energy networks association

# ENABLING AUSTRALIA'S CLEANER ENERGY TRANSITION

## Measures for efficient, national carbon abatement

August 2016

## CONTACT DETAILS

The Energy Networks Association values your feedback and welcomes comments on the modeling and identified policy measures.

**To provide feedback please contact**
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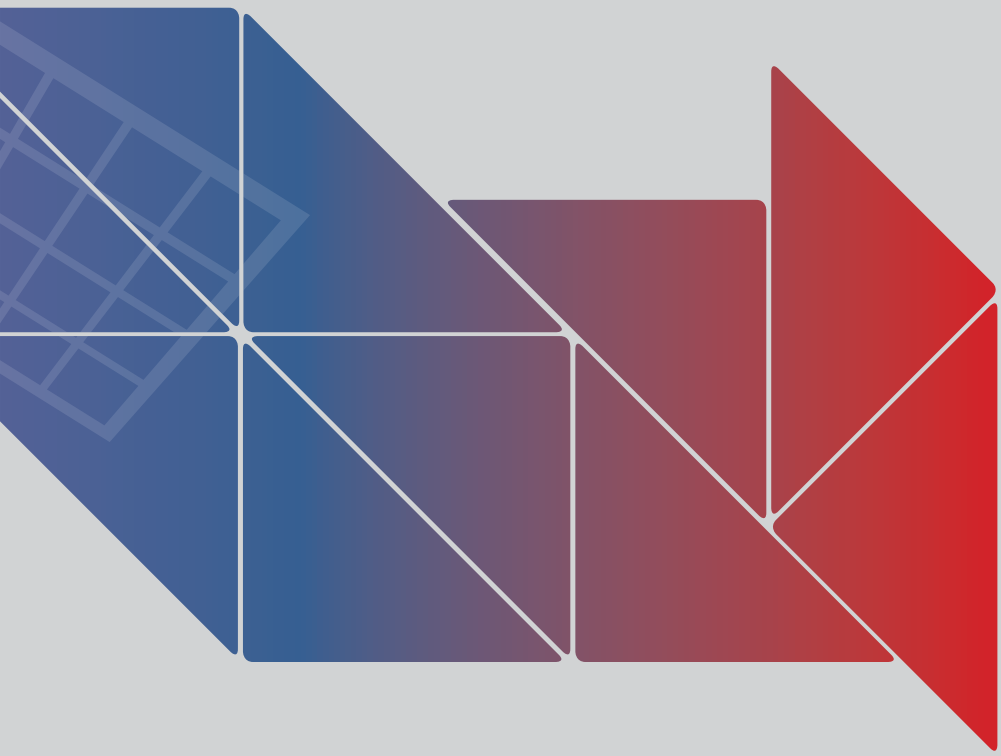


# INTRODUCTION

**The Australian Government has committed to undertake a review of Australia's climate policy settings and 2030 abatement target in mid-2017.**

Jacobs was commissioned to undertake modelling of alternate greenhouse gas abatement policy options affecting the energy sector. Specifically, the analysis was to assess the relative effectiveness and efficiency of alternate policy settings in meeting Australia's greenhouse gas abatement objectives assuming that the national abatement target would be applied to individual sectors of the economy. The study covered the period from 2020 to 2030 to help guide the pathway to reach Australia's current or alternative 2030 abatement targets. This recognises that Australia appears likely to meet its 2020 abatement target, but will require additional effort to meet its 2030 target of 26 to 28% below 2005 levels.

Both the electricity generation and direct combustion sectors were included in the analysis and assumed to collectively meet the percentage reduction of the national abatement target. The study focused on three policy scenarios:

1. **Business-As-Usual** – where the suite of current government policies continues and major policy settings are adjusted to reach specific abatement targets.
2. **Technology-Neutral** – where the current suite of policies is adjusted to become technology-neutral and elements of a 'baseline and credit' scheme are introduced.
3. **Carbon-Price-Mechanism** – where all policies are removed and replaced by a carbon price on all emissions.

By commissioning this analysis, the Energy Networks Association sought to support evidence-based policy development in the forthcoming review of Australia's carbon policy framework and future reviews of emission targets.

**BOX 1: SEVEN STEPS TO SMARTER CARBON POLICY**

1. Pursue an enduring, stable and nationally integrated carbon policy framework based on consensus.
2. Introduce a 'Baseline and Credit' Scheme leveraging the current legislative architecture of the Emissions Reduction Fund Safeguard Mechanism.
3. Over time, consider options to increase economic efficiency by moving to a Carbon Price mechanism, with appropriate financial transfers and household support and without risking subsequent policy 'churn'.
4. If governments maintain direct incentive programs, transition Commonwealth and State programs to focus on least cost abatement outcomes, which are scale neutral and technology neutral.
5. Continue to review Australia's abatement targets (in the form of Intended Nationally Determined Contributions or INDCs), within the 5 yearly cycle proposed following the COP21 Agreement in Paris.
6. Incorporate an explicit, independent assessment of national energy market implications when developing jurisdiction initiatives on carbon and renewables policy.
7. Ongoing support for research, development and demonstration on a diverse range of low emission technologies.

**Table 1:** Summary of outcomes under three Carbon policy scenarios

| | 1. Business as usual | 2. Technology neutral | 3. Carbon pricing |
|---|---|---|---|
| Abatement target met by 2030? | Yes | Yes | Yes |
| Generation Mix in 2030 (GWh) | | | |
| Wind | 38,358 | 38,358 | 42,675 |
| Large Solar | 768 | 768 | 768 |
| Rooftop PV | 15,837 | 14,428 | 15,848 |
| Other renewable | 21,745 | 21,021 | 20,912 |
| Gas fired generation (OCGT) | 13,448 | 11,375 | 7,144 |
| Gas fired generation (CCGT) | 83,384 | 74,906 | 66,188 |
| Coal fired generation | 82,891 | 92,972 | 101,393 |
| Total | 256,430 | 253,828 | 254,928 |
| Change in Generation Capacity (2020 to 2030) (MW) | | | |
| Wind | 5,006 | 5,006 | 9,460 |
| Large Solar | 0 | 0 | 0 |
| Rooftop PV | 5,243 | 4,316 | 5,395 |
| Gas fired generation (OCGT) | 818 | 818 | 818 |
| Gas fired generation (CCGT) | 7,357 | 7,586 | 7,019 |
| Coal fired generation | -8,250 | -8,250 | -8,250 |
| Total | 10,566 | 9,940 | 14,660 |
| Resource Cost, $ billion | 127.9 | 127.0 | 126.4 |
| Residential Bill (2030), $/annum | 1,773 | 1,557 | 1,831 |

# AUSTRALIA'S CLIMATE POLICY OPTIONS– KEY FINDINGS

The analysis undertaken by Jacobs shows that the Government's abatement target for 2030 can be met by any of the three policy scenarios. The main difference between the scenarios is the change in fuel mix and the impact this has on the total economic cost during that decade, as well as on household bills.

### 1. Carbon Abatement targets achieved

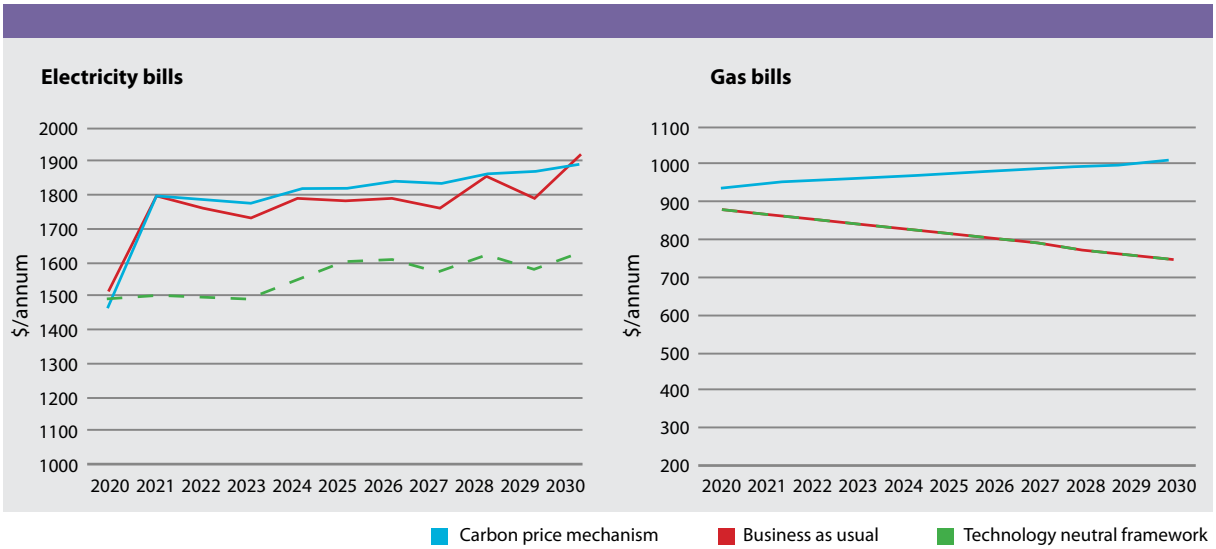
The modelling indicates that emission reductions of 26 to 28% from the energy sector can be achieved with any of the selected policy scenarios. The 2030 target of 188 Mt $CO_2$ and the cumulative emissions over the decade are achieved in all scenarios indicating that they all achieve the same abatement outcome. The main difference is in the cost to achieve this.

### 2. Household bills could be $216 per year lower

Household bills are affected by changes to the wholesale electricity or gas price and/or by the additional impost from trading, where it can occur. The lowest household bills occur in the Technology-Neutral scenario. This reflects a lower wholesale price compared to the Business-As-Usual scenario since the reduction in Absolute Baselines[1] is modified to become an emission intensive baseline and credit scheme, where trading can occur within the generation sector to achieve an overall emission intensity across the sector. The Technology-Neutral scenario saves an average of $216 per year on electricity bills compared to Business-As-Usual and does not impact on gas bills as there are no changes to wholesale gas prices between the scenarios.

The Carbon-Price-Mechanism applies a carbon price to all carbon emissions and increases all household bills. This results in bills, in this scenario, being higher for both electricity and gas. However, it should be noted that there are opportunities for governments to develop appropriate financial transfers to provide household support and offset these higher bills.

**Figure 1:** Policy scenario impacts on electricity and gas bills



### 3. Potential Economic Benefits between $0.9 billion and $1.5billion

The economic cost reflects the capital cost for new plant and interconnectors, retirement costs of plant being removed from the system and operating and fuel costs to meet energy demand. It is estimated as the net present value in 2020 for all the costs for the decade from 2020 to 2030. The resource cost for the Business-As-Usual scenario is $127.9 billion. A lower resource cost is required in the other scenarios as they allow a more efficient use of existing infrastructure. Jacobs found that, with a 7% discount rate, the savings over the decade in these scenarios range between $0.9 to $1.5 billion (Figure 2).

### 4. Significant Renewable Generation without specific targets

The fuel mix changes for power generation between 2020 and 2030 to achieve the abatement target. The fuel mix in all scenarios changes from being coal dominant to becoming more diverse with renewables, gas and coal all contributing more equally in 2030. The generation from renewables is roughly constant across the three scenarios, growing from the 2020 Large Scale Renewable Energy Target (LRET) level and reaching levels of between 74,500 GWh and 80,000 GWh in 2030, representing approximately 30% of the energy mix (Figure 3).

Small amounts of renewable energy generation are added between 2020 and 2025, as meeting the LRET resulted in an oversupply. The models indicate that renewable energy generation becomes the lowest cost technology for new generation beyond 2025 and does not need new support to drive additional take up.

The changes in the fuel mix occur mainly between coal and gas as part of the policy settings. Coal is displaced more quickly in the Business-As-Usual scenario, as reducing the absolute baseline to achieve the abatement target removes those plants and results in a higher level of gas generation being required. On the other hand, the Carbon-Price-Mechanism allows more of the coal fired fleet to remain in the mix, although they now operate at a higher cost, and results in the least amount of gas required to meet annual electricity demand.

Within the industrial sector, gas consumption remains relatively constant and emissions reductions occur mainly from the take up of energy efficiency, cogeneration and switching to electricity. Within households, take up of solar PV continues and reaches saturation levels in all scenarios around 2030. Switching from electric hot water to gas hot water occurs in all scenarios at a rate of approximately 20,000 units per year.

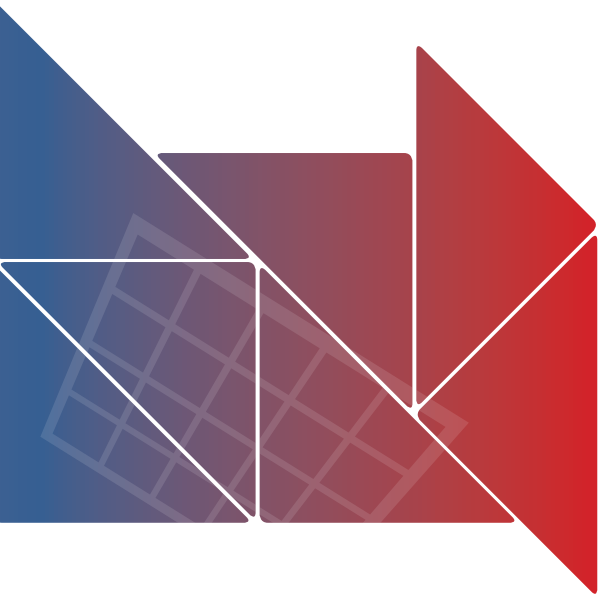


**Figure 2:** Potential Economic Benefits from efficient Carbon Policy

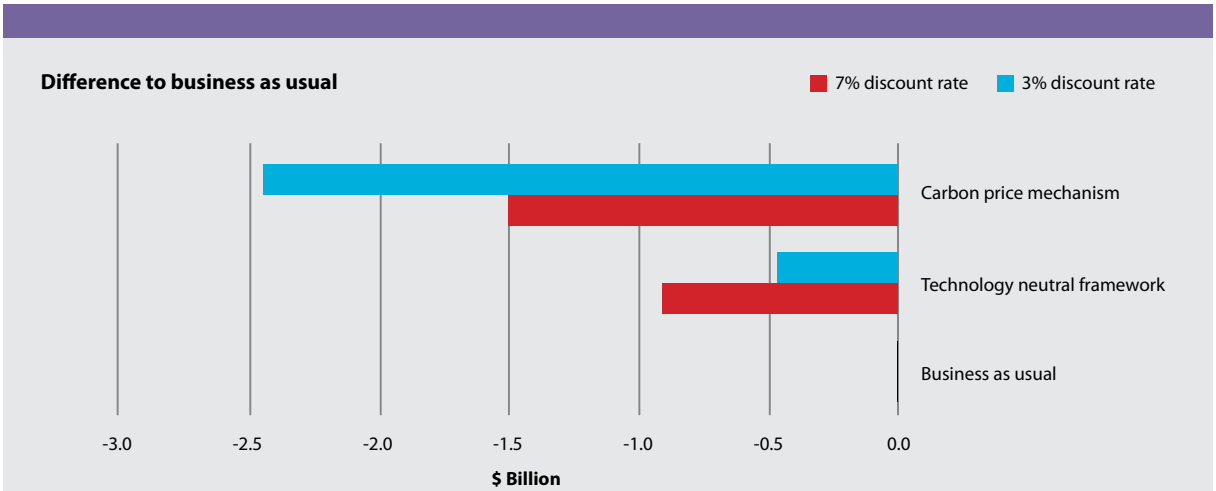
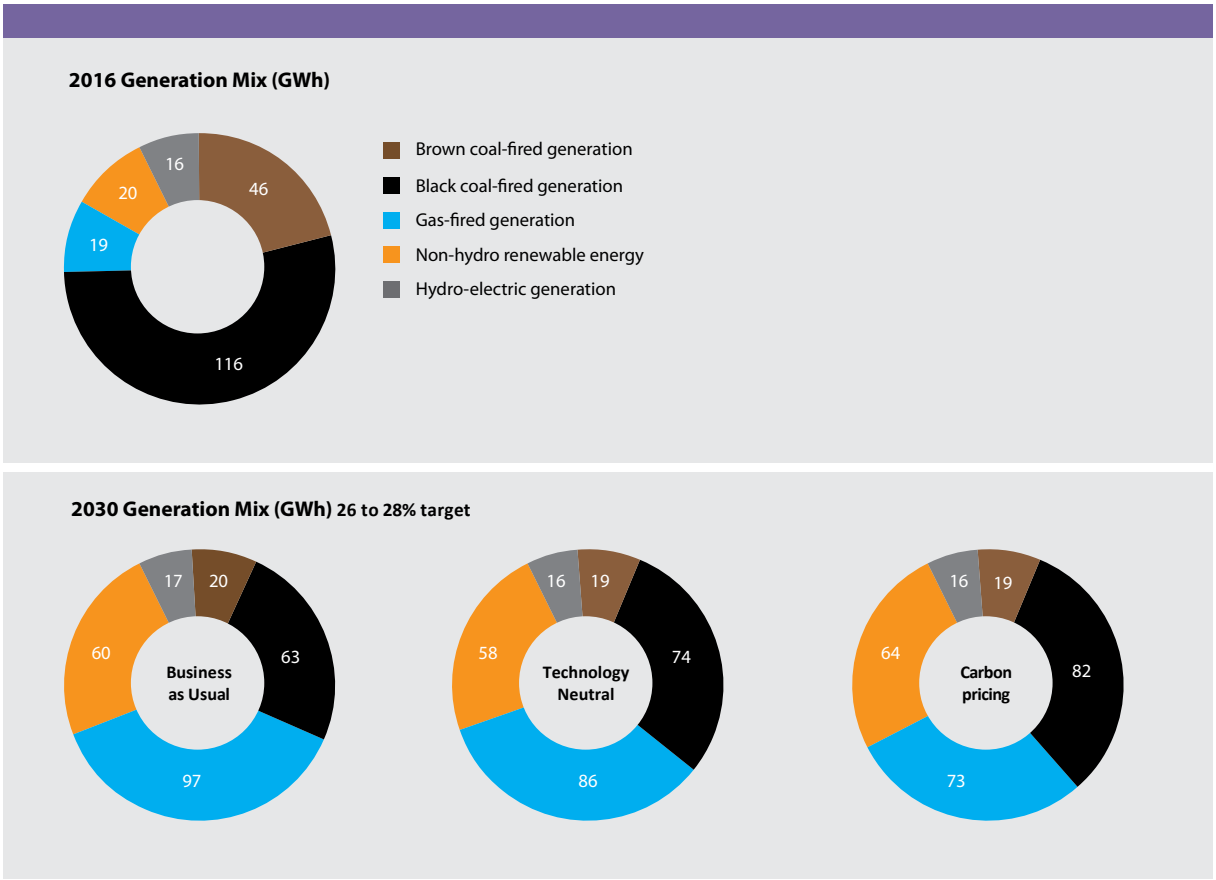



**Figure 3:** Change in Generation Mix from 2016 to 2030 under Carbon Policy Scenarios



## 5. A technology neutral approach results in lowest household bills with growing abatement targets.

The Australian Government has committed to a 26 to 28% target by 2030. As part of the global agreement reached in Paris in December 2015, governments around the world have agreed to strengthen their nationally determined contributions agreed in Paris. The Australian Government has undertaken to complete a review of its climate policy settings and its 2030 abatement target in mid-2017.

The analysis by Jacobs also considered a more ambitious abatement target of 45% reduction by 2030. The modelling indicated that this target could be achieved although it required a higher overall economic cost (between $17.9 and $26.3 billion extra would be required) and higher household bills compared to the 26 to 28% target.

Nevertheless, the relative benefits between the scenarios was the same as for the 26 to 28% target. The lowest economic cost occurred in a Carbon-Price-Mechanism scenario, while the lowest household bills occurred in a Technology-Neutral scenario.

This analysis indicates that the least impact on customers is to adopt a Technology-Neutral scenario in the near term, but that the lowest total economic costs requires a Carbon-Price-Mechanism. Clearly this mechanism would need to consider how revenue raised would be returned to household to address net financial impacts.

# MEASURES FOR EFFICIENT, NATIONAL CARBON ABATEMENT

Australia can achieve its abatement objectives through each of the three policy mechanisms - ***Business-As-Usual, Technology-Neutral*** and a ***Carbon-Price-Mechanism.***[2] The Technology-Neutral approach provides the lowest residential customer bill impacts to achieve the national abatement objectives, while the Carbon-Price-Mechanism provides the lowest overall economic cost. The legislative architecture of the Emissions Reduction Fund Safeguard Mechanism could be revised to achieve this lowest cost outcome as shown in Box 2.

1. **Pursue an enduring, stable and nationally integrated carbon policy framework, based on consensus.**

   A core design requirement of future carbon policy frameworks should be their durability and stability based on stakeholder consensus. Australian governments should prefer:

   - Policy options that have a reasonable prospect of bipartisan and intergovernmental consensus to provide a stable investment environment that secures both carbon abatement objectives and efficient investment;
   - Policy options that secure concrete progress towards efficient carbon abatement and avoid polarisation or retrospectivity.

2. **Introduce a 'Baseline and Credit' Scheme leveraging the current legislative architecture of the Emissions Reduction Fund Safeguard Mechanism.**

   The electricity sector emissions reduction target can be achieved through a 'Baseline and Credit' scheme within the electricity generation sector, developed through policy consultation in the scheduled 2017 Review. Given stated policy positions and objectives, such a carbon policy mechanism could be a feature of bipartisan and intergovernmental consensus, which is important for the certainty discussed above.

   Through the tightening of an 'average intensity' baseline, electricity generation emissions could be progressively reduced to achieve a 26-28% reduction in $CO_2$-e emissions by 2030. The 'Baseline and Credit' scheme could be based on an emission intensity baseline for the generation sector. It would be necessary for this emission intensity baseline to reduce at regular intervals (eg. annually) to achieve the abatement target. This would replace the Absolute Baseline approach, which implicitly applies under the Emissions Reduction Fund Safeguard Mechanism.

   Such a scheme would allow efficient trading within the generation sector to achieve lower cost abatement. When combined with other technology neutral policy, it is estimated the economic cost saving would be $0.9 billion compared to the current absolute baseline framework and residential customer bills would average $216 lower from 2020 to 2030, while still achieving the greenhouse gas emissions abatement objective.

## BOX 2: THE TRANSITION TO A 'BASELINE AND CREDIT' SCHEME

Currently, the Emissions Reduction Fund Safeguard Mechanism includes a sectoral baseline for the electricity generation sector of 198 million tonnes of $CO_2$-e. The Safeguard Mechanism will be put in place from July 2016 and will cover facilities with direct emissions of more than 100 kt $CO_2$-e per year. The energy sector will have an absolute sectoral baseline and facility-level absolute baselines for liable thermal operations that are triggered if the sectoral baseline is breached.

To achieve the long term targets, the sectoral baseline would need to be reduced at an average of 3% pa from 2020 to achieve the 2030 emission target.

Jacobs' analysis indicates that an emission intensive 'baseline and credit' scheme within the generation sector would, however, deliver the lowest residential electricity bills over the period 2020 to 2030. This will require a sector wide emission intensity level to be set and reduced over time.

Under this scheme, each generator would receive a number of certificates reflective of their projected generation volume for that year multiplied by the emission intensity level (to be corrected for actual generation). This scheme would allow generators below the emission intensity level to produce credits that can then be purchased by generators producing above the emission intensive level. The emission intensity level would be reduced annually resulting in emission reductions from the electricity sector.

For example:

- The emission intensity level in 2020 is 0.8 t $CO_2$/ MWh.
- Each certificate represents 1 tonne of $CO_2$-e emissions.
- Generator A produces 500 MWh at an intensity of 1.0 t $CO_2$/ MWh. It would receive 400 certificates. Its emissions are 500 tonnes and it will need to provide an additional 100 certificates for these additional emissions. These can be purchased from generators operating below the emission intensity level.
- Generator B produces 250 MWh at an intensity of 0.4 t $CO_2$/ MWh. It would receive 200 certificates and will need to provide 100 of those certificates to cover its own emissions. It can sell the other 100 certificates to Generator A so that it can meet its emissions obligations.
- The emission intensity level in 2021 is 0.77 t $CO_2$/ MWh, which will result in Generator B producing fewer credits and Generator A requiring more certificates to meet its obligation.

The Jacobs modelling limits this trading to the electricity sector, but the Government should consider how this can align with the allocation of Australian Credit Carbon Units (ACCUs). The legislative architecture already provides a mechanism by which facilities that generate emissions below a baseline could receive Australian Carbon Credit Units and facilities that generate emissions above a baseline could acquire them to offset an obligation. ACCUs are financial products for the purposes of Commonwealth legislation and can be traded.

3. **Over time, consider options to increase economic efficiency by moving to a Carbon Price mechanism, with appropriate financial transfers and household support and without risking subsequent policy 'churn'.**

   The Jacobs analysis indicates that a Carbon Price mechanism would achieve greenhouse gas abatement objectives with the greatest economic efficiency. Resource costs savings of $1.5 billion could be achieved compared to a Business as Usual policy setting, and savings of $0.6 billion could be achieved compared to Technology Neutral policy settings. However, such a mechanism does result in higher residential bills over the period from 2020 to 2030, which would require careful complementary financial transfers and compensation arrangements to be considered. Over time, governments should consider options to achieve the benefits to economic efficiency of introducing a Carbon Price mechanism, with appropriate financial transfers and household support and without risking subsequent policy 'churn'.

4. **If governments maintain direct incentive programs, transition Commonwealth & State programs to focus on least cost abatement outcomes, which are scale neutral and technology neutral.**

   Jacobs' analysis compared the outcomes from seeking to achieve a 45% abatement target by a Baseline and Credit Scheme (alone) or with a technology specific Renewable Energy Target of 50%. The analysis found that, while achieving no additional abatement over that period, the inclusion of a 50% renewable energy target adds an additional $1.3 billion to the cost over the decade to 2030 and increases customer bills by $121 per year in 2030.

   It is timely for Australian governments to consider if there is any incremental benefit of introducing additional direct financial incentives within the energy sector, in addition to a general carbon policy framework such as a Baseline and Credit Scheme. Governments should be satisfied that the incremental costs to the economy and customers are demonstrably offset by the benefits.

Australian governments have previously recognised the value of ensuring that carbon and renewables policies are complementary. Regardless of the policy measures undertaken to meet greenhouse gas abatement objectives, the principles of complementarity remain relevant. Key Federal, State and Territory measures should be routinely assessed to ensure their policy objectives remain relevant, or might be amended to account for changes in technology that demonstrably meet least cost abatement objectives.

For the Federal Government the key programs that may be considered include:

- **Large-scale Renewable Energy Target** (LRET) (if expanded beyond the 33,000 GWh target). The Jacobs modelling indicates that the 2020 LRET target is met and growth in renewables continues out to 2030 even without expanded targets set beyond 2020. This illustrates that growth in renewable energy generation will occur in the absence of an expanded renewable energy target and that a technology focused incentive program is no longer justified.

  If the Government seeks to extend the LRET, it could be strengthened to focus on abatement outcomes and to cover all low emission activities, with incentives based on equivalent emission reductions beyond 2020. For instance, if extended beyond 2020, the LRET could transition to a Low Emission Target scheme, in which all low emission generation technologies (defined as emission intensities below say 0.6 t $CO_2e$/MWh) are eligible. Eligible generators could earn a portion of a certificate correlated with their emission intensity compared to the specified $CO_2e$/MWh cap.

- **Small-scale Renewable Energy Scheme** (SRES) (if extended beyond its current timeframe). Given the market penetration and maturity of the technology, it is no longer clear that solar PV or solar hot water require continued subsidisation. In addition, the scheme is not scale neutral, resulting in higher cost abatement compared to potential larger scale opportunities. If maintained, the program could be strengthened to focus on least cost abatement at small scale and expand eligibility to include gas hot water heaters that replace electric water heaters. Scheme credits should reflect the relative abatement achieved by the technology.

For State and Territory governments, the key programs to be reviewed include:

- State Renewable Energy Targets. At present, some state governments, including Queensland and Victoria, are considering state based renewable energy targets, while the ACT has set itself a target of 100% renewable generation by 2020. A nationally consistent approach, coordinated through COAG, should focus on abatement outcomes through adopting technology neutral and scale neutral policies. The impact of state renewable energy targets on the NEM should be assessed and if targets were assessed as being required, they should focus on abatement outcomes and be technology and scale neutral supporting all low emissions technology.
- Other incentives and programs that have abatement outcomes should also be reviewed to align the abatement objectives of those programs with a nationally coordinated carbon and energy policy. These incentives and programs are listed in Box 3.

If maintaining technology-specific or scale-specific schemes, governments should:

- Ensure schemes are based on, and adapt to, the changing market circumstances including the subsidy required, based on the competitiveness of the technology.
- Support technologies that are technically proven and commercially promising, but require early stage commercialisation support. Jacobs analysis indicates significant growth in renewable technologies under technology neutral frameworks without expanded renewable energy targets.
- Adopt a national approach to national abatement outcomes and co-ordinate state and/or territory renewable energy targets to be consistent with a national approach.

### BOX 3: TECHNOLOGY SPECIFIC SCHEMES TO BE REVIEWED

Australia has a wide range of energy related incentives and programs that are focused on technology outcomes. Many of these incentives and programs vary across jurisdictions adding to the complexity to work with and administer these incentives. A secondary outcome of these programs is a reduction in greenhouse gas emissions.

These incentives and programs could be reviewed as part of a coordinated national approach to carbon and energy policy. The review of Australia's climate policy settings and 2030 abatement target by mid-2017 provides an opportunity to review these other incentives and programs. The reviews should consider:

- The primary objective of the incentive or program
- The cost and benefits of the incentive or program, including both direct and indirect costs and benefits
- Similarities between programs
- Whether the incentive or program is technology focused, and if so, if ongoing support to that technology continues to be warranted or whether the incentive or program should become outcome focused
- The timing of the program or incentive, and potential for amending these programs or incentives to be coordinated by COAG.

The objective of these programs should be to achieve abatement outcomes at the least cost by adopting a technology neutral approach. The incentives or programs to be part of this review include:

- State based renewable energy targets (ACT, Vic and QLD)
- Retailers Energy Efficiency Scheme (South Australia)
- Victorian Energy Efficiency Target
- NSW Energy Savings Scheme
- Energy Efficient Improvement Scheme (ACT)
- Small-scale renewable energy scheme

5. **Continue to review Australia's abatement targets (in the form of Intended Nationally Determined Contributions or INDCs), within the 5 yearly cycle proposed following the COP21 Agreement in Paris.**

   The Paris Agreement reaffirms the goal of keeping average warming below 2 degrees Celsius, while also urging parties to pursue efforts to limit global warming to 1.5 degrees. The Agreement articulates two long term emission goals, firstly to reach a peak in emissions as soon as possible and secondly, to achieve net greenhouse gas neutrality in the second half of this century. The pathway to achieving these reductions requires countries to establish nationally determined contributions and review these contributions every five years with the expectation that they will show progress beyond the previous ones.

   Australian industry requires long-term stability in enduring carbon policy settings. This can be achieved through bipartisan support of Australia's carbon policy and the mid-2017 review into climate policy should seek bipartisan support that will provide the long-term investment decisions required by industry. This review should confirm the targets for each sector in 2030 and indicate how that target may likely tighten to 2030 and 2050 to accommodate the ongoing strengthening of nationally determined contributions agreed in Paris. COAG should be engaged during this review to achieve a nationally agreed approach on carbon and energy policy.

6. **Incorporate an explicit, independent assessment of national energy market implications when developing jurisdiction initiatives on carbon and renewables policy.**

   Australian governments have recognised the need for better integrated carbon and energy policy. This is likely to improve the efficiency with which national energy markets achieve abatement objectives and the maintenance of power system security. To support integrated carbon and energy policy, Australian governments should agree to incorporate an explicit assessment of national energy market implications when developing jurisdiction initiatives. Proposed carbon and energy policy initiatives can be assessed for their impact on national energy markets or network efficiency. This assessment should consider the typical energy trilemma issues of energy security, affordability and environmental sustainability. It should be independent and conducted by an agency such as the Australian Energy Market Commission.

7. **Ongoing support for research, development and demonstration on a diverse range of low emission technologies.**

   Innovation in existing clean energy technologies and development of new technologies to achieve large scale emission reductions should continue. The Australian Government has many initiatives in place that support research, development and demonstration of low emission technologies, many of which require co-investment from industry. Support for these innovation programs should continue and be assessed on the potential to achieve lowest cost abatement, while ensuring energy security and keeping the cost of energy low. This support should ensure technology neutrality and those support programs focused on specific technologies should be broadened. The level of support should be reviewed regularly and adjusted as the technology matures to become commercially viable.

# ENABLING AUSTRALIA'S CLEANER ENERGY TRANSITION

Beyond the critical national discussion about the future of carbon policy frameworks, Australia's distribution and transmission networks have a key role to play in supporting the transition to Australia's cleaner energy future.

To do this, there are a range of other operational and market issues that need to be addressed, including for instance:

- Power system security issues caused by loss of synchronous generation and retirement of traditional forms of generation; and
- The role of electricity networks in integrating and incentivising a range of distributed energy resources.

These and other issues are being explored within the *Electricity Network Transformation Roadmap,* which will address key enablers of the cleaner energy transition.

The detailed Jacobs modelling report can be downloaded from the Energy Networks Asssocation website www.ena.asn.au.

## Have your say

The Energy Networks Association values your feedback and welcomes comments on the modeling and identified policy measures.

**To provide feedback please contact**
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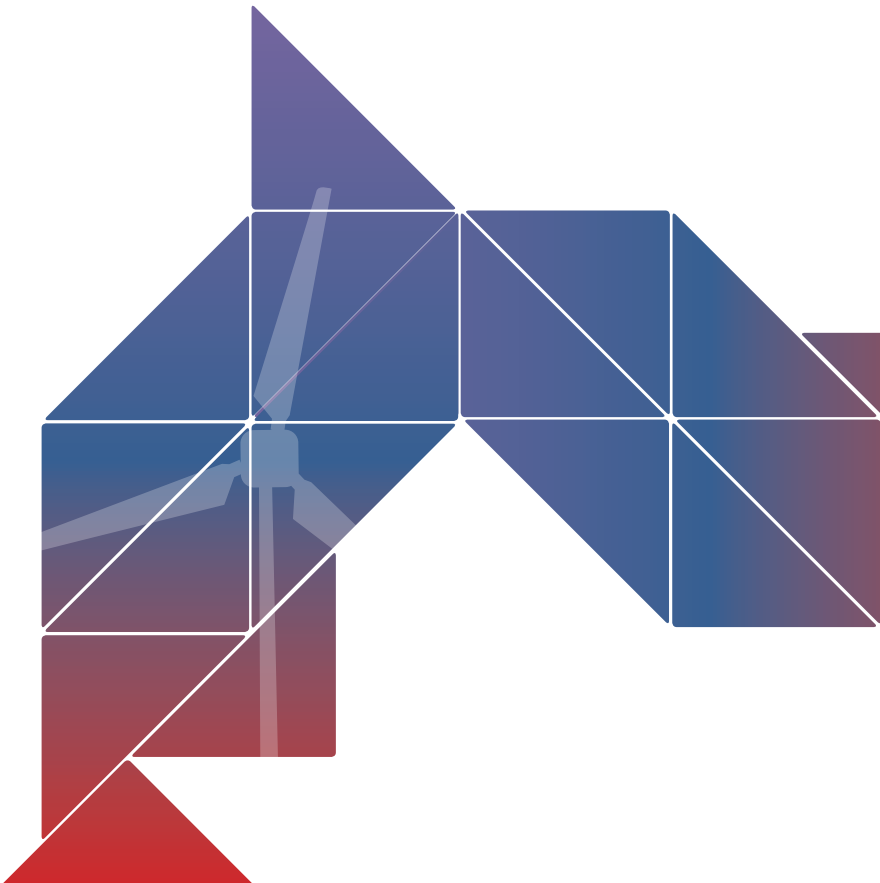

# END NOTES

1 The reduction in Absolute Baselines under the Business-As-Usual scenario forces coal generation to close earlier and hence the demand needs to be met by more expensive plants (Jacobs, 2016).

2 Jacobs (2016), Australia's Climate Policy Options – Modelling of Alternate Policy Scenarios (report commissioned by the Energy Networks Association)

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