FE–V

Future of Electricity
Viet Nam

DISCUSSION PAPER

Future Markets

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.

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Photo: Ho Chi Minh City at night – wallpaperflare.

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List of Abbreviations

Abbreviation	Full name
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ARENA	Australian Renewable Energy Agency
CEFC	Clean Energy Finance Corporation
CfD	Contracts for Difference
ERA	Economic Regulation Authority
EAAP	Energy Adequacy Assessment Projection
FCAS	Frequency Control Ancillary Services
FRC	Full Retail Contestability
GIG	Green Investment Group
GDP	Gross Domestic Product
ISP	Integrated System Plan
LNG	Liquified Natural Gas
LTESAs	Long-Term Energy Services Agreements
EMR	Market Review Program
NECA	National Electricity Code Administrator
NEL	National Electricity Law
NEM	National Electricity Market
NEO	National Electricity Objective
NER	National Electricity Rules
NSW	New South Wales
PDP	Power Development Plan
PPA	Power Purchase Agreements
PASA	Projected Assessment of System Adequacy
RE	Renewable Energy
SWIS	South West Interconnected System
TWh	Terawatt hours
TNSPs	Transmission Network Service Providers
VRE	Variable Renewable Energy
VRE	Variable Renewable Energy
VRET	Victorian Renewable Energy Target
WA	Western Australia
WEM	Wholesale Electricity Market

The term "WEM" used across five discussion papers may differ in full-name definitions. Some authors perceived its full name as "Western Electricity Market", while others called it "Wholesale Electricity Market". After internal discussion, we have come to a consensus that the term "WEM" could mean both "Western Electricity Market" and "Wholesale Electricity Market". Note that the market operated in Western Australia enables wholesale electricity sales between generators and retailers, and so is itself a wholesale electricity market. In all discussion papers, we retained the full-text definitions in the text and the abbreviation list according to each author's usage.

A. Thematic Setting

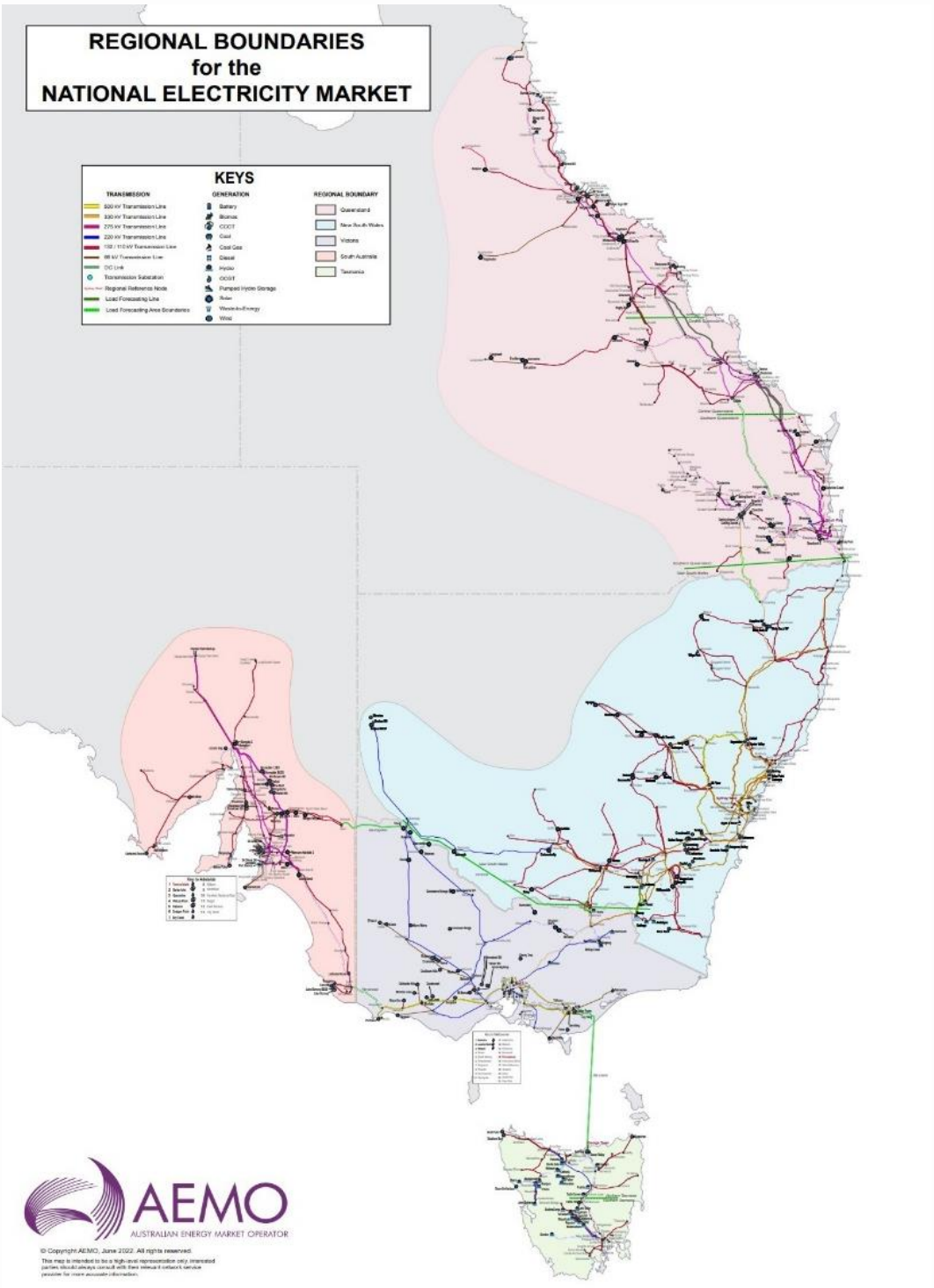
A1 - Overview

Australia presents with examples of two alternative fundamental market designs, both successful but also with their own unique challenges. The east coast National Electricity Market (NEM) was established in 1998 following more than a decade of various phases of privatisation or corporatisation of State Government generation assets and trial markets. The NEM established an interconnected power system connecting six State Government jurisdictions being the states of Queensland, New South Wales, Australian Capital Territory, Victoria, South Australia and Tasmania. The NEM is one of the longest interconnected power systems in the world, spanning approximately 5,000km from the far north of Queensland to the south-west reaches of South Australia. The NEM presently has a potential peak demand of approximately 45,000 MW and energy consumption of around 200 TWh. The following map[1] illustrates the coverage of the high voltage transmission network, the six interconnected regions and some indicative distances between major generation and load centres.

Today, power is freely traded throughout the NEM, between regions, between independent generators and individual customers. There is an open access framework to enable connecting new generation facilities to the network. The power market is dispatched and the wholesale market price is cleared and published every 5-minutes. Along side the wholesale electricity market there are number of mature financial trading markets that enable various forms of financial risk management. There are more than ten large generation/retail trading entities, many independent power producers, more than ten electricity distribution networks businesses (poles and wires is separate to electricity sales), five major transmission networks businesses and approximately 60 electricity retail businesses[2].

[1] Source: https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/maps/nem-regional-boundaries-map-web.pdf
[2] Australian Energy Regulator, State of the energy market 2022 (pp201). Available at State of the Energy Market | Australian Energy Regulator (aer.gov.au).

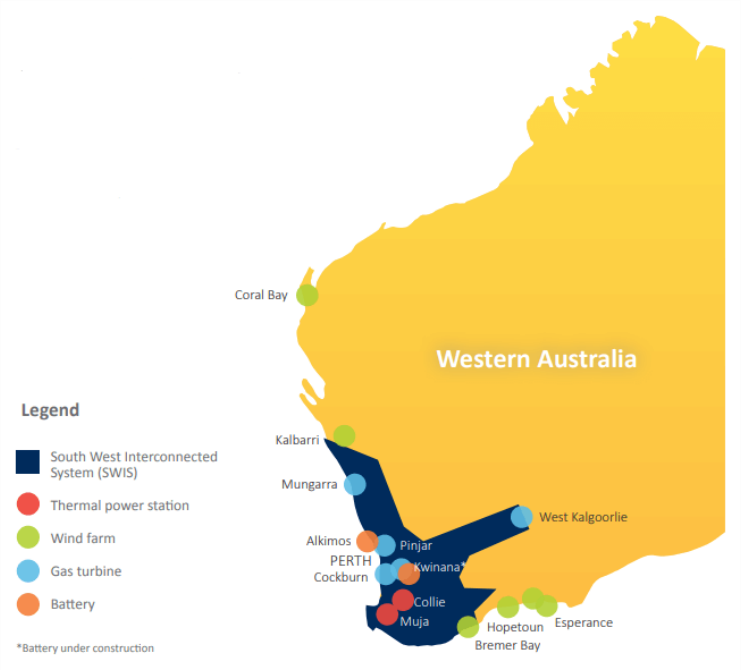
Figure 1 | Geographical diagram of the major NEM transmission system and state based regional market



On the west-coast the Wholesale Electricity Market (WEM) of Western Australia is completely separate from the NEM. The WEM is contained wholly within the state of Western Australia. The WEM was initiated in 2006 through the disaggregation of the State's electricity assets into separate government trading entities for operation, maintenance and investment in networks, generation and electricity retail sales. The State of Western

Australia has maintained ownership of the electricity networks, approximately 60% of the generation portfolio and the majority of retail electricity sales to customers. The following map[3] shows the geographical coverage of the WEM and the electricity network referred to as the South West Interconnected System (SWIS) with major generation assets operated by the State owned generation company, Synergy. There are several independent power producers and a number of independent electricity retail businesses however connection of significant new generation has been stifled by the network access framework and resistance to enabling full retail competition. The WEM has a peak demand of approximately 4,000 MW and delivers approximately 20 TWh to electricity consumers.

Figure 2 | Geographical diagram of the extent of the WEM SWIS transmission system regional market



A2 - Evolution of the theme

Realisation of these two distinctly unique markets towards “go live” was a decades long pathway. The seeds of market reform were borne out of a widespread view throughout the late 1980s and early 1990s that State Governments had at times under-invested leading to black-outs and power rationing and then over-corrected leading to over-investment, surplus reserves and high electricity costs. The pathway to what is generally described as micro-economic reform of the energy sector requires careful consideration. Whilst analysis of electricity market reform across the globe is an important aspect of the process, ultimately every decision must be localised, cognisant of the existing framework of laws, regulation and rules and government policy of the specific jurisdiction undertaking the challenge. The market framework of the NEM and WEM are fundamentally

[3] https://www.synergy.net.au/Blog/2022/06/What-makes-up-the-electricity-generation-mix-in-Western-Australia

different due to various localised considerations which will be discussed further in Part B of this paper.

The NEM commencing in 1998 and the WEM in 2006 are now mature wholesale energy markets, although they are by no means fixed in their design or regulatory frameworks. The ability to evolve with the changing needs of the power system, technological innovation, customer choices, and environmental and social objectives is a critical measure of success.

Both markets were enacted with the same core principles in mind to enable greater choice for suppliers and consumers, attract new forms of financing and funding and transition towards a reliable, sustainable and affordable power system. The primary purpose or objectives of the market framework are inscribed in the law or rules of both markets.

In the NEM, the National Electricity Objective (NEO) is stated in the National Electricity Law (NEL), being: "to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to: • price, quality, safety and reliability and security of supply of electricity • the reliability, safety and security of the national electricity system." A consultation to change the NEO in the NEL to specifically incorporate an emissions reduction objective is scheduled to result in a legislative amendment by mid 2023.[4]	In the WEM, the WEM Objectives are outlined in the preamble to the WEM Rules. The objectives of the market are: (a) to promote the economically efficient, safe and reliable production and supply of electricity and electricity related services in the South West interconnected system; (b) to encourage competition among generators and retailers in the South West interconnected system, including by facilitating efficient entry of new competitors; (c) to avoid discrimination in that market against particular energy options and technologies, including sustainable energy options and technologies such as those that make use of renewable resources or that reduce overall greenhouse gas emissions; (d) to minimise the long-term cost of electricity supplied to customers from the South West interconnected system; and (e) to encourage the taking of measures to manage the amount of electricity used and when it is used.

[4] https://www.energy.gov.au/government-priorities/energy-and-climate-change-ministerial-council/priorities/national-energy-transformation-partnership/consultation-proposed-legislative-changes-incorporate-emissions-reduction-objective-national-energy-objectives

To provide an indication of the evolution and maturity in market dynamics, the outworking of rule change processes in each of the two major markets in Australia is informative:

- The NEM began in 1998 with development of the National Electricity Code (NEC) under the NEL. Initial versions of the NEC were in the order of 300 pages
    - By 2005 the NEC was transitioned to the first version of the National Electricity Rules (NER) which was 900 pages
    - Today, version 196 of the NER is over 1800 pages
- Similarly, the first gazetted version of the WEM Rules in 2004 (preceding market start in 2006) was 400 pages in length.
    - The WEM Rules today now cover 800 pages.

Both the NEM and the WEM have undergone several review and reform processes since their inception. History would suggest that market performance review and reform come to pass about every seven years in Australia. No electricity market is perfect. A well-defined, efficient, and properly resourced administration of the rule change process is critical to enabling the market design to evolve at pace to keep up, if not stay one step ahead of the rapidly evolving energy sector.

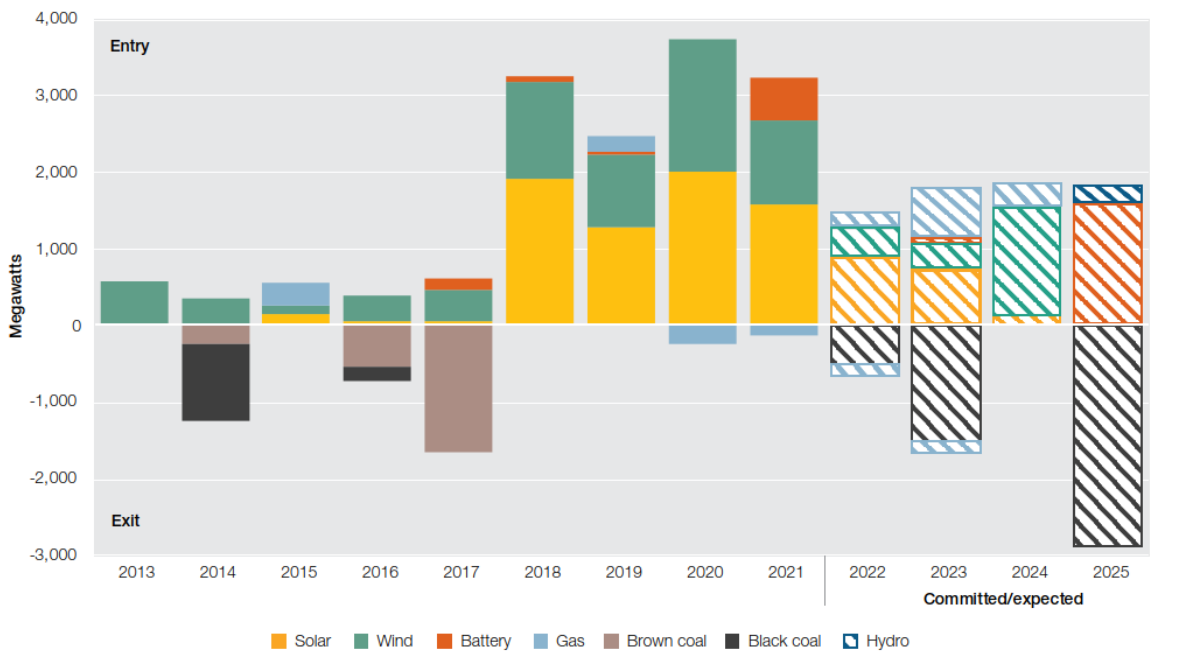
Despite the challenges of the past and those that will come, the establishment and continued evolution of electricity markets in Australia have unarguably been successful in attracting private investment and stimulating innovative solutions to the emergence of the climate challenge. Despite significant generation retirements due to asset end of life and pressures to reduce carbon emissions, reliability has been high. The market has enabled the establishment of Commonwealth and State Government initiatives and Policy such as renewable energy targets. It may be argued that the market enabled such policy objectives to be achieved within the competitive private investment framework. The continuous publication of the wholesale electricity market price supports a level playing field for stimulating innovative solutions to the dynamic high capital cost environment

A3 - Importance of theme to the Australian electricity services industry

The capital that has been invested by the private sector in just the last five years in the NEM would have been a significant challenge for the various State Government balance sheets. With an estimated blended average capital cost for new generation of approximately AU$2m/MW, annual capex commitment into the east coast NEM has been in the order of *AU$7-8billion per annum* since 2017-18 leading up to achievement of the Commonwealth Government's renewable energy target objective of achieving 20%

renewable generation by 2020. The following chart[5] shows the magnitude of investment in new renewable generation in the recent past and that which is projected to continue to be required in order to replace energy that is lost from retiring coal fired generation due to end of life and the continued push for decarbonising the electricity supply technology platform.

Figure 3 | Generation investment in the NEM since 2013 and projected to 2025



Note: Capacity includes scheduled and semi-scheduled generation, but not rooftop solar capacity. Actual and expected investment and closures from 1 January 2022 are shown as shaded components. These include Liddell and Osborne power stations in 2023 and Eraring power station in 2025.

Source: AER; AEMO (data).

The measure of success in relation to energy prices for industry and small retail customers will forever be a matter of debate. The counterfactual world of having not transitioned to competitive market structures of the NEM and WEM is of course, unknown. What is certain however is that the rate of change is accelerating

A4 - List of key issues

Development of the electricity markets that underpin the existing structures in Australia was focussed on introducing private sector involvement and competition to deliver improved efficiency in the electricity sector and consequentially improving affordability and reliability. There is strong evidence those reforms were very successful, even if in some cases they remain incomplete.

The two major electricity markets in Australia have been in a constant state of evolution since their creation which is unsurprising given their complexity

[5] Australian Energy Regulator, State of the energy market 2022 (Figure 2.23, pp50). https://www.aer.gov.au/system/files/State%20of%20the%20energy%20market%202022%20-%20Chapter%202%20-%20National%20Electricity%20Market.pdf

and the changing demands placed on them over time. This paper presents a perspective on several key aspects of market establishment and reflections on performance in relation to achievement of objectives, current and future challenges. The paper is structured into the following key themes throughout Part B:

1. Governance Reform: Establishing an independent market operator & regulator
2. Establishing stable and competitive energy markets
3. Embedding an environmental & social objective into the market structure
4. Attracting capital to electricity markets
5. Financial sustainability of electricity service provision

The purpose of the paper is not to compare and contrast the specific market designs of the NEM and WEM. Throughout this paper the markets of the east-coast NEM and the west-coast WEM will be referenced in relation to the abovementioned key themes to support the narrative and share key observed learnings.

A5 - Relevance and recommendations to Vietnam

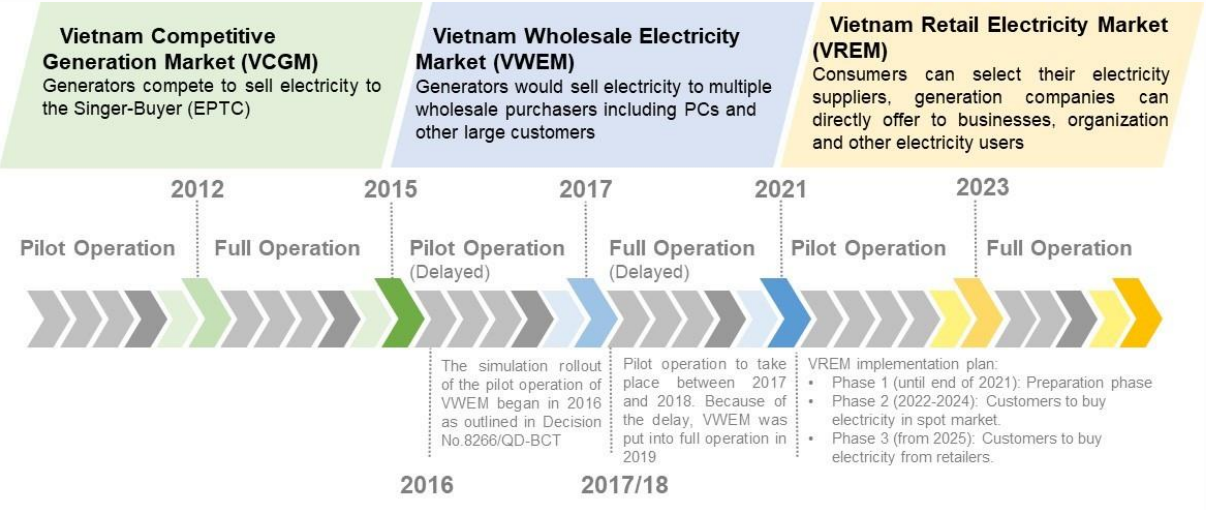
Regarding the transformation of the Electricity sector and Electricity market, the Government of Vietnam have issued various documents to provide the directions and regulate the sector. Within those documents, the relevance between Vietnam's context and Australia's context can be recognized with the key highlights mentioned below.

Similar to Australia, Vietnam would like to ensure the equality, fair competition, non-discrimination within the power sector and respect the rights to opt for partners and transaction forms. Those principles are mentioned in the Electricity Law 2004:

1. *To ensure **publicity, equality, fair competition**, non-discrimination among subjects participating in the electricity markets.*
2. *To respect the **rights to opt for partners and transaction forms of subjects purchasing and selling electricity on the markets** suitable to the development stages of electricity markets.*
3. *The State shall regulate the operation of the electricity markets in order to ensure the sustainable development of the electric systems, meeting the requirements of safe, stable and efficient supply of electricity.*

To encourage the competitiveness, create opportunities for private sectors to participate in the market and bring more choices for customers, Vietnam has developed a roadmap for electricity market reform. Since 2013, the roadmap of electricity market reform was decided by the Government under Decision 63/2013/QD-TTg. The roadmap planned out the different phases within the market reform journey toward a more competitive market and the conditions for implementation of each phase. A summary of the Vietnam market reform roadmap is described in the below illustration.

Figure 4 | The summary of Vietnam market reform roadmap



It's recognized by the Government that to have a competitive market, the sector needs to restructure itself to have suitable governance structure. In alignment with the market reform roadmap, the Government also issued Decision 168/QD-TTg in 2017 for the restructuring of electricity sector in period of 2016 – 2020 with the vision toward 2025, the key points of the Decision include:

- System operator and Market operator are independent unit without any interest with other market participants and owned 100% by the State;
- Generation: privatize EVN's Generation Corporations and reduce EVN's market share through increase of BOT power plants and strategic power plants to participate directly in the market;
- Transmission: remain 100% owned by EVN;
- Distribution and retail: separate the accounting record of costs for distribution and retail; implement the cross subsidy among power corporations and retail tariff to meet the market's requirements and privatize power corporations.

Recently, acknowledging the importance of sustainability issues within the sector, and following Vietnam's commitment in COP26 to become net-zero by 2050, there are documents which introduce new environmental objectives into the energy sector. Resolution 55 sets out the target to increase the proportion of renewable energy in the energy mix to 15 – 20% by 2030 and to 25 – 30% by 2050.

Most recently, the Vietnam National Power Development Plan #8 (PDP8) was officially approved on 15 May 2023. From a markets perspective, PDP8 most relevantly includes a government commitment to focus on capital investment in the power sector, whilst also encouraging private sector investment. The latter through a focus on healthy competition and setting electricity prices under a market-based mechanism. It also states that electricity supply must ensure national energy security and enable socio-economic development. More specifically, PDP8 anticipates the need to accommodate:

- GDP growth of, on average, 7% between 2021-2050
- Consumption growth of 51% between 2025 and 2030 and growth of approximately 134% between 2030-2050
- Peak demand growth of approximately 118% between 2030 and 2050
- Much stronger capacity growth of approximately 253% between 2030 and 2050.
    - More than double the rate of peak demand growth
    - Almost double the rate of consumption growth
    - This capacity growth will facilitate a shift to renewables (primarily wind and solar, but also biomass, ammonia and hydrogen)
- A generation capital investment need of circa:
    - US$12 billion per year between 2021 and 2030
    - US$21 billion per year between 2030 and 2050

This is anticipated to deliver a substantial reduction in carbon emissions (of at least 80%). These are very substantial capital requirements.

To the extent that the private sector participates in this investment it will require clear and certain incentives in the form of market-based price signals and / or complimentary policies (as have been used in Australia). This is particularly the case if the generation mix PDP8 envisages is to be delivered.

Given the investment need it is probable however that the government will also need to invest in or underwrite a material proportion of the new capacity. This has implications for how government does this whilst maintaining incentives for private sector investment (i.e. ensuring that government investment does not 'crowd out' the investment the private sector would have otherwise made).

These capital requirements also have material implications for system costs (particularly given capacity is forecast to grow at nearly double the pace of consumption) and tariffs, if these costs are to be recovered from electricity consumers.

The opportunity for Vietnam is to approach its market development in the knowledge that:

- There is substantially more that can be done to complete the reforms that are underway in terms of:
    - Enabling greater competition in generation and retailing, by creating a market structure more conducive to competition
    - Allowing greater private sector involvement in these parts of the supply chain
    - Eventual removal of price regulation in the competitive elements of the supply chain and introducing more cost reflective locational wholesale electricity market pricing
- It can learn from the lessons that Australia and other jurisdictions have learned, and are still learning, particularly in respect of ensuring vulnerable customers are protected from the changes that

more competitive markets create. This is essential to maintaining support for reform

- A key advantage Vietnam has is that it is in the process of rapidly creating much of its electricity industry capital stock to meet economic development goals, so it has an opportunity to incorporate sustainability objectives into that process. In Australia, that occurred subsequent to market development.
- This is compared to Australia which is having to essentially replace its existing capital stock in a market where modest demand growth is occurring, which creates complex energy transition (e.g. reliability and price) and legacy issues (financial sustainability of the existing industry and creating incentives for investment). In practice, greater sustainability will likely only be delivered if it occurs with a recognition of the constraints imposed by reliability and affordability.

B. Issues exploration

Issue 1 - Governance reform, establishing an independent market operator & regulator

B1 - Problem Context

The factors influencing decision making of Government is ultimately transparent in hindsight. However, supporting transparent engagement in decision making that will enable and influence allocation of private investment requires a platform for public debate and accountability. A summary of key factors that enabled the establishment of the NEM is well summarised in the 2013 report[6] published by the Australian Energy Market Commission (AEMC) as follows:

- *Strong and appropriate support structures were established with key stakeholder participation:*
    - *Reform across the Commonwealth and the States required significant collaboration and cooperation. Establishment of appropriate governance structures across federal, jurisdictional and industry levels was essential to ensure the reform had appropriate coordination of policy, technical design and implementation.*
    - *It was important to give credibility to the process. This was enhanced by having an independent, highly regarded chair. The people who were involved understood the commercial realities of the businesses and the impacts of the reform on them.*

B2 - Strategic setting

Establishing a clear and transparent framework for the appropriate allocation of responsibility, accountability, and authority, to fulfil each role that is required to manage and evolve the power system and market operations is the most important and most difficult challenge. This may involve managing overhead costs of market establishment through minimising duplication of business unit administrative functions by first establishing ring-fenced[7] roles within existing structures. This should be supplemented by thinking about the pathway towards full operational separation of definable entities over time when it becomes economically efficient to do-so. Again, referencing the AEMC 2013 report states *"Getting the industry structures right was key for effective competition"*.

[6] Australian Energy Market Commission (AEMC), A case study in successful microeconomic reform, December 2013. https://www.aemc.gov.au/sites/default/files/content/The-National-Electricity-Market-A-case-study-in-microeconomic-reform.PDF
[7] https://www.aer.gov.au/networks-pipelines/ring-fencing

- *The process highlighted that competitive markets only work well with a competitive industry structure.*

- *It also demonstrated there is an explicit trade-off between the benefits of a competitive industry structure and maximising sales proceeds from privatisation. The gains for the economy of a competitive industry structure needs to take precedence over the fiscal impacts of privatisation. To do otherwise poses a risk to the benefits of the reform being sustained.*

B3 - Solutions

The first step in the pathway to market establishment in Australia was the establishment of an energy market reform implementation taskforce to enable a public debate on market design and the initial strategy for the disaggregation of State-owned assets, some of which was already in various stages of advancement. This included disaggregation of the electricity industry into regulated network owner/operators, competitive generation trading entities and market customers (large independent consumers and retail businesses). In regard to the NEM, the roadmap towards the establishment of a competitive energy market, with fair and transparent regulation, is well outlined in the following figure[8].

The final step towards market reform in Australian markets has been punctuated by passing legislation/laws through Parliament to create statutory authorities which will then subsequently establish rules for operation and trading of electricity (and gas). In the NEM this has been achieved through corporatising existing government owned asset management functions to establish trading entities and adding electricity regulation responsibilities to an existing regulatory body. The Australian experience has shown that the minimum cross section of independent roles required for a sufficiently empowered, independent regulatory structure is as follows

1. Economic regulator (oversees expenditure and performance of regulated networks entities and prosecutes adherence to market rules by market participants)

2. Market administration (maintains rules and rule change process)

3. Market operator (manages trading and settlements platform)

4. Power system operator (manages dispatch of generation to meet demand whilst maintaining the power system in a secure operating state)

[8] Australian Energy Market Commission (AEMC), A case study in successful microeconomic reform, December 2013. (pp5)

5. Generation supply (existing generation supply portfolio may be kept together or purposefully split into multiple entities to establish competitive behaviour from day 1)

6. Network owner (manages network infrastructure asset management and investment)

7. Network operator (manages day to day operation of the network availability and interface with power system operator – may be a role assigned to the network owner)

8. Metering data agent (may be an independent authority or may be a role assigned to the network owner)

9. Market customer (may be independent large loads but usually starts with a retail business unit that manages the wholesale market interface on behalf of all small/large customers)

Figure 5 | Snapshot of NEM evolution of regulatory, structural and legal framework changes

The role of the economic regulator is to oversee the regulated planning, operation, maintenance, investment and pricing framework for the monopoly transmission and distribution networks businesses. The economic regulator is also responsible for prosecuting market compliance and investigating undesirable market pricing events and bad actors exerting market power or anti-competitive behaviour (which may indeed be government trading entities). Importantly, the economic regulator must "have teeth", authority to initiate civil legal proceedings and issue monetary fines as a course of action to adequately fulfil its role. In the NEM the role of economic regulation was initially appointed to the existing Australian Competition and Consumer Commission. In 2003 the Australian Ministerial Council on Energy recommended establishing a new authority with the primary role of economic

regulation of the NEM and subsequently the Australian Energy Regulator (AER) was established and continues to the present day.

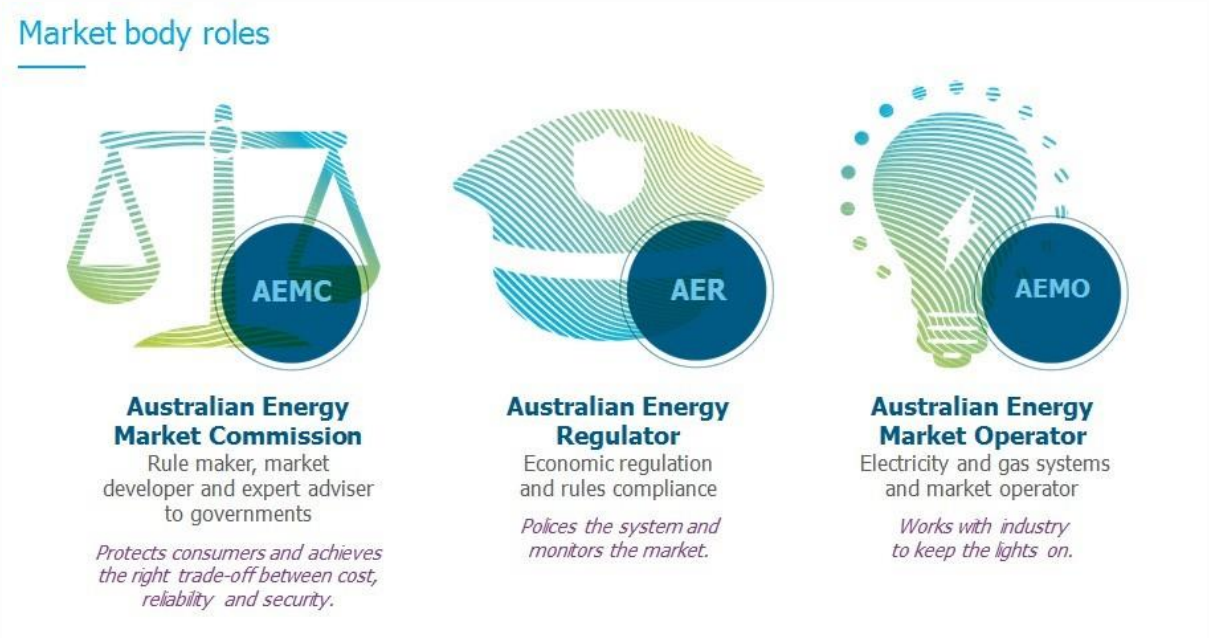
The establishment of the National Electricity Law created the National Electricity Code Administrator (NECA) and the National Electricity Market Management Company (NEMMCO). The same 2003 review by the Ministerial Council on Energy also recommended augmentation to the rules authority, creating the Australian Energy Market Commission (AEMC) to supplant NECA. These 2003 recommendations were driven by the Commonwealth Government seeking to re-enter the national discussion on energy market reform and are perhaps a natural refresh of arrangements after the first five years of experience from the newly formed regulatory framework. By 2005 the National Electricity Law was revised to enable creation of the AER and AEMC.

The market operator body is responsible for executing the rules of the electricity market. This will require significant information technology (IT) and operational technology (OT) investment and highly skilled and experienced personnel across engineering, planning, legal, commercial, finance and communications functions. The market operator body tends to be the political public face of the operational electricity market and therefore management of communications guidelines is a discipline not to be underestimated. NEMMCO successfully operated the market, operationalising inter-jurisdictional electricity and capacity sharing arrangements as interconnections were established and upgraded. NEMMCO created a significant body of operational procedures in consultation with market participants and industry stakeholders including operational forecasting to manage maintenance planning outages for generation and transmission facilities broadly existing to this day in the form of Projected Assessment of System Adequacy (PASA) and other capacity adequacy measures. NEMMCO was absorbed into what is now known as the Australian Energy Market Operator through the rationalisation of several state planning bodies, gas network operations and trading entities and the Victorian State transmission planning role.

The single sentence description for the role of these three critical market bodies in the NEM as they exist today is presented in the following infographic.[9] The AER and AEMC are statutory bodies established under the National Electricity Law and commonwealth legislation respectively. AEMO is a registered public company limited by guarantee. AEMO is described as a non-for-profit organisation with a membership of 60% government and 40% industry. AEMO's operating costs are recovered through fees paid by market participants.

[9] https://www.aemc.gov.au/regulation/national-governance

Figure 6 | The three primary and necessary market and regulatory bodies in the NEM



The establishment of the WEM was achieved through a similar process regarding governance, market operations and regulation. Key milestones are well articulated in the following snapshot from the inaugural 2004-2005 Annual Report of the Independent Market Operator (WA):[10]

Figure 7 | Timeline of electricity sector reform to enabling competitive market operations in the WEM

The Government's electricity reform process has achieved many significant milestones in the lead up to establishing the Wholesale Electricity Market and the IMO. These milestones include:

> **October 2002**	Electricity Reform Task Force submitted recommendations to Cabinet
> **November 2002**	Cabinet endorsed Electricity Reform Task Force recommendations
> **August 2003**	Wholesale Electricity Market Design endorsed by the Minister for Energy
> **November 2003**	Introduction of Electricity Reform Legislation into Parliament
> **September 2004**	*Electricity Industry Act 2004* passed through Parliament providing heads of power for the establishment of the Wholesale Electricity Market
> **June 2004**	Top Up and Spill regime introduced as an interim measure prior to the commencement of the Wholesale Electricity Market
> **October 2004**	Public comment sought on Wholesale Electricity Market Rules
> **October 2004**	Wholesale Electricity Market Rules approved by the Minister for Energy
> **October 2004**	Launch of Expression of Interest for Reserve Capacity Mechanism
> **December 2004**	Establishment of the Independent Market Operator

[10] Independent Market Operator – Annual Report 2004-2005, available at parliament.wa.gov.au

B4 - Expert reflection on Australian experience

The transition from centrally planned, owned, and operated power systems to the establishment of independent governance arrangements was planned over many years. The reform was underpinned by a strong legal framework and the willingness of the State Governments and Commonwealth Governments to work towards a common goal. The pathway was not linear, and it is reasonable to expect such a complex and significant reform will experience periods of advancement and setbacks as issues are identified and resolved iteratively.

Now some two decades on a key reflection is that of enabling and supporting change. The governance arrangements of both the NEM and the WEM have experienced periods of challenge, shortcomings, dissatisfaction, review, and reforms. The experience has illuminated the emergence of the nine independent roles of the governance and regulatory framework outlined above. The extent of the evolution of the market rules has illustrated the need for a well-defined, efficient, and properly resourced administration of the rule change process.

B5 - Expert reflection on Vietnamese significance

Currently, the Ministry of Industry and Trade (MOIT) is the Government agency being responsible for:

a. Formulate and organize the implementation of regulations on operation of competitive electricity market;

b. Direct the formulation of electric power supply plans, inspect and supervise the electric power supply and operation of electrical grids so as to ensure the balance of electricity supply and demand; do research, propose and manage solutions for balancing electricity supply and demand; provide guidance on conditions and procedures for temporary suspension or shutdown of electricity supply or reduction of electric power consumption; conditions and procedures for connection to the national electrical grid;

c. Play the leading role and cooperate with the Ministry of Finance of Vietnam in establishing and submitting the bracket of average retail electricity prices, the mechanism for adjustment of electricity prices and structure of retail electricity prices to the Government for consideration; organize the implementation of mechanisms and policies on electricity prices;

d. Play the leading role and cooperate with the Ministry of Finance of Vietnam in providing guidelines on methods for determination of electricity generation, wholesaling and transmission prices, prices of ancillary services, load dispatch service charges, and electricity market transaction management fees; consider giving approval of load dispatch

service charges and electricity market transaction management fees after obtaining approval from the Ministry of Finance of Vietnam; consider giving approval of electricity generation, wholesaling and transmission prices, prices of ancillary services; inspect fixed-term power purchase agreements signed between electricity generating units and electricity purchasing units, and fixed-term wholesale power contracts in accordance with the Government's regulations;

e. Resolve disputes arising in electricity market;

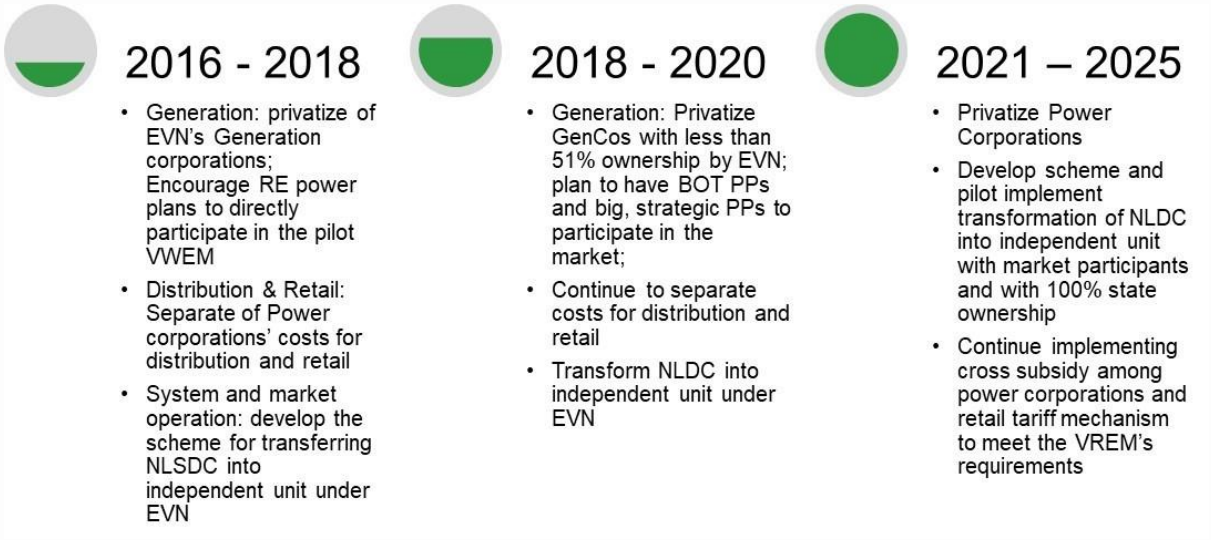
f. Instruct and inspect the compliance with regulations of law and take actions against violations in electricity sector in accordance with regulations of law;

MOIT is assigned the leading road in implementing the sector restructuring roadmap and the market reform roadmap (as stated in Decision 168 and Decision 63). It's also required the collaboration from Ministry of Finance (MOF) and Ministry of Planning and Investment (MPI) in terms of privatization, cross subsidy mechanism among Power Corporations (PCs), setting tariffs and state budget preparation.

Under MOIT, Electricity Regulatory Authority of Vietnam (ERAV) is a government agency with the functions of advising and assisting the Ministry in performing state management and organizing the implementation of regulations. During the transformation journey, the role of MOIT may not be changed but the model of ERAV is required to change to meet the requirements of managing and monitoring of the Wholesale market.

In alignment with the market reform roadmap toward a fully competitive wholesale and retail market, the Government issued Decision 168/QD-TTg in 2017 about restructuring of electricity sector in period of 2016 – 2020 with the vision toward 2025. The roadmap is summarized in the below illustration.

Figure 8 | The roadmap to restructure the electricity sector in period of 2016 – 2020 with the vision toward 2025



It's recognized by the Government about the importance to unbundle the power sector with more private sector participation and to establish an independent system and market operator. However, the implementation of the roadmap has faced some delays against the privatization of EVN's Generation Corporation (GenCo 1 and GenCo 2) and transforming the National Load Dispatch Center (NLDC) into an independent unit being responsible for system and market operation. Reflecting from the Australia's context, the implementation of the roadmap should be accelerated to ensure the clear and independent roles & responsibilities of each market participants.

The ongoing reform of the power sector needs to take account of the needs of PDP8 and the new demands being placed on it. In particular, the magnitude, timing and type of investment it demands, and the likely need for substantial government involvement in delivering that investment.

Issue 2 - Establishing stable and competitive energy markets

B1 - Problem Context

Prior to the introduction of the NEM in 1998, the Australian electricity industry was dominated by vertically integrated state-owned utilities. This meant that the same company controlled both the generation and distribution of electricity within a given state, leading to little competition and few incentives to improve efficiency or lower costs. The vertically integrated utilities were also subject to regulation by state governments, which meant that prices were set by government regulators rather than being driven by market forces. This led to inefficiencies in pricing and investment decisions. Additionally, there

were technical barriers to interconnecting power systems between states, which limited competition and prevented the sharing of resources during periods of high demand.

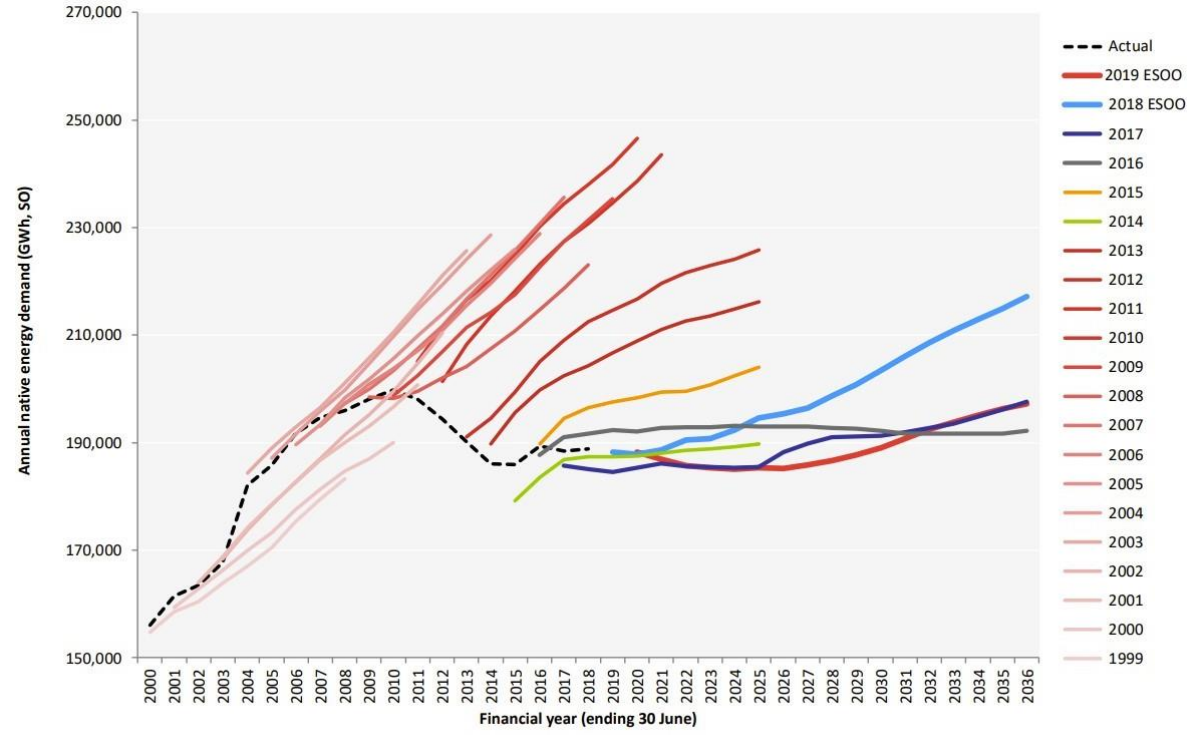
Furthermore, the lack of competition resulted in limited innovation, as there was little incentive for utilities to invest in new technologies or explore alternative energy sources. This led to a heavy reliance on coal-fired generation, which was cheap but environmentally damaging. The introduction of the NEM was therefore seen as a way to address these issues by facilitating competition, providing fair access to the market, and stimulating innovation. The key objectives of the NEM were to eliminate discrimination between energy sources and technologies, facilitate trading between and within regions, and ultimately deliver the lowest cost of energy supply.

In conclusion, the issues that were present in the Australian power sector pre-NEM were related to a lack of competition, inefficient pricing and investment decisions, and limited innovation. The introduction of the NEM aimed to address these issues and create a more stable and competitive energy market..

B2 - Strategic setting

As identified above, one of the objectives for establishment of the east coast NEM was to incentivise and enable increased interconnection between the States in order to share surplus reserve capacity between the regions. This objective was established in an environment of strong levels of forecast demand growth. The outlook for demand growth in the early 2000's was driven in part by development of a gas exploration, extraction and subsequent liquid natural gas (LNG) export industry along with other industrial and population growth drivers. Within this setting the ability to share surplus reserve capacity between regions was aimed at reducing the rate of generation investment required and to improve the future reliability of the combined power system and electricity market.

Figure 9 | NEM forecast electricity consumption growth over time



Each series reflects the year of each forecast

In the creation of the WEM, the objective was already looking towards facilitating a platform for investment in lower emissions generation technology, which is articulated in the official WEM Objectives as outlined earlier in this paper. Rather than the government needing to invest in developing the skills required for the development and deployment of new technologies, a key benefit of the market was to attract experienced renewable generation developers to the region

B3 - Solutions

When considering solution options, it is useful to establish clear objectives. The primary objectives of establishing competitive energy markets in Australia were the same as many other markets around the world:

1. To facilitate competition
2. To allow customers to choose their trading partners
3. To provide fair access to the market
4. To remove barriers to entry
5. To eliminate discrimination between energy sources and technologies

6. To facilitate trading between and within regions
7. To stimulate innovation
8. Ultimately to deliverer lowest cost of energy supply

Networks are regulated monopolies

In practically all major electricity markets globally, the role of electricity transmission and distribution networks is considered a natural monopoly. As such, the framework for network investment and operation is by its very nature, not competitive. Formation of the Australian NEM and WEM established strong regulation and oversight of the efficiency of network capital and operating expenses and the methods by which the total cost of operation of the networks should be allocated to market participants. The role of deregulating networks applies to practically all eight objectives identified above. A critical role of networks is to enable and facilitate the connection of new generation facilities and new load customers to the grid. This gave rise to the connection enquiry, application, and access frameworks.

The NEM design originated with an open access framework[11] for both generation and load customers. The complete set of rules and regulations prescribing the connections and access, investment and cost recovery of transmission and distribution networks is contained in specific chapters within the NER. The network is required to deliver a high level of reliability to customers in relation to delivering certainty that the network will maintain sufficient capacity and reliability to meet customer peak demand and energy consumption. There is however no guarantee that generation facilities will be able to export energy into the grid. This so-called constrained network access framework for generation has enabled the investment and connection of approximately 20 GW of new generation facilities over the past 20 years, and approximately have of that has occurred in just the last 5 years. Whilst access has been granted and facilitated for new generation technologies in great quantities, this has led to the challenge of grid congestion and curtailment of generation dispatch. In return for prescribed network reliability standards to meet customer demand, the cost allocation methodology attributes all costs to customers. On the other hand, generators do not pay network charges, other than for the specific assets required to facilitate their physical connection to the shared network. A review of proposed network investment and operating costs and cost allocation has settled into a 5-yearly cycle. Each transmission network service provider and distribution network service provider submits a comprehensive Regulated Revenue Proposal to the AER[12]. A key aspect of the regulatory review process is the determination of the regulated rate of return allowed for the networks business. The regulated rate of return

[11] AEMC Fact Sheet How transmission frameworks work in the NEM. Accessible https://www.aemc.gov.au/sites/default/files/content/4ea65c9e-2995-4164-ab4e-ed2584efd126/Fact-sheet-how-transmission-frameworks-work-in-the-NEM.PDF

[12] Or the ACCC before the formation of the AER.

is a significant factor in attracting global debt funding and the cost pass through to ultimate end use customers.

In the WEM, network regulation is prescribed within the Electricity Networks Access Code 2004 and regulated by the ERA. There is similarly a 5-year review cycle in the WEM, referred to as the Access Arrangements. The connections and access framework in the WEM prescribes customer supply delivery reliability standards, similar to the NEM. The generation access arrangements also require a level of firm access for generation connections. Whilst this appeared to provide certainty of access for generation investment, it has ultimately created a barrier to entry. The access arrangements effectively require generators to fund deep network augmentations in order to secure their own network access. As the network was already highly utilised it was not long before connection of new generation became prohibitively expensive. This will be discussed further in the following section.

Market design principles

A core principle that guided the proposed structure of the NEM and WEM market design was to establish market mechanisms only where there was likely to be sufficient depth in supply options to enable adequate competition. The scale of the NEM power system enabled adequate competition for the provision of energy and for the provision of frequency keeping services. The disaggregation of generation assets into multiple competing portfolios suggested that a gross-pool energy only market design could work. This was supported through a number of trial markets in the lead up to market start. From the outset, the NEM design incorporated real-time markets for energy and eight frequency control ancillary services (FCAS) markets. This paper will not delve into the details of the day-to-day operations of the NEM energy and FCAS markets. The most important aspect of market design and operations is transparency. Both markets are predicated on publishing real-time pricing and generation dispatch outcomes and numerous levels of planning and forecasting information. The Projected Assessment of System Adequacy (PASA) is a critical aspect of market transparency. The PASA process[13] supports operational planning to inform market participants on opportunities for delivery of capacity and energy, particularly when reserve margins are low.

In the WEM the choice of establishing a single generation trading entity meant that competition for delivery of frequency keeping services was not achievable. A framework for establishing the requirements for frequency keeping services was established, however the role for the provision of frequency keeping services was appointed to the single generation trading entity. With a single dominant generation portfolio there was a need to effectively embed market power mitigation into the fundamental design of the WEM. This (amongst other factors) led to the WEM design features to include a reserve capacity market with a day-ahead short term energy market,

[13] https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-reliability/projected-assessment-of-system-adequacy

followed by a net-pool balancing market in which generators are restricted to offer their energy into the market only at or below their (demonstrable) short run marginal cost of operation. The Economic Regulation Authority (ERA) was appointed with powers to request evidence of underlying costs from generation providers to support the formation of generator offers into the wholesale balancing market. The ERA was also required to review the cost for provision of frequency keeping services to ensure its transparency and reasonableness.

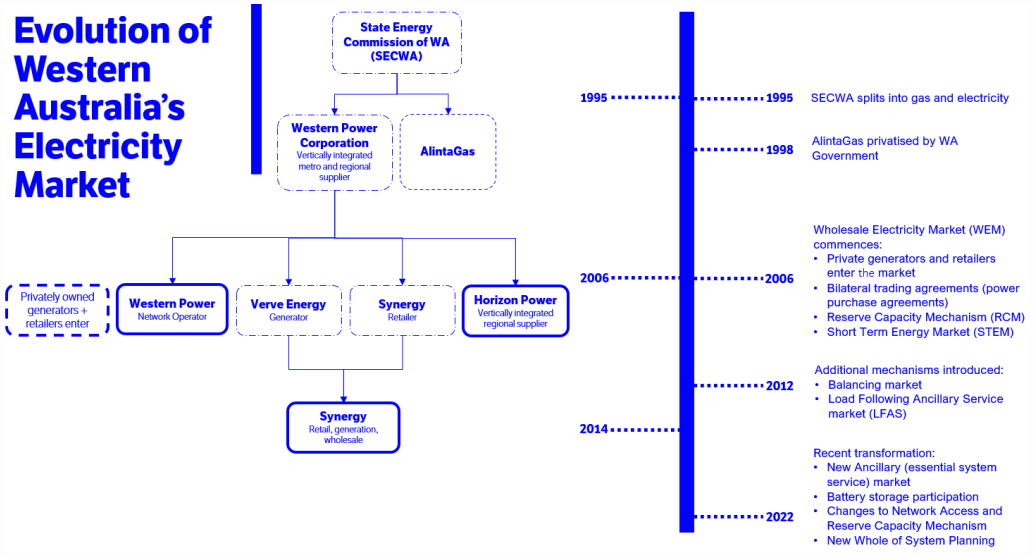
Competition for the supply of energy to customers

The evolution of preparing the east coast Australian NEM is shown in Figure B.1 earlier and will not be repeated here. Each State Government approached the reform to establishing a competitive platform over different timespans and with different outcomes. The State of Victoria privatised its generation, transmission and distribution networks asset portfolios in the mid-1990s, whilst the states of Queensland and Tasmania still maintain ownership over a majority of the state's generation capacity as well as full ownership of transmission and distribution network infrastructure assets. One important observation is that Tasmania chose to maintain a single generation trading entity, whilst other states established three to four separate entities that would compete from day one.

A snapshot of the evolution of the Western Australia key entities has been highlighted in earlier FE-V work and is shown in the following figure. Networks, generation, and retail functions were separated into government trading entities. A single generation trading entity was created which took ownership of existing bilateral electricity contracts between IPPs and government. A key reform measure applied was to limit the extent to which the incumbent generation trading entity could invest in new generation. A Ministerial Direction[14] required Verve (now Synergy) to not exceed 2,275 MW nameplate capacity under ownership. The purpose of the Ministerial Direction was to enable increased competition over time as new generation would necessarily need to be developed and owned by independent power producers.

[14] 4903.pdf (parliament.wa.gov.au)

Figure 10 | Evolution of WA Market Trading Entities



B4 - Expert Reflection on Australian Experience

The development of the NEM has experienced and identified numerous instances of the exercise of transient market power. During the period 2005 to 2009 a period of rapid demand growth was largely met with sufficient investment in gas fired generation. However a long period of drought led to reduced availability of hydro generation and derated availability of thermal coal generation due to rationing of water for cooling. This led to a recommendation for augmenting the PASA process to include an energy adequacy assessment, in addition to capacity adequacy. The Energy Adequacy Assessment Projection (EAAP) incorporated a 2-year ahead assessment of energy adequacy based on hydrological inflows, dam levels and restrictions in thermal generation in order to provide the market with advisory information and the market operator with powers to procure capacity to ensure reliability of supply was forecast to be met. In the same period of time one of the pricing regions, Snowy, demonstrated situations that enabled exertion of wholesale market pricing ability. This led to abolishing the Snowy region of the NEM, reallocating regional borders and affected generator regional allocation.

The first seven years of the WEM delivered only a handful of new generation investments, many of which were already in an advanced state of planning prior to the beginning of the market. A Western Australia energy market review program (EMR) was initiated in 2014, citing the primary need for review as the "high cost of electricity supply in Western Australia and the associated high cost of a government subsidy for small-use customers is the main reason for the proposed reforms to industry structure and market mechanisms identified by the Review".[15] The review identified the need for reforms to industry structure and market mechanisms to enable greater

[15] Public Utilities Office, Electricity Market Review, Options Paper, December 2014

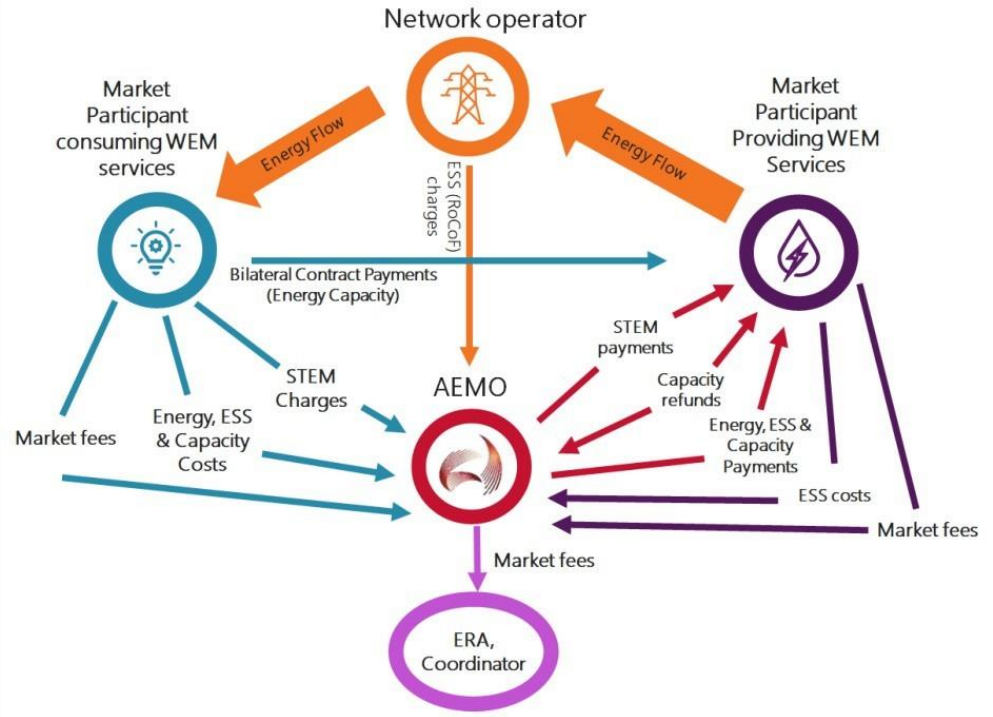
investment in renewable energy and support the transition to a more sustainable and affordable power system. A major outcome of the 2014 review was the establishment of the Australian Energy Market Operator (WA) (AEMO (WA)) to improve maturity and transparency of dispatch and pricing processes. This included formal separation of ring-fenced System Management group out of the Western Power networks business and into AEMO (WA). The 2014 reforms stimulated the connection of two new major wind farms and several smaller solar farms on the basis of a "non-reference" connection standard. The non-reference connection standard allowed the new generation to connect on a constrained access arrangement and thereby avoid the high cost of deep network reinforcement. A second critical issue stifling investment in the WEM is ineffective competition in the generation and retail space. This is summarised in the ERA's 2020 review[16]:

> *The market objective of encouraging competition among generators and retailers is not being met. While Synergy's wholesale market share has fallen, largely because of rooftop solar, the WEM remains highly concentrated. Demand cannot be met without generation from the three largest generators: Synergy, Alinta Energy and Summit Southern Cross Power. More than a quarter of the time, demand cannot be met without Synergy's generation, particularly in the afternoons and into the evening when demand peaks. Consequently, the market is always dependent on its market power mitigation mechanisms to prevent the misuse of market power and the resultant higher energy prices.*

In 2022, the WEM is once again embarking on a significant reform program to fully enable real-time security constrained economic dispatch and market based procurement and trading of essential system services. [17] The transition to security constrained economic dispatch is an important development in the evolution of the WEM as it will allow the connection of new renewable generation resources which over the past decade have been disincentivised by the high cost associated with the connections and access framework. The issue of market concentration will still take several years to be diluted, which will come about through the planned retirement schedule of the Synergy coal generation portfolio between 2024 and 2030. One unexpected challenge of the WEM related to the prudential and settlements system. Cash flow settlements must be clearly articulated, and systems put in place to ensure rules are adhered to. One of the 2022 reforms is to articulate this aspect of market design more clearly. The key illustration of this is shown below.[18]

[16] Report on the effectiveness of the Wholesale Electricity Market 2020, Economic Regulation Authority,
28 August 2020. Available https://www.erawa.com.au/cproot/21468/2/WEM-Report---Final---2020-v4.1-Redacted-further-for-Publication.PDF
[17] WEM Reform: Wholesale Electricity Market Design Summary, May 2021. Available wem-reform-market-design-summary.pdf (aemo.com.au)
[18] wem-reform-market-design-summary.pdf (aemo.com.au), Figure 1, pp14

Figure 11 | Illustration of cash flows between market trading entities and market operator



A very high level of information transparency is key to attracting participation and investment in the evolving market. This is obviated by the level of information available in relation to real time market operations, operational forecasting and rules and regulatory change processes in the NEM and WEM:

1. AEMO | National Electricity Market (NEM)
2. https://www.aemc.gov.au/energy-system/electricity
3. Wholesale Electricity Market - Economic Regulation Authority Western Australia (erawa.com.au)
4. Wholesale Electricity Market (www.wa.gov.au)

The establishment and continued evolution of transparent market pricing in the two major Australian markets has enabled risk-based investment from the private sector and emergence of a significant number of independent power producers. There are several emerging themes that are common to the outworking of increased penetration of variable renewable generation, both at the small-scale distribution level and large-scale transmission connected developments:

1. The need for major investments in the regulated monopoly transmission network has been significantly delayed, relative to the pace of generation investment. This is partly due to the missing environmental objective of the National Electricity Objective of the NEM and partly due to the generator firm access arrangements of the WEM. Accounting for the long-

term benefits of transmission network investment is a critical enabler.

2. The pace of consumer investment in distributed energy resources (particularly rooftop PV) should not be under-estimated. Establishing a small-scale generation registration compliance program is a critical factor to informing the PASA and operational forecasting processes.

3. Critically and most difficult to overcome is that in the long term, the true cost of the whole energy supply chain should be transparent and ultimately reflected in electricity tariffs. In the NEM this has largely been achieved. However, in the WEM this remains an impediment to full retail contestability and a challenge for the government to overcome.

4. The following sections will talk to the importance of secondary financial markets to manage financial risk and establish revenue certainty. A transparent and stable wholesale energy and essential system services market design is a foundation for competition and attracting private investment. Facilitating a financial framework to enable deep and liquid secondary financial instruments has been shown to be an important risk management factor.

B5 - Expert reflection on Vietnamese significance

There are some similarities for Vietnam and lessons learnt from Australia's experience can be drawn out including:

- The transmission and distribution network in Vietnam are 100% owned by the State and managed by National Transmission Corporation and Power Corporations under EVN. Previously, the investment in network infrastructure is limited to activities done by those units, however, recently, the revised Electricity Law opens up opportunities for other stakeholders to invest in the network. According to Decision 24/2017/QD-TTg Transmission price, distribution and retail price and other service price are contributed to the retail average retail tariff. The transmission price is calculated based on capital expenditures, operation and maintenance expenditures and return on equity rate (ROE) as regulated in Circular 02/2017/TT-BCT and Circular 14/2022/TT-BCT. The ROE is decided based on the retail tariff or other basis by the Government. On the other hand, the distribution and retail prices and supporting service prices (for administration, dispatch service) are not clearly defined in any regulation. Currently, Vietnam still apply the national margin price without differentiating cost for transmission in regions. There remains an existing cross subsidy mechanism among Power Corporations due to the imbalance between demand and supply structure in each region. The retail tariff also covers the power purchase prices which are calculated annually.

Therefore, the underlying price signal is not reflected in the customer tariff.

- The market design in Vietnam is based on the gross pool market principles with the objective to optimize electricity price within a cycle in consideration of technical operating limits. The operation of the markets is designed and approved by MOIT for both wholesale and retail markets in 2015 then 2020. At each stage, the markets were in pilot implementation then full implementation. From the starting point, the intention is to have greater participation from various power plants including: BOT power plants, strategic multi-purposed hydro power plants and also RE power plants. In comparison with Australia's market, the proportion of power plants that directly participate in the market is not very high, only about 36%. Vietnam also does not have sufficient conditions in terms of governance structure (establishment of independent SMO) or IT infrastructure to reach the mature stage as Australia market. For the wholesale market, Vietnam only has the energy market, while Australia have energy market (NEM, WEM) and eight frequency control ancillary services (FCAS) market to support the system reliability. Importantly, Australia has a mature financial market to facilitate investors managing their risks through various hedging methods. The financial market in Vietnam is currently at the stage of analysis for pilot implementation. The transparency of the market is also a key point for Vietnam to consider to increase the attractiveness for the private sector. As in Australia, it's required the market operator to prepare and provide the market with next day, short term and medium term forecast of the adequacy of the power system to stay within the reliability standard (PASA) and also the Energy Adequacy Assessment Projection (EAAP) report with the information on the impact of potential energy constraints, such as water storages during drought conditions or constraints on fuel supply for thermal generation, on supply adequacy in the National Electricity Market (NEM).

Establishing stable and competitive energy markets has the potential to contribute to the efficient delivery of PDP8. It is therefore necessary for the delivery of PDP8, but may not be sufficient given the magnitude, timing and type of investment that the PDP8 demands.

Issue 3 - Embedding an environmental & social objective into the market structure

B1 - Problem context

Australian energy market structures are evolving to meet the changing demands being placed on energy use more broadly and on electricity use in particular. The demands themselves are not new but the priority being placed on them is changing. Those demands include embedding

an environmental and social objective into the market structure. The integration of environmental objectives into the market design requires a significant shift in thinking and policy-making. This includes not only the introduction of new regulations and policies, but also a change in the mindset of key stakeholders involved in the market. For example, market participants such as energy retailers, generators, and consumers, would need to place a greater emphasis on environmental objectives in their decision-making processes. Additionally, regulators and policy-makers would need to balance the need for environmental objectives with the existing priorities of affordability and reliability.

B2 - Strategic setting

The key objectives associated with developing electricity market structures typically involve balancing three key priorities:

- Affordability (and implicitly accessibility)
- Reliability
- Sustainability

The development of the Australian electricity markets that underpins the existing market structure, as discussed under Part A and Part B issues A and B above, was primarily focussed on introducing competition to deliver improved:

- Affordability; and
- Reliability

Affordability

Competition was implemented to increase market competition, encourage innovation, improve efficiency and improve the affordability of supply. It was part of broader economic reforms that occurred across the economy. Those reforms were underpinned by the findings and recommendations of the Hilmer Review.[19] The introduction of competition policy into the electricity industry was intended to drive down costs and increase innovation, leading to lower prices for consumers.

- There is strong evidence that the NEM was particularly successful in that regard and substantially reduced costs.[20] This was achieved by materially increasing efficiency, including plant availability.[21]
- Generation plant availability in Victoria and NSW was shown to increase from below 80% in the early 1990s to around 90%

[19] National Competition Policy Review Report (The Hilmer report), August 1993 (ncc.gov.au)
[20] Energy Reform Implementation Group, Energy Reform The way forward for Australia, January 2007, showed that wholesale spot prices in NEM regions reduced dramatically, up to 10% per year, in the first six years from 1999–2000 to 2005–06 (p49)
[21] Energy Reform Implementation Group, Impediments to investment in Australia's energy market, November 2006, (p27)

following market implementation. The effect of this increase in availability is equivalent to adding 1800MW of base plant to the system.[22]

In addition, other policies were and continue to be used to address social objectives, including:

- Equitable access to electricity infrastructure - regulating network connections to ensure reliability and efficiency, such as implementing standards for grid connections and disconnection policies (e.g. for non-payment)
- Affordable access has also been furthered by:
    - Addressing energy affordability and equity issues through policies that promote fair competition and market pricing, such as regulating retail electricity prices and implementing demand management programs.
    - Broader social policy (e.g. using the government welfare system to protect vulnerable consumers, such those relying on government income)
    - Tariff policy, particularly to manage the impact of changes in tariffs and implementing pricing structures that encourage energy efficiency and discourage excessive consumption during peak demand periods, such as through time-of-use tariffs and demand response programs.

Reliability

Reliability was addressed by implementing the National Electricity Market (NEM) and creating the Australian Energy Market Operator (AEMO) as the central market operator responsible for ensuring the reliability of the grid. Additionally, the Australian Energy Market Commission formed the Reliability Panel as an independent group responsible for reviewing the form of the reliability standard and the market settings associated with the objective of achieving the reliability standard. AEMO also has supplementary powers to directly contract with demand side response and non-market supply options where it deems reliability of supply to be at risk.

Sustainability

Less direct attention was paid to sustainability when the NEM was introduced, although there is strong evidence that it has delivered benefits in that regard. The improved plant availabilities outlined above deferred the need for planned investments in additional coal fired generation capacity.[23]

[22] P., Simshauser, 'The dynamic efficiency gains from introducing capacity payments in the NEM Gross Pool', conference paper No.8, p5.
[23] P., Simshauser, p5.

- In more recent times a key focus of policy developments has been to pay increasing regard to sustainability objectives (in particular carbon emissions), whilst also addressing the second order impacts both on reliability and sustainability.

- Embedding sustainability objectives into the NEM has been more problematic primarily due to the amount of change those objectives imply for the electricity industry and the associated cost..

B3 - Solutions

There are a large number of policies at both the Commonwealth and State levels focussing on reducing carbon emissions. Increasingly some are addressing both sustainability and reliability at the same time, as the link between the two objectives has become more evident. The key policies at the Commonwealth and NEM market structure level have been:

- The Commonwealth Government's legislated 43% emissions reduction target by 2030, which relies on an 82% reduction in electricity industry emissions relative to 2005 levels.[24]

- The proposed inclusion of an emissions objective into the National Electricity Objective (NEO) in the National Electricity Law.[25] A consultation process is now well advanced to include an explicit emissions objective into the NEO, which will require the AEMC to consider the impact of its decisions on carbon emissions and the existing NEO. In effect, this means that emissions become (like reliability standards) an additional constraint in the optimisation process that seeks to minimise costs in the long-term interests of consumers

- The Australian Energy Market Operator's (AEMO) 2022 Integrated System Plan (ISP)[26], which sets out for the first time an 'Optimal Development Pathway' for the National Electricity Market to contribute to achieving both the 2030 emissions target and net zero emissions by 2050. This influences the planning process for the transmission system in particular.

- Reforms to the Safeguard Mechanism: This broader policy is aimed at reducing greenhouse gas emissions from the largest emitters in Australia. Reforms to the Safeguard Mechanism have been approved and will come into effect on 1 July 2023 to address issues with the policy's original design, including its limited effectiveness in reducing carbon emissions. Explicitly, 215 large energy users will be required to reduce their carbon emissions by 30% by 2030.[27]

[24] The Commonwealth of Australia, The Climate Change Act 2022
[25] https://www.energy.gov.au/sites/default/files/2022-08/Energy%20Ministers%20Meeting%20Communique%20-%2012%20August%202022.docx
[26] AMEO, 2022 Integrated System Plan, June 2022
[27] https://www.climatecouncil.org.au/resources/safeguard-mechanism-decision-explainer/

- The renewable energy target to achieve 20% renewable generation by 2020.
- The Australian Renewable Energy Agency (ARENA), which is a Commonwealth corporate entity that provides grants to fund renewable energy projects and delivers knowledge sharing to industry and the relevant technology sector. It focuses on increasing the supply and improving the competitiveness of renewable energy technologies in Australia.
- The Commonwealth Clean Energy Finance Corporation (CEFC), which is an entity that facilitates funding to the clean energy sector. It focuses on investment in clean energy projects that may not be able to achieve finance from commercial sources.

There are also numerous state-based schemes to further reduce carbon emissions and incentivise the development of renewables including state based renewable energy targets and mechanisms to reach those targets, including for example

- The Victorian Renewable Energy Target (VRET) which has led to two rounds of underwriting of renewable energy developments
- The development of Long-Term Energy Services Agreements (LTESAs) in NSW to secure financing for renewable energy projects including storage
- Feed in tariffs for rooftop solar PV
- State Government's purchasing renewable energy underwritten by their own energy consumption
- Explicit carbon emission reduction targets, which in some cases are legislated

B4 - Expert reflection on Australian experience

The key reflections are as follows:

- Some aspects of electricity markets have been destabilised by the policies introduced to rapidly reduce carbon emissions
- Importantly, whilst those policies are leading to reduced emissions, they are often poorly designed and not coordinated
- This has coincided with higher wholesale electricity prices (see Issue D) and higher retail electricity prices (where the costs of schemes have been passed onto consumers, such as the RET) affecting affordability of electricity supply for consumers

- With an ageing generation fleet, in effect the entire existing capital stock of the industry needs to be replaced or substantially upgraded over the next 20 years. Whilst this is perhaps different timing to other markets, it is never too early to start preparing for large scale generation retirements.

- The current attempts to hasten down the pathway or retiring ageing (and high carbon emissions intensity) generation facilities are now running into substantial logistical constraints due to the previously discussed challenges relating to transmission network investment and global supply chain constraints on renewable generation development

In hindsight, the Australian approach has been sub-optimal. A more formal carbon emissions pricing regime (e.g. carbon tax, emissions trading scheme or similar) may have helped. Such a carbon pricing policy was in place in Australia for a short period in 2012 to 2014, however it proved to be politically unsustainable at that time. The International Energy Agency (IEA) has stated that achieving net zero emissions "*will require the widespread use after 2030 of technologies that are still under development"*, and that *"in 2050, almost half the reductions come from technologies currently at demonstration or prototype stage".* Moreover, the IEA's most recent Electricity Market Report notes that governments have implemented a suite of policy measures to decarbonise their economies and electricity sectors, but even if implemented in full, they would be insufficient to meet net zero emissions.[28] In addition, it has very recently drawn a very similar conclusion for Australia specifically.[29] Indeed, it suggests that a rapid and significant set-up in efforts to reduce emissions in the electricity sector will be required to meet the 2030 targets).

B5 - Expert Reflections on Vietnamese significance

There are a number of potential implications for the Vietnam. The introduction of sustainability objectives (and energy transition) has been and remains a fundamental challenge for Australia's and many other electricity markets worldwide. Enabling energy transition, whilst not unduly impacting on reliability and affordability, remains a key priority.

The contribution of RE in Vietnam's generation mix has increase recently and reached 24% (solar) and 1% (wind). The most significant increase occurred during 2020 to meet the condition for FIT policy.

After having the commitment in COP26, a large number of policies have been issued in Vietnam to set the target for reducing carbon emission:

[28] International Energy Agency 2022, Electricity Market Report 2022. https://iea.blob.core.windows.net/assets/d75d928b-9448-4c9b-b13d-6a92145af5a3/ElectricityMarketReport_January2022.pdf
[29] Australia 2023 Energy Policy Review (windows.net)

- Resolution 55 (2020) sets the target to increase RE proportion in the energy mix to 15 – 20% by 2030 and to 25 – 30% by 2050, to increase energy saving rate in comparison with normal scenario by 7% in 2030 and 14% in 2050, to reduce GHG emission of energy sector by 15% in 2030 and 20% in 2045;

- The Green Growth strategy (2021) also follows the Resolution 55 targets on RE's proportion in energy mix increase from 15% to 30% for the period from 2030 to 2050;

- The National Climate change strategy (2022) sets the target to increase the contribution of RE in the generation mix to 33% by 2030 and to reach 50% by 2050.

Most recently, PDP8 effectively:

- Overlays an explicit environmental objective on the market structure by dictating the generation mix that will be permitted. PDP8 must provide appropriate power development *"based on the protection of resources and the environment"*.

- Includes consideration of social objectives including delivering the *"lowest cost".* PDP8 also calls in respect of tariffs for the *"harmonisation between (A) the political-economic-social goals of the State and (B) the production, business and financial autonomy objectives of the enterprises"* It therefore recognises the trade-offs between environmental protection and costs to consumers, but is less explicit on how the latter will be delivered.

With the current state and the targets for the next period, it's expected to have higher level of RE integration into the power system. Together with the unequal distribution of RE across regions, it may create a challenge to maintain power system security and reliability. Congestion and curtailment have occurred recently. Therefore, to ensure the energy security and system reliability, it's important to have flexible generation (gas power plan, pumped Storage Hydropower, etc.) with suitable auxiliary services mechanism to deliver the financial feasibility for the investors. The master plan to develop RE power plants across regions shall be carefully considered to reduce the cross-region transmission. The RE production forecast and planning capability is also essential to be enhanced.

Currently, the retail tariff is calculated based on the average electricity retail price and the tariff structure for each group of customers. The domestic purpose, the tariff structure may support vulnerable customers who have low consumption with lower percentage in comparison with the average tariff. However current tariff structure is not very clear to the end users about the prices of each phase within the value chain and other government's subsidies toward the affordability target. On the other hand, to ensure the affordability of electricity, the contract mechanism and other financial enablers on the

market may need to be further developed to support investors' risk management and to maintain a stable wholesale market price.

Issue 4 - Attracting capital to electricity markets

B1 - Problem context

The transition of electricity markets to heavy reliance on intermittent renewables is creating substantial challenges for attracting capital to electricity markets, because of the direct impacts they have on the wholesale market pricing mechanisms, the price volatility they introduce, and the uncertainty created by government policies to introduce them. For the purpose of this discussion, it is assumed that attracting capital means attracting private sector capital.

The capital needed to enable energy transition is very substantial and growing. There does not appear to be a shortage of global capital supplies to address the energy transition. Private equity has recently assumed control of one of Australia's largest generators and retailers (or 'gentailers'), AGL and Origin Energy is the subject of one of Australia's largest private equity buy-outs ($A18.7 billion, current transaction subject to regulatory approval))[30].

The amount of new renewable capacity proposed by developers is truly remarkable. It is however becoming evident that there is a mismatch between the risk capital providers are willing to take and the risks that the market presents. It is, therefore, becoming increasingly difficult for the private sector to invest in generation, without increasing government support, particularly at the level required to meet the investment need. This is reflected in the low levels of projects reaching financial close compared to the investment need. This is a function of:

- The level of market uncertainty
- The impact that high penetration of intermittent capacity has on the market given the nature of existing baseload generation, the cost structure of renewables and the implications for wholesale electricity prices
- The willingness of government bodies to directly invest in new capacity into the market. This activity is likely to crowd out at least some of the investment that the private sector would have undertaken anyway. i.e., the more government underwrites investment the harder it can become for the private sector to justify investing.

[30] Origin Energy takeover: Brookfield promises billions for decarbonisation, investors on board (afr.com)

B2 - Strategic setting

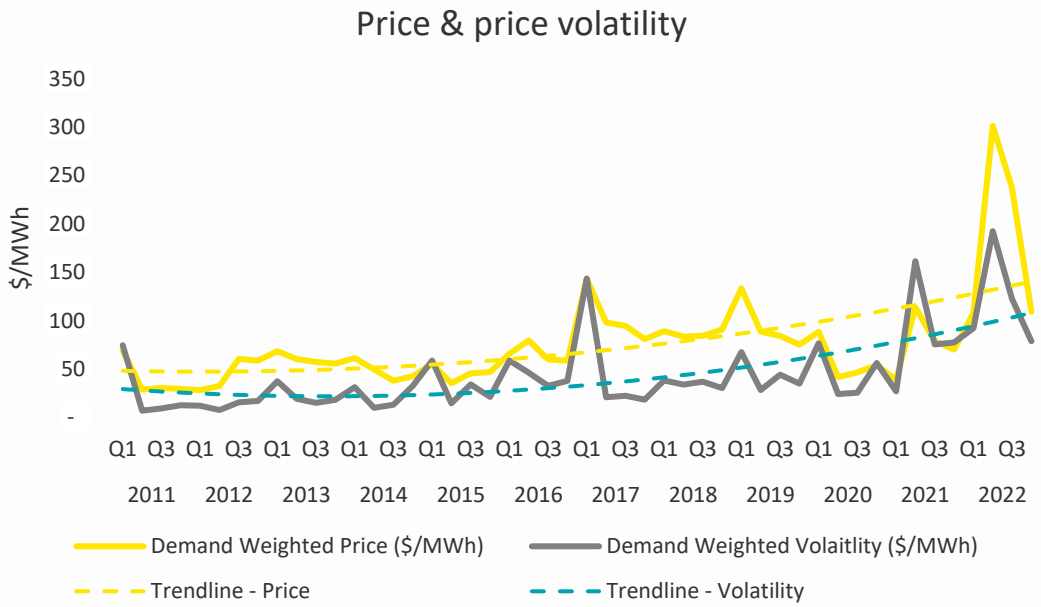
Price and price volatility

The rapidly increasing penetration of renewables has coincided with substantial wholesale price increases and substantial increases in price volatility. The following chart shows (nominal) wholesale electricity prices and price volatility in the NEM over the period 2011 to 2022.[31] It particular, it shows that:

- Prices, based on the trendline, have increased by 185%. This is an 8% increase over that recorded to June 2022 (171%), despite a material reduction in prices over the last six months of that year.
- Price volatility, on the same basis, has increased by 288%. This is a 14% increase over that recorded to June 2022.

This substantially increases the risks associated with attracting private investment, as the price increases are not uniform. Price predictability and stability is perhaps more important than simply "high" prices. But to meet the carbon emission targets substantially more renewable investment is required, which is also substantially more investment than Australia has ever delivered at any time in the past.

Figure 12 | Illustration of wholesale electricity market price and volatility metric in the NEM

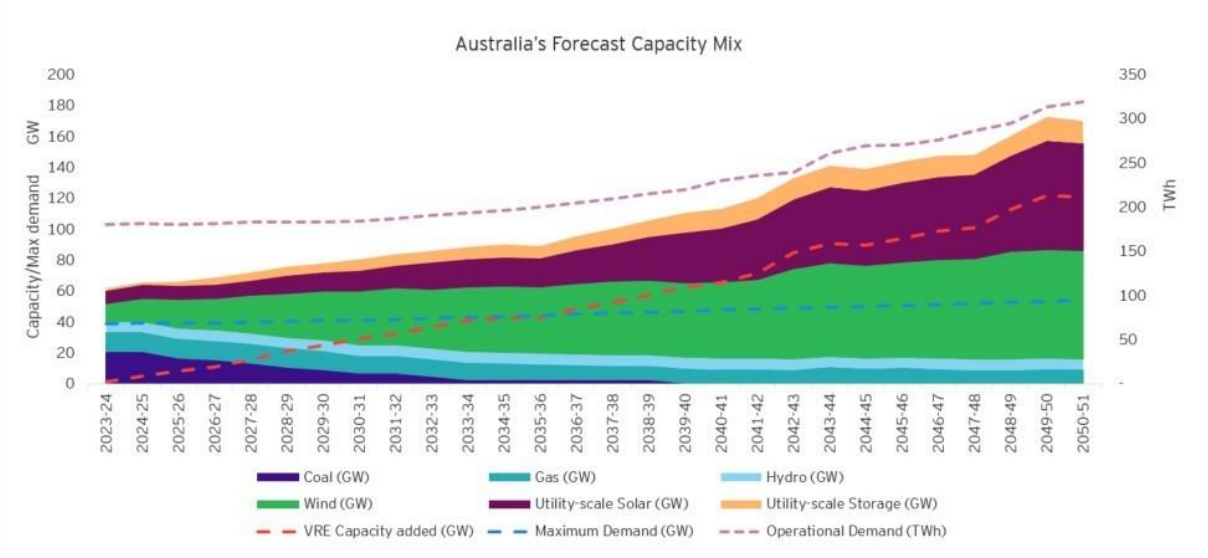


[31] EY analysis. The period from 2011 is used as this is when material quantities of variable renewable energy (VRE), as defined by AEMO, started entering the market. The figures are nominal for ease of presentation. The demand weighted price is an 'average' NEM wide figure. It is estimated by taking the average quarterly demand weighted price in each NEM region and averaging that by each region's share of demand. The trendline is estimated using the 2nd order polynomial approach because it provides a more accurate representation of data by incorporating the data volatility within the period, as compared to a simple linear trendline. Demand weighted volatility is measured using the standard deviation of the daily prices in each region, averaged by quarter and averaged by that region's share of demand. There are of course a large number of ways in which volatility can be measured which may yield different results.

The investment need

The AEMO ISP 2022 has identified an Optimal Development Pathway to enable meeting the 2030 and 2050 emission targets.[32] The chart below shows AEMO's forecast capacity mix, including the increased Variable Renewable Energy (VRE) capacity, maximum demand and total output to 2050 (based on the AEMO ISP 2022 Step Change Scenario).

Figure 13 | Illustration of magnitude of investment need in the NEM to 2050



The forecast requirement is circa 4,750 MW/year to 2030.[33] That is substantially more capacity than Australia has ever delivered in a single year and it needs to be replicated every year for the next 7 years. The cost implications of meeting the forecast investment need are outlined in the table below

Variable	Unit	Current	2030	%	2050	%
Capacity	GW	60	81	35	170	180
Maximum demand	GW	39.0	41.4	6	54.5	40
Capacity as a proportion of maximum demand	%	153	–	196	–	311
Output	TWh	180	184	2	323	80
Asset Utilisation	TWh/GW; % change on current	3.0	2.2	-26	1.9	-48

[32] Australian Energy Market Operator, 2022 Integrated System Plan, June 2022, https://aemo.com.au/-/media/files/major-publications/isp/2022/2022-documents/2022-integrated-system-plan-isp.pdf?la=en&hash=D9C31A16AD6BF3FB2293C49AA97FE1EA

[33] The investment need determined by AEMO is 35.6 GW to 2030 (or 7.5 years)

In particular, it shows:

- **Falling asset utilisation** – By 2030 net capacity is expected to increase by 35% but demand is only expected to increase by 2%. The fall in overall asset utilisation will to 2030 mostly be reflected in reduced coal generation, fundamentally compromising their financial viability (see Issue E). However, by 2050 material VRE spill (20% of output) is expected.34 Notably, 2050 asset utilisation falls materially from current levels despite strong output growth, driven by fuel switching (to meet net zero emissions) particularly after 2040. This is because capacity grows much faster than output (and faster still than maximum demand).

- **Increasing asset intensity** – the system becomes significantly more asset intensive, which also reflects the greater capital intensity of VRE.

In summary, a decarbonised electricity system based on renewables is going to have substantially greater capital invested than there is demand to support it. The implications for system costs are outlined below. The following table below shows the relationship between capacity, output and cost based on AEMO data.[35] These metrics present a significant risk to the case for private sector investment.

- It shows the extent to which total system costs will increase over the relevant periods. This implies that average prices will need to increase over time if investors are to recover their costs. Alternatively, subsidies will need to increase.

- Over time increased VRE market share will therefore likely lead to greater price volatility because the lower prices when VRE is producing at relatively high levels may be offset by higher prices at other times. The market will also be 'thinner' at those times, which may mean that prices increase by more than costs. This may, however, incentivise more storage.

[34] Intermittent renewable generation assets have lower capacity factors and are therefore effectively more capital intensive but will supply whenever they produce.
[35] The change in total system cost is measured by comparing AEMO's total system costs in the relevant years. The total system cost in 2023–24 is estimated to be $6.06 B. By way of comparison, the total value of energy traded in the NEM in 2020 was $10.9 B (AER 2021 State of the Market Report). AEMO's 2022 ISP does not provide a counterfactual against which to assess relative costs of generation, and thus cost increases, because the targets are assumed to be met (i.e., all required investment is in the Optimal Development Pathway)

Variable	Unit	2030	2050
Capacity	GW	81	170
Net New Capacity	GW	21	110
Retirements	GW	14	25
Gross New Capacity	GW	35.6	135.0
Gross New Capacity as a proportion of existing capacity	%	59%	224%
Capital cost	$B	56.6	166.0
Capital cost per unit of new capacity	$B/GW	1.6	1.5
Capital cost of meeting incremental output	$B	33.4	165.0
Change in system cost	%	56%	278%

The capacity of the private market to deliver that investment

There is no shortage of capital willing to invest in energy transition but there are clear limits on the risks that capital is able to take. The typical mechanism to deliver price sector investment is via (non-recourse) project finance. This requires that the cash flows from the asset is able to support its debt financing. To be cost effective, project financing requires a relatively high degree of revenue certainty. That revenue certainty is underpinned by demand certainty based on underwriting by investment grade counterparties. Power purchase agreements (PPAs) are a common way to finance renewable energy projects in Australia. Under a PPA, the developer sells the electricity generated by the project to a buyer at an agreed-upon price for a set period of time, typically 10-20 years. This provides a relatively stable revenue stream for the project and can make it attractive to investors. The market for PPAs in Australia has grown in recent years, driven by increasing demand from corporate buyers looking to meet their sustainability goals. However, there are challenges in meeting the growing need for PPAs to underwrite new capacity, such as the limited demand growth, the limited availability of suitable buyers, and the risk of PPAs being 'out of the money' (i.e. the strike price being higher than the underlying market price). Despite these challenges, PPAs are expected to continue to be an important way to finance renewable energy projects in Australia

B3 - Solutions

The key policies to attract private capital are the same ones as outlined under Issue C. This includes:

- Changing reliability standards and settings - to provide greater incentive to invest to meet demand when the market is constrained, for example by increasing the market price cap (as discussed in Issue C). Policy makers have already concluded however that this is unlikely to be sufficient

- The move to a capacity market – this may be necessary to provide more certainty to investors (by paying them to install capacity regardless of how well it is utilised). In theory this should not be necessary[36] but in practice it may be required given the price volatility implications of relying on an energy only market and the political acceptability of that price volatility

A capacity market will likely reveal the relatively low capacity value VRE provides (e.g., VRE capacity ratios are less than 20% of the most reliable generators in WA's WEM, which does have a capacity mechanism). This means that the capacity payments that an intermittent generator receives will only recover part of the capital costs of building it. Also, it does not resolve the implications of rapidly increasing renewable penetration on prices in the balancing market (i.e. they can be expected to fall when production is low). The evidence from other electricity markets (with capacity mechanisms) is that the need to separately underwrite capacity to achieve energy transition is not removed.[37]

B4 - Expert reflection on Australian experience

There are a number of reflections that can be drawn from the Australian experience. The key reflections are as follows:

- There is no shortage of potential supply of capital, as long as the investments are sufficiently de-risked.

- It remains to be seen whether the private equity that has recently entered the market will be prepared to take more market risk. Even if it is, it seems probable that the returns they require will be higher than the investors they are replacing, before any allowance for the increased industry risk. This will ultimately be reflected in prices. It is more likely that they will require investment to be substantially de-risked as well.

However, the market simply does not have the capacity to de-risk the requisite amount of investment, and even if it did, the risks associated with investing are increasing. At present, it is difficult to avoid the conclusion that the investment need is only likely to be met with

[36] A capacity market is not essential as the existing energy-only market can provide sufficient incentives for generators to invest in new capacity. However, in practice, a capacity market might be considered necessary due to political reasons as policymakers may be hesitant to rely solely on the energy-only market for the reliability and security of electricity supply, especially during high demand periods. The energy-only market may not provide sufficient long-term price guarantees for investors, which a capacity market can provide, making it a more politically acceptable solution (Wolak, F.A. 2005. *Managing Unilateral Market Power in Electricity*. World Bank Policy Research, Working Paper 3691, September 2005. P5)

[37] The United Kingdom (UK) Government has played a significant role in supporting investment in renewable energy projects in the UK by providing underwriting and financial guarantees. The Contracts for Difference (CfD) scheme is one such mechanism that offers long-term price guarantees to renewable energy producers, and it has proven successful in attracting significant investment, especially in offshore wind projects. Furthermore, the government has set up the Green Investment Group (GIG), a government-owned company that invests in renewable energy projects and provides financial expertise to the private sector. The GIG has successfully attracted private capital to the renewable energy sector and has facilitated large-scale projects such as offshore wind farms.

substantial government support either through underwriting of private capacity or through direct government investment.

B5 - Reflection on Vietnamese significance

Vietnam's challenges in respect of attracting (private sector) capital to electricity markets are broader than those in Australia. In Australia the challenge is primarily about attracting capital to fund energy transition. This creates a unique set of challenges (i.e. essentially replace its existing capital stock in a market where modest demand growth is occurring).

In Vietnam the challenge is attracting capital to fund the rapid growth in demand, which is a function of broader market reforms discussed above, and increasingly to fund energy transition within that context. This creates substantial challenges too, but somewhat different to those Australia is experiencing.

It is likely that resolving the former will go some way to resolving the latter. In other words, in the near term, persuing market reforms is likely to be the best way to attract capital. Other complimentary measures to attract capital to fund energy transition can be developed in that context. Further consideration for Vietnam is to establish mechanisms for RE and other power plants to participate in the market. The mechanism to get existing BOT power plants and RE power plants to participate in the competitive market is under analysis and has not been officially decided. Besides, after the FIT mechanism to promote RE expired, there have not been any new policy guidance relating to the development of RE, especially, for off-shore wind projects, a potential and new area in Vietnam.

PDP8 recognises the need to encourage private capital investment to deliver the plan. It is less explicit however on how it will provide that encouragement and how that will be balanced with government investment. It is likely that complimentary policies to the ongoing market reform will be required to deliver the scale, timing and type of investment required.

Issue 5 - Financial sustainability of electricity service provision

B1 - Problem context

As Issue C & D show, the greater focus on environmental sustainability (e.g. carbon emission targets) is leading to unprecedented changes in the electricity industry and is challenging the capacity to attract capital to deliver the required investment. This is creating substantial challenges for the financial sustainability of electricity service provision. For example, in the latter half of 2022, neither of the NEM's two largest gentailers were prepared to provide annual earnings guidance, due to market volatility. Both have since been effectively taken over by private equity (control has changed in respect of AGL and Origin is likely to be delisted if the agreed takeover by Brookfield and EIG gets regulatory approval).

B2 - Strategic setting

Issue 3 outlines the policies that have been put in place to deliver greater environmental sustainability (e.g. emission targets). Issue4 focuses on the implications for attracting capital to electricity markets (for new investment) to deliver the investment required to meet those emission targets. These policies have created substantial challenges for the financial sustainability of electricity service provision. For the purposes of this analysis financial sustainability is defined to mean the ability of investors to recover their costs and a commercial return on the capital employed over the short to medium term.

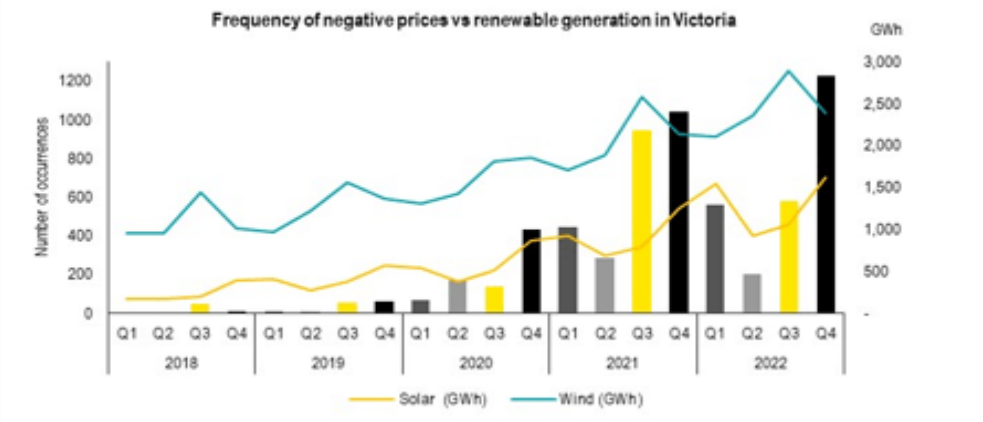
Issue 4 addresses the issue of the forward-looking financial sustainability of electricity service provision. The discussion under Issue E focuses on the current issues with the financial sustainability of electricity service provision (e.g. for existing generators), The current challenges to financial sustainability are a function of the introduction of a substantial amount of new renewable energy capacity into the market. It creates challenges primarily due to the following factors:

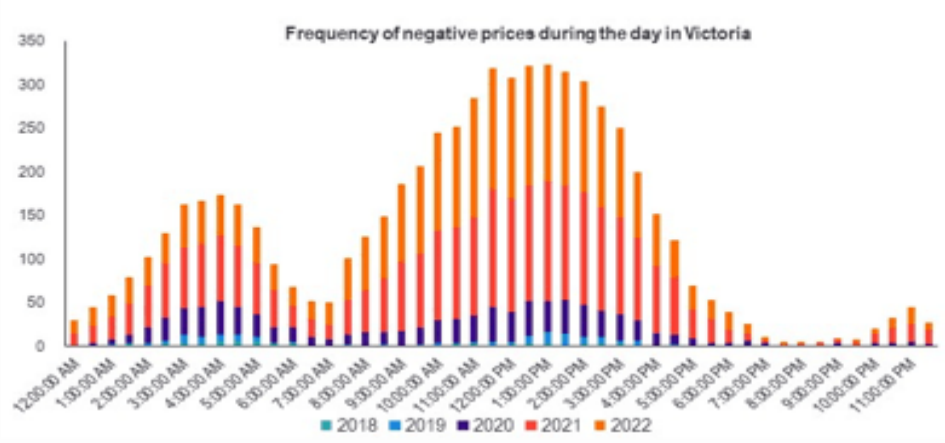
- Most renewable capacity produces intermittent generation – generation can vary widely in the short and medium term depending on the weather
- The cost structure of that capacity and the implications it has for wholesale market prices:
    - Renewable generation has practically zero marginal costs so it typically bids into the market at prices close to zero (putting aside the impact of external policy support mechanisms)
    - This means that wholesale prices are often very low when VRE is producing at relatively high levels

Most coal fired generation is designed to operate at consistent levels of output and have relatively high minimum stable operating levels. This means coal fired generation is forced to bid at negative prices to get called in the merit order before renewables, even though this will often mean that the price they receive may be very low or negative some of the time. The figures below provide an example for market pricing outcomes in the Victoria pricing region:

- The first graph shows the increase in the frequency of negative prices between 2018 and 2022 versus the amount of renewable generation in Victoria.[38]
- The second graph shows the growth in the frequency of negative prices in Victoria between 2018 and 2022 by time of day.[39] The increases are a function of wind and solar generation at the relevant times of day (i.e. wind only at night when demand is low but the coal fired generators need to continue running).

Figure 14 | Implications of significant penetration of low marginal cost variable renewable generation resources





[38] Based on EY analysis
[39] Based on EY analysis

In order to recover their costs, it is therefore necessary that prices the rest of the time are much higher. But the baseload generators are typically price takers, so cannot influence prices at those times. This has fundamentally undermined the profitability of baseload generators, notwithstanding with greater market disruption there are times when they can earn significant profits (provided of course that policy makers do not intervene in the markets to fix prices at those times).

These market conditions have also impacted on the financial sustainability of mid-merit and peaking generators due to the greater uncertainty that now exists. While greater market volatility can improve the financial position of these generators, there is much greater uncertainty in respect of that volatility than there once was. Previously high price events were largely a function of demand side events (e.g. hot weather) and quite predictable; now they can be a function of either supply side events (e.g. relatively low renewable production and plant outages), demand side events or some combination thereof. The increased uncertainty increases the risk and the cost of capital.

B3 - Solutions

The challenges to financial sustainability have manifested themselves in:

- The early retirement of certain coal fired power stations and proposals to bring forward the retirement of other coal fired generation. For example, the closure of Hazelwood Power Station in Victoria in 2017, the planned closure of Liddell power station in April 2023, and Eraring power station due to close in 2025.[40]

- The refinancing of certain generation business[41] such as Intergen's Callide Power Station in Queensland, which faced financial difficulties leading to receivership and the exit of certain investors from the industry (replaced by private equity).

- Falling returns and increased government support (either directly or indirectly) for government owned generation,[42] leading to taxpayer-incurred losses in places like Queensland where power generation assets remain under government ownership.

- Moves to provide greater control over the exit of power stations,[43] such as the rule changes requiring power stations to give at least 3 years notice before closure.

40 You, Kevin and Wild, Daniel, Australia's Net Zero Energy Crisis, June 2022, P4
41 https://www.csenergy.com.au/news/statement-regarding-genuity
42 https://www.aemc.gov.au/rule-changes/amending-generator-notice-closure-arrangements
43 https://www.aemc.gov.au/rule-changes/amending-generator-notice-closure-arrangements

- The provision of government support to ensure certain power stations stay open to meet demand, despite economic challenges (such as Yallourn Power Station).[44]

- The moves to introduce a capacity market (see Issue 4), although it is unlikely to apply to existing gas and coal fired generators.

- Falling reliability of certain existing coal fired power stations due to the reduced incentive to invest in them.[45] The market events of 2022 described in Issue D were in part a function of unplanned plant outages.

AEMO or government agencies have intervened in the market as described in Issue D including suspension of the market and the capping of input costs to manage price outcomes. The willingness to intervene in the market creates further risks, as it makes it more likely that it might happen in future. Higher prices are necessary for periods of time to enable generators to recover their costs and to incentivise new investment. If such high price events do not eventuate because policy makers are putting affordability in the short term above the financial sustainability of existing generators this ultimately challenges the reliability of the system.

The AEMO has warned about threats to the reliability of supply in its publications, such as the need for strategic investments in new, flexible, and reliable generation and storage assets, as well as demand-side management initiatives to maintain system stability and reliability. It is important to strike a balance between short-term affordability and long-term reliability of the power system.[46]

B4 - Expert Reflection on Australian experience

There are a number of reflections that can be drawn from the Australian experience. The key reflections are as follows:

- The process of introducing environmental objectives (such as the Renewable Energy Target and various emissions reduction policy objectives) has been disorderly resulting in unintended consequences

- Further measures may be necessary to ensure financial sustainability of existing generators. These are likely to take the form of bespoke ‘capacity payments’ to keep the relevant baseload plants open until a similarly reliable (but low carbon emission producing) solution can be found.

44 https://www.premier.vic.gov.au/statement-minister-energy
45 https://reneweconomy.com.au/structural-failure-takes-callide-coal-plant-offline-18-months-after-explosion/
46 AMEO, 2021 Electricity Statement of Opportunities, August 2021, https://aemo.com.au//media/files/electricity/nem/planning_and_forecasting/nem_esoo/2021/2021-nem-esoo.pdf

The focus is now on the government 'managing' the more orderly exit of existing fossil fuel fired generation to ensure maintenance of reliability, whilst not threatening affordability.

B5 - Expert Reflection on Vietnamese experience

The issues Australia is facing in respect of financial viability are primarily a function of the energy transition it is undertaking and the implications it is having for existing generators.

These issues are likely to be less relevant to Vietnam in the near term.

The Vietnam electricity industry, however, faces its own substantial challenges with financial viability. These are a function of the stage of market reform that the industry is at, the weaknesses in that position, and much more substantial challenges Vietnam faces with introducing more cost reflective prices.

Further consideration for Vietnam may be noted as:

- Congestion and curtailment issue due to the imbalance of RE development and demand across regions and the limitation of network capability may result in lower investors' profitability and the attractiveness of the market.

- The direction to have higher contribution of gas power plants (including LNG) to support the energy transition may also require new investment in association with the risk of gas price volatility. Therefore, it may be important to have further development of the contract mechanism or other financial tools to support financial sustainability for investors.

The energy transition also requires lowering the contribution of coal fired power plants. The phasing out plan for coal fired power plants shall be analysed to ensure the financial sustainability for investors.

PDP8 recognises the need for a stable and sustainable power system of which financial stability of service provision is part. In respect of tariffs, PDP8 also calls for the *"harmonisation between (A) the political-economic-social goals of the State and (B) the production, business and financial autonomy objectives of the enterprises".* It therefore explicitly recognises the trade-offs between financial sustainability and costs to consumers, but is less explicit on how this will be achieved.

FE–V

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Viet Nam

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