



ENGINEERS  
AUSTRALIA

# Energy Governance and the Engineering Voice

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ENERGY EVP DISCUSSION PAPER

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# Executive Summary

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A reliable and secure supply of electricity is a critical component of modern life and drives the Australian and global economies. Australia is undergoing an energy transformation at an unparalleled pace and scale.

The certainty of climate change and the need to radically reduce emissions, coupled with the need to enhance the resilience of physical energy assets and systems, drives the urgency of the transformation process facing Australia. Actions and investments taken between now and 2030 will determine how successful the transformation will be. Energy is the principal driver of economic prosperity and is essential to ensuring high living standards. Unfortunately, energy is a controversial policy area that has been overly politicised, to the detriment of the community, environment and economy. This document is a reflection of stakeholders' input and a response to these issues.

The context for energy advocacy is challenging. It includes a complex mix of political, regulatory, commercial and technical issues. The energy debate is fractured and divisive. Constitutional powers for energy matters reside with the states and territories, but a national electricity market was established in 1998 and is regulated by the Australian Government. Many Engineers Australia members feel the federal government is not playing a strong enough role in the coordination of a strategic and future-focused energy sector. Much change is being driven by the states and territories, government institutions, the private sector, and consumers.

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Engineers Australia advocates for a comprehensive national plan based on science and facts that outlines a clear transition from fossil fuels to clean, reliable, low-cost energy.

Yet, as well as these challenges, there are also opportunities. Australia has the resources to become a world leader in the low-carbon energy future. Australia has a rich endowment of the critical minerals needed for electrification of both existing and new low-emissions industries, excellent sunshine and wind to power renewables, and the engineering expertise to develop and deploy new technology and industries. Energy-intensive industries can leverage Australia's natural resource advantages to reduce costs, add value and improve global competitiveness.

Many international and local agencies believe the right policy settings could create well over a million jobs in Australia's 'green' economy. If Australia implements appropriate policy settings and more deeply engages engineering expertise, it can secure low-cost, reliable, clean energy that generates additional jobs and new market opportunities.

However, there is no comprehensive national transition strategy to take Australia from a centralised system of large fossil-fuel generation to smaller-scale distributed generation through renewables and new fuel sources such as hydrogen. The necessity to reduce emissions will drive changes in the energy sector regardless, but the lack of coherent policy settings can only harm the transition.

Engineers Australia advocates for a comprehensive national plan based on science and facts that outlines a clear transition from fossil fuels to clean, reliable, low-cost energy. The certainty and increasing severity of climate change increases the urgency to develop a comprehensive transition plan with engineering expertise at its heart.

Electricity networks are massive in scale and are dynamic systems within systems. The facilitation of market forces is very apparent in current governance, but an independent technical voice is lacking in decision-making and forward planning. Highly competent engineering is critical for electricity market design, safe operation and technical innovation. Technical leadership is progressively being devalued and this is reflected in diminished safety, reliability and efficiency. The power system engineering workforce is in decline and is not keeping up with rapid changes in the sector. The current governance arrangements are a separation of functionally differentiated roles that lack systematic reference to independent engineering advice.

Australia needs coherent and stable policy settings focused on community benefit and certainty for investors. Engineering solutions must also be integrated with political, economic and social concerns. If these issues are considered in isolation, Australia will not achieve an orderly transition to clean, reliable and cost-effective energy. Policies that reflect competing and conflicting interventions make the energy transition slower, less transparent, and more costly than it needs to be. Policy settings should drive consumers and investment to the cleanest and most efficient technologies.

Widespread electrification is a significant challenge, but the increase in renewable electricity supply will reduce total system costs. The challenges are large, but so are the opportunities. With the right vision and clear short- and medium-term targets, Australia can target further substantial transition to clean electricity by the mid-2030s.

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Australia needs coherent and stable policy settings focused on community benefit and certainty for investors. Engineering solutions must also be integrated with political, economic and social concerns.

# 1 Introduction

## 1.1 THE EXTERNAL VOICE PROJECT

Engineers Australia's Strategy 2020–23 seeks to strengthen the engineering profession's contribution to public life and to be recognised for doing so. The External Voice Project (EVP) is an exciting new initiative for delivering on this Board priority.

Engineers Australia's strength is its established system for contributing authoritative technical perspectives to public policy debates. The EVP will help to unlock that value and integrate technical perspectives into broader public policy discourses and decisions.

The EVP will build the engineering profession's reputation for impact in public policy by demonstrating that engineering is a profession that is both technically competent and socially engaged. It will do this via a leadership agenda that builds alliances with community decision-makers on critical and engineering-intensive social matters.

The EVP will focus on four workstreams. These have been selected because they are complex public issues with broadscale community demands for action, and engineering is vital to their success:

- climate change
- energy
- infrastructure
- technology and industry.

With each workstream, Engineers Australia will engage extensively with members and will develop new models for bringing non-member engineers and allied professions into our work. Collaboration is an overarching component of the EVP, with discussion papers used to focus debate.

Advocacy to government and the community is a vital element. Engineers Australia will publish a series of directions papers to present a considered view on the future for each issue explored as part of the EVP.

## 1.2 EVP ENERGY WORKSTREAM

During consultations, the following topics were identified as important in the energy workstream:

- energy governance and the engineering voice
- energy/power transition
- energy reliability and security
- skills supply and demand
- energy efficiency
- transport – electrification and hydrogen
- power system services
- information and data analytics
- decarbonisation of oil and gas
- community participation in the grid
- industrial energy use
- hydrogen
- offshore wind
- innovation and research agenda
- tidal, wave, bioenergy, Small Modular Reactors (SMRs).

The certainty of climate change and the need to radically reduce emissions, coupled with the need to enhance the resilience of physical energy assets and systems, drives the urgency of the transformation process facing Australia. This has led most stakeholders to see energy governance as the most pressing need. Actions and investments taken between now and 2030 will determine how successful the transformation will be. Energy is the principal driver of economic prosperity and is essential to ensuring high living standards. Unfortunately, energy is a controversial policy area that has been overly politicised, to the detriment of the community, environment and economy. The first workstream activity, Energy Governance and the Engineering Voice (this document), is a reflection of stakeholders' input and a response to these issues. It is the least-technical policy area, but the urgency of the transition drives it to the forefront.

## 1.3 ENERGY GOVERNANCE

Three themes relating to energy governance arose during consultations. These are areas where Engineers Australia can make an impact for members, the engineering profession, and the community at large:

1. The need for a comprehensive national transition plan that charts a path to clean, reliable, cost-effective and affordable energy.
2. Ensuring the engineering voice is present in decision-making processes and policy and regulatory discussions that involve engineered systems, including the potential establishment of an independent technical authority.
3. The necessity of coherent policy settings focused on community benefit that provide certainty for investment opportunities.

### 1.3.1 ENERGY IN THE AUSTRALIAN CONTEXT

A reliable and secure supply of electricity is a critical component of modern life and drives the Australian and global economies. Australia is undergoing an energy transformation at an unparalleled pace and scale:

- The Australian Energy Regulator (AER) reports that over 3,700 MW of large-scale solar and wind projects entered the National Electricity Market (NEM) in 2020, with a further 2,500 MW of rooftop solar installed.<sup>1</sup> Total electricity generation in Australia was estimated to be 265,232 gigawatt hours (GWh) in the 2020 calendar year.<sup>2</sup>
- Wind and solar accounted for 19% of electricity generation in 2020.
- The Australian Energy Market Operator (AEMO) expects distributed energy generation to double or triple. By 2040, more than 26 GW of new grid-scale renewables will be needed to replace 15 GW of coal-fired generation, and 6 to 19 GW of new firming dispatchable resources will be needed through pumped hydro and large-scale batteries.
- Coal and gas generators provide inertia and system strength so, as they retire, a greater emphasis is placed on system services to maintain energy reliability and security. Alongside these changes are significant additions in terms of storage capacities such as pumped hydro and grid-scale batteries.<sup>3</sup>

The context for energy advocacy is challenging. It includes a complex mix of political, regulatory, commercial and technical issues. The energy debate is fractured and divisive. Constitutional powers for energy matters reside with the states and territories, but a national electricity market was established in 1998 and is regulated by the Australian Government. Many Engineers Australia members feel the federal government is not playing a strong enough role in the coordination of a strategic and future-focused energy sector. Much change is being driven by the states and territories, government institutions, the private sector, and consumers.

The energy transition is politically divisive. The public discourse following South Australia's statewide blackout in September 2016 serves as a good example. An extreme weather event rendered 23 transmission towers inoperable, including those that link Adelaide to the transmission hub. The 'black start' systems that were supposed to kick in failed. The subsequent AEMO investigation found that South Australia's generation mix played no role in the blackout, but it did note that with less synchronous generation (fossil fuel, hydro) the system needed to be made more resilient to periods of low inertia. The situation led to a review of the security and reliability of the Australian energy system, led by Dr Alan Finkel AO, the then Commonwealth Chief Scientist. The subsequent blueprint provided several recommendations that have undoubtedly improved the reliability of the grid. Engineers Australia has a role in adding evidence-based engineering information to these types of discussions.

As the power network evolves with the growth of renewables and customer-owned generation, the system must be planned, analysed, designed, and operated as a holistic engineered system. Complex energy systems require mechanisms both to support effective technical management and facilitate efficient markets. Electricity is an essential public service that should be provided in an appropriately regulated market. Market support measures are readily apparent in the current structure, but an independent technical voice is lacking.

Uncertain policy settings send the market mixed signals. Many stakeholders believe that business would prefer certainty, even if it were to mean a lower return on their investments. The Australian Prudential Regulation Authority is very clear about the financial risks of climate change and that these risks are 'foreseeable, material and actionable now'.<sup>4</sup> This has been reinforced by Australia's other financial regulators, including the Reserve Bank of Australia and the Australian Securities and Investments Commission.<sup>5</sup> Business is adjusting to the changing demands of customers and investors, as well as macro drivers such as the 2015 Paris Agreement that established the prevailing global framework for reaching net zero emissions by 2050. If policy settings are not coherent and aligned with this goal, it will become harder for Australia to attract energy-related investment.

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1 Australian Energy Regulator, State of the energy market 2021, Australian Energy Regulator, 2021, p.6, available at <https://www.aer.gov.au/publications/state-of-the-energy-market-reports/state-of-the-energy-market-2021>, accessed 6 October 2021

2 Department of Industry, Science, Energy and Resources, Australian Energy Statistics, Table O: Electricity generation by fuel type 2019-20 and 2020, Energy.gov.au website, 2021, available at <https://www.energy.gov.au/publications/australian-energy-statistics-table-o-electricity-generation-fuel-type-2019-20-and-2020>, accessed 6 October 2021

3 Australian Energy Market Operator, 2020 Integrated System Plan, AEMO website, 2020, available at <https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2020-integrated-system-plan-isp>, accessed 6 October 2021

4 Australian Prudential Regulation Authority, APRA's response to climate-related financial risks, APRA website, 2021, available at <https://www.apra.gov.au/apra%E2%80%99s-response-to-climate-related-financial-risks>, accessed 6 October 2021

5 Australian Prudential Regulation Authority, APRA's response to climate-related financial risks



### 1.3.2 OPPORTUNITIES ABOUND

Along with these challenges, there are also opportunities. Australia has the resources to become a world leader in the low-carbon energy future. Australia has a rich endowment of the critical minerals needed for electrification of both existing and new low-emissions industries, excellent sunshine and wind to power renewables, and the engineering expertise to develop and deploy new technology and industries. Energy-intensive industries can leverage Australia's natural resource advantages to reduce costs, add value and improve global competitiveness.

Many international and local agencies believe the right policy settings could create well over a million jobs in Australia's 'green' economy. Beyond Zero Emissions, an independent international non-government organisation, believes renewable and low-emissions projects can deliver 1.8 million jobs in five years, while modernising Australian industry.<sup>6</sup> Globally, the International Labour Organization has forecast that 24 million jobs could be generated to replace the six million that could be lost in fossil fuel industries.<sup>7</sup> If Australia implements appropriate policy settings and more deeply engages engineering expertise, it can secure low-cost, reliable, clean energy that generates additional jobs and new market opportunities.

### 1.3.3 TRANSITION PLANNING

There is no comprehensive national transition strategy to take Australia from a centralised system of large fossil-fuel generation to smaller-scale distributed generation through renewables and new fuel sources such as hydrogen. The necessity to reduce emissions will drive changes in the energy sector regardless, but the lack of coherent policy settings can only harm the transition. As far back as the Finkel Review in 2017, an overwhelming message from the 390 submissions received from a broad range of stakeholders was a 'call for Australia to adopt a single, nationally agreed plan to manage the transition'.<sup>8</sup>

Renewables such as wind and solar are generating some of the lowest-cost energy in the NEM's merit order of dispatch. At the same time, fossil fuels are becoming more expensive, as many assets approach the end of their economic life and investors increasingly shy away from investing in new fossil fuel assets for fear they will become stranded due to future climate policies. According to Bloomberg research, wind power is the most economical way to produce electricity. Electricity sourced from a brand-new wind farm costs AUD\$80/MWh. This is compared to the A\$143/MWh rate to source energy from a coal-fired power station or A\$116/MWh from a gas-baseload power plant.<sup>9</sup> Investment and reporting based on environmental guidelines is increasingly expected and, in some cases, required.

There is no doubt that the international context of a future carbon-neutral operating environment will drive the transition, regardless of the policies at play in Australia. At this stage, the most likely, if not the optimal, route to achieving a national pathway seems to be for the states and territories to increasingly coordinate with the oversight agencies – the Australian Energy Market Commission (AEMC), Australian Energy Market Operator (AEMO) and the Australian Energy Regulator (AER) – that manage the National Electricity Market (NEM).

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...route to achieving a national pathway seems to be for the states and territories to increasingly coordinate with the oversight agencies...

6 Beyond Zero Emissions, The Million Jobs Plan, Beyond Zero Emissions website, 2021, available at [https://bze.org.au/research\\_release/million-jobs-plan/](https://bze.org.au/research_release/million-jobs-plan/), accessed 6 October 2021

7 United Nations, Green economy could create 24 million new jobs, UN Sustainable Development Goals website, 3 April 2019, available at <https://www.un.org/sustainabledevelopment/blog/2019/04/green-economy-could-create-24-million-new-jobs/>, accessed 6 October 2021

8 A Finkel, K Moses, C Munro, T Effeneay, M O'Kane, Independent Review into the Future Security of the National Electricity Market – Blueprint for the Future, Commonwealth of Australia: Canberra, 1 June 2017, p3, available at <https://www.energy.gov.au/publications/independent-review-future-security-national-electricity-market-blueprint-future>, accessed 6 October 2021

9 W Mathis, 'Building new renewables is cheaper than burning fossil fuels', Bloomberg Green, 23 June 2021, available at <https://www.bloomberg.com/news/articles/2021-06-23/building-new-renewables-cheaper-than-running-fossil-fuel-plants>, accessed 6 October 2021

The progress made in South Australia provides an example of what coherent policy settings can achieve. In 2006, South Australia generated all its electricity from fossil fuels. By 2015, renewables met 36% of demand, and in 2020 it was 60%. Latest figures suggest it is now 71%.<sup>10</sup> With very low operational costs and no fuel costs, renewables have undercut gas- and coal-fired plants. South Australia recorded the lowest wholesale prices in the NEM during the last four months of 2020, albeit with by far the most trading intervals of negative prices to other comparable states. Although these changes started under a Labor government, they have continued under the current Liberal government that came to power in 2018, demonstrating the importance of consistent policy direction. The transition to a zero-emissions, zero-inertia grid with demand response and optimisation of large-scale distributed energy resources could be a reality in South Australia within a decade.<sup>11</sup>

### 1.3.4 NEXT STEPS

This discussion paper is designed to initiate and inspire debate and thought-provoking discussion, rather than present all the answers. This debate will inform the development of an Engineers Australia Policy Directions Paper that will articulate the formal positions of the organisation and the profession it represents as the basis for future advocacy and action. The following sections present the above issues in more detail.

10 Government of South Australia, Green energy powering South Australia to become global player, Growth State website, 16 September 2021, available at <https://www.growthstate.sa.gov.au/news/green-energy-powering-south-australia-to-become-global-player>, accessed 6 October 2021

11 S Fleming, 7 renewable energy lessons from South Australia, World Economic Forum website, 14 June 2021, available at <https://www.weforum.org/agenda/2021/06/renewable-energy-south-australia-climate-change/>, accessed 6 October 2021



# 2 Comprehensive transition plan

The early and orderly transition to clean electricity is the principal driver of the enormous changes facing the energy sector. This is not just true in the power sector; the rise of clean electricity will also play a critical role in transforming sectors such as transport and agriculture, as well as creating opportunities to add value to mineral resource industries.

Engineers Australia advocates for a comprehensive national plan based on science and facts that outlines a clear transition from fossil fuels to clean, reliable, low-cost energy. The certainty and increasing severity of climate change increases the urgency to develop a comprehensive transition plan with engineering expertise at its heart.

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## 2.1 EXISTING ENERGY SYSTEM MANAGEMENT

The call for a national comprehensive transition strategy is not to suggest that no planning is taking place. Many organisations essential to the energy sector are either developing or delivering agreed plans. The Australian Government is developing the Technology Investment Roadmap. However, while this is a useful vehicle to consider the contribution of specific technologies such as hydrogen, it is not sufficient to guide long-term strategies for energy transition. The National Energy Productivity Plan (NEPP) is the vehicle to improve Australia's energy productivity by 40% between 2015 and 2030.

Several bodies play important roles in managing the National Electricity Market (NEM):

- the Australian Energy Market Commission (AEMC) to make rules governing the NEM
- the Australian Energy Market Operator (AEMO) to operate the NEM
- the Australian Energy Regulator (AER) to enforce the NEM's rules.

The AEMC and AER Chairs and the AEMO Chief Executive, together with an independent Chair and Deputy Chair, comprise the Energy Security Board (ESB), which coordinates advice to National Cabinet on energy policy. These bodies play a central role in planning Australia's energy system, including through design of the AEMO NEM Integrated Systems Plan 2020, and the ESB's Post-2025 Market Design Strategy.

Individual states are also engaged in planning or delivering plans to guide the energy transition. Examples include Western Australia's Energy Transformation Strategy and the NSW Electricity Infrastructure Roadmap.

These are just a few examples of the plans guiding the energy transformation. The activities identified by Engineers Australia in this paper would build on Australia's planning systems to ensure the nation has:

- technology and innovations for clean, reliable and cost-effective energy
- enabling frameworks, including policy, laws, regulations, technical standards and governance
- a system-of-systems approach to ensure consistency at state and territory level
- equitable approaches that recognise the impacts on communities and industries.

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The cheapest replacement for the coal-based fleet is a system of renewable sources firmed by storage and peaking capacity of gas, pumped hydro and batteries.

## 2.2 CHALLENGES TO TRANSITION

The cheapest replacement for the coal-based fleet is a system of renewable sources firmed by storage and peaking capacity of gas, pumped hydro and batteries. Unfortunately, Australian federal, state and territory governments do not yet agree on how that transition should be guided, which gives rise to competing and conflicting interventions that increase risk and make the energy transition less cost-effective. The task of reaching net zero emissions, the main driver for changes in the energy sector, is complicated by the lack of a national transition strategy that can drive incentives across the Australian economy. The most efficient national policy may be to put a price on carbon, but recent Australian political history indicates that meaningful debate on this issue presents many challenges.

## 2.3 TRANSITION FACTORS

The energy transition requires participation and coordination across a broad range of government and non-government entities. The risk is that Australia ends up with energy systems that are not fit for purpose. To move forward with confidence, the Australian Government should develop a whole-of-system plan and enabling framework that considers:

- a workforce that represents future requirements rather than today's market forces
- a trade and investment strategy that positions Australia for the opportunities afforded by the new energy system
- a clear national strategy for clean electrification of the power system using wind, solar, batteries and pumped hydro, enabled by grid-forming inverters and demand-side management
- a comprehensive risk analysis of energy dependencies and an update of the 2011 National Energy Security Assessment
- rules and markets for essential system services, such as fast frequency response, system strength, and inertia, to ensure the reliability standard of unserved energy demand is not breached
- an expansion program of transmission and distribution infrastructure that can support the significantly increased distributed and variable generation of 26–50 GW expected by 2040
- a stronger risk-management framework to protect against natural disasters and cyber attacks
- clear rules for behind-the-meter systems, including tariffs and technical standards for batteries and inverters
- funding mechanisms to encourage the development and implementation of necessary technology, system services and infrastructure, such as integration tests for grid-forming inverter-based resources, including batteries, at a minimum of 5 MW
- regularly reviewed and certified black start systems for each region
- phase-out of coal and gas generation at the earliest opportunity in a transparent and orderly manner, including contingency plans for early retirement
- standards for electric vehicles and charging infrastructure to ensure interoperability
- public electric vehicle charging infrastructure, including for those that can't be charged privately
- targets for government electric vehicle fleets
- energy-efficiency standards for all buildings, including retrofits wherever possible, equipment and appliances
- a regular national assessment of future workforce requirements to ensure a suitably skilled workforce is available when required
- a nationally coordinated approach to Renewable Energy Zones and industrial hubs
- a strategy to incentivise local manufacturing of essential components for the new energy market such as solar panels, batteries, fuel cells, electrolyzers and inverters.

This is not an exhaustive list, but consideration of these issues is important in the development of a plan that defines the future characteristics of an integrated energy system.

### QUESTIONS FOR DISCUSSION



1. What are the critical priorities an energy transition plan should address?
2. Should a transition plan include an emissions-trading mechanism?
3. What are the social and economic costs of not taking an integrated systems approach?
4. How should local energy planning be coordinated at national level?

# 3

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## Independent technical authority plan

Electricity networks are massive in scale and are dynamic systems within systems. The facilitation of market forces is very apparent in current governance, but many Engineers Australia members feel an independent technical voice is lacking in decision-making and forward planning. Highly competent engineering is critical for electricity market design, safe operation and technical innovation. Technical leadership is progressively being devalued and this is reflected in diminished safety, reliability and efficiency. Many senior engineers consulted for this discussion paper feel the power system engineering workforce is in decline and is not keeping up with rapid changes in the sector. The 2017 Independent Review into the Future Security of the National Electricity Market recommended the development of a national assessment tool to ensure a properly skilled workforce is available.<sup>12</sup> The current governance arrangements are a separation of functionally differentiated roles that lack systematic reference to independent engineering advice.

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Highly competent engineering is critical for electricity market design, safe operation and technical innovation.

12 Finkel et al, Independent Review into the Future Security of the National Electricity Market

### 3.1 INDEPENDENT TECHNICAL AUTHORITY

Engineers Australia proposes support for the establishment of an independent technical authority for the energy sector. This proposal was raised by Engineers Australia Colleges to address the senior members' concerns that the predominance of market design considerations in the management of energy networks constrains engineering innovation and technical reform. Furthermore, members are concerned that independent engineering insight and leadership is missing in core decision-making.

Engineering skills must be at the heart of decision-making for systems that rely on engineering to succeed. This can be seen in the Energy Security Board's NEM health report published in January 2021. It found that improvements have been made in the effective development of open and competitive markets and network investments, but that system security is still a critical risk.<sup>13</sup>

Governance arrangements in the energy sector need to be reviewed to create a clear role for independent engineering advice. Engineers Australia strongly advocates for evidence-based policy and decision-making as best practice in governance. Engineers have an important role to play because, as a profession, they:

- have specialised competencies
- create value by solving technical problems
- deliver system solutions
- apply standards and risk mitigation.

Technical authority describes a framework and process that effectively manages technical issues and risks in a forward-looking, accountable manner. The oversight by such an authority promotes engineering excellence to support improved performance over the lifecycle of a project and/or process.

Independent status means such an authority would operate at arms-length from government. It would have a clear charter to provide advice to government to achieve prescribed policy objectives based on the best evidence available to the engineering community. Government at all levels would seek advice from the authority before making decisions. Incorporating such a perspective into the decision-making process would ensure that decisions are based on thorough assessments of long-term need and cost/benefit analysis.

Any model for an independent authority would need to have a governance and operating framework that recognises that minister(s) and Cabinet are accountable for policy decisions, setting financing parameters, and entering agreements with state governments.

The specific responsibilities of a technical authority could include:

- systematic engineering advice and insight at critical decision-making junctures
- advice on engineering capability development
- definition of technical and performance standards or deviation
- interpretation of good engineering practice
- review and audit
- risk assessments
- ensuring conformity with legislation and standards.

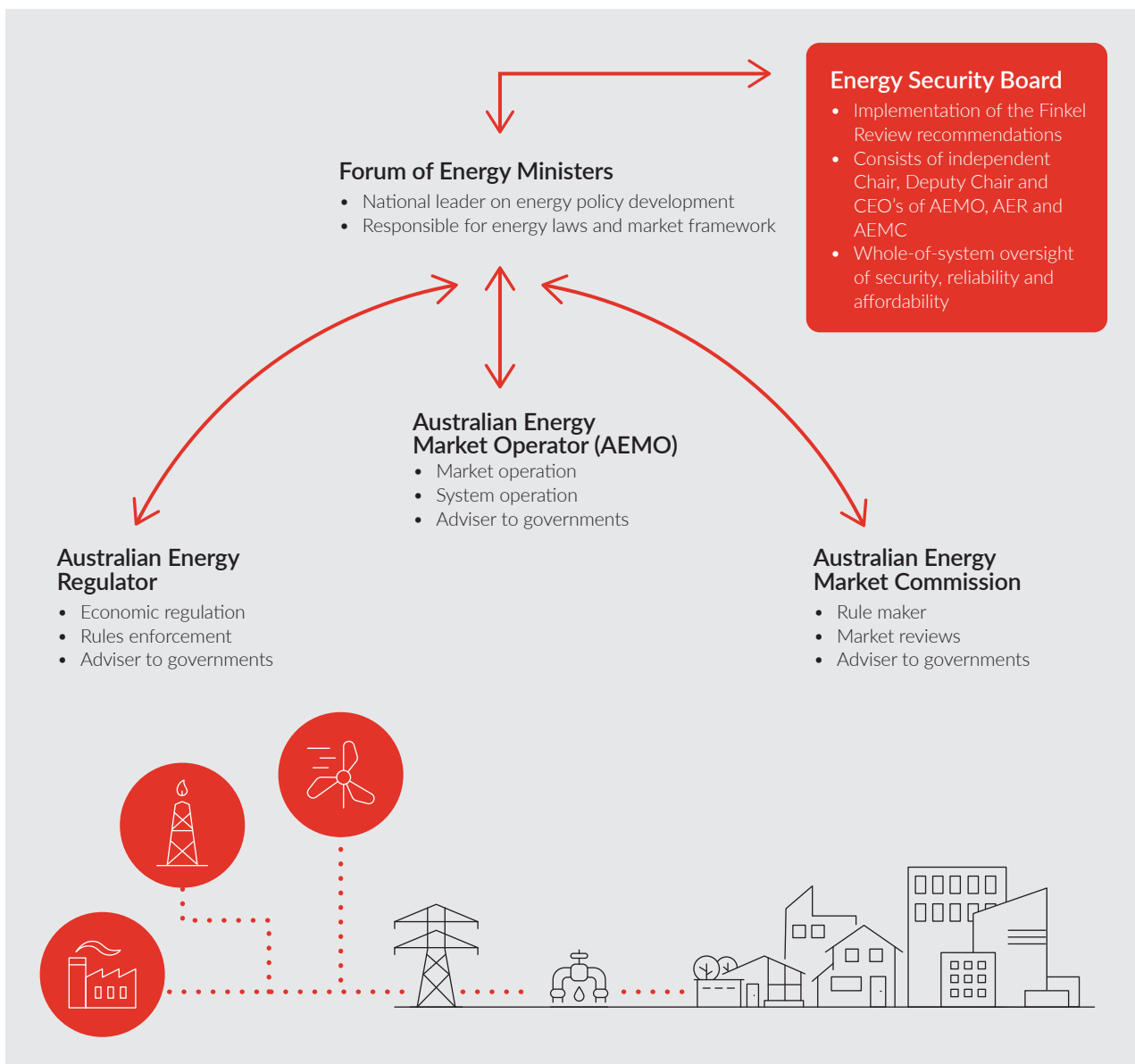
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13 Energy Security Board, The Health of the National Electricity Market 2020 V01, p 26, Energy Ministers website, 5 January 2021, available at <https://energyministers.gov.au/publications/2020-health-nem>, accessed 6 October 2021

An example of the value of technical authorities can be found in the Australian Technical Advisory Group on Immunisation (ATAGI), which advises the Minister for Health on the National Immunisation Program and other immunisation issues. ATAGI also provides advice to research organisations and consults with relevant organisations in implementing immunisation policies and procedures, and vaccine safety. ATAGI provides the community with certainty by ensuring government decisions are technically credible.

An independent technical authority could work with other organisations in the system to proactively investigate technology options to manage, operate and regulate future energy systems. It would play a critical role in developing and adopting a coherent and integrated approach to technical imperatives in the energy sector, and particularly the complex, nation-building transition currently underway.

Figure 1: Governance structure of the NEM





### 3.1.1 STRATEGIC PARTNERSHIPS

Engineers Australia will be better placed to achieve greater influence and a louder voice for technical competence through strategic and tactical partnerships with a range of organisations, leading to:

- a stronger voice by amplifying the message through partnership
- building reputation and adding credibility
- greater reach – acknowledging that Engineers Australia does not have the resources to apply effort and expertise across all areas of the energy debate in parallel
- building capacity by sharing experience and lessons learned.

We should be clear about the purpose of each partnership, for example by:

- providing engineering expertise to critical processes such as the AEMO Engineering Framework and the NEPP
- sharing information and data
- developing common messages and advocacy campaigns.

As well as the organisations mentioned above, potential partners could include:

- government departments and organisations, such as the federal and state Offices of the Chief Scientist and Offices of the Chief Engineer
- peak bodies, such as the Australian Industry Group, the Australian Council of Social Service, the Australian Institute of Company Directors and Energy Networks Australia
- industry organisations with a relevant purpose, such as the Australian Power Institute
- academic groups, such as universities, the Australian Institute of Energy, and the Australian Committee for Power Engineering
- research and funding bodies, such as the Australian Renewable Energy Agency and the Clean Energy Finance Corporation
- member organisations supporting improved energy efficiency, such as the Energy Efficiency Council and the Australian Alliance for Energy Productivity
- think tanks and advocacy organisations that inform the energy debate, such as the Smart Energy Council, Beyond Zero Emissions, and the Climate Action Network Australia
- energy-specific groups, such as the Australian Gas Infrastructure Group, National Energy Resources Australia, and the Australian Hydrogen Council
- energy users and consumer groups
- Engineers Australia Learned Society groups, such as the Electric Energy Society of Australia (EESA)

This is just a selection of potential partners. Engineers Australia will need to develop a strategic approach to partnerships that focuses on achieving significant outcomes with the resources we have.

External developments may lead to either a change in direction or a new opportunity to achieve practical outcomes for Engineers Australia members and the community. These will need to be identified and assessed as they arise.

## QUESTIONS FOR DISCUSSION



1. Is a technical authority the right solution to address these issues?
2. Where would a technical authority be situated in the national infrastructure?
3. What changes should be made to ensure Australia has effective and fit-for-purpose energy governance?
4. What strategic partnerships should Engineers Australia prioritise to give a stronger voice to engineering?

# 4 Policy settings

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Australia needs coherent and stable policy settings focused on community benefit and certainty for investors. Most stakeholders (predominantly members of Engineers Australia) consulted in the development of this paper see a clear disconnect between policy settings in the energy sector and desirable outcomes on the ground. Stakeholders raised this in the context of specific issues, such as vehicle emission standards, through to broad funding decisions in the energy market. Engineering solutions must also be integrated with political, economic and social concerns. If these issues are considered in isolation, Australia will not achieve an orderly transition to clean, reliable and cost-effective energy.

Policies that reflect competing and conflicting interventions make the energy transition slower, less transparent, and more costly than it needs to be. Policy settings should drive consumers and investment to the cleanest and most efficient technologies.

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## 4.1 NATIONAL INVESTMENT

The market needs certainty. Between April and August 2021, more than US\$30 billion was raised globally by some of the world's largest asset managers for energy transition.<sup>14</sup> The Clean Energy Investor Group (CEIG), which represents 18 leading clean energy investors with an Australian portfolio of over \$A24 billion, has expressed concern over the lack of a national plan and the detrimental impact this causes in raising the cost of capital and stifling investment. Those investors include Macquarie, PowAR (AGL) and the federal government-owned Snowy Hydro. The CEIG says the cost of capital in Australia is nearly 200 basis points higher than overseas.<sup>15</sup>

The Australian Industry Energy Transitions Initiative, which includes some of Australia's largest companies, representing 20% of the ASX100 and 100,000 employees, believes that early uptake and integration of renewable energy will maintain Australia's position as an energy and commodity export power.<sup>16</sup> Its members are plotting a course to decarbonise nearly all emissions in heavy industry supply chains by 2050 using existing and emerging solutions. The Initiative believes Australian industry can play a pivotal role in the transition internationally as well. However, the solutions require collaboration on enabling technology and infrastructure across industry, government, finance and the energy sector.

## 4.2 TRADE, INVESTMENT, AND THE LINK TO CLIMATE CHANGE

Many of Australia's largest trading partners, including China, Japan, South Korea, the United Kingdom, and the United States, have made commitments to achieve net zero emissions by 2050, or 2060 in the case of China. The European Union has passed a proposal to introduce a carbon border tax to come into effect in January 2023. Japan and the United States are considering similar schemes.<sup>17</sup>

Further, many international investors are becoming more focused on measurable environmental, social and governance performance indicators. Global capital, by its very nature, is 'self-interested'. To deliver outcomes that benefit Australia, now and in the future, the Australian Government needs to take an active role in shaping investment outcomes to ensure they deliver long-term value to Australia. Investors in the energy sector are hesitant about Australia because of the uncertainty in the current environment.

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There is an increasing move among investors globally to account for climate risks.

There is an increasing move among investors globally to account for climate risks. The International Energy Agency's 2021 energy roadmap is clear that the international community needs to quickly boost clean energy sources and radically reduce fossil fuel use.<sup>18</sup> Markets thus require clear, comprehensive, high-quality information on the impacts of climate change and climate policy to aid decision-making. The absence of such information could hamper or raise the cost of Australia's access to capital. For instance, investors are already moving to diversify and limit exposure to fossil fuel providers. Commonwealth Super recently decided to invest only in companies that earn less than 70% of revenue from thermal coal.<sup>19</sup> BHP, Australia's largest company, decided to divest itself of oil and gas entirely in August 2021.

14 M Taylor and D Perkins, 'Energy Transition Fund Frenzy' [audio file], Switched On podcast, 3 August 2021, Bloomberg, available at <https://www.bloomberg.com/news/audio/2021-08-02/energy-transition-fund-frenzy>, accessed 6 October 2021

15 Giles Parkinson, Renew Economy, 23 August 2021 available at <https://reneweconomy.com.au/its-ridiculous-lack-of-leadership-leaves-australia-starved-of-capital-for-energy-transition/>

16 Australian Industry Energy Transitions Initiative, Setting up industry for net zero, June 2021, p 4, AIETI website, available at <https://energytransitionsinitiative.org/wp-content/uploads/2021/06/Phase-1-Highlights-Report-June-2021.pdf>, accessed 6 October 2021

17 Australian Industry Energy Transitions Initiative, Setting up industry for net zero, p7.

18 International Energy Agency, Pathway to critical and formidable goal of net-zero emissions by 2050 is narrow but brings huge benefits, according to IEA special report [media release], IEA website, 18 May 2021, available at <https://www.iea.org/news/pathway-to-critical-and-formidable-goal-of-net-zero-emissions-by-2050-is-narrow-but-brings-huge-benefits>, accessed 6 October 2021

19 B Potter, 'ESG investing isn't just about cutting fossil fuels', Australian Financial Review, 3 June 2021, available at <https://www.afr.com/policy/energy-and-climate/esg-investing-isn-t-just-about-cutting-fossil-fuels-20210603-p57xuw>, accessed 6 October 2021

Scrutiny of carbon risks and emissions could soon become mandatory. The Reserve Bank's Financial Stability Board created the Task Force on Climate-related Financial Disclosures in 2015 to improve and increase reporting of climate-related financial information. At present, this scheme is purely voluntary, but many have suggested it will eventually become compulsory.<sup>20</sup> The UK Government is investigating a proposal to make climate-related financial disclosures mandatory from publicly listed companies, large private companies and limited liability partnerships.<sup>21</sup>

At their recent meeting, the G7, an intergovernmental forum comprising Canada, France, Germany, Italy, Japan, the UK, and the US, called for making climate-change reporting mandatory. Australian companies in the energy sector are already adjusting to these changes, but that is happening in the absence of a coherent national policy. In this context, it seems likely that accounting for climate risk through universal benchmarks will soon become mandatory, particularly when such action is viewed as a competitive advantage.

### 4.3 A JUST TRANSITION

Further, policy settings need to reflect how structural change will be managed equitably across industry sectors and geographies for a just transition. The energy transition is also about people and communities, and it is important to understand the context in which they live and work.

Renewable energy will be a major source of employment, including in regional Australia, and it already employs more people than the domestic coal sector.<sup>22</sup> However, not everyone in the fossil fuel industry can move into a clean energy job. Governments have a critical role in setting expectations and facilitating new industries and training opportunities, particularly in regional areas that are transitioning from the carbon economy. Adding complexity to the task is the fact that prolonging the lifetime of declining industries may increase the environmental costs paid by all Australians, increase the financial costs of subsidies and retraining, and cause Australia to lag international competitors in taking advantage of clean energy business opportunities.

### 4.4 PRIORITIES

Relevant and appropriate policy areas will emerge during the formulation of technical workstream activities, as referenced in the Introduction. However, the following are examples of areas where Engineers Australia could advocate for evidence-based, clear and coherent policy settings:

- **Supply and demand:** The rapid integration of distributed and variable renewables into the grid means the level of supply and demand has become more erratic. Demand has reached record lows in several places in Australia over the past year, driving negative wholesale prices. While the increase in renewables is a positive development, it does bring challenges. The reality is that Australia will have a hybrid system for many years, highlighting the need for increased system agility and resilience. Solutions include dispatchable resources, demand management and smart technology. Engineers Australia can play a role in supporting consistent regulatory and market reforms, as well as pushing forward technical solutions.
- **Power system control:** Engineers Australia could advocate for a system based on power system control across the network to manage system strength, inertia, frequency and voltage. A system that relies on market mechanisms, rather than engineering control, will be fraught with problems. We have a highly complex system, but we also have access to signal processing and data analysis to manage it.

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20 M Roddan, 'Investor groups demand climate risk disclosure overhaul', Australian Financial Review, 29 June 2021, available at <https://www.afr.com/companies/financial-services/investor-groups-demand-climate-risk-disclosure-overhaul-20210628-p584zu>, accessed 6 October 2021

21 Environment Analyst, Mandatory TCFD disclosure moves closer in UK, Environment Analyst website, 2021, available at <https://environment-analyst.com/global/106800/mandatory-tcfd-disclosure-moves-closer-in-uk>, accessed 6 October 2021

22 C Briggs, J Rutovitz, E Dominish, K Nagrath, Renewable Energy Jobs in Australia: Stage one, Institute for Sustainable Futures, University of Technology Sydney: Sydney, 20 June 2020, p 9, available at <https://apo.org.au/node/306560>, accessed 6 October 2021

- **Energy sources:** The role of specific energy sources, such as hydrogen, gas, and nuclear power, over the next few decades needs consideration. For example, gas may not be a major source of energy in Australia moving forward, but what role does it have as a firming resource? Gas peaking plants can help provide stability because they can sit at a low level or even offline during low demand but come online rapidly when required. If Australia cannot develop zero-carbon alternatives, does gas have a role, and how can it be de-carbonised? The uses of hydrogen as both a fuel and an energy carrier are developing rapidly, but this needs to be managed on an engineered basis rather than emerging as disruptors to the system.
- **Sector issues, such as road transport:** There is a global trend towards the adoption of electric vehicles. This will undoubtedly have a major impact on Australia. Major trading partners have set targets to phase out internal combustion engines between 2030 and 2035. The Australian Renewable Energy Agency and Clean Energy Finance Corporation forecast that, with no government intervention, 30% of the vehicle passenger fleet will be electric by 2040 – but this could be as high as 70% with increased intervention.<sup>23</sup> Electric vehicles can act as portable batteries and play a role in managing the grid using smart chargers. We can increase energy security at the same time by reducing the need for refined fuels like petrol and diesel that we spend billions of dollars on each year. Electrification and hydrogen will make our economy more independent and resilient. If these changes are well managed, they can be beneficial, but by the same token, they could have negative impacts on the community if poorly managed. Engineers Australia could advocate for the infrastructure, rules and incentives for electric vehicles to sell power to the grid.
- **A shortage of sufficiently qualified and experienced power system engineers:** Emerging technologies and rapid change requires ongoing skills development and training. Engineers Australia already plays a role in encouraging the STEM pipeline. The fundamentals of an undergraduate degree are still of critical importance, but they are no longer sufficient. Engineers Australia could assist in ensuring the demand for power system engineering can be met. At the same time, Engineers Australia could play an enhanced role as a bridge between industry and academia, particularly around retraining, on-the-job training, and projects for the last year of undergraduate and master's degrees. The trans- and multidisciplinary nature of modern power engineering requires an ongoing discussion around the balance between electrical, electronic, and systems engineering. A greater emphasis on the importance of a diverse and inclusive workforce is required.
- **Future energy technologies:** Future energy systems will require more complex technologies to manage and coordinate them from both the supply and demand side. Information and communication technologies, together with emerging digital technologies, such as artificial intelligence, are expected to have an important and increased role in future energy systems. However, this brings risks that need to be managed through cybersecurity to maintain reliability and resilience in electricity supply. The future energy system will be increasingly diverse and interconnected relative to legacy systems, and engineers will be critical to managing these risks.
- **Role of renewable energy for exports:** The role of renewable energy in facilitating Australia's export industries also needs consideration, including exports of renewable fuels as alternatives to exports of coal and liquefied natural gas, and exports of rare-earth metals and other minerals required by a growing renewable energy/green electricity sector worldwide. Low domestic energy costs will grow our local manufacturing sector, enabling exports of products where we have added value, for example, green steel instead of iron ore exports.

These are just a few examples. All these issues have engineering solutions, but without a plan and coherent policy settings, innovation, development and deployment will be significantly less effective. Engineers are uniquely placed to use systems thinking to understand what is happening and to identify and leverage solutions for change.



## QUESTIONS FOR DISCUSSION

1. What policy settings should Engineers Australia advocacy prioritise?

<sup>23</sup> ENERGEIA, Australian Electric Vehicle Market Study, Australian Renewable Energy Agency, May 2018, available at <https://arena.gov.au/knowledge-bank/australian-electric-vehicle-market-study/>, accessed 6 October 2021

# 5 Conclusion



Widespread electrification is a significant challenge, but the increase in renewable electricity supply will reduce total system costs. The challenges are large, but so are the opportunities. With the right vision and clear short- and medium-term targets, Australia can target further substantial transition to clean electricity by the mid-2030s. Crucially, there needs to be a federal government framework to bring together the plans of diverse government agencies and state and territory governments. This will ensure the future energy system is coordinated to achieve clean, reliable and affordable energy. Energy resilience is vital to the Australian way of life and the market cannot provide that security without governments taking the lead.

As states and territories do their own planning and institutions proceed with their own mandates, Australia runs the risk of losing sight of the original purpose of the National Electricity Market, which was to take a coordinated national approach. The danger of siloed decision-making is that investors and consumers will become confused and will lose faith in the opportunities and promise of the transition. Australia cannot design and deliver a power grid to balance demand and supply without considering the requirements and potential of electric vehicles. The benefit of installing solar panels is undermined by a building with poor energy efficiency. Incentivising fossil fuels when the driver of the energy transition is to allow the fossil fuel generators to retire and move to clean, reliable and cheap renewable energy may prove counterproductive.

These are not trivial tasks, and no single government, industry or institution can address all the challenges posed by the energy transition. But the Australian Government has a role in bringing together all the disparate elements to coordinate policy settings across all sectors and all infrastructure. Most importantly, the engineering profession must play a lead role in the successful implementation of technical solutions.



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