers like residential customers. As a result, the pace of change towards strong price signals reflecting cost-reflective tariffs for this customer cohort has been much slower.

The key factors affecting small customer demand and appropriate price signals has also been changing in recent years. In the past, price signals were used mainly to manage peak demand, incentivising consumers to use energy at off-peak times which would reduce the need for augmentation of the network. With the increase in DER in Australia, DNSPs began to observe significant changes to the way the network was being used. Minimum demand became an issue as most consumers with solar PV would export in the middle of the day. Customers were incentivised to do this because they were being paid generous feed-in tariffs for excess electricity generated and exported back to into the grid.[68] With the growing adoption of EVs, it is expected that customers charging at home at the end of the working day is likely to amplify peak demand, in the absence of price signals to incentivise different behaviour.

B2 - Solutions

The discussion below examines the solutions in place for these two categories of customer cohorts:

- Large energy users.
- Small energy users, such as residential and small to medium sized commercial customers.

[67] kVA is a unit of power rather than energy consumed.
[68] Department of Climate Change, Energy, the Environment and Water. (2023). Electricity feed-in tariff. Accessed here on 8 March 2023.

Large energy users

Wholesale market pricing in Australia has been effective in sending strong price signals to large industrial customers that are exposed to the market spot price. The variability of spot prices in the NEM and the potential for high prices during peak demand periods provides an incentive for consumers that are exposed to the spot price to reduce their consumption (or increase their generation) during these periods.

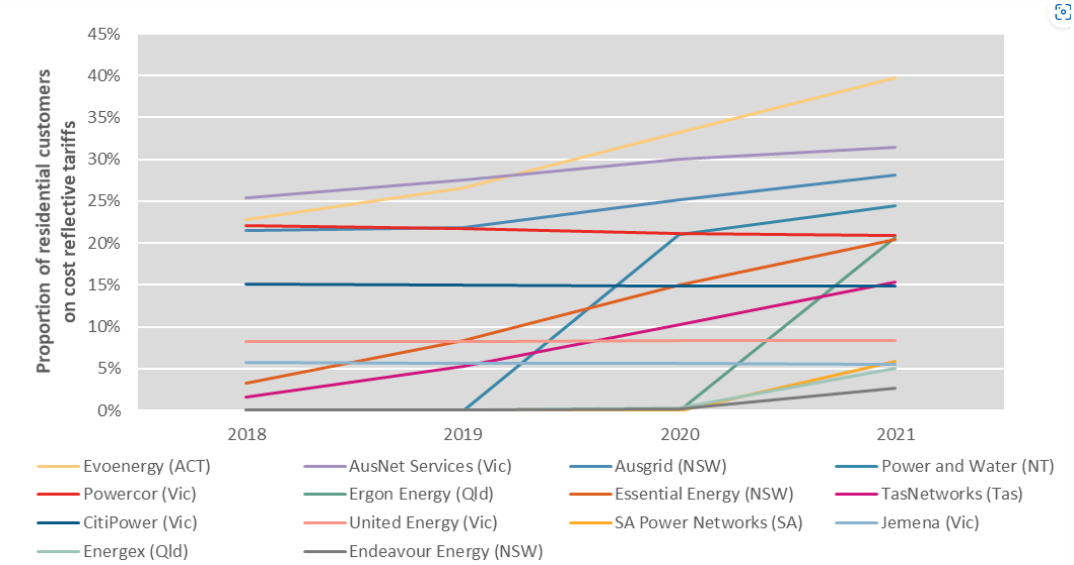
KVA tariffs have been introduced across the NEM for large commercial and industrial customers. These tariffs incentivise the adoption of energy efficient equipment by using a measurement of equipment efficiency called the 'power factor'. These tariffs charge more if inefficient equipment is being used. Less efficient equipment doesn't use all the power it draws from the network and therefore some of that electricity can be lost. Inefficient electrical systems have lower power factors and tend to use a large quantity of reactive power, which is lost in the operation of inductive equipment such as transformers and electric motors. If a business operates efficient equipment (i.e. a power factor closer to 1), its energy bills will be lower with a kVA tariff than they would be otherwise.

Small energy users

Many residential and commercial customers are on retail offers with flat tariff structures. These flat tariffs structures have dampened price signals and have limited the effect on residential small business energy demand profiles.

Figure 8 below shows the progress of residential customer assignment to cost reflective tariffs, per DNSP, using data collected by the AER. As at 30 June 2021, the proportion of residential customers on a cost reflective network tariff across the NEM was 16.6%.

Figure 8 | Residential customers on cost reflective tariffs in the NEM[69]



[69] Australian Energy Regulator. Accessed here on 31 March 2023.

This low take up of cost-reflective tariffs for small energy users is in part due to network tariffs not being required to be reflected in retail tariffs, but also due to the limited roll out of smart meters nationally and the concern that some customers who cannot afford to change their energy consumption patterns (such as those who are at home for most of the time, caring for families or the sick or the elderly) will face higher costs that they cannot control.

There are targeted policies in place to address the costs of energy consumption faced by vulnerable customers. Some residential consumers, including low-income earners, pensioners, and individuals with medical conditions, are entitled to rebates and concessions on energy bills that are indexed to inflation.[70] The detail and application of these policies vary from state to state. There are also other targeted policies to assist small energy users manage their energy bills outside of the concessions framework. For example, the Victorian Government introduced a Power Saving Bonus (PSB) scheme that provided a $250 incentive for Victorian households to search for a better energy deal on Victoria's Energy Compare website.[71] A previous iteration of the PSB scheme was specifically targeted at low income and vulnerable consumers.

Despite these targeted policies to insulate the most vulnerable customers from the potential cost impacts of cost-reflective pricing, there is a reluctance from governments to expose small energy customers to cost-reflective tariffs. In some instances, such as in Victoria where smart meters are installed and therefore the technology exists to deploy cost-reflective prices widely, they are only required to be applied to small customers on an 'opt in' basis. This is despite the potential savings that could occur if they were deployed. DNSPs spent $17.6 billion on building their networks between 2009 and 2013. If prices had encouraged consumers to use less power in periods of peak demand, the Grattan Institute estimated that $7.8 billion of this investment could have been avoided and the savings passed on as lower power bills.[72]

B3 - Reflection on Australian experience

The Australian market has had success with price signals for large energy users like industrial and large commercial businesses by exposing them to cost-reflective tariffs. Success with price signals for large energy users can have beneficial impacts for all energy users. However, the success of similar approaches to residential and small business customers has been more limited and progress has been a lot slower.

High energy prices have been a significant political issue in Australia, and many governments are not inclined to make decisions that may make this issue more acute for anyone, and in particular for low income and vulnerable customers. However, the importance of effective price signals is becoming more acute with the increased penetration of DER on the network. Increased two-way flows of electricity resulting from solar PV exporting back to the grid

[70] Australian Energy Regulator. (2023). Rebates and assistance. Accessed here on 21 March 2023.
[71] Department of Climate Change, Energy, the Environment and Water. (2023). Power Saving Bonus for all Victorian households. Accessed here on 11 March 2023.
[72] Grattan Institute (2014). Fair Pricing for Power. Accessed here on 24 April 2023.

is driving increased augmentation costs for DNSPs.[73] Unmanaged charging of EVs also has the potential to increase peak demand and drive higher augmentation costs. Managed charging of EVs through effective price signals could incentivise charging at times of low demand on the network when solar PV exports are at their highest. Therefore, the need for effective price signals in the evolving energy system is becoming more and more important.

Under the regulatory pricing regime for DNSPs, they are allowed to design and implement tariffs in a trial environment, before including them in a pricing proposal to the AER. This has enabled DNSPs to trial different cost-reflective tariff options in a controlled environment and observe the impacts. If the tariffs prove successful and customers respond well, the DNSP can roll them out to its broader customer base. This process, from tariff trial to broader application can take time due to regulatory requirements that require consultation and evidence gathering. While the requirements of this process are important and consumers should have a level of certainty for the price they will pay for electricity, the rapid pace of change in the sector requires a more agile framework to support a faster evolution of network price signals and enable the benefits to networks and consumers to be realised sooner.

B4 - Reflection on Vietnamese significance

Open pool markets, in which load dispatch centres prioritise the lowest cost providers on a continuous basis, can operate efficiently if providers compete based on price. In Vietnam, there are currently 108 power plants directly participating in the open pool, spot market, with a total installed capacity of 30,837 MW, equal to about 38.8% of the total capacity of the national power system. Many of these are small and medium scale hydropower facilities. Many of the larger facilities, and most renewables, provide wholesale power to a single buyer, the Electric Power Trading Company (EPTC), under specific power purchase agreements through regional Generation Companies, or Gencos. The Gencos deliver power to the EPTC under contracts for difference. The EPTC then sells power to regional power companies in a retail market. This structure limits the capacity of markets to drive down prices primarily due to the prevalence of contracted prices and limited trading ranges. Transition to a wholesale power market will require both regulatory changes related to pricing and renegotiation of contracts with power suppliers. This is a long-term process that has already begun but needs to be accelerated.

The basic strategy for reform includes removing EPTC as the monopoly buyer of power, forcing all sources onto the open market. A similar set of market mechanism would also apply to provincial utilities who purchase power from the regional power companies. This structure, which could provide better price signals, will be hampered by both the prevalence of contracted pricing within Vietnam's power system and by trading bands set by the national assembly. These two issues need to be addressed. The change in contracting – BOTs, FiTs, and SOEs – will take time to renegotiate

[73] See recent DNSP regulatory submissions to the AER. Non-network forecast expenditure, which includes expenditure to improve ICT systems to accommodate increased DER, now makes up approx. 20% of all revenue forecasts. Accessed here on 24 April 2023.

or even buy out. The pricing bands can be gradually widened as part of a longer-term strategy of market pricing power tariffs.

Issue 2 - Effective design of market-based policies to improve energy efficiency

B1 - Problem context and strategic setting

Energy efficiency appliance standards, white certificate schemes, information disclosure schemes and grant programs were progressively introduced over time to address barriers to greater energy efficiency. These barriers included a lack of available, consistent and trustworthy information on the energy performance of appliances and of buildings, and limited access to funding to make energy efficiency retrofits to homes and commercial premises.

Policies designed to improve the energy efficiency of appliances and buildings have been relatively successful. Appliance standards, white certificate schemes and grant programs to fund energy efficiency retrofits and enable the deployment of demand management technologies have been particularly successful.

Policies that have been most effective have had a singular policy objective and in almost all cases, have considered the potential impacts on the market that they may have through rigorous market assessment analysis and extensive consultation before implementation.

B2 - Solutions

Solutions explored to date include:

- Appliance standards.
- White certificate schemes.
- Information disclosure schemes.
- Grant programs.

Appliance standards

An example of a key policy that has been effective in reducing energy consumption is the national appliance labelling framework under *the Greenhouse and Energy Minimum Standards Act 2012* (GEMS Act) which came into effect on 1 October 2012. The GEMS Act implemented a commitment by the Australian Government to establish national legislation to regulate energy efficiency and labelling standards for appliances and equipment. The purpose of the labelling is to increase consumers' awareness of options to improve energy efficiency and reduce energy consumption, energy costs and greenhouse gas emissions.

The GEMS Act is the underpinning legislation for the Equipment Energy Efficiency (E3) Program which commenced in 1992. E3 is a cross-jurisdictional program through which the Commonwealth, state and territory governments and the New Zealand Government collaborate to deliver a

single, integrated program on energy efficiency standards and energy labelling for equipment and appliances. The program currently regulates 22 products by way of Minimum Energy Performance Standards (MEPS) and the Energy Rating Label (ERL). The GEMS Act also gave effect to certain commitments under the United Nations Framework Convention on Climate Change (UNFCCC) to adopt national policies and measures to mitigate climate change and limit Australia's emissions of greenhouse gases.[74]

The economic benefits delivered under the GEMS Act have been significant. In 2018, the implementation of GEMS regulations in Australia resulted in net savings to the economy of between $1.13 and $2.15 billion. [75] Additionally, it led to a reduction in greenhouse gas emissions of between 4.8 and 7.6 million tonnes.[76] It has been estimated that the GEMS regulations have provided emissions abatement at a negative cost of approximately $200 per tonne to date.[77]

White certificate schemes

White certificate schemes generate tradable certificates from the implementation of energy-efficiency measures. Under these schemes, energy retailers are required to purchase a certain number of certificates each year and surrender these to the regulator in order to reach a target of emission reductions. These schemes are established through legislation, and therefore are subject to rigorous market impact assessments and stakeholder consultation before implementation.

White certificate schemes have been extremely successful in achieving their policy objective of increasing energy efficiency and delivering bill savings to consumers. For example, through the VEU program, households and businesses are incentivised to invest in smarter and more innovative appliances and energy systems through rebates. These rebates are offered by businesses that provide energy efficient products and services and are enabled through the requirement for retailers to buy them from the market to meet their legislative liabilities. The VEU program has supported more than 2 million households and 141,000 businesses to upgrade appliances and equipment since the program started in 2009.[78,79] The program is expected to reduce Victorian energy consumption by 7% in 2025 and reduce greenhouse gas emissions by 28 million tonnes between 2022 and 2025.[80]

Information disclosure schemes

Buildings account for around 19% of total energy use and 18% of direct carbon emissions in Australia.[81] In 2015, the Australian Government released a National Energy Performance Plan (NEPP). The NEPP sets out the

[74] Commonwealth of Australia. (2019). Independent review of the Greenhouse and Energy Minimum Standards (GEMS) Act 2012. Final Report June 2019. Accessed here on 25 March 2023.
[75] Commonwealth of Australia. (2019). Independent review of the Greenhouse and Energy Minimum Standards (GEMS) Act 2012. Final Report June 2019. Accessed here on 25 March 2023.
[76] Commonwealth of Australia. (2019). Independent review of the Greenhouse and Energy Minimum Standards (GEMS) Act 2012. Final Report June 2019. Accessed here on 25 March 2023.
[77] Commonwealth of Australia. (2019). Independent review of the Greenhouse and Energy Minimum Standards (GEMS) Act 2012. Final Report June 2019. Accessed here on 25 March 2023.
[78] State Government of Victoria. (2023). Victorian Energy Upgrades for households. Accessed here on 24 March 2023.
[79] State Government of Victoria. (2023). Victorian Energy Upgrades for businesses. Accessed here on 24 March 2023.
[80] State Government of Victoria. (2023). About the VEU program. Accessed here on 24 March 2023.
[81] Department of Climate Change, Energy, the Environment and Water. Accessed here on 30 March 2023.

framework and initial measures to deliver on the target of 40% improvement in energy productivity by 2030.[82] The Trajectory for Low Energy Buildings, which is Australia's national plan to achieve zero energy and carbon-ready commercial and residential buildings in Australia, is a key initiative to achieve the target committed to under the NEPP. The Trajectory outlines policies to deliver cost-effective energy efficiency improvements to homes and businesses. One of the workstreams under the Trajectory is information disclosure schemes.

There are several national policies that support information disclosure schemes, such as the National Australian Built Environment Rating System (NABERS) and the Nationwide House Energy Rating Scheme (NatHERS). NABERS provides a simple energy efficiency rating in order to measure and compare the energy performance of a building. NatHERS provides software tools that can assess and rate a home's energy efficiency performance.[83]

In 2022, Energy Ministers agreed the Draft National Framework for Disclosure of Residential Energy Efficiency Information. The Framework provides nationally harmonised settings for state and territory governments to implement their own disclosure schemes and supports a market environment that encourages disclosure in the residential sector.

Information disclosures schemes exist in parallel with other policies directed at the built environment, such as energy efficiency requirements for new buildings and renovations, established through the National Construction Code.

Grant programs

Grants programs have also been used to incentivise businesses and community organisations to invest in new energy technologies, including energy and emissions monitoring and management systems. These grants de-risk projects for businesses and have been effective in improving energy efficiency in Australia. For example, the Energy Efficient Communities Program (EECP) enabled technology upgrades that may not have otherwise occurred, and the projects funded under the program achieved energy efficiency improvements of approximately 350 Terajoules (TJ) per annum. This is equivalent to the energy used by over 6,800 Australian homes.[84]

Recently, the Department of Energy, Environment and Climate Action (DEECA) in Victoria announced the opening of Energy Market Ready Grants (EMRG). The aim of the ERMG is to support start-ups with innovative digital energy solutions.[85]

B3 - Reflection on Australian experience

Market-based policies like white certificate schemes and targeted grant programs have both been effective in Australia at reducing energy consumption, particularly for residential and small businesses. The

[82] Commonwealth of Australia (2015). 'National Energy Productivity Plan 2015–2030'
[83] Department of Climate Change, Energy, the Environment and Water. Accessed here on 30 March 2023.
[84] Department of Industry, Innovation and Science. (2017). *Community Energy Efficiency Programme Evaluation*. Accessed here on 28 March 2023.
[85] https://www.energy.vic.gov.au/grants/energy-market-ready-grants

effectiveness of both of these approaches is measurable, due to the ability to track them against set targets, or because measurements can be taken before and after installation. To be effective though, these policies must be carefully designed, and consideration given to the risks and consequences of market intervention before implementation.

Programs that were designed without a singular and clear policy outcome have historically been ineffective, and in some cases have caused significant unintended consequences. Others have been poorly designed or implemented. A key example of this is the Homeowner Insulation Program (HIP) that was implemented as part of the Energy Efficient Homes Package (EEHP) in 2009. The primary objective of this policy was to stimulate the economy following the global financial crisis, while also improving energy efficiency of residential buildings. However, due to the economic context of the time, the Department of the Prime Minister and Cabinet (PM&C) developed this policy hastily without performing a full assessment of the potential consequences on the market and with limited consultation with the Department of Environment, Water, Heritage and the Arts (now known as the Department of Climate Change, Energy, the Environment and Water). Consequently, appropriate risk management practices, governance arrangements, compliance frameworks, applicable state and territory-based regulations and an assessment of the potential impacts on the construction market were not adequately considered. This resulted in numerous quality and safety issues, and instances of fraud. Following an audit of the HIP in 2010, 29% of installations were identified with some level of deficiency, ranging from minor quality issues to serious safety concerns.[86]

While market-based schemes and grant funding have been effective, there are still significant barriers to deepening their effectiveness. For example, renters face significant barriers in making substantial energy performance improvements to their rented accommodation, as they have limited authority to make improvements to the building fabric and the incentive for landlords to make these improvements are limited because they do not accrue the energy savings.[87] This creates a considerable limitation to Australia's ability to improve the overall energy performance of residential buildings, as approximately 30.6% of Australia's housing stock is rented.[88] In addition, low-income households have limited ability to invest in energy efficient appliances or retrofits. Small to medium businesses also often have limited access to energy expertise and funding to make energy efficiency improvements in the absence of grants or other government incentives.

Many policy developments have already occurred to improve the effectiveness of what does exist, such as raising minimum energy efficiency requirements under the NatHERS star rating system, expanding NABERS to include more building types, and expanding the Australian Renewable Energy Agency's (ARENA) mandate to allow the agency to support energy efficiency and electrification technologies.[89] Despite these improvements, challenges remain. For example, the purpose of energy efficiency disclosure schemes, such as NatHERS, have enabled property buyers to make more

[86] Australian National Audit Office. (2010). *Home Insulation Program*. Accessed here on 21 March 2023.
[87] Department of Climate Change, Energy, the Environment and Water. (2022). *The National Energy Performance Strategy: Consultation Paper*. Accessed here on 11 March 2023.
[88] Australian Bureau of Statistics. (2021). *Housing: Census*. Accessed here on 11 March 2023.
[89] Department of Climate Change, Energy, the Environment and Water. (2022). *The National Energy Performance Strategy: Consultation Paper*. Accessed here on 11 March 2023.

informed choices through simple energy ratings. However, the disclosure of residential energy efficiency information is voluntary in all states and territories with the exception of the Australian Capital Territory, in which it is mandatory. Due to the voluntary nature of these disclosure schemes, not all property owners disclose this information and therefore buyers cannot make comparisons between options. The effectiveness of these disclosure schemes is also difficult to measure.

B4 - Reflection on Vietnamese significance

Programs related to energy efficiency operate in or through the Department of Energy Efficiency and Sustainable Development under the Ministry of Industry and Trade. Under the Departments' 'Vietnam Energy Efficiency Program', labelling of air conditioners, washing machines, fans and rice cookers has been mandatory since July 2013. Other products have been introduced periodically. Currently, nearly all electrical appliances are included, and televisions are intended for inclusion by 2025. There are two kinds of energy efficiency labels: an endorsement label and comparative label. To bear either energy efficiency label, products must meet the minimum energy performance standard (MEPS) prescribed by the MOIT. An endorsement energy label indicates, called the Vietnam Energy Star, means that the product meets or exceeds High Energy Performance (HEP) levels. Energy Efficiency performance levels are prescribed by testing at laboratories designated by the MOIT. The comparative energy label provides consumers with information on the energy performance of the product, compared to other similar products, helping consumers to choose equipment with low energy consumption.

The key to the success of the program is consumer awareness and salience. Yet, a quick look at online electronics and electrical appliance retailers indicates that these companies offer no means of sorting through appliance lists based on efficiency ratings. In fact, finding any efficiency rating is difficult. Clearly, the retailers do not consider efficiency as a tool in marketing. Thus, while labelling has now reached most sectors of the retail market, one must question the effectiveness with respect to consumer demand.

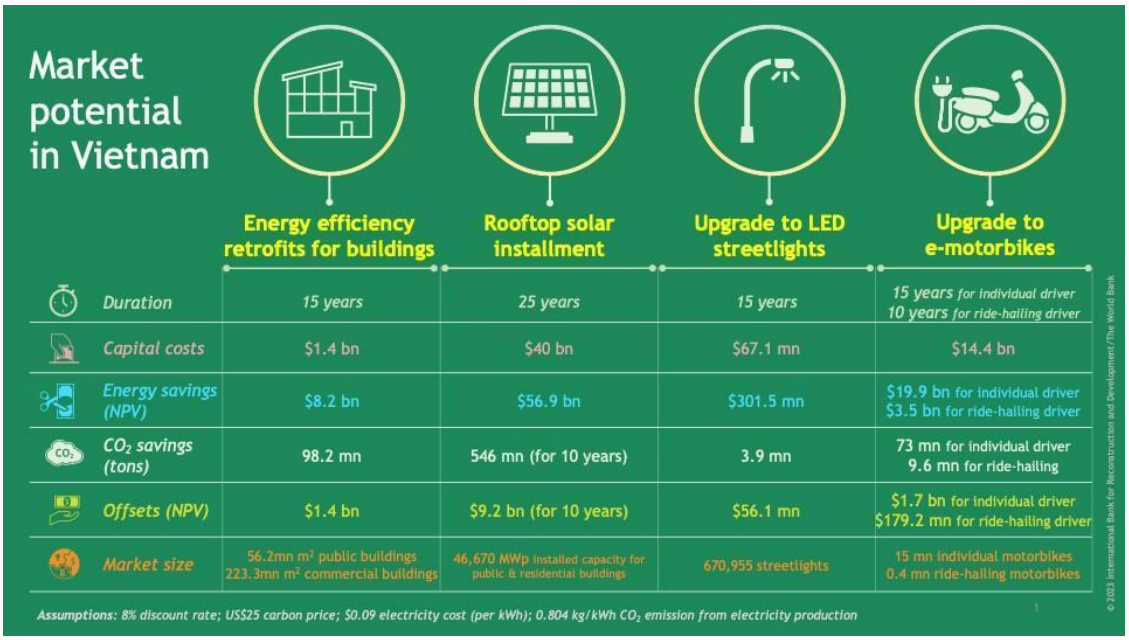
Since 2013, it became illegal to import, produce, or distribute incandescent light bulbs greater that 60w in Vietnam (Decision 51/2011/QĐ-TTg). The lower end of this market was maintained to protect the poor, who may not have been able to afford higher cost LEDs at the time. Since the regulations were established, however, the cost of LEDs has come down dramatically, so much so that it is difficult, or nearly impossible, to find incandescent light bulbs in Hanoi's largest electrical and electronics market, a collection of alleys off Nguyen Cong Tru Street known locally as "Heaven's Market."

Lighting accounted for about 25% of demand in 2015.[90] It is not clear how much of this is represented in public lighting. Unfortunately, we cannot find corresponding data for the near present. If the consumption of power for lighting as a percentage of overall energy consumption has gone down, we

[90] Access here on 26 April 2023.

can assume that the switch to LED lighting has had value. Lighting should typically account for 12-15% of energy consumption.

Figure 9 | Market potential in Vietnam



About half of all energy use in Vietnam is industrial. The World Bank anticipates that Vietnam could save approximately 11GW of new generation capacity in this next decade should the industrial sector actively execute energy-efficiency projects. In 2017, the World Bank developed an energy efficiency in industry project focused on a few key energy consuming sectors, namely steel and cement. Because the government would not provide guarantees, including basic non-indemnification, the World Bank was forced to seek "first loss" funds elsewhere.[91] In March 2021, the package was approved by MOF (the only World Bank loan approved in 3 years). It includes US$8.3 million to build capacities for the private sector to identify, appraise and execute energy efficiency projects, a US$75m guarantee fund provided by the GEF, and US$3 million to MOIT for policy reform. By reducing lending risks, the facility is expected to mobilise around US$250m of commercial financing, to be provided to industrial enterprises and energy service companies at competitive terms and with low collateral requirements. Typically, first loss funds guarantee 20% of a short term loan, often the startup costs of a project. The World Bank is offering guarantees on 50% of loans for improved energy efficiency. At times, the government has urged the World Bank to use these funds to support SOEs. However, the World Bank found that many SOEs had no interest in the program as they were operating profitably and had no debt.

[91] Non-indemnification clauses used in government guarantees and undertaking ensure that, in the case of default, the government will not make claims on assets funded by the lender.

Issue 3 - The need for managed integration of DER

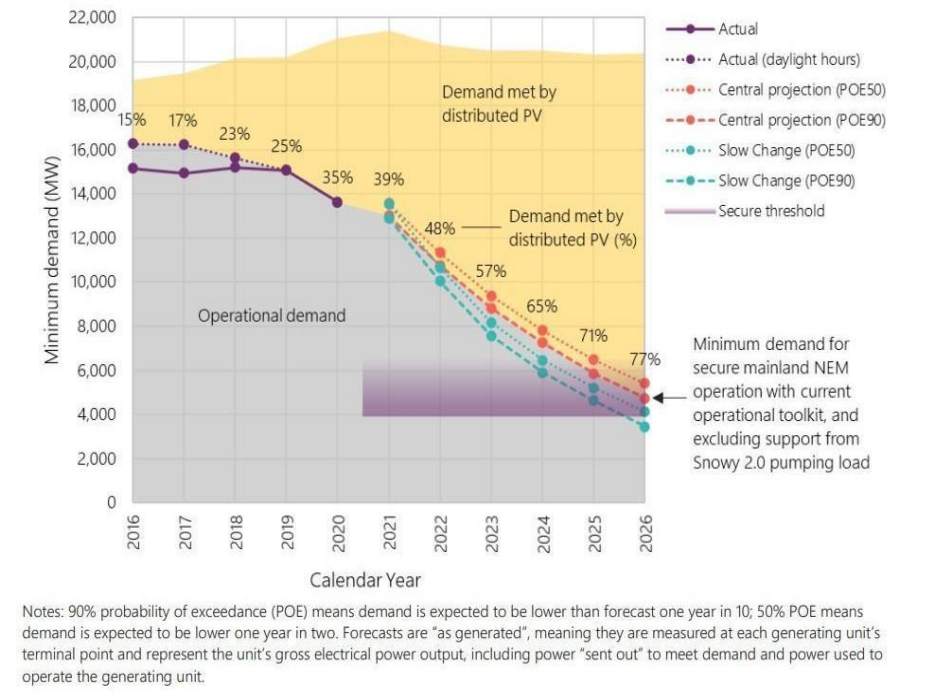
B1 - Problem context and strategic setting

Traditionally, minimum demand has occurred overnight which has been manageable. However, with the rapid uptake of solar rooftop PV in Australia, some parts of Australia are experiencing severely low minimum demand levels in the middle of the day due to the output from solar rooftop PV outstripping demand. As explained in section 'Forecast energy consumption and demand' of this paper, solar PV penetration has increased significantly in Australia due to government incentives in the form of generous FiTs, government rebates and certificates through the SRES.

Not only has the increasing minimum demand issue prevented customers from exporting solar energy to the grid in some instances, but this has been a key reason for negative pricing events in the NEM which have been occurring more regularly.[92]

Rooftop solar PV uptake has also caused significant stability issues for the energy grid. To maintain stability of the grid, there are certain thresholds that demand cannot fall below. In 2019, the level of minimum demand increased due to electrification, but the minimum demand is forecast to decline rapidly as solar PV penetration increases.[93] Based on demand projections by AEMO as outlined in **Figure 10** below, minimum demand may fall below the secure threshold by as early as 2026.

Figure 10 | Minimum demand on the NEM mainland (excluding Tasmania)[94]



Notes: 90% probability of exceedance (POE) means demand is expected to be lower than forecast one year in 10; 50% POE means demand is expected to be lower one year in two. Forecasts are "as generated", meaning they are measured at each generating unit's terminal point and represent the unit's gross electrical power output, including power "sent out" to meet demand and power used to operate the generating unit.

[92] Energy Networks Australia. (2020). *Energy demand – flattening the curve?* Accessed here on 24 March 2023.
[93] Australian Energy Market Operator. (2022). *Electricity Statement of Opportunities*. Accessed here on 21 March 2023.
[94] Australian Energy Market Operator. (2021). *Electricity Statement of Opportunities*. Accessed here on 21 March 2023

In addition, the large volumes of solar PV being installed across Australia has had technical implications for distribution network. For example, in late 2020, a town on Essential Energy's network in rural New South Wales experienced two unplanned outages due to solar PV systems operating above the approved export limits of the network, with the wider local network having a limited ability to absorb these increased levels of solar exports. To ensure community safety and reduce the risk of further unplanned power outages due to thermal limits being breached, Essential Energy had to temporarily disconnect all identified non-complying solar PV systems within the area. As a result, exports from some solar PV systems was limited to zero to ensure the safety of the broader community, until a long-term solution to increase capacity could be implemented over the following 9-12 months.[95] This was not an isolated example, and many customers with solar PV were prevented from exporting excess generation.[96]

As a result, the AEMC introduced new rules for access, pricing, and incentive arrangements for DER in 2021. Following these new rules, DNSPs have been required to allow consumers to export excess generation back into the grid while also enabling DNSPs to develop dynamic pricing options, or 'dynamic operating envelopes' (DOEs), to incentivise customer actions that minimise impacts to the network by dynamically updating price signals to reflect the real-time requirements of the network.[97] DOEs enable export limits to vary over time and location depending on the capacity of the network at that time in that location, which will maximise the level of electricity exported from DER while maintaining system reliability and managing augmentation costs.[98] DOEs are in the early stages of industry adoption in Australia but are expected to be an important feature of the grid in the future as DER penetration increases. These rules were designed to support more DER to efficiently connect to the grid and to ensure that Australia's electricity network can better manage the changing supply and demand dynamics.

The increase in uptake of EVs will also influence the demand profile across the network and may further impact on network stability and reliability. Given the relative nascency of EVs in Australia, there exists a window of opportunity to develop policy, regulatory, and non-regulatory measures that promote the efficient and effective integration of EVs into the grid and energy market.

B2 - Solutions

Regulatory reforms in Australia that are focussed on the integration of DER consider issues such as data availability, developing network tariffs that send appropriate price signals and amendments required to retail regulatory frameworks to ensure that customers are adequately protected. Reforms and initiatives underway to improve the integration of DER are being progressed

[95] Essential Energy (2021). Submission to the AEMC's Draft Rule Determination – Access, Pricing and Incentive Arrangements for Distributed Energy Resources. Accessed here on 30 March 2023.
[96] Australian Energy Market Commission. (2021). Rule determination: National Electricity Amendment (Access, pricing and incentive arrangements for distribution energy resources) Rule 2021. National Energy Retail Amendment (Access, pricing and incentive arrangements for distributed energy resources) Rule 2021. Accessed here on 8 March 2023.
[97] Australian Energy Market Commission. (2021). Rule determination: National Electricity Amendment (Access, pricing and incentive arrangements for distribution energy resources) Rule 2021. National Energy Retail Amendment (Access, pricing and incentive arrangements for distributed energy resources) Rule 2021. Accessed here on 7 March 2023.
[98] Australian Renewable Energy Agency. (2021). *Dynamic Operating Envelopes Workstream*. Accessed here on 7 March 2023.

by the AEMC, the AER and the Distributed Energy Integration Program (DEIP) in consultation with governments, industry and consumers.

AEMC

In addition to the new rules for access, pricing, and incentive arrangements for DER in 2021 as noted above, the AEMC has also put forward a rule change request to establish a Flexible Trader Model. This model will enable end users to separate their controllable DER and enable them to be managed independently from their passive load, without needing to establish a second connection point to the distribution network.[99] This model will be a key part of the two-sided market where customers are awarded for flexible demand and generation, where they are able to participate directly in the market and sell their energy back to the grid and be paid for the use of their assets, like batteries and EVs, to be used for system stability services.

AER

To sell electricity in Australia, a supplier must have a retail licence, an authorisation, or an exemption. The AER, that grants retail licences and authorisations in the NEM, is reviewing the retailer authorisation and exemption arrangements to consider how new services and technologies may impact on the nature of energy supply to consumers and to understand the broader potential consumer harms to ensure that consumers remain well-protected as business models evolve.[100]

DEIP

There is also a range of non-regulatory measures being progressed across Australia. The DEIP is a government-funded collaboration of government agencies, market authorities, industry and consumer associations aimed at maximising the value of customers' DER for all energy users. The DEIP is currently considering a range of issues related to DER and EV grid and market integration.

Initiatives underway include:

- Exploring the value that DOEs could offer to the energy transition.
- Examining how network regulations can evolve so that consumers get the best value from innovations in distributed energy.
- Its Electric Vehicle Grid Integration Working Group is considering how a growing number of EVs can be integrated into Australia's electricity system.
- The DEIP EV Data Availability Task Force is working on an EV Supply Equipment (EVSE) Standing Data Register and a Vehicle Standing Data Register.
- There is also work being progressed by the DEIP Vehicle-Grid Integration Task Force on charging interoperability, energy and

[99] AEMC (2023) Unlocking CER benefits through flexible trading
[100] AER (2023) Review of consumer protections for future energy services

services market integration, disturbance performance and grid support.[101]

B3 - Reflection on Australian experience

State and territory governments have incentivised the uptake of solar PV through a range of policies and incentives over the last few years. Government rebates for the installation of solar PV were a large incentive, coupled with generous feed-in tariffs that reduced the pay-back period for installation and incentivised customers to export their excess generation. These rebates and incentives were largely aimed at increasing the penetration of renewables in the electricity system while also lowering energy costs for consumers. In Victoria alone, the Government has paid a total of $494m in rebates for 218,057 solar panel systems installed on the network since 2018.[102] Consumers responded to these incentives and by August 2021, the AEMC noted that between 2.6 and 3 million Australian households already installed solar panels with a further 3 million households expected to follow during the next decade.[103]

However, the government incentives were not matched with targeted policies to address the impact that the uptake of solar PV would have on the network or on customers in the longer term. Early adopters were rewarded with high feed-in tariffs and subsidies, whereas late movers were left with lower rewards or not being able to export at all. Some customers in areas of high solar penetration were also subject to blackouts when customers who did have solar PV exceeded their approved physical capacity limits.

These issues are being addressed now through a range of policy measures at both national and jurisdictional levels, but these experiences offer us valuable learnings. In particular:

- Policies that incentivise the uptake of technology that require interaction with the electricity system need to be complemented with measures to manage that integration to minimise costs, security and reliability issues and maximise customer choice, flexibility and equity. This includes the consideration of appropriate price signals to drive optimum use of the network.

- Data transparency and availability is essential for network stability. Market and network operators need to know what DER is being installed on the network and ensure that minimum technical requirements are set and adhered to. Having a register of installed DER enables this visibility.

- The impacts of integrating new DER on the grid is broader than managing the flow of electricity. It also impacts on a range of issues that are regulated such as connection agreements between DNSPs and their customers, tariff arrangements, the regulatory reset

[101] https://arena.gov.au/knowledge-innovation/distributed-energy-integration-program/
[102] Solar Homes Victoria, Accessed here on 30 March 2023.
[103] Australian Energy Market Commission (2021). *National Electricity Amendment (Access, Pricing and Incentive Arrangements for Distributed Energy Resources) Rule 2021*. Accessed here on 30 March 2023.

process and consumer protections.[104] Connection agreements for example can set appropriate standards for installations and enable the capture of data.

B4 - Reflection on Vietnamese significance

Vietnam faces similar problems within the rapid increase of solar power between 2019-2021. This includes both utility scale solar and rooftop solar, including both commercial and industrial, as well as residential. Since January 2021, EVN has refused grid connections to new rooftop solar PV and, with regard to utility scale solar, the main efforts have been to improve grid connections and renegotiate tariffs, especially for project that reached COD after the deadline for inclusion in fairly generous FiTs. This pause gives Australia an opportunity to assist Vietnam in removing barriers to the inclusion of DERs. This including pricing, technical standards, reporting requirements for grid connections, system improvements and new arrangements with legacy providers who provide baseload power. Policies need to be put in place to encourage commercial and industrial rooftop solar to install battery storage to shift supply of surplus power to peak demand periods. In Vietnam, this typically occurs when employees are returning to work after lunch.

Issue 4 - Failed action on national carbon markets and emission trading schemes

B1 - Problem context and strategic setting

Over the past few decades, Australia has developed numerous climate policies targeted at carbon markets and reducing emissions. However, as the mining industry is the largest contributor to the Australian economy, with the industry contributing to 14.6% of total national economic output as at March 2023, these policies have been one of the most divisive issues in Australian politics and have been largely unsuccessful to date. [105]

B2 - Solutions

Solutions explored to date include:

- The Clean Energy Act 2011
- The National Energy Guarantee
- The Emissions Reduction Fund
- Recent reforms to the Safeguard Mechanism.

[104] The regulatory reset process refers to the five year cycle where DNSPs apply to the AER for revenue determinations, which set the maximum revenue amount that DNSPs can recover customers during that regulatory period, which then flows through into the prices that DNSPs can charge their customers.
[105] Reserve Bank of Australia. (2023). *Composition of the Australian Economy Snapshot*. Accessed here on 23 March 2023.

Each of these is discussed below.

Clean Energy Act 2011

In 2011, the *Clean Energy Act 2011* was introduced by the Federal Labor Government to reduce carbon pollution through placing a cap on carbon emissions and charging the highest polluting firms a levy per tonne of carbon emitted which effectively placed a price on carbon.[106] The initial price of AU$23 per tonne came into effect on 1 July 2012, with a subsequent increase to $24.15 per tonne a year later as part of an increasing trajectory eventually leading to a floating, tradeable carbon pricing system. Despite the notable reduction in carbon emissions arising after the Act came into effect, as outlined in Figure 10 below (particularly in the electricity sector where more carbon-intensive brown coal generation exited first – see Generation discussion paper), this Act was highly controversial due, in part, to the concerns around negative economic impacts – and was repealed by the subsequent Coalition Government in 2013 (taking effect on 17 July, 2014).

National Energy Guarantee of 2017

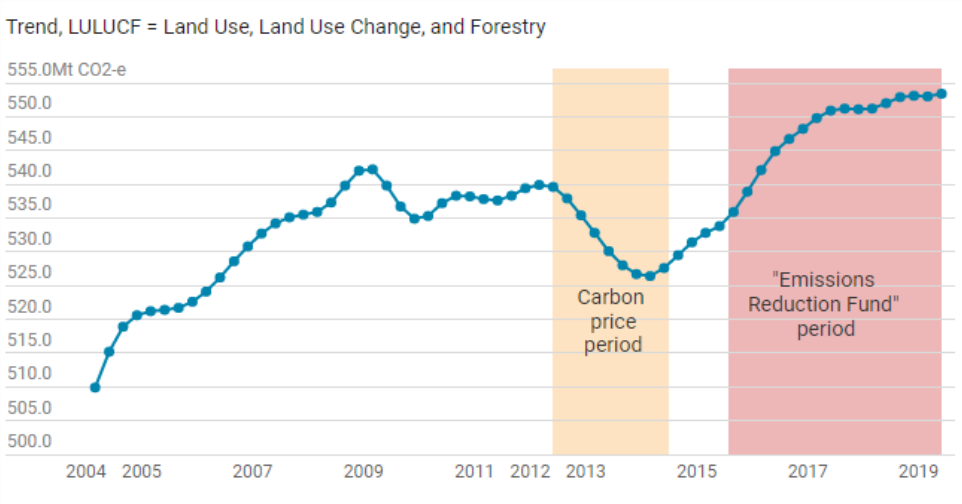
Subsequent to the Independent Review into the Future Security of the National Electricity Market ('Finkel Review' – see Generation discussion paper), the National Energy Guarantee (NEG) was proposed in 2017 which placed a reliability and emissions guarantee on energy retailers operating in the NEM.[107] These guarantees required retailers to purchase a specified portion of energy from dispatchable sources, while also maintaining a specific emissions threshold which required procurement of renewable energy resources.[108] However, this policy was highly contentious and was never implemented.

Emissions Reduction Fund

A key climate policy that is still in effect is the Emissions Reduction Fund (ERF) Policy. It was established in 2015 under the *Carbon Credits (Carbon Farming Initiative) Act 2011*. This policy offers tradeable Australian Carbon Credit Units (ACCUs) for adopting new practices and technologies to reduce emissions.[109] Another key component of the ERF Policy is the Safeguard Mechanism. In conjunction with the reporting and compliance obligations under the *National Greenhouse and Energy Reporting Act 2007*, the Safeguard Mechanism is the broadest mechanism in Australia for incentivising industry decarbonisation. However, due to the limitations of its original design, the ERF Policy has not been as effective in reducing carbon emissions, as outlined in Figure 11 below.

[106] Federal Register of Legislation. (2011). *Clean Energy Act 2011*. Accessed here on 23 March 2023.
[107] The NEG was the final proposal following a range of earlier attempts by the Coalition Government at the time to introduce some form of carbon pricing mechanism. All failed to secure Coalition party room approval.
[108] PricewaterhouseCoopers. (2017). *National Energy Guarantee. A balancing act between emissions and reliability*. Accessed here on 23 March 2023.
[109] Australian Government Climate Change Authority. (2020). *Review of the Emissions Reduction Fund*. Accessed here on 20 March 2023.

Figure 11 | Annual greenhouse gas emissions trend from 2004 – 2019 excluding LULUCF[110]



Reforms to the Safeguard Mechanism

As outlined previously, reforms to the Safeguard Mechanism will come into effect on 1 July 2023 to address the limitations summarised in section 'The inclusion of emissions reduction in the role of energy efficiency policies'. The new Safeguard Mechanism will cover 215 of the highest emitting facilities which account for almost 30% of Australia's total carbon emissions. These reforms include:[110,111]

- Defining Safeguard Mechanism baselines in absolute terms.
- The implementation of a baseline decline rate of 4.9% each year to 2030.
- New flexible compliance arrangements that will enable facilities to earn tradeable credits for emitting below baselines.
- Setting new facility baselines in line with international best practice. For example, gas facilities will be required to have net zero carbon emissions from their first day of operation.
- Introducing a rigorous assessment process on any new projects that would add significantly to emissions under the Safeguard Mechanism and acting on the findings.
- Commissioning a review to examine the feasibility of an Australian carbon boarder adjustment mechanism (CBAM), particularly for the steel and cement sectors.
- Ensuring public funding to support only future-focused industries (i.e. is not directed at coal and gas projects).

These approved reforms are a positive step forward to enabling the achievement of net zero by 2050. Notwithstanding these changes, the Australian Productivity Commission has provided further recommendations on how the Safeguard Mechanism could be progressively recalibrated to become Australia's principal economy-wide abatement mechanism. The

[110] Commonwealth of Australia. (2023). *Safeguard Mechanism one step closer to Parliamentary passage.* Accessed here on 31 March 2023.
[111] Department of Climate Change, Energy, the Environment and Water. (2023). *Safeguard Mechanism Reforms Position Paper.* Accessed here on 11 March 2023.

following recommendations have been made as part of the Commission's five-year productivity inquiry and include:[112]

- Expanding the Safeguard Mechanism coverage by reducing baseline thresholds.
- Imposing Safeguard Mechanism baselines on individual electricity generators.
- Broadening the scope of sectors that are covered by the Safeguard Mechanism.

B3 - Reflection on Australian experience

Establishing carbon markets and emissions trading schemes in Australia has been politically fraught due to the reliance of the economy on the mining industry. However, the recent reforms to the Safeguard Mechanism have the capacity to enable meaningful decarbonisation efforts in the most emission-intensive areas of the economy. Advancing to this point has been incremental and slow. While the recent reforms to the Safeguard Mechanism are viewed as a positive step, there remains a debate around the ability of the policy in its current design to achieve its targets.

For example, a baseline decline rate of 4.9% on average will not leave much of a reserve for new entrants. If production remains constant, and the 4.9% decline rate applies to most facilities, the reserve will be no more than 10 MtCO2-e. This may not be adequate to cover all of the new projects which may enter the scheme. For example, one new or expanded LNG plant could add over 4 MtCO2-e per annum. The Australian Government proposes to retain flexible baselines to give facilities room to increase production without being penalised. But if production increases, so will the overall baseline emissions, putting the carbon budget at risk.

Whether the supply of ACCUs will cover demand over the next seven years and beyond, especially for hard-to-abate sectors that will rely on them for compliance, is not clear. While there are sizeable opportunities to abate emissions across the covered facilities, many of the emissions reduction projects are reliant on emerging technology or will take time to implement. As a result, it is likely that there will be a significant reliance on offsets out until 2030 and as demand for these offset increases, so too will their price. Given how new these reforms are, it is difficult to predict the impact they will have on the market and the Australian economy.

B4 - Reflection on Vietnamese significance

Vietnam is expected to establish an Emissions Trading System by 2027 and is considering a carbon tax. Vietnam is also the focus of voluntary carbon markets where RECs are traded internationally, as are projects in which offset credits are used to fund transition to lower carbon emissions. Regulations regarding carbon pricing and markets are included in Decree 6 on Carbon Emissions Reduction and Ozone Layer Protection.

[112] Australian Government Productivity Commission. (2023). *5-year Productivity Inquiry: Managing the climate transition. Inquiry report – volume 6.* Accessed here on 20 March 2023.

FE–V

Future of Electricity
Vietnam

A science – to – policy initiative
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