Lila Oldmeadow
National Energy Performance Strategy Branch
Deparment of Climate Change, Energy, the Environment and Water
Email - EnergyPerformance@dcceew.gov.au

3 February 2023

Re: Energy Efficiency Council response to the National Energy Performance Strategy discussion paper

Dear Lila,

The Energy Efficiency Council welcomes the opportunity to provide a response the consultation paper on developing a National Energy Performance Strategy. The Energy Efficiency Council is Australia's peak body for energy efficiency and management, with a membership of businesses, universities and governments working to guide Australia on the path to an efficient, prosperous net zero economy.

The EEC strongly supports the Government's intention to develop a strategy to improve energy performance. Improving energy performance is one of the quickest and cheapest ways to reduce Australia's emissions and drive down energy bills. The EEC encourages the Government to commit to an ambitious but achievable target and series of reforms to unleash a new wave of improvements to energy efficiency, energy productivity and facilitate rapid decarbonisation.

We are pleased to provide our comprehensive advice to Government on matters that we see as essential to include in the forthcoming NEPS. In this submission, the EEC has placed an emphasis on high-level policies and frameworks to unlock ongoing energy performance improvements that will both accelerate our trajectory to net zero emissions, and enable continued energy bill savings.

In our submission, we recommend that the Government prioritise reforms to energy governance and markets, industrial decarbonisation, and rehabilitation of the residential building stock. These areas have received insufficient attention in recent years and are long-term tasks essential to achieve Australia's emissions reduction targets. A number of other areas for action and reform are also highlighted.

The EEC would welcome the opportunity to support you and your team as you undertake development of the Strategy. For further information please don't hesitate to contact me at alex.stjohn@eec.org.au or on 0413 698 181.

Yours sincerely

Alex St John
Acting Head of Policy
Energy Efficiency Council

energy efficiency
COUNCIL

Submission to the National Energy Performance Strategy consultation paper

3 February 2023

Summary

The Energy Efficiency Council warmly welcomes the Government's commitment to develop a National Energy Performance Strategy (NEPS). Being smarter about how and when we consume energy will be crucial to a rapid and low-cost transition to a high penetration renewable energy system and a prosperous, net zero economy.

Improved energy performance reduces bills and emissions, and enhances wellbeing

Energy efficiency and management has a huge potential to rapidly reduce emissions. However governments in Australia have put relatively little effort into efficiency policy and programs relative to programs focused on decarbonising energy supply, especially compared to other developed countries. Addressing this gap in Australia's policy armoury is crucial and made more urgent by the current energy crisis brought on by escalating prices for globally-traded energy commodities. This crisis will be most effectively addressed by reducing our exposure to these fuels through a combination of efficiency, electrification and smart energy management, a response that deals with current price pressures while accelerating a cost effective transition to net zero emissions. In the future, energy performance will be critical to operating a zero emissions energy system at least cost, by managing and linking supplies of low-cost energy with energy demand that can effectively utilise that supply.

Energy performance also unlocks a range of other community objectives that are unrelated to energy. Creating healthy, comfortable buildings that protect their occupants against hot and cold weather; improving business productivity to realise greater economic prosperity and employment opportunities, as well as ensuring that a transition to a net zero economy occurs at an affordable cost to consumers (particularly vulnerable consumers), are all important broader outcomes that improving energy performance helps achieve.

A well-designed and implemented strategy is critical to guide investment to 2050

The Albanese Government's commitment to a revamped energy performance strategy for Australia is both welcome and urgently needed. Realising the very significant opportunities on the demand side of the energy system frequently requires some level of coordination or facilitation from governments. Clear, unambiguous policy signals will give businesses and markets the confidence to invest in energy efficiency, energy management, electrification and other energy performance activities. Additionally, government has an indispensable role in creating long-term plans for the transition to net zero emissions by 2050 to help align and amplify the actions of individuals, businesses and investors.

Setting appropriate, ambitious, measurable, and achievable targets for the NEPS is an important first step. Targets should be complemented by effective governance, data collection and reporting mechanisms for evaluating progress. The EEC believes that national, economy-wide targets should be complemented by more granular sectoral targets. A 'dashboard' of appropriate metrics and indicators may be the most effective way to monitor progress against the strategy. We would also encourage the Government to ensure that the Strategy's targets are ambitious but achievable through steady, sustainable ramp up. Lessons from previous energy performance

initiatives and extensive industry consultation should be embedded in strategy and program design.

While there is a long list of actions to improve energy performance that have individual merit, it isn't possible for governments, businesses and householders to implement them all at once. Some areas – such as appliance standards and commercial building efficiency – have well established policy and programs in place, and the task before government is straightforward: to rapidly ramp up these efforts. However, the EEC is very conscious that the resources of government are finite, and beyond these obvious areas, some prioritisation of action is essential to create an effective strategy. In examining areas of energy performance in greatest need of attention, the EEC has considered which tasks will require long-term, sustained effort to enable successful decarbonisation by 2050 and have been largely unaddressed to date. The EEC therefore recommends that the NEPS prioritise **energy governance and markets reform, residential building rehabilitation, and industrial decarbonisation** in its first tranches of work. There are opportunities to take action in these areas to catalyse rapid energy performance improvements, and build communities and economies that are prepared for the changes that will occur over the coming decades.

Governance and market reforms are needed

The NEPS is likely to require a range of supporting initiatives to achieve its targets. Making improvements at scale on the demand side of the energy system requires the coordination of decisions by millions of individual householders and business owners. That means efficiently-designed, effective and well-targeted regulation is an indispensable tool to realise the full benefits of energy performance at least cost to consumers and the community.

Reforms to energy governance and market settings are also urgently required and create market settings that deliver the transition to a zero emissions energy system at least cost. Reform of national energy laws and regulatory processes is needed to to enable greater demand-side participation in the energy system. Establishment of a new energy performance body is crucial to build coordination and expertise between state and federal efforts and policy areas such as buildings, transport, industry and energy that are currently disparate and disconnected but are becoming increasingly interdependent as we transition to a net zero economy.

Industry needs guidance, assistance and motivation to decarbonise

As an urgent priority, the NEPS should commence development of a long-term industrial decarbonisation plan. Industrial decarbonisation is likely to be challenging, and while significant decarbonisation can be achieved with current technologies, investments in research and development of new technologies will be critical to eliminate emissions from some major processes. A long-term plan can highlight actions to improve industrial energy performance in the short term, and will provide important guidance to industrial companies and the energy sector they rely on to pivot investment to clean and efficient industrial capacity. While this strategic work is taking place, the Government should move quickly to implement straightforward actions that can immediately improve the energy performance of industrial and commercial enterprises, particularly those not currently addressed by existing policy

such as the Safeguard Mechanism. These actions include including basic literacy and awareness, coupled with extensive deployment of energy metering and monitoring. Government should also take actions that support the adoption of energy management systems, complemented by incentives that focus attention on improving energy performance in industry. Longer-term decarbonisation will be supported by ongoing investment and attention to research and development programs, leveraging Australia's high-quality research and development (R&D) capabilities.

Improving the performance of residential buildings is critical to the transition

Long-term planning will also be essential to decarbonising the buildings sector. Updating the *Trajectory for low energy buildings* to include ambition to decarbonise buildings well before 2050 is a vital task to provide clear guidance for future updates to the National Construction Code, as well as guiding investment into building retrofits to create net zero ready buildings. Efficient electrification will be a key tool to decarbonise building operations in most cases, and long-term planning and guidance is needed to ensure that building operations and energy systems co-evolve efficiently to effectively to balance investments in supply, networks, storage, demand side efficiency and electrification. The role of Government programs as an exemplar of best practice and source of firm initial demand to direct investment towards development of skills and supply chains in the residential sector is particularly valuable.

A substantial effort is required to rehabilitate a large portion of the eight million homes that were built before the introduction of minimum energy efficiency standards, which will require sustained involvement from governments at all levels. However the effort is justified. Residential buildings are one of the keys that unlock the transformation to a zero emissions energy system. The energy demand from homes disproportionately impacts the energy system's overall peak demand, and is the most misaligned with the output of low-cost solar generation. Improvements to the thermal performance of residential building shells will help manage peak demand, and support an efficient, orderly and least-cost transition away from fossil gas.

Underpinning this transformation will be the urgent finalisation and deployment of a national residential energy performance rating system, and mandates for the disclosure of ratings when buildings are sold. Disclosure is a crucial element of a broader effort to overcome market failures and information asymmetries. Deployment of the rating system will also facilitate the involvement of global finance markets to resource residential rehabilitation. Upgrades to social and public housing, as well as the establishment of minimum standards for rental properties in every state and territory, will protect the health and wellbeing of those most at risk from homes with poor energy performance. These initiatives will need to be accompanied by efforts to upskill the building industry to deliver quality retrofits at scale.

Continuing Australia's leadership in commercial building energy performance is a clear winner for the strategy. Expanding NABERS and the commercial building disclosure program to different building types will leverage effective, well-developed programs, and help facilitate improved energy performance right across all types of commercial and public buildings. Retrofitting existing buildings to decarbonise building operations, as well as harnessing the potential demand flexibility resource presented

by commercial buildings, are clear priorities to maximise the value of the expertise and skills present in the commercial buildings sector.

We must step up efforts to help consumers to improve energy performance

Further expansion of Greenhouse and Energy Minimum Standards (GEMS) are important to step up the level of ambition for this highly effective program. Australia should pivot to considering rapid harmonisation and uptake of internationally demonstrated standards, and reduce barriers to making standards for a wider range of equipment. The GEMS program (and international equivalents) has been shown time and time again to reduce costs for consumers, while providing benefits in reducing energy system demands and emissions.

Energy efficiency schemes in state and territory jurisdictions have likewise been consistently shown to provide consumers with benefits. These schemes provide an avenue to deploy energy efficiency technologies at scale and low cost, while delivering benefits to the energy system and community more broadly. Energy efficiency schemes should be expanded to all parts of Australia to ensure all Australians have equitable access to energy performance upgrades. Better national coordination of schemes would reduce the cost for governments, suppliers and energy users, and ensure that these schemes operate at their peak effectiveness and support the transition to all-electric and all-efficient homes.

By contrast, the Emissions Reduction Fund has been ineffective at driving energy performance improvements or fuel switching, and reforms to energy efficiency methods are long overdue to reduce barriers to participation. The ERF will be much better placed to support increased demand arising from the Safeguard Mechanism if emissions reductions can be sourced from a broader cross-section of the economy, as well as reducing risks posed by any single type of offsets.

Decarbonising transport is another important priority that the NEPS can support. The forthcoming National Electric Vehicle Strategy (NEVS) will play a key role in decarbonising light passenger vehicles, but addressing the potential benefits and costs that electric vehicles will present for the electricity network is an important area of action for the NEPS. Opportunities to manage costs through demand flexibility will be best harnessed if early action is taken. Improvement in the performance and efficiency of Australia's freight and logistics networks will be an important complementary task for the NEPS, as some of these transport tasks will take longer to fully decarbonise.

Critical enablers for a successful strategy

There are a range of key enablers that the NEPS should consider. Improving energy performance will require scaling up of the energy performance workforce – data, frameworks for quality and safety, and efforts to improve the visibility of the largely hidden energy performance workforce are all critical. Efforts to accelerate innovation in clean technologies – including innovative business models – is also important. This should include strategic investments in the onshore production of low-emissions technologies, particularly where areas of onshore competitive advantage, expertise, or bespoke local requirements are identified. Enhancing access to energy data is another crucial enabler of improving energy performance; long-held ambitions to unleash innovation through better data availability must be realised.

Lastly, the role of finance in driving the energy performance revolution cannot be overlooked. Decarbonising industry and buildings alone will require the investment of hundreds of billions of dollars before 2050. While there will be a role for governments to directly fund some energy performance improvement activities, the majority of energy performance spending will come through the private sector. Providing the finance sector with the necessary information and frameworks to invest in energy performance upgrades is critical. In addition, as interest rates return to normal levels, concessional finance is once again becoming a more meaningful incentive for households and businesses to incorporate energy efficiency and sustainability outcomes into investments (such as building renovation or equipment financing).

There is a considerable amount of work to do, but the opportunities are substantial. Australia will succeed in unlocking a massive improvement in energy performance through careful prioritisation and playing the long game. This is a policy area littered with short term, ad hoc programs and policy. The evidence from around the world is clear: big improvements in energy performance require a long term commitment and sustained, steady effort over time.

Ultimately, the National Energy Performance Strategy will be judged on whether it succeeds in catalysing the sustained action required to ensure the demand-side plays its full part in the transition to (and beyond) net zero emissions by 2050.

List of recommendations

As part of the National Energy Performance Strategy, the EEC makes the following recommendations:

National Energy Performance Strategy targets and governance

1. The Government should select a range of economy-wide and sectoral metrics to measure Australia's energy performance improvement that also reflect the broader objectives of the NEPS.

2. The NEPS should include energy efficiency targets that are informed by international ambition for increasing energy efficiency, are consistent with Australia's emission reduction targets, and set an ambitious but achievable stretch goal.

3. Progress against the National Energy Performance Strategy should be included in the Minister's annual climate change statement to Parliament, and also the advice provided by the Climate Change Authority to the Minister in advance of the statement.

4. The National Energy Performance Strategy should prioritise actions in energy governance and market reform, industrial and commercial decarbonisation, and residential rehabilitation.

Energy governance and market reform

5. The Commonwealth, state and territory governments should establish a national energy performance body, to link policy areas together that are responsible for energy, buildings, industry and transport, and make energy demand as integral to energy system policy and market settings as energy supply.

6. The Commonwealth, state and territory governments should require that the Integrated System Plan better integrates demand-side opportunities, and resourcing is provided for an annual Energy Performance Statement of Opportunities.

7. The Commonwealth, state and territory governments should establish a taskforce and process to rapidly reform national energy laws to better promote, facilitate and value demand-side activities.

8. The Commonwealth, state and territory governments should both enable and require expertise in energy management, demand-side issues and consumer issues to be embedded deeply within energy market bodies, including at board level.

Industrial decarbonisation

9. The NEPS should expand and deepen resourcing nation-wide to support energy-intensive businesses to access advice and implement energy metering, monitoring and management systems.

10. The NEPS should put in place a package of incentives to assist businesses to improve their energy performance, as well as provide a clear policy signal for businesses to engage with decarbonisation and energy performance. In particular, the NGERS framework should be more effectively used to create incentives to decarbonise.

11. The NEPS should fund a major industrial decarbonisation demonstration program through ARENA to help commence the transition to clean industrial capacity, deliver immediate energy performance improvements, and build skills and supply chains required for long-term industrial decarbonisation.

Buildings - general

12. The NEPS should incorporate long-term planning for improving the energy performance of buildings – including decarbonisation – as a high priority, to provide clear guidance to asset owners.

13. The National Construction Code should be regularly updated to be consistent with a long-term plan for building energy performance and decarbonisation and makes phasing out fossil gas usage in new buildings a priority.

Residential buildings

14. A national residential building energy performance rating system should be finalised as a matter of extreme urgency.

15. The Government should commission a comprehensive baseline study of residential energy performance to build a critical mass of energy performance ratings and create a high-quality data set on residential energy performance.

16. The NEPS should prioritise achieving mandatory energy performance disclosure of residential buildings at point of sale in all jurisdictions as soon as possible, contingent on finalisation and deployment of the residential energy performance rating.

17. The NEPS should work with state and territory governments to implement minimum mandatory rental standards as soon as possible.

18. The NEPS should facilitate a partnership between the Commonwealth, states and territories to ensure all social, community, public and Indigenous housing meets at a NatHERS rating of at least 5 stars by 2030.

19. The NEPS should implement a package of foundation work to enable deployment of energy efficiency upgrades to rental homes at scale.

Commercial buildings

20. The NEPS should support continued expansion of NABERS and Commercial Building Disclosure to additional building types.

21. The NEPS should support an ambitious policy for decarbonising government operations through the Net Zero APS by 2030 initiative, including re-establishing Commonwealth government leadership as an exemplar of innovative decarbonisation.

22. The NEPS should support a series of demonstration projects for decarbonising existing commercial buildings (including large apartment buildings) to build awareness, skills and supply chains.

Appliances

23. The NEPS should reform the Greenhouse and Energy Minimum Standards program to allow rapid adoption of suitable international standards, and harmonisation of existing Australian standards with international comparators.

Transport

24. The Government should introduce ambitious corporate average fleet economy standards for light vehicles as a matter of urgency.

Energy Efficiency Schemes

25. The NEPS should take a leadership role in building on the achievements of existing energy efficiency schemes by:
    a) working with state and territory governments to expand energy efficiency schemes to all jurisdictions, leveraging existing expertise and architectures, and
    b) encouraging greater cooperation and collaboration to promote national consistency in energy efficiency schemes as far as possible.

26. The Government should significantly reduce barriers for participation of energy efficiency and fuel-switching activities in the Emissions Reduction Fund to mobilise new sources of investment in energy efficiency activities.

Cross-cutting issues and enablers

27. The NEPS should include an ongoing commitment to comprehensive data collection about the energy workforce through an appropriately funded, designed and delivered Australian Energy Employment Report.

28. The NEPS should commission technology demonstration and deployment programs that support a series of projects to capitalise on skills development and unlock learning rates to drive down technology deployment costs.

29. The NEPS should consider how to complete the rollout of advanced metering infrastructure while building community acceptance, should governments consider finalisation of the rollout to be a priority.

30. The NEPS should explore and encourage a range of financing models that can leverage the Government's ability to borrow at low cost and provide compelling concessional finance products to encourage energy performance improvements.

List of key findings

National Energy Performance Strategy targets and governance

1. Improving energy performance is a key strategy to ameliorate the impacts of the global energy crisis on Australia. New approaches to policy and deep collaboration between and across governments are needed to better manage the demand side of the energy system, reducing exposure to global energy shocks.

2. It is critical that energy policies holistically consider supply, storage, networks and demand-side measures at the same time to determine the optimal mix of investments to deliver affordable and reliable energy.

3. Improving energy performance is crucial to reduce emissions in the short term, build and accelerate the transition to zero emissions in the energy system, and maintain affordability and reliability of the energy system in the future.

4. While the achievement of a net zero economy will require deployment of a range of technologies, electrification is an important immediate step that can deliver rapid improvements to energy performance and emissions reduction with commercially available technologies.

5. Ensuring that electrification is undertaken efficiently is important to delivering the greatest cost and emissions reduction benefits from decarbonising electricity supply. Poor-quality electrification imposes unnecessary costs on consumers and the energy system.

6. Policies and programs to improve energy performance should heed lessons from previous efforts and seek to scale up steadily and sustainably. Rushed implementation risks poor results. Efforts to improve energy performance should be based on durable, multi-year programs to sustain effort over the long term. Inadequate short-term funding for programs risks both delay and inefficiencies. The NEPS should prioritise firm commitments to multi-year programs that steadily move from program design through trial to completion.

7. Well-designed, effective regulation is an indispensable tool in improving energy performance. The NEPS should look for opportunities to increase the ambition of Australia's regulatory programs to improve energy performance.

Industrial decarbonisation

8. Improved energy performance will support industrial decarbonisation. However, sustained effort to decarbonise industrial production will be necessary, and there is a clear role for government to plan, coordinate and enable the pathway to industrial decarbonisation by 2050.

9. While lack of information can be a critical barrier to improving business energy performance, novel methods of engaging with businesses are needed to create awareness of the benefits of – and avenues to – improved energy performance.

10. A mix of incentives is required to drive industrial energy performance improvements. Incentives should provide practical assistance to businesses to decarbonise, and also drive attention and engagement towards industrial decarbonisation and improving energy performance.

Buildings - general

11. Improving the energy performance of buildings supports a range of better outcomes for occupants. Reducing unnecessary energy use to maintain safe, comfortable and productive environments reduces energy expenditure and energy hardship, as well as reducing emissions and reducing health system expenditure.

12. Improving the energy performance of buildings over the long term will require bringing together improvements in building design; building upgrades and retrofits; smart integration of buildings into energy systems; and a reduction in embodied energy and emissions. Successfully bringing these elements together can support an accelerated transition to net zero.

13. A plan to decarbonise buildings must plan for the fuel switching of services that currently use fossil gas, primarily through efficient electrification. Planning is important to provide guidance both to building asset owners, but also electricity networks as new electric demand comes online.

14. Government procurement is an important lever to drive market transformation and can help build better practice. Cooperation and collaboration between different jurisdictions can help maximise the benefits of government investment in high-performing buildings.

Residential buildings

15. Substantial investment in residential rehabilitation from a range of sources is required. Initial work in scoping the residential rehabilitation task is needed, ahead of the development of a substantial residential upgrade package.

16. Access to cost-effective energy performance upgrades differs across Australia. Consideration should be given to ensuring that every Australian resident has access to effective energy performance upgrades at low cost.

17. The greatest benefits accrue from holistic improvements to building energy performance, however lack of skills and a viable market for integrated energy performance retrofit professionals presents a barrier to unlocking this energy performance potential. The NEPS could consider how governments might encourage development of a market in residential retrofit advisors and managers.

18. Apartment buildings present unique challenges to improve building performance, owing to the nature of strata-owned buildings, and technical barriers to upgrades in some building types. Including apartment building types in building decarbonisation demonstration programs could be an effective way to help overcome these barriers and build skills and market readiness to carry out energy performance retrofits in these building types.

Commercial buildings

19. While commercial buildings have high potential as a demand response resource, incentives do not currently create a compelling business case for asset owners to invest in demand flexibility capabilities. The NEPS could examine to how leverage this resource.

Appliances

20. Integrated demand response capabilities are a valuable addition to appliances that can help improve energy system security and reliability. Piecemeal implementation of demand response requirements is inefficient and increases costs for consumers.

21. Future energy performance standards for commercial and industrial equipment could consider the entire energy using system, rather than regulating individual components. This would support accelerated industrial and commercial decarbonisation, as well as provide greater incentive for better integration of system components.

Transport

22. Efficient electric vehicles are likely to support strong decarbonisation of the transport sector, particularly when coupled with renewable energy. However, widespread adoption of electric vehicles will present new challenges for managing grid demand, but also present opportunities for close integration with sources of energy supply.

23. As decarbonisation of heavy transport is more difficult than passenger transport, freight efficiency in Australia is an important component of improving energy performance and reducing emissions. The NEPS could consider instigating a review of freight performance to highlight opportunities for improvements to benefit consumers and reduce emissions.

Cross-cutting issues

24. Frameworks for ensuring quality and safety in energy performance improvement programs are critical to success of the NEPS. Safeguards against poor safety and quality – including scaling up sustainably – should be interwoven throughout any NEPS-related initiative.

25. Programs to improve energy performance are likely to require expansion of the energy performance workforce. The NEPS could consider how to elevate visibility of energy performance trades and professions to assist in building the workforce.

26. A transition to a net zero, high energy performance economy will require deployment at scale of a range of strategic technologies. Opportunities exist to shore up Australia's supply chains for these technologies through judicious investment in onshore innovation and production, and the NEPS could explore opportunities to leverage other government initiatives to facilitate these opportunities.

27. Comprehensive, high-quality data supports sound policymaking and targeting. Development of the NEPS should take into account government requirements for energy performance data that will drive sound strategy implementation and reporting.

28. Data availability and access, appropriately protected, is a key enabler to developing new business models and opportunities that can improve energy performance. Reforms to improve data availability and access have stalled, presenting a barrier to innovation in digital tools to improve energy performance.

29. Significantly improving energy performance will require investment of hundreds of billions of dollars over the next two decades. This investment will need to be shared across governments, businesses, households and the energy system.

Action plan

This section seeks to help prioritise the actions that could be undertaken as part of the development of the National Energy Performance Strategy. While not including every recommendation made in this submission, it is intended to give an indication of relative priority for implementation of the submission's recommendations.

Urgent or overdue actions – finalise as soon as possible	Section
1. Finalise a national residential building energy performance rating	11.3
2. Implement ambitious corporate average fuel economy standards	14.1

First tranche – start work within six months	Section
1. Select and develop meaningful targets and metrics for the NEPS – including sub-sectoral targets - complemented by effective governance and reporting arrangements	5.1
2. Establish a national energy performance body to advise, plan and coordinate demand-side policies between and across governments	8.2
3. Establish a multi-jurisdictional taskforce and process to start work on energy law, governance and market reforms to better incorporate demand side measures into the energy system	8.4
4. Commence work on a national industrial decarbonisation plan	9.1
5. Work with states and territories to implement mandatory energy performance disclosure of residential properties at point of sale	11.3.2
6. Establish a national partnership to undertake energy performance upgrades to social, public and community housing	11.4.1
7. Commission a national baseline study on the energy performance of homes to build data and deploy energy performance ratings at scale	11.3.1
8. Commence work to reform the GEMS regime to enable rapid adoption of suitable international standards and harmonise existing Australian standards with international comparators	13.1
9. Fully establish and fund initial and subsequent Australian Energy Employment Reports to inform workforce adequacy planning	16.1
10. Commence work on removing barriers to energy efficiency and fuel switching methods in the Emissions Reduction Fund	15.2

Second tranche – start work within twelve months	Section
1. Update and expand the *Trajectory for low energy buildings* to make it compatible with a zero emissions buildings sector before 2050	10.4
2. Undertake a package of work to facilitate deployment of energy efficiency upgrades to rental properties at scale	11.4.2
3. Work with states and territories to implement minimum performance standards for rental properties nation-wide	11.3.3
4. Expand the application of NABERS across a wider range of commercial building types, and extend commercial building disclosure to new classes of building where appropriate	12.1
5. Support the rollout of industrial energy metering, monitoring and management systems	9.3.2
6. Establish decarbonisation demonstration funds for commercial buildings and industrial enterprises	9.4; 12.3
7. Finalise a reinvigorated program for energy efficiency in government operations through the Net Zero APS policy	12.2
8. Resource the production of an annual Energy Performance Statement of Opportunities to inform the Integrated System Plan	8.3
9. Scope and design a national residential retrofit program to leverage government finance and private investment	11.3.4; 19.1.2

Later tranches – start work within this term of Parliament	Section
1. Finalise the rollout of advanced metering infrastructure while building community acceptance	18.1
2. Expand energy efficiency schemes across all jurisdictions and work with states and territories to improve consistency across existing schemes	15.1
3. Update the National Construction Code to be consistent with achieving net zero in buildings before 2050	10.5.1
4. Create a package of incentives for businesses of all sizes to improve their energy performance and decarbonise, leveraging the NGERS framework	9.3.3

Contents

1 Objectives of the National Energy Performance Strategy

The Energy Efficiency Council welcomes the Government's initiative in developing a National Energy Performance Strategy (NEPS). While policy attention has been focused on the substantial changes underway in the supply side of the energy system for some years, the demand side of the energy system has an equally important part to play in achieving a successful transition to a prosperous, net zero emissions economy. Successful integration of demand- and supply-side policy in the energy system (and broader economy) will deliver substantial savings in both emissions and cost, and contribute a range of positive outcomes for the nation.

The NEPS will seek to achieve several aims, including reducing energy bills for consumers and supporting the achievement of Australia's mid- and long-term emissions reduction targets. These are important immediate drivers, but the objectives and ambition of the NEPS should be framed in the important long-term outcomes that improving energy performance can deliver for Australians. These objectives are not related to energy, but rather are aspirations that improving energy performance can support:

- **Creating homes that are healthy, comfortable, and climate-safe**
  Improving the energy performance of residential dwellings through thermal shell upgrades and use of efficient appliances creates homes that foster the long-term health and wellbeing of occupants, as well as reducing energy bills.

- **Improving the productivity and competitiveness of businesses**
  While for many years Australian business enjoyed competitive advantages based on availability of cheap fossil fuels, the increasing globalisation of energy markets has eroded this advantage. Improving energy performance, energy productivity and maximising the use of abundant renewable energy will lower energy input costs for Australian business, as well as improving productivity.

- **Supporting a reliable, secure and affordable energy system**
  Improving energy efficiency and taking advantage of opportunities in energy management, demand response and flexibility, and close alignment between energy supply and demand minimises energy system costs, and improves system reliability and resilience to global energy shocks.

- **Accelerating the transition to a net zero economy**
  Improving energy performance immediately reduces the size of the task to decarbonise the economy. Improved energy performance helps Australia harness its endowment of renewable energy resources, reduces the amount of new infrastructure that must be built, and frees up resources for investment in clean, productive, and net zero-compatible assets. Improving energy performance is a crucial strategy for delivering the net zero transition quickly and at least cost, improving our chances of keeping a 1.5°C future within reach.

Expressing the objectives of the NEPS in terms beyond improvements to energy performance could help build momentum for widespread take-up of energy performance measures and bring the importance of energy performance into the living room of every Australian.

Key terms

In this submission, the Energy Efficiency Council makes recommendations to **improve energy performance**. In line with the intent of the consultation paper, we broadly interpret this as taking actions that enable households, businesses and the community make the best or most cost-effective use of energy.

These activities include:

- **Energy efficiency**, which means reducing the amount of energy required to perform the same service or produce the same good. *Example – reducing the amount of energy a household freezer requires to keep its contents frozen.*

- **Energy management**, which means taking actions to alter the volume, time or instantaneous power requirements of energy use for cost or operational reasons. *Example – changing the time that an appliance runs to take advantage of periods of low-cost renewable energy.*

- **Demand response, flexibility or management***,* which means taking actions to alter instantaneous energy use to manage the demands that energy users place on energy networks. *Example – demand response-equipped air conditioners throttle down power usage in response to a network signal to reduce exceptional stress on the electricity network.*

- **Fuel switching**, which means substituting one energy source for another, to reduce emissions, cost, or both. While fuel switching is an important tool to reduce emissions, it can also provide additional efficiency benefits. *Example – switching from a gas water heater to an electric heat pump water heater.*

These activities are the practical means of improving energy performance and are often undertaken together. For example, as electric appliances are frequently more efficient than those running on other fuels, fuel switching to electricity is also a significant source of energy efficiency.

This submission also refers extensively to ***demand-side measures***. These are activities that are undertaken on the customer side of the energy meter – in contrast to *supply-side* measures that occur on the network side of the customer's energy meter. Demand-side measures are generally within the control of the user or consumer, while supply-side measures are within the control of energy suppliers and networks. Energy efficiency, energy management and fuel-switching are generally considered demand-side activities (although energy suppliers and networks can also use these techniques).

2 The EEC's approach to this submission

The Energy Efficiency Council has a broad interest in improving energy performance across the economy and has attempted to canvass as many relevant areas as possible in this submission to the National Energy Performance Strategy. However, there are a range of areas that we are unable to cover either in sufficient detail, or at all.

In many cases, this submission has focused on the frameworks and overarching policies that will be needed to facilitate improved energy performance, rather than actions to improve energy performance in specific situations. We acknowledge the vast resource of knowledge and expertise that exists within other organisations, and encourage the NEPS process to complement the policy recommendations made in our submission with the recommended opportunities for technical solutions that many of our colleagues and partners will make in their own individual submissions.

In particular, we acknowledge that there are important areas we have felt are beyond our expertise to satisfactorily address in this submission. These include energy performance improvements in agriculture, infrastructure, mining and resource extraction, and energy-intensive information technology infrastructure. These are areas which the NEPS should consider energy performance improvements, but not areas in which we will provide strong guidance to Government at this time.

Additionally, the EEC understands that the NEPS is likely to be a strategy that is primarily driven by the Commonwealth, and our response is framed through consideration of the policy levers available to the federal government. However, as the demand-side of the energy system lies throughout the economy, both within and without the constitutional limits of Commonwealth responsibility, there are several matters canvassed in this submission that are likely to require coordination or joint implementation with state and territory governments. Nonetheless, Commonwealth leadership is an important tool, and the role of the Commonwealth as a facilitator and convener of intergovernmental fora is a critical lever to progress reforms that sit outside the Commonwealth's direct responsibility.

Finally, the EEC welcomes the Government's commitment to ongoing consultation in development of important climate and energy policies, and looks forward to ongoing opportunities to provide feedback and industry perspectives in the development of policies arising from the NEPS. Scaling up energy performance activities is likely to be a challenging task, set against labour shortages and global supply chain disruptions, and strong lines of communication between industry and policy makers is likely to improve the prospects for successful policy implementation.

3 Energy performance and the energy crisis

Australia's energy performance is a mixed bag. While there are isolated examples of great and cutting-edge energy performance in the economy, big sections of the energy system are used wastefully and are not fit-for-purpose. Australia's pre-2005 housing stock performs poorly and jeopardises the health of residents. Industrial energy efficiency efforts remain embryonic. The fuel efficiency of vehicles in Australia has stagnated since 2015 and is at risk of going backwards.[1] These factors have led Australia's energy performance to be ranked last of the OECD nations among the world's largest energy users.[2]

This has meant that Australian households and businesses are ill-equipped to deal with the energy crisis that gripped the world in 2022. Poor energy efficiency leaves people and enterprises more exposed to price increases than they need to be, with disastrous consequences. However, there is a silver lining – energy affordability can be dramatically improved simply by bringing our energy performance into line with other developed economies.

3.1 The 2022 energy crisis – decades in the making

Historically, Australia's energy policy was principally concerned with encouraging development of new sources of energy supply. Fossil fuel resources were historically available at low production cost, and protectionist policies and technical barriers to export meant that abundant energy supply was available to the domestic market at relatively low cost.

Under these conditions, energy efficiency and other energy management measures held a relatively low priority. This can be understood, as investing in efficiency in a time of plenty may not appear to be a productive use of time, skills or capital. In turn, this means that Australia has not built a culture of efficiency and energy performance improvement that is visible in other economies that have historically paid a higher price for imported energy.

However, the Australian energy landscape has evolved significantly over the last three decades. Important changes include:

- Closer integration of the Australian and global economies and liberalisation of barriers to inbound and outbound trade, creating structural shifts in the Australian economy away from general manufacturing towards services and commodity resource production.
- Overcoming technical and logistical barriers to export of fossil fuels – particularly natural gas – which has gradually introduced global competition into Australian energy markets.
- Changes in Australia's energy supply profile, such as the peaking of domestic oil production and decreased reliance on solid fuels for residential and commercial applications.

- Introduction of the National Competition Policy reforms to state energy markets and the breakup of vertically integrated state energy utilities.
- Realisation of the role of the energy system as a primary driver of climate change, and consequent efforts to reduce greenhouse gas emissions.
- The emergence in the 2010s of wind and solar power as sources of very low-cost energy, coupled to new challenges of generation variability.

Overall, these changes have made the energy system more complex, with different interactions exerting influence over energy markets in different ways. Energy consumers - who previously relied on government entities to manage energy risks for them - find themselves increasingly exposed to complex global supply chains with few levers at their disposal to control their energy expenditure.

While energy supply has made dramatic changes over the past three decades, our energy performance has not kept up. Through a legacy borne of our previous circumstances, we have not developed systems, expertise, skills or markets to evolve the demand-side of the energy system to match evolution in the supply side.

A combination of inefficient legacy capital stock across residential and business sectors, a low base of skills and organisational and cultural awareness of energy management, high economic energy intensity, over-reliance on fossil fuels and low policy support for improving energy performance have left Australia exposed to energy supply disruption.

This exposure was brought into stark relief in 2022, as global energy supply disruption and subsequent runaway price escalation collided head-on with Australia's ill-equipped energy systems and markets. In 2020-21, Australia's primary energy production was **more than four times greater** than our final energy consumption.[3] Despite this, Australia struggled in 2022 with keeping the lights on – and stories of ordinary Australians facing energy hardship hit the headlines weekly.

Australia's energy problems do not stem from a lack of energy supply. There is more than sufficient energy produced in Australia to meet the needs of every Australian household and business, **four times over**. This highlights that our energy challenges arise in our distribution and use of energy – and how our demand for energy is unresponsive to changing circumstances.

To address the challenges facing Australia's energy system, a shift in focus towards improving energy performance and making smarter use of energy is required.

3.2 The way forward requires new thinking

Improving energy performance is a strong basis for addressing the energy crisis. Essentially, improving energy performance is all about making the most effective use of energy. Instead of treating energy demand as a 'given' in the energy system, energy demand must be adapted, harnessed and re-imagined making the best use of Australia's energy resources.

Entirely new approaches will be required to solve several of the most persistent issues with energy performance in Australia. Areas in need of urgent action including kick-starting improvements to energy performance in industry, as well as starting the job of rehabilitating sub-standard housing stock. Current policy doctrine has been unsuccessful at addressing these issues to date, and careful reconsideration of the role of government is indicated.

The demand-side of the energy system is far more complex to deal with than the supply-side. Energy supply, while complex in itself, is composed of a limited set of actors and stakeholders that occupy a well-defined economic sector. In contrast, energy demand is spread throughout the *whole* economy. Factors that influence energy demand arise in industry, in housing and construction, in healthcare and education, in logistics, in security – and policy responsibility is distributed across different departments as well as different levels of government.

These factors necessitate policy solutions that require expertise and thought – challenging, but by no means impossible. Relying on previous templates to bring Australia's energy performance up to scratch will not work. Achieving results will require strong collaboration between and across governments, and prevailing policy orthodoxies may require adjustment to suit the task at hand.

3.3 What will success look like?

Success or failure of a National Energy Performance Strategy will ultimately be judged with the passage of time. However, a successful strategy will likely have encouraged the development of a range of attributes in the economy. These could include:

- Overall reduction in the use of non-renewable primary energy;
- Improved resilience to energy prices and reduction in energy poverty;
- Further decoupling of economic growth and energy intensity; and
- Clear progress towards alignment of energy use with a net zero economy.

These attributes show the NEPS will only be successful if it encourages holistic, economy-wide action to improve energy performance. This means that a successful NEPS will catalyse and drive collaborative action between the Commonwealth and state and territory jurisdictions, and across different portfolio areas between and across governments.

The NEPS will also be successful if it empowers the community to take meaningful action. Previous approaches to empowering communities have relied heavily on the supposed existence of engaged, active consumers to exploit competitive market opportunities – a model which has not been particularly successful. Instead, a successful NEPS will catalyse extensive collective action amongst households and businesses.

The benefits of improved energy performance accrue when action is taken at scale, requiring millions of individual actions. Governments have an obvious role in coordinating and facilitating those actions and success will require governments to embrace this role. In 2022, governments were willing to take extraordinary actions to protect consumers and businesses in the short term, and applying a similar level of

ambition and innovation to the demand side of the energy system will underpin a successful NEPS.

Key finding 1

Improving energy performance is a key strategy to ameliorate the impacts of the global energy crisis on Australia. New approaches to policy and deep collaboration between and across governments are needed to better manage the demand side of the energy system, reducing exposure to global energy shocks.

4 Energy performance and the transition to net zero

Australia has a bipartisan commitment to achieving net zero emissions by 2050 and has started its transition to a net zero economy in earnest. The first task of the transition is already well underway – decarbonising electricity supply. However, there are a range of other challenges to come, including decarbonising industry, transport and commerce.

Improving energy performance is a strategy that can immediately reduce emissions. Around 65 per cent of Australia's gross emissions (excluding LULUCF) come directly from combustion of fossil fuels for energy, with a further ten per cent coming from fugitive emissions from production of fossil fuels. [4] Energy efficiency, energy management and fuel switching can have a direct and immediate impact on these emissions, with a positive return on investment in many cases. Study after study has noted energy efficiency techniques as some of the cheapest abatement available and it remains a substantially untapped resource in Australia.[a]

Globally, respected bodies see energy efficiency and other energy performance activities as playing a key role in the transition. The International Renewable Energy Agency sees energy efficiency and electrification delivering almost half of the abatement needed to achieve a 1.5°C future (see Figure 1). The International Energy Agency sees a similar role for energy efficiency, with more than 40 per cent of emissions reductions coming from demand-side measures by 2050 in their Net Zero by 2050 scenario.[5]

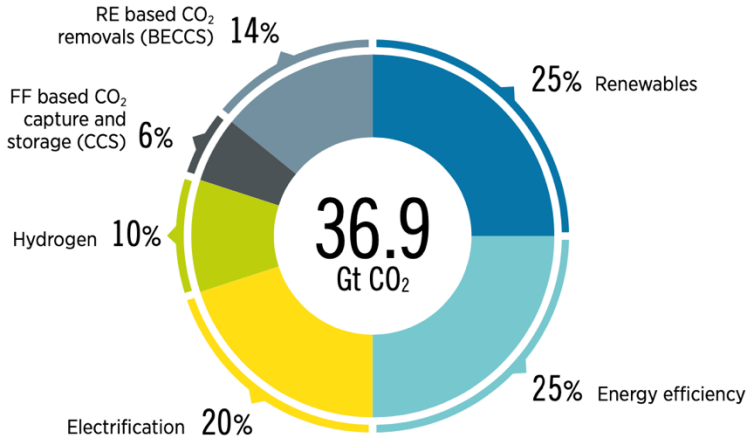

Figure 1 - Share of emissions reductions in a 1.5-degree pathway. Source: IRENA 2022 World Energy Transitions Outlook 2022 – 1.5°C pathway, IRENA, Abu Dhabi.

Improving energy performance has already delivered substantial abatement to Australia – the Greenhouse and Energy Minimum Standards regime is expected to have delivered abatement of up to 79 Mt CO_2-e by 2020. The unexpected peaking of electricity consumption in the National Electricity Market in 2010 was estimated to

[a] For examples, see McKinsey (2008), Reputex (2015), Energetics (2016).

have substantially been delivered by demand-side measures including appliance standards, as well as building code upgrades and state and territory efficiency schemes.[6] Reducing electricity consumption has amplified the effect of increasing renewable energy penetration in the NEM – lower overall demand means that the increased renewable generation powers an increased share of consumption than would otherwise be the case.

In some sectors – particularly industrial sectors – technologies to enable deep decarbonisation remain in early stages of development, and zero emissions operation of these sectors is not likely in the short term. Despite this, improving energy performance in these sectors using long-established techniques like energy efficiency and energy management provides an avenue to drive emissions reduction even in hard-to-abate sectors, as well as delivering productivity and competitiveness improvements to business. Feedback from EEC members suggests that while some companies are well advanced in their embrace of these techniques, these firms are in the minority and substantial further opportunities for abatement exists.

4.1 Energy performance – accelerating the transition

Improving energy performance not only has a role in directly abating emissions, but also in facilitating and expediting the transition to a zero emissions energy system. This occurs in several ways:

- Energy efficiency and energy management can work to reduce the amount of energy that energy systems must supply, and reduces demands on energy networks. Therefore, this reduces the size (and cost) of the clean energy system that must be built to replace fossil fuel-based energy systems.

- A combination of demand-side measures can help to better align energy demand with times of abundant, cheap renewable energy supply. This directly reduces the amount of storage required in a zero emissions energy system, which is the most expensive component.

- Energy performance will help manage the costs of decarbonisation of those processes that will require more costly solutions. Where energy use cannot be decarbonised by low-cost technologies like renewable electrification, managing and improving energy use reduces the amount of higher-cost replacement energy sources required.

- Smart energy management – where energy users re-imagine how, where and when they use energy – can open a wider range of opportunities for using lower-emissions and/or lower-cost fuel. For example, changes to industrial processes could make the use of biofuels viable, or permit replacement of fossil fuel combustion with renewable energy systems integrated with lower-cost thermal storage.

Every action that improves energy performance not only has the potential to reduce emissions, but also brings the eventual decarbonisation of the energy system closer.

It is for this reason that a net zero strategy must encompass ***both*** decarbonising energy supply through renewable energy and creating a revolution in smart energy demand.

Key finding 2

It is critical that energy policies holistically consider supply, storage, networks and demand-side measures at the same time to determine the optimal mix of investments to deliver affordable and reliable energy.

4.2 Energy performance in a net zero world

There is a view that in a world of ultra-cheap solar and wind generation (once the energy transition is substantially complete), improving energy performance is redundant. This belief is rooted in the idea that once energy supply is 'free' (i.e., running at zero marginal cost), there are no further cost or emissions benefits that would justify energy performance interventions. This could not be further from the truth – in a net zero world, energy management and efficiency are even more important than before.

In a net zero world where solar and wind generation make up the backbone of the energy supply system, it is very true that there will be times when energy supply is so plentiful that efficiency will not be an effective use of resources. For example, midday on a clear December solstice following a mild spring will be characterised by high levels of solar PV generation coupled to relatively low underlying energy demand. At this time, energy has a marginal cost that is effectively zero, making the return from investing in energy performance negative.

However, at other times of the year, improving energy performance will be incredibly valuable, even in the absence of a generalised need to reduce emissions. During extended periods of low solar and wind production, increasingly costly reserve energy systems will need to be deployed. This might be long-duration storage or renewably-powered thermal generation – both of which are likely to be significantly more expensive than directly-used wind and solar generation.[b] At these times, the marginal cost of energy could be very high, and improving energy performance during those periods could yield dramatic cost savings.

This is true both on an individual basis and a system-wide basis. Individuals who have exposure to the electricity spot market will pay a vastly higher price for energy during brief periods of exceptionally mismatched demand and supply. As a whole, the energy system will also incur substantially increased costs where energy demand cannot be managed through periods of low supply. By its nature, reserve generation that is used

[b] While exact costs for the future energy system depend significantly on the scenarios and assumptions used to model them, CSIRO's annual GenCost report consistently predicts that solar and wind generation are the lowest cost energy supply options, with energy storage costs roughly an order of magnitude higher.

to provide security to the energy system on only a few days or hours per year sits idle for the vast majority of the year, yet still adds significant cost to the energy system. Being smarter about demand, and improving energy performance to reduce energy consumption during low supply periods, will remain highly valuable even in a net zero world.

Key finding 3

Improving energy performance is crucial to reduce emissions in the short term, build and accelerate the transition to zero emissions in the energy system, and maintain affordability and reliability of the energy system in the future.

4.2.1 Energy performance must also encompass climate adaptation and resilience

Although energy performance is an important lever to keep a 1.5°C future scenario within reach, the reality is that the impacts of climate change are already with us. These impacts will increasingly intensify over the next few decades due to emissions already in the system.

Energy performance improvements can in many instances work as resilience improvements. For example, upgrades to buildings to improve their passive thermal performance not only reduces the heating and cooling load, but also increases their resistance to extreme temperatures, better protecting their occupants. Policies put in place now must be evaluated against how they will perform in a warmer world. Energy performance improvement policies should be designed to complement and amplify adaptation and resilience efforts.

4.3 Energy performance and electrification

Electrification is rapidly emerging as a key tool to decarbonisation and improving energy performance. This is due to several factors:

- Electric products are frequently considerably more efficient than equivalent fossil fuel-powered appliances. Electric vehicles, for instance, consume around a third to a quarter of the energy required for an equivalent internal combustion engine vehicle. In many cases, electrification is inherently energy efficiency.

- Electric products can often be operated more flexibly and take better advantage of advanced, smart control mechanisms. This means that electric products can more easily optimise the amount of energy they use to suit prevailing circumstances.

- At present, renewably-source electricity is commercially available at relatively low cost. Low-emissions replacements for other fossil fuels are currently limited in availability (such as biomass, bioliquids and biogas) or commercial readiness (such as hydrogen and derivatives).

While electrification will not provide the answer for every decarbonisation need, it is a tool that is available now and can be implemented to commence decarbonisation across a range of opportunities in all economic sectors.

However, while electrification has many advantages, there are important considerations to bear in mind.

- Electrifying a substantial portion of Australia's current energy usage will create substantial extra demand in the electricity system. A focus on electrifying efficiently and flexibly will help reduce the impacts of that additional load.

- Electrification is likely to be the least cost decarbonisation option in many instances, but it may not be no-cost for individual actors. Decarbonisation is likely to come at a substantial initial cost to the community, whichever route is chosen, and governments may need to take action to facilitate decarbonisation at least cost.

- There are many use cases for which electrification may be theoretically possible, but technical constraints make implementation difficult or disproportionately costly. Technological progress and improved market capabilities may address these challenges over time.

Key finding 4

While the achievement of a net zero economy will require deployment of a range of technologies, electrification is an important immediate step that can deliver rapid improvements to energy performance and emissions reduction with commercially available technologies.

4.3.1 Efficient electrification

Increasing evidence illustrates that a large portion of decarbonisation will be achieved through fuel-switching to renewable electricity. While there are a range of use-cases in which electrification may not be feasible with available technology, there are a significant range of use cases that are amenable to electrification in the short-term.

Fuel-switching to electricity will inevitably place higher loads on electricity systems. The magnitude of these additional loads – and additional electricity system costs induced by extra demand – are amenable to management and optimisation through energy performance measures. High-quality, efficient electrification will help deliver decarbonised energy use at low additional cost, while poor-quality electrification will impose additional, unnecessary costs on the energy system.

Planning and coordination, rigorous energy performance standards, as well as appropriate market settings to deliver high-quality, efficient and flexible electrification are an important area of policy focus in the near-to-medium term. Creating frameworks that encourage efficient electrification by default in advance of significant extra demand coming online will avoid costly remediation down the track.

Considering the efficiency of electrification at the design stage of implementation can also help reduce the costs. For example, concurrently making low-cost upgrades to a

building shell at the same time as electrifying space conditioning can significantly reduce the capital outlay required for new electric plant.

Key finding 5

Ensuring that electrification is undertaken efficiently is important to delivering the greatest cost and emissions reduction benefits from decarbonising electricity supply. Poor-quality electrification imposes unnecessary costs on consumers and the energy system.

5 Targets and ambition

The consultation paper poses whether the NEPS should set a target for energy efficiency (or energy performance more generally). The EEC strongly agrees that targets are an important component of the forthcoming strategy, although further work will be needed to determine which types of target and metric will be most appropriate and effective to galvanise action under the strategy. This section will discuss 'energy efficiency targets', rather than an energy performance target, as energy efficiency targets are implemented and well understood in global policy discourse.

5.1 Setting energy efficiency targets

Energy efficiency targets set a goal for reducing or managing the energy use of a set of energy users. Targets can be implemented at a range of scales from individual households and businesses up to national or international groups. At a national level, targets have a range of possible forms but commonly seek to reduce energy consumption, improve energy productivity, or improve other energy-related measures such as reducing reliance on energy imports or lowering the cost of energy services for households and businesses. An energy efficiency target can also be an important component of an overarching emissions reduction goal.

As a policy lever, a successful energy efficiency target will encompass all of the following:

- One or more clearly defined goals for the target;
- A clear, relevant indicator to measure progress towards the target;
- Well-designed and appropriately resourced programs or policy to incentivise action to achieve the target; and
- An accountable entity responsible for achievement of the target (or coordination of achievement of the target).

5.1.1 Goals

Energy efficiency goals can be expressed in a range of ways. Common examples include:

- Reducing energy consumption compared to business-as-usual. An example of this is the European Union's 2012 Energy Efficiency Directive, which set a target reducing the EU's energy consumption by 20% compared to business as usual (BAU) projections, or Japan's 5th Strategic Energy Plan that envisions reducing energy demand by 13% compared to BAU.[7]
- Reducing energy consumption by an absolute amount. An example of this would be India's National Mission on Enhanced Energy Efficiency that sought to reduce annual energy usage by 23 million tonnes of oil equivalent.[8]

- Reducing economic energy intensity. China's 13th five-year plan included a target to reduce energy intensity of the economy by 44% by 2020 compared to 2005.[9] An energy intensity target can also be expressed as energy productivity, which is the inverse of energy intensity. COAG agreed to increase Australia's energy productivity by 40% between 2015 and 2030.[10]

Beyond these overarching goals, other types of goals may explicitly or implicitly reference energy efficiency. These could include:

- Goals to decouple economic or activity growth from growth in energy usage. However, these types of targets are more abstract and difficult to communicate and measure simply.

- Goals to improve energy security. For example, a desire to reduce dependence on oil imports is common amongst Pacific countries, with both energy efficiency and fuel substitution being an important part of achieving these targets.[11] The United States' first Corporate Average Fuel Economy standards were largely a response to the 1973 oil crisis, and the revised legislation that implements increased fuel economy standards is known as the *Energy Independence and Security Act*.

Setting goals for Australia depends on the Government's overall policy intention for the NEPS. However, there are a range of goals that an energy efficiency target could achieve that would strongly support the NEPS' overall aims of reducing energy bills and emissions:

- Reducing the amount of non-renewable primary energy used in Australia;
- Reducing the energy intensity of economic activity on a sectoral basis;
- Increasing the economic value extracted from renewable energy resources; and
- Reducing average energy consumption in buildings.

In line with discussion of the NEPS' objectives in chapter 1, the goals for an energy efficiency target should be broader than simple performance against a nominated metric. This will allow for greater buy-in from a range of stakeholders, including businesses and the general public.

5.1.2 Metrics or indicators

Progress towards a target must be able to be measured. Without measurement, there is no way of knowing whether a target has been achieved or not, or whether progress to date suggests momentum sufficient to meet a future target.

Measuring energy efficiency targets can be less straightforward, as energy efficiency itself is not a practical quantity to measure. Energy efficiency targets must therefore be measures in terms of a proxy quantity, or through setting specific targets in discrete sectors. Targets can either be set at a broad, economy-wide level, or on a sectoral basis, or both.

5.1.2.1 Economy-wide metrics

Broad economy-wide targets are typically measured either through energy intensity, or energy consumption savings relative to an actual or assumed baseline (typically business as usual). An energy consumption target is easy to measure, easy to understand and communicate to the general public. Energy consumption targets also provide a measure of certainty about the final level of energy consumption and are inherently compatible with energy conservation measures.

However, energy consumption metrics that support efforts to reduce energy consumption can interact poorly with unexpected economic growth that increases the overall usage of energy. Similarly, forecasts of energy usage that underpin business-as-usual baselines are subject to a significant amount of uncertainty, meaning that should actual business-as-usual energy usage be lower or higher than forecast, achieving the target may be more difficult than expected (or be achieved with minimal energy efficiency activity).

Economy-wide energy efficiency can also be measured through energy intensity or energy productivity (which are simply the inverse of each other).

$$Energy\ intensity = \frac{Energy\ used}{GDP} \qquad Energy\ productivity = \frac{GDP}{Energy\ used}$$

The advantages of using energy intensity or energy productivity for measuring a target is that it is a relatively easily understood metric amongst policy makers, is simple to measure and calculate, and does not rely on comparing use against an assumed business-as-usual baseline. An intensity or productivity target could be denominated as a percentage reduction compared to a baseline year. Energy intensity targets inherently accommodate economic growth or contraction and provide a strong measure of the overall energy efficiency or otherwise of the economy, when compared to similar economies. Energy intensity is also a measure that makes global benchmarking possible, as energy intensity is calculated for most countries.

Disadvantages of setting an energy intensity target include the fact that intensity targets do not necessarily require an overall reduction in energy usage, even if the target is achieved, making them less useful for purposes of energy conservation. Energy intensity targets that look to global benchmarking can also be problematic, as energy intensity will be heavily influenced by a jurisdiction's economic profile. Some activities (such as mining, resource extraction and heavy industrial manufacturing) are inherently energy intensive, meaning that the energy intensity of resource-based economies will typically be higher than those without substantial heavy industry.

Further, energy intensity is concept that resonates in some sectors (such as manufacturing and food processing) but has much less purchase in others (residential and commercial buildings). Given this, energy intensity targets can be enhanced by being underpinned by granular sectoral targets that utilise sector-relevant metrics.

Energy intensity is also more difficult to communicate to the general public, although trends in energy intensity are a useful and relatively easily understandable concept.

5.1.2.2 Sectoral metrics

While broad economy-wide targets are useful as indicators of the overall energy efficiency or otherwise of the economy, it can be helpful to translate these metrics into more meaningful targets for individual sectors.

For example, while householders and builders may not have much familiarity with the energy intensity of the homes they build and occupy, an energy rating (such as NatHERS) has a much more tangible and understandable meaning. A sectoral target appropriate for residential buildings might be to reduce the average energy consumption per square metre by 25% by 2030, which could be expressed as increasing the average NatHERS star rating of homes by 2 stars or so (depending on the current average rating).

Sectoral targets have several other benefits:

- They can be tailored to the circumstances of a particular economic sector. A target that treated improving energy efficiency in professional services and commercial buildings on the same terms as improving energy efficiency in mining and heavy manufacturing would be of limited meaning and utility. However, setting an appropriate sectoral target for each of these sectors would give clear policy guidance to these sectors to guide investment.

- Setting sectoral targets could also be integrated with deep, long-term planning for sectoral decarbonisation pathways. This would help both coordinate policy activity and provide guidance to each economic sector, but also provide a clear understanding of an achievable level of ambition in setting targets.

- A sectoral approach is complementary to Australia's existing suite of climate and energy policies, which seek to address climate change through a toolkit of different policies, appropriate to different sectors. This is in line with the Climate Change Authority's recommended approach to emission reduction policy.[12]

However, sectoral targets can also be more complex to set effectively. This is particularly the case when a set of sectoral targets are designed to give effect to a broad economy-wide target. Sectoral energy efficiency targets and plans are in use in a number of international jurisdictions, and despite the complexity the EEC encourages the Government to consider using sectoral energy efficiency targets as part of the NEPS.

5.1.3 Setting a target for Australia

An energy efficiency target for Australia is an important policy lever to improve energy performance. An effective energy efficiency target that complements and supports emissions reduction measures would both place downward pressure on the total amount of energy used, as well as reducing the energy intensity of the economy. This would support the Government's dual aims of achieving emissions reduction targets and placing downward pressure on energy bills.

As the previous discussion of energy efficiency target metrics demonstrates, there is no single, perfect way to set an energy efficiency target, and overreliance on any individual metric is risky. For example, the previous National Energy Productivity Plan (NEPP) set a target of improving energy productivity by 40% between 2015 and 2030. Initial momentum around the NEPP quickly faded, meaning that relatively little policy action arose from it. Nevertheless, structural and historical trends influencing energy intensity and productivity remained, and energy intensity continued to decrease, as shown in Figure 2. Based on decadal trends, Australia would achieve the NEPP goal by around 2034, even in the absence of substantial policy support.

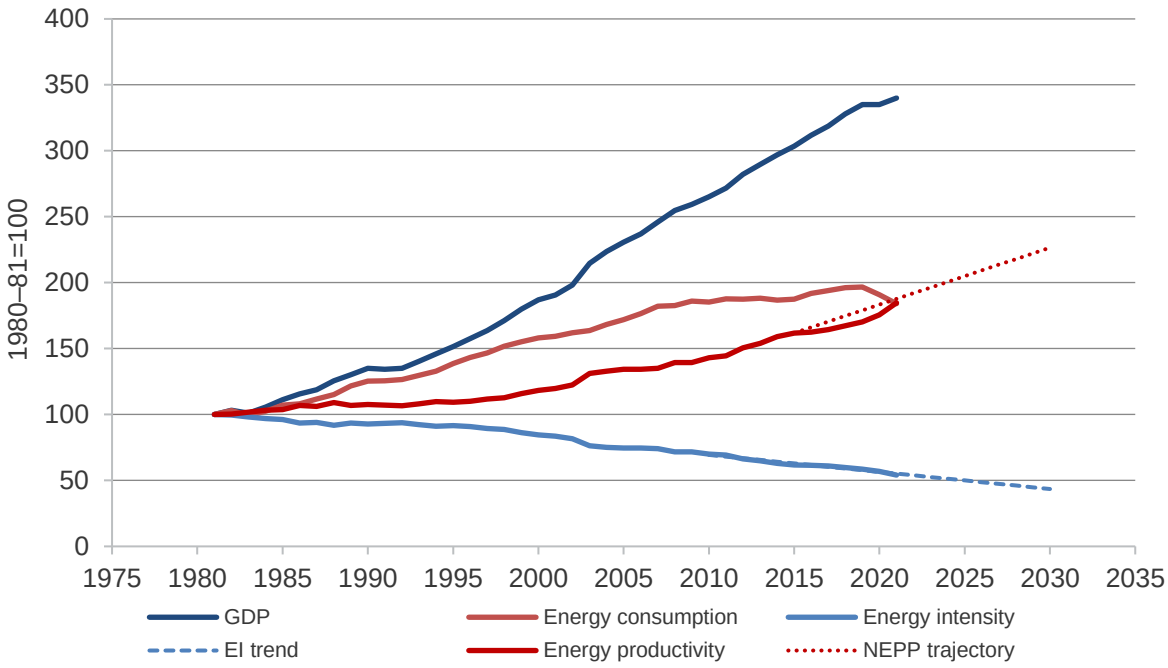

Figure 2: Australia's energy intensity and consumption – base year of FY1981 Source: Australian Energy Statistics

This suggests that a better approach would be to use a dashboard of a range of relevant indicators to measure progress against the target. A dashboard of indicators would include relevant economy-wide metrics, as well as relevant sectoral metrics. While this approach would be different to the well-established Renewable Energy Target, it would provide a better picture of how Australia's energy performance is tracking against the Government's ambition.

At this stage, the EEC does not propose any particular targets, and believes that further development of targets is a matter best undertaken by departmental officials. However, we would suggest a number of potential candidate metrics:

- Economy-wide energy intensity;
- Final domestic energy consumption of non-renewable energy resources;
- Sub sectoral targets for energy performance improvements in:
    - Residential buildings;
    - Commercial buildings;
    - Industrial energy performance, including:
        - Mining and resource extraction;
        - Heavy manufacturing;
        - Medium manufacturing; and
        - Light industrial and commercial;
    - Transport;
    - Agriculture and primary production; and
    - Services.

At this stage, we are not convinced of the reliability of expressing a target in terms of an international benchmark (such as OECD average energy intensity) without further exploration of the comparability of Australian energy intensity with other nations.

Recommendation 1

The Government should select a range of economy-wide and sectoral metrics to measure Australia's energy performance improvement that also reflect the broader objectives of the NEPS.

5.2 Target ambition

Determining the appropriate ambition for an energy efficiency target is a challenging task. A target should encourage ambitious action, yet also have a reasonable prospect of achievement.

The EEC would suggest that the ambition of an energy efficiency target for Australia should take cues from global experts, such as the International Energy Agency, and be guided by aligning efforts to achieve a 1.5°C future. Currently, Australian energy intensity decreases at a relatively steady rate, averaging a decline of around 2 per cent per annum over the past decade (see Figure 2). The International Energy Agency is advocating for energy intensity improvements of around 4 per cent per annum to help achieve global climate goals.[13] This could be a useful starting point to target improvement in energy performance.

Setting target ambition should also be informed by emissions reduction modelling undertaken by Government, to settle on a level of ambition that is consistent with scenarios in those models that achieve appropriate climate goals.

Recommendation 2

The NEPS should include energy efficiency targets that are informed by international ambition for increasing energy efficiency, are consistent with Australia's emission reduction targets, and set an ambitious but achievable stretch goal.

5.2.1 Scale up steady

The EEC encourages strong ambition in the NEPS and programs to implement it. However, we issue a note of caution – programs should start slow and scale up steady. The current pool of trades and professions to implement energy performance upgrades in Australia is small and requires steady development to avoid the mistakes of previous energy efficiency improvement programs. Pilots, evaluation, continuous monitoring and deliberate, phased implementation are all key to delivering improvements to energy performance in a sustainable way that minimises risks both to government and the general community. Continuous, open dialogue with industry is important to ensure programs are proceeding within expectations and to effect early mitigation of any emerging problems.

Key finding 6

Policies and programs to improve energy performance should heed lessons from previous efforts and seek to scale up steadily and sustainably. Rushed implementation risks poor results. Efforts to improve energy performance should be based on durable, multi-year programs to sustain effort over the long term. Inadequate short-term funding for programs risks both delay and inefficiencies. The NEPS should prioritise firm commitments to multi-year programs that steadily move from program design through trial to completion.

5.3 Target and strategy governance

While broader demand-side governance arrangements will be discussed in more detail in later chapters, governance of this strategy and mechanisms for tracking progress against energy efficiency targets are important considerations.

While many items in the proposed NEPS will require national collaboration, the EEC notes the Government's intention for the NEPS to be a largely Commonwealth-led strategy. This means that accountability for achievement or otherwise of the strategy will lie to a large extent with the responsible Commonwealth minister.

As with the Government's climate change policies, there is merit in ensuring that progress against the strategy and targets are transparently reported to the Parliament. This could be achieved with relatively little additional effort, by adding reporting against the NEPS to the Minister's annual statement to Parliament on progress against climate change targets. As with progress against the targets, the Climate Change Authority could add advice on energy performance to its advice to the Minister in advance of the annual climate change statement.

This would provide a relatively simple way to assure visibility of Australia's progress in improving energy performance, and elevate the consideration of energy efficiency and demand-side measures in the thinking of policy makers.

Recommendation 3

Progress against the National Energy Performance Strategy should be included in the Minister's annual climate change statement to Parliament, and also the advice provided by the Climate Change Authority to the Minister in advance of the statement.

6 Overcoming barriers to improving energy performance

There is a substantial literature on the barriers to improving energy efficiency, and by extension energy performance. The Climate Change Authority (2020) provides a useful summary of the barriers classically considered to impede progress in energy efficiency, including market failures, including imperfect information, split incentives and externalities; behavioural, cultural and organisational barriers; the opportunity and financial costs of investing in energy efficiency, and policy uncertainty.[14]

A significant complication in improving energy performance (including energy efficiency, demand response and energy management), is that while actions to improve energy performance must be taken at scale, the ability to take that action is distributed amongst millions of individual householders and business leaders. A limited number of these people possess the required motivation, knowledge, financial resources, and agency to invest in energy performance upgrades, or even to implement zero-cost behaviour changes. In contrast, influencing the actions of the energy supply system is more straightforward. Historically, the supply side has been made up of a smaller set of decision makers, who have a greater level of resources, knowledge and motivation and are closer to ideal, perfectly rational economic actors.

This highlights the limitations of the current policy approaches to improving energy affordability. Over the past two decades, energy policy reform has prioritised introducing additional competition into energy markets, allowing consumers a greater degree of choice in how they acquire energy services, and providing consumers with tools that could unlock innovation in energy service delivery (such as advanced metering infrastructure). However, these reforms have not unlocked a new wave of engaged, empowered consumers.

The simplest, least-risk action that a consumer can take to reduce their energy expenditure – with zero capital investment or need for any technology upgrades or behaviour change – has been to switch energy providers in competitive markets. This one single action can save consumers hundreds of dollars each year, however consumer research continues to indicate that energy users are reluctant to invest the time to switch energy providers.[15] The Victorian Government has gone so far as to provide customers with a $250 payment if they simply compare their energy bills using the Victorian Energy Compare website.[16] This clearly demonstrates that consumer engagement with demand-side actions to reduce energy bills is relatively limited, and policy approaches that rely on consumers acting as engaged, rational economic actors capable of overcoming barriers to improving energy performance should be treated with a high degree of caution.

In contrast, the more successful programs to improve energy performance have relied on well-designed regulation. Two strong examples of this are the Greenhouse and Energy Minimum Standards (GEMS) regime, and the Commercial Building Disclosure (CBD) Scheme. These programs successfully overcome market failures and correct for bounded rationality on the part of the consumer. Both of these programs have successfully delivered energy performance improvements for Australia. In just the first three years of the CBD program, it delivered benefits of more than $44 million, and was reducing emissions by more than 0.6 Mt CO_2-e per year in 2018-19.[17] The GEMS

regime is estimated to save consumers up to $19 *billion* between 2000 and 2020, as well as 79 Mt CO_2-e. These regulations have delivered substantial economic and emissions benefits for Australia and provide a strong template for future action.

Regulation is clearly an effective method of improving energy performance at scale. The benefits of improving energy performance are frequently only realised through implementation at scale. While in some instances (such as in emissions-intensive industry), single decisions can have substantial effects on energy use and emissions, similar effects can only be realised when the action of millions of smaller consumers are coordinated. This is a clear role for government.

The Council is aware that there are currently several hurdles to introducing new regulatory regimes, or even continuing the existence of current ones, including the Regulatory Impact Assessment process. While the cost-benefit analyses that underpins such decisions can sometimes be useful, the Council is cautious of using such tools as the principal determinant for decision making in improving energy performance. Cost benefit analyses have significant limitations – in particular, while the costs of energy performance improvements can usually be easily determined, properly characterising the benefits from these activities is more difficult.

For example, the Decision Regulatory Impact Statement informing the National Construction Code 2022 attempted to quantify the costs of implementing the proposed energy efficiency upgrades but did not attempt to quantify the broader health benefits associated with improving the energy efficiency and thermal safety of residential buildings.[18] This is despite the health impacts of energy efficiency being widely characterised both in the literature, and even in a pilot study in Victoria conducted to measure health system savings from energy efficiency upgrades in homes. [19]

There are a range of policy approaches for improving energy performance, and the NEPS should embrace a suite of policy interventions. Nevertheless, there is a clear role for regulation to ensure that consumers can capture the benefits of improved energy performance. While Australia has some regulatory regimes, international jurisdictions have made greater use of regulation to improve their energy performance – notably the European Union and the United States. The NEPS should take guidance from these examples to raise the ambition of programs to improve energy performance.

Key finding 7

Well-designed, effective regulation is an indispensable tool in improving energy performance. The NEPS should look for opportunities to increase the ambition of Australia's regulatory programs to improve energy performance.

7 Prioritising action

Improving energy performance is a significant challenge and the forthcoming strategy has a difficult task to effectively direct activity and resources to the sections of the economy most in need of attention. Poor historical performance in energy efficiency means that while there is a significant opportunity to reduce emissions and energy bills, determining the critical areas for action seems overwhelming.

The EEC strongly endorses the view that the NEPS should make decisions about which areas of energy performance to prioritise and commit significant resources to ensuring that substantial momentum is created behind those priorities. A strategy that does not make strategic decisions to prioritise action, and instead attempts to address a wide range of actions at once, risks making little to no progress at all.

The EEC recommends that the NEPS prioritise effort and action in those areas that are long overdue for improvement and that are likely require sustained effort to properly address. Further, the EEC notes the importance of the Strategy prioritising reforms to frameworks and governance that will unlock future substantial improvements in energy performance.

In considering which areas the EEC recommends for priority action, we have considered which areas of the demand-side are in significant need of improvement to allow Australia's achievement of net zero emissions by 2050. These are the areas which would, should no improvement be seen in the next five years, present a critical risk both to non-achievement of Australia's emissions reduction targets, but also pose unacceptable risks to the wellbeing and prosperity of Australians.

We recommend the following areas of priority for the National Energy Performance Strategy:

Priority 1: Energy governance and market reform
Australia's arrangements for energy governance and markets do not adequately promote, value or facilitate effective demand-side participation. Reforms to these arrangements are critical to unlock savings in energy costs and emissions.

Priority 2: Industrial and commercial decarbonisation
To achieve net zero by 2050, Australian industry must be substantially decarbonised. However, Australia currently has no substantial plan to achieve this, leading to a lack of guidance for industry participants. Improving industrial energy performance is a critical part of wider industrial decarbonisation.

Priority 3: Residential rehabilitation
More than eight million homes were constructed prior to the introduction of energy efficiency standards of any type, and a significant number of these houses have poor performance that puts the health and wellbeing of their occupants at risk. Rehabilitating these buildings is a large task that must commence now.

This does not represent a comprehensive list of areas in which energy performance should be improved. However, the NEPS will be supported by other policy initiatives (such as the National Electric Vehicle Strategy and the Safeguard Mechanism) that will work to improve energy performance in other sectors, as well as drive decarbonisation.

Recommendation 4

The National Energy Performance Strategy should prioritise actions in energy governance and market reform, industrial and commercial decarbonisation, and residential rehabilitation.

8 Energy governance and market reform

Energy policy and market design has not created a strong enabling environment to promote, value and facilitate improved demand-side participation in the energy system. National energy frameworks are largely focused on ensuring the orderly operation of energy supply markets, without thorough consideration of better integrating demand-side measures to optimise energy system costs.

The EEC believes that the time is right for a substantial reform of energy governance and market settings to better integrate consideration of energy demand into the energy system. Current energy governance arrangements were designed for a different time, and the need to oversee and facilitate a rapid transition to zero emissions energy supply were not considered as part of those energy policy settings.

Reforms should elevate the demand-side of the energy system so that energy system development is considered holistically, both in energy markets and in energy policy more broadly. Such reforms would give energy users – consumers – a greater stake in the energy system, making it better suited to their needs.

8.1 Energy governance and market reform should be a priority for the NEPS

Reforms to energy governance and market settings can enable significantly increased demand-side participation in energy markets at relatively low cost. Therefore, reforms in this area are critical to improve energy performance over the next couple of decades. Without enabling reform, private sector investment is less likely to have the ability to expedite and facilitate energy performance improvements.

In many cases, energy governance and market settings are shared between the Commonwealth and state and territory governments. Leadership and cooperation will be needed to successfully progress reforms, however this effort should be handsomely rewarded with a cheaper, faster and more equitable transition to net zero. The EEC believes that a process to make these reforms should aim to make at least a first tranche of substantial reforms within the life of this Parliament.

8.2 Make energy performance and the demand side someone's job

Currently, responsibility for demand-side policy is distributed across a wide range of portfolios, ministers and jurisdictions. To a certain extent, this is unavoidable, as the demand side of the energy system is distributed right throughout the economy and community. However, this does illustrate the clear need for strong mechanisms to connect and coordinate demand-side policy development, and to drive collaboration across different levels and areas of government.

Current institutional arrangements for energy performance do not provide that strong coordination. National energy market bodies are primarily focused on energy supply, as that has been their job since the commencement of national energy market arrangements. Responsibility for energy efficiency currently lies between a range of state, territory and Commonwealth officials who work together principally around specific initiatives or specialised intergovernmental fora. This is not meant as a criticism of those officials, whose work continues to progress the energy performance

agenda – it is a reflection on the potential for improvement in arrangements for energy performance policy.

There is a need for a dedicated energy performance body to be responsible for driving improvements to energy performance. Such a body would have a range of functions, both within and external to energy markets, and provide a central point for developing and coordinating demand-side energy policy, on behalf of all national energy jurisdictions.

An energy performance body would:

- Be responsible to Commonwealth, state and territory jurisdictions, in the same way as current energy market bodies;
- Have functions to plan, analyse, develop and prosecute improvements to energy performance and demand-side energy market participation;
- Provide clear inputs to energy system planning processes on opportunities to manage energy demand to optimise system costs, security and reliability;
- Provide a national point of coordination for energy efficiency activities;
- Provide advice to Energy Ministers (and other ministers) on opportunities for improving energy performance to reduce energy bills and emissions; and
- Where possible, exercise responsibility for national functions relating to energy performance (such as making minimum energy performance standards).

There are a range of international examples of a dedicated body with responsibility for improving energy performance, both at national and sub-national levels. Lessons from international jurisdictions could inform the formation of a new body.

While the exact functions and form of such a body would need to be refined in consultation with stakeholders, other governments and industry, the necessity for such a body is clear. The body would provide an important counter-balance in energy governance and markets, elevating the consideration of the demand side of the energy system – and consumers' interests in how they use energy – to be just as integral to energy policy as the supply side.

Recommendation 5

Commonwealth, state and territory governments should establish a national energy performance body, to link policy areas together that are responsible for energy, buildings, industry and transport, and make energy demand as integral to energy system policy and market settings as energy supply

8.3 Better integrate demand-side opportunities into energy system planning

Current arrangements for long-term energy system planning and development rely on scenarios and models generated by energy market bodies that guide supply investment. The Integrated System Plan plays a large part in system development – and the ultimate costs of the energy system – through informing regulatory

investment test processes. However, the ISP treats energy demand as an exogenous input, rather than a factor that can be influenced and varied to ensure optimal investment the energy system, and therefore optimal reliability and affordability.

Future integrated system planning could take account of granular opportunities to manage demand and add these opportunities into scenario planning and evaluation. This could be achieved in several ways, but one potential way could be to require the new energy performance body to create an annual Energy Performance Statement of Opportunities, in the same manner as the electricity and gas statements of opportunity. This could then be incorporated into the Integrated System Plan, highlighting opportunities for investment not only in new supply, but also in demand management, demand response and energy efficiency.

Recommendation 6

Commonwealth, state and territory governments should require that the Integrated System Plan better integrates demand-side opportunities, and resourcing is provided for an annual Energy Performance Statement of Opportunities.

8.4 Reform national energy law to promote, facilitate and value demand-side participation in energy markets

National energy laws and frameworks focus almost exclusively on the regulation of the supply of energy. This provides relatively little latitude or guidance to energy market bodies to promote or facilitate demand-side activities. Reforms to national energy laws are needed to better facilitate demand side participation to reduce energy bills and emissions:

8.4.1 Update the National Energy Objectives

The three National Energy Objectives require energy market bodies to make decisions prioritising efficient investment in energy markets in the long-term interest of consumers with respect to the price, security and reliability of energy supply. However, these objectives are not fit for purpose in a 21st century energy system.

In a modern energy system, it is just as important to regulate and manage frameworks for the demand for energy as it is to manage frameworks for energy supply. Additionally, the NEO's emphasis on *price* is unhelpful, as it can be construed to encourage reducing the *unit cost* of energy to a consumer, rather than reducing the *total cost* of energy services. In the energy system, *prices* are the way that the *cost* of the energy system are distributed amongst consumers. However, it would be better to put effort into driving reductions in the *total cost* of the system, which can be facilitated through demand-side activities, as well as supply-side innovation.

The EEC welcomes moves to include emissions reduction in the objectives, but reforms must go further to ensure they prioritise driving down system cost, and providing energy services at the least possible cost to the consumers by effectively optimising energy supply and demand.

8.4.2 Reform regulatory investment tests

The regulatory investment tests (RITs) for approving expenditure on transmission and distribution networks are intended to prevent unnecessary expenditure in monopoly infrastructure that is then charged to consumers. In some cases, demand-side activities could reduce the need for network augmentation and development, thereby reducing costs to consumers, and the regulatory tests do require proponents to investigate non-network options prior to advancing network investment proposals.

However, detailed development of such options is not necessarily within the skillset or resources of network service providers, and there is no business incentive for network service providers to more exhaustively investigate potential demand-side solutions to network challenges. Reform to the RITs – including participation from appropriately incentivised demand-side experts and advocates – is needed to ensure that energy network development reflects the optimal balance of supply-side and demand-side investment. A principle of 'demand-side first' should be mandated in network planning and investment, with network augmentation considered only where demand-side activities cannot address identified constraints.

Recommendation 7

Commonwealth, state and territory governments should establish a taskforce and process to rapidly reform national energy laws to better promote, facilitate and value demand-side activities.

8.5 Amplify demand-side voice in energy governance and markets

Energy markets are intended to serve the long-term interests of consumers through promoting economically efficient investment decisions, and consumers are represented by several different groups in the national energy markets. However, the voices representing demand-side interests and consumers – particularly small consumers – are limited in scope and poorly resourced compared to the voices representing the supply side of the energy market. Although it is not the intention, existing market frameworks and governance largely ignore consumer participation.

While energy market bodies have mechanisms for consumer consultation, only one director of the AER, AEMO or AEMC has any listed expertise involving consumer issues – and experience with consumer issues or the demand side is not a qualifying area of expertise for appointment to these boards. The balance of energy market body corporate leaders are former energy industry executives, business executives, public service executives or lawyers. While these leaders provide valuable expertise, there is a clear gap in systemically driving the activities of these bodies towards the evolving interests of consumers, who are likely to benefit most from expanding demand-side measures in energy markets.

Similarly, there is a clear gap in expertise in demand-side activities and energy use among leadership in energy market bodies. Adding expertise in applying market settings to improve energy performance would be a simple way to elevate consideration of demand-side measures to deliver long-term benefits to consumers.

Closer integration of the demand-side of the energy system is required at all levels within energy market bodies – at board level, within agency staff, and through bringing demand-side interests and consumer voices more closely into the operations of energy market bodies. A rebalancing of energy market bodies, acknowledging that the market is made up of suppliers and of consumers, would help advance the interests of consumers, who are ultimately the principal actors and beneficiaries of improving energy performance.

Recommendation 8

Commonwealth, state and territory governments should both enable and require expertise in energy management, demand-side issues and consumer issues to be embedded deeply within energy market bodies, including at board level.

9 Industry

To achieve Australia's emissions reduction targets of net zero by 2050, industry must be substantially decarbonised. This is likely to be a challenging task, requiring significant investment in new, clean industrial processes. In some cases, the technology required to decarbonise industrial processes are still under development – although there are substantial opportunities to commence the work of decarbonisation with existing technologies.

Additionally, the global energy crisis is likely to hit gas-reliant industry hard. Energy performance measures that help businesses reduce their exposure to globally traded gas resources will boost competitiveness and resilience in the medium to long-term, as well as help to protect jobs in the near term.

The task of decarbonisation is likely to take sustained effort over decades – but a start must be made now. Industrial decarbonisation should be considered a clear priority under the National Energy Performance Strategy. While reforms to the Safeguard Mechanism should be calibrated to drive decarbonisation among Australia's largest industrial emitters, small to medium industry will also require significant attention and assistance to decarbonise over the coming decades.

Improving energy performance is a key strategy to facilitate industrial decarbonisation, and the NEPS will be an important part of starting the industrial decarbonisation process. The United States' industrial decarbonisation roadmap anticipates using energy efficiency, electrification, low carbon fuels, feedstocks and energy sources, and carbon capture and storage to reduce emissions from industry – the first three of these are energy performance strategies that provide the immediately-available opportunities for reducing industrial emissions in Australia.

Improving energy performance in industry is a substantial opportunity to save money and emissions in Australia. The ACEEE scorecard ranked Australia's industrial energy efficiency very poorly, being ranked 22nd of 25 countries assessed. Significant effort and ambitious policy leadership will be required to improve this poor situation.

9.1 Industrial decarbonisation is a clear priority that needs a plan

Australia currently has no significant long-term plan or strategy for industrial decarbonisation or energy efficiency. This contrasts with international jurisdictions like New Zealand, the United Kingdom and the United States who have developed strategies and roadmaps for industrial decarbonisation. This means that Australia is well behind, and can expect to fall further behind unless we commence planning urgently.

A plan for industrial decarbonisation is also necessary to inform other policy initiatives of the government and provide clear guidance for private sector investment. For example, the National Reconstruction Fund currently under development is expected to invest in industrial capability, but it is important that these investments support industrial decarbonisation and are compatible with a net zero future. Without a plan or guidance, there are risks that investments will be made in inappropriate or inefficient industries and capital stock that will lock in unnecessary emissions and

energy waste for decades. Work should begin on a long-term industrial decarbonisation planning process as a matter of urgency.

9.2 Do the groundwork to facilitate better industrial energy performance

There are several key enablers that will enable future industrial decarbonisation to occur towards 2050 and are likely to be best carried out by government.

9.2.1 Research and development

Technological progress, as well as further development of nascent technologies, will be needed to abate a range of industrial emissions. Australia has a strong R&D sector, with already-existent mechanisms like ARENA and the RACE for 2030 CRC designed to help transfer knowledge into industry. Continuing and strengthening these mechanisms is an important enabler to bringing new technologies, processes and expertise into the market in Australia.

In many cases, Australian industry will need to adapt technologies used internationally for local conditions and circumstances. This means that Australia's R&D capabilities will be useful both for creating new technologies and knowledge in industrial decarbonisation, but also to provide a pool of knowledge and skills to 'fast-adopt' global technologies. The role of ARENA as an agent for knowledge sharing and transfer (as well as a facilitator and coordinator of research activity) is important, and should be continued and expanded, taking into account ARENA's new remit in energy efficiency.

9.2.2 Build a knowledge base of industrial processes and energy demand to inform decarbonisation opportunities

Key to industrial decarbonisation will be the ability to link sources of clean energy supply with appropriate industrial demand. Similarly, industrial energy demand presents a substantial resource for demand flexibility and demand response – capabilities that will be increasingly valuable in the energy system of the future.

To maximise these opportunities, a better understanding of where, when, and how energy is used in Australian industry is required. Other jurisdictions have already realised the importance of understanding this data – for example, New Zealand is developing the Regional Heat Demand Database to map process heat demand across the country. This will be used to understand additional demand for electricity expected to occur as some industrial processes – particularly heating – are moved from gas or other fossil fuels to renewable electricity. This type of exercise will also be important for Australia as fuel switching occurs over the next few decades.

There will also be other benefits from the development of a knowledge base of Australian industrial energy usage. It could:

- Inform requirements for R&D to decarbonise particular processes;
- Indicate regions that may be at significant risk of structural adjustment;
- Help guide and facilitate investment in new, clean industry; and
- Provide opportunities to expand engagement with business that could benefit from measures to improve energy performance.

Government is well-placed to develop (or to facilitate development) of this knowledge base.

Key finding 8

Improved energy performance will support industrial decarbonisation. However, sustained effort to decarbonise industrial production will be necessary, and there is a clear role for government to plan, coordinate and enable the pathway to industrial decarbonisation by 2050.

9.3 Make sure industry has the tools to decarbonise

Improving energy performance in industry is a big opportunity, but transforming Australian industry to an energy efficient, low-emissions sector will be challenging. EEC members report that there is a significant variance amongst industrial enterprises in their level of expertise, resources, and motivation to implement energy efficiency strategies, meaning that many opportunities are not taken up.

Many businesses are not currently well equipped to undertake improvements to their energy performance. There are a range of tools that businesses can use to help improve their energy performance, but deployment will require the right mix of incentives.

9.3.1 Basic information and literacy

The first step towards business decarbonisation is to understand the potential problems that must be addressed, and to be aware of where solutions might be found. Basic energy efficiency literacy is needed – however the solution is more complex than publishing information on a website. EEC experience has shown that active engagement of businesses and peer-to-peer knowledge exchange between business leaders is a more effective way of raising awareness and motivation for energy efficiency and decarbonisation, and linking those businesses to appropriate information and resources.

The NEPS should consider the role of active engagement of businesses through a range of channels – including through the use of energy advisors to engage with small and medium businesses – to build literacy and awareness of energy performance issues. Additionally, partnering with appropriate networks will be important. Local governments and business chambers are good examples of bodies that can facilitate outreach to businesses that may otherwise be difficult to engage and can provide opportunities to deliver locally relevant programs.

Key finding 9

While lack of information can be a critical barrier to improving business energy performance, novel methods of engaging with businesses are needed to create awareness of the benefits of – and avenues to – improved energy performance.

9.3.2 Meter, monitor, manage, mend

After basic literacy and awareness are established, there are proven tools to improve business energy performance. Key among these is the use of an **energy management system (EnMS)**. There are a variety of ways to implement an energy system, ranging from basic processes to systems certified under the ISO 50001 standard, but all EnMS' are essentially a system for understanding, valuing and managing energy use; identifying opportunities to reduce energy use and cost, and engaging senior management in decisions made around energy use.

Energy management systems are a proven tool for reducing energy use and improving energy performance. The United Nations Industrial Development Organisation notes that businesses can typically save 10 to 20 per cent of their energy consumption in the first two years of implementing an EnMS, and savings of 25 to 30 per cent are available in the medium term in industrial production. In some cases, energy savings of up to 15 per cent can be achieved in the first year of implementation with little or no capital investment.[20] Sometimes, simple repairs and servicing of ageing equipment can help yield substantial results at low cost.

To successfully implement an energy management system, there are some necessary prerequisites. To understand where, how and when energy is being used, proper metering and sub-metering of energy usage is required. This means that energy meters should be installed on as many pieces of energy-consuming equipment as possible, and their consumption monitored over time. This provides the basic information on energy usage that can be used to identify opportunities for energy efficiency. However, businesses may find it difficult to justify investment in metering technology which does not appear to provide an immediate payback – despite their being an integral part of an EnMS that will provide a rapid payback.

Many businesses are also likely to require specialist advice on implementing an energy management system and identifying opportunities for energy efficiency. Energy Management System advisors, as well as energy auditors and other advisors, are frequently engaged to assist businesses in implementing systems, reforms and upgrades to improve energy efficiency and productivity.

Lastly, there may be a need in some cases to provide finance or other assistance to businesses to implement any upgrades that energy management systems identify as being likely to improve energy performance. Businesses struggling under high energy prices may not be able to devote capital or cash flow to upgrading equipment, even if it would be likely to have a rapidly positive payback. There may be a role for government to facilitate businesses making upgrades, through concessional finance or other methods of de-risking investment.

Some jurisdictions have already piloted programs to assist businesses in making these upgrades. The New South Wales Government is providing assistance for businesses to plan their pathway to net zero, implement metering and monitoring, access technical advice and upskill industry.[21] The Victorian Government has also recently rolled out a Business Recovery Energy Efficiency Fund that is expected to deliver energy savings of 40 GWh per year of electricity and 150 TJ per year of gas, and emissions reduction of 50,000 t CO_2-e per year.[22] There is opportunity to learn from these programs, and look

to extend programs to improve business capability in energy efficiency and management nationally.

The role of skilled professionals in helping businesses to implement these systems is also important. Advice in implementing an energy management system is vital for many businesses that will not have the necessary expertise in-house to effectively implement an EnMS. The Commonwealth, New South Wales and Victorian Governments have supported the development of a professional certification for Energy Management Advisors that will ensure businesses have access to quality advice and support in implementing an EnMS.

Recommendation 9

The NEPS should expand and deepen resourcing nation-wide to support energy-intensive businesses to access advice and implement energy metering, monitoring and management systems.

9.3.3 Creating the right mix of incentives

At face value, investing in improving energy performance should be a business-as-usual activity for every firm. As discussed, there are a range of barriers to improving energy performance – some of which are technical or financial, while many are behavioural, organisational or cultural. Overcoming technical and financial barriers with an otherwise engaged and motivated business requires relatively obvious solutions, such as access to finance, co-investment, assistance to access technical services or other advice. Overcoming organisational, behavioural and cultural barriers is more complex and requires a mixture of incentives.

Incentives should include practical and financial assistance to businesses to help them improve their energy performance and also an incentive to drive attention towards energy performance improvements.

For example, small grants and financial assistance to businesses to access energy advice and implement energy management and upgrades should be available to all businesses. This should be in place as soon as possible to provide resources for those businesses struggling with high energy costs and wish to improve their energy performance, but don't have the knowledge or resources to begin.

Other financial incentives could include continuing instant asset write off arrangements, but targeted to investments in energy performance improvement, or creating a premium write-off or tax credit for capital investments that reduce operational emissions.

Secondly, consideration should be given to a set of incentives to drive attention towards improving energy performance. The previous Energy Efficiency Opportunities program was an excellent example of this – it provided large energy users with a requirement to undertake an energy efficiency opportunity assessment every five years and publicly report on the results of that assessment. While this program

involved imposing regulation on business to do something that some would argue should be business-as-usual practice, the program was extraordinarily successful. In 2013, ACIL Tasman estimated that the program had saved energy users **$323 million per annum**, with a cost-benefit ratio of 1:3.67, net of implementation and compliance costs. This is a strong example of well-designed regulation that provided a low-cost win-win for industry and the community.

The EEC encourages the Government to consider how an incentive to drive attention and engagement with energy performance could work. While the reformed Safeguard Mechanism should drive some engagement with energy performance, there are still a large number of enterprises outside the coverage of the mechanism who face no regulatory or financial pressure to decarbonise their operations. This presents an equity issue – an entity that lies just below the threshold for safeguard will not be required to reduce emissions, and may therefore acquire a windfall competitive advantage compared to a competitor captured by the safeguard.

At minimum, entities whose scope 1 emissions exceed the threshold for inclusion in the National Greenhouse and Emissions Reporting Scheme should face some type of additional requirements designed to help them to start decarbonising. Requirements could be relatively light touch, but still be a meaningful signal to assist decarbonisation. There are several ways such requirements could be formed:

- Reinstating energy performance opportunity reporting, with immediate exemptions for entities that operate an effective energy management system. This would target the regulation to those firms that require a 'nudge' to improve energy performance, without adding regulatory burden to firms already engaged with improving their energy performance.

- Imposing surcharges for unmanaged energy market demand. Energy use which is not effectively managed imposes unnecessary costs on energy systems and increases competition for energy resources, which increases costs for all energy users. This would further enable cost-reflective energy pricing.

- Requiring evidence of effective energy and emissions management systems as a prerequisite to any claim for Emissions-Intensive Trade Exposed entity relief from liability under the Renewable Energy Target.

Furthermore, efforts to drive further engagement with energy performance amongst energy-intensive industry should also consider expansion to the National Greenhouse and Energy Reporting Scheme – lowering the threshold for inclusion to scope 1 emissions of 10,000 t CO_2-e per annum at both corporate and facility level. This could result in a graduated scheme that imposed greater requirements with increasing energy and emissions:

Scope 1 emissions (t CO_2-e)	**Requirement**	**Signal to decarbonise**
0-10,000	None	Educate, incentivise
10,000-25,000	Include in NGERS	Measure and report energy and emissions
25,000-100,000	NGERS + Energy Performance Opportunity Reporting	Measure, report and manage energy and emissions
100,000+	NGERS + Safeguard + Declining baselines	Legally required to decarbonise

This would also provide an incentive to businesses to effectively manage and reduce their emissions, as increasing their emissions would increase compliance requirements.

Key finding 10

A mix of incentives is required to drive industrial energy performance improvements. Incentives should provide practical assistance to businesses to decarbonise, and also drive attention and engagement towards industrial decarbonisation and improving energy performance.

Recommendation 10

The NEPS should put in place a package of incentives to assist businesses to improve their energy performance, as well as provide a clear policy signal for businesses to engage with decarbonisation and energy performance. In particular, the NGERS framework should be more effectively used to create incentives to decarbonise.

9.4 Accelerate deployment of low-emissions technology through demonstration projects

Industrial decarbonisation is likely to take a several decades, and significant technological progress and innovation is required to fully transform industry to a net zero future. The International Energy Agency suggests that while sufficiently developed technologies are available to meet emissions reductions required by 2030, around half of industrial emissions that must be abated by 2050 require technologies that are still under development.[23] This points to the need for development and demonstration projects to bring newer technologies to market.

In Australia, there will also be a significant need to develop skills and supply chains for industrial decarbonisation. This is a classic chicken-and-egg problem – industrial businesses cannot invest in low-emissions technology without appropriate skills and equipment available to acquire, but suppliers are unlikely to invest in bringing skills and equipment to market until there is a demonstrated demand for them.

There is a clear role for government to help accelerate the transformation of Australia's industry into a clean, efficient and net zero compatible economic sector. An important way for this to occur is through bringing demonstration projects to market, preferably funded through existing frameworks like ARENA. Such demonstration projects have a number of important benefits:

- De-risking investment in low-emissions technology for both industrial consumers and suppliers;
- Immediate energy performance and emissions reduction outcomes;
- Creating the basis of a pool of skilled trades and professions to create future markets in low-emissions technology;
- Using ARENA's knowledge-sharing functions to disseminate lessons throughout relevant sectors and creating exposure to new technology; and
- Demonstrating that barriers to investment in clean technology can be overcome and helping to build momentum behind the net zero transition.

We would encourage the Government and ARENA to consider engaging in a substantial demonstration program that does not fund single projects – but rather, looks to fund a *series* of demonstration projects in selected strategic technologies in target sub-sectors. While funding an initial demonstration project is an important start and can provide a lighthouse example that builds awareness, commissioning a *series* of projects in a strategic sub-sector can help progress learning rates, and begin building a critical mass of activity. Single projects that require specialised skills will often import those skills for the project, while a series of projects provides an opportunity to build a skills base within Australia – not only providing jobs, but also laying groundwork for a future industry sector that will help the industrial sector decarbonise over time.

Recommendation 11

The NEPS should fund a major industrial decarbonisation demonstration program through ARENA to help commence the transition to clean industrial capacity, deliver immediate energy performance improvements, and build skills and supply chains required for long-term industrial decarbonisation.

10 Buildings

In the transition to a net zero economy by 2050, the buildings sector could make relatively early and rapid progress in decarbonising. Activities in residential and commercial buildings accounted for 18.7 per cent of Australia's final energy consumption in 2020-21. Sixty per cent of the operational energy used in buildings came from electricity, including solar panels, around 10 per cent comes from wood and solar hot water, and the other third comes from the direct combustion of fossil fuels, largely natural gas (see Table 1).

Table 1 - Buildings sector final energy consumption

ANZIC sector	2020-21 Energy Usage (PJ)						% Total Final Energy Consumption
	Coal	Gas	Oil	Electricity	Renewables	Total	
Residential	0	166	16	236	66	484	11.7%
Commercial and services	0	43	30	214	1	288	7.0%
Total	0	209	46	450	67	771	18.7%

Source: DCCEEW (2022), *Australian Energy Update*, Table H3, Australian Government, Canberra

There are two key challenges with buildings that the NEPS should address:

1) Ensuring that Australians have access to healthy, comfortable buildings that are affordable to run; and
2) Decarbonising residual fossil fuel usage in buildings.

While the second outcome is a pressing and urgent concern, the first outcome is an enduring challenge. In particular, residential dwellings require focus and urgency. There are around 11 million residential dwellings in Australia – of these, about eight million were built before the introduction of mandatory energy efficiency standards for buildings, and a significant portion of these will require some remediation or rehabilitation to bring their energy performance to an acceptable level. Secondly, decarbonising fossil fuel use in residential buildings is a substantial task, with a transition away from fossil gas combustion needed to ready homes for a net zero emissions economy.

10.1 The need for healthy and comfortable buildings

Improving the energy performance of buildings – while important to reduce emissions and energy bills – is a priority to ensure that Australians have access to safe and healthy housing, and productive places to work. The effects of poor building quality have long been recognised – excessively cold or hot buildings have a range of health impacts, including:

- Increased respiratory and cardiovascular disease;
- Increased symptoms of rheumatism and arthritis;
- Increased allergies; and
- Increased mental health conditions.[24]

In addition, Australia has disproportionate levels of hypothermia acquired indoors.[25] There may be a range of contributing factors to this, but it is clear that buildings in Australia are not maintaining a temperature that will keep their occupants safe.

The energy performance of buildings will become of even greater concern in coming years as the impacts of climate change are felt to an even greater extent. Buildings – both residential and commercial – are important in protecting their occupants from the extremes of weather, both hot and cold. Buildings that rely excessively on space conditioning to achieve safe temperatures put their occupants at risk, whereas buildings that achieve good energy performance will help shelter their occupants for minimal energy expenditure. For example, upgrading older homes in Melbourne from their current average NatHERS energy efficiency rating of 1.8 stars to 5.4 stars could reduce deaths in heatwaves by 90 per cent.[26]

Research by Sustainability Victoria has clearly linked energy performance improvements in houses with better health outcomes for occupants and reduced health system spending.[27]

Climate-safe buildings are likely to be those that combine good passive thermal performance, along with efficient and appropriate appliances. Such buildings will place relatively low demands on energy networks, reducing the demand that networks must serve on days of extreme temperature, or at times of exceptional misalignment between renewable energy production and demand. These buildings will protect their occupants from extreme cold or extreme heat, which are expected to become significantly more frequent in the future.

Currently, many buildings – particularly residential rental dwellings – fail to keep their occupants safe. The World Health Organisation recommends a safe internal minimum temperature of around 18 degrees in winter, and maximums of between 25-32 degrees inside in summer during the day depending on the local climate, and 24 degrees overnight.[28] Research by Better Renting has clearly established that rental dwellings are not meeting these thresholds in many cases, meaning that urgent action is needed.[29]

Key finding 11

Improving the energy performance of buildings supports a range of better outcomes for occupants. Reducing unnecessary energy use to maintain safe, comfortable and productive environments reduces energy expenditure and energy hardship, as well as reducing emissions and reducing health system expenditure.

10.2 Buildings and the transition to net zero

Improving energy performance in buildings means:

- Improving the thermal performance of new and existing buildings;
- Using efficient, smart appliances to perform building services;
- Integrating automation, technology and innovative services in buildings to optimise energy use and create a better environment for occupants; and

- Integrating buildings into energy systems to support system security, reliability and low cost.

10.2.1 Improving thermal performance of buildings

Improving building thermal performance is one of the most effective ways to improve a building's energy performance. For new buildings, efficient design that maximises passive thermal features is important, while retrofitting poorly performing existing buildings can bring substantial improvements in energy performance at relatively low cost. In cooler climates, space conditioning accounts for 55-60 per cent of energy usage in residential buildings, while it makes up around 30 per cent of energy use in warmer climates (see Figure 3).

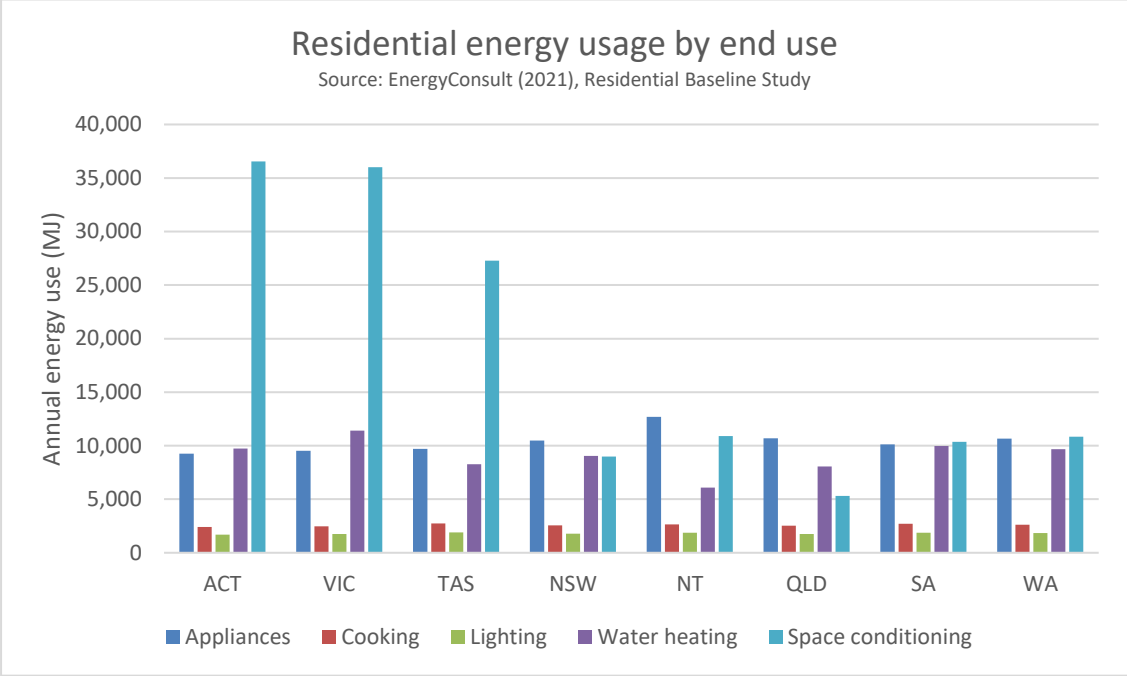

Figure 3 - Residential energy usage.

Buildings that are designed to maximise use of passive thermal features are inherently better energy performing buildings – they require a lower heating and cooling load, and are safer and more comfortable for occupants in the event of energy system interruption. Lower heating and cooling loads help support energy system operation, as the demands placed on systems are lower during times of extreme weather.

For new buildings, thermal performance is an important part of building design. Building-based regulations and standards are important features of encouraging better thermal performance, and building codes and rating tools should not permit good thermal performance to be substituted by other measures like onsite solar PV generation, renewable power purchase agreements or carbon offsets.

Additionally, land-use planning plays an important role in ensuring that new buildings can achieve high levels of thermal performance. Urban planning that encourages poor building orientation, insufficient urban vegetation or poor design that inhibits optimal building use is a significant barrier to creating new buildings with high energy performance at acceptable cost.

For existing buildings, there are a range of ways to improve energy performance. While it might be challenging for many existing buildings to achieve the same thermal performance as a well-designed new building, the thermal performance of existing buildings can often be dramatically improved to at least a solid level of performance. In particular, the worst-performing buildings can be dramatically improved through just the application of insulation, draughtproofing, basic window treatments and installation of efficient heating and cooling equipment like a heat pump.

10.2.2 Efficient and smart building appliances

As energy supply changes and needs to decarbonise, our approach to building appliances also must change. In particular, previous approaches to building conditioning that relied on using large amounts of cheap energy, with little focus on building fabric, are no longer fit-for-purpose. Future buildings must couple a high-performing thermal shell with flexible, efficient appliances. For example, heat pump water heaters and reverse cycle air conditioners are effective, efficient, and flexible – and are able to take advantage of low-cost renewable energy.

Appliances form a core part of building design, and new buildings should be designed for all-electric operation. Similarly, retrofitting older buildings with efficient, electric appliances where possible is the fastest and most efficient route to decarbonising buildings. Increasing evidence is showing that this is the least-cost approach.[30]

10.2.3 Innovative integration

For existing buildings, there are a range of actions that could be taken to improve energy performance. However, the best improvements in performance are typically achieved by implementing a holistic suite of upgrades or retrofits. For example, in a residential setting, upgrading insulation and draughtproofing are useful to do in conjunction with upgrading space conditioning appliances – as the required appliance size and cost can be reduced once thermal performance has been improved. Similar examples apply in larger buildings – applying a holistic approach to upgrading energy performance will greatest improvements.

In many cases, a holistic approach will require the services of an appropriately skilled and experienced professional who can assess and advise of the best course of action. This can be tied to a range of other services, particularly in larger building retrofits. Commercial building retrofits can be extensive and require a range of trades and services to yield strong energy performance improvements. In these instances, innovation in service delivery to provide an integrated service that looks at energy performance, emissions, occupant comfort, safety, productivity and cost are needed.

Effective integration can include building upgrades, as well as integrating technology and automation to make best use of these upgrades. Further, expertise in integrating building operations into the energy system can deliver benefits for both the building owner through lower cost of operation, and the wider community through lowering demand on the grid (and hence network costs).

The NEPS should consider how new commercial delivery models for integrated building retrofits to improve energy performance could be encouraged. There is a

limited pool of suitable professionals able to provide these services in the commercial buildings area, and very few in residential buildings. Current incentives have not established a market for these types of professions, who will be needed to help improve the performance of Australia's existing building stock. New building retrofit leaders – who could help couple appropriate technology with skilled installers, finance and incentives, as well as energy management, could unlock significant energy and emissions savings to help achieve a healthy, comfortable and fit-for-purpose building stock by 2050. While the skillset exists through Certified Emissions Reduction Leaders for the commercial buildings space, a significant gap exists for appropriate commercial delivery models – and skills – in the residential buildings space.

10.2.4 Buildings and net zero

Decarbonising building operations is a logical near-term step on the journey to net zero. In most cases, the services required by a building can be delivered through commercially-available technology powered by renewable electricity – although there are technical, financial, legal, behavioural and organisational barriers to retrofitting some buildings that must be overcome. Improving the energy performance of buildings is an early first step to full decarbonisation, and policy frameworks should consider encouraging rapid and early decarbonisation of the buildings sector while technology advances to allow other sectors to decarbonise.

Buildings have an incredibly important role to play in the transition to net zero and a future zero emissions energy system. Residential and commercial buildings are substantial sources of energy demand – but energy demand that can be used flexibly. Some building energy demand – such as appliance use - is often not elastic and must occur at specific times. However, some building energy demand is flexible, and can be used to support a strong, stable net zero grid. For example, integrating efficient electric heating and cooling with thermal storage can allow buildings to capture and store heat (or cool) during times of high renewable energy availability, and use that stored thermal resource to condition the building during times of low availability.

Currently, building integration into energy markets is an under-used resource, and the National Energy Performance Strategy should strongly consider how creating connected, efficient, smart buildings will facilitate and accelerate the establishment of a zero emissions grid at low cost. Incentives will be important to engage building owners and operators with energy system needs, and should be sufficient to help overcome barriers to capital investment that would enable participation.

10.2.5 Embodied carbon

Increasing focus is being brought on the emissions that are required to create buildings. Concrete, steel and glass are all common building materials that require large amounts of energy to create and include process emissions in some cases. Technological solutions to eliminating these emissions are some way off. Although improving the energy performance of production of these materials can reduce embodied emissions, reducing the amount of high embodied energy and carbon materials used in buildings will be essential to reduce overall emissions towards 2050.

Indeed, as energy systems decarbonise, embodied emissions are likely to be the major component of building lifecycle emissions.

While some materials such as timber and other materials derived from recently grown biological matter are relatively easy to identify as low embodied energy and carbon, innovative synthetic materials with reduced embodied energy and carbon are more difficult for the market to identify as lower energy and carbon. There is a role for governments to help build consumer trust and understanding of low embodied carbon products, through initiatives such as product certification and recognition of Environmental Product Declarations. Future building regulations are likely to be required to manage embodied emissions.

Encouraging the use of low-embodied carbon products also helps provide a market for the output of industrial enterprises that are making commitments to decarbonise their own operations. This helps support those businesses to invest in low emissions technologies, creating a virtuous circle that helps to lower overall emissions in the buildings and industrial sectors.

10.3 Bringing it all together – high performing, zero emissions ready buildings

Buildings with high energy performance will strongly support the transition to net zero emissions and provide occupants with a comfortable, healthy, safe environment at an affordable cost. Achieving high energy performance buildings that support a future zero emissions energy system requires integrating quality building passive thermal elements with efficient appliances, creating an environment that incentivises smart and flexible building operation, as well as minimising building emissions from all sources, including embodied emissions.

Efficient buildings that can operate flexibly will facilitate and accelerate a transition to a net zero compatible building stock, in a zero emissions energy system. By creating buildings with high energy performance, energy demand during times of low renewable energy supply is reduced, minimising costs for occupants and the grid. Efficient, flexible operations help lower the overall infrastructure requirements for transitioning the energy system to zero emissions, and can make best use of on-site renewable energy generation where installed. These actions help minimise requirements for storage in a high renewable energy grid, which is currently the costliest element (see Figure 4).

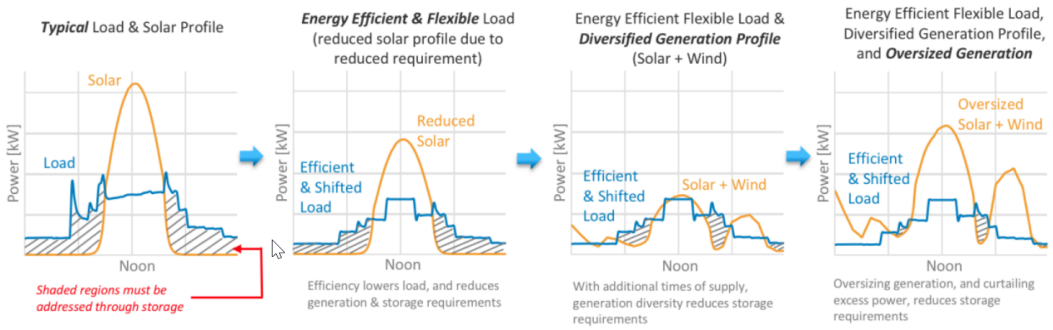

Figure 4 - Efficient, flexible energy demand is key to optimising energy system costs

Source: Houssainy, S and Livingood, W (2021), 'Optimal strategies for a cost-effective and reliable 100% renewable electric grid', *Journal of Renewable and Sustainable Energy*, vol. 13

Efficient, flexible buildings can also support electricity grid strength with flexible, dynamic grid interaction. Elastic demand – like heating and cooling system pre-storage, or modulation of electric vehicle charging – could help the grid by soaking up solar generation during times of excess, and by curtailing demand when inelastic demand is high. However, realising the benefits of these buildings will require a long-term plan for a net zero-compatible buildings system.

Key finding 12

Improving the energy performance of buildings over the long term will require bringing together improvements in building design; building upgrades and retrofits; smart integration of buildings into energy systems, and a reduction in embodied energy and emissions. Successfully bringing these elements together can support an accelerated transition of both the electricity system and buildings to net zero.

10.4 Planning for buildings in a zero emissions system

The 2019 *Trajectory for low energy buildings* is a good start on the path to a high energy performance future. However, our aspirations to meet emissions reduction commitments will require sectors like buildings that have the potential to decarbonise more quickly to do so rapidly, allowing harder-to-abate sectors the time needed for technological progress to bring abatement solutions to market.

Building decarbonisation is possible and feasible, but it is unlikely to happen rapidly and effectively without clear guidance from all levels of government. While there are low-cost solutions to decarbonisation that will likely end up providing savings to the community as a whole, individual asset owners may still see financial hurdles to investment in decarbonisation. ASBEC's recent report notes that while electrification is the quickest and lowest cost path to net zero compatible buildings, it is not a no-cost option.[31]

The NEPS should provide substantial guidance to the building sector about decarbonisation, through the generation of a long-term plan for the building sector. This should indicate likely priorities for government investment, and long-term direction about phases of the decarbonisation pathway. This will allow asset owners to make informed decisions about the best way to decarbonise their own operations, allowing for optimal investment decisions. Failure to provide clear guidance to asset owners risks them making decisions that could unnecessarily lock in long-term emissions, wasting opportunities to accelerate decarbonisation.

Importantly, a long-term plan for buildings should introduce milestone dates for the decarbonisation of buildings, to give clear guidance to the development of building codes and other regulations.

Recommendation 12

The NEPS should incorporate long-term planning for improving the energy performance of buildings – including decarbonisation – as a high priority, to provide clear guidance to asset owners.

10.4.1 A plan to decarbonise operations

Over the medium term, residual gas usage in building operations must be decarbonised. In most cases, this is likely to be achieved at least cost through electrification. While there may be limited use cases for other types of renewable energy in buildings may exist (such as tanked biogas in some commercial buildings), on current trajectories for renewable fuel costs and availabilities it seems unlikely that gas networks will be repurposed to carry renewable gases or hydrogen at low cost in the near to medium term.

Governments should plan for a transition away from fossil gas as a high priority, to ensure that:

- Clear signals are provided to asset owners to replace end-of-life gas plant with efficient, electric appliances where possible;
- The transition away from fossil gas is as orderly as possible; and
- Costs for those remaining on the gas network for a longer period are manageable.

The Victorian and ACT Governments have already commenced planning to decarbonise operations that use gas through substitution. The ACT has already announced a shut-off date for its natural gas network. In other jurisdictions, it is likely that the gas network will not be shut off for a longer period, and parts of it may be retained for industrial purposes. Planning for these eventualities is important, particularly if parts of the decarbonisation process involve renewable gases which may require significant development time.

Similarly, electrification of buildings (and transport) is likely to place additional load on the electricity network. Although the higher efficiency of electric appliances means that the new electric demand will be less than the previous gas demand, this will still place additional demand on the electricity network. Electrifying efficiently and understanding how and when this is likely to occur is important for optimal network planning and development.

Building data is likely to be a key input into planning. Wider availability of data about building energy performance will assist both government in understanding the scope of the task ahead, and also industry in planning new capacity to implement building energy performance improvements.

Key finding 13

A plan to decarbonise buildings must plan for the fuel switching of services that currently use fossil gas, primarily through efficient electrification. Planning is important to provide guidance both to building asset owners, but also electricity networks as new electric demand comes online.

10.5 Implementing the plan

Bringing Australia's building stock up to a satisfactory level of energy performance will require sustained investment over the next two decades from government, the private sector and individuals. There are important pieces of enabling work that must be completed to allow investment to support achieving a net zero compatible, high energy performance building stock. Further information on specific frameworks and incentives is outlined in the following chapters on residential and commercial buildings.

Two areas of initiative are common to both sectors – national building regulation and the role of government in catalysing change.

10.5.1 National Construction Code

The National Construction Code is a model code implemented by states and territories to regulate the standards and safety of new buildings. In 2022, state and territory buildings ministers agreed to upgrade the energy efficiency provisions of the National Construction Code to a minimum of a 7-star NatHERS rating, however implementation of the NCC is expected to be piecemeal – some jurisdictions are implementing the new code by October 2023, while others have not yet committed to implementing the code.

The NCC is a pivotal piece of building regulation, and nationally consistent regulation significantly lowers costs, builds economies of scale and a broader pool of skilled trades and professions.

The NCC should also align to a long-term plan of decarbonising buildings, and create milestones. Given the rapid pace of technological change and adoption of efficient electric technologies, phasing out of fossil gas appliances in new buildings as an important step that should be taken in the NCC as soon as possible. Installation of fossil gas building appliances that may have a 15-20 year lifespan risks either locking in unnecessary emissions, stranding assets, or both. Additionally, given the current disruption that global markets are causing to gas supply, reducing reliance on fossil gas in buildings makes economic sense – and all-electric buildings are most cost-effective when buildings are built to be all-electric.

Currently, the NCC is implemented for buildings on an as-designed basis, meaning that designs are modelled and compliance with NCC energy efficiency provisions is determined on the basis of the modelled performance. However, recent years have shown an increasing gap between the as-designed and as-built performance of buildings across all facets of building construction. Over time, the NCC should be evolved to focus on an as-built implementation, with performance verified during and after construction phases.

Further, the NCC should continue to increase ambition for affordable improvements to energy performance. Increasing energy performance ambition as technologies become more affordable and widely deployed in Australia will lead to benefits for occupants and asset owners, including lower energy costs, improved health, wellbeing and productivity.

Recommendation 13

The National Construction Code should be regularly updated to be consistent with a long-term plan for building energy performance and decarbonisation and makes phasing out fossil gas usage in new buildings a priority.

10.5.2 Government as an exemplar

Government is an important driver of change in the market. The levers of government procurement can help build nascent markets and catalyse investment without the need for regulation, and the requirements of government as model tenants or landlords are a powerful signal to the market.

The Government's Net Zero APS policy is an important component of the broader climate and energy policies and will help drive clean procurement across a range of economic sectors, including buildings. Building on early successes pioneered by the Commonwealth, Victoria and New South Wales, many jurisdictions are interested in improving the performance of their building stock. While this is a welcome development, many independent efforts risks competition for expertise, skills and market capacity to deliver.

There is scope for the NEPS to drive cooperation and collaboration across the government sector in procurement of high-performing buildings. Cooperation and collaboration between jurisdictions could ensure that early experience can inform nation-wide efforts, maximising the benefits of governments in building a market for building stock that is compatible with net zero.

10.5.3 Harness the full power of government procurement

Government procurement levers can also be important in encouraging quality to the marketplace without increasing regulatory burden. Government procurement, which can specify quality, training, safety, provenance and other standards, can be a low-risk, high-efficacy channel for building skills and supply chains. As the first mover, governments can create quality demand that can build a minimum viable size for a market, enabling suppliers to bring goods and skills to market that would otherwise suffer from the 'chicken and egg' problem.

The use of accredited suppliers and other procurement frameworks can help drive best practice in markets, bringing spill over benefits to private consumers. The Energy Efficiency Council acknowledges the support of Victorian, New South Wales and Australian Capital Territory Governments in bringing a new professional certification for insulation installers to market. These certifications permit governments to have a greater level of assurance about quality and safety standards where they are used in government procurement programs, but also means that the general public can engage professionals with demonstrated training and experience.

Key finding 14

Government procurement is an important lever to drive market transformation, and can help build better practice. Cooperation and collaboration between different jurisdictions can help maximise the benefits of government investment in high-performing buildings.

11 Residential buildings

Residential buildings must be a core focus for the forthcoming NEPS. For too long, residential energy performance has been placed in the too-hard basket. Without meaningful action on residential buildings, Australia's transition to net zero will be more costly and harder than necessary, as well as consigning another generation of Australians to live in sub-standard houses which are not fit for purpose in a changing climate. This chapter will focus on existing residential buildings, as new build residential dwellings should be addressed through the National Construction Code, dealt with in the previous chapter.

11.1 Residential buildings hold the key to a zero emissions energy system

In the transition to net zero and a zero emissions energy system, residential buildings present a complex challenge. While the energy usage of residential buildings is only a small part of the overall energy system, the times of energy demand are highly misaligned with times of abundant, low-cost renewable energy supply. This occurs both on an intraday basis, as well as an interseasonal basis.

To take the intraday example, while demand from business and industry occurs to a larger extent during business hours, residential energy demand tends to occur in the early morning, and to a larger extent in the evening around 7pm. While rooftop solar is progressively reducing the energy demanded from the conventional suppliers during the day, energy demand in the peaks – particularly the evening peak – is less affected by solar (see Figure 5).

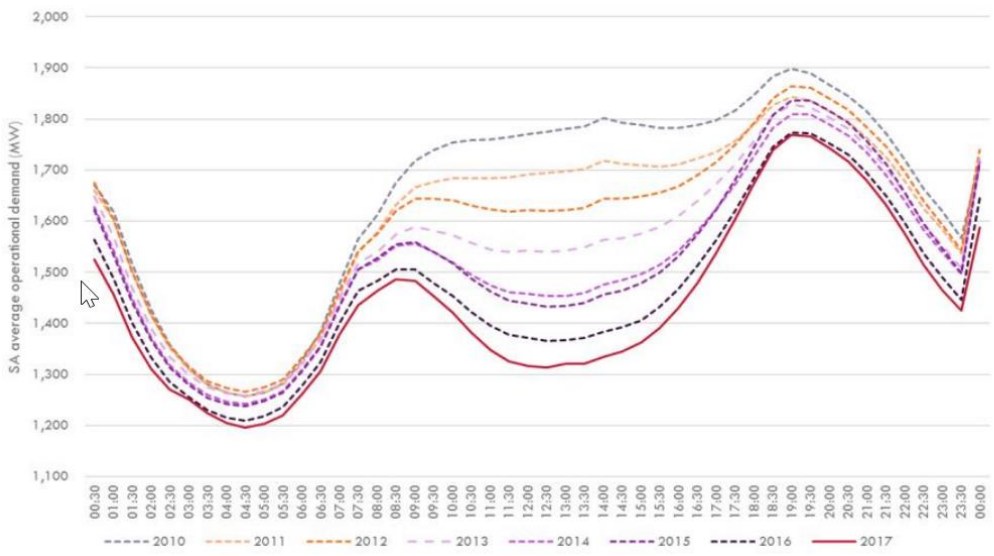

Figure 5 – Example of daily energy demand.

Source: Australian Energy Market Operator (2018), *AEMO observations: Operational and market challenges to reliability and security in the NEM*, AEMO, p.20

This means that in a high renewables energy system, the evening peak must be served by wind generation augmented by pumped hydro and more costly forms of energy storage. Improving residential energy performance is therefore an important strategy to reducing the maximum demand on energy systems. Reducing residential energy demand will support lower costs and a faster transition and requires immediate attention.

A critical part of improving residential building performance includes improving the building shell. Improved insulation, draughtproofing and other low-cost upgrades can make a substantial difference to the energy demand that a dwelling places on networks. This will help reduce the impacts on the electricity network of a shift away from fossil gas heating in southern states, reducing the cost of transition for both energy users and the community at large.

This is in addition to the other benefits of improving energy performance – safe and comfortable buildings that promote the health and wellbeing of their occupants, reduction in energy hardship and improving resilience.

11.2 Residential rehabilitation is an urgent priority

Australia has around 11 million residential dwellings – eight million of which were built before the introduction of mandatory energy efficiency standards – and millions of these homes will require attention to improve their energy performance. There are a range of avenues to improving the energy performance of these homes, but initial focus should be on remediating the worst-performing dwellings.

The worst-performing dwellings are the most susceptible to energy price shocks. As Figure 6 shows, while an energy price rise hits all users by a similar proportion, the absolute value of the extra cost of energy services is vastly different. While residential dwellings with good energy performance will see an increase of hundreds of dollars due to the energy crisis, a poor performing dwelling will need to find thousands of dollars extra to pay their energy bills. The worst performing dwellings also tend to be inhabited by some of the most vulnerable in society, making the extra impost doubly harmful.

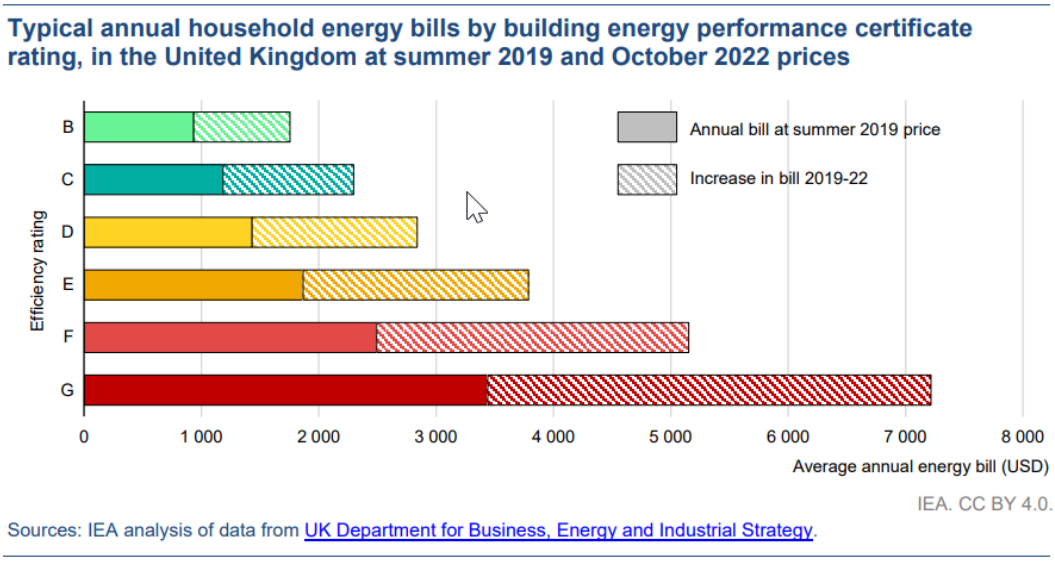

Figure 6 - Energy price shocks affect poorly performing dwellings the worst

Source: International Energy Agency (2022), *Energy Efficiency 2022*, IEA, Paris, p.15

Focussing on the worst performing dwellings will also yield the most dramatic energy and emissions savings. For example, raising an example dwelling in Melbourne from a 1 to a 4-star NatHERS rating would save ***more than three times*** as much energy as raising a building from 4 stars to 7 stars (see Figure 7). This would save the household at least $2,275 and avoid more than 13 tonnes of emissions annually.[c]

[c] Assuming the household is on the Victorian Default Offer in the Powercor area, and using emissions intensities for Victoria from the 2021 National Greenhouse Account Factors.

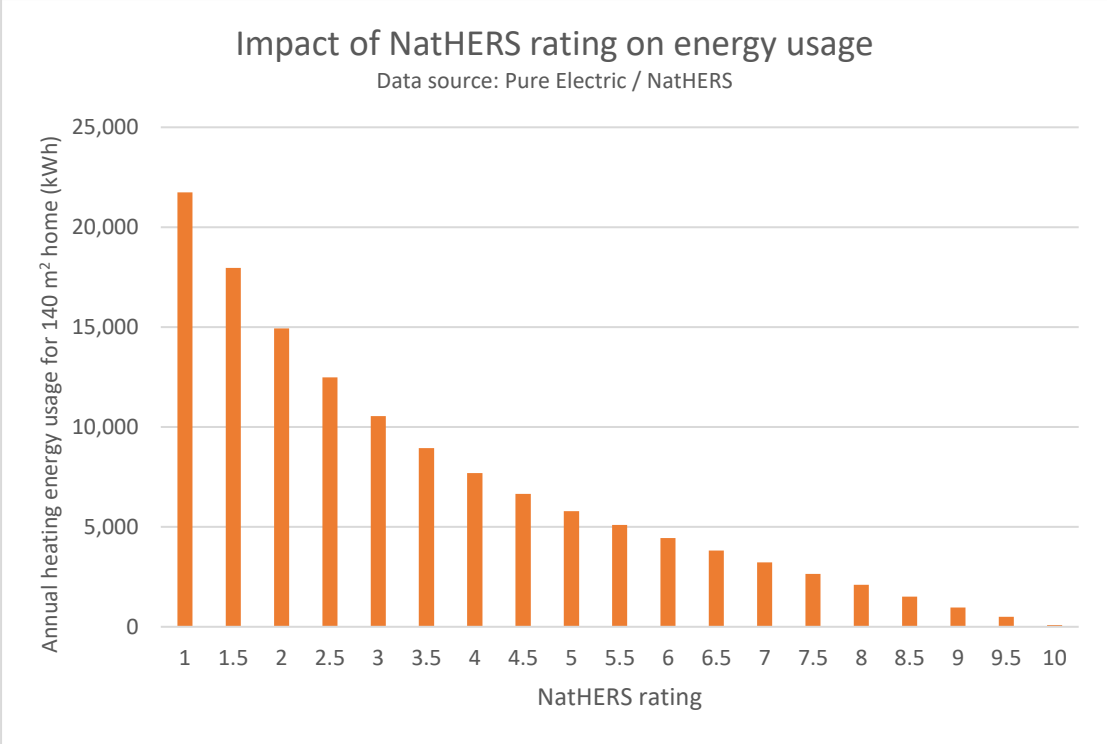

Figure 7 - Energy usage of an example Melbourne house

Making these types of upgrades are relatively cost-effective – improving insulation, basic draughtproofing and replacing inefficient appliances with modern, flexible electric appliances should generally lead to energy savings of around 50% or more.

The NEPS must address residential dwellings as a priority. The task of rehabilitating millions of homes will take many years, and potentially hundreds of billions of dollars. While this seems like a daunting task, it is achievable – but only if we start in earnest, now. The rest of this chapter is devoted to the important actions that will enable residential rehabilitation.

11.3 Frameworks

Realising residential rehabilitation at least cost will be facilitated by rapid implementation of several frameworks. While many of the levers in residential buildings are within the purview of states and territories, the leadership of the Commonwealth is an important tool to progress these items.

11.3.1 Finalise and deploy a residential energy performance rating at scale

The most important enabler of residential rehabilitation is to be able to measure the energy performance of a house. Without the ability to measure and communicate energy performance through an energy performance rating, it is very difficult to create meaningful energy performance targets for residential buildings, or unlock sustainable finance markets to drive energy performance improvements.

The Nationwide House Energy Rating Scheme (NatHERS) is an important tool in providing energy performance information about residential dwellings, however

NatHERS is primarily used to rate the as-designed performance of a house for compliance with the National Construction Code. Enhancements to NatHERS in recent times are likely to allow expansion of its capabilities to include the ability to make estimates of the energy performance of dwellings using real estate data sources.

The National Residential Scorecard inistiative is designed to allow performance rating of houses as-built (and as-existing), although further refinements are required to ensure that it provides effective information to consumers to drive improved energy performance.

Finalisation of a national residential energy performance rating tool (or suite of aligned tools) to deliver nationally recognised energy performance ratings for all dwellings is an urgent priority.

To be effective, the energy performance rating must be universally recognised and used and deployed at scale. Once a national energy performance rating framework is finalised, steps should be taken to give the rating system a critical mass of available ratings, to create a larger pool of accredited assessors as well as increasing awareness and familiarity with the tool.

A useful way to do this would be to fund a baseline study of Australian residences. While there are limited sets of data characterising the performance of Australian residential dwellings, there would be significant benefit in establishing a more complete picture of the energy performance of residential buildings, with particular focus on rental dwellings. Beyond helping to create a larger market for residential assessments, this would provide a valuable data set that a range of stakeholders including government, industry and finance partners could utilise to help mobilise private sector finance to achieve the bulk of the residential rehabilitation task.

Over time, the aspiration should be for energy ratings to accurately reflect the performance of buildings through performance verification measures (like blower door testing and thermal imagery). There can be substantial differences between the design of buildings and the quality of final completion or alterations made over time, and complementing design based tools with measurements will enhance the quality of energy performance ratings.

Recommendation 14

A national residential building energy performance rating system should be finalised as a matter of extreme urgency.

Recommendation 15

The Government should commission a comprehensive baseline study of residential energy performance to build a critical mass of energy performance ratings and create a high-quality data set on residential energy performance.

11.3.2 Mandate disclosure of energy performance ratings

Once the residential energy performance rating is established and deployed, all jurisdictions should implement mandatory disclosure of energy performance ratings at point of sale. This helps overcome a key barrier to improving energy performance – lack of information for consumers to make decisions on.

Energy performance disclosure has been mandatory in the Australian Capital Territory for more than two decades. This has been demonstrated to be an effective policy that not only reduces information barriers to energy efficiency, but establishes a clear way to reduce split incentives in energy efficiency upgrades.[32] For example, building owners who are concerned that they may not capture the full value of energy efficiency upgrades if they need to sell their dwelling in the short term can use a higher energy performance rating as a selling feature, allowing the residence to command a higher sale price. Mandatory disclosure has also been demonstrated as an effective policy in the commercial buildings area.

Implementation of mandatory disclosure is important to build drivers for improved energy performance in the residential property market, and ensure that consumers purchasing a home have adequate information about the embodied energy performance of the dwelling, which is not always apparent during home inspections.

Initially, mandatory disclosure should be applied to all homes at point of sale. Where an energy performance rating exists, it should also be disclosed at point of lease. Over time, consideration could be given to requiring all rental properties to possess a valid energy performance rating.

Recommendation 16

The NEPS should prioritise achieving mandatory energy performance disclosure of residential buildings at point of sale in all jurisdictions as soon as possible, contingent on finalisation and deployment of the residential energy performance rating.

11.3.3 Implement mandatory minimum rental standards

Renters occupy around a third of dwellings in Australia and have limited ability to make upgrades to premises to increase energy performance. Additionally, in the current housing market, competition for housing means that renters are functionally unable to exercise consumer choice, and are unlikely to be able to insist on landlords making upgrades to properties.

This is a classic split-incentive problem – landlords are responsible for capital improvements to property and must bear the up-front cost, while tenants will enjoy the benefits of reduced energy bills. Conversely, landlords do not experience the hardships that poor energy performance will visit on tenants of poorly performing properties, and so have limited incentive to improve energy performance.

It is not reasonably foreseeable that market circumstances will change in such a way that will change this situation. It is therefore necessary for governments to regulate to protect the health and wellbeing of tenants, who will make up an increasing share of Australia's population.

Minimum rental standards should be implemented as soon as possible. In the first instance, minimum rental standards should be based on certain features. In cooler climates, features should include minimum ceiling insulation standards as well as an efficient heating solution. In warmer climates, standards could focus on adequate insulation, cooling and ventilation.

Ultimately, once energy performance ratings are an established feature of the Australian property landscape, rental standards should be based on minimum energy performance ratings, and the NEPS would be well placed to flag a future transition to performance-based minimum rental standards.

In the first instance, the NEPS should emphasise the importance of minimum rental standards to protect the health and wellbeing of renters, and work with state and territory governments to implement rental standards as soon as possible.

Recommendation 17

The NEPS should work with state and territory governments to implement minimum mandatory rental standards as soon as possible.

11.3.4 Scope the residential retrofit task

Rehabilitating Australia's housing stock will require sustained, steady effort and investment over several decades from governments as well as homeowners, landlords and owners' corporations. Multi-year programs will be required, with long-horizon funding maintaining momentum in residential rehabilitation to ensure the residential building stock is fit for purpose in the coming years.

An important task for government will be to scope the requirements for a large retrofit program. Government investment will be important for a subsector of housing rehabilitation, but government leadership and coordination are vital to facilitate the achievement of the whole task. Skills development, access to financing and expertise, targeting government funding to the most vulnerable, building strong supply chains, creating one-stop shops for retrofits and other tasks are integral to delivering a retrofit package and are an important task for governments at all levels to engage with. This work will enable development of a larger residential rehabilitation package.

Key finding 15

Substantial investment in residential rehabilitation from a range of sources is required. Initial work in scoping the residential rehabilitation task is needed, ahead of the development of a substantial residential upgrade package.

11.4 Programs to improve residential energy performance

Framework policies are incredibly important to mobilising energy performance upgrades. However, practical action is also required, and in some cases governments will be needed to catalyse or undertake action.

11.4.1 Social and community housing upgrades

Upgrading social and community housing is an important step in improving residential energy performance. Social and community housing tenants are unable to undertake energy efficient upgrades, forcing them to rely on energy conservation measures if their energy bills are too high. Upgrades to social and community housing has several benefits:

- Providing an avenue for government to directly procure efficiency upgrades and apply quality, safety and performance standards to upgrades;
- Building market demand and opportunities for training and skills development in energy performance upgrades; and
- Ensuring that social and community housing – which houses vulnerable community members – is fit for purpose in a changing climate.

Upgrades of social and community housing is largely a matter for government funding. Without government resources, housing providers are unlikely to be able to afford upgrades, and tenants will miss out.

The NEPS should consider setting a target for remediation of poorly performing social and community housing to drive a partnership with states and territories. For example, we suggest all governments commit to all social, public and community housing dwelling achieving a 5-star NatHERS rating by 2030. This would provide a reasonable window to ensure that the 440,000 social, public, community and Indigenous housing dwellings meet basic standards of energy performance, safeguarding the health and wellbeing of tenants.

Direct government procurement of upgrades for these dwellings would have spill over benefits mobilising private sector retrofits, as the firm demand from government would induce investment in skills and supply chains that will drive down retrofit costs for the private sector.

Recommendation 18

The NEPS should facilitate a partnership between the Commonwealth, states and territories to ensure all social, community, public and Indigenous housing meets at a NatHERS rating of at least 5 stars by 2030.

11.4.2 Build foundations for national rental home upgrades

Minimum rental standards are an important policy to drive improved energy performance in private rental properties, but facilitating upgrades is also important. Governments should partner with rental providers to build a successful program of upgrading rental properties. The stock of housing is a shared community asset, and facilitating upgrades ultimately benefits the entire community over the long term.

To help inform the introduction of minimum rental standards, we suggest that the NEPS considers rolling out a package of enabling works. These measures will help build confidence in the rollout of rental standards, build familiarity with necessary upgrades, expand the evidence base to help target policy interventions, and help landlords implement upgrades at lower cost.

We believe a package of enabling works for improving rental residences would include the following elements:

1. A national baseline study of the energy performance of rental homes;
2. Piloting methods to build engagement with landlords;
3. Run a trial and evaluation of different technical interventions to improve energy performance in a range of rental properties across the country to demonstrate the most cost-effective interventions;
4. With states and territories, provide funding for co-development of feature-based minimum rental standards, with a long-term goal of implementing performance-based rental standards; and
5. Provide seed funding for the CEFC to develop a finance program to support landlords implementing upgrades for minimum rental standards.

In the long run, mandatory energy performance disclosure and minimum rental standards would be the drivers for improving energy performance in rental housing, but these small interventions could help build foundations for deployment of rental upgrades at scale.

Recommendation 19

The NEPS should implement a package of foundation work to enable deployment of energy efficiency upgrades to rental homes at scale.

11.4.3 Ensure equitable access to energy performance upgrades

Across Australia, there is inequitable access to energy performance upgrades. In four jurisdictions, energy efficiency certificate schemes provide low-cost upgrades to households, providing them with energy savings while at the same time delivering savings to the energy system. Residents of other jurisdictions have no access to these schemes, meaning that households face additional barriers to energy performance upgrades. The NEPS should consider how all Australians – particularly low-income households – could receive equitable access to energy efficiency upgrades to improve their home's energy performance.

Key finding 16

Access to cost-effective energy performance upgrades differs across Australia. Consideration should be given to ensuring that every Australian resident has access to effective energy performance upgrades at low cost.

11.4.4 Consider creating expertise in residential retrofits

There is a range of scales of intervention in improving energy performance of residential buildings. In the smallest scale of retrofits, exchanging appliances or minor works such as gap sealing can deliver tangible benefits at very low cost. In medium scale rehabilitation, more invasive building fabric works can deliver substantial results, such as improving insulation or replacing worn building components that permit excessive air leakage. In a large renovation where structural changes are made, more substantial holistic changes to residential energy performance can be contemplated.

However, consumers currently lack easy avenues to arrange holistic energy performance upgrades. Residential energy assessors are currently extremely rare – there are only nine assessors in all of Queensland, and only *one* to cover the 1.35 million square kilometres of the Northern Territory. Accessing advice about residential energy efficiency upgrades is therefore not a straightforward task, and the market for professionals that can advise, design and implement holistic residential energy performance retrofits is relatively limited. Experience from international jurisdictions in frameworks and standards to support whole-of-home energy efficiency upgrades could inform Australian efforts.

Feedback from professionals and consumers routinely highlights the 'effort factor' as a clear barrier to implementing energy efficiency upgrades. Even a straightforward upgrade like replacing a gas storage water heater with a heat pump water heater requires coordinating at least two different trades. For larger scale retrofits, where there is opportunity to incorporate energy performance upgrades as part of the works, the absence of professionals to seamlessly arrange services presents a barrier to maximising the benefits of these works.

Key finding 17

The greatest benefits accrue from holistic improvements to building energy performance, however lack of skills and a viable market for integrated energy performance retrofit professionals presents a barrier to unlocking this energy performance potential. The NEPS should consider how governments might encourage development of a market in residential retrofit advisors and managers.

11.5 Apartments and strata buildings

Apartments and strata buildings present a particularly complex case for improving energy performance, meaning they are often passed over for energy efficiency program and policy.[33] However, with 16% of dwellings in Australia being apartment buildings,[34] this segment of the building stock still requires attention.

Ownership by multiple residents means that a majority of owners generally must agree to any significant energy upgrades. In many cases, all owners must contribute towards capital costs, particularly for collectively owned common areas, including structural elements. Some retrofit work within private lots may be subject to owner's corporation restrictions that may hinder energy upgrades. Challenging these rules can be confusing, time consuming, and costly.

Decarbonisation of building operations for apartment buildings can also be challenged where embedded energy networks exist. The presence of embedded networks can limit individual agency in choosing energy providers and make accessing renewable energy more difficult or impossible.

Navigating the different legislation and governance practices appliable to strata buildings can be especially complicated. Legislation differs between states, and obligations vary between owner's corporations of different sizes. This can make upgrades difficult to execute. Ultimately, regulatory solutions – including reforms to

state strata legislation to enable (and ultimately require) apartment buildings to be decarbonised are likely to be needed.

Given the difficulty of conducting retrofits and other works in apartment buildings, constructing newly built apartments to a high standard of efficiency must be a priority. New apartment buildings should be built to high standards of building performance, with efficient electric appliances well-integrated into the design.

For existing apartment buildings that do not meet appropriate energy efficiency standards or require decarbonisation, retrofits will be needed. A range of financial, technical and legal barriers can exist to retrofitting apartment buildings.

In some cases, upgrades to apartments may be treated in a similar fashion to upgrades of detached or semi-detached dwellings – essentially for those cases where apartments share very limited common services and structural fabric permits upgrades for individual apartments. Established pathways for encouraging upgrades – such as through state and territory energy efficiency schemes – can be an effective channel for improving energy performance in these types of apartments. Larger apartment buildings with common central services are more difficult to retrofit, and may have significant commonalities with commercial building retrofits, which will be discussed in the next chapter.

Currently, retrofit skills in larger, commercial-style buildings are limited, and apartment buildings may benefit best from the transfer of capacity built in the market (including skills and supply chains) for residential and commercial buildings. Including larger apartment buildings in decarbonisation demonstration projects could be a good way to build market readiness for apartment building retrofits, as well as help develop experience in navigating the strata environment.

Key finding 18

Apartment buildings present unique challenges to improve building performance, owing to the nature of strata-owned buildings, and technical barriers to upgrades in some building types. Including apartment building types in building decarbonisation demonstration programs could be an effective way to help overcome these barriers and build skills and market readiness to carry out energy performance retrofits in these building types.

12 Commercial buildings

Commercial buildings represent one of the few successful areas of achievement in Australian energy performance. The introduction of the National Australian Built Environment Rating System and the Commercial Building Disclosure program have driven clear, measurable improvements in energy performance in the office building stock in Australia.

Commercial buildings and services account for around 7 per cent of energy use in Australia, and continuing the momentum in this space is an easy way to continue emissions reduction and energy performance improvements across the economy. Building on initial success in commercial buildings also has spill over benefits including cementing Australia's position as a leader in commercial buildings emissions reduction that could lead to international trade opportunities, creating a larger skills pool which could benefit other sectors over time, and creating better and more productive environments for Australians to work in.

12.1 We're in front, but the job isn't finished

Australia has a strong base to continue improving energy performance in commercial buildings. Our skills and expertise in this area is a national asset, as well as the commitment of some of Australia's largest property groups to improving energy and emissions outcomes over the long term.

NABERS gives building owners and operators a tool (and a reason) to monitor and improve their energy performance. Periodic renewal of ratings provides a clear timeframe for investing in energy performance improvements, and a motivation for prosecuting energy performance upgrades with building owners.

However, there are still a range of challenges that need to be addressed in commercial buildings:

- Market leading office buildings have generally high energy performance, but mid- and lower-tier buildings require improvement to close the gap;
- Takeup of energy performance improvements in office buildings is strong, driven by NABERS and CBD. Extending improvements to other building types requires attention this decade;
- Retrofitting older buildings to decarbonise their operations and phase out fossil gas use presents commercial and technical challenges; and
- Mandatory disclosure has proven an effective tool in office buildings. Extension to some other building types is warranted, but other commercial and public building types may be less amenable to the influence of mandatory disclosure.

The NEPS should aim to continue improvements in energy performance in commercial buildings, leveraging previous success. To continue momentum, the NEPS could consider supporting further rollout of the NABERS tool, including supporting operators of other building types (like schools, hospitals, aged care homes) to obtain their first NABERS rating.

Further, the paused 2019 review of the Commercial Building Disclosure program should be renewed, and expansion of CBD to office tenancies, shopping centres, hotels and data centres. The introduction of CBD to these building types could be staged, and may be different in form to the disclosure requirements for office buildings. For example, the CBD requirement for some building types might be to more appropriately have and display a current NABERS rating, rather than to disclose at the point of lease or sale. Supporting initial ratings for some of these building types may be appropriate and ease the implementation of the program.

Recommendation 20

The NEPS should support continued expansion of NABERS and Commercial Building Disclosure to additional building types.

12.2 Update government ambition

The Energy Efficiency in Government Operations policy in the late 2000s was an important driver for uptake and improvement of NABERS ratings in the commercial buildings sector. The Net Zero by 2030 APS policy has the potential to drive similar changes in the commercial buildings sector, as asset owners are likely to be responsive to government demand.

The EEC encourages the Government to be ambitious in developing its new policy for government operations, and seek to drive innovation and excellence in the private sector using the levers of government procurement. The NEPS can reinforce the NZAPS strategy to provide clear signals to the private sector. Elements of a new government operations policy could include:

- Increasing the *average* NABERS rating across the government estate to 5.5 stars;
- Committing to phase out fossil gas from government operations as soon as practicable;
- Using the Defence Housing Australia estate to drive innovation in housing developments ;
- Fostering innovative private sector mechanisms to roll out energy performance upgrades on a holistic basis, building a market that can then facilitate lower cost and more rapid private sector decarbonisation; and
- Demonstrating retrofits to older, heritage buildings within the Commonwealth estate to help build market experience and familiarity.

The EEC encourages the Government to avoid using offsets to achieve the NZAPS policy, and instead commit to genuine decarbonisation that is compatible with achieving net zero by 2050.

Further, while we understand the practical reasons for excluding Defence operations from the NZAPS target, the Defence estate provides a significant opportunity to pilot energy performance upgrades. The scale of Defence operations provides a significant opportunity for developing new skills and experience in decarbonising government operations, and we would encourage cooperation and collaboration between Defence decarbonisation efforts and the broader NZAPS decarbonisation efforts where

possible. Defence should develop an energy management strategy that focuses on supporting operational readiness in its defence functions, and normal energy management goals in its more conventional facilities, like housing and office tenancies.

Recommendation 21

The NEPS should support an ambitious policy for decarbonising government operations through the Net Zero APS by 2030 initiative, including re-establishing Commonwealth government leadership as an exemplar of innovative decarbonisation.

12.3 Accelerate commercial building decarbonisation efforts

While technologies to decarbonise building operations exist and are commercially available, market readiness in Australia is low. Decarbonising residual gas usage in large commercial buildings will present a challenge for building operators and owners, with distinct problems to be solved in various building types (apartments versus large office buildings, for example). There is a role for government to help accelerate deployment of retrofits into existing commercial buildings.

Demonstration projects are important at building expertise and awareness, accelerating knowledge transfer into the wider professional community. Importantly, we would encourage the NEPS to consider supporting a ***series*** of demonstration projects in commercial building retrofits. While individual demonstration projects are useful, their value is maximised when a series of projects is able to build a critical mass of skilled labour and supply chains, unlocking learning rates and ultimately driving down the cost of retrofits.

Recommendation 22

The NEPS should support a series of demonstration projects for decarbonising existing commercial buildings (including large apartment buildings) to build awareness, skills and supply chains.

12.4 Harness untapped demand response and flexibility resources

Commercial buildings present a significant resource that could be used to support the energy system through flexible demand, demand response and two-way market participation. Elastic demand in commercial building services – particularly for the 60-65% of energy usage used for space conditioning[35] – could be utilised to support energy system stability. Commercial buildings are particularly suited for utilisation in this way, as their energy systems are often well-managed and automated through Building Management Systems, with supervision of a facilities manager who is likely to have access to expertise and resources to assist in building energy management.

Well-managed, responsive commercial building energy use could help support grid stability, but current incentives do not provide substantial motivation to asset owners to invest in smart response capabilities. The NEPS could consider how to best harness the potential resource of flexibility in commercial buildings.

Key finding 19

While commercial buildings have high potential as a demand response resource, incentives do not currently create a compelling business case for asset owners to invest in demand flexibility capabilities. The NEPS could examine to how leverage this resource.

13 Appliances

Greenhouse and Energy Minimum Standards, along with appliance equipment labelling, are the long-standing backbone of energy efficiency in Australia, and have been repeatedly demonstrated to be an effective policy that saves consumers money, reduces emissions, and delivers additional capacity to energy systems at negative cost. There is an opportunity for the NEPS to significantly increase the ambition for the energy performance improvements to be delivered through appliance standards in Australia.

However, Australia's efforts to improve the energy performance of appliances are out of date and require supercharging to continue improving performance of appliances. The process for making GEMS determinations in Australia is cumbersome and slow, and requires overhaul.

13.1 Leverage international performance standards

Harmonisation with existing international standard setters – particularly the European Union and the United States – is desirable and would facilitate greatly improved energy performance at low cost.

Reform to the GEMS program should seek to reduce barriers to making standards, particularly where suitable international examples exist, and providing additional resourcing to the GEMS program to adapt or create Australian standards where a genuine need exists to do so (for example, to fit in with Australian climactic conditions). Where multiple international jurisdictions have a standard, but Australia does not, the focus should be on determining if there is a valid reason why Australia has *not* made a standard, rather than determining if there is a positive cost-benefit analysis for making such a standard.

There is a current backlog of priority appliances to inclusion in the GEMS regime, and consideration of these should be expedited. Minimum standards and appliance labelling for strategic technologies like heat pump water heaters need implementation as soon as possible, as there is a clear gap in information for consumers in these areas.

There is no reason why Australia should not see itself amongst the global leadership group for appliance standards. Australia possesses both the technical and regulatory capabilities to effectively implement ambitious energy efficiency standards for appliances, which will deliver long-term, tangible emissions reduction and energy cost savings for Australia.

Recommendation 23

The NEPS should reform the Greenhouse and Energy Minimum Standards program to allow rapid adoption of suitable international standards, and harmonisation of existing Australian standards with international comparators.

13.2 Deploy demand response capabilities.

Integrated demand response capabilities in energy-intensive appliances can provide a valuable emergency service to the grid where exceptional demand and supply mismatches exist. Demand response capabilities provide a graduated response to reduce demand, permitting steps between full, unrestricted operation and load-shedding.

While governments have agreed to implement demand response capabilities in appliances, slow implementation has meant that different jurisdictions are taking matters into their own hands and implementing different versions of demand response requirements. Different jurisdictional requirements raise costs more generally, and efforts to implement harmonised demand response capability requirements should be re-energised.

Key finding 20

Integrated demand response capabilities are a valuable addition to appliances that can help improve energy system security and reliability. Piecemeal implementation of demand response requirements is inefficient and increases costs for consumers.

13.3 Consider energy standards for commercial and industrial systems

Australia currently regulates individual appliances and products, which is straightforward for consumer plug-in appliances. In these cases, the performance of a product is likely to be relatively consistently predicted through GEMS compliance. However, for commercial and industrial products, individual products are more commonly part of an integrated system, and the efficiency of the component products depends greatly on the configuration of the entire system. For example, while the efficiency of industrial chillers and air-conditioning units is regulated by GEMS, the overall efficiency of the chiller will also depend on the other components in the system like fans and ducts, which are not regulated.

Key finding 21

Future energy performance standards for commercial and industrial equipment could consider the entire energy using system, rather than regulating individual components. This would support accelerated industrial and commercial decarbonisation, as well as provide greater incentive for better integration of system components.

14 Transport

Transport remains Australia's largest domestic energy end-use, using more energy than commercial buildings and services, residential buildings and agriculture combined. Australia's heavy dependence on road transport and lack of meaningful transport efficiency policy means Australia is ranked third-last by the ACEEE's international scorecard for transport out of the world's 25 largest energy users, falling behind Russia and beating only Saudi Arabia and the United Arab Emirates.

Fuel efficiency in vehicles has long been recognised by international peers as an important policy that reduces costs for consumers and reduces exposure to international oil markets, which are highly volatile and reactive to global events. Yet almost fifty years after the United States instituted its first fuel economy standards, Australia remains without any policies to improve the fuel efficiency of vehicles. Unsurprisingly, average vehicle fuel efficiency in Australia has not advanced in line with other advanced economies, and average vehicle emissions have remained stagnant since the middle of the last decade.[36] Inefficient transport policy leaves Australian consumers needlessly exposed to global oil markets, hinders emissions reduction efforts, and acts as a barrier to eventual transport sector decarbonisation.

14.1 Implement ambitious fuel efficiency standards without delay

It is now almost a decade since the Climate Change Authority recommended the implementation of fuel efficiency standards for light vehicles. If the CCA's recommendation had been taken up at that time, the average fuel economy of Australian vehicles would be around 105 g CO_2-e per kilometre in 2025.[37] Instead, average emissions are likely to be somewhere between 170-180g/k,[d] meaning millions of tonnes of unnecessary emissions have been created.

The evidence on fuel efficiency standards around the world is clear for the efficacy of the policy to improve energy performance, save consumers money and reduce emissions. The EEC welcomes the Government's commitment to introduce light vehicle fuel efficiency standards as an essential tool to decarbonising transport and accelerating uptake of zero emissions vehicles.

The EEC encourages the Government to set an ambitious target for fuel efficiency, implemented on a corporate average fuel economy basis. This single measure would have the greatest impact in advancing Australia in the global competition for supply of zero emissions vehicles.

Recommendation 24

The Government should introduce ambitious corporate average fleet economy standards for light vehicles as a matter of urgency.

[d] The National Transport Commission altered the way it calculates vehicle emissions in 2020, separating out light vehicles into two segments. This makes pre- and post-2020 data incomparable.

14.2 Prepare for the transition to electric vehicles

Global momentum is now clearly showing that electrification is the likely pathway for decarbonisation of a large portion of the passenger transport task, as the beginnings of critical mass of electric vehicles demonstrates. This means that a significant population of electric cars in Australia is probably unavoidable, and these vehicles will place additional demands on the electricity grid.

Like other electric appliances, electric cars are significantly more efficient than their fossil fuel counterparts under most conditions. This means that Australia's current energy usage for transport will not be placed onto the grid in its entirety, as efficiency will reduce the total amount of energy used for transport. Nevertheless, the additional demands placed by electric vehicles on the grid will be substantial and requires advanced planning.

If implemented properly, electric vehicles could be a significant source of flexible demand, and potentially even a source of emergency energy supply. On average, Australians commute for around 32 kilometres each day. Using a modest electric vehicle fuel efficiency of 18 kWh/100 km and a charging efficiency of 80 per cent, this would translate to energy usage of around 7.2 kWh per car per day. If charged at home overnight predominantly, this is a relatively modest impost on the electricity grid. However, if charging needs to happen predominantly in fast charging mode, this could lead to more substantial grid impacts.

Electric vehicle charging can be used flexibly to support grid security and reliability, however forward planning and enabling policies (such as minimum standards for EV chargers, interoperability with the grid, and appropriate incentives for charging behaviour that minimises impacts on the grid) will be needed. The NEPS and the forthcoming National Electric Vehicle Strategy should ensure that these considerations are progressed well in advance of widespread adoption of electric cars.

Key finding 22

Efficient electric vehicles are likely to support strong decarbonisation of the transport sector, particularly when coupled with renewable energy. However, widespread adoption of electric vehicles will present new challenges for managing grid demand, but also present opportunities for close integration with sources of energy supply.

14.3 Productive businesses need better freight efficiency

Australia is heavily reliant on road transport for its freight task, and at 18th in the world, Australia's logistics performance index lags reasonable competitor countries.[38] To a large extent, this reflects lower population densities than in some comparator countries, and is to be expected. However, there is a range of avenues available to improve freight efficiency which are worth exploring.

Australia does not currently have a smart freight program, which helps improve visibility and understanding of the performance of the freight network and identify opportunities for improvement. Isolated examples of freight optimisation, such as the Hunter Valley Chain Coal Coordinator exist, but Australian logistics would benefit

from better, more widespread application of smart data and analytics to its freight operations, facilitated by more open use of logistics data.

Currently, the Australian logistics industry is characterised by a high level of single truck owner-operators, whose capacity to engage with smarter and more efficient logistics planning is limited. Such operators are likely to continue to be an important component of Australia's freight network. However, it would be worthwhile exploring how freight performance in Australia might be better monitored and integrated.

The NEPS would be well-placed to instigate a review of Australia's freight efficiency, with a focus on improving efficiency to reduce emissions and reduce transport costs for businesses and consumers. Other matters that could be examined would be the role of important transport infrastructure such as rail and ports, and the achievements and failures of national competition policy in maximising the utilisation of these assets.

Key finding 23

As decarbonisation of heavy transport is more difficult than passenger transport, freight efficiency in Australia is an important component of improving energy performance and reducing emissions. The NEPS could consider instigating a review of freight performance to highlight opportunities for improvements to benefit consumers and reduce emissions.

15 Energy efficiency schemes

Energy efficiency obligation schemes in NSW, Victoria, SA and the ACT have proven to be an effective method for deploying energy efficiency upgrades at scale. These schemes save consumers money, reduce energy system costs, reduce greenhouse gas emissions, and help build critical mass in markets for energy efficiency products.

15.1 Energy efficiency obligation schemes

Energy efficiency schemes typically impose an obligation on energy retailers to fund energy efficiency upgrades in consumer premises either directly or through the purchase of certificates created by authorised certificate creators that undertake upgrades.

As the Climate Change Authority explains:

"[Energy efficiency] schemes have been shown to be:

- *Successful at overcoming barriers to energy efficiency, particularly information and expertise barriers;*
- *Cost-effective (schemes return benefits typically three to four times more than their costs);*
- *Successful in reducing greenhouse gas emissions as a result of energy use savings;*
- *Successful in promoting awareness of energy efficiency;*
- *Providing both public and private benefits (although the largest benefits accrue to consumers that participate in the schemes);*
- *Able to be targeted to priority groups, such as low-income households."*[39]

Yet despite these benefits, energy efficiency schemes are not available universally around Australia. This means that consumers in Queensland, Tasmania, Western Australia and the Northern Territory are missing out on equitable access to cost-effective energy efficiency upgrades that could materially reduce their exposure to volatile energy prices and improve the energy performance of their homes and businesses.

The NEPS should consider how access to energy efficiency schemes could be expanded to all Australians. Energy efficiency schemes represent a proven method for accessing large untapped resources of abatement through energy efficiency at low cost, delivering abatement quickly. For example, the combined targets for the Victorian and New South Wales energy efficiency schemes locked in cumulative abatement of **more than 10.7 Mt CO_2-e in 2021 alone.**[40] This is equivalent to taking every aeroplane out of the sky for just over a year, or taking around a quarter of cars off Australia's roads for a year.

As far as possible, energy efficiency schemes should be consistent across the nation to reduce administrative costs for government, compliance costs for businesses and maximise the benefits for consumers. The NEPS could play an important role in encouraging coordination and collaboration across the schemes as far as possible. Development of nationally consistent energy efficiency schemes should proceed as a

priority, but efforts to establish nationally consistent schemes should not interrupt the activity underway in current schemes.

In some cases, local variations to schemes are necessary. For example, the Victorian Energy Upgrades scheme is likely to play an important role in enabling the Victorian Government's Gas Substitution Roadmap, while this of lesser concern in other jurisdictions. However, a great deal of work has already been done in existing schemes, so using architecture and knowledge embedded in those schemes to deploy energy efficiency schemes to all jurisdictions will save considerable time and cost in establishing schemes around the country.

Recommendation 25

The NEPS should take a leadership role in building on the achievements of existing energy efficiency schemes by

a) working with state and territory governments to expand energy efficiency schemes to all jurisdictions, leveraging existing expertise and architectures, and

b) encouraging greater cooperation and collaboration to promote national consistency in energy efficiency schemes as far as possible.

15.2 The Emissions Reduction Fund

The Emissions Reduction Fund/Carbon Farming Initiative has an architecture that could help enable energy efficiency improvements through providing tradable Australian Carbon Credit Units. However, to date the scheme's design has proven unsuitable to encourage using ERF methods to fund energy efficiency projects. The Council's submission to the Independent Review of Australian Carbon Credit Units outlines these issues in greater detail. However, in the broad, barriers to energy efficiency participation in the ERF include:

- Barriers arising from the carbon abatement contracting process and the associated additionality requirements that make advancing a business case for energy efficiency upgrades almost impossible;
- Uncertainty of financial returns from ACCUs resulting from volatile certificate prices;
- Lack of forward-crediting mechanisms to allow ACCU creation to defray upfront capital costs; and
- High transaction costs associated with registering and crediting an ERF project.

As it stands, projects that require capital investment to proceed – which is almost all energy efficiency projects – are too difficult to transact via the ERF.

This represents a substantial missed opportunity. As reforms to the Safeguard Mechanism are brought online, there will be new opportunities for safeguard mechanism entities that are unable to decarbonise some of their emissions to partner with other entities that could do so, and to settle the transfer of emissions reductions via the ERF. However, present arrangements make this very difficult to achieve, and should be reviewed as a matter of urgency.

Recommendation 26

The Government should significantly reduce barriers for participation of energy efficiency and fuel-switching activities in the ERF to mobilise new sources of investment in energy efficiency activities.

16 Building the future energy performance workforce

Improving energy performance in Australia at scale will require a substantial increase in the number of skilled trades and professions to undertake energy performance advice and assessments, upgrades and related services, energy management, building demand management – all in addition to the substantial workforce required to decarbonise the supply side of the energy system.

At present, Australia is in the grips of a widespread labour shortage, but these conditions will not persist indefinitely. To achieve improvements in energy performance that will facilitate and accelerate the transition to net zero emissions at least cost, policies and frameworks must be implemented to ensure Australia has the necessary skills to undertake these tasks.

Skilled trades and professions needed include electricians; plumbers; refrigeration mechanics; insulation installers; building retrofit designers and managers; energy auditors, advisors and assessors; energy managers; industrial process and efficiency engineers; fitters and turners; electrical, mechanical and chemical engineers; financiers; legal and policy professionals; researchers; innovation experts; teachers and lecturers; sales and marketing professionals, and the list goes on.

The distribution of skills and expertise is an inherently market-based component of the economy over which governments have an important (although limited) role in influencing. However, there is a clear role for government in ensuring that frameworks for quality and safety (including accreditation and certification) are in place to ensure that consumers are assisted by suitably qualified professionals to improve their energy performance. Additionally, governments exercise control over funding for tertiary education as well as skilled immigration, which are both important components of the supply of skilled trades and professions.

16.1 Baseline data and future projections

An important role for government in workforce development is to compile information about the current workforce in order to inform future projections, allowing governments and other actors to make decisions about prioritising investment in skills development. Baseline data collection forms a crucial input into future workforce scenario modelling, and governments should ensure that a robust dataset on the existing energy workforce is acquired.

This will occur through the Australian Energy Employment Report (AEER) survey which is currently under development. The first iteration of the AEER, released in January 2023, will be unable to capture baseline data and will therefore not enable projections that can be used for future workforce planning. The EEC strongly recommends that the NEPS commit to development of a comprehensive baseline data collection in line with earlier pilots, suitable to be updated on a regular basis to help inform energy workforce development policy.

Recommendation 27

The NEPS should include an ongoing commitment to comprehensive data collection about the energy workforce through an appropriately funded, designed and delivered Australian Energy Employment Report.

16.2 Quality and safety frameworks

Previous programs in energy performance improvement have strongly demonstrated that frameworks to assure safety and quality are essential to conducting these types of programs successfully. While governments of course can never mitigate every risk, sound program design can reduce the level of risks posed to workers, consumers and the community at large.

Government procurement can play an important role in establishing quality and safety frameworks. For example, eligibility for the Small-scale Renewable Energy Scheme requires that installers are accredited by the Clean Energy Council, who assures that installers have minimum acceptable levels of formal training and education, minimum demonstrated competencies, and minimum acceptable levels of safety systems and insurance. While this does not completely eliminate risks associated with the installation of solar systems, it does provide a baseline level of assurance that individuals participating in the scheme have a lower likelihood of operating in an unsafe or unacceptable manner, as their ongoing livelihood depends on continuing accreditation.

The EEC acknowledges the critical role that several governments have played in establishing schemes to promote quality and safety in energy performance, including the support of the Commonwealth and state governments in establishing the Certified EnMS Advisor program that can support wider rollout of Energy Management Systems. State and territory governments have also supported the redevelopment of the Certified Insulation Installer program to promote high levels of quality and safety in insulation installation, which will be a key component of improving residential building energy performance.

There are a range of other activities in the energy transition that could benefit from similar levels of assurance. In some cases, this could be achieved thought partnerships with similar industry, through mechanisms such as EEC Professional Certifications and other schemes that have strong links to both industry and governments. However formal accreditation mechanisms will not always be necessary. Any programs that the NEPS creates to improve energy performance must contain safeguards to mitigate against unacceptable risks to quality and safety for the protection of consumers and workers.

Government additionally has a role as a ‘patient investor’ in helping to establish training that underpins quality and safety in energy performance programs. While such education and training should in general be conducted through established mechanisms for these activities, initial development phases can benefit from government support – both financially and in-kind.

Key finding 24

Frameworks for ensuring quality and safety in energy performance improvement programs are critical to success of the NEPS. Safeguards against poor safety and quality – including scaling up sustainably – should be interweaved throughout any NEPS-related initiative.

16.3 Career path visibility and development.

To a large extent, the energy efficiency and management workforce is hidden. While there is a very limited number of people who consciously work in energy efficiency, the actual energy efficiency and performance workforce could number up to 236,000.[41] There are problems with relying on a hidden workforce – especially in providing visible career paths for people considering education and training options.

The NEPS should consider how the profile of energy performance workers can be made more visible to encourage potential energy performance workers to consider a career in the sector. Previous estimates have found that even a very basic program of energy efficiency upgrades could create more than 120,000 job-years of employment, creating a significant additional workforce that must be found to implement any new program of energy performance upgrades.

The *Developing the future energy workforce* report from the RACE for 2030 CRC clearly noted the importance of developing clear career and professional development pathways to attract and retain skilled workers in the energy sector. The report further highlighted the importance of linking careers to delivering net zero by 2050.[42]

This suggests that a core area for consideration under the NEPS is workforce development in the short and long term, which will be aided by efforts to increase the visibility of career path options in energy performance-related trades and professions.

Key finding 25

Programs to improve energy performance are likely to require expansion of the energy performance workforce. The NEPS could consider how to elevate visibility of energy performance trades and professions to assist in building the workforce.

17 Innovation and clean tech manufacturing

Improvements in energy performance are likely to rely on a combination of smart design, deployment of existing technologies and development of nascent technology. As with many other fields, Australia is likely to pursue a combination of fast adoption and adaption of global advances, as well as development of innovations in areas of specific expertise or competitive advantage. As part of development, the NEPS should consider the long term needs for innovation and technology development to solve more challenging decarbonisation and energy performance improvement problems.

Australia has strong R&D capabilities through its higher education system, as well as through ARENA. These mechanisms function well, and should be brought to bear to support the objectives of the NEPS. Later-stage innovation can be supported through the Clean Energy Finance Corporation as well as normal business innovation measures. These are important components of the clean technology innovation pipeline, and we encourage the Government to look for opportunities to expand and strengthen its commitment to these institutions.

17.1 Unlock cost reduction through learning rates

Throughout this submission, the EEC has recommended investment in technology demonstration and deployment programs to improve the commercial readiness of technologies necessary to decarbonise the economy and improve energy performance. The EEC strongly recommends that demonstration programs be configured as support for a series of demonstration projects in each instance, rather than individual projects. The rationale for this is straightforward – repeated demonstration projects will have a far greater impact on building awareness and expertise, and facilitating cost reductions through learning rates, than a single project.

In addition, we suggest that evaluation, review and continuous improvement is embedded into technology demonstration and deployment programs to capture maximum value from the investment.

Recommendation 28

The NEPS should commission technology demonstration and deployment programs that support a series of projects to capitalise on skills development and unlock learning rates to drive down technology deployment costs.

17.2 Promote strategic technology production

Australia is a relatively small economy by global standards, and unable to compete in volume production right across the economy. However, there are opportunities for manufacturing of high-value products, or those that are uniquely suited to Australian conditions. There are strategic technologies that will underpin decarbonisation of buildings and industry that will be the subject of significant global competition – such as heat pumps, electric vehicle charging equipment and others – that Australia could viably manufacture onshore.

Strategic technologies with a uniquely Australian requirement (for example, heat pumps strongly adapted to Australian climatic conditions) or a root in deep Australian innovation and expertise (for example, electric vehicle charging equipment) are strong candidates for governments to facilitate and invest in.

The Government has a number of policies that will encourage Australian industry, including the National Reconstruction Fund, the Powering the Regions Fund, the Rewiring the Nation initiative, as well as other ongoing initiatives. These initiatives are well-placed to catalyse investment into technologies that are compatible with a net zero future and can improve our energy performance. The EEC encourages the NEPS to explore creating interlinkages and lines of support with other policies to maximise the value captured from these investments, and promote beneficial spill overs to other industries.

Key finding 26

A transition to a net zero, high energy performance economy will require deployment at scale of a range of strategic technologies. Opportunities exist to shore up Australia's supply chains for these technologies through judicious investment in onshore innovation and production, and the NEPS could explore opportunities to leverage other government initiatives to facilitate these opportunities.

18 Data

Fundamental to improving Australia's energy performance is a revolution in the data available to support the development of policies and programs, innovative business models, and integration of energy demand and energy supply. However, poor data is a clear limitation on development of effective energy performance improvement policies.

18.1 Responsibly complete the rollout of advanced metering infrastructure

As discussed earlier, the transition to a high renewable energy system will involve a more time-dependent balance of energy supply and demand. This makes more granular information about energy demand a vital component of managing the transition, particularly to enable innovative business models like distributed demand response and virtual power plants that could provide substantial resources to the energy system at low cost. An important enabler of this activities is the deployment of advanced metering infrastructure to all energy consuming premises.

The rollout of advanced metering infrastructure has proceeded slowly, in part due to program implementation that has generated opposition to the program in some quarters of the community. Although advanced metering infrastructure is important to managing the future energy system broadly, the benefits to consumers are not immediately apparent. This means that forcing consumers to explicitly pay for metering infrastructure upgrades that they may not feel they neither need nor want is not well conceived, and lessons should be heeded for completing the rollout of advanced metering infrastructure.

There is a case for completing the rollout of advanced metering infrastructure on the basis of providing important data to the energy system to manage the transition and support appropriate and optimal investment in supply and demand side initiatives. Advanced meters can also facilitate increased demand-side participation in the market, although such participation is likely to be limited to a smaller cohort of engaged consumers. There is limited ability for consumers to respond to price signals delivered through energy tariffs, so advanced metering infrastructure should not necessarily be considered as a widespread enabler of the introduction of cost-reflective pricing into the market for small consumers.

Although Victoria has had universal deployment of advanced meters in place for small consumers for some years, uptake in other jurisdictions has been driven by installation of solar PV on existing dwellings (and installation into new dwellings). However, completing the rollout of advanced metering infrastructure will increasingly require installation of new meters into residences that do not – or cannot have – solar installed, and hence the benefits of new meters may not be apparent to occupants.

Should governments consider that completing the rollout of advanced metering is important, it must be done in a way that builds social licence and acceptance, and does not place burdens on consumers.

Maintaining social licence for metering rollouts means ensuring that:

- Consumers are not explicitly charged for metering services or replacements that they do not explicitly request;
- Consumers are not forced to change energy plans simply as a result of meter replacement; and
- Consumer concerns about metering are dealt with sincerely and genuinely.

The notion that engaged consumers will exercise choice in metering providers through the Power of Choice is somewhat fanciful. Expecting small consumers to engage with competitive choice in metering providers is unlikely to be a productive use of time and energy in the energy system, given consumers' general reluctance to even take advantage of the immediate financial incentives from switching retail providers.

To maintain social licence, it may be a better option for governments to fund advanced metering infrastructure upgrades, rather than consumers. This would represent an impost on government budgets, but options for claw-back from the energy system could exist.

Recommendation 29

The NEPS should consider how to complete the rollout of advanced metering infrastructure while building community acceptance, should governments consider finalisation of the rollout to be a priority.

18.2 Energy performance data collection

Improving energy performance will be better supported by high-quality data about current energy usage and performance, and opportunities to improve energy performance right throughout the economy. Current sources of data are limited and piecemeal and do not support strong, evidence-informed policymaking.

For example, how many Australian households will require upgrades to bring them up to an adequate level of energy performance? What level of industrial heat energy demand could be substituted by efficient, renewably powered low-temperature process heat pumps? What quantum of Australia's energy usage arises from government operations, which is amenable to direct policy intervention? The data to answer these questions is not immediately available, making it difficult to effectively target initiatives to improve energy performance.

Increasing the level and quality of data collected about energy performance should be considered as part of the NEPS. Indeed, better data collection may be necessary to effectively set targets for the NEPS, and effectively report against them.

Key finding 27

Comprehensive, high-quality data supports sound policy-making and targeting. Development of the NEPS should take into account government requirements for energy performance data that will drive sound strategy implementation and reporting

18.3 Enable innovation through wider data availability

Government policy has recognised the need for better data availability since the middle of the last decade. However, progress in making data more universally available has been slow. The Consumer Data Right in energy has only recently been established, and is yet to significantly enable innovation.

Innovative business models that can help improve energy performance and accelerate the transition to net zero are likely to require access to better data about a range of facets of energy demand – data that currently is not widely available. At the same time, the constraints of privacy and security are equally important, and balancing these competing concerns is undoubtedly challenging.

Nonetheless, reinvigorating data sharing and availability reforms to enable innovation in clean industry and managing household and business energy usage is a clear step towards improving energy performance.

Key finding 28

Data availability and access, appropriately protected, is a key enabler to developing new business models and opportunities that can improve energy performance. Reforms to improve data availability and access have stalled, presenting a barrier to innovation in digital tools to improve energy performance.

19 Finance

Substantially improving energy performance – and achieving a net zero economy - is likely to require the investment of hundreds of billions of dollars between now and 2050. Existing, inefficient and high emissions capital stock will require replacement, and new technologies and business models must be developed to allow full decarbonisation.

Despite the high price tag, it is likely that the private sector will be able to facilitate the majority of the investment task, given the right incentives and appropriate catalysis from governments. There are broadly three main sources for funding energy performance improvements – direct funding from government, investment through normal commercial sources, and funding captured through energy and emissions reduction systems (like energy efficiency schemes, the Emissions Reduction Fund, Safeguard Mechanism and other arrangements). Financing for energy performance improvements could come from one or more of these sources.

Direct government funding has an important role in energy performance upgrades. In some instances, government is the relevant property owner (e.g. public housing) and the only organisation in a position to make required investments. In other instances where there is limited potential commercial return for an upgrade (such as in community housing, or where an emissions reduction upgrade does not provide a business cost reduction), government funding has a key role in ensuring that these upgrades are undertaken to support wider community objectives. Government funding can also be important to de-risk ventures to allow the balance of an upgrade to be funded through commercial means, or to provide 'seed capital' to establish frameworks and markets which will later become self-sufficient.

Funding derived through the energy and emissions reduction systems can also be important. Energy efficiency obligation schemes operate in this manner, and are an effective way to finance energy performance upgrades that deliver benefits both to the recipient, and the broader set of energy system users. Energy system levies could also provide a source of funding for other energy performance upgrades. Governments provide authorising regulation and frameworks for this type of funding.

Lastly, normal commercial investment channels and private financing are incredibly important. Governments have a role in establishing markets and regulation to support efficient market operation, as well as incentivising investment through a range of other programs. Governments can also leverage their size and procurement levers to help kick-start normal commercial investment activities.

The NEPS will need to consider all these sources for funding energy performance improvements across the economy. Clear policy signals are needed to guide investment, and the NEPS will make an important contribution to providing long-term guidance to investors about ensuring that investment in Australia is consistent with a transition to a high energy performance, net zero future economy.

Key finding 29

Significantly improving energy performance will require investment of hundreds of billions of dollars over the next two decades. This investment will need to be shared across governments, businesses, households and the energy system.

19.1 Immediate opportunities to catalyse finance

Improving energy performance is a task which can start immediately, assuming financing is available to fund upgrades and other activities. There are opportunities to provide financing leveraging government's ability to borrow money at low costs.

19.1.1 Green upgrades financing schemes

State and territory jurisdictions are using their ability to borrow money at low costs to establish concessional finance for relatively small energy performance upgrades, that would otherwise attract relatively high rates of interest in the commercial world. The ACT's Sustainable Household Loan scheme and the Tasmanian Government's Energy Saver Loan are two examples of these. Government funding for loan facilities presents a way for the market to finance energy performance upgrades with reduced risk, and catalyses activity though concessional incentives. The NEPS could consider extending such schemes nationwide, leveraging existing architectures.

19.1.2 Putting the CEFC to work to deliver high performance homes

Once the residential energy performance rating is finalised, ratings should be leveraged to enable low-cost financing for high energy performance housing mortgages for new builds and loans for housing renovations to improve energy performance.

Ratings will underpin a national framework to provide the financial sector with the information necessary to use green bond markets to finance energy performance upgrades to homes. Information about house energy efficiency, available in a format acceptable to banks and other financial institutions, would make wide-scale availability of financing at concessional interest rates a reality. Creating access to a centralised database of residential energy performance information that can be accessed easily with customer consent is critical to establishing a framework for deployment of energy efficiency upgrade finance at scale.

However, there is a significant amount of work required to unlock this ambition. The CEFC is in a strong position to help facilitate the framework, as well as provide initial finance to retail financial institutions to underwrite the first tranches of concessional loans. Further financing would be developed through crowding in private sector finance, accessed on global green bonds markets. Skills development of assessors, advisors and other trades, as well as finance professionals will be required to ensure that investors are provided with assurance of a quality product with robust environmental credentials.

With the return of interest rates to more historically consistent levels, concessional interest rates once again are an important tool to removing financial barriers to energy efficiency upgrades.

19.1.3 Finance for government energy efficiency upgrades

Some Australian and international jurisdictions have experienced success with implementing revolving finance funds for energy efficiency upgrades in portfolio agencies and other controlled entities. In revolving fund arrangements, a central fund provides capital for energy efficiency upgrades at low or zero interest rates, with energy savings reinvested, facilitating improved budget outcomes and ongoing energy and emissions savings. The Energy Efficiency Council's *Smart energy management in government operations* guide provides further detail on successful financing methods in government. Consideration of whether these types of arrangements could be compatible with the architecture of the *Public Governance, Performance and Accountability Act 2013* would be required.

Recommendation 30

The NEPS should explore a range of financing models that can leverage the Government's ability to borrow at low cost and provide compelling concessional finance products to encourage energy performance improvements.

19.2 Longer term financing opportunities

In the transition to net zero, financial markets are taking an ever-increasing role in mobilising resources to achieve emissions reduction outcomes. Corporate governance, prudential supervision, and global availability of insurance products are likely to direct funds towards lower-emissions intensity investment opportunities.

This presents an opportunity for investors to fund improvements to energy performance that will lower emissions. The Government's initiatives to support this – including the implementation of the Taskforce for Climate related Financial Disclosure's recommendation as an Australian Accounting Standard will help facilitate finance flows to improve energy performance.

The NEPS should look for opportunities to harmonise with, and support, other initiatives that aim to direct capital towards long-term investments that are compatible with a net zero future.

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