Energy Efficiency Council submission to the Electricity and Energy Sector Plan discussion paper

26 April 2024

Introduction

The Energy Efficiency Council (EEC) welcomes the opportunity to provide comment on the Electricity and Energy Sector Plan discussion paper. The EEC is Australia's peak body for energy management, electrification, and decarbonisation.

The Electricity and Energy sector plan is critical to guiding the transition of the energy system towards zero emissions. It must provide clear and unambiguous direction to all stakeholders in the energy system about the intended national pathway to energy decarbonisation. The task ahead of the nation is substantial, and equivocal or vague policy direction will not support a rapid, least-cost transition.

The Electricity and Energy sector plan must harness the power of the demand side

Decarbonising the energy sector should follow the general hierarchy of decarbonisation:

1. Energy efficiency;
2. For energy use not avoided by efficiency, electrification with renewables-powered electricity;
3. For energy use not able to be electrified by 2050, substitute fossil fuels with zero-emissions alternatives such as biofuels, biomethane, or green hydrogen in some circumstances.
4. Offsets: Offsetting ongoing energy usage is not appropriate and will not support a timely net zero transition. Genuine carbon sequestration is likely to be highly valuable, and should be reserved for industrial processes that have no viable pathway to eliminate all emissions by 2050.

While it is likely that significant investment is needed to bring technologies in step (3) to market at scale, the Plan's immediate priorities should leverage those technologies that are currently commercially available and ready to substantially contribute to energy sector decarbonisation today.

The Government's focus on replacement of existing electrical generation infrastructure is necessary, but a more holistic view of energy sector decarbonisation is required. Efficiency measures make the decarbonisation task smaller – every unit of energy demand avoided directly translates to a unit of new energy infrastructure that does not need to be built. Increasing and accelerating adoption of existing electrification technologies *now* will reduce Australia's cumulative emissions, creating more headroom in our emissions budget should technology replacements for harder-to-abate sectors not materialise in time.

Energy management, efficiency, and flexible demand should be considered integral resources of the energy system. While these approaches can deliver direct benefits to end users, far greater benefits can accrue to the energy system as a whole. The NSW Government's review of its Energy Savings Scheme noted:

> *"Energy efficiency will reduce the amount of new renewable energy generation required to replace these retiring generators. For example, the energy savings the ESS delivered in 2018 are equivalent to a 1050 MW solar farm. This is seven times the size of the largest operational solar farm in New South Wales, Coleambally. This is*

already reducing the cost of replacing retiring coal fired power stations with clean energy by $1.5 billion."[1]

This means that it is clearly within the remit of the energy sector plan to consider policies and activities that occur behind the meter. These actions can collectively be described as consumer (or distributed) energy resources. The energy sector plan must consider all of these potential resources to aid the transition – including behind-the-meter generation and storage, but also including flexible demand, demand management, demand response and conventional energy efficiency.

The Energy Efficiency Council understands that the energy sector plan is one of six sectoral decarbonisation plans, and that demand side activities are expected to be addressed in each of the five other plans, namely industry, resources, the built environment, agriculture and land, and transport.

However relying on these plans to recommend an optimal level of demand side activity without considering the system benefits in an integrated way risks the perpetuation of siloed thinking across the supply side and demand side that has plagued energy policy in Australia for generations.

The energy sector plan is unique among the six plans – it needs to *co-optimise* with the other five sector plans to identify a transition pathway for Australia's energy system that effectively balances supply and demand side investments to ensure a rapid, affordable transition for Australia's energy system.

The energy sector plan should consider how the energy sector can best leverage energy efficiency, demand response and management, and flexible consumer energy resources to reduce the transition ahead, and make the greatest contribution to achieving net zero emissions as rapidly and cheaply as possible.

The energy sector plan must aspire to zero emissions no later than 2050.

Australia has committed to achieving net zero emissions by 2050. This target recognises that some current activities – particularly industrial processes – are currently very challenging to fully abate and are likely to have no functional replacement by 2050.

Given this, the energy sector plan should set a clear target of ***zero*** emissions by 2050 from the supply and use of energy– not net zero.

A net zero target relies on a small amount off negative emissions to net off any residual emissions. Currently, the only feasible source of negative emissions is sequestration through biological sources – direct air capture and storage of carbon would be very energy intensive and has not yet been demonstrated to be commercially viable at acceptable scale. However, even if concerns around the additionality and integrity of some land-based offsets suggests are addressed, there will be limited capacity for high-quality, genuine biological sequestration. This means that Australia's sequestration capacity needs to be reserved to offset emissions from industrial processes and other sectors that have no functional zero-emissions replacement.

[1] Department of Planning, Industry and Environment 2020, *NSW Energy Savings Scheme – Final Statutory Review Report 2020*, NSW Government, p.15

An aspiration towards a zero emissions energy system is feasible. The bulk of electricity usage, and a considerable amount of energy usage currently supplied through other fuels will be decarbonised by renewable electricity sources. Some residual gaseous and liquid fuel usage will likely remain by 2050, but these should be based on zero-emissions fuels like biofuels, biogases and green hydrogen in limited quantities.

The energy sector can achieve zero emissions with technologies that are currently either commercially available or showing promise of being commercially viable at scale within the next couple of decades. While achieving a zero-emissions energy system by 2050 will undoubtedly be challenging, setting an ambitious target today will provide clear guidance to energy system stakeholders, and support private sector investment to help achieve that goal. Weak, unclear or ambiguous targets for the energy sector will only serve to delay work and investment towards the energy sector transition, ultimately increasing cost for all Australians.

The energy sector plan must take a holistic view of energy

The Electricity and Energy sector plan must take a broad view of the energy system. Contemplation of the energy sector only through the lens of the supply-side of the energy system is likely to produce solutions that deliver an inefficient transition, at a slower speed and greater cost than would be possible with a transition pathway co-optimised between supply and demand.

As we transition towards an energy system influenced by high levels of variable renewable electricity, the value of energy is changing. As outlined in the EEC's 2023 report *Clean Energy, Clean Demand*, we have traditionally considered energy efficiency to value the savings that accrue from avoided energy use equally. However, as we move towards an energy system characterised by increasing levels of variable renewable energy, the ***time*** and ***place*** of energy use becomes increasingly important. Avoiding energy demand on a cold winter evening in southern states can become extremely valuable, while avoiding energy use at midday on a mild December day is of significantly less value.

By extension, demand-side energy resources that can reduce gaps between supply and demand at critical times can provide high levels of value to the energy system, and need to be effectively integrated into the energy system sector plan. While the electricity sector is most affected by these dynamics, other energy uses will also be influenced by these factors. For example, there will be linkages between the electricity system and the use of renewable gases (such as through the use of gas in peak generation plant and in industrial applications) and biofuels (such as where biofuels are used at the margins of electrified transport operations).

This strongly suggests that the energy sector plan should consider (and plan for) close integration of temporal and spatial linkages between energy supply and energy demand in the future. Technologies that are currently available or foreshadowed for decarbonising the energy system are typically more challenging to transport than fossil fuels, so closely integrating energy demand and supply in both temporal and spatial dimensions will enable the most effective and least-cost ways.

Flexible demand is an important energy system resource

The EEC sees a future energy system characterised by long periods of low-cost, low-emissions energy supply, punctuated by shorter periods of *critical demand* – that is, periods when there is a significant mismatch between energy demand and available supply. These periods can occur during summer where heatwave conditions create high peak demand from space cooling needs, although these periods tend to be relatively short-lived. Other periods of critical demand are expected during winter evenings in southern states, when demand for space heating is high, but overall renewable energy yield is lower. These periods are expected to be of longer duration and will result from constraints on bulk energy availability, rather than peak capacity availability.

There are two approaches to dealing with *critical demand*. One approach uses supply-side measures almost exclusively, with demand-side measures used only as emergency interventions (such as load-shedding or activation of demand-response enabled devices). In this approach, new infrastructure needs are high, as energy storage and reserve generation are the primary methods to bridge the periods of critical demand. This approach necessitates building infrastructure that will lie idle for almost the entire year – it will be needed only to cover critical demand events that occur over a handful of hours each year.

The second approach deals more holistically with energy supply and demand. In this approach, a more active approach is taken to manage energy demand and harness flexible demand, and to align it with periods of high renewable generation. This necessitates significant interventions on the demand-side of the energy system, with both incentives and regulatory measures complementing energy system investment to drive well-managed, effective and efficient use of energy that makes the best use of low-cost renewable energy resources. This second pathway reduces the amount of new energy supply infrastructure that is required, reducing overall energy system costs and potentially accelerating the achievement of a zero emissions energy system by reducing the decarbonisation task.

Australia currently has a significant untapped flexible demand resource. Flexible demand exists at a range of time scales:

- *Emergency demand response* capacity exists to rapidly reduce energy demand at times of exceptional, unforeseen demand-supply mismatch. These can involve load shedding of households and small businesses, or disorderly shutdowns of large industrial loads in order to protect the network, usually at extremely short notice.

- *Dispatched demand response* capacity, such as the Wholesale Demand Response Mechanism, provides an opportunity for large consumers to reduce their energy use to lower supply-demand mismatch, in exchange for a commercial rate of return. Dispatched demand response can help reduce system load in a matter of minutes, assuming facilities have made capacity available for dispatch.

- *Grid-responsive demand management* can proactively monitor and modulate energy use by adapting the time or volume of energy use in response to forecast or actual energy market conditions. This can help prevent critical demand periods and reduce overall energy system costs, as the need to deploy costly reserve generation is reduced. This is analogous to the services provided by a virtual power plant – indeed a VPP

can consist of both flexible energy supply (such as batteries) and flexible energy demand.

- *Permanent load-shifting* such as programming water heating to run during solar production periods makes a permanent contribution to reducing network and supply infrastructure requirements, making optimal use of renewable energy.

Due to a lack of compelling policies and incentives, much potential for flexible demand is being overlooked. For example, the Wholesale Demand Response Mechanism as currently implemented is not accessible to a wide range of potential flexible loads, and the NSW Peak Demand Reduction Scheme is in its infancy, and only incentivises flexible load within NSW.

The energy sector plan must consider how to harness these low-cost energy resources that can provide significant support to the energy system – particularly as rapid scale up of renewable energy infrastructure has proven more challenging than first thought. Modelling by NERA consulting for ARENA has shown that a high-flexibility world could reduce costs to NEM consumers by up to **$18 billion** in net present value between 2021 and 2042, compared with a low-flexibility world, while reducing NEM emissions by up to 3.5% annually.[2]

New incentives and markets are needed to harness these types of energy resources, as well as improvements to existing mechanisms. Failing to adequately catalyse flexible demand resources through the Electricity and Energy sector plan will leave a significant contribution to accelerating the transition on the table.

Recommendation:

The Electricity and Energy sector plan should elevate flexible energy demand resources to make it an equal partner to new infrastructure in the transition, embracing the 'efficiency first' principle.

A holistic energy transition requires holistic energy governance

Current governance arrangements in the energy system have not made the most of demand-side opportunities to reduce cost and emissions. Energy governance arrangements have been almost totally concerned with ensuring the efficient *supply* of energy, rather than viewing the energy system as a whole.

Under current settings, energy governance mechanisms fail to consider linkages between energy demand and supply. For example, the Integrated System Plan considers demand-side involvement through energy efficiency and similar measures as an exogenous input to modelling, and does not seek to co-optimise demand-side and supply-side investment. Instead, the ISP assumes energy demand scenarios and looks at the network options that are required to meet that projected demand. This represents a highly conservative view of the demand side's ability to moderate and temper energy demands resulting from electrification. It also assumes that substantial increases in final electricity demand through electrification and efforts to create renewables-intensive manufacturing industries are a foregone conclusion, rather than a parameter for optimisation. This results in a highly costly approach to ensuring consumers'

[2] NERA Consulting 2022, *Valuing load flexibility in the NEM*, p.ix

needs for energy services are met, with an infrastructure-first approach. Current methods for examining non-network options to meet needs are limited in scope and ineffective in practice.

This is one example of the current failings of energy governance. Well-functioning energy governance mechanisms would build connective tissue between demand and supply, and consider a range of options to meet the needs for energy services. The Electricity and Energy sector plan must set out a plan for energy governance arrangements that are fit-for-purpose to deliver the energy sector transition, and effectively integrate demand-side energy resources into the energy system.

There are significant gaps in energy governance that the energy sector plan should consider. For example, while energy supply policy is relatively well connected, there is no obvious agency or person that oversees demand-side policy in the energy system. No agency or framework has responsibility for coordinating and facilitiating demand side participation, meaning that little attention is paid to the opportunities for emissions and cost savings available through demand-side participation.

Recommendation:

The Electricity and Energy sector plan should closely examine energy governance arrangements with a view to significantly improving realisation of demand-side potential.

Electrification is inevitable, but quality electrification will reduce costs

The overwhelming majority of evidence is clearly pointing to electrification using renewable energy as the most feasible approach to decarbonise a wide range of energy uses. The International Energy Agency's Net Zero by 2050 scenario has electricity supplying almost half of global final energy consumption in 2050, up from 20% in 2050.[3] Electrification is understood to be the least-cost decarbonisation pathways across a range of sectors, including buildings,[4] transport and some industrial applications.[5]

This means that it is highly likely that electrification will occur as society responds to address climate change for a variety of reasons, and that a certain degree of electrification is inevitable. Typically, electrification will see a reduction in total final energy demand due to the more efficient nature of most electric appliances. However, there remains a spectrum of efficiency among electric appliances, and the Electricity and Energy sector plan should consider how low-quality electrification might create additional risks and challenges to the transition.

Fortunately, there are proven existing policy mechanisms that can help guard against poor quality electrification if used effectively. Minimum energy performance standards have delivered between 40-60 Mt CO_2-e of abatement in the last decade alone, saving consumers up to $18 billion in energy bills.[6]

[3] International Energy Agency 2021, *Net zero by 2050 – a roadmap for the global energy sector*

[4] Australian Sustainable Built Environment Council 2022, *Unlocking the pathway, why electrification is the key to net zero buildings*

[5] Climateworks Centre 2020, *Decarbonisation futures*.

[6] Energy Consult 2023, *GEMS data modelling project 2022*

Improvements in minimum energy performance standards, energy labelling, smart grid integration and operability, building fabric performance, enabled demand response capability, as well as innovative incentives for consumers to take advantage of these capabilities are all accessible ways to ensure the quality of electrification is as high as possible.

While these measures relate to end-use of energy, they should not be considered only in sectoral plans that deal with energy use (such as the built environment sector plan, manufacturing sector plan etc.) The success (or otherwise) of these policies has significant implications for the rate and cost of decarbonisation of the energy system. We strongly suggest that these types of measures are included explicitly in the energy sector plan to create strong links between the energy system and demand-side measures that can play an important role in energy sector decarbonisation.

Additionally, by ensuring electrification places the least additional burden on infrastructure possible, the transition to a clean grid can occur more quickly.

Target supply-side efficiency in the energy system for a least cost transition

Beyond end-use energy efficiency, the Electricity and Energy sector plan should strongly consider supply-side energy efficiency – that is, emphasising energy efficiency improvements in energy supply systems to free up capacity and reduce the need for new transmission and distribution infrastructure – ultimately lowering costs and speeding up the transition.

Transmission and distribution businesses face relatively weak incentives to improve efficiency in their business. A number of international jurisdictions require networks to operate on an efficiency-first basis, or set efficiency targets for networks.[7] However, Australian energy governance relies on networks to access benefits-sharing incentive schemes, rather than setting expectations of efficiency.

A recent report from the Rocky Mountain Institute showed just three network efficiency technologies – dynamic line ratings, advanced power flow controls, and topology optimisation – could save over a billion dollars a year in energy cost savings in five US states, enable integration of an additional 6.6 GW of renewable energy, and cost **less than 10%** of rebuilding infrastructure.[8] This demonstrates the significant role that supply-side energy efficiency and management can have if deployed strategically.

Recommendation:

The Electricity and Energy sector plan should explicitly target supply-side energy efficiency, and signal the need for strong policies to ensure networks deploy efficiency to the greatest possible extent.

[7] Mid East Energy Alliance, *Integrated resource plans*; Pató, Z., Mandel, T. 2022, Energy Efficiency First in the power sector: incentivising consumers and network companies. Energy Efficiency 15, 57

[8] Katie Siegner, Sarah Toth, Chaz Teplin, and Katie Mulvaney 2024, GETting Interconnected in PJM: Grid-Enhancing Technologies (GETs) Can Increase the Speed and Scale of New Entry from PJM's Queue, RMI,

An orderly gas network phasedown needs a plan

As electrification takes hold, there will be fewer active, paying connections on the gas network. At some point, the costs of operating the network for a small number of remaining connected households will become excessive, which could lead to a haphazard transition, or even unsafe network abandonment. Leaving a phasedown of the gas network to chance risks a disorderly, 'death-spiral' transition, with the most vulnerable paying the highest cost.

While avoiding a death spiral is desirable, there are other, more positive reasons for policymakers to put in place a clear plan. Most notably, clear public communication that the gas network is being phased out will enable millions households and businesses around Australia to make an informed decision when they replace aging appliances. This step alone is likely to drive a degree of market transformation, especially for consumers that can afford to switch from gas to efficient electric appliances.

Commonwealth, state and territory governments have a clear role in planning and coordinating electrification and a concurrent gas network phasedown. Electrification should be planned and undertaken on a suburb-by-suburb basis, with clear guidance provided to residents, suppliers and other stakeholders to manage the transition as clearly as possible. These plans should distinguish between household and industrial energy use, noting that localised networks in industrial precincts may have an ongoing role in distributing renewable gases.

It is not clear that the current National Energy Law framework is fit-for-purpose to manage this transition, and an urgent review should take place to determine how the gas network phasedown can be managed in an optimal, cost-effective way.

The Electricity and Energy sector plan could play a pivotal role in assisting in the orderly phasedown of the reticulated gas network for some sectors.

Recommendation:

The Electricity and Energy sector plan should provide clear and strong guidance to facilitate an orderly phasedown of the reticulated gas network to avoid a disorderly death spiral that will impact vulnerable consumers the most.

Responses to specific questions

Mobilising investment to transform energy

1. *What actions are needed to attract the required large scale private capital and household investment in the energy transformation, with or without government intervention?*

The most important action that Government can take with the Electricity and Energy sector plan is to provide clear signalling of the policy intent to move to a zero emissions energy system by 2050. Any ambiguity or equivocation on the need to decarbonise energy usage completely will introduce needless and unproductive delay to the transition task.

There are also a range of other important enablers to deliver a zero emissions energy system by 2050. These include:

- Effective energy governance arrangements to ensure the demand side of the energy system is properly included in system transition planning;
- Measures to help households make the transition to electricity in an orderly way, through resources and assistance for electrification and energy performance improvements;
- Integration of a demand-side first approach into the energy sector plan;
- Ensuring the necessary workforce capability and capacity exists to implement the sector plan;
- Ensuring that system planning has access to data about energy use and availability of low-emissions energy sources to enable investment for commercial and industrial energy services at least cost;
- Improve markets and incentives for end-users to deploy flexible demand resources that can accelerate the transition.

Enabling electrification for a smooth transition

2. *What actions are required to ensure Australia's energy systems can enable increased electrification, while maintaining equity, reliability and security?*
3. *What insights do you have on the pace, scale and location of electrification, and how to embed this in system planning?*
4. *How can electrification efforts be sequenced to align with expansion of electricity generation and network capacity?*

See general comments earlier.

Growing alternative low carbon fuels

5. *What policy settings and certainty are required to support a fair, equitable and orderly transition for the decarbonisation of both natural gas and liquid fuels?*

As discussed earlier, the most important element of equitable and orderly decarbonisation is for the development of a plan – with clear signals – for an orderly phasedown of the reticulated gas networks.

We do not see the same level of fairness and equity concerns with the liquid fuels transition – the lower level of embedded infrastructure required for liquid fuels means the risks of transition can be more effectively managed by energy system stakeholders. While we would expect demand for liquid fuels to decrease in areas that have ready access to electricity and easily substitutable processes, liquid fuels may remain in demand for some high-energy density applications. Government policy should be directed towards making decarbonised liquid fuels

available at an affordable cost, particularly through research, development and innovation support.

6. *What actions are required to establish low carbon fuel industries in Australia, including enabling supply and demand, and what are the most prospective production pathways?*
7. *Are the proposed policy focus areas for managing the liquid fuels transition (outlined in Section 4 of the discussion paper) the correct areas to focus on, and what is missing?*

The EEC strongly supports the application of energy efficiency to manage and reduce energy demand in liquid fuels. In those areas that are not currently feasible to substitute with electricity or other low-emissions energy sources, energy efficiency is still the primary method to reduce emissions, and ambitious equipment and vehicle efficiency standards can deliver substantial abatement.

The EEC suggests that further work on mapping the use of liquid fuels in non-transport applications would be beneficial. Liquid fuels currently support a wide range of remote and non-remote energy needs, some of which are amenable to electrification. Understanding the scale of the task to fuel-switch non-transport end uses for liquid fuels is important to develop effective policies and incentives to support that substitution.

Building Australia's clean energy workforce

8. *What actions are required to ensure workforce requirements for the energy transformation are met, while supporting equitable outcomes?*

Australia has extensive needs in energy workers over the next few decades. As renewable energy infrastructure development gears up, there is a need to make sure that skills in common with demand-side activities (such as engineering, electrotechnology specialists, systems analysis and designers) are able to be deployed to both the critical areas of the transition – in both energy supply and energy management. Government has a role to play in continuing to understand workforce needs (such as by continuing the Australian Energy Employment Report and Clean Energy Generation initiatives), and by ensuring skills development programs are directed towards meeting the needs of the energy transition.

Governments have a clear role to play, by investing in frameworks for quality and safety, including professional development and certification, alongside traditional VET and higher education frameworks. Governments should also provide strong policy certainty and commit to electrification early to allow suppliers to stand up supply chains. This policy certainty is important as we compete with international jurisdictions for skills and supply – both Europe and the United States have clear agendas to increase their electrification momentum, and lack of policy certainty in Australia puts access to skills and supply chains in jeopardy.

Maximising outcomes for people and businesses

9. *What actions are required to ensure better energy outcomes for people and businesses, and maximise their benefit from the energy transformation?*
10. *What social licence and circular economy aspects should be considered as part of the pathway for the energy transformation?*

Improving energy governance – including putting people and businesses at the centre of energy system decision-making – is a critical to improving demand side

participation in the energy system. Deployment of demand-side solutions is critical to reducing the need for new infrastructure, and avoiding some of the connected issues in acquiring social licence.

However, careful thought must go into enabling demand side involvement. It is clear that the approach of the last two decades, of designing policies that appeal to rational, engaged consumers, have not worked, and a new model of assisting consumers to participate in the market is needed that removes as many barriers as possible and provides clear guidance and facilitation for households and businesses. Relying on individuals and small businesses to act as perfectly rational actors in the energy market has failed time and again, and the Electricity and Energy sector plan should avoid making the same mistakes.

Other

11. What are other gaps in Australia's energy sector decarbonisation policy and what actions are required to address them?

See earlier comments on energy system governance.