Submission

Energy White Paper – Issues Paper

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INTRODUCTION

Established in late 2005, The Climate Institute (TCI) is a non-partisan, independent research organisation that works with community, business, and government to catalyse and drive the change and innovation needed for a low-pollution economy and culture. Our vision is of a resilient Australia prospering in a zero-carbon global economy; participating fully and fairly in international climate-change solutions.

TCI welcomes the opportunity to comment on the Energy White Paper (EWP) Issues Paper. The submission below consists of three sections: first, a summary of our views; second, our overarching concerns with the parameters of the Issues Paper, and third, our responses to several of the specific issue areas identified in the Issues Paper.

SUMMARY

The Climate Institute's overarching concerns for the Energy White Paper are:

The Energy White Paper risks embedding chronic short-termism, and needs to take a long-term view to promote efficient investment and minimise costs to investors and consumers.

The Issues Paper considers no trends or challenges in timeframes beyond 2020, but policy based only on current and recent issues will cause ongoing instability. The EWP should examine the future of the energy sector in the context of Australia's economic interests in the period between now and 2050.

The EWP should recognise that the global imperative to limit climate change to less than 2°C above pre-industrial levels is among the most significant challenges for the energy sector.

Multiple analyses show that climate change of up to 2°C imposes heavy costs on Australia's ecosystems and economy, while global warming above this level exceeds the adaptive capacity of many Australian industries.[1] Like the United States and China, Australia is among the 192 countries that have agreed to limit global warming to 2°C.

As noted by the head of the OECD, achieving this goal requires net zero emissions from fossil fuels in the second half of this century.[2] Australia's share of a global "carbon budget" consistent with the 2°C limit is estimated to be roughly 8.4 billion tonnes. Meeting our national carbon budget requires sustained decarbonisation of Australia's energy supply. Other countries' efforts to decarbonise their own energy use will have significant impacts on Australia's energy exports and on technologies entering Australia's domestic energy markets. There is a risk that policy intending to shield conventional energy business models from these disruptive pressures will distort the energy sector, reduce its flexibility and adaptability, and impose costs on the broader economy.

The EWP needs to consider national emission reduction targets above and beyond the minimum national emissions reduction target of 5per cent below 2000 levels by 2020.

Independent and government assessments have found that the Government's agreed conditions for moving above the minimum commitment have been satisfied and stronger and longer-term emission targets are justified by advances in international action.[3] Stronger targets are also justified by the risks to Australia from even moderate levels of climate change and the high economic costs and risks of delaying deeper emission cuts until after 2020. The EWP should consider the implications for the energy sector and its stakeholders of 2020 targets of 25 per cent below 2000 levels and emission reductions of roughly 60 per cent by 2030. It should also consider the cost implications for the energy sector and the broader economy of delayed action to reduce emissions.

The EWP should develop a credible long-term decarbonisation strategy to avoid incoherent, unstable energy policy and maximise low emission energy opportunities.

Decarbonisation—progressively reducing both the emissions intensity and the overall emissions —of Australia's energy is central to Australia's emission reduction goals, necessary to remain within Australia's carbon budget and to secure competitiveness in the longer term. Analysis by CSIRO finds that prolonged carbon policy uncertainty would increase electricity prices by 17 per cent.[4] Developing an energy decarbonisation strategy based on Australia's 2°C carbon budget should be a central consideration of the EWP as well as relevant processes such as the development of the Emission Reduction Fund, the Renewable Energy Target review and efforts to improve Australia's energy productivity.

The EWP should consider the risks other countries' emission reduction efforts pose to Australia's energy exports.

The Issues Paper notes that Australia's energy exports will be shaped by international efforts to reduce greenhouse gas emissions, but does not consider how to manage the risks to Australia of changing demand for Australian energy resources. In the absence of widespread carbon capture and storage, exploitation of Australian coal resources is incompatible with the 2°C goal. These risks of stranded assets or "unburnable carbon" to Australian and other high carbon investments have been highlighted by a growing number of mainstream investment analysts from the IEA to CitiGroup to HSBC to Oxford University.[5] [6] [7] [8]

Energy resource exporters should assess and disclose their exposure to risks associated with other countries' efforts to reduce their carbon emissions and other pollutants, and these should be factored into any public impacts and public investments associated with export projects.

The EWP must consider the risks posed by the physical impacts of 2°C and 4°C climate change to Australia's energy infrastructure and activities.

While 2°C is the global goal, current international efforts put the world on track to global warming of at least 4°C.[9] Energy infrastructure is highly exposed to a wide range of impacts associated with climate change, which worsen as temperatures rise. Examples include the effects of sea level rise and storm surge on coastal assets, and the higher electricity demand resulting from increases in extreme temperatures. CSIRO estimates that building distribution infrastructure for temperature rise-driven peak demand adds another 2.8c/kWh, or about $180 for a household using 6500 kWh.[10] Currently, climate risk management across the energy sector is at best patchy, and often undermined by government policy and regulation. For example, despite the Infrastructure Coordinator's warning that rising sea levels and heat stress are among the climate impacts threatening "a significant proportion of Australia's existing infrastructure assets…and adaptation will require changes to the scope and mix of infrastructure investment" [11], the Government has prepared a bill removing Infrastructure Australia's mandate to assess the implications of climate change on infrastructure policy .

Australia's energy infrastructure and investments should be assessed for their resilience under scenarios of at least 2°C and 4°C of global warming. Given their centrality to the broader economy the results of these assessments should also be publicly disclosed.

Our responses to specific issue areas are:

Energy Security: The EWP should expand its conception of energy security beyond affordability and reliability. Long-term energy security term requires that energy production and use be environmentally sustainable and resilient to technological, physical and economic shocks.

Regulatory Reform: The EWP should prioritise the following tasks:

+ Develop a decarbonisation strategy and ensure regulation is complementary, not conflicting, with decarbonisation goals.

+ Address market distortions, externalities and other market failures by removing fossil fuel subsidies, accounting for, articulating and balancing the financial costs of energy production and use with economic and social welfare costs such as carbon and other pollutants, peak demand, and congestion. This may be done explicitly through price mechanisms or implicitly through other policy measures.

+ Harmonise and streamline energy market regulation to improve the energy sector's ability to respond to technological, policy, market or physical megashifts.

+ Require major energy producers and infrastructure operators to disclose their exposure to risks associated with carbon reduction policies (domestic and international) and the physical impacts of climate change under 2°C and 4°C global warming scenarios

Energy Productivity: The EWP should aim to increase Australia's energy productivity by at least 30 per cent by 2020 (on 2010 levels). This can be achieved by strengthening Australia's energy efficiency policy framework by addressing its gaps and increasing the ambition of existing policy measures. Additional measures should include ambitious emissions/efficiency standards for vehicles equivalent to United States standards by 2015 and European standards by 2020.

Alternative and emerging energy supplies: The EWP should prioritise policy stability in this area. A recommitment to the Renewable Energy Target is urgently needed. Implementation of a decarbonisation strategy will provide a clear signal for timely investment in appropriate low-emission technologies. In the absence of a price and limit on carbon this may also require additional regulatory measures, such as increasingly stringent emissions performance standards (EPSs).

The upcoming review of the Renewable Energy Target, which TCI does not support, needs to assess the role of this mechanism in achieving electricity decarbonisation consistent with a fair contribution to the 2ºC goal. This should also consider standards for new generation should be set at no more than 500 kg CO2e/MWh, declining to no more than 200 kg CO2e/MWh after 2020. Standards, or other interventions, for existing generators should be examined to ensure that the most emission intensive power generation is decommissioned by 2020 and the power sector is nearing net decarbonisation by 2030.

Support for demonstration projects will also be necessary for technologies that have not yet reached commercial readiness, such as bioenergy with carbon capture and storage (bio-CCS).

OVERARCHING ISSUES

The Energy White Paper risks embedding chronic short-termism in Australian energy policy. It needs a long-term view to promote efficient investment and minimise costs to investors and consumers.

The energy sector is characterised by investments that cost hundreds of millions of dollars and have operating lives of 40 years or more. A stable regulatory framework is vital to avoid inefficient investment, stranded assets and higher consumer and taxpayer costs. With the energy sector also facing significant technological shifts and physical disruptions, policies for the sector must also allow for adaptation to significant changes in the operating environment.

None of the trends or objectives discussed in the Issues Paper is considered beyond 2020. This risks limiting the EWP's focus to recent or near-term issues, and consequently failing to prepare the sector for more significant longer term challenges. This in turn risks uncertainty and instability in the policy environment. To achieve appropriate policy settings and promote efficient investment, the EWP should base its recommendations on an articulation of Australia's economic interests over the next several decades that has a solid analytical foundation and broad stakeholder support. An appropriate timeframe for the EWP should be at least to 2035 and preferably to 2050.

It is clearly in Australia's economic interest to avoid global warming of more than 2°C above pre-industrial levels. Numerous assessments have demonstrated that global warming above 2°C would lead to substantial costs to Australia's economic, human and natural systems and would exceed the adaptive capacity of key Australian industry sectors.[12] [13] [14] The costs of global warming above this level are significantly higher than the costs of implementing ambitious and efficient carbon mitigation policies consistent with Australia's fair share of the global carbon budget.[15]

The EWP should recognise that the global imperative to limit climate change to less than 2°C is among the most significant challenges for the energy sector.

Australia has made a number of international commitments to contribute to avoiding climate change greater than 2°C. Achieving a 75 per cent probability of keeping global warming below this limit requires global emissions of greenhouse gases not exceed 870 billion tonnes between 2013 and 2050.[16] Australia's share of this "carbon budget" is estimated to be roughly 8.4

billion tonnes.[17] At its current rate of emissions, Australia would exhaust its 2050 carbon budget before 2030.

As the energy sector contributes two-thirds of global greenhouse gas emissions, its transformation will be critical to achieving the 2°C goal. As noted by the head of the OECD, this requires "the complete elimination of emissions to the atmosphere from the combustion of fossil fuels in the second half of the century".[18] In Australia, energy production and use is currently the source of 72 per cent of national emissions.[19] While some proportion of energy emissions may be offset by domestic or international emission credits, sustained decarbonisation of Australia's energy is central to meeting Australia's national carbon budget and achieving the country's national interest in avoiding global warming above 2°C.

Some decarbonisation pressures will be inevitable. Other countries' efforts to decarbonise their energy will continue to affect Australia's energy production. Countries are implementing policy tools such as emission performance standards for fossil fuel power generation and vehicles; carbon limits and prices; renewable and low emissions energy targets; pollution limits and controls; energy efficiency standards and incentives. Public and private investment in clean energy and demand management technologies and energy efficient goods and services is also growing globally.

These trends have begun to influence energy markets and energy business models, often in unpredicted ways. Decarbonisation efforts are contributing to the spread of new and disruptive energy technologies, and slowing or even reversing demand growth for power and for fuels. Further decarbonisation efforts will significantly change the availability of technologies for use domestically and the demand for Australian energy resources offshore.

The timing and scope of these trends is highly uncertain, but this increases the need to plan for them. The EWP must explicitly account for these trends and related uncertainties in its formulation of Australian energy strategy and policy. There is a risk that policy intending to shield conventional energy business models from these disruptive pressures will distort the energy sector, reduce its flexibility and adaptability, and impose costs on the broader economy.

The EWP needs to consider national emission reduction targets above and beyond the minimum national emissions reduction target of 5 per cent below 2000 levels by 2020.

Australia has committed to reduce emissions by up to 25 per cent on 2000 levels by 2020. The conditions for moving to stronger emission targets have been clearly outlined to the international community in a number of forums[20] and supported by the Coalition since 2009[21]. Independent and government assessments have found that the Government's agreed conditions for moving above the minimum commitment have been satisfied by advances in international action.[22] Stronger emission targets are also justified by the high economic costs and risks of delaying deeper emission cuts until after 2020, and the risks to Australia from even moderate levels of climate change.[23]

The Climate Change Authority (CCA) has noted that "A 5 per cent target would leave such large reductions for later that future Australians would either face a very large emissions reduction task or have to abandon the long term national emissions budget. This is inequitable in the first case and against Australia's national interest in the second."[24] The CCA also noted that the 5 per cent target "requires an implausibly rapid acceleration of effort" beyond 2020 to remain within the long term carbon budget" consistent with a 2°C goal.[25]

Australia will face increasing pressure over coming years to increase the ambition of its emission reduction targets. During 2014 several international processes and events – a Kyoto Protocol ministerial roundtable (June), the UN Secretary General's Leaders' Summit (September) and the twentieth UN Conference of Parties to the Framework Convention on Climate Change (COP20, December) - will catalyse international pressure on countries to put forward to the international community more ambitious national targets for 2020. These forums will act as stepping stones to the 2015 COP, at which a legally binding agreement covering post-2020 emission reduction commitments from all major emitters will be agreed.

The Government has stated it will review the current target commitments in 2015.[26] This is misaligned with the international processes noted above; nonetheless, both domestic and international commitments imply that Australia could adopt a significantly more ambitious 2020 emissions reduction target than the 5 per cent minimum, and even more ambitious post-2020 emission reduction targets.

It would be prudent for the EWP to examine the implications and opportunities for the energy sector of more ambitious 2020 targets and targets for future decades. The CCA's analysis of Australia's caps, targets and trajectories provides a framework for consideration of higher 2020 targets and a trajectory range for 2030.[27] The Climate Institute recommends that the EWP examine a target of 25 per cent for 2020 and 60 per cent for 2030. These targets are consistent with a 75 per cent probability of keeping climate change below 2°C.[28] The EWP should also consider the cost implications for the energy sector and the broader economy of delayed emissions reduction efforts.

The CCA notes that the electricity sector could be the single largest source of domestic emissions reductions. Modelling for the CCA found that the combination of boosting the efficiency of electricity use and reducing the emissions intensity of the power supply could achieve emissions reduction of up to 59 million tonnes of carbon dioxide equivalent (Mt CO_2-e) in 2020 and up to 174 Mt CO_2-e in 2030. This is additional to the emission reductions due to the RET, at its current legislated level. On the other hand, failure to capture the emission reduction potential of electricity could see its emissions rise 14 per cent above 2000 levels by 2020 and 39 per cent by 2030 (to 200 Mt and 244 Mt, respectively).[29]

Similarly, transport emissions could increase by 40 per cent above 2000 levels by 2030 in the absence of mitigation policies, or fall by 10 per cent below 2000 levels if measures such as efficiency standards and switching to electrified or biofueled vehicles are implemented (assuming biofuels and electricity production have low emission intensity).[30] Direct combustion and fugitive emissions from coal and LNG production pose particular challenges to Australia's national emission reduction goals as both are forecast to increase significantly: direct combustion emissions by 79 per cent and fugitive emissions by 144 per cent above 2000 levels by 2030.[31] However, the fugitives sector could contribute the second-largest reduction in energy emissions—up to 51 Mt CO2-e in 2030—if fugitives producers are appropriately incentivised.[32]

An objective of the EWP should be to ensure that energy policy settings encourage rather than prevent the energy sector achieving the emission reductions of which it is capable and which are necessary for Australia to reach its emission goals.

A credible long-term decarbonisation strategy is needed to avoid incoherent, unstable energy policy and maximise low emission and zero-emission energy opportunities.

Determining the most appropriate pace, scope, mechanisms and sequence of energy decarbonisation is not considered in the Issues Paper but should be a central consideration of the EWP, as decarbonisation—both domestic and international—presents risks as well as opportunities for Australia's economic outlook.

A decarbonisation strategy should define a target and timeframe to achieve net zero emissions from Australia's energy sector. These should be derived from an Australian carbon budget consistent with a 75 per cent probability of keeping climate change to less than 2°C. They should be implemented through a stable policy framework that, consistent with Australia's economic interests, enables a steady and efficient transition.

The need for a stable decarbonisation driver is widely recognised. The Future Grid Forum, representing stakeholders from across the electricity sector, was convened by CSIRO to assess the outlook for electricity supply and use to 2050. The Forum's final report called for "bipartisan agreement on Australia's long-term greenhouse gas emission reduction target and implementation", noting that "agreement on the policy mechanism and long term targets (beyond 2020) to reduce greenhouse gas emissions would allow the electricity industry to respond to the challenge in the most efficient way."

To date, many of Australia's electricity decarbonisation efforts have been patchy, and have often interacted with other policies or activities in less than optimal ways. For example, energy efficiency policies such as building and appliance standards have reduced consumers' demand for electricity[33], but this was unforeseen by regulators and investors in increased network capacity. Failure to plan either for the impacts of these policies or for consumer responses to rising electricity prices contributed to a worsened network utilisation rate, the costs of which are likely to be felt by consumers or taxpayers for decades to come.[34] Similarly, incentives for take-up of solar PV panels have contributed to PV deployment across about 1.6 million households across Australia; however, these policies and their subsequent revisions prompted a series of destabilising boom-busts in the solar PV industry. Moreover, household-scale PV deployment was encouraged with inadequate consideration of the implications (both positive and negative) for other elements of the electricity sector

such as grid utilisation, peak demand, pricing systems, skills requirements, and larger-scale renewables. The electricity sector was unprepared and is now struggling to adapt.

These recent experiences show the perils of targeting elements of the energy sector in isolation. Although measures that contribute to energy sector decarbonisation such as renewable and low emission technologies are discussed in the Issues Paper, they are considered as "add-ons" separate from—and subordinate to—core considerations such as energy security. Unless policies in these areas are integrated into a long-term strategy, there is a high risk that the incoherence, instability and inadequacy that currently characterises the Australian climate and energy policy environment will continue. The costs of such instability are significant. As CSIRO's modelling for the Future Grid Forum showed, prolonged uncertainty around carbon policy would drive up electricity prices by 17 per cent, as investors choose generation options that are most likely to remain competitive in a range of carbon policy environments but which are less well-suited for any specific carbon policy environment.[35]

This is a particular risk to Australia's ability to benefit from emerging energy technologies that improve the efficiency of fossil fuel generation or capture and store carbon. These technologies require significant upfront investment and a reasonable certainty of return over their operation; they will not be built if there is a high risk that future policy change - for example, to reduce electricity emissions more swiftly and deeply – could reduce their value. CSIRO's Future Grid Forum modelling shows that, in an environment of ongoing carbon policy uncertainty, investors avoid new coal and combined-cycle gas plant, and carbon capture and storage (CCS) is never deployed.[36] Excluding potential energy sources in this way undermines the achievement of least-cost energy sector decarbonisation.

The Issues Paper notes that other processes such as the Renewable Energy Target review and the development of the Direct Action Policy are "relevant" to the EWP. Unless these relevant processes are undertaken with a consistent approach to a long-term emissions reduction framework and decarbonisation strategy, they are likely to result in incoherent policy outcomes, potentially undermine the achievement of Australia's long term emission reduction and decarbonisation goals, and increase the costs of energy.

The EWP must consider the risks other countries' emission reduction efforts pose to Australia's energy exports.

The Issues Paper notes that Australia's energy exports will be shaped by international efforts to reduce greenhouse gas emissions, but does not consider how to manage the risks to the Australian public if countries' decarbonisation efforts lead to a significant fall in demand for Australian energy resources.

Avoiding climate change of 2°C would have a major impact on demand for Australian coal. Under the International Energy Agency's 450 Scenario, which envisages climate change mitigation efforts consistent with the 2°C goal, global coal demand would fall by 1.6 per cent per year on average through to 2035, resulting in a pronounced drop in coal prices. This compares to an average increase of 0.8 per cent per year under current carbon reduction commitments (the IEA's New Policies Scenario).[37] Australia currently produces about 11 per cent of the world's coal output, but consumption of its coal reserves and just half of its coal resources would use up 17 per cent of the global carbon budget of 870 billion tonnes of carbon dioxide.[38] Much of Australian coal resources are effectively "unburnable" in the absence of widespread use of carbon capture and storage.

While a fall in coal prices would generally affect older, less competitive mines which have already recovered their investment expenditure, substantial losses may still be incurred on sunk investment, particularly where it includes major investment in auxiliary infrastructure such as rail lines and ports. Research by Oxford University's Smith School of Enterprise and the Environment into the risks to Australia's coal exports finds that environmental factors could drive down China's coal demand sufficiently to "strand" some of the largest new coal projects planned for Australia.[39] Many costs associated with energy export projects are borne by the public, through public funding for auxiliary infrastructure such as rail lines or ports, or negative impacts on host communities. In order to accurately assess the costs and benefits of such public investment or public impacts, and to ensure the public is not made worse off by risky investments in energy exports, energy exporters should assess and disclose their exposure to risks associated with other countries' efforts to reduce their carbon emissions and other pollutants, and these should be factored into any public impacts and public investments associated with export projects.

The Issues Paper must consider the risks posed by the physical impacts of 2°C and 4°C climate change on Australia's energy infrastructure and activities.

Despite global agreement to limit climate change to 2°C, current international efforts are insufficient to prevent warming of at least 4°C.[40] Climate change will affect almost every part of the energy supply chain in multiple ways, but its impacts on the sector are not yet well understood or quantified. A rare quantification of one of the potential costs of climate change on electricity comes from CSIRO, which estimates that building distribution infrastructure for temperature rise-driven peak demand adds another 2.8c/kWh, or about $180 for a household using 6500 kWh.[41]

Assessment by The Climate Institute of the electricity sector's readiness for climate impacts found that preparation is patchy at best. Network service providers are at an early stage of coordination among themselves and with regulators. Isolated examples of climate risk planning can be found among electricity generators. Energy exporters and operators of auxiliary infrastructure such as ports may factor climate projections into some elements of their operations or investments.

Government policy regarding climate risk management is fragmented, and can sometimes undermine efforts to adapt to climate change. For example, the *Infrastructure Australia Amendment Bill 2013* removes Infrastructure Australia's mandate to assess the implications of climate change on infrastructure policy. This is despite the Infrastructure Coordinator's warning that rising sea levels and heat stress are among the climate impacts threatening "a significant proportion of Australia's existing infrastructure assets…and adaptation will require changes to the scope and mix of infrastructure investment." [42]

There are no requirements or guidelines for energy service providers to assess, disclose or manage the risk of climate change-related impacts on their assets, let along on the energy supply system as a whole.[43] As the International Energy Agency notes, "unless the resilience of our energy system to climate change is considered more explicitly, energy supply and transformation will be exposed to greater physical risks, which will increase capital, maintenance and insurance costs, impair energy supply reliability and accelerate the depreciation and deterioration of assets."[44]

This is particularly concerning because of the centrality of energy supply to economic activity. The immediate costs of climate impacts to energy assets are amplified as the consequences of power outages, fuel shortages or operational interruptions cascade through the economy, often spread further through interdependencies with transport, water and communications systems. The United States Department of Energy has recognised that "compounding factors and interdependencies within and across the energy sector and other sectors must be better understood to effectively assess the overall impacts on the energy system"[45]. The United States has now instituted a Quadrennial Energy Review, which will recommend energy policies to enable U.S. energy infrastructure to respond to changes in energy supply, markets and use; aging infrastructure and capacity, impacts of climate change, and cyber and physical threats.[46]

Recent events illustrate how the interaction between energy services and other infrastructure systems can extend the impacts of extreme weather events. For example, the south-eastern heatwave of January 2009 caused outages of major transmission lines and distribution failures, resulting in the loss of power to more than 500,000 Melbourne residents in Melbourne, and to large sections of the tram and train networks. Between a quarter and a third of city commuter train services were cancelled over three days.[47] In the United States, electricity outages caused by Hurricane Sandy not only affected power consumers in 21 states, but also prevented the use of fuel pumps at some petrol stations, the operation of the Colonial Pipeline, which brings refined products from the Gulf of Mexico, two oil refineries with total capacity of more than 300,000 barrels per day, and forced an additional four refineries with a cumulative capacity of 862,000 barrels per day to reduce their output.[48]

To help ensure that Australia's energy sector adapts efficiently to climate change it is important to reduce its unacceptably high vulnerabilities to the current climate; identify and take no or low-regret actions; take climate change impacts into account when making decisions with long-term consequences such as design and location of major infrastructure, and build skills and information needed to manage climate risk now and in the future.[49]

As a starting point, Australia's energy infrastructure and investments should be assessed for their resilience under scenarios of at least 2°C and 4°C of global warming. The results of these assessments should also be publicly disclosed.

RESPONSES TO ISSUES IDENTIFIED

Energy security

The Issues Paper should expand its conception of energy security beyond short term reliability and affordability to an explicit examination of the necessary factors for Australia's long term (e.g. to 2050) energy security. In the long term Australia's energy supply will remain reliable and affordable only if its diversity of sources and resilience to shocks are increased, its negative environmental impacts are decreased, and its services appropriately aligned with their costs and customers.

Diversity and resilience.
In addition to price and supply shocks, the energy sector is likely to face significant disruption from "megashifts" which might be technological, policy- or market-driven, or physical. Likely megashifts include electricity storage, sustained shifts in consumption, and climate change impacts such as extreme weather. Ensuring energy markets, regulation, and infrastructure are capable of handling this range of challenges is necessary for long-term energy security.

Following from this, the extent to which measures boost resilience to shocks and thereby improve Australia's energy security should be recognised and incorporated into relevant cost-benefit analysis and policymaking. For example, improving the fuel efficiency of Australian vehicles and thereby reducing reliance on oil imports reduces pressure on national reserves in addition to cutting drivers' fuel costs; investing in renewable generation diversifies Australia's electricity mix and reduces the impact of fuel price shocks on electricity consumers. Distributed generation can mitigate grid outages or shortages by providing back-up power sources, while smart grid technologies reduce the costs of outages by enabling faster and more accurate responses by power providers.

Negative environmental impacts.
Energy production and use often result in a range of negative environmental impacts, the costs of which are generally external to energy prices. Unless addressed, growth of these externalised costs creates environmental threats both to continued energy production and use and to society more broadly. Key environmental impacts include water scarcity, which affects water use by energy producers and others; bushfires, which may be started by electricity lines and which can inflict significant damage on energy infrastructure; and air pollution from fossil fuel extraction and combustion, which can damage human health. For energy systems to be secure in the long term it is essential that their negative impacts are constrained sufficiently to prevent significant damage to the systems themselves, and even more importantly, to the communities they serve.

Stakeholder, service and cost alignment
Energy affordability is unlikely to be sustainable in the long term unless consumers pay the appropriate costs of their consumption and "smearing" is minimised. Poor price signals distort markets by encouraging overconsumption, inevitably pushing higher costs on to others or into the future; this has been demonstrated in several of Australia's price regulated markets. To date most discussions of "cost-reflective" pricing in Australian energy markets refer to pricing peak electricity demand. This is an essential element of electricity pricing reform, but it is not the only aspect of energy pricing to which the principle of cost-reflectivity should be applied. Other costs that are generally not reflected in energy prices include carbon and other pollution (apart from energy covered by the current legislated carbon price) and road congestion, while costs such as grid connection are inappropriately priced.

Improving the alignment of stakeholder incentives, customer preferences, energy services and their costs and benefits should be a priority of the EWP. Policies to improve cost reflectivity should assess the impacts of cost-reflective pricing on affordability. Where appropriate, assistance should be provided to vulnerable groups such as low-income households; this assistance should not, however, negate price signals.

Regulatory reform

There is great scope to improve the regulatory framework of Australia's energy sector to improve the alignment of stakeholder incentives, services and costs. The EWP should prioritise the following tasks:

+ **Develop a decarbonisation strategy and ensure regulation is complementary, not conflicting, with decarbonisation goals.** Basic building blocks of such a strategy should include energy sector emission reduction targets and trajectories derived from a national carbon budget consistent with a 75 per cent probability of limiting climate change to less than 2°C.

+ **Address market distortions, externalities and other market failures by accounting for, articulating and balancing the financial costs of energy production and use with economic and social welfare costs** such as carbon and other pollutants, peak demand, and congestion. This may be done explicitly through price mechanisms or implicitly through other policy measures, such as emission/efficiency standards for power stations and vehicles, demand-management. It is also important to appropriately value benefits, such as improvements in resilience or energy security, arising from new technologies or systems of energy production and use.

+ **Harmonise and streamline energy market regulation to improve the energy sector's ability to respond to technological, policy, market or physical megashifts.**
  - *Align stakeholders' incentives.* Revenue growth for electricity network and generator companies is tied to electricity consumption growth. This means that these companies' incentives are not aligned either with the preferences of households, who have an interest in maximising electricity efficiency to minimise their power bills, or the broader benefits of widespread energy productivity (estimated at an extra 0.1 percentage point to GDP for every 1per cent improvement in energy efficiency). Furthermore, unlike generators which operate in a competitive market, network businesses do not bear the downside risk where consumption is lower than expected.[50] Misaligned network incentives have contributed to power bill increases even as consumption has declined.

  - *Coordinate with stakeholders in other sectors to optimise uptake of emerging technologies such as electricity storage and electric vehicles.* Optimising the deployment of new technologies may require cross-sectoral coordination. For example, the uptake of electric vehicles in Australia will depend on industry promotion, customer demand, and availability of charging infrastructure, which may require government incentives (e.g. emission standards, rebates, parking or driving benefits). The benefits of EVs to electricity network efficiency will depend heavily on the capacity of the network to manage vehicle charging patterns and consumers' willingness to have their charging managed, while the emissions reduction benefits of EVs will depend on the reduction in emissions of the electricity used to charge them.

+ **Require major energy producers and infrastructure operators to assess and disclose their exposure to risks** associated with carbon reduction policies (domestic and international) and the physical impacts of climate change under 2°C and 4°C global warming scenarios.

Energy Productivity

Energy efficiency provides cost savings to its proponents and produces benefits to the wider economy. As noted in the Issues Paper, analysis suggests an annual 1 per cent improvement in economy-wide energy efficiency could boost GDP by 0.1 percentage point each year. ClimateWorks Australia has found that economically viable energy efficiency could drive emissions reduction of 61 million tonnes in 2020, achieving about one-fifth per cent of Australia's conditional 25 per cent target. This is achieved at an average benefit to investors of $110 per tonne.[51]

In addition to its cost saving and emissions benefits, energy efficiency can improve energy affordability and reduce exposure to shocks, maintenance requirements and pollution. Energy efficiency also has strategic benefits. Often at low or net-zero cost, energy efficiency investments are "no-regrets" options that can defer investments in more expensive solutions such as new generation capacity. During periods of policy, technological and/or market uncertainty, energy efficiency can buy time to develop more robust responses.

Australia's poor record in energy efficiency has changed somewhat in the last few years, due in large part to energy efficiency policies and consumer response to price increases. Currently, however, many significant energy efficiency opportunities are not being realised. ClimateWorks' analysis of EEO participants found, for example, that large energy users are now saving energy worth $1.2 billion per year, but wasting another $2 billion by not investing in identified opportunities.[52]

Australia's energy efficiency policy framework is riddled with holes. For example, state-based energy saving obligations only operate in NSW, Victoria, SA and the ACT; building efficiency disclosure requirements only apply to office buildings over a certain size; key sectors

like passenger transport have no efficiency policy focus at all. Table 1 (on page 11) notes the strengths and weaknesses of key energy efficiency policies operating and in development.

The EWP should aim to increase Australia's energy productivity by at least 30 per cent by 2020 (on 2010 levels).

This can be achieved by addressing gaps in the existing energy policy framework, increasing the ambition of existing policy measures, and implementing new policies in sectors where major energy efficiency opportunities are currently untapped. For example, the new national framework for regulating Minimum Energy Performance Standards (MEPS) should be used to drive more ambitious equipment standards. One method would be to adapt Japan's "Top Runner" program, where continually higher performance standards are set by the most energy efficient products. Additional measures should include ambitious emissions/efficiency standards for vehicles equivalent to United States standards by 2015 and European standards by 2020.

Alternative and emerging energy supplies

Australia's energy sector will continue its transformation as new technologies reshape energy production and consumption. As noted above, ensuring that this transformation is consistent with Australia's long-term interests is necessary to minimise costs and market distortions.

The first priority is policy stability for investors in this area. Current legislated arrangements enable a pipeline of renewable and low emissions technologies. There are some gaps and inadequacies in the existing framework: for example, carbon capture and storage is ineligible for ARENA or CEFC funding.

Of much greater concern, however, are the government's moves to abolish the carbon price and limits, the CEFC and the CCA before establishing institutions that are shown to be capable of replacing them effectively. These changes contribute to a hostile environment for investment in low and zero-emission energy technologies and increase the burden on the Renewable Energy Target (RET) to deliver emission reductions in the electricity sector.

In this context, the government's review of the RET increases policy uncertainty in the market to a level that is damaging and unsustainable. Rebuilding investor confidence requires policy stability in the short and long term. An immediate step for the government should be a commitment to maintaining the RET's 2020 target of 41,000 gigawatt hours (GWh) for large-scale generation and reducing the frequency and/or scope of RET reviews.

Long term stability demands a credible long-term decarbonisation strategy, underpinned by a policy framework that supports each stage of energy technology emergence from research to commercial-scale operation. In the absence of a price and limit on carbon this may also require additional regulatory measures, such as increasingly stringent emissions performance standards (EPSs).

The upcoming review of the Renewable Energy Target needs to assess the role of this mechanism in achieving electricity decarbonisation consistent with a fair contribution to the 2°C goal. This should also consider standards for new generation should be set at no more than 500 kg CO2e/MWh, declining to no more than 200 kg CO2e/MWh after 2020. Standards, or other interventions, for existing generators should be examined to ensure that the most emission intensive power generation is decommissioned by 2020 and the power sector is nearing net decarbonisation by 2030.

Targeted support for demonstration projects will also be necessary for technologies that have not yet reached commercial readiness, such as bioenergy with carbon capture and storage (bio-CCS).

Table 1. *Strengths and weaknesses of Australia's energy efficiency policies*

Policy mechanism	Strengths	Key gaps/weaknesses
Energy saving obligations *(NSW ESS, Vic ESI, SA REES, ACT EEIS)*	• Addresses many barriers • Broad coverage of energy saving options • Predictability of achieving targets	• Not operating in Qld, WA, Tas, NT • Tendency for piecemeal approach to energy efficiency activities; deeper savings not addressed by existing schemes • Difficulty in establishing and maintaining additionality • Inconsistency of state schemes reduces economies of scale
Mandatory reporting *(EEO program)*	• Enables wide range of savings in key sectors • Builds industry-specific expertise	• Applies only to companies using over 0.5 PJ per annum • Does not encourage or require companies to act on opportunities identified.
Performance standards *(eg. MEPS, building codes)*	• Effective in driving market transformation • Clear investment signal • Significant driver of historic greenhouse emission reductions	• MEPS program not as ambitious as world's best standards • Not applied to all potential products • Building standards inconsistent and do not address existing buildings
Disclosure requirements *(eg. BEEC, Energy Star ratings)*	• Effective in addressing some information gaps	• Mandatory for limited range of products • In buildings sector, only applied to large commercial buildings
Grants to improve energy efficiency *(eg. Low Income Energy Efficiency program)*	• Can target groups most in need of assistance • Can enable demonstration projects	• Piecemeal • Provides no forward investment signal • Difficult to prove savings
Legislated carbon price and limit	• Board based and potentially strong investment signal • Improves payback periods	• Some energy uses uncovered (eg passenger vehicles) • Volatility may lead to under-pricing of carbon emissions
Emission Reduction Fund *(in development)*	• Industrial energy efficiency is a possible contender for fund payments because it can offer lowest-cost emission reductions • Baselines could encourage more than BAU energy efficiency improvements	• Potential overlap with state energy saving obligations • Difficulty in establishing and maintaining additionality • Grant/auction system, five-year contract limit and overgenerous baselines may prevent forward investment signal • No clear long-term investment signal
Vehicle CO_2 emission standards *(in development)*	• Major fuel and cost savings achievable	• Standard-setting process took unambitious starting point and then stalled

ENDNOTES

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