Renewable Energy Sub Group

Report to the
Council of Australian Governments'
Select Council on Climate Change

COAG Review of Specific RET Issues

March 2012

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This report has been developed through the Renewable Energy Sub Group, which comprises officials from all jurisdictions. The report is intended to provide analytic input to assist consideration of these issues. The report does not necessarily reflect the views or policy positions of particular jurisdictions.

EXECUTIVE SUMMARY

The expanded Renewable Energy Target (RET) to achieve 20 per cent of our electricity from renewable sources by 2020 was legislated in August 2009 and further enhanced in June 2010 by the Commonwealth Government. These changes expanded the existing RET legislation. The enhanced RET, which includes splitting the RET into large- and small-scale components, puts in place important support for renewable energy deployment in our electricity market. The RET is designed to complement a carbon price and help us transition to a clean energy future.

The national expanded Renewable Energy Target (RET) scheme was agreed to by the Council of Australian Governments (COAG) in April 2009. In agreeing to the RET, COAG agreed that some specific issues should be the subject of further consideration in a review which has been known as the *COAG Review of Specific RET Issues* (the Review). Additional issues were subsequently included in the Review in November 2009.

A preliminary Review report was provided to COAG by the Renewable Energy Sub-Group (RESG) in late 2009. Finalisation of the Review has been delayed by changes to the RET legislation and follow-on regulations in 2010 and 2011 as well as developments in the Commonwealth Government's climate change policy including announcement of the Clean Energy Future (CEF) plan in July 2011 and passage of legislation to implement a carbon price in November 2011. The CEF includes a number of additional mechanisms to support clean energy and complement the RET, including the $10 billion Clean Energy Finance Corporation, $3.2 billion Australian Renewable Energy Agency and the $1.2 billion Clean Technology Program.

Passage of the enhanced RET legislation in 2010 directly responded to some of the issues considered by the Review. As a result, the remaining issues are:

- the eligibility of new small-scale technologies
- the self-generation exemption provisions, and
- the treatment of new Waste Coal Mine Gas (WCMG) power generation in the RET.

The report also provides information and informal analysis relating to the inclusion of large-scale geothermal direct heat, noting that formal consideration is outside the terms of reference of the Review.

This report identifies and analyses options for addressing each issue considered, informed by submissions received through public consultations during 2009 and 2010 and modelling of the impacts of the options on RET cost and technology mix. The report also recommends a preferred option for each of the issues considered.

The eligibility of new small-scale technologies

The preliminary report analysed ten technologies put forward by stakeholders. Two technologies (solar assisted cooling and geothermal—ground source—heat pumps) were considered sufficiently prospective to warrant more detailed modelling of the impacts of their inclusion in the RET.

This report presents updated modelling of the impacts of including these two technologies, taking into account relevant changes in the policy environment, noting the high level of uncertainty inherent in modelling uptake of these technologies.

The modelling indicates that including both technologies could increase the compliance costs of the RET by up to 9 per cent in the period to 2020, and increase retail electricity prices by up to 0.3 per cent in the same period.

Recommendation on new small-scale technologies

RESG's recommendation is to not extend eligibility under the RET to any new small-scale technologies. RESG considers that the uncapped nature of the SRES combined with the uncertainty inherent in the modelling mean an unacceptable level of uncertainty regarding the potential impacts of including new technologies, particularly on electricity prices. While the SKM MMA analysis indicates relatively minor impacts on electricity prices as a result of including the two technologies modelled, RESG notes SKM MMA's caveat around the uncertainty inherent in this modelling.

Further, it is RESG's view that as displacement technologies, the two technologies modelled would be better suited to support under an energy efficiency scheme rather than a scheme that is primarily designed to support renewable electricity generation.

The self-generation exemption provisions

The preliminary report acknowledged stakeholder feedback that the current narrowly focused exemptions from RET liability provided to entities that generate their own electricity could discourage investment in large resource projects by imposing additional costs, and distort efficient project design. Consistent with the preliminary report, this report presents two options:

> Option 1: Retain existing provisions, primarily to balance support for self-generation with minimising the impacts on non-exempt households and businesses that would bear additional costs as a result of expanding the exemptions, or
>
> Option 2: Extend exemptions consistent with stakeholder feedback that the current exemptions are not relevant to contemporary remote resource projects. This would involve extending the distance limit applied to the exemptions, as well as expanding the 'self-generator' concept to account for more complex ownership arrangements. The existing provisions would remain for pre-existing self-generation plant recognising the potential for windfall gains in respect of investments made under the existing legislative framework.

Recommendation on self-generation provisions

RESG's majority consensus recommendation is to choose option 1 (retain existing exemptions). The majority of RESG members consider that the RET is a national scheme that requires national participation, and that extending the exemptions would impose additional costs on liable parties. This would occur in the absence of clear justification of the assertion that significant project investments would not occur, be substantially delayed or be substantially sub-optimised in scope in the absence of the broader exemptions.

However, Western Australia (WA) holds a strong dissenting view to the majority, and considers that the self-generation exemption provision should be expanded in the manner outlined in section 3.3.2. WA agrees with the majority of stakeholder feedback that the current provisions are unduly restrictive and do not fully take into account the size and complexity of remote resource projects. This view is based on WA's understanding that:

- the RET scheme design supported by COAG was intended to apply to large grids with multiple customers and generators, where the liable party can exercise choices between a range of competing generators, and
- the RET scheme was not meant to apply to off-grid generation, or to stand-alone resources projects, even if the project is larger than 100MW, covers a relatively large distance and/or operates its own mini-grid to supply different parts of the project.

Given the increasing complexity of large-scale, remote resource projects (particularly in the Mid-West and Pilbara Regions of WA), including ownership structures, WA supports more flexible ownership provisions.

The Treatment of New WCMG Generation in the RET

This issue was added to the Review in November 2009 as part of negotiations on the Carbon Pollution Reduction Scheme (CPRS) legislation. It was not discussed in the preliminary report as there was insufficient time for consideration in that report. The Commonwealth agreed to the COAG Review continuing consideration of this issue despite the CPRS legislation not progressing.

This report identifies three options for the treatment of new WCMG projects:

> Option 1: No change, acknowledging that extending eligibility under the RET to new WCMG projects would involve a fundamental change in the policy basis for the RET, and noting that a carbon price would assist the competitiveness of such generation, and that opportunities may be available under other CEF initiatives.
>
> Option 2: Effectively doubles the current 850 GWh legislated cap under the LRET, providing offsetting increases in annual targets to ensure no renewable energy is displaced, balancing support for new WCMG generation with the associated impacts on electricity prices.
>
> Option 3: Provides eligibility until 2030 for new projects and expansions with a combined annual cap of 2,200 GWh and offsetting increases in annual targets. This is the industry preferred option, reflecting the substantial technical potential for electricity production from WCMG from existing and future gassy coal mines.

The report indicates that compliance costs would be around $400 million higher for a doubled target and around $1.4 billion higher for the industry target. When the decrease in wholesale prices that result from an increase in electricity supply relative to demand is not passed through to retail prices, there is a small increase in retail prices of around $0.9/MWh under option 3 in the period to 2020. The modelling suggests that combining the compliance cost and wholesale price impacts could lead overall to a small decrease in retail prices of less than 0.5% on average under option 3 in the period to 2020.

The report notes that, given WCMG is not a renewable energy source, extending eligibility under the RET to new WCMG projects would involve a fundamental change in the policy basis for the RET. The Commonwealth Government has designed a Coal Sector Jobs Package and Coal Mining Abatement Technology Support Package to support the mitigation of fugitive emissions and support investments in technologies which better utilise WCMG.

Recommendation on new WCMG

RESG recommends not extending eligibility to new WCMG generation under the LRET component of the RET. WCMG is not a renewable energy source, and existing WCMG generation was originally included in the RET as a transitional assistance measure in the context of the cessation of the New South Wales Greenhouse Gas Reduction Scheme and commencement of the then CPRS only, not as a valid source of renewable energy. This is reflected in the fact that annual targets under the RET were increased to ensure WCMG would not crowd out renewables or impact on achievement of the 20 per cent renewable energy target for 2020.

Similarly, given that WCMG is not a renewable energy source, extending eligibility to new WCMG would require increasing targets under the RET in order to ensure the overall target of 20 per cent renewable energy by 2020 is not compromised, thereby increasing the cost of the RET by between around $300 million and $1.5 billion, depending on the amount of WCMG allowed in.

Not only would extending eligibility to new WCMG increase the cost of the RET to accommodate a non-renewable energy source, it would also set a precedent for other low emissions technologies and shift the focus of the RET scheme away from renewable energy.

Queensland input into report during caretaker period

At the time of this report being drafted, the Queensland Government is in “Caretaker” mode in the lead up to the Queensland election on 24 March 2012.

Queensland officials have reiterated the fact that an incoming Queensland Government may provide comment on a range of matters regarding the RET scheme, including the recommendations set out in this report, after the 24 March election.

INTRODUCTION

In designing the national expanded Renewable Energy Target (RET) scheme the Australian Government worked with the Council of Australian Governments (COAG). In April 2009, and during the passage of the national expanded RET legislation, some specific issues were raised that required further analysis and consultation with stakeholders. These issues were referred for inclusion in the *COAG Review of Specific RET Issues* (the Review), originally to be completed by end-2009.

The initial issues to be considered by the Review were:

- whether any new small-scale renewable technologies that are not currently eligible should be included in the RET, as well as the eligibility of heat pumps

- whether changes should be made to the current provisions that allow for exemption from liabilities based on 'self-generation', which mainly affect off-grid remote resource projects, and

- whether the Solar Credits or a similar mechanism under the RET should be used to provide incentives for off-grid renewable generation.

On 5 November 2009, the Australian Government announced that the Review would also consider:

- factors that may be impacting upon the then Renewable Energy Certificate (REC) market in the short and long term.

In addition, as part of negotiations on the Carbon Pollution Reduction Scheme legislation in November 2009, the Government announced that the COAG review process would also consider:

- whether new waste coal mine gas (WCMG) projects should be eligible under the RET, and

- whether annual targets under the RET should be increased to offset additional RECs not backed by generation as part of the Solar Credits mechanism.

In December 2009, the Chair of the Renewable Energy Sub-Group (RESG) presented the Chair of the COAG Senior Officials' Group with a preliminary report covering the first four issues. The preliminary report was informed by stakeholder views as expressed in over 100 submissions, and drew on analysis of independent modelling of the benefits and costs of potential minor changes to the RET scheme.

The final report has been delayed by changes to the RET legislation and follow-on regulations in 2010 and 2011 as well as developments in the Commonwealth Government's climate change policy including announcement of the Clean Energy Future package in July 2011 and passage of legislation to implement a carbon price in November 2011.

On 26 February 2010 the Government announced changes to be made to the RET scheme and legislation to implement the separation of the RET into large-scale and small-scale components was put in place in mid-2010, with follow-on regulations implemented in December 2010. From January

2011, the existing scheme has operated as two parts—the Small-scale Renewable Energy Scheme (SRES) and the Large-scale Renewable Energy Target (LRET). On 19 April 2010, COAG noted the Commonwealth's announcement was intended to address concerns being considered by the Review regarding REC prices and additional RECs not backed by generation as part of the Solar Credits mechanism.

During passage of the enhanced RET legislation in June 2010, a number of amendments to the original design were agreed to that had further implications for the remaining issues being considered by the Review.

First, the amended RET legislation increases the capacity limit for which the Solar Credits multiplier applies in relation to off-grid small generation unit installations up to the first 20 kilowatts of a system capacity, subject to an annual cap on the total number of RECs (now small-scale technology certificates, or STCs). This amendment has addressed concerns underlying consideration under the Review of support through the RET for small-scale off-grid renewable generation in remote communities.

Second, the amended RET legislation agreed by the Commonwealth Parliament limits the eligibility of heat pumps to systems up to 425 litres in capacity. Other amendments were moved in the Senate but not agreed to, including the phase out of heat pumps in the RET by the end of 2010. This amendment to limit the size of heat pumps has addressed concerns underlying consideration under the Review of the eligibility of heat pumps.

As such, the remaining issues to be considered by the Review are:

- the eligibility of new small-scale technologies
- the self-generation exemption provisions, and
- the treatment of new WCMG power generation in the RET.

In addition to the discussion papers seeking feedback on the first two issues that were released in October 2009, a discussion paper on the treatment of new WCMG projects was released in December 2009.

Following the legislative amendments to establish the LRET and SRES in 2010, further amendments were made to bring forward the phase-out of the Solar Credits arrangements under the SRES in mid-2011 to balance support for rooftop solar panels with the impacts on electricity prices response. On 10 July 2011, the Australian Government announced its plan for a clean energy future, centred on the introduction of a carbon pricing mechanism to commence on 1 July 2012.

In addition, during 2010 and 2011 substantial changes were made to state and territory feed-in tariff schemes.

This final report identifies and analyses options to inform COAG consideration of these specific issues, drawing on stakeholder views as expressed in over 100 submissions that commented directly on the three remaining issues, and drawing on analysis of independent modelling by SKM MMA of the benefits and costs of potential minor changes to the RET scheme. This modelling has been updated to reflect the changes in the policy environment since the preliminary report was provided to COAG. The report also recommends a preferred option for each of the issues considered.

All potential changes to the RET identified by this report would require amendments to the RET legislation and regulations.

It is intended that this final report will be forwarded to the Select Council on Climate Change (SCCC) for consideration at a meeting anticipated to occur in early May 2012.

CHAPTER 1—BACKGROUND ON THE RET

Electricity generation accounts for more than one third of Australia's current greenhouse gas emissions, so Australia's transition to a low pollution future will require a significant transformation in this sector.

The Australian Government has developed a comprehensive plan to move to a clean energy future. Central to that plan is the introduction of a carbon price that will cut pollution in the cheapest and most effective way and drive investment in clean energy sources such as solar and wind.

Australia has some of the world's best wind resources and the highest average solar radiation per square metre of any continent in the world. To harness Australia's abundant renewable energy resources, the Government's plan will drive innovation and investment worth billions of dollars in renewable energy through the carbon price, the Renewable Energy Target (RET), the Australian Renewable Energy Agency and the Clean Energy Finance Corporation.

The RET scheme is designed to deliver on the Government's commitment that the equivalent of at least 20 per cent of Australia's electricity comes from renewable sources by 2020. As an important complement to a carbon price, the RET will speed up the adoption of renewable energy technologies and help smooth the transition to a clean energy future.

1.1 RET Legislation and Design

In August 2009, the Parliament passed legislation to implement the expanded national RET, which brought the former Mandatory Renewable Energy Target and previously existing and proposed state and territory schemes into one national scheme. It expanded the previous Mandatory Renewable Energy Target by more than four times from 9,500 gigawatt-hours to 45,000 gigawatt-hours by 2020. The expanded targets commenced in 2010.

The RET creates a guaranteed market for additional renewable energy deployment using a mechanism of tradable certificates that are created by renewable energy generators and owners of small-scale renewable energy systems. Each certificate represents one megawatt-hour (MWh) of renewable energy for compliance purposes. Demand for certificates is created by placing a legal obligation on entities that buy wholesale electricity (mainly electricity retailers) to source and surrender these certificates to the Renewable Energy Regulator to demonstrate their compliance with annual obligations. Alternatively, they would be required to pay a shortfall charge of $65 per MWh.

In June 2010, the Parliament passed legislation to separate the RET into two parts, which commenced on 1 January 2011—the Large-scale Renewable Energy Target (LRET) and the Small-scale Renewable Energy Scheme (SRES). The changes were designed to provide greater certainty for large-scale renewable energy projects, households and installers of small-scale renewable energy systems.

The LRET, covering large-scale renewable energy projects like wind farms, commercial solar and geothermal, will deliver the majority of the 2020 target. The LRET includes legislated annual targets which will require significant investment in new renewable energy generation capacity over the next 10 years. Targets under the LRET will ramp up until 2020 when the target will be 41,000 gigawatt-hours of renewable electricity generation. Certificates created under the LRET are called large-scale generation certificates (LGCs).

The SRES has been designed to assist households, small business and community groups with the upfront cost of installing small-scale renewable energy systems through certificates called small-scale technology certificates (STCs). Owners of systems are able to receive upfront STCs that the system would have otherwise generated over its life under the RET's standard deeming arrangements.

Solar Credits under the SRES provides additional support to households, businesses and community groups that install small-scale renewable energy systems such as rooftop solar panels, small hydro electric generators and small wind turbines, by multiplying the number of STCs able to be created for eligible installations. Solar Credits applies to the first 1.5 kW of capacity installed for systems connected to a main electricity grid and up to the first 20 kW of capacity for off-grid systems.

The Solar Credits multiplier reduces over time, reflecting reductions in rooftop solar panel costs. For eligible systems installed before 1 July 2011, the multiplier is five. From 1 July 2011 to 30 June 2012, the multiplier will reduce to three, and reduce by one each financial year until the standard rate of STC creation (a multiplier of one) applies for systems installed from 1 July 2013.

While it is possible for owners of renewable energy systems to create and sell the STCs themselves, in practice, installers of these systems usually offer a discount on the price of an installation, or a cash payment, in return for the right to create the STCs.

The Renewable Energy Regulator has established a voluntary 'clearing house' as a central point for the transfer of STCs at $40. However, system suppliers often choose to manage the risk of delays in finding a buyer in the clearing house by selling the STCs on the market outside the clearing house, at a price which depends on supply and demand in the market.

Unlike the LRET, the SRES does not include legislated annual targets and as such does not limit the overall number of certificates that can be created from installations of small-scale technologies. However, the RET legislation requires an overall annual liability to be set at the beginning of each year, based on modelled estimates of expected certificate creation for the year and taking into account any surplus or deficit of certificates from the previous year.

In 2009, waste coal mine gas (WCMG) was included in the RET legislation as an eligible energy source to provide transitional assistance for existing WCMG-based generation projects that would be affected by the commencement of a carbon price mechanism and consequent cessation of the NSW Greenhouse Gas Reduction Scheme (GGAS).

The RET legislation limits eligibility to existing power stations in operation during 2009 and for a limited period to commence from a date to be prescribed in the RET regulations and terminating at the end of 2020.

The Government has confirmed its commitment to providing transitional assistance for existing WCMG projects under the RET from 1 July 2012, contingent on prior passage of the carbon price legislation, while avoiding double-dipping under the RET and GGAS. Regulations to implement these arrangements are being put in place.

The Office of the Renewable Energy Regulator (ORER) has overseen the implementation of the RET scheme, including the accreditation of renewable energy generators, overseeing the validation of certificates created by power stations, solar water heaters and small generation units, and the provision of Solar Credits. On 2 April 2012 ORER's functions transferred to the Clean Energy Regulator.

CHAPTER 2—ELIGIBILITY OF NEW SMALL-SCALE TECHNOLOGIES

2.1 Background

As part of the process of designing the RET scheme, COAG agreed to examine further some of the eligibility provisions of the RET for new small-scale technologies as well as heat pumps.

The relevant Terms of Reference of the Review state that the Review will consider:

- *Whether any new small-scale renewable technologies that are not currently eligible should be included in the RET, as well as the eligibility of heat pumps. The review will have regard to:*
  - *The extent to which the technology is cost-effective, reliable, and able to be readily deployed in the market.*
  - *The impact that inclusion in the RET would have on deployment of existing eligible technologies and the market for Renewable Energy Certificates (RECs). There would be no change to annual targets under the RET legislation.*
  - *New small-scale technologies will be limited to devices which, drawing from a renewable energy source, either generate electricity or replace electrical devices (thereby displacing fossil-fuel based electricity consumption).*
  - *The review will also consider whether a regular process for assessing the eligibility of new technologies under the RET would be appropriate, also having regard to the impact on investor certainty.*

Heat Pumps

The enhanced RET legislation limits the eligibility of heat pumps to systems up to 425 litres in capacity. Other amendments were moved in the Senate but not agreed to, including the phase out of heat pumps in the RET by the end of 2010. This decision to limit the size of heat pumps addresses concerns underlying COAG consideration of the eligibility of heat pumps, and as such the issue is no longer being considered by the Review.

Regular Process for Assessing New Technologies

The preliminary report included consideration of whether a regular process for assessing the eligibility of new technologies for possible inclusion under the RET would be appropriate.

The report acknowledged that on one hand a regular periodic review may facilitate more timely inclusion of prospective new technologies. However, in light of the subsequent separation of the RET into the LRET and SRES, these reviews could also undermine certainty for market participants, particularly liable entities who would face higher liabilities under the uncapped SRES. At the time of the preliminary report, the RET legislation provided for a single review in 2014 and the report identified and analysed two options, four-yearly and annual reviews. However, during subsequent passage of the enhanced RET legislation in mid-2010, the

Australian Parliament agreed to an amendment that allows for a biennial review of the scheme, now to be undertaken by the Climate Change Authority (CCA), every two years commencing from the second half of 2012. While the exact format of this review is yet to be determined, the scope as prescribed is broad. It is expected that the CCA's biennial review would be able to consider whether or not eligibility under the RET should be extended to new technologies. Consequently, there is no need for further consideration of this issue in this Review.

Eligibility under the RET

Eligibility to create certificates under the RET currently applies to large and small-scale installations that use a renewable energy source—such as wind, hydroelectric, biomass, solar and geothermal—to either generate electricity or, in some cases under the SRES, replace electrical devices.

Installations or systems that generate electricity ('generation systems') include, for example, large-scale power plants and small-scale solar photovoltaic (PV) systems. Systems that replace electrical devices ('displacement systems') include solar hot water systems and heat pump hot water systems. Displacement systems are eligible under the SRES component of the RET because they use a renewable energy source rather than conventional electricity, which is generally sourced from fossil fuels. For example, installing a solar hot water system instead of an electric hot water system would displace electricity.

Small-scale technologies currently eligible to create STCs under the SRES component of the RET are defined in *The Renewable Energy (Electricity) Regulations 2001*. Eligible small generation unit installations include small-scale solar photovoltaic (PV) systems up to a capacity limit of 100 kilowatts (kW), small wind turbine systems up to 10 kW, and micro hydroelectric systems up to 6.4 kW. Eligible water heaters include solar water heaters and air source heat pumps with a volumetric capacity of 425 litres or less.

The RET rules allow STCs to be created at the time of installation, through deeming arrangements, to assist with the upfront costs of installing small scale systems and to reduce compliance and administration costs. Deeming arrangements allow STCs to be created for the renewable energy the system is expected to generate over the life of the system, which is up to 15 years depending on the system type. Deeming arrangements may also be appropriate for any new small-scale technologies identified, however regulatory change post government decision making would be required, and legislative change may also be required for electricity displacement technologies.

For the purpose of the Review, new small-scale technologies are devices which either generate electricity from a renewable energy source or replace and perform the same function as specific electrical devices thereby displacing fossil fuel based electricity consumption. New technologies include devices which fit this description, have been recently developed and are not currently eligible to create STCs. Small-scale technologies are generally considered to be for use by households and not for use on a commercial scale[1].

[1] Where such technologies are able to generate electricity from renewable energy sources and meter their output, they may already be able to be accredited as power stations under the RET.

2.1.1 Cost-effectiveness and reliability

The RET scheme is designed to encourage the deployment of small and large-scale renewable energy technologies to ensure that the equivalent of at least 20 per cent of Australia's electricity mix is from renewables by 2020. As such, the RET provides a financial incentive to invest in renewable energy technologies that, with the support of the revenue from LGCs and STCs, are able to be deployed in the market.

Where renewable energy technologies are generally more expensive than conventional electricity generation, revenue from certificates helps to bridge the gap between the base price received for fossil fuel-based electricity generation in wholesale electricity markets (the 'black' electricity price) and the cost of the electricity generation from renewable sources. The carbon price increases the return renewable energy solutions get from the 'black' electricity price and makes them more competitive.

As a result of technology cost reductions and economies of scale, some renewable energy technologies are becoming affordable in their own right. Where a renewable energy technology is cost-effective, the need for support from the RET to bridge the gap and incentivise deployment diminishes.

Alternatively, where a renewable energy technology is considerably more expensive than other technologies, it may not benefit from inclusion in the RET as support from certificates may not be sufficient for the technology to be cost competitive.

On the other hand there may be benefit in adding technologies that are at an early stage of development in the RET on technology neutrality grounds and to provide an incentive for the subsequent pursuit of economies of scale from wider scale deployment.

To the extent higher cost renewable technologies are deployed under the SRES component of the RET, this will also increase the overall cost of the RET to the economy. The RET is complemented by significant direct support that is better targeted at supporting basic research, development and commercialisation of emerging technologies.

In terms of reliability, the proponent should be able to demonstrate that its new technology can operate effectively and efficiently in standard operating environments. It would be reasonable for a consumer to expect that new small-scale technologies included in the RET are reliable when compared to more conventional technologies.

In assessing whether any new small-scale renewable technologies should be included in the RET, the Review examined whether the technology draws energy from a renewable source to either generate electricity or replace and perform the same function as specific electrical devices; is cost effective, and is reliable and readily able to be deployed in the market.

Small-scale technologies eligible under the previous Mandatory Renewable Energy Target, were market-ready and generally being deployed in niche areas, with technology cost a key impediment to wider deployment Assessing whether new technologies should be made eligible for the RET under this current review could draw on this concept, but may risk criticism that it is not technology neutral and will not create incentives through the RET for technologies at an early stage of development.

Under an alternative approach, assessment could be made on the basis of technology neutrality. Under that approach, a technology could be added to the list of RET eligible technologies whether or not it is market ready and irrespective of whether it is cost effective without RET support. Such an approach may risk criticism that it would provide de facto government endorsement for technologies that are not yet suitable for widespread deployment and establishes unnecessary cross subsidies for technologies that do not require support.

The Review has adopted a combined approach in which. Technologies are considered in terms of the following criteria:

- market-readiness
- whether or not they can achieve a net cost saving to the householder before RET support, and
- whether or not they can displace fossil-fuel based electricity generation.

  It is also recognised that a number of other complementary measures have, or are in the process of, being put in place to support renewable energy and clean energy. These include the Australian Renewable Energy Agency, Clean Energy Finance Corporation and Clean Technology Program. Together with the carbon price, these measures are central to the transition of our economy to a clean energy future and will provide crucial support to innovation and commercialisation of renewable energy technologies in Australia.

2.1.2 Increase to cost of the RET

Liable entities are required to source and surrender a certain number of STCs under the SRES component of the RET each year in order to demonstrate compliance with a target, called the Small-scale Technology Percentage (STP), which is set at the beginning of each year. The STP is set based on expected STC creation for the year, and taking into account any surplus or deficit from the previous year. This means that, unlike the LRET, the SRES is uncapped. Liable entities would generally pass on the costs associated with sourcing STCs as higher retail electricity prices.

Any new small-scale technology made eligible under the RET will be eligible to create additional STCs under the SRES. As such, a decision to include new small-scale technologies would increase the overall cost of the RET, and potentially its impact on electricity prices, to the extent of the additional STCs created.

2.1.3 Stakeholder submissions

To inform this Review, RESG released a discussion paper on this issue in October 2009. 61 submissions were received from several broad categories of stakeholders:

- organisations promoting a new small-scale technology to be included in the RET
- participants in the water heater market, including heat pump manufacturers and installers and their competitors

- renewable energy organisations, including developers of large-scale renewable energy projects, and
- environmental organisations.

While the separation of the RET into the LRET and SRES components addresses many of the concerns raised in the submissions that high uptake of small-scale systems acts to crowd out investment in large-scale renewable energy projects, discussion around which new technologies should be made eligible under the RET remains relevant.

For example Pacific Hydro (submission 24) argued that the RET should focus on supply-side electricity generation only, and suggesting that demand-side technologies be removed from the RET and integrated into a broad demand side policy framework:

Specific small-scale technologies should only be considered for inclusion in the RET where they are intended for use on the supply side of the meter and contribute to sent out electricity supply. These technologies should be subject to the same conditions under the RET as all other supply side technologies currently eligible and should therefore not qualify for a Solar Credits style multiplier.

In the longer-term, COAG should aim to remove small-scale technologies from the RET, using them instead as a key plank in a comprehensive demand side policy framework. This would provide appropriate targeted support to small-scale technologies and maintain the integrity of the RET.

Several of the submissions supporting inclusion of new small-scale technologies, particularly those supporting ground source (geothermal) heat pumps, stated that impact on existing technologies is not a legitimate reason for excluding new technologies from the scheme.

2.2 Assessment of New Small-Scale Technologies

SKM MMA was commissioned to provide an assessment of potential new small-scale technologies that could possibly be included as new eligible technologies under the SRES component of the RET, taking into account the policy considerations established by the Terms of Reference of the Review.

2.2.1 Stakeholder submissions

Broadly categorised, there were ten different technologies suggested for inclusion in the RET. These included:

1. Solar assisted cooling
2. Geothermal heat pumps
3. Fuel cells—generate electricity (and heat) from hydrogen rich fuels
4. Biomass fuelled heating or combined heat and power—uses various forms of biomass such as straw or woody weeds

5. Windmills for water pumping—converts wind energy directly into mechanical energy to pump water
6. Grey water heat exchangers—uses waste heat from discarded shower water to pre heat cold water prior to heating via a conventional method
7. Solar ponds—utilise the temperature differentials in saline lakes to provide thermal energy and potentially electricity
8. Solar Air
9. Solar evacuated tube, and
10. Azure Light Intelligence system.

Of these technologies, two have been identified as the most prospective against the agreed criteria and analysed further: solar assisted cooling, and geothermal heat pumps. The remaining technologies are discussed in Section 2.6 below.

2.3 Solar-Assisted Cooling

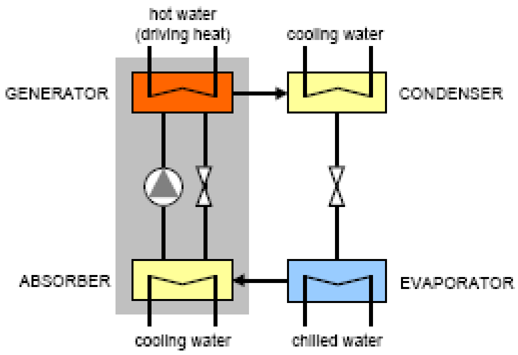
2.3.1 Description of technology

In a solar assisted cooling system, solar collectors are used to power a thermally driven cooling unit. In addition to the solar collectors and cooling unit, a typical system will require a storage tank, control unit and pipes and pumps. More recent technologies contain a solar assisted reverse cycle air conditioner to allow for heating as well as cooling.

Internationally, the most common cooling technology in operation is the absorption chiller. Adsorption chiller and desiccant cooling systems also exist although they are not widely used or available. Further, solar ejector cooling systems are currently in development with a number of prototypes in existence. However, these systems are not market ready and total costs remain comparable to or higher than absorption chillers.

An absorption chiller is a continuous, closed system that achieves cooling through the evaporation of water (the refrigerant) at low pressure (evaporator section of Figure 1). Generally, a lithium bromide (LiBr) and water solution is used to absorb the water vapour releasing heat which is externally vented (absorber section of Figure 1). The resulting more dilute solution is then pumped into the generator for regeneration (separation into concentrated LiBr slurry and water vapour) using solar heat (generator section of figure 1). The regeneration of the solution acts to cool the solution and improve efficiency. The generator is provided with hot water from the solar collectors and causes water to leave the generator and move to the condenser, where it is condensed by cooling water (condensor section of Figure 1), which causes a pressure drop. The water flows through an expansion valve, further cooling it, before it re-enters the evaporator and the cycle repeats.

Figure 1: The absorption process



Source: European Solar Thermal Industry Federation[2]

[2] European Solar Thermal Industry Federation, Key Issues for Renewable Heat in Europe—Solar Assisted Cooling—WP3, Task 3.5, 2006

2.3.2 Evaluating Solar Assisted Cooling Technology

In Europe, the estimated capital cost of an installed solar absorption system in 2008 was €4,500/kW[3] of energy input. The authors of that study note that these costs are expected to reduce to €3,000/kW of energy input in future but do not provide a time line for this cost reduction. In contrast, significantly higher costs of €3,000/kW for the cooling unit and €4,000/kW energy input for solar collectors, the balance of the system and installation costs have been provided for small scale absorption chillers in Europe by the Centre for Sustainable Energy Systems, Australian National University[4.] Lower costs would be expected in Australia as higher solar radiation levels enable the use of smaller solar collectors for the same cooling effect.

As such, the SKM MMA model assumes €3,000/kW of energy input for the air-conditioning unit and €3,000/kW energy input for solar panels (a reduction to reflect recent price declines)[5]. These capital cost estimates are similar to the average cost of $7,000/kW energy input contained in AIRAH's submissions to the review of the Renewable Energy (Electricity) Act[6]. This cost has come down recently due to the appreciation of the Australian dollar.

The conventional technology chosen for comparison is an average 7 kW cooling capacity inverter, reverse cycle split system air-conditioner. An air-conditioner of this size is sufficient to cool a large living area. The average capital cost for a system of this size was $1,925 and the average energy input required for cooling was 2.4kW. Installation costs were estimated at $1,000.

The estimated annual energy consumption of conventional air-conditioners for each capital city was calculated by SKM MMA on the basis of the number of hours of operation of the system provided in Table 2.1 below. Adjustments were made to the number of cooling hours per year in Hobart and Melbourne to account for more recent increases in the use of air conditioners.

[3] EuroSun 2008: Development and investigation of solar cooling systems based on small-scale sorption heat pumps, Jakob et al

[4] Personal communication from Dr Mike Dennis, Senior Research Fellow Centre for Sustainable Energy Systems, The Australian National University

[5] Based on July 30 2011 exchange rate of 1 AUD equal to 0.79 Euros.

[6] AIRAH. 2009. Submission to the review of the *Renewable Energy (Electricity) Act*

Table 2.1: Typical annual operating hours for air-conditioners by capital city[7]

Capital City	Cooling hours per year	Adjusted cooling hours per year
Brisbane	600	600
Adelaide	200	200
Canberra	150	150
Darwin	2,000	2,000
Hobart	50	124
Melbourne	100	248
Perth	300	300
Sydney	180	180

Source: SKM MMA estimates

Solar assisted cooling reduces energy consumption for space conditioning[8]. For the purposes of cost comparisons with a conventional system and the estimation of the number of STCs a system may receive, an enhanced 75% reduction in energy use has been assumed.

The estimated number of STCs per solar assisted cooling unit by state is shown in Table 2.2. These values have been calculated on the basis of the energy input required from a conventional air conditioner per hour and the average number of hours of operation. One STC has been allocated for each MWh of energy saved based on the assumed 75% reduction in energy use caused by a switch to solar assisted cooling. It is assumed that solar assisted units in Darwin, where there are an estimated 2000 cooling hours per annum, would receive a much greater level of STC support than a unit in Hobart, where the cooling is limited.

Table 2.2: Estimated number of STCs per solar assisted heating and cooling unit by State

Capital City	Estimated Number of STCs	
	Cooling Only	Cooling and Heating
Brisbane	16	22
Adelaide	5	20
Canberra	4	24
Darwin	54	54
Hobart	3	24
Melbourne	7	26
Perth	8	17

7 Sustainable Energy Development Office, Government of Western Australia, Your guide to energy smart air conditioners. 2004

8 Coolmax website 2009,last accessed 6 October, 2009

Sydney	5	16

Source: SKM MMA estimates

The system lives of both conventional and solar assisted cooling systems are assumed to be 15 years. In calculating the potential support provided by STCs, they are provided for energy savings deemed across the 15 year life of the product.

2.3.3 Break-even STC price required

Using the assumptions outlined above, SKM MMA has calculated the required STC price for a solar assisted cooling system installed in each state and territory that would make the cost of a solar assisted cooling system equivalent to the conventional technology it could replace. These results are presented below in Table 2.3.

Table 2.3: Estimated break-even STC price for solar assisted heating and cooling, $/certificate

State	Qld	NSW	ACT	Vic	Tas	SA	WA	NT
Cooling only	762	2,767	3,495	1,954	4,695	2,757	1,675	92
Cooling and heating	517	762	468	428	472	590	718	92

Source: SKM MMA analysis

The SKM MMA analysis indicates that for cooling purposes alone a solar assisted cooling system in all states and territories, with the exception of the Northern Territory, the required break-even price is considered extremely high even with the conservative assumption of a 75% reduction in energy consumption.

In regard to the Northern Territory, the high number of estimated cooling hours per year and subsequent net present value of energy savings over the life of the system (15 years) brings the break-even STC price down significantly.

Where both heating and cooling is concerned, for the southern states the break-even STC price is reduced significantly accounting for the increase in number of hours of operation during the cooler months and associated cost savings from further reductions in fossil energy consumption.

Considering the high capital costs of solar assisted cooling systems the impact of STCs alone would do little to close the gap in costs with a comparable conventional air conditioner. Table 2.4 presents the capital costs for solar assisted heating and cooling systems taking into account the estimated maximum level of support through the RET, using an STC price of $40 available through the voluntary clearing house.

Table 2.4: Solar assisted heating and cooling capital costs after STC support

Capital City	Capital costs	Estimated number of STCs—heating and cooling	Support through RET -$40 STC price	Capital costs after STC support
Brisbane	$18,000	22	$880	$17,120
Adelaide	$18,000	20	$800	$17,200
Canberra	$18,000	24	$960	$17,040
Darwin	$18,000	54	$2,160	$15,840
Hobart	$18,000	24	$960	$17,040
Melbourne	$18,000	26	$1,040	$16,960
Perth	$18,000	17	$680	$17,320
Sydney	$18,000	16	$640	$17,360

These estimates are particularly sensitive to the level of cooling hours per annum and if users typically ran their air-conditioners on a more regular basis and hence have high energy consumption costs, then a solar assisted cooling system may be a reasonable proposition.

Importantly, it should be noted that the break-even STC prices presented are only applicable at this point in time. Emerging technologies such as these solar assisted cooling systems are highly sensitive to capital costs. Like any new technology entering a market, long-term trends generally indicate capital costs decline over time as new technological advancements are made and the scale of production increases.

The very high break-even STC price implies there may be very little uptake of these expensive systems. However this is very sensitive to the assumptions made on costs and cost reductions over time. To test the sensitivity of the results presented above to the major assumptions, SKM MMA conducted a sensitivity analysis on the three major factors influencing the break-even STC price: capital costs, appliance usage and appliance efficiency.

The analysis indicated that even under the 'most favourable scenario' (capital cost -20%, appliance efficiency +20% and usage +20%), the STC prices required to support solar assisted cooling are still very high in all states except the Northern Territory. SKM MMA applied the 'most favourable scenario' parameters as part of the key assumptions used to model the impacts of including this technology in the RET.

2.4 Geothermal Ground-Source Heat Pumps

2.4.1 Description of technology

Geothermal heat pumps also known as ground source heat pumps (GSHPs) are used to transfer natural heat from the earth at shallow levels to the inside of a building for space and/or water heating. When operating to cool the air inside a building, heat pumps transfer the heat from the building and use the earth as a heat sink. A typical system comprises a ground loop, heat pump and heat distribution system.

The ground loop (a series of pipes) can be buried either in a bore-hole or a horizontal trench. In heating mode, water is pumped through the ground loop to extract heat from the ground. The heat pump then uses evaporation and condensing processes to transfer heat to the building. In cooling mode, the heat pump acts to remove the heat from the building and transfer it to the earth. Heat distribution systems can include low-temperature under-floor heating or radiators.

2.4.2 Stakeholder submissions

Seventeen of the submissions to this paper supported the inclusion of GSHP in the RET scheme. Various submissions refer to the technology as ground source heat pumps, direct use geothermal heating and cooling systems.

One of the primary reasons given for inclusion of this technology is that it is a form of heat pump, similar to air-sourced heat pumps that are already eligible under the RET, and utilises geothermal energy which is recognised as a renewable energy source under the RET scheme. It is argued that it is inequitable to include one type of heat pump while excluding another.

Many of the submissions made the further argument that GSHPs have several advantages compared to air-sourced heat pumps, the main one being that GSHPs are more efficient for heating in winter and cooling in summer. This is because ground temperatures are much more constant than ambient air temperatures. Other advantages of this technology cited in submissions are its ability to reduce peak electricity demand and its ability to produce energy 24 hours a day. [9]

Several examples were provided of demonstration projects in Australia that are completed or planned, with the most common being the Geothermal Australia building and the Brush Ski Lodge resort at Mt Hotham. Submissions also noted that ground source heat pumps have been much more widely deployed in the USA, Canada and the EU compared to Australia.

The high capital costs of this technology were mentioned by quite a few of the submissions. The above-ground components of ground source heat pumps are similar in cost to air-sourced heat pumps. However, drilling wells to access the geothermal energy adds significant cost.

9 The Energy Arbiter (TM) is a combination cogeneration and heat pump system that can be used in space and water heating. According to the proponent of the technology, Electricity Markets Research Institute (Submission 76), the Energy Arbiter includes a heat pump that can use geothermal heat or solar heat from the ambient air as its heat source. To the extent that this technology uses a heat pump utilising solar heat from the ambient air, it could already be eligible under the RET, subject to meeting the requirements for heat pumps set out in the regulations. If the Energy Arbiter used a geothermal heat pump, the eligibility of this technology is also being considered by this review.

2.4.3 Evaluating Geothermal Heat Pump technology

Based on research on domestic and international data, as well as information garnered from public submissions, SKM MMA assumed a capital cost of $8,000 (including installation) for a 7kW system. This is halfway between the estimates on capital costs for GSHPs obtained from two sources[10] and figures provided by the Australian Geothermal Energy Group (AGEG)[11].

SKM MMA has found data from various sources on energy consumption reductions from GSHPs. For example the International Ground Source Heat Pump Association and the United Kingdom Ground Source Heat Pump Association UK suggest similar savings in running costs of 25% to 50% compared to conventional technologies such as reverse cycle split system air-conditioners. While EnergyCore estimates that its geothermal systems can cut energy bills by up to 75%[12]. SKM MMA assumed running costs relate primarily to the cost of energy and for the purposes of cost comparisons with a conventional system, the midpoint reduction in energy use of 50% has been assumed. It was assumed that these energy savings apply to both heating and cooling requirements.

The estimated annual energy consumption of conventional heating systems for each capital city was calculated on the basis of the number of hours of operation of the system provided below in Table 2.5.

Table 2.5: Typical annual operating hours for heaters by capital city[13]

Capital City	Heating hours per year	Adjusted heating hours per year
Brisbane	100	200
Adelaide	250	500
Canberra	500	700
Darwin	0	0
Hobart	450	720
Melbourne	350	700
Perth	150	300
Sydney	200	400

Source: SKM MMA estimates

The system life of a GHP is estimated at 50 years for the full system, but an assumed life of 15 years is used as this is the estimated life of the inside components of the system. Ground loop equipment has an expected life of about 50 years[14]. In calculating the potential support provided by STCs, they are provided for energy savings deemed across the 15 year life of the inside components of the product.

10 Centre for Alternative Technology UK, Ground source heating fact sheet, 2009 and Cumming, P. Indiana residential geothermal heat pump rebate: program review, Indiana office of Energy and Defense Development, 2008.

11 Australian Geothermal Energy Group, Submission to COAG review of renewable energy target scheme design, 2009.

12 EnergyCore, http://www.energycore.com.au/, last accessed 20 October, 2009

13 Sustainable Energy Development Office, Government of Western Australia, Your guide to energy smart air conditioners. 2004

14 U.S. Department of Energy, Energy Savers: geothermal heat pumps, http://www.energysavers.gov/your_home/space_heating_cooling/index.cfm/mytopic=12640, accessed 20 October, 2009

Little data was available on the maintenance costs associated with geothermal heat pumps. As a result it is assumed that these costs are equivalent to those required for a conventional system.

The conventional system chosen for comparison is the same as for solar assisted cooling. That is, an average 7kW cooling capacity inverter, reverse cycle split system air-conditioner. The average energy input required for heating is 2.52kW. As this technology is able to provide both heating and cooling, it was considered the most appropriate reference.

The estimated number of STCs that a GSHP will be eligible for was calculated on the basis of the energy saving achieved from displacing conventional heating and cooling technologies. If the GSHP system was used to displace only heating or cooling the number of STCs generated would be reduced.

Table 2.6: Estimated number of STCs per GSHP system by capital city

Capital City	Estimated number of STCs	
	Heating Only	Heating and Cooling
Brisbane	9	36
Adelaide	24	33
Canberra	33	40
Darwin	0	89
Hobart	34	39
Melbourne	33	44
Perth	14	28
Sydney	19	27

Note: Assumes the unit is used for heating and cooling.

2.4.4 Break-even STC price required

Using the assumptions outlined above, SKM MMA has calculated the required STC price for a GSHP system installed in each state and territory that would bring the cost of the system in line with the conventional technology it could replace. These results are presented below in Table 2.7.

Table 2.7: Estimated break-even STC price for GSHP, $/certificate

State	Qld	NSW	ACT	Vic	Tas	SA	WA	NT
Heating only	706	262	104	113	99	191	429	-
Heating and cooling	51	100	43	37	47	70	97	-

Source: SKM MMA estimates

The SKM MMA analysis indicates that for heating purposes alone, the required break-even price for geothermal heat pump systems in all states and territories is high. This is particularly the case in the states with low annual heating demands such as Queensland and Western Australia. For the Northern Territory, it is assumed there was no heating requirement.

Where the technology is used for both heating and cooling purposes, the break-even price in all states and territories is reduced given the increase in the number of hours of operation during the warmer months and related savings in energy consumption

These estimates are particularly sensitive to the level of heating and cooling hours per annum and if users typically ran their air-conditioners on a more regular basis and hence have high energy consumption costs, then a geothermal heat pump would be a reasonable proposition.

Considering the capital cost of a system is assumed to cost around $8,000, the impact of STCs would assist in closing the gap between GSHPs and a comparable conventional air conditioner (estimated at $2,925 installed). However, it is evident that even in areas that receive a larger allocation of STCs, GSHPs still have considerably higher capital costs. Table 2.8 presents the capital costs for GSHPs taking into account the estimated maximum level of support through the RET, using an STC price of $40 available through the voluntary clearing house.

Table 2.8: Capital costs for Ground Source Heat Pumps after STC support

Capital City	Capital costs	Estimated number of STCs—heating and cooling	Support through RET - $40 STC price	Capital costs after STC support
Brisbane	$8,000	36	$1,440	$6,560
Adelaide	$8,000	33	$1,320	$6,680
Canberra	$8,000	40	$1,600	$6,400
Darwin	$8,000	89	$3,560	$4,440
Hobart	$8,000	39	$1,560	$6,440
Melbourne	$8,000	44	$1,760	$6,240
Perth	$8,000	28	$1,120	$6,880
Sydney	$8,000	27	$1,080	$6,920

In line with the commentary on the sensitivities of modelling solar assisted cooling systems, it should be noted the break-even STC prices presented are only applicable at this point in time. It could be expected the capital costs will decline over the long-term as further technological efficiencies are made and the scale of production increases.

While the high break-even STC price implies there may be very little uptake of GSHP systems, it should be noted that this is very sensitive to costs and the estimated profile of the expected cost of systems over time. To test the sensitivity of the results presented above to the major assumptions, SKM MMA conducted a sensitivity analysis on the same three factors as influencing the break-even STC price: capital costs, appliance usage and appliance efficiency.

Based on the analysis MMA has determined that capital cost is the most influential factor, with the GSHP becoming economically viable without the need for STC support in all states and territories where capital costs were reduced by 20 per cent for heating and cooling applications.

2.5 Potential Impacts of Inclusion of Solar-Assisted Cooling Systems and Geothermal Ground-Source Heat Pumps

Three scenarios were established to test the impact of inclusion of these small scale displacement technologies. The scenarios were:

- Inclusion of solar air-conditioning only.
- Inclusion of ground source heat pumps.
- Inclusion of both solar air conditioning and ground source heat pumps.

The model used by SKMMMA to forecast uptake of small-scale displacement technologies takes into account the net cost of generation (after taking into account government support measures) as well as a premium prepared to be paid for small scale embedded generation. The premium is calculated based on market survey data and other published market data. Further information on the model can be found in sections 2.1 and A.2.3 of the SKM MMA modelling report.

The SKM MMA modelling report notes that because these technologies are relatively novel, the information on installation costs and energy savings is uncertain. Therefore the findings should be interpreted with care as the impacts could change substantially should installation costs be far lower or energy savings benefits far greater than assumed.

2.5.1 Certificate creation

Uptake is limited by the immaturity of some of the technologies (solar air conditioning) as well as their high capital costs. The uptake projected also depends on assumed reductions in capital cost being achieved and rapid acceptance by consumers. In the case of ground source heat pumps, the potential uptake could be greater than modelled as uptake in existing buildings was assumed to be constrained by space limits.

When both small scale displacement technologies are eligible, certificate creation increases to a projected level of up to 3.4 million STCs per annum by 2017, falling to an increase of around 2 million certificates per annum over time. The level of certificate creation is not a simple addition of the certificate creation for each technology alone as these technologies compete with each other in some regions.

Figure 2: STC certificate creation with other displacement technologies

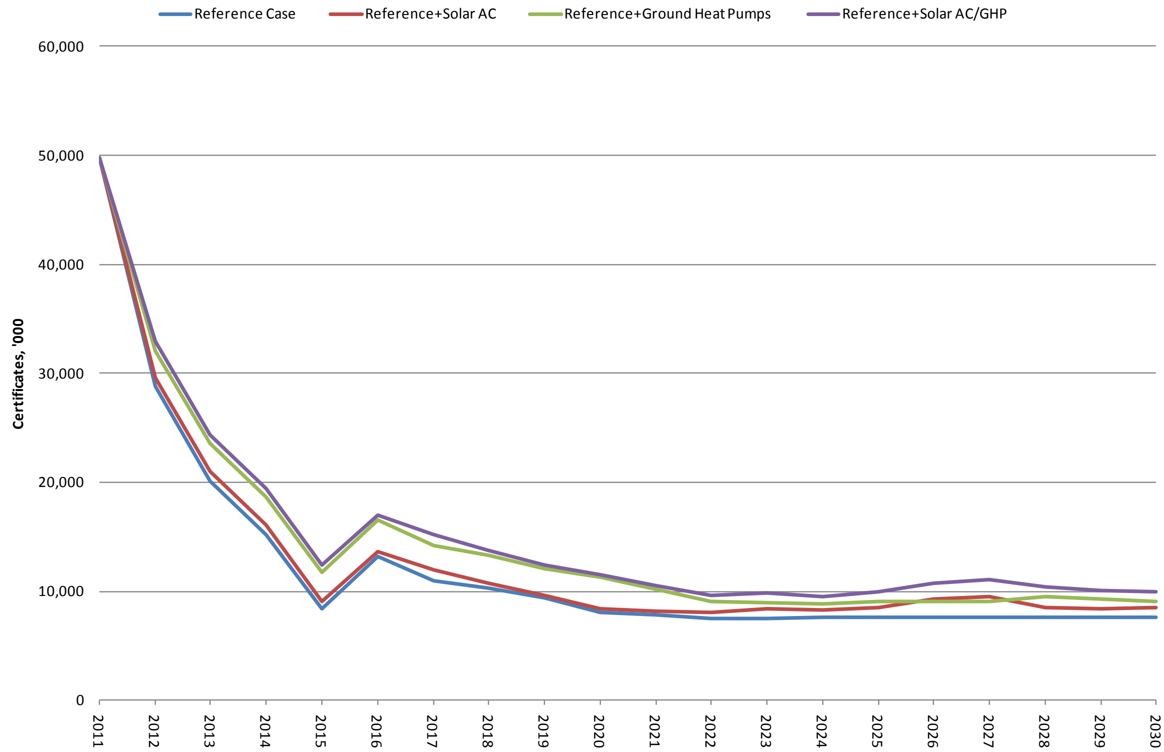
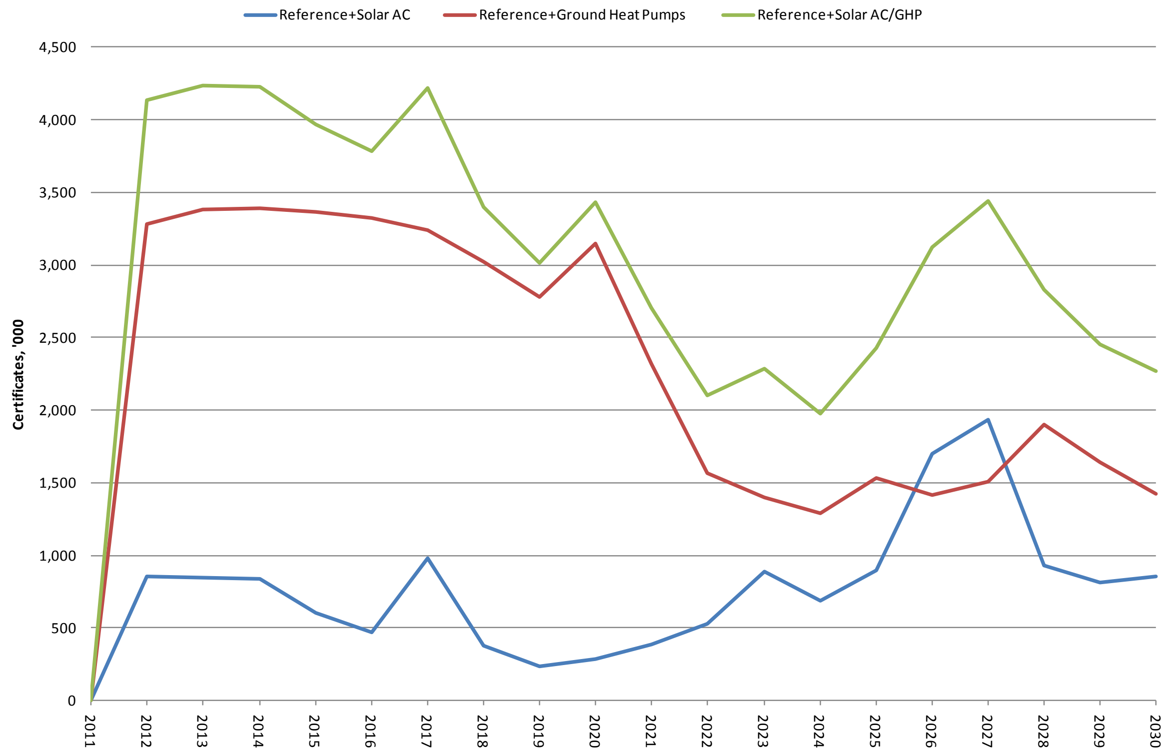


Figure 3: Additional certificate creation



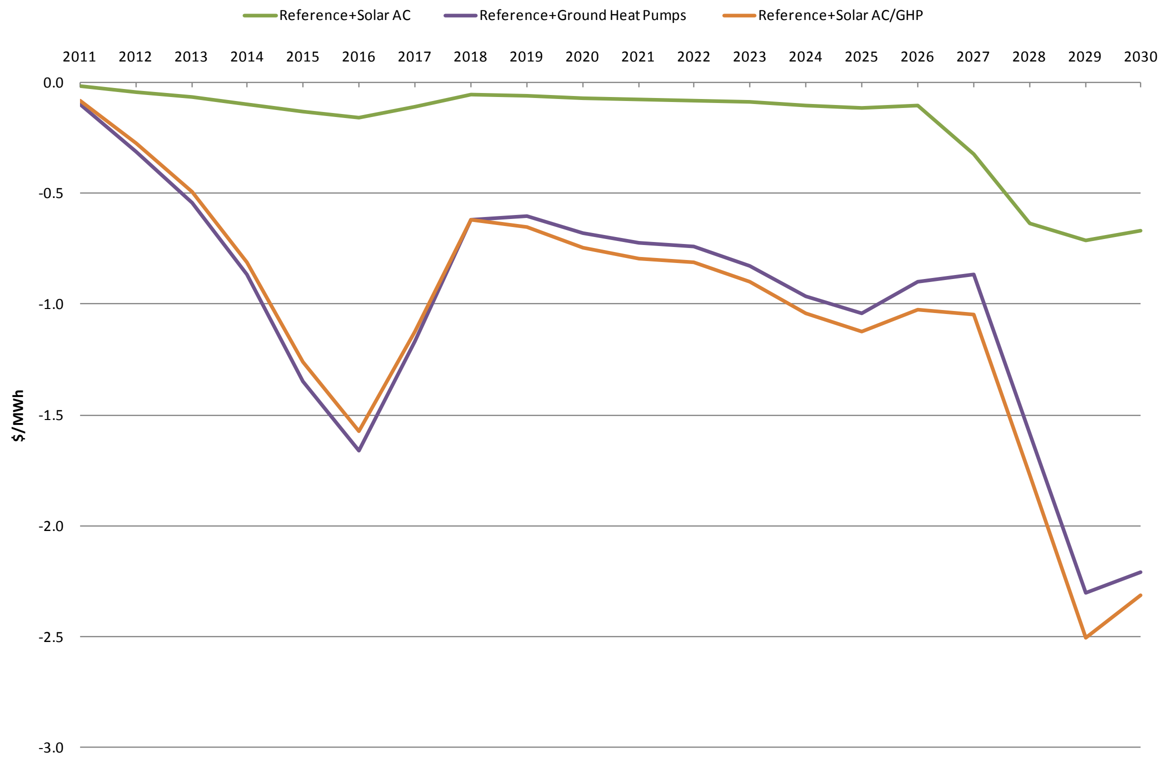
2.5.2 Electricity prices

There are two factors that affect electricity prices as a result of uptake of these technologies:

- Impact of increased uptake on wholesale prices. Ground source heat pumps and solar air conditioning are likely to displace electricity demand supplied by the grid during the peak summer and winter periods when wholesale prices are high.
- Cost of purchasing additional certificates under the SRES scheme. The additional permits would need to be purchased by liable entities at prices up to the $40 clearing house price set for certificates.

Uptake of solar air conditioners reduces electricity peak demand by around 75 MW by 2020. Uptake of ground source pumps (used for both cooling and heating) reduces peak demand by around 500 MW. Combined the demand is reduced by a little over 600 MW. These reductions in peak demand reduce wholesale electricity prices in the period to 2020 by about $0.1/MWh when only solar air conditioners are included, around $0.8/MWh on average when ground source heat pumps are included and about $0.8/MWh when both are included. The decrease represents a reduction in wholesale prices of around 1.3 per cent.

Figure 4: Change in wholesale prices relative to baseline



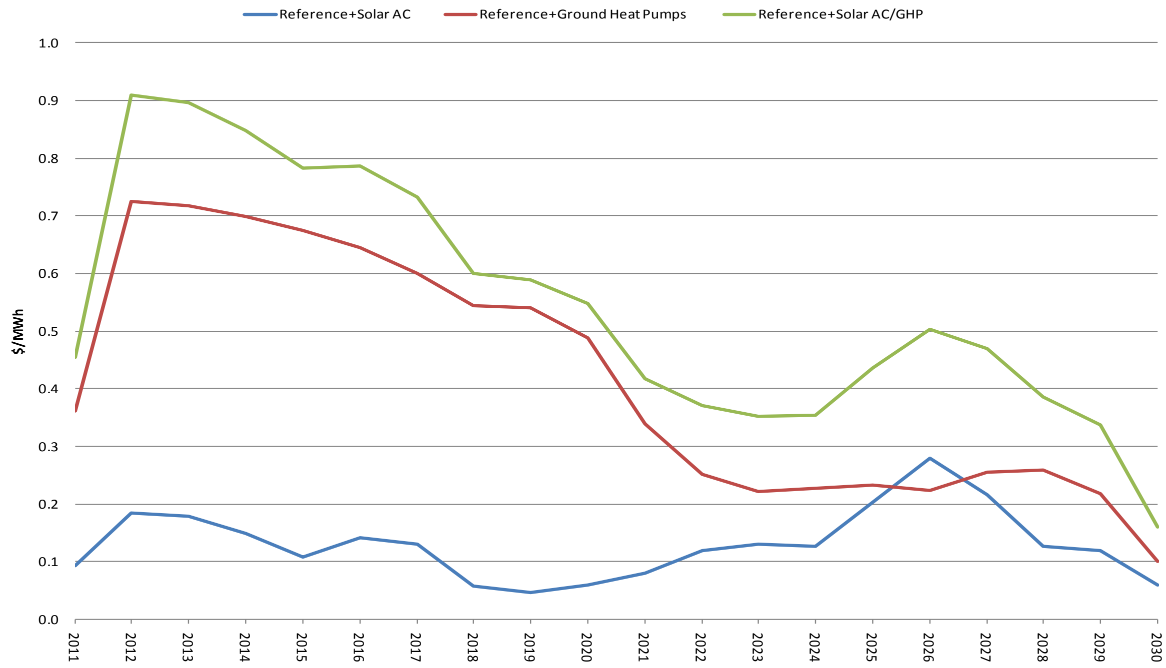
Compliance costs depend on the uptake of these appliances. Although uptake of solar air-conditioners is low, uptake of ground source heat pumps is quite high. The present value of the cost of purchasing additional certificates to cover this uptake ranges from $167 million to $1,535 million. The additional compliance cost is on average between $0.1/MWh to $0.6/MWh when spread over liable load.

Table 2.9: Compliance cost

	Costs			Present value, 2011-2030
	2011-2020	2021-2030	2011-2030	
Additional cost, $M				
Reference+Solar AC	205	259	464	263
Reference+Ground Heat Pumps	1,064	414	1,478	961
Reference+Solar AC/GHP	1,269	673	1,942	1,225
Additional compliance cost, $/MWh				
Reference+Solar AC	0.1	0.1	0.1	
Reference+Ground Heat Pumps	0.6	0.2	0.4	
Reference+Solar AC/GHP	0.7	0.4	0.5	

The impact on retail prices is a small change in price. If it is assumed there is no impact on wholesale price (or the wholesale price reduction is not passed through to customers) then retail prices increase by a maximum of $1.00/MWh (see Figure 5). The average price increase over the period to 2030 is less than $0.5/MWh or less than 0.5 per cent of the retail price in the reference case for residential and commercial customers. These figures can be considered as the most conservative estimate. If the wholesale price reduction is included, then there is a small reduction in retail prices of around $0.5/MWh.

Figure 5: Impact on retail prices when wholesale price impacts are not included



2.5.3 Renewable generation mix

The level of renewable generation under the policy cases increases compared with the reference case. Under the policy case which includes both ground source heat pumps and solar assisted cooling systems, the proportion of renewable generation reaches around 24.4% in 2020, around 0.3 percentage points higher than the reference case (see Figure 6). Under the reference case generation is measured on a sent out basis and includes the contribution of displacement sources of renewable energy (namely solar and heat pump water heaters).

The uptake of the displacement technologies is predicted not to impact on the market for solar water heaters and small scale PV systems. This is because uptake is confined largely to new homes and because uptake is limited to a small number of customers, most likely high income customers.

Figure 6: Proportion of total generation provided by renewable energy

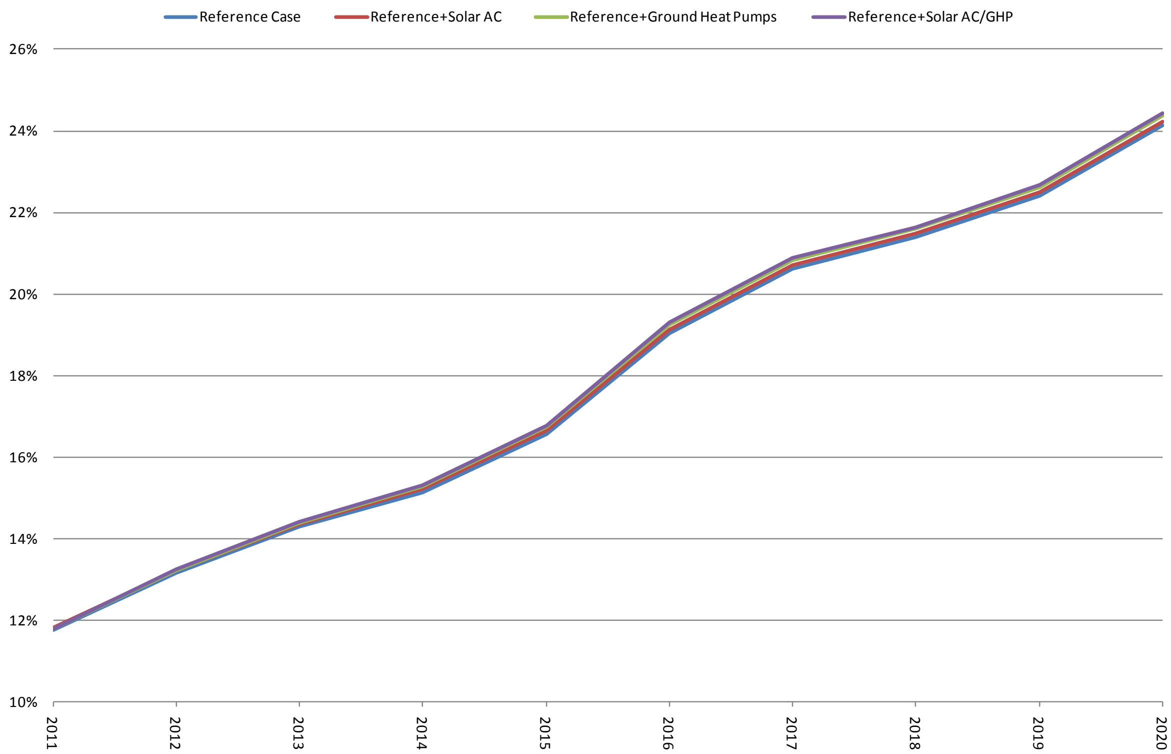
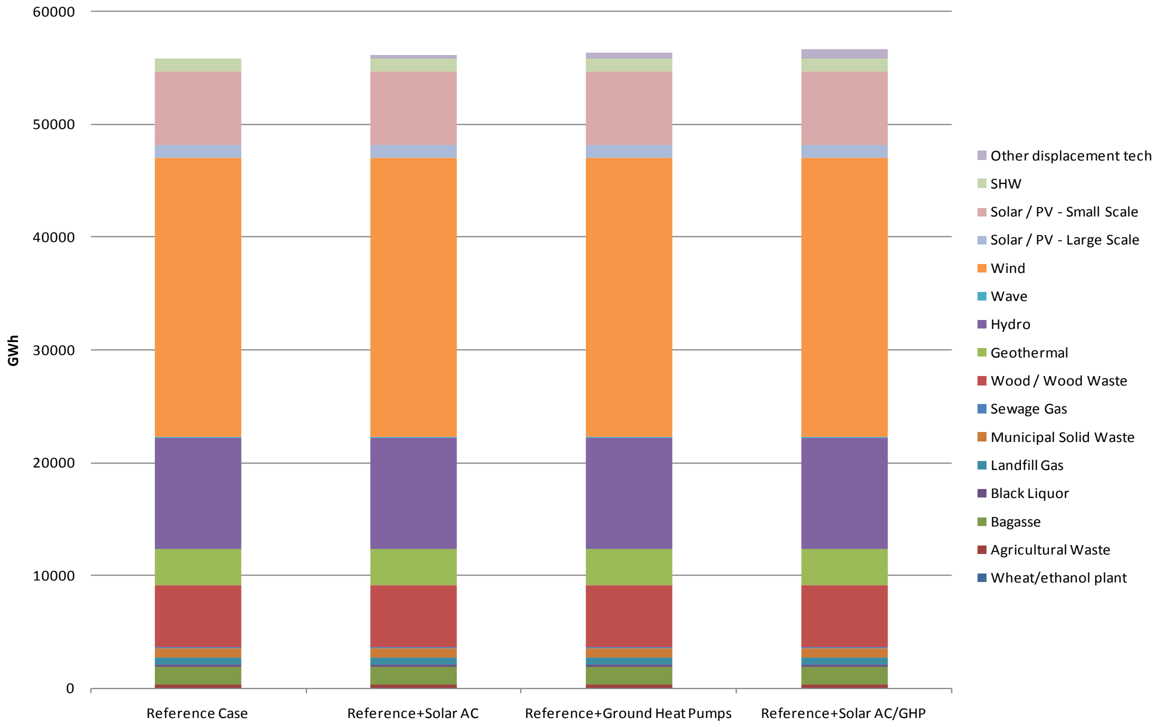


Figure 7: Renewable generation mix, 2020



2.6 Other New Technologies Assessed

Several other new small-scale technologies were proposed for inclusion in the RET by the submissions received, in addition to solar air-conditioners and ground-source heat pumps. Outlines of analyses of these technologies in terms of the agreed criteria are presented below. As indicated earlier in this report, none of these technologies was regarded, on balance, as sufficiently prospective to warrant more detailed consideration under the Review.

2.6.1 Fuel cells

Fuel cells convert natural gas into electricity and heat. Fuel cells convert the chemical energy in the fuel directly into electricity, heat and water. The conversion process used by fuel cells is efficient and produces significantly less greenhouse gas emissions than conventional electricity production.

Fuel cells have the potential to run on renewable fuels such as biogas, biodiesel and ethanol in the future. Fuel cells that use renewable energy sources are already eligible under the LRET scheme. However, fuel cells currently utilise natural gas as a feedstock which is not a renewable energy source, and under these circumstances it is not appropriate to include them in the RET as an eligible small-scale technology.

2.6.2 Biomass fuelled heating or combined heat and power using various forms of biomass such as straw or woody weeds

Biomass can be used to generate both heat and power and can use various sources of biomass as fuel. These include flammable residues and wastes such as straw, chipped plantation harvest residues, woody weeds, or municipal solid waste. Although the size of the systems that utilise biomass can vary considerably, a 3kW system has been chosen for the purpose of analysis.

Modelling of this technology suggests that support through the RET is not required to ensure a net cost saving over the life of the system compared to the installation of a conventional heating system in all states except Queensland and NSW (the system is not relevant to the Northern Territory where there is no heating load). However, inclusion in the RET may be supported on technology neutrality grounds.

In addition, there would be difficulty in adopting an appropriate deeming methodology for small-scale biomass-fuelled systems. The current deeming methods applied for small-scale solar PV, solar water heaters, mini-hydro systems and micro-wind turbines all take into account average solar insolation levels, average wind speeds and average water flow levels in determining the amount of electricity generated or displaced over a specific time period. As biomass heaters require constant fuel input which is at the discretion of system owners, it would be difficult to accurately determine the level of energy displaced for each installation.

2.6.3 Windmills for water pumping

Windmills for water pumping use the power of the wind which acts directly onto the pump through the up and down stroke created by the revolution of the wheel. Through this mechanism, wind energy is converted into mechanical energy to draw water from bores, wells, dams, rivers and other sources of fluid.

Windmills for water pumping are a well-established technology that has been available for many years and have been widely deployed. According to Comet Windmills Australia Pty Ltd (Submission 30), there have been an estimated four million windmills for water pumping installed in Australia to date. Support through the RET is not required to ensure a net cost saving over the life of the system. However, inclusion in the RET may be supported on technology neutrality grounds.

2.6.4 Grey water heat exchanger

A grey water heat exchanger recovers heat from waste water such as drain water from domestic showers. These devices can operate with or without a storage capacity although, where there is no storage capacity, the system requires a simultaneous supply of fresh and waste water.

The model proposed by Statula Industries (Submission 33) uses drain water from domestic showers to pre-heat fresh, cold water that is then delivered to the standard water heater. The system operates by piping the waste water and fresh water in concentric pipes and allowing the natural exchange of heat between the two pipes.

Modelling of this technology suggests that support through the RET is not required to ensure a net cost saving to the householder over the life of the system where the standard installed water heater uses electricity as its fuel source.

Furthermore, this technology utilises waste heat, and therefore does not use renewable energy to either generate electricity or displace electricity use. It does however utilise a resource that is otherwise wasted.

2.6.5 Solar ponds

Solar ponds may be used to generate large amounts of relatively low grade heat by using the natural properties of the salt water to collect and store heat. If a salt lake (3m deep) is managed such that hyper-saline water is on the bottom of the lake and less saline water on the top, then the lake cannot cool by circulation and will accumulate solar heat. Such lakes have reached temperatures of 106^0C (90^0C is common). This heat can be extracted by pumping water through pipes on the floor of the lake.

According to the proponent of this technology, Enersalt Pt Ltd (Submission 81), this technology is used for niche industrial applications such as animal breeding (e.g. pig & crocodile producers), dairy farming, aquaculture, glass house horticulture, and in abattoirs. As such, it is not a technology that is likely to be deployed at the household scale.

Unlike other displacement technologies currently eligible under the RET, it is not clear that this technology will displace fossil-fuel based electricity generation in all cases. It may displace gas-fired heating in some applications. Inclusion of this technology in the RET may be supported on technology neutrality grounds.

2.6.6 Solar Air

This technology uses the existing roof structure to act as a solar collector and heat the air within the roof space. A fan is used to transfer the heated air into the living space via a duct or network of ducts. Systems can be designed so as to provide cooling for homes by releasing over heated air from the roof space and bringing cooler air into the building when external temperatures are lower than internal temperatures.

Modelling of this technology suggests that support through the RET is not required to ensure a net cost saving to the householder over the life of the system where the standard installed air conditioner uses electricity as its fuel source. The additional cost of the solar air system will be recovered in energy savings within the first two years of operation based on NSW electricity prices. However, inclusion in the RET may be supported on technology neutrality grounds.

2.6.7 Small-scale solar thermal technologies

There were several submissions that described technologies that utilise solar thermal energy for combined heating and cooling and electricity generation.

One technology uses solar evacuated tube collectors to capture solar energy and convert it into electricity. Any excess power is stored in thermal form for use when solar power is unavailable. Two submissions were received that proposed the inclusion of this technology, although one of the proposed systems also used the solar energy for water and space heating in addition to electricity generation. This technology is considered to be at the early demonstration stage and is therefore not currently ready for large scale deployment.

A second technology uses solar thermal collectors (Azure Light Intelligence System, Azure Energy Ltd, Submission 20) to generate heat which is transferred to thermal storage tanks prior to use in a number of applications. Possible applications are stated to include: electricity generation, space conditioning, water heating and powering thermal chillers. It is also claimed that the system is able to store hydrogen. At the time submissions were made, this technology was expected to be on the market within two years, with an initial production capacity of approximately 500 units per year. Research indicates that this technology is still in the development stages. Insufficient detail was provided in the submission on this technology to ascertain the amount of support needed once market-ready, however it is anticipated the initial capital costs would be quite high. .

Small generation units that use solar energy are already eligible under the RET. However, under the current regulations only solar photovoltaic technology is eligible. While these small-scale solar thermal technologies are able to generate electricity or displace electricity, none of these technologies are considered market ready. There are risks associated with making these technologies eligible under the RET because stakeholders are likely to view this as Commonwealth endorsement of their readiness for widespread uptake.

2.6.8 Suitability for inclusion in the RET

The technologies discussed above may not be considered suitable for inclusion in the RET as they either: do not use a renewable energy source; do not require support under the RET to achieve a net cost saving to the householder; do not displace fossil-fuel based electricity generation in all cases; or are not yet market-ready. As such, the impacts of their inclusion have not been modelled by SKM MMA.

2.7 Recommendation on New Small-Scale Technologies

RESG's recommendation is to not extend eligibility under the RET to any new small-scale technologies. RESG considers that the uncapped nature of the SRES combined with the uncertainty inherent in the modelling mean an unacceptable level of uncertainty regarding the potential impacts of including new technologies, particularly on electricity prices. While the SKM MMA analysis indicates relatively minor impacts on electricity prices as a result of including the two technologies modelled, RESG notes SKM MMA's caveat around the uncertainty inherent in this modelling.

Further, it is RESG's view that as displacement technologies, the two technologies modelled would be better suited to support under an energy efficiency scheme rather than a scheme that is primarily designed to support renewable electricity generation.

2.8 Direct-Use Geothermal Aquifers and RET Eligibility

2.8.1 Introduction

Discussion of this new larger-scale renewable technology has been included here as an example of an innovative emerging technology. As the Terms of Reference for the Review do not contemplate the inclusion of this technology, it is not a remaining issue of the Review, and as such RESG has not provided the SCCC with a recommendation on this issue.

Direct-use geothermal energy technology does not generate electricity, but rather displaces its consumption. As such, direct-use geothermal energy-based plant is not eligible for accreditation under the Large-scale Renewable Energy Target (LRET). Extending eligibility under the LRET to direct-use geothermal applications would involve a significant policy shift for the RET away from electricity generation and require extensive changes to the legislation to enable the allocation of certificates for non-electricity technologies under the LRET.

While the Australian Government is not currently contemplating such a change to the RET, the next independent statutory review of the RET scheme is scheduled to commence in the second half of 2012. This broad-based review may provide an opportunity for stakeholders to raise issues such as the eligibility of direct-use geothermal energy under the LRET for consideration. The Commonwealth Government is substantially enhancing its support for innovation and investment in renewable energy as a central element of its plan for a clean energy future. Initiatives which complement a carbon price and the RET scheme and may provide future opportunities for development and deployment of technologies such as large-scale direct-use geothermal in Australia include the new $10 billion Clean Energy Finance Corporation and the new independent Australian Renewable Energy Agency.

2.8.2 Background on the technology

Geothermal energy used for electricity generation is currently included in the RET as an eligible source in two forms—hot dry rock and geothermal aquifer. Currently, no power stations are accredited to use these renewable energy sources to generate power. However, according to the SKM MMA modelling, geothermal energy from hot dry rock technology could contribute significantly to the RET target by 2020.

Several submissions, including the Australian Geothermal Energy Association (Submission 67) and the Western Australian Geothermal Centre of Excellence (Submission 66) suggested that direct use geothermal energy (utilising the hydrothermal energy of water) employed on a large scale for heating and cooling be included in the RET.

This technology utilises low to medium temperature geothermal resources, where the heat is drawn from an aquifer. In Australia, the Perth Basin has been identified as having a significant low to medium temperature geothermal resource. The heat is drawn from a depth of up to 3km, accessing temperatures in the range of 75-100 degrees. This technology can be distinguished from ground source heat pumps, which utilise heat at lower temperatures from significantly shallower depths for heating and cooling, and geothermal hot dry rock technology, which extracts heat at higher temperatures from greater depths for electricity generation.

A typical system comprises:

- a geothermal energy source which consists of a production well drawing on the aquifer and the injection well returning water to the aquifer
- the central plant containing a heat exchanger for heating and an absorption chiller for cooling
- the distribution network, which consists of two systems—one for cycling hot water, and one for cycling chilled water, and
- the consumer system.

As an example, through the Commonwealth Government's Education Investment Fund, around $20 million has been allocated to CSIRO for a geothermal direct-use project to use geothermal energy to provide cooling to the Pawsey High-Performance Computing Centre, and cooling and heating to the co-located CSIRO facility, the Australian Resources Research Centre, in Perth. This will be one of Australia's largest direct-heat use geothermal demonstration sites.

The submission received from the Australian Geothermal Energy Association proposes a definition for direct use geothermal energy plants, suggesting that they be defined as having a capacity rating of no less than 200kW, displacing no less than 1,250 MWh of electricity per year.

According to the submission from the Western Australian Geothermal Centre of Excellence, the capital costs of this technology are $460,000/MW for absorption chiller systems, which have an effective life of 20 years and use $1/7^{th}$ of the greenhouse gas emissions compared to conventional technology. The Australian Geothermal Energy Association notes that the capital costs of the technology are approximately five times higher than conventional electric compression chiller technology, due to the drilling costs involved in accessing the geothermal resource. However, the technology is expected to reduce energy costs for heating and cooling by 80 per cent, compared to a conventional electric compression chiller.

Direct use geothermal energy for commercial-scale or district heating and cooling is an example of a relatively large-scale displacement technology. Currently, the only displacement technologies eligible under the RET are solar water heaters and heat pumps, which are smaller-scale technologies, primarily deployed at the household level. Deeming output for systems of the size envisaged may be problematic. However, it would be possible to meter actual energy flows to arrive at a megawatt-hour energy displaced equivalent.

2.8.3 Potential Impact on LGC market and existing eligible technologies

Technology assumptions

There are a large number of technologies that could utilise geothermal heat. Different commercial and industrial loads will have different requirement for size of system and performance characteristics. In this analysis, it was not possible to model all potential users for this technology, and only representative users were modelled.

The major technology assumptions include[15]:

- Capacity ranging from 0.3 MW_{th} to 5 MW_{th}.
- 80% of energy consumed by conventional system is displaced by geothermal sources for an equivalent level of output.
- Capacity factor of 70%.
- Additional installed capital cost starting at $1,500/$kW_{th}$. This is assumed to cover the additional cost of pipe work to access the geothermal resource. It is assumed there is no additional cost to the electric alternative for the heating/cooling equipment.
- Operating costs are no different to electricity alternatives, with the exception of the energy cost component (only 20% of the electric alternative).
- Life of system of 20 years.

Information on the resource potential and its proximity to major loads is limited. The analysis has been limited to resources in south west Western Australia, where there has been some limited development. It has also been assumed that it would take 10 years for the industry to mature enough to allow maximum installation rates.

Given these limitations, the analysis of impacts should be seen as indicative only.

Uptake

Uptake is limited due to the cost of the technology, the fact the resource is located in areas where the load is limited and the need to install additional infrastructure in existing premises. The modelling indicates around 500 GWh of electricity generation equivalent is installed by 2020 (see Figure 8).

Uptake of geothermal aquifer as a heat source under the LRET scheme will impact on the mix of large-scale renewable generation (see Figure 9). The analysis indicates displacement of some biomass resources and some wind generation, but it also reduces generation from other geothermal technologies (assuming these are developed in time).

[15] Sourced from submissions to *the COAG Review of Eligibility of New Small Scale Technologies and Heat Pumps within the RET*.

Figure 8: Uptake of geothermal aquifer heat sources, electricity generation equivalents

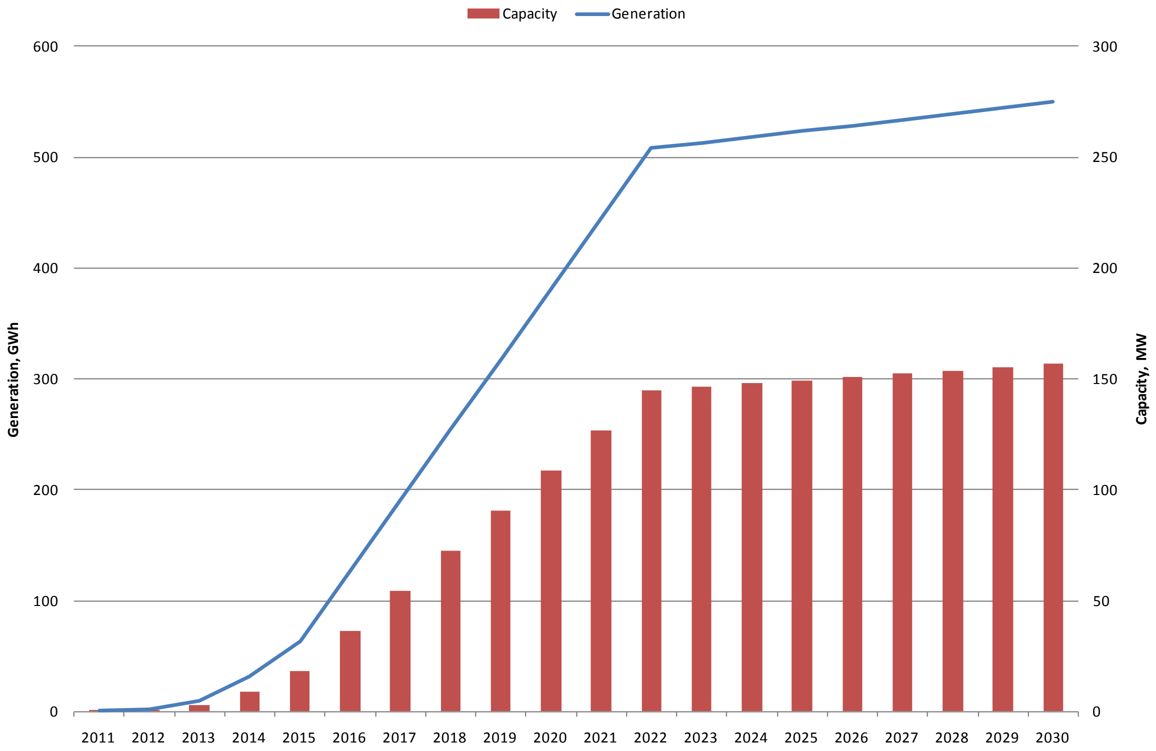
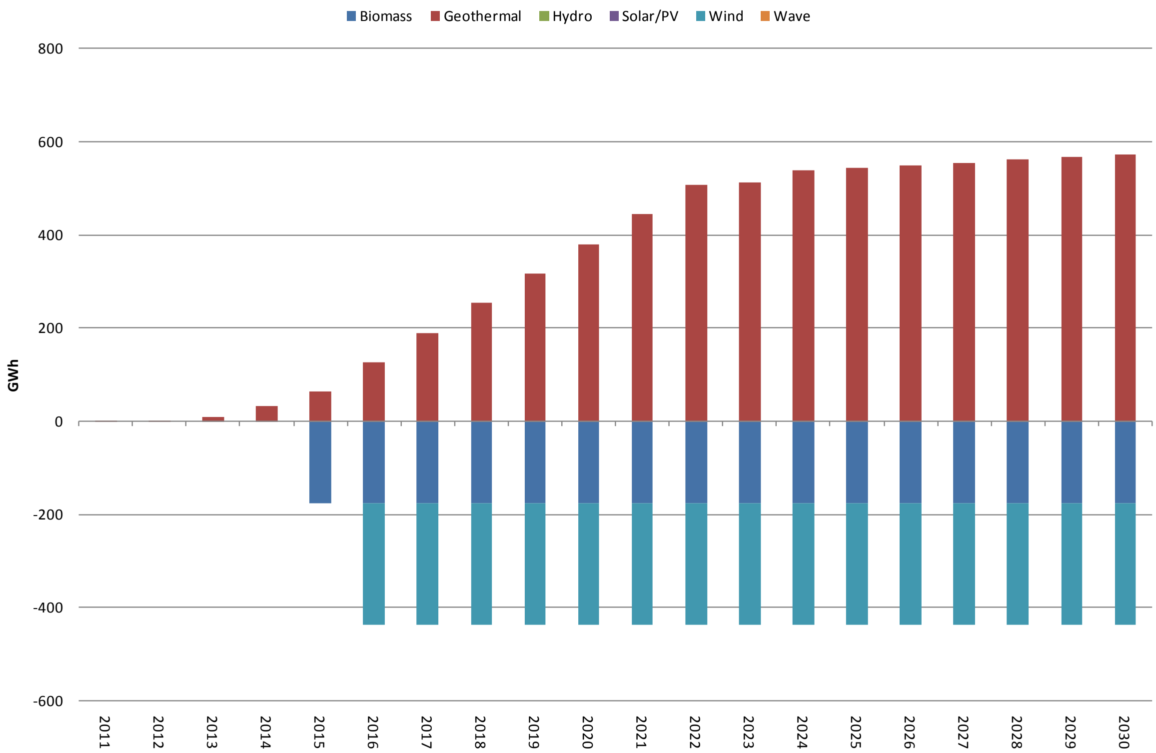


Figure 9: Generation displaced by uptake of geothermal aquifer heat sources.



Impacts

Inclusion of geothermal aquifer as a heat source under the LRET scheme has minimal impact on LGC prices, with a reduction in average LGC prices of around $1/certificate (see Figure 10). This small decrease leads to minimal impacts on retail prices, resulting in a small decrease of less than

1.0% on average over the period to 2030 (see Figure 11). The decrease occurs because the limited uptake of geothermal displaces some more expensive renewable generation options and becomes the marginal plant setting the price.

Figure 10: Impact on certificate prices

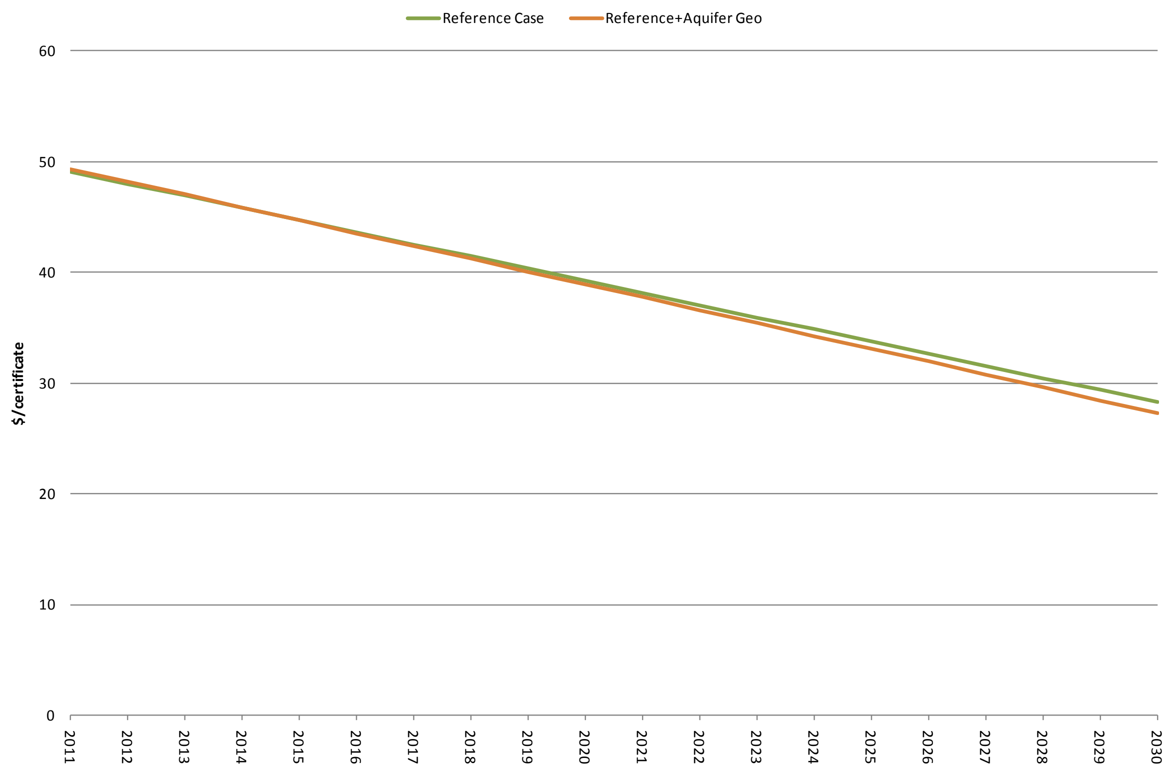
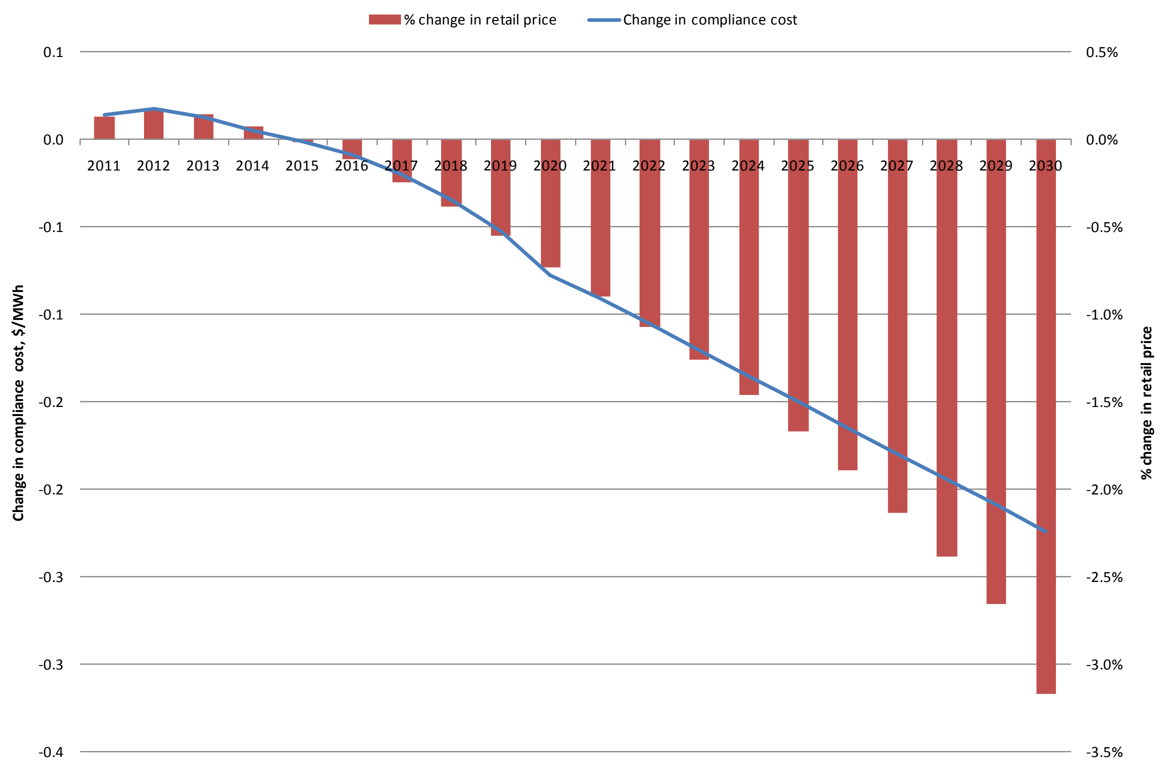


Figure 11: Impact on retail prices



CHAPTER 3—SELF-GENERATION PROVISIONS UNDER THE RENEWABLE ENERGY TARGET SCHEME

3.1 Background

As part of the process of designing the Renewable Energy Target (RET) scheme, the Council of Australian Governments (COAG) agreed to examine further some of the rules for off-grid resource projects.

The Terms of Reference for the Review include consideration of:

- *Whether changes should be made to the current provisions that allow for exemption from liabilities under the RET based on 'self-generation', which mainly affect off-grid remote resource projects. In particular, whether the rules continue to meet the original policy intent of excluding such projects, without creating unintended impacts on the RET's overall objective to support the deployment of renewable energy. The review will have regard to:*
  - *Recent developments in resource project development structures.*
  - *The potential for the self-generation provisions to create perverse incentives for companies to structure their operations to avoid RET liability, or otherwise distort resource development decisions.*

In accordance with the Terms of Reference, the Review has considered recent developments in resource project development structures and the potential for the self-generation provisions to create perverse incentives for companies to structure their operations to avoid RET liability or otherwise distort resource development decisions.

By meeting liabilities under the RET, participants in electricity markets contribute towards the deployment of additional renewables in Australia's electricity supply.

To minimise costs of compliance and administration, liability under the RET is imposed on wholesale acquisitions of electricity, mainly by retailers who are best placed to manage RET liabilities. Where end users acquire electricity directly from generators, the generator is assumed to have made a notional wholesale acquisition and is also liable. To reduce compliance and administrative costs, grids of less than 100 MW capacity are exempt from liability.

Exemptions for self-generators are also provided, recognising that they are generally less emissions-intensive than grid electricity. (It is noted that self-generators generally have little choice other than to supply their own electricity, usually at a higher cost). However, the self-generator exemptions were tightly targeted in recognition that excluding self-generators:

- places a relatively higher burden on non-exempt parties
- puts grid-based firms that buy electricity from a retailer at a competitive disadvantage, and

- can result in inefficient investment decisions with respect to the broader economy if proponents structure their ownership, project layout and electricity infrastructure arrangements to avoid liability under the RET.

Restrictions on ownership, distance and line-use were put in place to ensure that only electricity that is used by a genuine self-generator within a project site, and generally via a dedicated line rather than a public grid, is exempt.

In developing the original Mandatory Renewable Energy Target (MRET) legislation in 2000, it was considered that the tightly targeted definition of self-generators would act as a disincentive to restructure company structures in order to become exempt from the measure, while still giving effect to the Government's policy position that self-generators should not be liable parties.

Details of the provisions are at Appendix A. To obtain a self-generation exemption the following conditions must be satisfied: the end-user of the electricity must have generated the electricity, and either:

- the electricity is to be used less than 1 kilometre away from the point of generation; or
- there is a dedicated line between the point of generation and the point of use.

See Appendix B for a hypothetical project example illustrating these restrictions in concept.

The self-generation provisions mainly affect off-grid remote resource projects. The Review examined whether changes should be made to these provisions. In particular the Review considered whether the rules continue to meet the original policy intent of excluding such projects without creating unintended impacts on the RET's overall objective to support the deployment of renewable energy.

Ten submissions were received in response to the discussion paper on the self-generation provisions, from two broad categories of stakeholders. They include organisations representing energy and other resource development projects including mining, metals and energy supply including renewable and sustainable energy, and organisations directly involved with self-generation related to resource development and manufacturing.

3.2 Issues

3.2.1 Policy rationale for exclusion

At the time of introduction of the original MRET scheme, the key basis for the exemptions was to encourage self-generation, which is generally substantially lower in greenhouse emissions intensity than (mainly coal-fired) grid electricity. For example, on-site generation from industrial waste heat, and gases or liquids which would otherwise be flared, effectively displaces fossil-based electricity with very low to zero net greenhouse gas emissions.

The submissions generally supported the policy that self-generation be excluded, primarily on the grounds that self-generators continue to use lower emissions technologies and warrant continued encouragement. For example, APPEA (submission 84) noted that:

"..the self generation provisions, as they apply to the natural gas industry, are important in ensuring lower emissions power generation options are supported as part of the operation of the RET."

The Clean Energy Council (submission 91) also supported continued exclusion:

"Any additional incentive for businesses to purchase and consume electricity with a low or zero emissions footprint is supported by the CEC In the case of on-site generation, it may therefore be appropriate to amend the conditions to provide such exemptions, including supporting more flexible ownership and commercial structures of the generation assets."

Another submission commented, without justification, that RET liability discourages on-site generation, and the self-generation provisions should provide an economic signal to support projects that utilise otherwise waste fuel and heat streams, particularly within industrial facilities.

However, in some cases the commercial choice between fuels may already favour generation from lower emissions sources such as natural gas and industrial wastes (which can include renewable biomass), irrespective of RET liability. Particularly in remote areas, these sources are likely to be more readily available at lower cost, and would enable more flexible generation to meet variable load requirements.

On the other hand, some submissions argued the self-generation provisions can provide an important buffer against adverse impacts on local communities of increased costs of the expanded RET on existing projects, particularly in remote areas. It is also argued that without self-generation exemptions from RET liability, opportunities for investment in large resource projects in Australia may be scaled back or lost to overseas competitors.

For example:

> The WA Chamber of Minerals and Energy (submission 80) comments that the self-generation exemptions are necessary and that failure to expand them could place increased stress and undue financial impact on remote operations, jeopardising income generation, jobs and the viability of small local communities.
>
> The WA Chamber of Commerce and Industry (submission 35) also supports expansion of the exemptions on grounds that isolated mineral and energy projects are faced with higher costs of the expanded RET and that their viability of projects is threatened by the global financial situation and lower international commodity prices.

However, to the extent these projects involve undertaking emissions-intensive, trade-exposed (EITE) activities, the RET legislation includes partial exemptions for 60 or 90 per cent of the additional liability under the expanded RET for EITE activities. This will substantially reduce the impact for the most materially affected and trade-exposed existing or planned projects. The partial exemptions address both the additional liability resulting from the higher annual targets and the impact of higher certificate prices in relation to the liability under the previous MRET above a price of $40. These partial exemptions recognise the impact that costs through the RET may have on EITE activities.

The current provisions were scoped narrowly to avoid creating perverse incentives for companies to structure their operations to avoid RET liability. However, some submissions argue that the restrictions themselves have created perverse incentives. For example, APPEA comments that the self-generation provisions currently provide an incentive for power generation and transmission assets to be duplicated rather than being shared, in cases where it would normally be more cost-effective for shared assets to be developed. APPEA also argues that the provisions may provide an incentive for a self-generator to disconnect from the grid despite there being a broader economic value in retaining grid connection for security of supply.

3.2.2 Adequacy of existing provisions

Nearly all submissions on the self-generation provisions argued that they are unduly restrictive in some aspect of their scope and application. APPEA identifies these concerns in commenting that

"the provisions contain a range of restrictions on ownership, distance and line-use that limit the ability of self-generators to avail themselves of the provisions."

<u>Distance and line-use restrictions</u>

Several submissions commented that in view of the size and complexity of larger resource projects (some of which can stretch over ten kilometres or more) the 1 km restriction between point of generation and point of use for shared distribution lines and the requirement that longer transmission must be via dedicated point-to-point lines unduly restricts the amount of legitimately self-generated electricity able to be claimed as exempt from RET liability.

For example, the WA Chamber of Commerce and Industry (Submission 35) considers that the 1 km and sole use restrictions

"do not align with the realities of modern isolated mineral and energy projects, where the distances and infrastructure capital costs involved mean these restrictions are impractical. In such operations the point of generation and use can be over one kilometre apart and for transmission lines to transmit electricity to multiple points."

Another submission cited as an illustrative example a large and complex remote resource project where activities may be widely separated and involve multiple usage points. The Regulator has viewed such projects as meeting the requirements for exemption where the generation points and usage points belong to the same legal entity and are not connected at any point to an external grid or a third-party user or generator.

The Office of the Renewable Energy Regulator (ORER) has provided qualified advice on a case-by-case basis to parties seeking guidance on the 1 km distance and sole line use provisions. Any such advice is based on consideration of comprehensive documentation detailing the project context. Liable parties are responsible for self-assessing their liability, and only a small number of companies have approached ORER for clarification.

Stakeholder feedback indicates that once generated, it makes commercial sense to use as much as possible of the electricity at the site, but that project economics generally favour centralised generation on a site and dictate that it be close to the fuel source. It was argued that on this basis, the exemption should be extended to apply to self-generated electricity supplied by the internally owned distribution network and consumed within site boundaries.

A defined distance in kilometres has the advantage of being objective and easily measured. While extending the distance to the boundaries of a project site would be consistent with the underlying policy intent to exclude self-generation, implementation would require consideration of ownership and physical issues in determining these boundaries. In cases where self-generation would only provide a fraction of total electricity use at a site, determining the amount of self-generator exemption could involve more complex consideration of site electricity import and export to ensure the exemption provided doesn’t exceed the amount of self-generation.

Expanding the eligible distance from the point of generation and allowing on-site generation supplied via shared distribution lines of over 1 km in length to be eligible will significantly increase the amount of exempt electricity, particularly if applied to all existing projects/sites on and off the major electricity grids. This would increase the costs of the RET for non-exempt households and businesses.

<u>Sole-use restriction</u>

Where a site is connected to any liable grid, (one with a total capacity of greater than 100 megawatts generating capacity), and where the generator provides any electricity for use by a third party, the sole-use test is not met. As such, the exemption is not available for any of the electricity supplied on that grid, beyond a radius of 1km from the generation point, even though almost all of the electricity is generated by the end-user. This exemption reflects the policy focus on tightly targeting exemptions to ensure only genuine self-generators are exempt. Some submissions called for an approach whereby the sole-use test is effectively removed, allowing all self-generated electricity actually used by the end-user to be exempt, with only the proportion of electricity supplied by the self-generator to a third party being RET-liable.

As mentioned earlier, APPEA’s submission also criticises the current sole use restriction, on the basis that it can result in inefficient duplication of infrastructure (power generation and distribution) or disconnection from the main grid where it would otherwise be economically more efficient to share infrastructure or to connect to a grid for back-up.

To address the issue, APPEA suggests that full exemptions apply to contemporary resource development projects such as those currently planned in the upstream oil and gas industry. Another stakeholder suggested as an alternative to the proposed pro-rata approach above, that the exemption be expanded to include all generation which is not connected to a major external grid.

Extending the self-generation provisions to make it easier for projects to comply would reduce the potential for inefficient project development decisions, and would acknowledge that remote projects usually have fewer electricity supply options. On the other hand, expanding the amount of exempt electricity would increase costs for users of non-exempt electricity and confer an advantage on remote projects compared to those located near major grids regardless of whether they self-generate or use excess generation from the local grid.

Ownership restrictions—restrictions on the meaning of self-generation

Under the current provisions, where the same legal entity generates and uses the electricity the electricity meets the ownership requirement.

Several submissions commented that the definition of a self-generator is unclear and suggested that in light of the complex contractual arrangements around electricity provision in relation to site-generated electricity, some flexibility in interpretation would be beneficial. For example, the Clean Energy Council (submission 91) noted that a strict legal definition of ‘self-generation’ can be complex to ascertain, and commented that it may be appropriate to amend the exemption provisions to support more flexible ownership and commercial structures around generation assets.

The WA Sustainable Energy Association comments that “*the creation of a remote power system is capital intensive and in many cases need to take into account the need for multiple partners/joint venturers on a single project... As such, the factors involved in self-generation eligibility become more complex than envisaged in the legislation.*”

Other stakeholders suggested broadening the definition of self-generation to include assets involved in power generation, distribution and use that are owned or leased by an entity related to the electricity consumer or an entity providing a service exclusively to a related entity embedded within the independent distribution network. ‘End user’ would be defined here to include related bodies corporate, to ensure that the exemption flows through to all entities within the same corporate group.

3.3 Options

Two broad policy options have been identified. They include maintenance of the existing provisions, and expansion of exemptions, including components to address issues raised with the current provisions.

3.3.1 Retain existing exemptions

Under this option, the current tightly targeted provisions would be retained to balance support for self-generation with minimising the impacts on non-exempt households and businesses that bear additional costs as a result of the exemptions.

It can also be argued that all electricity users should share the cost of increasing the share of renewable energy to 20 per cent of Australia’s electricity supply in 2020, and that additional exemptions on top of those given to EITE activities would further redistribute this cost burden onto non-exempt households and businesses.

In addition, a future carbon price will provide longer-term support for the generally lower emissions technologies used for self-generation, while provision of assistance to EITE activities will mitigate the adverse impacts of the expanded RET on resource projects that produce trade-exposed products and for whom electricity and associated emissions represent a material cost of production.

In retaining the provisions, the Regulator would continue to work to provide clear guidance to investors on the detailed application of the current distance, line use and ownership provisions, to ensure clarity for industry.

3.3.2 Extend exemptions

Extension of the exemption provisions would be consistent with stakeholder feedback that the current provisions are too narrowly targeted, discouraging investment in large resource development projects in Australia and distorting efficient project design.

It is proposed that the extended exemptions would apply only to self-generation from new stand-alone power generation plant. This is because the costs of incrementally expanding generation capacity or increasing resource use are generally substantially less than for a new stand-alone power station, particularly in the context of an increasing carbon price. The existing provisions would remain for pre-existing self-generation recognising the potential for windfall gains in respect of investment decisions that were made under the existing legislative framework. Any expanded benefits to self-generators must also be balanced against the additional cost impost on non-exempt households and businesses.

This option includes two components:

Extending the distance limit

First, in recognition of the larger footprint of some contemporary projects using self-generation and the need for flexibility in electricity infrastructure design, the zone of potential exemption for self-generated electricity would be extended. The zone would be extended to the boundaries of the site where both the generating plant and the facility or facilities it supplies are located, irrespective of whether distribution lines are shared or dedicated. The generating plant must be located within the facility at the site, or be part of a contiguous site that includes both the power station and facility or facilities the power station supplies. With regard to defining site boundaries, an approach similar to that used in undertaking environmental impact assessments for projects could offer a practical basis. The electricity that the Regulator is satisfied is generated and consumed within those boundaries by the same legal entity would be exempt, regardless of whether the electricity is distributed to the user on shared distribution infrastructure.

This approach would avoid the need to apply an arbitrary distance test and effectively remove the sole-use test for these new, stand-alone power stations, allowing all self-generated electricity used by the end-user to be exempt, with only the electricity supplied by the generator to other users remaining as RET-liable.

Implementation would require consideration of ownership and physical issues in determining the site boundaries and consideration of site electricity import and export to ensure the exemption doesn’t exceed the amount of self-generation and provide a windfall for the entity which would otherwise be liable.

While more complex to administer than simply increasing the eligible distance in kilometres between generation and use, its flexibility would enable comparatively more future generation to be exempt. This approach would effectively exempt all self-generation from new, stand-alone power stations associated with projects on remote grids. By removing the sole-use test, this option would avoid discouraging self-generators from connecting to other grids for back-up, or from sharing electricity distribution infrastructure.

An example of how this option would operate for a hypothetical project is at Appendix C.

Expanding the ownership or ‘self-generator’ concept

This option would extend the concept of a self-generator to account for more complex ownership arrangements. To assist investment decisions and the management of future liabilities, it is important that the legislation clearly articulates this concept.

The Regulator currently considers that the same legal entity must generate and use the electricity for the ownership requirement to be met. This is consistent with the policy intent that the exemptions be tightly targeted. Ownership arrangements are considered on a case-by-case basis in light of the complexity often encountered.

Under this component, the revised test to determine that the ‘end-user generated the electricity’ would be met if:

- electricity is acquired directly from the generator by the end-user, with no intermediate acquisitions between generation and end-use, and
  - the legal entity that owns the power station is the owner of the assets that use the electricity; or
  - the corporation that owns the power station is a member of the same group as the corporation that owns the assets that use the electricity. “Group” would have a similar meaning to that defined under the national Greenhouse and Energy Reporting Act 2007, but excluding members that are joint ventures or partnerships. The group would include constitutional corporations and their subsidiaries under certain conditions.

Where some of the electricity is supplied to third parties, the electricity supplied to those parties would not be eligible for the exemption.

While extending the meaning of self-generation to account for broader corporate arrangements, the concept remains clearly focused on ownership arrangements where there is clear evidence that the generation and end-use assets are under control of one legal entity. Where a legal entity itself comprises several entities, for example an incorporated joint venture, the first legal entity must be the owner of both the generator and end-use assets to pass the self-generation test.

This extension to the meaning of a self-generator would tend to make it relatively easier for organisations to modify their arrangements to benefit from the exemption. While more flexible, this approach would require owners/operators to provide details of contractual/ownership arrangements.

3.4 Recommendation on Self-Generation Provisions

RESG's majority consensus recommendation is to choose option 1 (retain existing exemptions). The majority of RESG members consider that the RET is a national scheme that requires national participation, and that extending the exemptions would impose additional costs on non-exempt liable parties. This would occur in the absence of clear justification of the assertion that significant project investments would not occur, be substantially delayed or be substantially sub-optimised in scope in the absence of the broader exemptions.

However, Western Australia (WA) holds a strong dissenting view to the majority, and considers that the self-generation exemption provision should be expanded in the manner outlined above. WA agrees with the majority of stakeholder feedback that the current provisions are unduly restrictive and do not fully take into account the size and complexity of remote resource projects.
This view is based on WA's understanding that:

- the RET scheme design supported by COAG was intended to apply to large grids with multiple customers and generators, where the liable party can exercise choices between a range of competing generators, and
- the RET scheme was not meant to apply to off-grid generation, or to stand-alone resources projects, even if the project is larger than 100MW, covers a relatively large distance and/or operates its own mini-grid to supply different parts of the project.

Given the increasing complexity of large-scale, remote resource projects (particularly in the Mid-West and Pilbara Regions of WA), including ownership structures, WA supports more flexible ownership provisions.

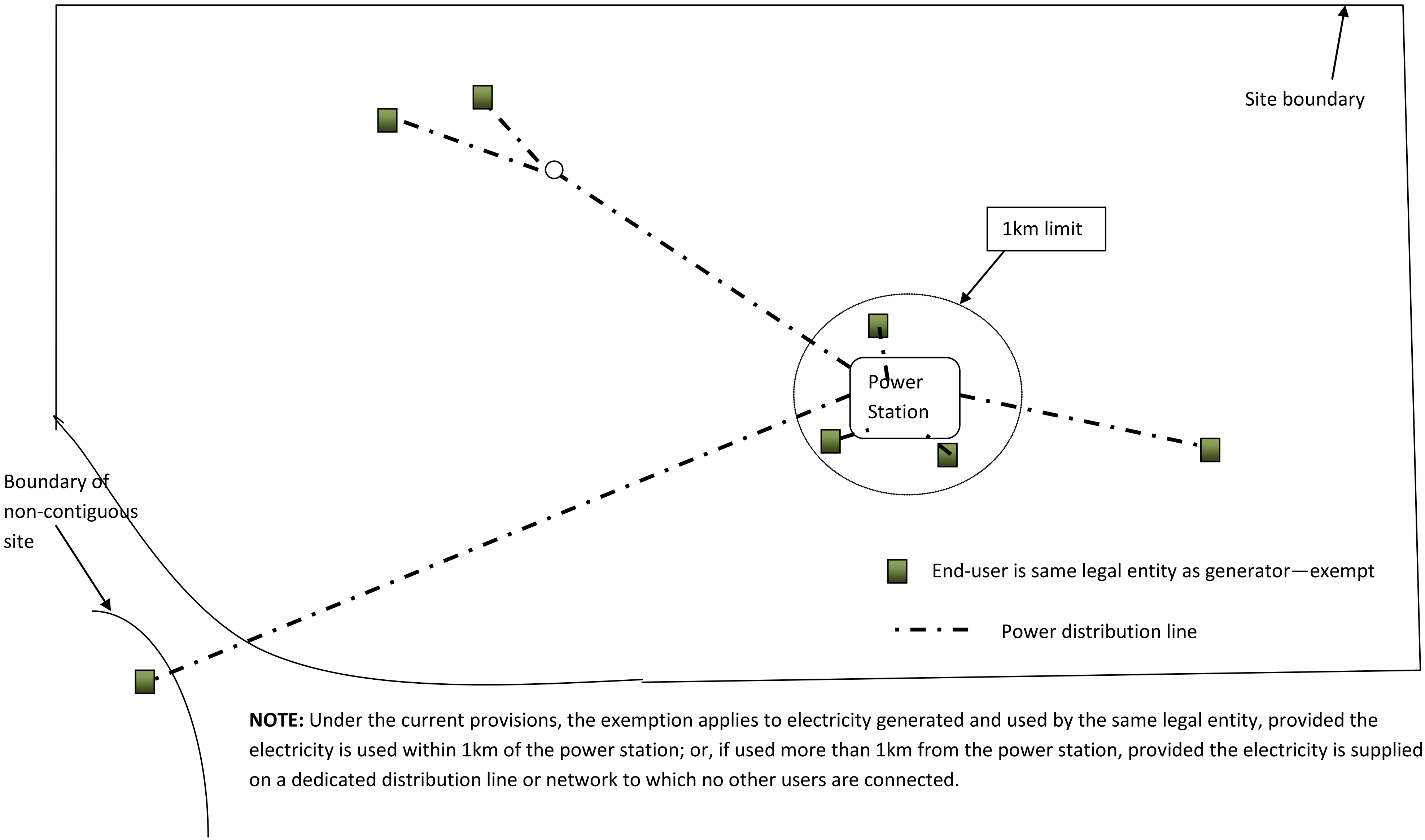
SELF-GENERATION PROVISIONS OF THE *RENEWABLE ENERGY (ELECTRICITY) ACT 2000* AND ASSOCIATED REGULATIONS

Self-generation meeting specified exclusion criteria set out in paragraph 31 (2) (b) of the *Renewable Energy (Electricity) Act 2000* is exempt from liability. The Act also puts a 100 megawatt (MW) lower limit on liable grids as set out in paragraph 31 (2) (a). Subsection 31 (2) reads:

> An acquisition is not a relevant acquisition if:
>
> (a) the electricity was delivered on a grid that has a capacity that is less than 100 megawatts and that is not, directly or indirectly, connected to a grid that has a capacity of 100 megawatts or more.
>
> (b) the end user of the electricity generated the electricity and either of the following conditions are satisfied:
>
> (i) the point at which the electricity is generated is less than 1 kilometre from the point at which the electricity is used
>
> (ii) the electricity is transmitted or distributed between the point of generation and the point of use and the line on which the electricity is transmitted or distributed is used solely for the transmission or distribution of electricity between those 2 points.

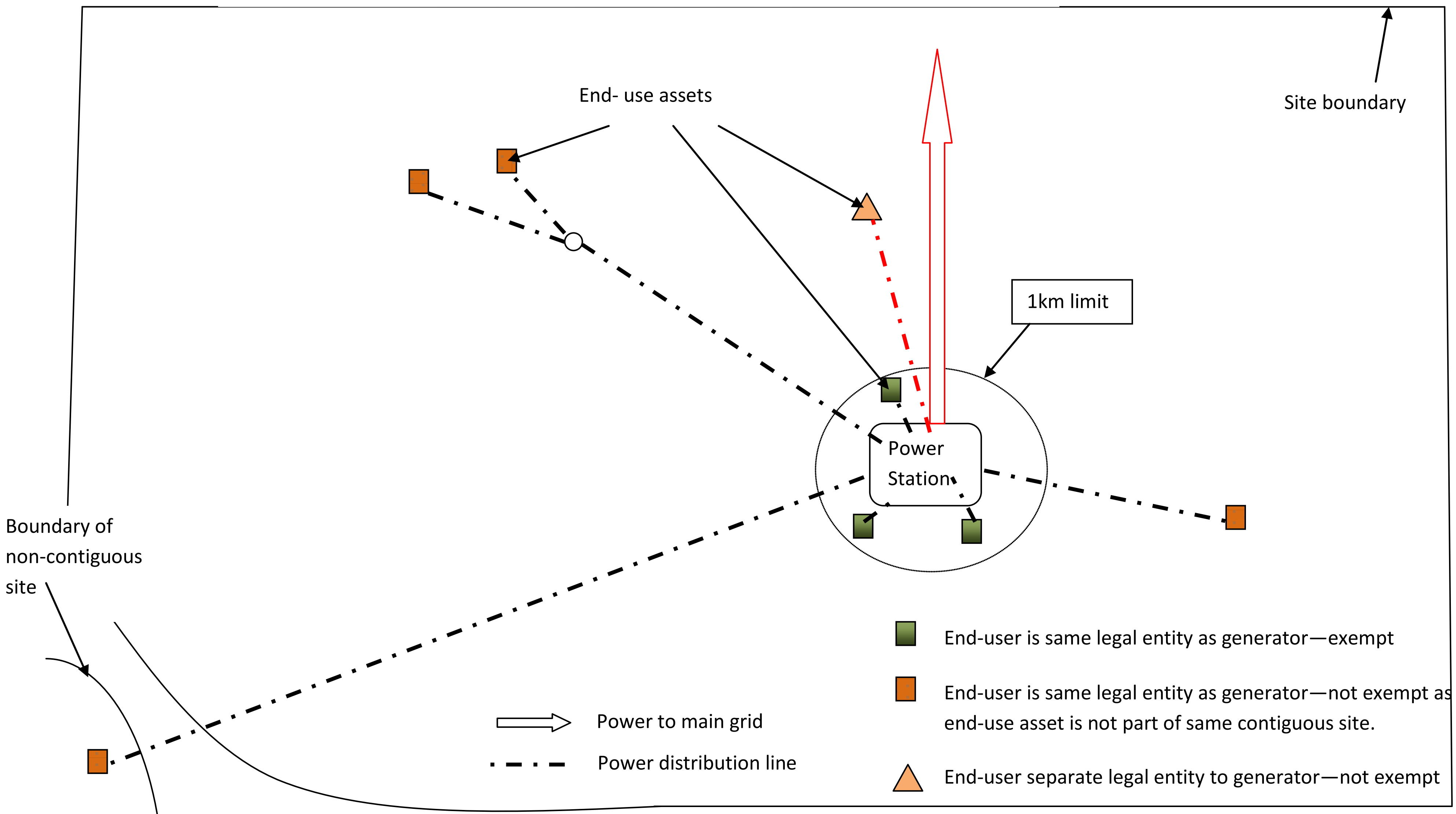
Regulations 21 and 22 of the Renewable Energy (Electricity) Regulations 2001 prescribe processes for determining the amount of electricity in relevant acquisitions (including the points of measurement) and whether a grid has greater than 100 MW capacity.

Hypothetical example of operation of current provisions



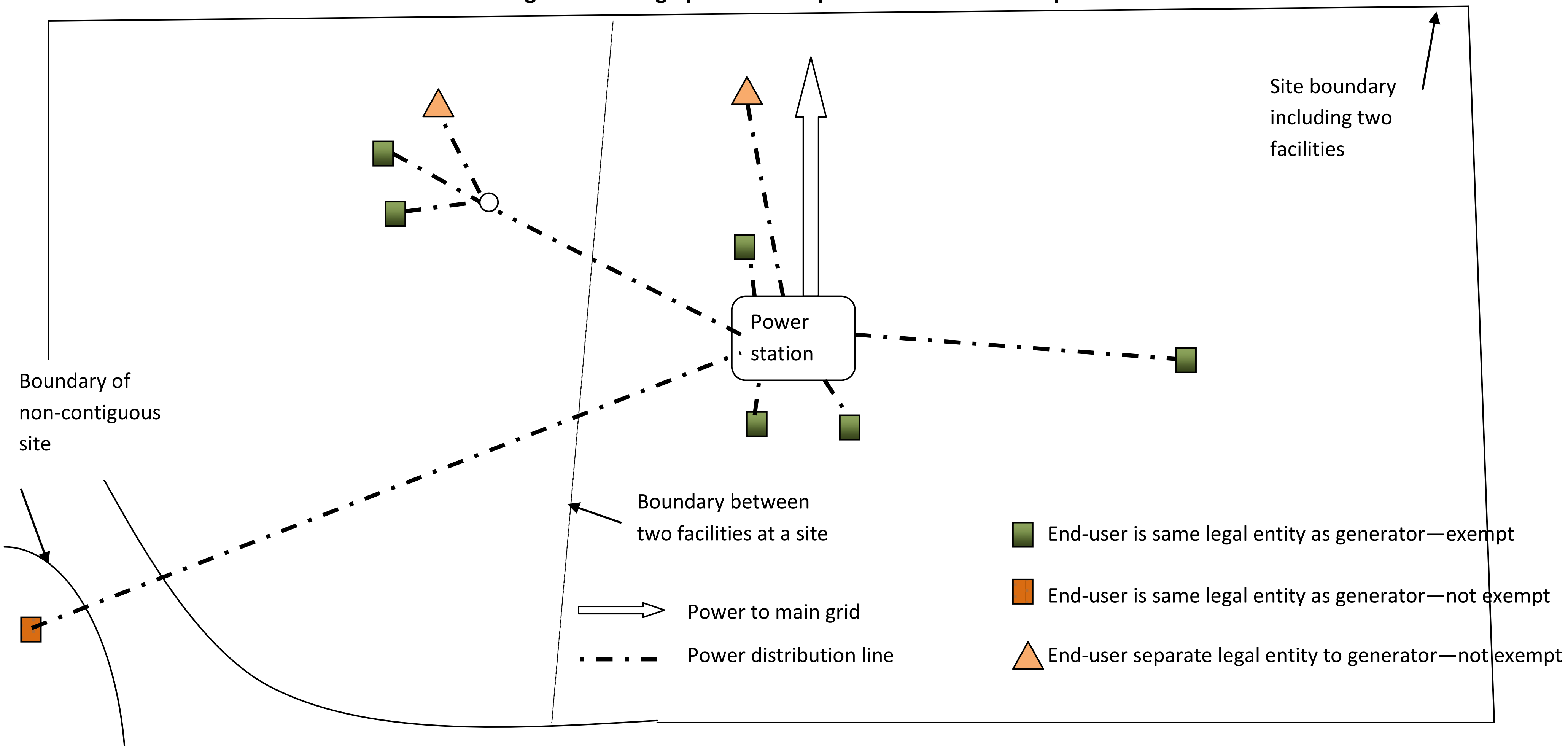
NOTE: Under the current provisions, the exemption applies to electricity generated and used by the same legal entity, provided the electricity is used within 1km of the power station; or, if used more than 1km from the power station, provided the electricity is supplied on a dedicated distribution line or network to which no other users are connected.

Impact of current provisions where some electricity is supplied to other parties



NOTE: Under the current provisions, if the power station connects to the grid (red arrow), or if it supplies an end-use asset that is owned by another legal entity and the asset lies beyond the 1km limit (orange triangle), this would violate the sole-use criterion, rendering all the electricity used more than 1 km from the power station ineligible for the exemption, regardless of ownership (orange rectangles).

Diagram showing operation of option B to extend exemptions



NOTE: Under Option B, where a power station supplies end-use assets that are owned by the same legal entity or by a corporation from the same corporate group, the electricity used by these assets would be exempt. However, the power station and end-use assets must be at the same contiguous site.

CHAPTER 4—TREATMENT OF NEW WASTE COAL MINE GAS POWER GENERATION IN THE RET

4.1 Background

Waste coal mine gas (WCMG) is a potentially explosive gas, mainly methane, which occurs naturally in coal seams and is released as a waste product during coal mining and after mine closure[16]. The amount of gas in coal seams varies significantly depending on site-specific physical and chemical factors; older, deeper seams tend to be gassier.

In underground mining of gassier seams, much of the gas is progressively removed (drained) from the coal seam ahead of the mining operation for safety reasons. While this methane-rich gas is generally destroyed by flaring to produce carbon dioxide and water, in some circumstances it is utilised to generate electricity.

The methane in WCMG is a powerful greenhouse gas, 21 times more powerful than carbon dioxide and is accounted for in Australia's national emissions inventory as a fugitive emission from coal mining. Flaring WCMG to convert it to carbon dioxide reduces its emissions intensity by up to 95 per cent.

Support in the form of capital grants and greenhouse emissions abatement-related assistance has underpinned Australian projects to date. For example, the Commonwealth Government's Greenhouse Gas Abatement Program (GGAP) provided upfront grant funding, while the New South Wales Greenhouse Gas Reduction Scheme (GGAS) provides a production-based revenue stream for reduction in greenhouse gas emissions through either destruction of methane by flaring or use in electricity generation.

WCMG is utilised by some 215 MW of power generation capacity at nine sites in regional Australia. These comprise six sites with total capacity of 114 MW in NSW and three sites with total capacity of 101 MW in Qld.

Two firms, Energy Developments Ltd (EDL) and Envirogen Pty Ltd, own or operate most of these power stations. In addition, BHP Billiton has developed a small (6 MW) power station utilising an innovative technology to harness the dilute methane in ventilation air (which includes WCMG), but is generally too dilute to either flare or use for electricity generation.

The viability of waste coal mine gas electricity generation depends on the base price received for electricity generation in wholesale electricity markets (the 'black' electricity price), which is influenced by the underlying cost of coal and gas, and its relative competitiveness with fossil fuel based electricity generation.

[16] WCMG does not include coal seam methane (CSM), which is extracted from coal seams that are generally unmineable, specifically as a fossil fuel resource.

Generation of electricity from WCMG is significantly more expensive than from other fossil fuels such as black or brown coal. For example, new entrant coal-fired generation costs are around $40-$50 per megawatt-hour (MWh) while costs of WCMG-based generation are reported to be around $80 per MWh. At around twice the current average wholesale electricity pool price, WCMG-based electricity, like renewables, is currently not commercially viable without additional government support.

In general, projects to expand existing power stations, where additional gas flow is available, will involve lower costs than projects at new sites. It may also be possible to relocate gas engines from more mature sites, where gas flow is tailing off, to incrementally expand newer projects.

4.1.1 Current treatment of WCMG under the RET

In 2009, WCMG was included in the RET legislation as an eligible energy source to provide transitional assistance for existing WCMG-based generation projects that would be affected by the commencement of a carbon price mechanism and consequent cessation of the NSW Greenhouse Gas Abatement Scheme. In the context of the Commonwealth Government's Clean Energy Future (CEF) plan, this policy was confirmed and following passage in November 2011 of the legislation to put in place a carbon price, existing WCMG projects will become eligible under the RET rules to create LGCs under the LRET from 1 July 2012 until the end of 2020.

WCMG fuelled electricity generation is not a renewable energy source. Under the RET legislation, WCMG is listed as an 'eligible energy source' to clearly differentiate it from renewable energy sources In addition, annual targets under the RET will be increased by an amount that corresponds with the amount of existing WCMG generation allowed into the RET to ensure renewable generation will not be displaced.

As part of the negotiations on the then Carbon Pollution Reduction Scheme (CPRS), the Commonwealth Government agreed that the COAG review would consider whether new WCMG projects should be eligible under the RET.

4.1.2 Stakeholder submissions

33 submissions commented on the WCMG discussion paper, four of which wished to be treated as confidential. Submissions were received from four broad categories of stakeholders:

- mining companies or organisations representing their interests
- companies directly involved in renewable energy generation or organisations representing their interests
- RET-liable parties (wholesale purchasers of electricity), and
- Community and environmental groups and interested individuals.

4.2 Issues

The WCMG industry supports the expansion of eligibility under the RET to include new WCMG projects on the grounds that this support would:

- render the utilisation of an otherwise wasted resource that would be flared commercially viable. In utilising gas that would otherwise be vented or flared to generate electricity, thereby displacing other predominantly fossil-based generation, it reduces (brings forward reductions in) net emissions in the energy sector. It is argued that the carbon price under the CEF will incentivise the cheaper alternative of flaring rather than the more efficient alternative of electricity generation for the foreseeable future

- stimulate investment in regional Australia, with related employment and regional development benefits for those areas, and

- align with international precedents in Europe and the USA where WCMG, along with renewable energy, is supported by feed-in tariffs and other market-based clean/low emissions energy initiatives similar to the RET. Examples cited include the German Legislation on renewable energy (the Renewable Energy Sources Act) which includes feed-in tariffs for WCMG, and the US Clean Energy and Security Act 2009, which includes WCMG as an eligible energy source in a proposed national target scheme similar in concept to the RET.

LMS Generation Pty Ltd (submission 114) commented:

> *The conversion of waste coal mine methane to usable energy rather than flaring with no energy recovery should be viewed as significant positive contribution and climate change driven legislation should be supportive of it.*

On the other hand, electricity retailers and businesses do not support the expansion of eligibility under the RET to include new WCMG generation on the basis that it would unnecessarily increase the costs to electricity users to support high cost electricity generation. Origin Energy (submission 186) commented:

> *...new waste coal mine gas projects may not be the next lowest cost emission reduction projects. Their inclusion in the RET would undermine the intention of the CPRS, which is supposed to be the central policy mechanism in reducing greenhouse gases in Australia. The increased costs associated with the projects will ultimately be borne by Australian electricity consumers.*

Renewable energy generators and environmental groups oppose inclusion of new WCMG generation in the RET on the grounds that it is not renewable energy. WWF-Australia (submission 118) stated:

WWF-Australia continues to oppose coverage of waste coal mine gas WCMG power generation under the RET scheme because it does not generate electricity from a renewable energy source. While burning this gas for energy can reduce its emissions impact, WCMG results from mining an emissions-intensive fossil fuel and still results in the release of carbon dioxide into the atmosphere.

Further, renewable energy generators have expressed concern that including WCMG in the RET could set a precedent for the inclusion of other non-renewable energy sources. Pacific Hydro (submission 139) commented:

...opening up the RET to greater penetration of non-renewable energy projects, risks changing the RET from a market for zero-emissions renewable energy projects, to a "cleaner energy" target. This would detract from the stated purpose of the RET which is to "encourage additional electricity generation from renewable energy sources"

Industry proponents have identified potential projects totalling [230 MW] of generating capacity from gassy mines in NSW and Qld that could be developed with inclusion in the RET. Increased mining activity over the next decade could add to this potential.

The carbon price will incentivise the reduction of fugitive emissions from coal mining. Electricity generation from low emissions waste products are expected to benefit relative to other fossil fuel based electricity generation as the emissions intensity (and therefore the carbon cost) is lower.

In addition, the Commonwealth Government's Clean Energy Future package contains two elements to assist the coal sector in transitioning to a clean energy future:

- The $70 million Coal Mining Abatement Technology Support Package, which will assist coal mines in developing and deploying new technologies to reduce their carbon pollution, and

- The $1.3 billion Coal Sector Jobs Package, which will provide transitional assistance to help the coal industry to implement carbon abatement technologies for the mines that produce the most carbon pollution. This Package will assist the operators of these mines to support jobs and local communities, some of which rely heavily on coal mining employment.

4.3 Options

Three policy options have been identified:

1. No change—support would not be extended to new WCMG projects.
2. Extend eligibility, until 2020, to include WCMG generation from new projects with combined annual generation caps of 850 GWh, along with offsetting increases in annual targets
3. Extend eligibility, until 2030, to include WCMG generation from new projects and from expansions to power capacity at existing WCMG power stations, with a combined annual cap of 2,200 GWh and offsetting increases in annual targets (the industry-preferred option).

4.3.1 No change

This option recognises that WCMG is not a renewable energy source, and existing WCMG generation was included in the RET for a limited time, and subject to annual caps on total eligible generation, as a transitional assistance measure in the context of the cessation of GGAS and commencement of the carbon price, not as a source of renewable energy.

Given that WCMG is not a renewable energy source, extending eligibility to new WCMG would require increasing targets under the RET in order to ensure the overall target of 20 per cent renewable energy by 2020 is not compromised, thereby increasing the cost of the RET by between around $400 million and $1.4 billion, in real terms, depending on the amount of WCMG allowed in, ultimately increasing the cost of electricity to households and businesses by supporting an expensive form of electricity generation.

Extending eligibility to new WCMG would also represent a fundamental departure from the Commonwealth Government’s existing policy, setting a precedent for other low emissions technologies and shifting the focus of the RET scheme away from renewable energy.

The carbon price will provide an increasing incentive in favour of low emissions electricity generation, including WCMG by altering the relative cost of different forms of generation, in line with their emissions intensity. In this way, it will encourage cost-effective emissions reductions. If WCMG is unviable even with a significant carbon price, other, cheaper forms of abatement are pursued instead.

4.3.2 Include generation from new WCMG projects until 2020 and double the existing WCMG allocation

This option includes a capped amount of generation from new WCMG projects by increasing annual targets by 425 GWh in 2012 and 850 GWh for the years 2013 to 2020 inclusive (doubling the current allocation to the industry). Once the cumulative caps across accredited projects reaches 850 GWh, no further projects would be accredited.

These new projects could either be expansions in nameplate generation capacity at existing power stations, or new power stations.

This option would encourage the use of an otherwise wasted resource and further encourage the use of WCMG to generate electricity as a relatively low emissions technology. There would be regional development and employment benefits for those employed in the WCMG sector.

Increases in annual targets would ensure no renewable energy is displaced by non-renewable WCMG generation. Where these annual caps are not met by WCMG generation, renewable energy would be able to make up the shortfall.

Increasing annual targets to accommodate new WCMG projects until 2020 by doubling the amount already allocated for existing WCMG electricity generation would increase the cost of the RET (for liable parties) by around $400 million, in real terms, over this period.

By limiting eligibility until 2020, this option recognises that the carbon price will provide an increasing investment incentive over time, as WCMG generation has a relatively low emissions intensity compared to the average grid intensity which reflects the dominant impact of coal-fired electricity. By 2020, in real terms, the carbon price is expected to be around $30[17]. Estimates by SKM MMA of the cost in terms of carbon price required for new waste mine gas projects to be viable, including for new ventilation air technologies, is in the order of $30/t CO_2e to $50/t CO_2e. This would indicate that some WCMG projects could be commercially viable with LGC revenue up to 2020 and under the carbon price alone after 2020.

4.3.3 Industry-preferred option—Include generation from new projects until 2030, up to a cap of 2,200 GWh.

This option, by allowing new WCMG projects to be eligible under the RET for the duration of the measure, recognises the benefits outlined in option 2 while providing additional assistance above the carbon price after 2020.

The 2,200 GWh cap for new generation corresponds to generation from around 300 MW of potential additional power capacity and is consistent with industry estimates.

By providing a longer revenue stream for new projects and a higher cap on total annual generation, this option would promote higher uptake of WCMG for power generation, rendering higher cost projects commercially viable. This would:

- stimulate investment in regional Australia, with related employment and regional development benefits for those areas, and
- Utilise gas that would otherwise be vented or flared to generate electricity, thereby displacing other predominantly fossil-based generation, it reduces (brings forward

[17] Under the CEF core policy scenario.

reductions in) net emissions in the energy sector. It is argued that the carbon price will incentivise the cheaper alternative of flaring rather than electricity generation for the foreseeable future.

It would also provide a more stable deployment incentive to encourage further development and commercialisation of emerging technologies to harness ventilation air methane.

As for option 2, in order to ensure no displacement of renewable energy, annual targets would be increased to offset the higher annual caps. Under this option, annual targets would be increased by 850 GWh in 2012 and 2,200 GWh for the years 2013 to 2030 inclusive.

Implementation would include setting annual caps as part of accreditation for new projects as for option 2. That is, once sufficient projects have been accredited for the total of individual caps to reach 2,200 GWh, no more projects would be accredited. Again, where annual caps are not met, renewable energy would be able to make up the shortfall.

The SKM MMA modelling indicates that increasing annual targets to accommodate new WCMG projects by up to 2,200 GWh until 2030 would increase the cost of the RET (for liable parties) by around $1.4 billion, in real terms, over this period.

Compared to option 2, this option doubles the WCMG generation cap and extends project eligibility by 10 years to 2030. This would be a significant increase in the allocation for the WCMG sector, noting that the 2,200 GWh target increase from 2013 represents around 12 per cent of the existing 2013 LRET target of 18,238 GWh.

4.4 Potential Impacts of Increasing WCMG Targets

4.4.1 Technology assumptions

Waste coal mine gas plants are small scale generators that utilise methane gas collected from coal mines. Key assumptions used in the analysis include:

- Average size of new power stations of 20 MW.
- Capital cost of $2,000/kW.
- Capacity factor commencing at 80% and progressively reducing to represent the profile of gassiness of mines.
- Gas extraction costs of $3/GJ.
- Non-fuel operating costs of $5/MWh.
- Marginal loss factors starting at 0.95 and progressively reducing as more power stations are installed.
- Three years for development approvals and construction.

Another key assumption is that any shortfall in achieving the target through WCMG generation is made up for by additional requirements for renewable generation under the LRET scheme.

4.4.2 Scenarios

The Federal Government announced that the COAG review process would consider whether additional new waste coal mine gas (WCMG) projects should be eligible under the LRET, with an increase of a target to include a new level of generation for waste coal mine gas.

Two scenarios were assessed with different target levels applying to generation from new waste coal mine gas plant. The proposal has an additional separate target for WCMG in addition to the 850 GWh (425 GWh in calendar year 2012) top up already introduced for existing coal waste gas generation over the same period. The additional targets for new WCMG generation projects modelled included:

- **Double WCMG target**: An additional 425 GWh WCMG top up in 2012, and 850 GWh from 2013 to 2020.
- **Industry target:** Up to 300 MW of new waste coal mine gas generation, leading to annual additional target of 2,200 GWh from 2014 onwards until the end of 2030.

In years where this top up is not met by new WCMG projects, then the shortfall can be supplied by renewable energy projects.

The impact on the annual targets under the LRET scheme is shown in Figure 12 and the change in LRET energy generation is provided in Figure 13. For the low target, an additional 2,100 GWh of renewable energy generation is required over the life of the scheme to make up the predicted shortfall in additional WCMG generation. For the industry target, an additional 6,300 GWh of renewable generation is required over the life of the scheme. This impact could be reduced if the timing for the additional WCMG is modified.

Figure 12: Revised targets under the proposed amendments

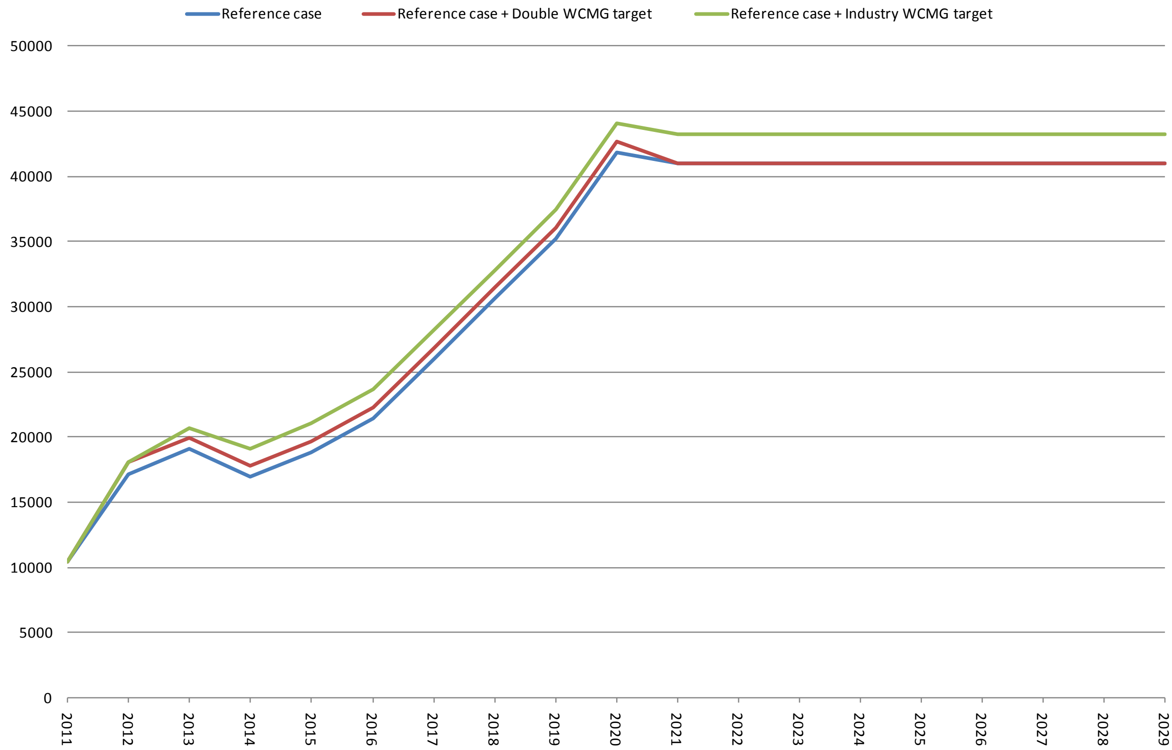
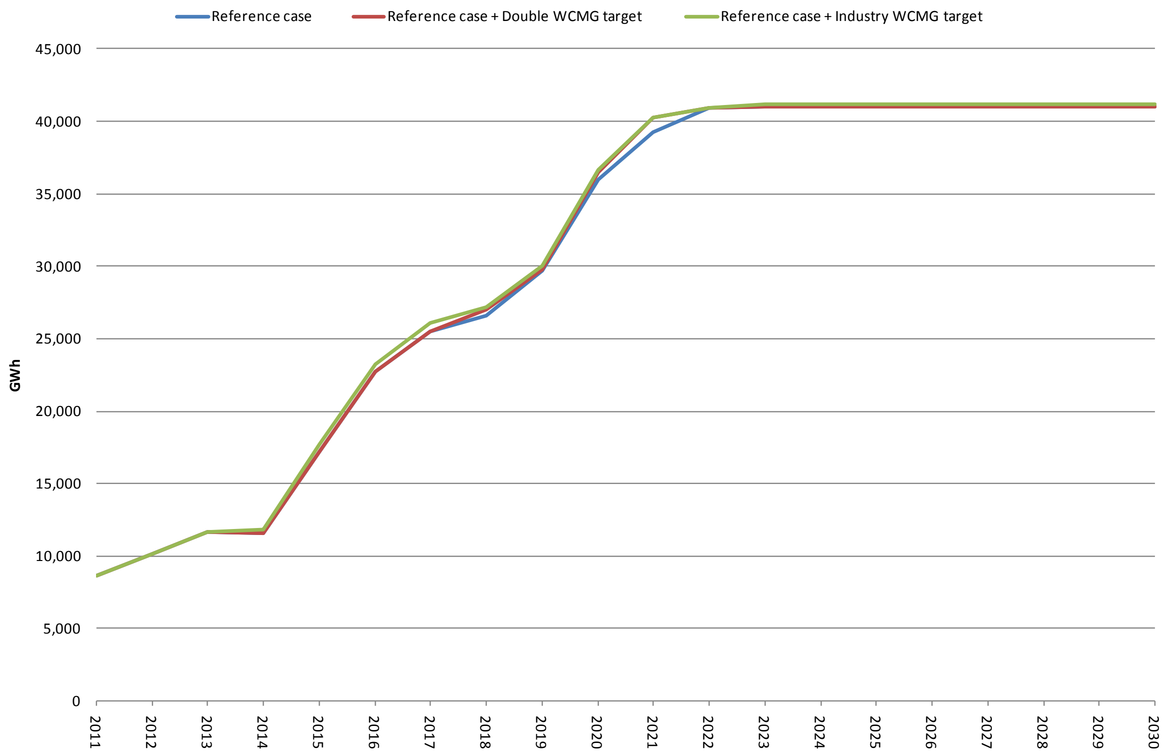


Figure 13: Change in LRET certificate creation by renewable generation—addition of new waste coal mine gas

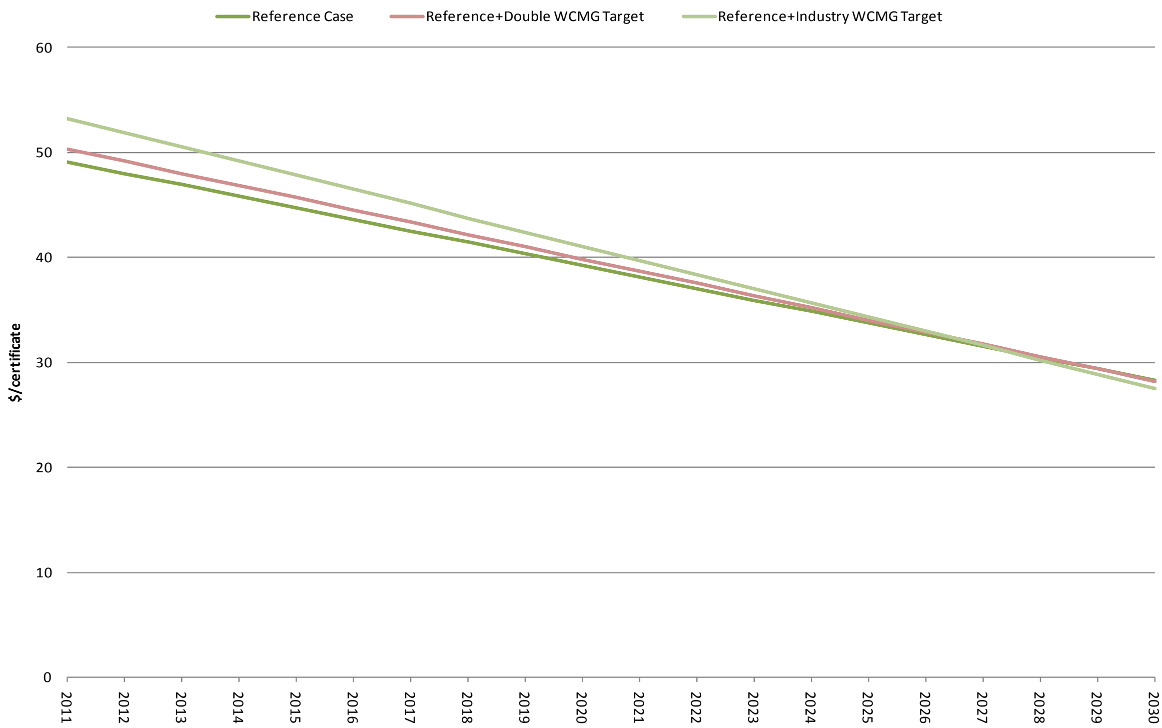


4.4.3 Impact on Certificate Prices

Impacts of the proposed amendments on certificate prices are shown in Figure 14. The simulations indicated that there are minimal impacts on LGC prices for proposed amendments. Certificate prices are slightly higher with the inclusion of new WCMG due to the small increase in target imposed by the change.

This increase in LGC prices is due to the fact that additional renewable energy generation is required in the early years to make up a shortfall in the level of new WCMG. The shortfall occurs because the long lead time required for new WCMG generation projects. For the low target, the shortfall is equivalent to requiring an additional 15 MW wind farm for a 15 year period. For the industry target, the shortfall is equivalent to a 95 MW wind farm generating for a 15 year period.

Figure 14: Impact on certificate prices



It should be noted that the impact of the proposed measure to include new WCMG is likely to only bring forward the level of uptake. Estimates by SKM MMA of the cost in terms of the carbon price required for new WCMG projects, including for new ventilation air technologies, is in the order of $30/t CO_2e to $50/t CO_2e. This carbon price range is likely to occur under a carbon pricing regime from around 2020 onwards, and earlier for lower carbon targets.

4.4.4 Impact on Retail Electricity Prices

There are minimal impacts on retail prices due to countervailing forces. The proposed inclusion of additional WCMG may lead to lower wholesale prices even if they encourage more large scale renewable energy options. This is because the additional renewable generation is bid into the wholesale market at their short run marginal cost, which is typically lower than for the fossil fuel generation they displace in the market. The downward pressure on prices is mitigated by mothballing of some fossil fuel plant that becomes uneconomic with the higher levels of renewable generation. Overall, wholesale prices are on average 1.3% lower over the life of the scheme with the inclusion of double the target for WCMG and 2.5% for the industry target.

The impact on the wholesale market is mitigated by the higher certificate prices required in many cases to pay for the more expensive renewable generation options and the higher level of certificates required (to meet the higher targets for WCMG generation). Compliance costs, on a present value basis, are some $440 million higher for a doubled target and $1,440 million for the industry target. When the decrease in wholesale prices is not passed through to retail prices, there is a small increase in retail prices of less $0.9/MWh. Combining the compliance cost and wholesale price impacts lead overall to a small decrease in retail prices of less than 0.5% on average.

Figure 15: Impact on wholesale prices

Figure 16: Compliance costs

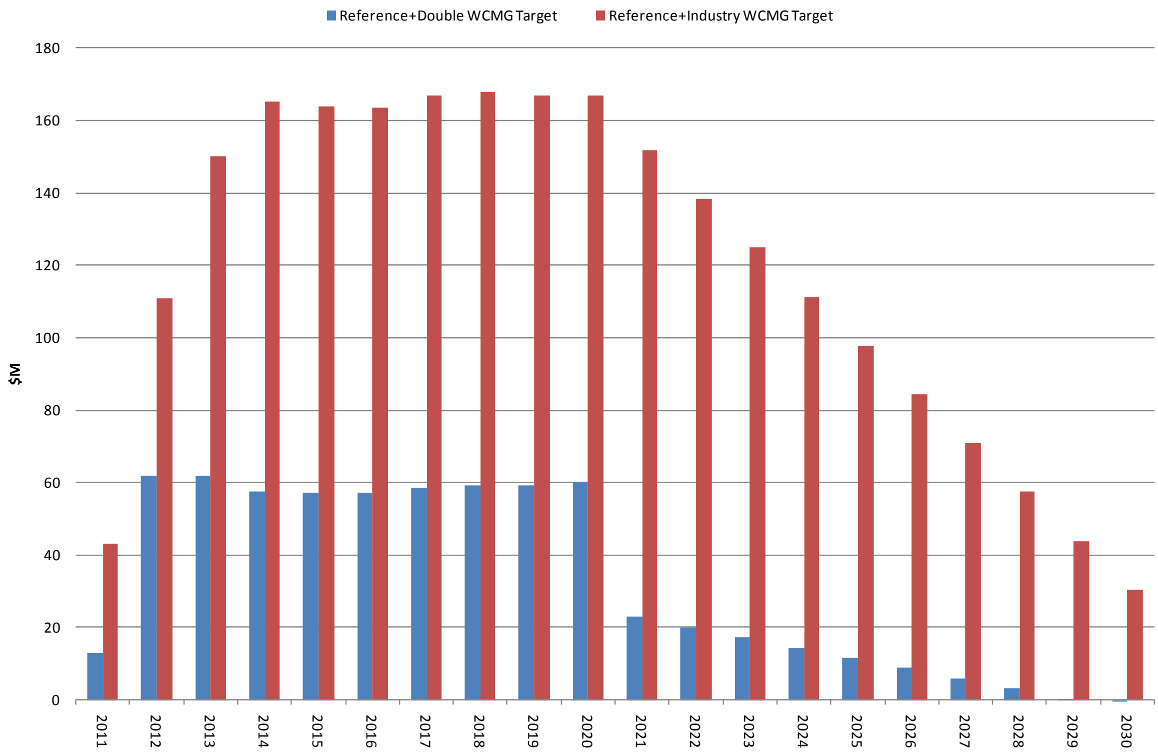
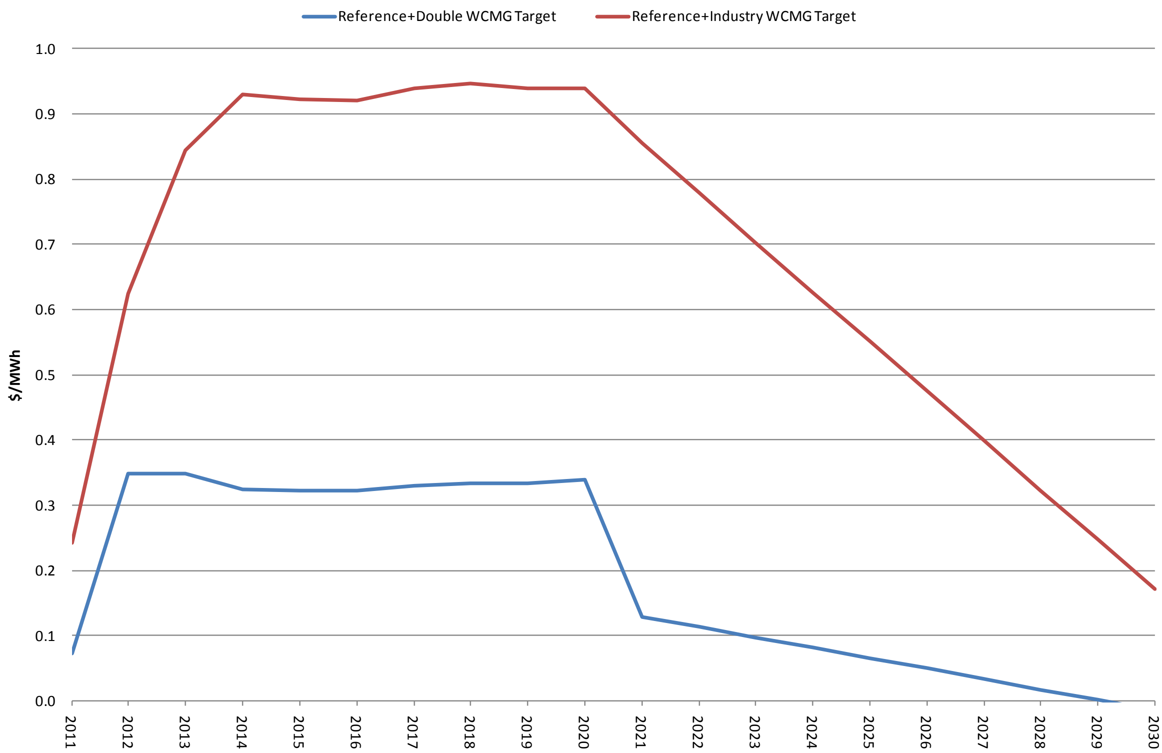


Figure 17: Impact on retail prices of inclusion of higher waste coal mine gas targets when wholesale price impacts are not included



4.4.5 Impact on Large-Scale Renewable Energy Generation

There are minor impacts on the level of large scale renewable energy generation. Adding new WCMG leads to an increase (of less than 2%) in the large scale generation in the period to 2015 mainly by bringing forward the entry of biomass and wind generation. This arises because there is insufficient generation from new WCMG to meet the target specified in the short term for this technology. The target for new WCMG commences in 2012, and there may be insufficient time to develop projects to meet the target for new WCMG generation in the first three years.

Figure 18: Change in renewable energy generation mix—new coal mine gas generation included—double target

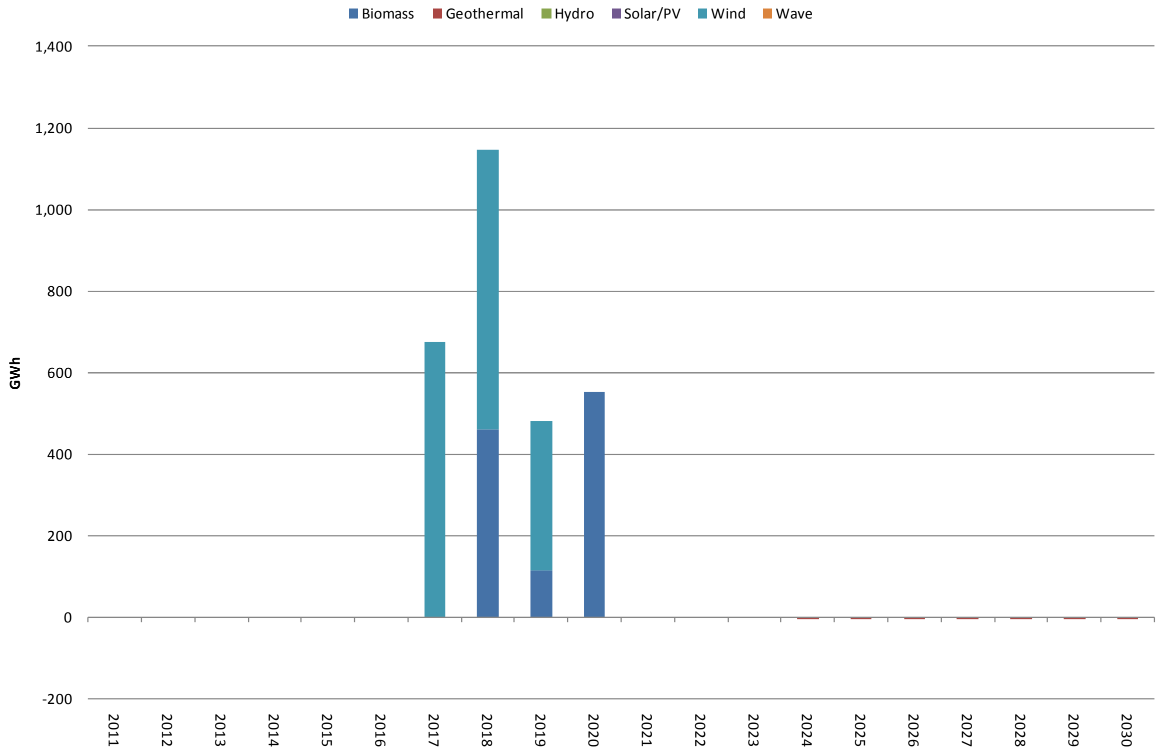
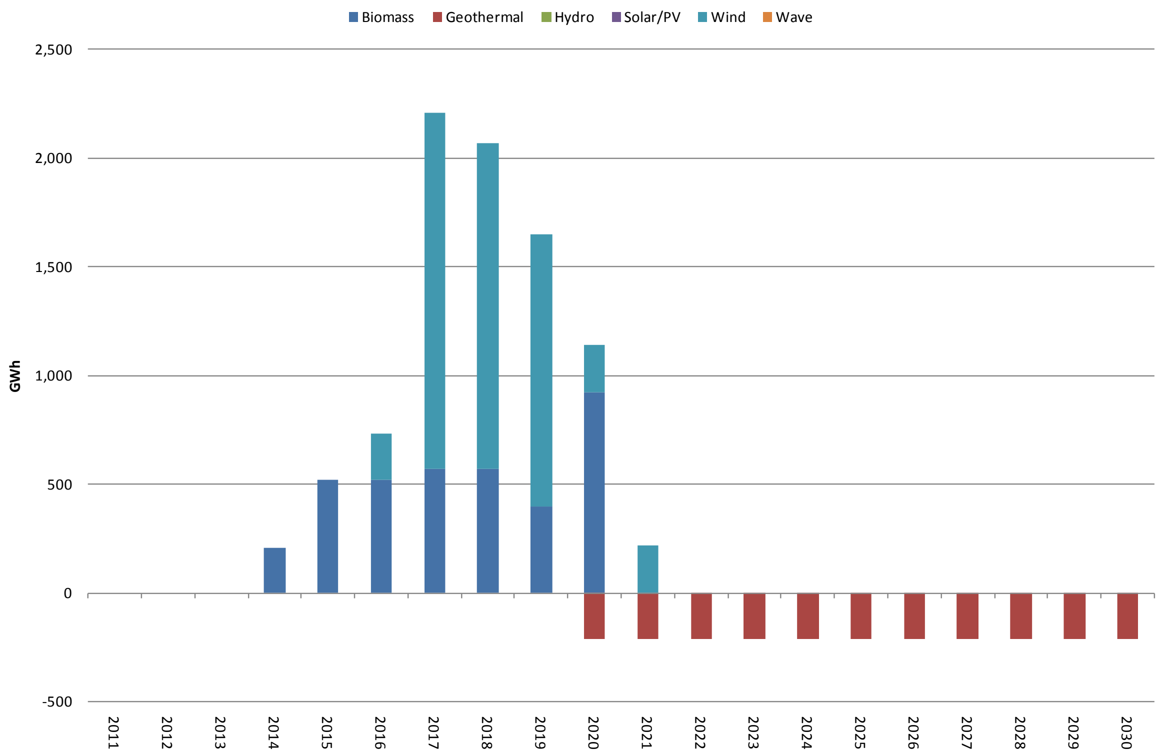


Figure19: Change in renewable energy generation mix—new coal mine gas generation included—industry target



4.5 Recommendation on New WCMG

RESG recommends not extending eligibility to new WCMG generation under the LRET component of the RET. WCMG is not a renewable energy source, and existing WCMG generation was originally included in the RET as a transitional assistance measure in the context of the cessation of GGAS and commencement of the then CPRS only, not as a valid source of renewable energy. This is reflected in the fact that annual targets under the RET were increased to ensure WCMG would not crowd out renewables or impact on achievement of the 20 per cent renewable energy target for 2020.

Similarly, given that WCMG is not a renewable energy source, extending eligibility to new WCMG would require increasing targets under the RET in order to ensure the overall target of 20 per cent renewable energy by 2020 is not compromised, thereby increasing the cost of the RET by between around $300 million and $1.5 billion, depending on the amount of WCMG allowed in.

Not only would extending eligibility to new WCMG increase the cost of the RET to accommodate a non-renewable energy source, it would also set a precedent for other low emissions technologies and shift the focus of the RET scheme away from renewable energy.