3rd June 2016

Response to draft ESC report: The Energy Value of Distributed Generation.(Distributed Generation enquiry Stage 1 Draft Report April 2016)

Energy Innovation Co-operative Ltd

This response is briefer than we (Energy Innovation Co-operative ltd) would like, due to lack of time. We regret that we did not hear about the report until late, are very appreciative of the opportunity provided by the public consultation session in Traralgon earlier this week, and hope that we will have more time to contribute to the next stage of the report.

General Comments:

1. We very much appreciate and value that:
   a. This report has been requested by the Victorian government under the terms that it has.
   b. To our knowledge, for the first time a regulatory body such as the ESC has actually acknowledged that there is an economic, environmental and social value in renewable distributed energy generation, and that this should be paid for appropriately.
   c. The draft report is written in clear intelligible language accessible to the lay person

2. The report is headed "distributed generation", mentions low emission generation (Chair's introduction), and provides models of potential payments for tariffs for wind and solar generation (p111).
   However, at other times other possible forms of distributed generation are mentioned, although not detailed.

   We are concerned that there should be a more specific clarification and specified focus on "renewable, zero-emissions energy generation" throughout this whole report.
   a. There are existing and potential gas fired power stations which could claim to be part of a "distributed generation" network. They should be excluded from consideration for additional payments as they are using non-renewable resources, and are carbon polluting.

   b. There are potential biomass generation systems which whilst technically "renewable" are not environmentally sound as they'd continue the burning of native forest timbers, or crop wastes, and would be carbon pollution emitters. They also should be excluded from any eligibility for additional FiT or other payments.

c. However, other systems such as micro-hydro systems should be included where they are genuinely renewable and zero emissions, and where power output is clearly measurable as per solar and wind (see comments below rejecting "deemed power output" or "deemed emissions reduction")

3. We consider it very important for the ESC to give specific consideration to community owned renewable energy generation, including properly considering the additional economic and social value provided by this iteration of distributed energy generation.

The Victorian government has begun removing regulatory and other barriers to the expansion of community owned renewables in Victoria. Other states are well ahead of us, but there is a back-log of projects planned and underway in Victoria and it is rapidly expanding.

At present this report only attempts to put a value on the environmental value of distributed energy, basically absolving itself of the task as specified by the Victorian government to consider the social value of distributed energy as being "too hard to quantify".

Respectfully, our submission would be that you need to do more work, and to properly put a value on the social and economic value provided particularly by community owned renewable energy generation.

We would submit that that consideration should be given to a proposal to provide an additional payment beyond the FiT to community owned renewable energy generation systems which recognises the additional value provided by the community ownership.

1. This is currently operating within the ACT- reverse auction for community solar and community wind.

2. Calculating the value of local community ownership should include calculations of income earned which stays within the local community, recirculating multiple times, instead of being lost as profits going overseas.

3. Suggested references as a start point (some of which will be attached to this submission):
    a. Check websites: Community Power Agency (www.cpa.org.au), Reposit Power (www.repositpower.com) Renew economy (www.reneweconomy.com.au)
    b. "Renewables for All: Increasing customer access to renewables" ACT 2015 Community Power Agency
    c. "Community Renewable Energy Fund" (has detailed economic & social benefits of government investment in CE) Marsdon Jacobs prepared report for Coalition for Community Energy 2013

d. Social and Economic Benefits of Community Energy Schemes (UK) Mark Walton 2012

Response to Questions BOX 7.1 p 120)

Wholesale market value of distributed generation exports

1. The proposed multi-rate feed in tariff (FiT) does not yet fully allow for payments to better reflect the market value for their exports.
    a. We reject any notion that payments should be made on the basis of "deemed electricity generation outputs" or that there should be "deemed output tariff components". **This is a recipe for scams** and is **not necessary** given the capacity of online access to metering and inverter data.

    b. The very last thing we would want this report to encourage government to do is supply a FiT or other payments which encourage exploitative business practices putting poor equipment in the wrong places because customers receive a financial benefit assuming a level of production and emissions reduction which is never actually achieved. We have already seen far too much of that poor policy.

    c. We reject any argument from either retailers or distributors that this data is expensive to collect or to distribute where necessary.

    d. Modern inverters already collect data on actual solar/ wind generation, and make this data available to installers, customers, retailers and others. (www.gippslandsolar.com.au)

    e. Most of us are in Ausnet Services region. Customers in our region paid for smart meter installation many years ago and the failure to get them operating still is a scandal and unacceptable. We will be penalised by not being able to access any "time of use" feed-in tariffs for distributed energy generation. Ausnet Services should be compelled to speed up its connections of smart meters to enable on-line access to timed power generation usage (and production) by customers.

2. Yes, we do support the proposal to amend the FiT framework to enable multi-rate tariffs for distributed generation.

    We commend the proposal for the 3 time periods (shoulder, peak and off-peak) and particularly commend the introduction of the "critical peak" payment.

    a. It is more complex than a single time payment. However, customers have already been confused by the proliferation of deliberately confusing pricing arrangements brought in by a multitude of supposedly competing retailers.

b. The solution to that confusion is to enforce comparability into power bill formatting, and to support and encourage community education efforts, which groups such as ours (Energy Innovation Co-op www.eico-op.com.au)and many organisations like ourselves, put a lot of time into.

We condemn the current practice of paying all generators the highest prices per kWh currently being paid for all power generated during those current times of “critical peak” power usage.

a. This is a distortion of the market which is effectively a subsidy to dirty coal fired power.

b. Baseline coal generators do not face additional costs for their power during those times of critical peak power usage. They should not be paid additional fees which are effectively unearned profit (subsidy).

c. The best way of reducing the costs of implementing a market based payment system, which properly recognises the economic, social and environmental benefits of distributed renewable energy, particularly during those critical peak times, would be to remove this current subsidy paid to baseload power generators during those same critical peak power usage times.

d. The idea of paying a “critical peak” tariff is to provide a clear signal to generators, to bring in new generation at those particular times- whether by turning on new systems, or by stopping current power usage which is non-essential. Paying critical peak prices for power generation which does not change, and is heavy with emissions and environmental costs, does not make any sense at all.

e. As climate change bites more over coming years, we can expect a rise in the number of days per year where we experience those “critical peak” loads. This is a significant issue.

Environmental and social value of distributed generation electricity.

Yes, there is a lot of additional data on the social benefits of community owned renewable energy generation in particular, which should be considered.

See general comments at beginning of this submission.

Implementation (retailers and distributors)

We reject the notion that implementing a proposed distributed generation tariff, environmental or social benefit payments, or time of use payments including the critical peak tariff, imposes significant additional costs to retailers or distributers.

Many retailers are also in the generation business, and those who have still resisted the public's wish to move towards renewable/ distributed energy generation could be said to be suffering a conflict of interest. Many such companies have not assisted people to reduce their confusion over power pricing, but have sought to capitalise on that confusion.

Distributers already have an advantage of being a mandated monopoly which has given them access to profits with little accountability to their customers, particularly to customers wanting to be part of a distributed renewable energy generation economy.

We live in a world where IT systems can be rapidly developed to provide real time, accurate information factoring multiple aspects of a pricing system together very quickly and which can present it in an on-line form which is easily understandable.

Maybe the distributers and retailers should just invest some of their profits.

But maybe also the ESC can provide recommendations to government on pricing and regulations allowing community owned competition, to give customers the option of leaving those old distributors (www.energystorage.org.au) and retailers (www.enova.com.au) behind altogether.

There may be initial costs involved in implementing prices which recognise the clear economic, social, and environmental **benefits of renewable distributed energy generation**.

The easiest and most appropriate way to pay for those measures is by implementing prices which recognise the clear economic, social and environmental **costs of dirty brown coal energy generation.**

There is a mandated requirement that the industry and regulators act in the best long term interests of consumers. There can be no doubt that renewable distributed energy generation is in the best long term interests of consumers and we hope that the ESC report will seek to encourage it as much as possible, particularly with respect to community owned renewable energy generation.

With thanks

Susan Davies for

Energy Innovation Co-operative Ltd.

Social and Economic Benefits of Community Energy Schemes

The Clore Social Leadership Programme

National Trust

SHARED ASSETS

Executive Summary

The Department for Energy and Climate Change is currently reviewing its policy towards community energy, seeking evidence of its benefits and a better understanding of the barriers to its development.

In addition to its commitment to generate 50% of its own energy from renewable sources the National Trust has also been working with local communities to assist them in developing their own community renewables schemes, including the development of a small hydro project in the village of Abergwyngregyn, North Wales.

To inform the current debate the National Trust worked with 2012 Clore Social Fellow, Mark Walton to explore the social benefits that community scale renewables can deliver. The work was undertaken through interviews with 30 people involved in community energy generation, either as practitioners or as supporting figures, both inside and outside the Trust.

The report identifies many of the wider social benefits delivered by community renewables and how these can best be measured and multiplied. It also examines some of the barriers faced by community renewables and highlights the positive role the National Trust can play as an enabler for local communities and an advocate for community energy. It includes a case study of the Abergwyngregyn project.

Key Findings

- **Social benefits**
  Community renewables schemes can deliver a range of social and economic benefits to local communities including increased autonomy, empowerment and resilience by providing a long term income and local control over finances, often in areas where there are few options for generating wealth.
  Other benefits include opportunities for education, a strengthened sense of place and an increase in visitors to the area.

- **Measuring social impacts:**
  There is a great deal of interest in this issue but very little formal measurement of social benefits of community renewables. Only two systematic attempts to measure social benefits were identified. Effective measurement of social returns would provide useful evidence to support a more favourable policy and funding environment for community owned renewables.

- **Barriers faced**
  Access to land, raising capital and obtaining planning permission present barriers to community renewable projects. Lack of clarity and consistency in national government policy was also a significant concern. A lack of knowledge and confidence can prevent people getting involved in projects that may appear complex and unfamiliar. They may also be unwilling to commit to a long-term project.

- **Role of the National Trust**
  The National Trust is well placed to support community renewable projects. At a local level this might include providing access to land and signposting useful sources of support and funding. They can also use their own experience of installing renewables to help communities navigate the complexities of the process and lend credibility to projects they partner with.

Introduction

The UK government has a commitment to supporting community energy projects as part of its strategy to achieve an 80% reduction in carbon emissions by 2050, and to ensure that 15% of the UK's energy needs are met by renewable sources by 2020. The Department for Energy and Climate Change is currently reviewing its policy towards community energy, seeking evidence of its benefits and a better understanding of the barriers to its development.

The National Trust has a commitment to generate 50 per cent of its energy from renewable sources and halve its fossil fuel consumption by 2020. In the majority of cases the Trust is working independently to develop and install new renewable capacity on its properties; however in North Wales it is working in partnership with a local community, to help them develop a small hydro power scheme on the Afon Anafon. The Trust is a member of the Community Energy Coalition - a group of UK-based organisations that support a dramatic increase in community energy.

30 individuals involved in community energy generation, as practitioners or in supporting roles, both inside and outside the Trust were interviewed about the benefits that could be delivered by energy generation projects and how these are currently measured. They were also asked about the barriers faced by community energy projects and the role of the National Trust in supporting and enabling their development.

The partnership between the National Trust and the Abergwyngregyn Regeneration Company to develop a new small hydro scheme in the Afon Anafon, a river that flows down the Anafon valley in North Wales, is presented as a case study.

1. Social benefits

In most cases interviewees focussed on the economic benefits delivered by community energy generation. Whilst some community renewables projects use the income created by the renewable scheme to fund further energy efficiency measures and micro renewables in a bid to reduce their carbon footprint or become carbon neutral, this is not always the main or only use of income generated.

Some of the key benefits identified were:

- **Autonomy:**
  Long term income and control over finances in areas where there are few options for generating sustainable wealth. The size of the income will vary depending on the size and profitability of the scheme.

- The Talybont on Usk hydro scheme delivers an income of about £25,000 per year and enabled the creation of a small community fund providing grants to other projects in the village.

- **Resilience:**
  The income from schemes can be used to increase the energy efficiency of local houses and community buildings, protecting against the impact of fluctuating fuel prices.

  In Abergwyngregyn the community is considering the potential to use income generated to develop projects that can create jobs, and improve the local economy, such as establishing a village shop or pub. They are also exploring the potential to lower fuel bills and reduce fuel poverty through "sleeving" the energy produced to local consumers. [See box below]

Sleeving

In most cases community renewable generation does not lead to lower local household energy prices as,
in the absence of local or 'smart' grids, the energy is sold directly to the national grid rather than to individual households. However, the National Trust is working with energy providers to explore the possibility of using a process known as 'sleeving'. Sleeving matches the energy usage of a defined customer group with the output of a specific generation source. This pricing mechanism provides consumers with a more direct relationship with the source of at least some of their energy, and by reducing marketing and administrative costs enables the supplier to offer consumers a reduced rate for their energy supply.

- **Community empowerment:**
  Engagement in a significant long term project such as development of new renewable energy generation involves local people in a range of activities, improving skills and confidence. By making collective decisions about the use and distribution of income local communities also develop greater self determination through the direct control of local resources.

- **Education:**
  Renewable generation installations attract school and college visits and student projects. They provide direct experience of the application of science and technology; study sites for a range of disciplines, and opportunities for technical skills development, connecting people to where their energy comes from.
  In 2012 as well as visits from local schools Torrs Hydro in Derbyshire attracted students from Cardiff, Aberdeen, Sheffield, Bath and Manchester universities.

- **Sense of place:**
  Community control of the type and size of the installation ensures appropriate scale technology is installed which is sensitive to the landscape and the needs of the local community. By improving the prospects for self sufficiency renewables schemes can also contribute to the protection of local culture and language. The collective endeavour of developing and managing such sites can improve social cohesion, creating new networks and connections between individuals.

- **Local economy:**
  While much of the hardware and technology is sourced from outside the UK, the planning, survey and engineering works all provide local employment opportunities, and the income from schemes strengthens the local economy. Existing schemes also reported that the renewables installations themselves can become visitor attractions, attracting new visitors and retaining them longer. Torrs Hydro estimate that 1000 people per year visit the site, which is included in the annual lantern parade and is used as a site for art installations during the local art festival. The turbine, which has been named “Archie” by local school children, is ranked as the second most popular visitor attraction in New Mills on the Trip Advisor website.

Case study – Anafon Community Hydro Scheme

Abergwyngregyn is a small village in Gwynedd, North Wales. It has a population of approximately 250 people and contains about 100 properties. Like many rural villages Abergwyngregyn has witnessed the withdrawal of local services and amenities including its pub and shops.

Abergwyngregyn Regeneration Company

The Abergwyngregyn Regeneration Company (ARC) was established in order to improve the social and economic wellbeing of residents. Over the past 10 years it has successfully developed a range of community projects, including the purchase and renovation of an old mill which now houses a café and community centre, annual summer and Christmas fairs and the management of two local car parks.

Hydro Scheme Initiation and Development

Since 2011 ARC have been working with the National Trust to develop a proposal for a hydro electric scheme that will harness the power of the nearby Afon Anafon River. The National Trust were aware of the hydro potential of the site, but due to complicated land ownership issues, it was not a high priority. Other sites offered more straightforward opportunities. However ARC were made aware of the opportunity and in 2011 met with other organisations where it was agreed to explore the potential to develop a community managed hydro scheme.

Current Development

Working with the National Trust Environmental Advisors, ARC secured funding that enabled an initial feasibility study to survey the site.

Feasibility and survey work can cost tens of thousands of pounds, up to 10% of the capital cost of a scheme. It must be done before applying for planning permission and at any stage issues may be found meaning the project cannot continue.

At Anafon these risks were managed by identifying the most high risk areas at the start, and surveying them first before moving on to the lower risk issues. So far survey work has found a rare grassland fungus which has resulted in changes to the proposed route for the pipeline as well as reducing the size of the project from 500kW to 300kW in order to protect bryophyte habitats.

The Trust and ARC are exploring joint venture options which would enable the National Trust and Forestry Commission to lease the land required for the scheme to ARC who would finance, develop and operate the hydro. The proposed model allows the group to apply for support and grant financing as well as benefiting reduced borrowing costs for post planning capital construction.

Funding

Funding for the pre-planning stages of the scheme has been provided by the Welsh Government's Ynni'r Fro, Cooperative Community Energy Challenge and the Waterloo Foundation. Funding required for the capital works themselves will be sought from a commercial lender or investor based on a sound business case model. This will be repaid in 5-10 years. The total life span of the facility is expected to be up to 100 years.

Community benefits

ARC have considered the range of benefits that could be delivered using the income from the sale of energy.

Priorities for the use of funds are likely to be:

- improving energy efficiency through e.g. improved insulation (powering down)
- reducing carbon emissions through e.g. installed solar PV (powering up)

With only 100 properties in the village there will be a limit to the need for these measures. Other options include:

- improving the local economy by establishing a village shop, community bus service or village pub,
- creating a new children's play area,
- providing educational opportunities such as a college bursary.

Role of the National Trust

In the case of the Anafon scheme the National Trust has been able to provide a wide range of practical and technical support to the local community.

The main benefit has been the identification of the site and the offer to the community of the opportunity to develop it. Access to land is a critical issue facing many community renewable projects.

A further key benefit to the community has been the technical expertise that the Trust has developed as result of pursuing its own renewables programme, including the installation of similar hydro schemes at other local sites.

It has also been able to provide access to a range of additional expertise and support programmes, and credibility with other statutory bodies and agencies.

2. Barriers Faced

A wide range of barriers that communities face when developing energy generation projects were identified. These included:

- **Access to land:**
  Most communities do not own land where the resources (wind, water etc.) are suitable for renewable energy generation. The first hurdle is therefore often negotiating access to land and the terms of leases and access rights with a landowner.

- **Finance:**
  In most cases the main financial barriers come at the start of the process. Undertaking the suite of specialist surveys and studies required for a feasibility study, and to support applications for planning, licences and loan finance can cost tens of thousands of pounds. Whilst there are sources of grant funding which can support these, their availability is patchy. Loan finance is not available for these activities due to the risks of failing to get project approval. There are many issues that may derail a project at this stage ranging from insufficient flow of head to the sensitivities of specific species or habitats.

  Once the viability of the scheme has been assessed and planning permission has been granted, most schemes are able to access commercial loan finance from a range of providers.

- **Planning and licences:**
  A key barrier to developing community renewables schemes is gaining planning consent and other permissions. This is clearly a major obstacle to the development of wind farms but is less of an issue for hydro schemes where the key regulatory hurdle is obtaining an abstraction licence from the Environment Agency based on the available flow in the watercourse.

- **Lack of clarity and consistency in national government policy:**
  While the UK Government has stated its support for community energy there are concerns that until a clear strategy is published there are uncertainties regarding the future price of energy, dependency on power purchase agreements with large commercial energy firms, the ease of connection to the grid, the future of the feed in tariff and the level of support available for community schemes.

- **Unfamiliarity, lack of skills, experience, or access to expertise:**
  Developing a new renewable project is a new process for most communities that can appear complex, uncertain and unfamiliar, requiring a high degree of specialist knowledge. While some schemes and programmes exist which can assist communities this is often not clearly signposted or universally accessible. The fact that every new scheme has to experience the same learning curve is seen as a severe drain on developing more such schemes.

- **Lack of confidence:**
  Whilst expert advice is available and an increasing number of schemes demonstrate that a wide range of renewable schemes are achievable for local communities, the lack of familiarity can result in a lack of confidence that such a project can be undertaken. This is especially true where a community does not have previous experience or track record of delivering a project involving substantial capital works.

- **The long term nature of the work:**
  The fact that timescales from initiation to income generation can be several years is a significant issue for community organisations where people are working in a voluntary capacity during their spare time. The long timescales can make it particularly difficult to deal with set backs when a lot of time, effort and money has been invested.

- **Overcoming differences of opinion:**
  The use of the term "community" can lead to assumptions that all of the community are involved in or supportive of a project. In fact projects are often driven by a small number of enthusiasts and the wider community may have limited involvement or influence. Whilst hydro and renewable heat schemes are less contentious than wind turbines it remains important that wide community engagement is undertaken to maximise understanding and awareness of, and support for, the project. There may always be some opposition and this may sometimes be quite vehement. Individuals undertaking this work need to be able to deal well with such situations.

3. Measuring social benefits

There was a wide spread belief amongst interviewees that effective measurement of social returns would provide useful evidence to support the creation of a more favourable policy and funding environment for community owned renewables. Such evidence would be of interest not only to national and local government and practitioners but also to the growing field of social investment where investors are looking for social returns on their investment as well as, or instead of, financial returns.

While there is a great deal of interest in this issue and a wide range of actual and potential benefits were identified by interviewees (see above), there is very little formal measurement of social benefits of community renewables being undertaken in practice. The current literature and guidance for the delivery of community benefit is mainly aimed at developers of onshore windfarms and focuses on ownership options and on the establishment and management of community funds using a proportion of the income from installations.

Only two systematic attempts to measure social benefits were identified:

- Community Energy Scotland has undertaken an impact survey to look at the social impact of its work to support community energy projects. This survey used 5 point Likert scales to identify changes in a range of areas such as skills, awareness, engagement and wealth.[1]

- New Economics Foundation have undertaken some early stage work to develop a set of metrics for a Social Return on Investment (SROI) study with the Ashton Hayes "Going Carbon Neutral" project. A full SROI report has not yet been undertaken. This work builds on a previous SROI project with Kirklees Warm Zone, an energy efficiency project.[2]

4. Role of the National Trust

The areas where interviewees felt that the National Trust is most able to support the development of community renewables were:

- Access to land / identification of opportunities
- Signposting the route by providing case studies / practical examples
- Navigating the complexities of the process and offering familiarity with the technical expertise and issues that might arise
- Engagement with other agencies and statutory bodies with whom it already has relationships
- Providing credibility to inexperienced community organisations by partnering in order to provide track record
- Engagement with visitors and interpretation of schemes and works
- Taking a leadership role with regard to national policy, land use and planning issues and identifying the benefits of community renewables
- Sharing lessons with other land and asset owners

There was general support for the National Trust acting to support community renewable projects through partnerships. However this was tempered with some concerns that the Trust should not seek to duplicate or undercut existing consultancy and support programmes.

In the case of the Anafon scheme the National Trust has been able to provide a range of practical and technical support to the community.

The main benefit has been the identification of the site and the offer to the community of the opportunity to develop it. Access to land is a critical issue facing many community renewable projects.

A further key benefit to the community has been the technical expertise that the Trust has developed as a result of pursuing its own renewables programme, including the installation of similar hydro schemes at other local sites.

It has also been able to provide:

- access to a range of additional expertise and support programmes,
- credibility with other statutory bodies and agencies,
- access to capital funding.

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[1] Community Energy Projects – 2012 Impact Survey, Community Energy Scotland

[2] An evaluative framework for social, environmental and economic outcomes from community-based energy efficiency and renewable energy projects for Ashton Hayes, Cheshire, March 2012, nef

Conclusion

Community renewables schemes can deliver a range of social and economic benefits to local communities including; increased autonomy empowerment and resilience, opportunities for education, a strengthened sense of place, and an improved local economy. However, despite a widespread recognition of the social and economic benefits delivered by community renewable schemes very little work has been done to identify metrics and methodologies for measuring them.

There is a clear opportunity for the National Trust, using its capacity and expertise, to support the development of metrics to measure the social, economic and environmental benefits of community renewables through its partnership with the Abergwyngregyn Regeneration Company at Anafon. This work, particularly if undertaken jointly with other projects and partners with an interest in this field, has the potential to contribute significantly to the evidence base to support policy development and social investment in this field.

Significant barriers to the development of more community renewable energy generation include access to land, finances and obtaining the relevant licences and permissions. Lack of clarity and consistency in government policy towards community renewables was also cited as an issue. The specialist skills and knowledge required to develop a renewables project, the steep learning curve and the time take to develop projects are also seen as barriers to individuals getting involved in community energy projects.

The National Trust has the potential to build on its work on the Anafon scheme at Abergwyngregyn by partnering with local communities to provide access to land as well as a range of practical support, knowledge and expertise to new community energy projects.

About this research

This research was carried out between March and May 2013.

A desk review was undertaken of:

- Academic research on the public benefit of community energy projects,
- Reports, guidance and policies on community benefits delivered by community renewable schemes,
- Community energy project websites.

Telephone or face-to-face semi structured interviews were undertaken with 30 people, including:

- People local to, or associated with, the Anafon scheme
- Community energy support organisations
- Community projects
- Finance organisations
- Energy organisations
- National Trust staff

A list of interviewees and questions is available on request.

Mark Walton undertook the research while on secondment to the National Trust as part of his fellowship with the Clore Social Leadership Programme. He is Executive Director and co-founder of the social enterprise Shared Assets Ltd.

The National Trust is a conservation charity of over 4 million members. We were created more than 115 years ago to care for special places, for ever, for everyone. To achieve these goals we look after a quarter of a million hectares of land, over 700 miles of coastline, several hundred historic houses and their gardens and parks, and many thousands of vernacular buildings. Many millions visit and enjoy our places, while over 60,000 people volunteer with us on a regular basis.

Clore Social Leadership Programme identifies the UK's most promising social leaders and gives them gold-standard training, skills and opportunities. During the highly individualised Fellowship programme Fellows attend residential courses, experience coaching and mentoring, undertake an extended secondment and practice-based research project, as well as engaging in Action Learning.

Shared Assets support the development of social enterprise and community management of environmental assets such as woodlands, waterways, coastal areas and parks. They aim to reconnect local communities with their natural resources and facilitate new collaborative relationships between landowners and communities, based on principles of productivity, replenishment and enterprise.

With thanks to all 30 interviewees who participated in the research.

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2015

Renewables for All: Increasing Customer Access to New Energy Technologies

ACT DISCUSSION PAPER

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1. Introduction

Australian and global energy systems are undergoing a rapid transformation. The introduction of low-cost solar photovoltaics (PV), storage, energy control and management systems and energy efficiency measures provide an unprecedented opportunity for energy consumers to participate in the energy system.

However, access to this level of participation through new clean energy technologies, energy efficiency measures and energy upgrades is restricted for a number of customer segments, specifically:

- Low to moderate income households,
- Renters,
- Apartment dwellers and
- People who live in shaded or heritage listed buildings.

A range of barriers exist for these customer segments, which left unaddressed will exacerbate inequality. However, this inequality should not be used as a reason to stifle clean energy innovation, but rather a driver for greater innovation.

Around the world, social enterprises, charities, companies and governments are establishing new business models and policy settings and programs that increase access to new energy technologies such as solar PV and battery storage to those customer segments that are currently not able to access them.

Discussion Question:

1. Are there any other customer segments that should be considered in this project?

1.1 About the project

The *Renewables for All* advocacy project is a strategic initiative of the Coalition for Community Energy[1], led by the Community Power Agency. auspiced by Starfish Initiatives with ACT partner Solar Share. This project was funded by Energy Consumers Australia (www.energyconsumersaustralia.com.au) as part of its grants process for consumer advocacy projects and research projects for the benefit of consumers of electricity and natural gas. The views expressed in this document do not necessarily reflect the views of Energy Consumers Australia.

The project will work with state policy makers and key stakeholders to help create the policies that will increase access to new clean energy technologies to the identified customer segments. For the purpose of this Discussion Paper new clean energy technologies are defined as solar photovoltaics (PV), energy storage, energy control and management systems and energy efficiency measures. It should be noted that solar PV is a particular focus of the business models identified.

The project will be conducted in NSW, Victoria, Queensland, South Australia and the ACT.

This discussion paper will inform a stakeholder workshop in October and lead to policy briefs that will be used in advocacy with state policy makers. As such, discussion

[1] This Discussion Paper does not necessarily represent the views of all C4CE Members.

questions are interspersed throughout this document to stimulate debate between key stakeholders on the future direction for clean energy technology access in the ACT.

1.2 ACT Context

The ACT is well known to be a leader in clean energy and renewable ambition, not only in Australia, but also internationally, with a 90% renewable energy target for 2020 and 100% target for 2025.

Although there are a number of programs that address energy efficiency within the ACT (eg. the Home Energy Advice Team) and energy costs to some low-income households (the Energy Concession) there is surprisingly little when it comes to increasing access to new clean energy technologies. The one exception is the Community Feed-In Tariff, which offers a guaranteed 20c per KWh feed-in tariff for 20 years. It is designed for locally-based solar investment programs with the total program capped at 1MW.

There are likely a number of other relevant initiatives and policy processes in ACT that are unknown to the authors; the workshop process is intended as a means to ensure these ideas and initiatives are incorporated into the Renewables for All advocacy if appropriate.

1.3 New policy mechanisms and business model options – overview

This discussion paper identifies a range of new mechanisms designed to increase new clean energy technology access to the identified customer segments; Table 1 provides a summary.

We note that the customer segments identified have overlaps, but for simplicity we have determined it is not practical to segment further. Also many of the mechanisms identified can be of benefit to all customer segments, including those already with access to clean energy, however policy and focus can help preferentially benefit the disadvantaged customer segments. The mechanisms and examples included are structured around two key barriers:

- Accessing the benefits of clean energy beyond the bounds of your own dwelling
- Affordability and ease of repayment – making it simple

Accessing the benefits of clean energy technology beyond the bounds of a home, is one way to address more commonly known barriers such as

- Split-incentives for where renters may benefit from a solar PV or energy efficiency installation but the landowner does not share the incentive; and
- the difficulties of engaging with the body corporate for apartment dwellers.

Affordability and ease of repayment is focussed on providing cost effective and easy methods to finance clean energy technologies and energy efficiency to assist people without easy access to cost effective finance.

Table 1: Summary of Mechanisms

Mechanism	Customer Segment	Status in ACT
Access beyond bounds of home		
Solar gardens whereby energy from a central 'off site' shared solar installation is sent directly to homes	Apartment, renters, inappropriate roof, some low-income	Not possible without virtual net metering/peer-to-peer energy provision in energy regulation
Community-owned renewable energy	Apartment, renters, inappropriate roof	Possible and projects in development
Tax incentives	Apartment, renters, inappropriate roof, some low-income	Not possible without changes to the tax code.
Affordability and ease of repayment		
Power Purchase Agreements /equipment loans/ equipment Leases	Moderate-income homeowners	Possible and products available
Rent-based repayment whereby energy upgrades are financed and repaid through rent payments	Low-income community housing tenants	Housing providers due to funding restrictions and regulation may not be able to pass-on the repayment through rent.
Rates-based repayment whereby energy upgrades are financed and repaid through rates payments	Moderate-income homeowners, potentially renters and apartment dwellers	Not possible without legislative changes.
On-bill financing whereby energy upgrades are financed and repaid through energy bill payments	Low-income, potentially renters	Likely not possible without changes to electricity tariff categories, approval from ICRC and/or clarity around the National Electricity Retail Law.

Discussion Question:

2. Are there any other key barriers and mechanisms or business models that should be considered in this project?

3. What do you think should be priorities for the ACT Government in increasing access to new clean energy technologies?

1.4 Discussion Paper Structure

The Discussion Paper is structured as follows:

Section 1 presents the background and objectives of the Renewables for All project and provides a brief overview of the status quo of policy support for clean energy in the Australian Capital Territory (ACT). At the end of this section the different options are shortly summarised.

Section 2 focuses on the chances of individuals and community groups to access clean energy beyond their own premises. This section firstly introduces major challenges for disadvantaged groups to participate in renewable energy deployment. To address those challenges, three different innovative solutions – community owned renewable energy project, solar gardens and tax breaks – are presented. Each option includes benefits, limitations and project examples from around the world.

Section 3 looks at options for access to clean energy on a house/apartment. Low-income households are a particular focus, with examples for affordable and simple payment solutions outlined such as: loan/ lease arrangement or repayments through rent, rates and utility bills. The options are explained by presenting information about benefits, limitations and specific project examples.

In all sections the ACT context is considered and references to existing examples and policy interventions suggested.

Appendix A provides links to more information about and examples of each of the mechanisms identified.

2. Access to clean energy beyond one's premises

As mentioned in Section 1, groups such as low-income households, renters and homeowners with unsuitable rooftops find it hard to participate in the energy transition. As such, in the last five years different innovative mechanisms and business models have emerged that seek to enable the access of clean energy solutions for a larger segment of customers by reaching beyond the bounds of a property.

These customer segments face a number of challenges. For **low-income households** the main barrier is the lack of financial means that are required to afford the capital intensive costs of energy upgrades such as a solar PV installation or solar hot water system. This is further aggravated by the fact that such households are often not considered creditworthy and are therefore not able to access debt finance or are subjected to higher interest rates. The financial risks that banks or other lenders (e.g. solar retailers) associate with these households decreases the actual economic viability for conducing renewable energy or energy efficiency measures and leaves the households stranded.

Tenants of apartments or houses may be interested in decreasing their electricity bills by establishing energy efficiency or renewable energy solutions on the premise. Yet, a dynamic referred to as the 'split incentive' leaves both the tenant and the landlord reluctant to invest in efficient or renewable technologies, since neither will fully reap the economic benefits: on the one hand the landlords aren't driven to invest in capital intensive building or apartment upgrades as the electricity cost savings will accrue to the tenants only; on the other hand, tenants can be unwilling to buy e.g. solar systems because their lease doesn't go long enough to reap the benefits. This challenge is further amplified by the usual lack of adequate processes between landlord and tenant to negotiate and decide on building or apartment upgrades.

Thirdly **Homeowners** who are equipped with adequate funding can be constrained by technical barriers arising from issues such as unfavourable and shaded roofs or restrictions due to heritage listing. Restrictions are also likely if these households live in communal or strata dwellings. The shared property rights (with the body corporate) add a complexity regarding responsibilities (for costs), decision making and sharing the benefits that makes not attractive to undertake solar system installations. A lack of capacity (e.g. education, resources, information) could detain all households from well-informed decisions for an efficient deployment of new technologies.

Under the term 'community energy' a diverse spectrum of innovative solutions that help different customer segments access new energy technologies have emerged. This section specifically focuses on the solutions that allow customers to reap the benefits of renewable energy beyond the bounds of their home. Typically this works through the establishment of a central grid-connected renewable energy facility, backed by a business model that offers energy consumers the opportunity to invest, purchase or just lease electricity generation. A central renewable energy facility has the added benefit of ensuring there are optimal renewable energy resources and the highest output can be generated.

Furthermore community energy models provide a broad range of financing, ownership as well as engagement options and help households from the lower to the upper end of the income scale to benefit from clean energy. Benefits such as reduced electricity bills or a return on investment will directly flow on to the participating household and help to increase the acceptance of renewable energy as well as energy literacy.

2.1 Community-owned renewable energy

Who is it for?

People who would like to invest in renewable energy but can't do so on their own property (due to renting, unsuitable roof or living in an apartment).

What is it and how does it work?

Community-owned renewable energy projects (CORE) are developed across a range of technologies (e.g. solar PV and wind power). CORE projects are usually initiated by a small group of locals and offer community members but also the wider public the opportunity to engage and invest typically between $100 to $20,000 (though in some cases more) in a renewable energy project. As an ethical investment opportunity the projects typically yield a 4-10% dividend and as such can be quite attractive.

In Australia CORE is the most common approach for community participation in new energy technologies beyond household scale with more than 20 CORE projects currently operating. Hosts for such projects are usually community halls, leisure centres, commercial building as well as farmland or other unused plots of land.

What are the benefits?

Community-owned renewable energy projects offer both economic and social benefits. People can invest into medium scale renewable energy project and receive a return on investment from favourable interest rates. Furthermore those projects offer an option to participate in community activities and help to increase energy literacy and knowledge about renewable energy.

What are the Limitations?

People who can invest in renewable energy for their own home save energy and money, and (naturally) do not pay tax on the money they save. Participants in a community owned renewable project which sells energy to the grid are however taxed on the money that their share of the community owned project earns them. These limitations can be addressed by the mechanisms outlined in Section 2.2 and Section 2.3.

Example:

Repower Shoalhaven One – is a small-scale community-owned solar array on the Shoalhaven Heads bowling club on the South Coast of NSW. The Repower Shoalhaven model uses a proprietary limited company Special Purpose Vehicle (SPV) legal structure to enable up to 50 community members to co-invest in a project (though no more than 20 per year). For the first project 20% of the system was financed and owned by Shoalhaven Heads Bowling and Recreation Club, with the remaining 80% financed and owned by community shareholders. Other CORE projects in Australia include Clearskys Solar Investments, Denmark Community Wind and Hepburn Wind.

Status in ACT and Policy support needed:

There are currently at least two groups developing CORE projects within the ACT. While the

ACT Government has to date been very supportive of community-owned renewable energy, there remains a number of significant barriers.

The National Community Energy Strategy outlines the barriers facing CORE projects and identifies strategies to address them; the key barriers identified include:

- The investor limit imposed by the Corporations Act that makes equity based-crowd funding very difficult. If a project exceeds 20 investors in a year, which is highly likely for community projects, there are high compliance obligations and costs (e.g. regarding public offerings and advertising), greater legal complexity (e.g. potentially needing an Australian Financial Service License), as well as uncertainty and liability risks for issuers (Australian Government, 2015; C4CE, 2015). Changes to the Corporations Act are required that allow for exemptions for CORE projects or raise the investor threshold.
- Funding and business model support for larger CORE projects (>100kWs). Currently, there are replicable models for community-owned solar projects less than 100kWs. However, larger projects, particularly those of a scale of Hepburn Wind or Denmark Community Wind require upfront funding support or contracts for difference/reverse auctions to de-risk the project and prove the business model.
- Accessibility of appropriate host-sites for community-owned solar projects. The current CORE business model that stacks up, is a ~100kW solar array on a commercial building, where the building purchases the power for approximately 10 years. However, there are a number of specific characteristics needed to be a good host site for a community-owned solar project; help from the government in the form of a host-site register would greatly expedite CORE projects in ACT.

In order to address some of the financing barriers for community projects, the ACT Government has legislated a feed-in tariff (FiT) mechanisms and reverse auctions. These policies provide incentives for community involvement as well as community ownership of renewable energy systems.

The Electricity Feed-in (Large-scale Renewable Energy Generation) Act 2011 provides the framework for this mechanism promoting the establishment of large-scale facilities (defined as capacity of more than 200kW) for the generation of electricity from solar, wind and another energy source (to be defined by the Minister).

In the Community Solar Scheme a feed-in tariff of up to 20c per kilowatt-hour, guaranteed for 20 years and capped at 1MW has been offered. A request for proposals had been launched in June 2014, the received proposals are currently being assessed.

The 200 MW wind auction design considers some specific conditions for community engagement: it will be open to local but also regional generators where they demonstrate exceptional local economic development benefits and competitive pricing. A positive community engagement has been key part in assessing the proposals.

Additionally, in 2010 the ACT Government awarded a sustainability grant ($77,000) to a community group to explore community solar options, including conducting feasibility studies, and researching all of the legal, financial, and business aspects of operating a successful community solar project.

For more information see Appendix A.

2.2 Solar gardens – Community-owned renewable energy direct to your house

Who is it for?

People who would like to invest in renewable energy but can't do so on their own property (due to renting, unsuitable/limited roof or living in an apartment)

What is it and how does it work?

Solar Gardens (also known as Shared Solar or Community Solar) help electricity customers receive further benefit from being involved in community owned solar by receiving credits on their electricity bills earnt through shared ownership in a centrally located Solar PV project.

In the United States Solar Gardens can be up to 50MW in size and can be owned or leased (through a service contract) by individual community members. A minimum of 5 separate owners are required to qualify as a solar garden in the US.

Solar Gardens have become to the most prevalent community solar program in the US in the last four years. According to the Solar Electric Power Association (SEPA, 2014) they represented 96% of all active and planned community solar capacity with a cumulative capacity of 40 MW. As of August 2014, SEPA listed 57 community solar programmes spanning 22 states (other sources provide even higher numbers). While this is still relatively small sector, solar gardens in the US are predicted to increase in capacity seven-fold by 2020 (Honeyman, 2015).

What are the benefits?

The main benefits of this model are:

- Installation size not limited by electricity demand
- Avoids need to run physical cabling to customer's connection point in their home apartment or rented property.
- Solar PV accessible for all
- Easier purchasing local renewable energy electricity
- Capital constrained customers can buy renewable energy without high upfront costs
- The fact that the return on investment is returned as a credit against an electricity bill means that participants are not taxed, just like people who put solar on their own roof.

Examples:

MN Community Solar is the first community solar garden (CSG) developer in Minnesota. The organisation has partnered with Xcel Energy, an energy utility and retailer who purchases the energy generated by the community solar arrays in the region. With their model customers don't own the solar panels but subscribe via a service contract to the community solar garden and receive credits on their electricity bill for up to 25 years. The MN Community Solar has already helped to installed community solar gardens on the rooftops of warehouses, a library and a church as well as standalone systems erected on brownfield. Read more: http://www.mncommunitysolar.com/

Clean Energy Collective is a developer for shared solar providing services to communities throughout the US. The strength of the Clean Energy Collective model is that it minimises the financial barriers to entry through allowing customers to purchase just a single operating panel if they like. This models works by Clean Energy Collective building centrally located community solar project in partnership with the local/ regional utility, developing a custom community solar proposal and offering panels to purchase. After customers have bought their panels, they will receive credits directly to their bills. Read more: http://cleanenergycollective.com

Status in ACT and Policy support needed:

In the US this model is enabled by a special legislation for peer-to-peer electricity usage (virtual net metering) - an arrangement where the geographic limitations between the location of the electricity consumer relative to the generator are reduced. It allows electricity be 'sold' or 'transferred' from generator to the consumer via the consumers' billing account. That is electricity generated at the central solar facility is then credited against the owner/lessor/investor's electricity bill.

In July 2015 the US federal government has announced the Clean Power Plan, which include ambitious targets to triple the amount of rooftop solar installed on low-income housing, as well as to boost the development of community solar projects such as Solar Gardens. The plan entails a National Community Solar Partnership with commitments of philanthropic and impact investors, states, and cities to invest $520 million to advance community solar and scale up solar and energy efficiency for low- and moderate- income households. It also provides clearer guidelines on how local housing authorities can access federal funds to finance PV installations.

One of the questions to resolve if this model is to be implemented, is what is the value of the electricity credited – is it wholesale electricity price (4-8c/kWh) or retail electricity price (18-30c/kWh) or some-middle range?

In Australia this form of peer-to-peer electricity usage is constrained by the energy market. While not directly disallowed, there are no incentives for energy market actors to put in place peer-to-peer energy retailing. As such, it likely that a regulatory reform and rule changes are required to expressly allow peer to peer metering and enable the creation of 2nd tier retailers (Solar Garden developers) to facilitate the model.

Currently, a consortium of different stakeholders including the Institute for Sustainable Futures and a number of Councils, Networks and retailers are funded by the Australian Renewable Energy Agency (ARENA) to investigate the opportunities of peer-to-peer electricity usage and trial testing options to inform the development of alternative charging methods for local energy projects and potential changes to electricity market rules.

Additionally, a rule-change has been submitted by the City of Sydney, the Property Council and the Total Environment Centre to help clarify the value of local energy generation and thus what the credit on a consumers bill should be if such a mechanism were to be enabled (Local Generation Network Credit Rule Change). However, state governments can also put in place legislation to compel networks or retailers to credit certain eligible customers who participate in a solar gardens scheme at a certain rate. One option would be that customers who cannot put solar on their own roof could be eligible for full-retail electricity rate, while those customers who can put solar on their roof, would be credited at a lower rate, thereby increasing equity of access.

For more information see Appendix A.

2.2.1 Tax Breaks for community owned renewable projects

Who is it for?

People who would like to invest in renewable energy but can't do so on their own property (due to renting, unsuitable roof or living in an apartment).

What is it and how does it work?

Tax breaks are a policy mechanism that has been enacted in a number of countries to promote the development of renewable energy and specifically community renewable energy. These are targeted entitlement programs that allow a reduction or exemption of the projects' or shareholders' contributions to the public treasury either from the income or other tax obligations such as property tax. In theory, governments make use of tax incentives as flexible tools that can be gradually increased or decreased according to the market development of a specific technology or business sectors.

Specific options include:

- Production tax credits which address operating production costs and investment tax credits focus on initial investment costs,
- Tax credits or exemptions for the use of renewable energy electricity, and
- Tax reductions and exemptions may also cover property, sales, energy, carbon and value-added tax and act directly on the total payable tax, thereby reducing its magnitude and thus the total cost associated with development (Mitchell et al., 2011).

Both previous models examined - solar gardens and community owned renewable energy internationally, have and still do benefit from such tax exemptions. The tax exemptions particularly help to encourage the establishment of small-scale businesses by increasing their economic viability, provide a better value proposition and ultimately making them more attractive to community investors and customers. It also allows CORE projects to seek local investors and distribute the economic benefits within the community.

What are the benefits?

Tax breaks are included in this discussion paper, as households who put solar on their own roof do not have to pay tax on the subsequent savings on their electricity bills. However, if an apartment dweller or renter were to invest the equivalent amount in a Community Owner Renewable Energy (CORE) project, they would have to pay tax on the dividend returned, particularly if peer-to-peer solar gardens are not enabled, and thus the benefit is not credited against their electricity bill.

Examples:

Denmark which is known for its wind power success story was one of the first countries to introduce tax exemptions for owners of wind turbines on the portion of the wind generation that offset a household's domestic electricity consumption. A wind cooperative would then buy a wind turbine, site it to its greatest advantage, sell the electricity to the utility, and share the (tax-free) revenues among its members (Paul Gipe, 2011). The threshold of shares have changed over time, in 1996 the tax-exempt ownership threshold was increased to 9,000 kWh per year or 150% of household consumption (www.repp.org/repp_pubs/articles/issuebr14/02Denmrk.htm). This, among other support policies, has incentivized over 150,000 households to own shares in wind farms in Denmark.

In the UK a number of tax relief schemes are available to community energy projects through the Enterprise Investment Scheme (EIS), the Seed Enterprise Investment Scheme (SEIS) and the Social Investment Tax Relief (SITR) in the social enterprise sector. Tax relief has been an important incentive for many community energy projects by encouraging people to invest in community energy schemes because they allow investors to reclaim income tax on their investment (in SITR also for debt investments) at the rate of either 30% or 50% respectively. Most taxpayers are eligible for these reliefs (up to an annual limit), and are able to reclaim from HMRC, or offset against tax payable, a proportion of the capital they have invested in qualifying schemes.

In Colorado/ USA solar gardens are classified as locally assessed properties for the purpose of property taxation. Since January 2015, projects that are attributed to residential subscribers, governmental subscribers, or organizations (that already have been granted property tax-exempt status) are exempts from property tax to the percentage of the electricity capacity of the community solar garden. In general solar garden projects such as Clean Energy Collective take advantage of those rebates and tax credits incorporating them into their products and passing on savings to their members.

Status in ACT and policy support needed:

In Australia, special tax incentives can be granted at the local (property), territory (income) or national (income, GST) level. In May 2015, the Abbott Government has announced a tax break for small business providing a temporary increase to the instant asset write-off, allowing small businesses to claim back purchases of up to $20,000. This applies to businesses with an annual turnover under $2 million for the next two years.

While this small business package is valuable, it will cease in 2 years with no guarantee for extension. In order to offer long-term support for CORE projects and other community investment models, the introduction of tax incentives for investors should be considered to help increases both the viability of the project as well as the rate of return issued to investors.

States and territories collect only a small share of the overall tax revenue (18%), the majority of which is collected through payroll. As such, the key role state and territory governments can play is to advocate to the federal government to provide tax exemptions or other tax incentives for CORE projects.

For more information see Appendix A.

Discussion Question

4. Do you think the business models that enable customers to benefit from new energy technologies beyond their premises are worth pursuing in ACT?
5. Which business model or business model combination (if any) is most appropriate and needed in the ACT context?

3. Access to clean energy at one's premises - addressing affordability and ease of repayment

One of the key barriers to uptake of new energy technologies by many of the identified customer segments (particularly low-income customers and renters) is the high up-front cost. To overcome this issue a range of organisations are developing finance products that pay for the technology up-front with a customer paying back the cost over a period of time. There are two key elements to new-technology finance:

1. How the finance product is structured. The main three options are a:
   a. Lease,
   b. Power Purchase Agreement (PPA) or
   c. Loan.
2. How the finance repayment is collected over time. The main options are through:
   a. A stand-alone contract and special repayment mechanism
   b. Rent, particularly by community/social housing providers
   c. Land rates
   d. Electricity bill – through a retailers
   e. Regulated utility bill e.g. through an electricity network or a water utility bill.

Repayment mechanisms are important as they are about making new energy technologies easy for customers. Further, some of these repayment mechanisms address additional barriers such as landlord-tenant split incentives, as discussed below.

One of the key challenges associated with a pre-financing approach to new energy technologies for households is that while a customer is often ahead from day one, they will most likely pay more for the technology over the life of the system than if they had paid upfront. The main reasons for this are the cost of capital and finance program costs. If a household pays upfront they use their own funds – the cost of capital (opportunity cost) is quite low as the alternative is having the money in the bank. If financing is used, often the organisation/individual that puts up the finance will expect a return on their investment, and when dealing with low-income households there may be a risk premium. The exception to this is if a low or zero interest financing is possible. However, there will still be the cost of setting up the financing and repayment mechanisms that will need to be repaid by the customer over time. This is extra cost is the unavoidable trade-off with increased access, unless such programs are subsidised by government, which is also a possibility.

3.1 Financing - Loan/lease/PPA

Who is it for?

Moderate-income homeowners, who find the upfront capital cost of new energy technologies prohibitive are the people most likely to benefit from standard solar/energy loans, leases and PPAs. This segment typically have a reasonable credit rating and are able to put their home up as security for the finance. For these mechanisms to start to benefit low-income households and renters they need to be coupled with one of the repayment mechanisms outlined below.

What are they and how do they work?

Energy consumers can secure finance for clean-energy upgrades to their home, as identified above, there are three main approaches taken – a loan, a lease and a PPA.

A loan works like a standard loan or mortgage, with finance provided to cover the new energy technologies either by a bank or an energy company at a certain level of interest over a certain period.

A lease works by a solar or energy company installing solar on a customers roof and the customer pays a fixed amount each month/quarter over a certain period. The energy company remains the owner of the equipment in a similar way that some companies offer lease/rentals on whitegoods. Electricity generated can be used by the customer and any electricity exported is credited on the customers electricity bill at the export rate as set by the energy retailer (currently approximately 7.5c / kWh from ActewAGL).

A PPA works by a solar or energy company installing solar on a customers roof and the customer pays a specified amount to the company for every kWh of electricity generated, typically lower than retail electricity rate.

The key distinction between these three finance mechanisms is that with a loan the household owns the technology from day one, whereas for a lease and a PPA an energy company owns the technology, with households either gifted the technology after a certain period as well as having the option to buy the technology outright at any time. The other main difference is that loan finance can cover a range of new energy technologies – solar PV, energy efficiency upgrades etc, while PPAs and leases are specific to solar PV.

What are the benefits?

Solar loans, leases and PPAs allow home owners to upgrade their property with clean energy technologies and energy efficiency measures with no upfront cost. The savings they make on reduced electricity purchased from the grid, are used to pay for the finance costs.

Status in ACT and policy support needed:

Currently there are a range of clean energy/solar loan, lease and PPA products available in ACT. There is no specific policy support required to enable these financing mechanisms in the ACT.

3.2 Repayment through Rent

Who is it for?

Low income households and their landlords.

What is it and how does it work?

Repayment through rent refers to a model that specifically applies to community/social housing providers that would collect repayment for renewable energy or energy efficiency upgrades through their tenants' rent. As such community housing providers as landlords are in a great position to help their low-income households to access new clean energy technologies and enable cost savings through reduced electricity bills. The advantage of this model is that community housing providers have well-established processes and administrative procedures (e.g. rent collection) that would allow for efficiently collecting of repayments from tenants. Additionally they have a good understanding of the needs of their tenants which will help to communicate such changes.

Community housing providers that are willing to go the extra mile for their tenants have different options to finance renewable energy or energy efficiency upgrades:

- Self-funded, all costs are covered by the community housing provider, which collects the repayments from the tenants;
- Collaboration with a community energy organisation, which finances, installs and manages the solar assets on the low-income households' roofs and in return the community housing provider pays the lease until the end of the contract period.
- Other options include financing provided through a third party financier or solar retailers

What are the benefits?

- Low income households can access clean energy technologies in a way that provides certainty to the landlord who is buying the technology
- Rent carries a low risk of default
- No ongoing adjustments to legal documentation, and therefore no complications when the tenant moves out.
- Less stakeholders involved with this model than with other repayment models.
- Helps to overcome the landlord/tenant problem (see 'split incentive' in Section 2) to an extent as the cost pass-through can be agreed upon mutually by landlord and tenant

Example:

In Germany landlords can pass along the costs of a building upgrade (e.g. solar heating or insulation) to their tenants through the "Modernisierungsumlage", which is basically a leasing rate or modernisation allocation. This leasing rate is regulated in the civil code law §559 BGB and represents a special form of rental increase, which should incentivise the landlords to modernise their building stock and reclaim some of the costs in form of a rental repayment. In order to protect the tenant, the regulation only allows for an annual rental increase of 11% of the costs associated with the refurbishment (that means for refurbishment costs of 1000 Euro a rental increase of 9.17 Euro per month is permitted). Hereby a modernisation can apply to a single house but also to multiple apartments, in the latter case the landlord has to distribute the costs equally across all tenants. The landlord is furthermore obligated to disclose (in writing) the rental increase including a detailed calculation of the costs and the new rent.

Modernisations or building upgrades usually comprise measures such as improvements of heating system, façade insulation, solar water heating, double windows or replacement with modern insulated glass and water or energy meters. However those measure can only justified a rental increase if they provide primary energy or water cost savings for the tenant.

A special case are solar PV systems. In Germany solar PV systems are usually connected to the grid to benefit from the (small but still reasonable – 12.34 cent/kW for 10kW system) Feed in Tariff. In this case the tenant won't directly benefit from a decreased electricity bill and the installation costs can't be issued as modernisation costs.

Status in ACT and Policy support needed:

The authors are not aware of any operating examples of rent-based repayment projects in Australia. However, in neighbouring NSW different community groups (e.g. Solar Suburbs, Clean Energy of Newcastle and Surrounds, South Coast Health and Sustainability Alliance in Eurobodella, Repower Coffs) have started to collaborate with a number of community housing providers to explore the options of the repayment, which include rent-based models.

Currently, many low-income housing providers are not able to pass on rent increases. This may be due to government funding conditions or rent increase restrictions. In such cases, a separate 'utility charge' similar to a water charge could be recovered by the landlord. Such a charge is expected to be permitted under funding and regulatory rules; however, it is less preferred (relative to rent) as it is an additional bill and therefore higher administrative costs and higher default rates are expected.

It should be noted that as with many of these repayment options, solar and energy efficiency provision is not core-business for the key organisation (in this case social housing providers) and as such there may be other cultural and institutional barriers to implementation.

For more information see Appendix A.

3.3 Repayment through Rates

Who is it for?

General home-owners and low-income homeowners and potentially renters and their landlords.

What is it and how does it work?

Repayment through rates or rates-based financing for clean energy is where finance for new energy technologies is mediated through the Local Government; with the repayment occurring through a special charge or rate levied on the property and paid by the occupant through normal rate repayments.

What are the benefits?

One of the benefits of this approach is that because the repayment it tied to a local government rate, it becomes a statutory requirement for the property against which it is leveraged. As local government debt gets first recall at point of sale, it becomes a much lower risk venture for financiers, thus lowering the cost of capital. Furthermore, because the rate is tied to the property it overcomes longer payback periods associated with more capital-intensive clean energy technologies and upgrades. However, one of the challenges is setting up the scheme by local government – it is not core business and thus requires determination and support to work through the complexity of setting up a rates-based finance scheme.

Examples:

Darebin Solar Savers is a program developed by Darebin City Council. The program in its first year saw the installation of solar PV on 300 low-income households in the City of Darebin. The cost to these households as free up-front, with repayment occurring over 10 years through a special rate/charge, the solar PV system was scaled to ensure households were better-off (through lower electricity bills) from day one. The Council partnered with Moreland Energy Foundation and Energy Matters (now Sun Edison) to deliver the program. Only pensioners who owned their home and were eligible for the existing rates discount were eligible for the scheme. Darebin Council used its own capital reserves to finance the project at a 0% interest rate due to the fact that it was both a climate and social justice program.

Environmental Upgrade Agreements (EUAs) for commercial buildings have been available in both NSW and Victoria for a number of years. EUAs enable commercial buildings owners to finance a range of environmental upgrades including energy efficiency and solar PV installation through a rate repayment scheme. The main difference with EUAs and the Darebin Solar Savers model other than target audience, is that in EUAs finance comes from a commercial lender and is thus not on the books of a council.

Status in ACT and Policy support needed:

Currently, rates-based financing for residential clean energy is not allowed under ACT legislation. Due to its special constitutional status, ACT doesn't have separate local councils and respective functions are performed by territorial government. As such, legislative changes would need to be made by ACT territory government to levy an 'opt-in' rate for specific households (i.e. those that sign up to a scheme).

Additional legislative change would also be required to support renters to access rates-based financing. In addition, there are a range of other ways policy can support the uptake of rates-based financing for example, creating a program that would support local governments to implement rates-based financing. **For more information see Appendix A.**

3.4 Repayment through Bills

Who is it for?

General homeowners, low-income homeowners and possibly renters and their landlords.

What is it and how does it work?

Repayment through bills allows a homeowner or resident to invest in a clean energy upgrade for their home for no money upfront, finance is provided via the utility (energy or water) company who collects repayments via the utility bill.

The main difference between the utility and the electricity retailer on-bill-models is that utility is a regulated monopoly and do not face the same competition requirements which potentially prevent an electricity retailer from conducting on-bill financing. Furthermore the utility repayment is tied to the water or electricity meter identification number, and therefore the finance could be easily passed on to the following household if the occupants move out. This helps to overcome the split incentive between landlord and tenant.

Repayment through bills refers to a mechanism where either a monopolistic utility or an electricity retailer collects repayments via special charges on water or electricity bills. The utility could be an electricity distribution network service provider (DNSP) such as ActewAGL Distribution, or Icon water, . The electricity retailer or water utility places a special charge on the household's electricity or water bill, before being channelled back to the financier and avoiding additional billing fees.

What are the benefits?

Although this model comes with high set-up costs and requires the billing organisation (utility or retailer) to be interested in and see a benefit in this approach, for customers it's a simple repayment mechanism for new clean energy technologies that does not require a new bill. As with the other two repayment mechanisms, customers pay for the clean energy technologies over extended terms on their monthly/quarterly utility bills whereby the electricity savings offset the costs.

In contrast the electricity retailer model is not tied to the property, but rather the dwelling occupant. As a result, although this model provides benefits to homeowners it doesn't overcome the landlord-tenant problem because it becomes very difficult to transfer the finance to the next account holder if the occupant is moving address.

Conversely, electricity retailers are in the business of billing customers for energy services, while network companies and water utilities are not.

Example:

So called on-bill programs have been used by U.S. utilities for many years. In most US jurisdictions where on-bill financing has been successfully deployed, electricity is sold by a vertically-integrated monopoly utility (i.e. there is no competition concerns because there is only one retailer).

The US National Grid has offered an on-bill program for small business customers since the 1990s. New York State passed the Power NY Act in 2011 authorizing residential on-bill loans, which is being implemented by the New York State Energy Research Authority (NYSERDA) in cooperation with New York utilities.

Status in ACT and policy support needed:

Currently there are no Australian examples for on-bill financing through water or other utilities known by the authors. Although a number of Australian electricity retailers, such as Origin Energy and AGL, do offer solar financing packages (as discussed in the lease/PPA section), but they do not currently offer the repayments on electricity bills. This may be because solar power installation and financing deals are covered by the Australian Consumer Law, but the sale of electricity is governed by the National Energy Retail Law. The National Energy Retail Law contains strong provisions to ensure that consumers can access the price benefits of competition by switching retailer. It remains unclear whether it is allowed for an electricity retailer to sign a customer to an electricity supply contract by promising them a solar power system, financed on their bills. Even if this was possible the retailer would need to unbundle the solar power bill and the electricity bill should the customer wish to switch supplier, which may create more administrative cost than the benefit provided by on-bill financing. These legal issues would have to be resolved/worked through in order for this mechanism to be possible.

To do on-bill financing through a network or water utility, would possibly require the introduction of regulations in the Australian National Electricity Market and definitely include the creation of a new network or water tariff category, which in turn would require approval from the Independent Competition and Regulatory Commission (ICRC) and/or the Australian Energy Regulator (AER).

For more information see Appendix A.

Discussion Questions

6. Do you think the mechanisms that make it easy for customers to access new energy technologies with zero upfront cost are worth pursing in ACT?
7. Which repayment model (if any) is most appropriate and needed in the ACT context?

Appendix A

More information and examples about each of the presented solutions can be found under the following links:

Community Owned Renewable Energy

http://c4ce.net.au/nces

http://c4ce.net.au

http://cpagency.org.au/

www.embark.com.au

http://hepburnwind.com.au/

http://www.repower.net.au/projects.html

http://solarshare.com.au

Solar Gardens

Further reading:

http://www.ncsl.org/research/energy/net-metering-policy-overview-and-state-legislative-updates.aspx

http://www.greentechmedia.com/research/report/us-community-solar-market-outlook-2015-2020

http://reneweconomy.com.au/2015/how-solar-power-is-learning-to-share-the-rapid-growth-of-community-solar-gardens-90567

http://www.nytimes.com/2014/06/20/business/energy-environment/buying-into-solar-power-no-roof-access-needed.html?_r=0

http://www.businessspectator.com.au/article/2015/7/20/smart-energy/sick-lowly-feed-tariffs-plan-better-rewarding-local-generators

http://thinkprogress.org/climate/2015/07/09/3674045/community-solar-gardens-grow/

http://www.solargardens.org/

http://www.cleanenergyresourceteams.org/solargardens

http://communitypowernetwork.com/

http://www.nhsolargarden.com/

www.mysunshare.com

http://cleanenergycollective.com

http://www.mncommunitysolar.com/

Examples:

http://www.nhsolargarden.com/

www.mysunshare.com

http://cleanenergycollective.com

http://www.mncommunitysolar.com/

Tax Breaks

http://communityenergyengland.org/members-area/briefings/faqs-sitr/tax/

http://www.communityenergyscotland.org.uk/news/19-mar-2015-budget-changes-on-social-investments-detail.asp?term=tax

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414360/Budget_2015_announcements_on_Social_Investment_Tax_Relief.pdf

https://www.gov.uk/government/publications/the-enterprise-investment-scheme-introduction/enterprise-investment-scheme

https://www.gov.uk/seed-enterprise-investment-scheme-background

http://programs.dsireusa.org/system/program/detail/5500

Financing Loan/ Lease/ PPA

www.choice.com.au/home-improvement/energy-saving/solar/articles/solar-pv-system-leasing-and-power-purchasing-agreements-ppas

http://reneweconomy.com.au/2014/cefc-to-provide-120m-to-unlock-australia-rooftop-solar-finance-41906

Repayment through Rent

https://www.trillionfund.com/ProjectDetails.aspx?projectId=26

http://blog.abundancegeneration.com/2014/12/oakapple-berwickshire-meet-berwickshire-housing-association/

https://de.wikipedia.org/wiki/Modernisierungsumlage

Repayment through Rates

http://embark.com.au/display/public/content/Darebin+Solar+Savers+model+description

Repayment through Bills

http://www.nrdc.org/energy/on-bill-financing-programs/default.asp

http://aceee.org/sector/state-policy/toolkit/on-bill-financing

http://www.energy.gov/eere/buildings/eeclp-webinar-5-bill-financing-text-version

13 June 2013

Community Renewable Energy Fund

Report prepared for the Coalition for Community Energy

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TABLE OF CONTENTS

1. Report Summary

This report presents the assumptions and results of modelling undertaken by Marsden Jacob Associates (MJA) on the impact a community renewable energy fund would have to renewable energy development and associated community benefits.

The key findings of the modelling are as follows:

- CRE project funding levels of $15 million, $50million and $100 million would result in the construction of 94MW, 326MW & 656MW of community renewable generation capacity respectively;
- The total capital cost of generation projects built is expected to be $875 million over the scheme lifetime. The high and low cases would have generation build costs of $254million and $1,716 million respectively. On average this gives a capital investment to fund ratio of 17:1, i.e. for every $1 of government money CRE projects will leverage an average of an additional $17;
- CRE project funding levels of $15 million, $50million and $100 million would result in 55, 153 & 292 community renewable energy projects respectively;
- Community wind power projects would dominate the CRE funding with wind projects accounting for 73% of total installed capacity and 73.6% of the energy produced;
- Solar power would account for the large number of projects, but due to the small project sizes would only account for about 4% of CRE project generation;
- Carbon emission abatement in the medium case is expected to average 816 $kTCO_2$ annually (equivalent to 149,900 cars of the road each year). The low and high funding cases have abatements of 185kT and 1298 kT annually respectively;
- Employment from jobs created by projects funded as part of the $50 million CRE grant would be expected to peak at 1145 during the construction phase and provide 137 ongoing jobs for upkeep and maintenance of assets;
- Community support for the projects in the medium funding case is expected to be 4,277 volunteers, 142,450 investors of all contribution sizes, including those who invest less than $1000, and 380,200 supporters of projects who are not finically involved.

2. Introduction

This report has been prepared by Marsden Jacob Associates (MJA) for the Community Power Agency and Backroad Connections as part of the Coalition for Community Energy (CCE).

The purpose of the study was to quantify through appropriate modelling the impact to renewable energy development and benefit to communities if a community renewable energy (CRE) grant fund were established.

The purpose of such a grant fund would be to cover project start-up costs up to the point where they are investment ready and communities can raise money through community investors and debt financing. As the CRE grant is only to provide support pre the investment stage, all project construction costs would be sourced from other (non-grant fund) sources with community investor providing the majority of funds.

2.1 Project Scope

The report focuses on three levels of funding termed Low, Medium and High. The fund levels for each of these are $15 million, $50 million, $100 million respectively. The fund was assumed to operate for a period of four years commencing in 2014.

Each grant level would result in a different portfolio of investment ready projects of varying project sizes and types. As funding level increases so will the size of the portfolio. No upper limit to the number of projects available was assumed, as a primary goal of the modelling was to provide an analysis of potential project uptake. Once a portfolio is selected, an economic model determines the expected revenue of each project over the time frame 2014 to 2040.

2.2 Outline of Report

Chapter 2 presents the modelling methodology and lists the major assumptions used in the report.

Chapter 3 details the results from the modelling of each of the cases and provides a brief discussion on the result of the Medium funding case.

Chapter 4 presents a summary of the key finding of the modelling.

2.3 Notes

All dollar values listed are $AUD Jan 2013 unless otherwise stated.

Dates listed are calendar years.

3. Modelling Method

This chapter details the modelling approach used in this study with a focus on project selection and expected future revenues. Also included are the major assumptions used throughout the modelling such as capital costs and the milestone funding process.

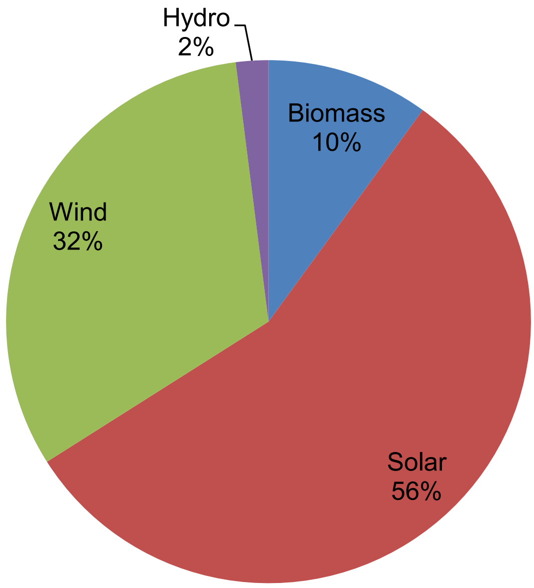
The modelling process was split into three main parts as summarised below:

1. Project Selection:
   - a list of potential CRE projects across Australia is created
   - the number of projects that will reach investment ready stage due to grant funding is determined;
2. Project Revenue:
   - project revenue from annual energy sales is calculated
   - project revenue from LGC production is calculated;
3. Project Costs:
   - annualized construction costs of the portfolio of CRE projects is calculated
   - annual operating cost of the portfolio of CRE projects is calculated.

3.1 Project Selection

The model operates by creating a large pool of potential projects (at random) based upon the technology distribution shown in Figure 1 below. The technology distribution is based on known CRE projects in Australia with a small percentage of mini hydro added. The potential CRE project pool is extended beyond the number of currently purposed CRE projects as it is assumed that the number of CRE projects in development will grow, particularly once a dedicated CRE fund is established..

Figure 1 Distribution of Community projects in development by type

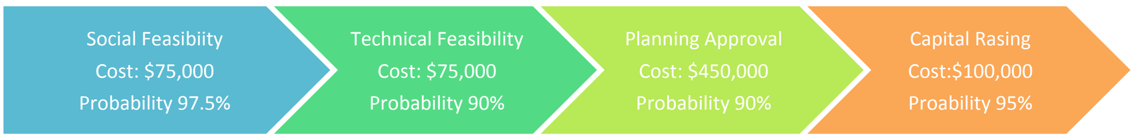


Projects are selected for funding on a "first in first serve" basis and the money is assigned to the project at the start of each year. The likelihood of a project which has received grant money reaching construction ready stage is based upon a series of approval milestones. The overall success rate of projects was assumed to be 75%.

3.1.1 Pre-Construction Project Milestones

Before a CRE project reaches construction ready stage it must first meet a series of milestones. Each milestone has an associated cost and probability of success. Milestone costs were developed based upon the challenges faced by existing CRE projects. Figure 2 below shows an example of the milestones and associated costs for a wind project. Milestone stages and amounts vary for the different technologies modelled.

Figure 2 Milestones for community wind project



Any project that fails a milestone requirement before the construction stage it would not receive any further funding and was assumed not to proceed..

3.1.2 Build times

The time taken from grant funding to final construction of the project is based upon project technology. The assumptions of this are listed in Table 1 below. The timing recognises the different development timeframes expected for different technologies.

Table 1 Project build times years

Technology	Feasibility	Planning	Construction	Total
Biomass	1	1	1	3
Solar	0.5	1	0.5	2
Wind	1	2	1	4
Mini hydro	0.5	1	0.5	2

Historically most CRE projects have had a longer planning phase lasting up to 5 years, but with the approval of grant funding and the maturing of the CRE sector this is likely to decrease.

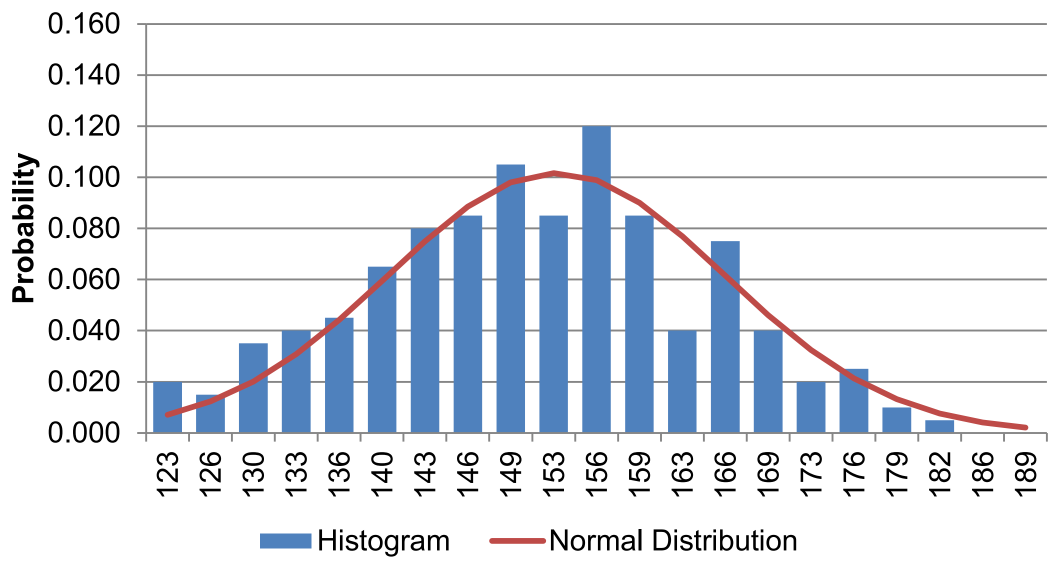
3.1.3 CRE Grant levels

The difference between cases is determined by the grant level assigned each year. Three levels have been selected: Low, Medium and High with $15 million, $50 million, $100 million funding respectively. Funding ceases to a project if a milestone is not successfully completed. This can cause the annual funding level to vary yearly resulting in some years with a greater number of projects reaching investment ready stage.

3.1.4 Monte Carlo Simulation

The project selection process is run multiple times to determine an expected number of projects. As the model uses probabilities a single simulation can lead to outlier results. Figure 3 below shows an example distribution of the number of projects based on a total of 200 simulations. The histogram shows the relative likelihood of the number of projects that will be developed. For example the most likely number of projects (or expected number) is about 153 and the number of projects developed would be expected to be between say 130 and 179. The distribution of projects fits Gaussian distribution which can be used to determine a mean value and confidence interval.

Figure 3 Project number distribution $50 million funding



3.2 Project revenue

The revenue of a community project is the revenue from electricity spot energy and Large Generator Certificates(LGCs) for all years of the project.

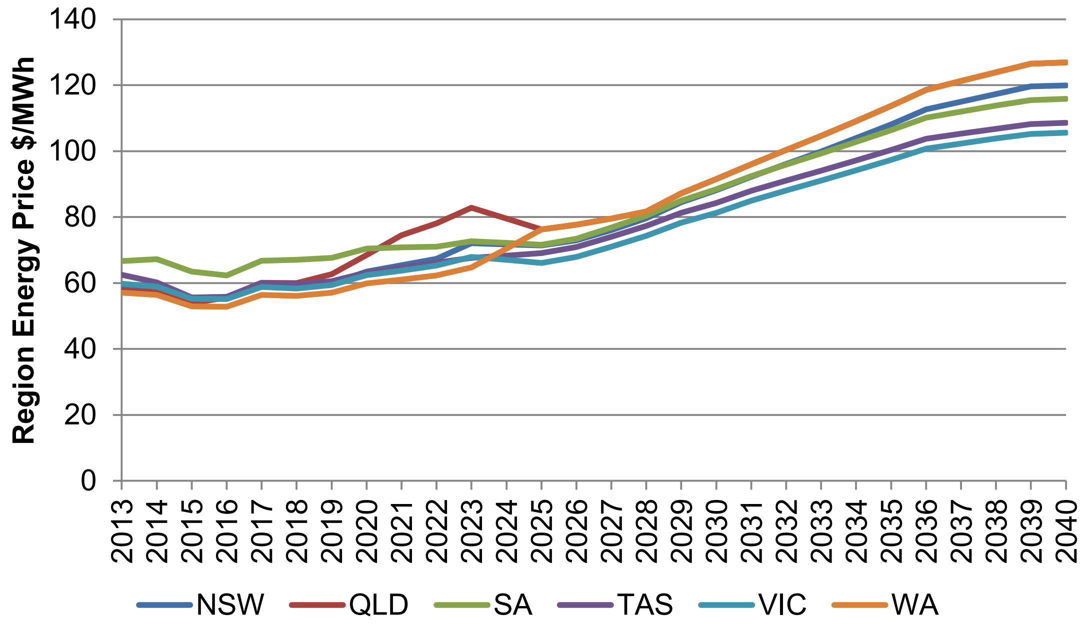
Equation 1 CRE Project Revenue

$$\sum Generation_{year} \times (Energy\ Price_{year} + LGC\ Price_{year})$$

3.2.1 Projected Electricity Prices

Figure 4 below shows the average annual electricity spot price for each region. The received prices by generators are based upon technology type. The projected energy prices are modelled using the medium growth projections from the *AEMO National Electricity Forecasting Report 2012*. Electricity spot prices in the NEM up to 2025 were modelled on a half hourly basis using a detailed regional model. Long term prices post 2025 were based on the expected long run marginal costs of combined cycle gas turbine generation and extrapolated to the end of the modelling period.

Figure 4 Regional Energy Prices 2013 to 2040 $/MWh



The technology of the project plays a major role in the time of day at which generation will occur and the resulting electricity spot price it may receive. An example of this is that solar generation generally receives a higher than average as it operates best on hot sunny day when electricity prices are normally high. Table 2 below shows the received energy scalars from the regional price for each region by technology type.

However we note that many small solar projects are "behind the meter" thus saving costs based on retail tariff prices. Such projects would have enhanced economics.

Table 2 Energy values percentage of base.

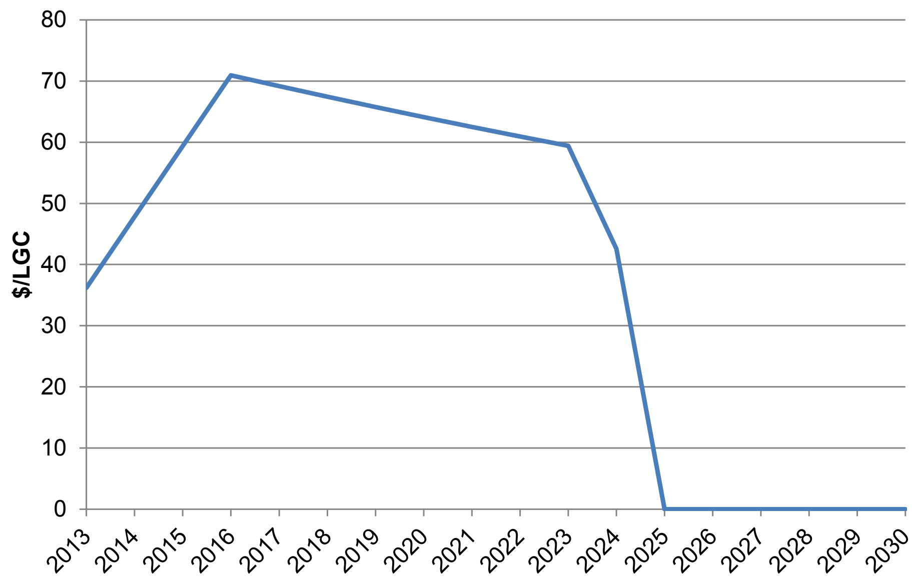
Region	Wind	Solar & Hydro	Biomass
NSW	95%	133%	100%
QLD	100%	131%	100%
SA	90%	136%	100%
TAS	90%	112%	100%
VIC	95%	132%	100%
WA	95%	121%	100%

3.2.2 Projected LGC prices

All potential CRE projects are eligible to receive LGCs providing an additional revenue stream to the wholesale electricity value. As the LRET scheme has a completion data of 2030 the additional funding will only be available for the early years of a CRE project.

The projected LGC price is determined using a least cost planning model of the NEM including the LRET target. The planning model calculates the projected development of renewables needed to meet the LRET target and uses this to determine a forward LGC price. Figure 5 below shows the projected LGC price.

Figure 5 Projected LGC Price $/LGC



The maximum price for an LGC is the shortfall penalty price. However the maximum price in the market will be influences by the value to the marginal players and this is influenced by tax imputation and allowance. This has the effective penalty price as the midpoint between the actual penalty $65/LGC and tax adjusted penalty of $92.85/LGC.

The projected LGC price matches the penalty price from 2016 to 2024 indicating that there is a shortfall of LGCs between these years. Post 2024 the prices drop as renewable development has enabled the flat target from 2024 to 2030 to be maintained and there is an overabundance of LGCs.

3.3 Project Costs

Table 3 below lists the assumed capital costs for each project by technology type. The costs are based on a capacity basis ($/MW) and thus can be scaled to match the size of different CRE project. Of the projects listed below biomass in the only one that requires a combustible fuel and these costs are assumed in the Variable Costs of the project.

Table 3 Project costs summary table 2013

Type	Capital $/MW	Variable Cost $/MWh	Fixed costs $/MW/yr
Wind	2,530,000	12	40,000
Solar PV	2,500,000	1	44,000
Biomass	3,250,000	8	65,000
Mini Hydro	4,650,000	1	93,000

Sources: IRENA, "RENEWABLE ENERGY TECHNOLOGIES: COST ANALYSIS SERIES, Volume 1: Power Sector, Biomass for Power Generation", & "Hydropower" June 2012

Worley Parsons, "Cost of Construction New Generation Technology", Feb 2012

Solar capital costs from Live Community Power http://www.live.org.au/

The variable cost for wind generation is associated with maintenance and works that are required to maintain wind plant in operation through the life of the plant.

3.4 Project financing

Projects are assumed to obtain the following debt funding based on technology:

- wind generation: 25% of capital cost;
- biomass: 25% of capital cost; and
- solar: no debt funding.

Debt terms are assumed to be 8% (nominal) paid over 15 years.

4. Results and Analysis

This chapter presents the results of the economic modelling and a discussion of the issues highlighted from the results. The results have been split into three sections: Project Portfolios, Funding Leverage & Employment and Carbon Abatement.

Project Portfolios focuses on the types of projects that reach investment stage and compares the effect the level of grant funding has on the number of projects developed.

Project Returns shows the total revenue of the CRE projects less the total costs across the entire lifetime of the project. This figure is then divided by the number of years of operation and installed capacity to give an expected annual return each year for every MW of capacity installed.

Table 4 below summaries the mean values from the three funding levels for 200 separate model simulations. Shown are:

- Grant funding – total money from the fund;
- Number of projects – total number of projects completed
- Installed capacity - total capacity in MW of the completed projects;
- Employment – average over the period 2014 to 2040, the peak number over that time and the ongoing operational/maintenance employment;
- Capital – total capital cost of the project (excludes fund money);
- Grant funding ration – the ratio of capital cost / grant funding;

Table 4 Simulation Results

	Grant Funding $m	Number of projects	Installed Capacity (MW)	Employment (Average/Peak)	Employment (Maintenance)	Capital $m	Grant funding Ratio
Low	15	55	94	86/346	42	254	16.9
Medium	50	153	326	288/1145	137	875	17.5
High	100	292	656	575/2300	274	1716	17.61

4.1 Project Development – Medium Funding $50M

The results for medium funding case of $50M are presented in the rest of this chapter. The detailed modelling results for the high and low funding cases are presented in the appendices.

For the $50M fund case, Figure 6 overleaf shows the breakdown of CRE projects by installed capacity and Figure 7 shows the level of generation from these projects to the year 2040.

Figure 6 CRE project by Installed Capacity (MW) - $50 Million grant funding

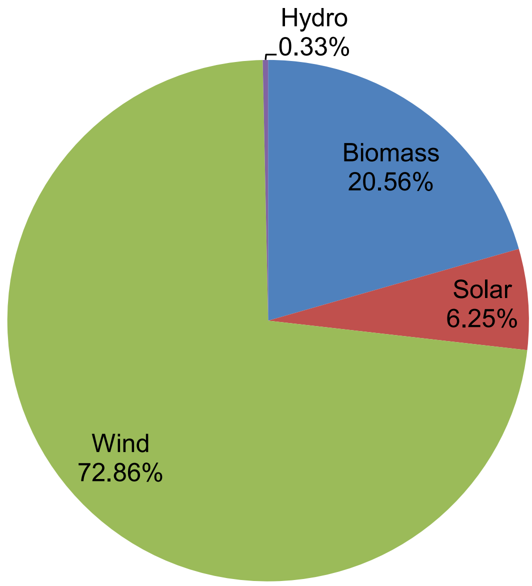
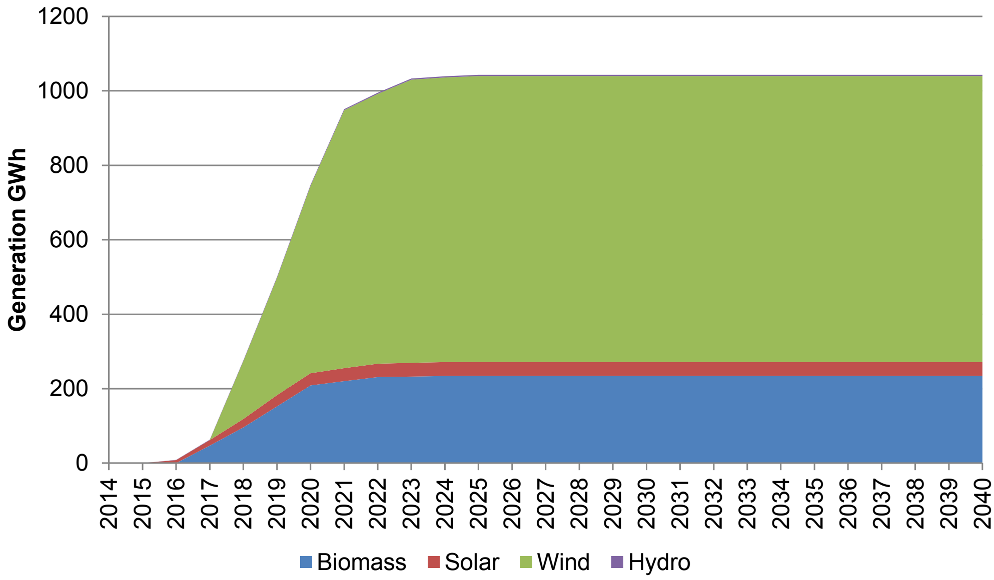


Figure 7 CRE project generation - $50 Million grant funding



The following are observations are made from these results.

- When all projects are developed projects produce 1043 GWh of electricity per year. Wind is the largest producer providing 768 GWh annually;
- The average number of projects developed with the $50 million grant fund was 153. The breakdown that follows is an average of the 200 individual simulations:
  - 14 Biomass
  - 91 Solar PV
  - 44 Win
  - 4 Mini hydro;

- Solar PV accounts for the most projects by number. However due to the small size of most solar projects (mostly less than 1MW) the contribution to total generation is about 6%;
- Hydro only plays a very minor role due to the expected small project size and low number of potential projects and has little effect on the CRE scheme overall. The main benefits of hydro come from the ability to store power and control water flow and this ability is underestimated in the costs benefits due to the complexity of modelling;
- Although only making up a 21% of the total number of projects, Biomass projects can be highly profitable as they have the ability to control generation time of use;
- Wind power showed finical benefits for all years due to higher generation levels than solar and extra income from LGCs.

4.2 Employment and Community Engagement

Figure 8 below shows the additional employment over the lifetime of the CRE projects. The employment levels are based upon those published by the Clean Energy Council in the report *"Wind Farm Investment, Employment and Carbon Abatement in Australia"* and scaled to the CRE project size and technology. The high peak in employment between 2015 and 2025 is due to the construction of projects where labour is most intensive. Post 2025 after all CRE projects from the grant has been constructed, employment drops to the levels required for maintenance and operation.

Figure 8 Expected employ outcome from 2015 to 2020 ($50M Grant fund)

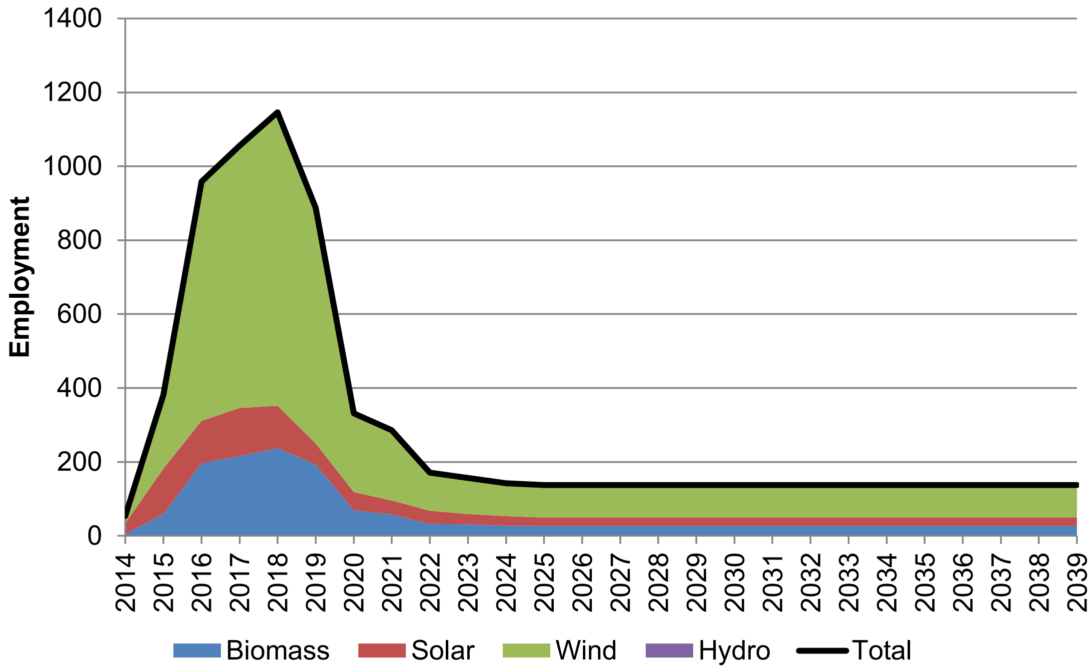
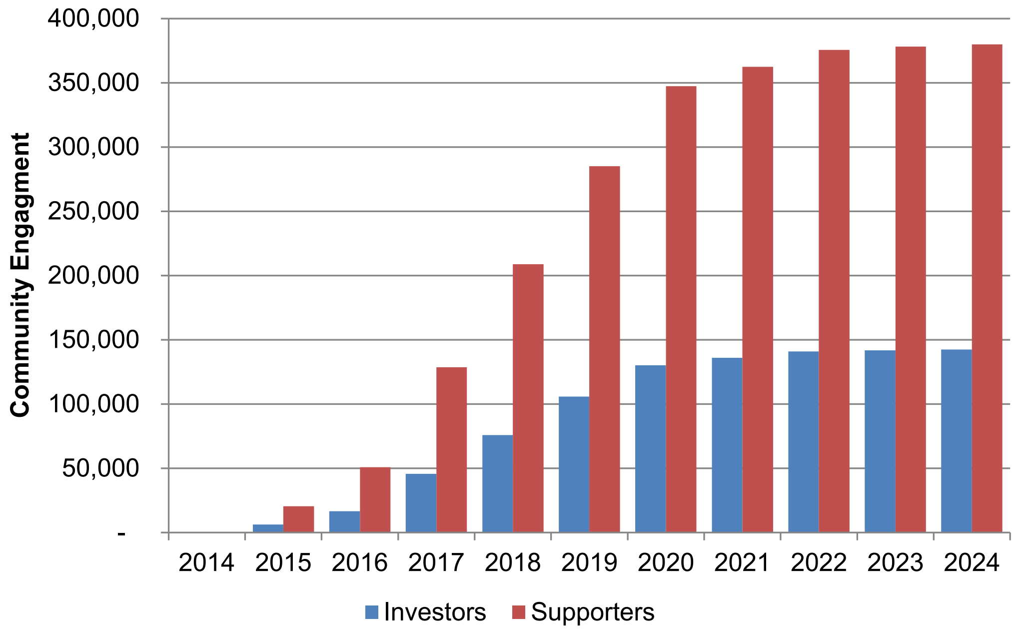


Figure 9 below shows the level of community engagement for CRE projects funded by the grant program, with the number of investors and non-investing supporters from 2014 to 2025. By 2025 there is expected to be 4277 volunteers involved with CRE projects.

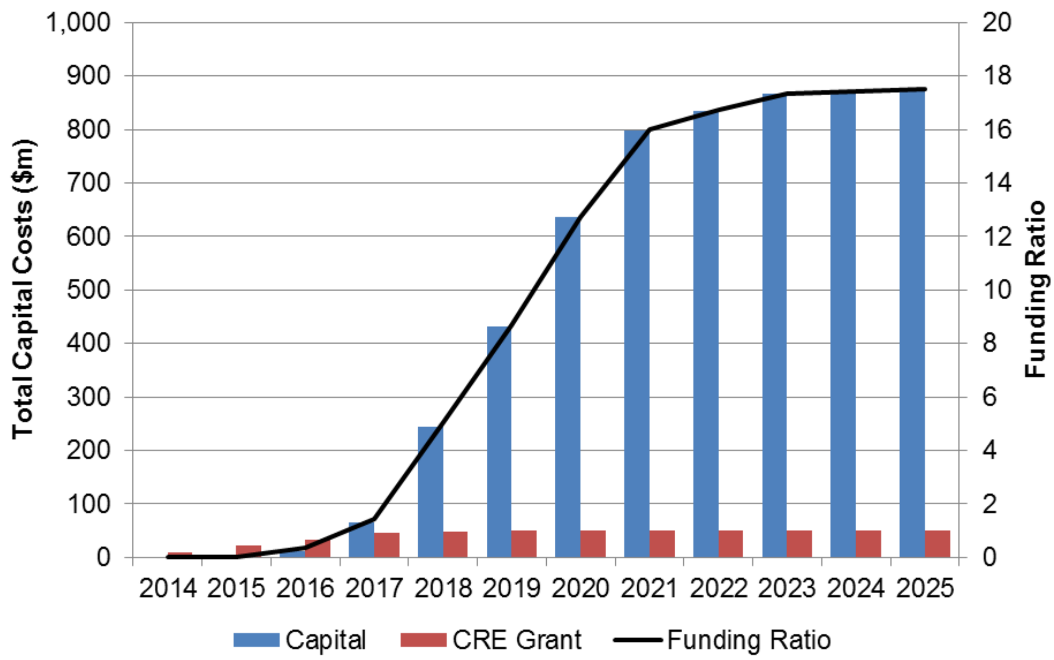
Figure 9 Community Engagement



4.3 Capital Expenditure

Figure 10 below shows the cumulative capital expenditure on CRE projects. Capital funding is most intensive during the first 5 years when grant money is still being assigned. $30 million worth of projects are development between 2022 and 2024. Also included is the funding ratio of grant money to capital. It should be noted that there is a minimum 2 year lag between the grant money spend and capital spend as the grant money is assigned at the start of the project and staged based on milestones (see Sections 3.1.1 and 3.1.2) while capital spend is at the construction stage.

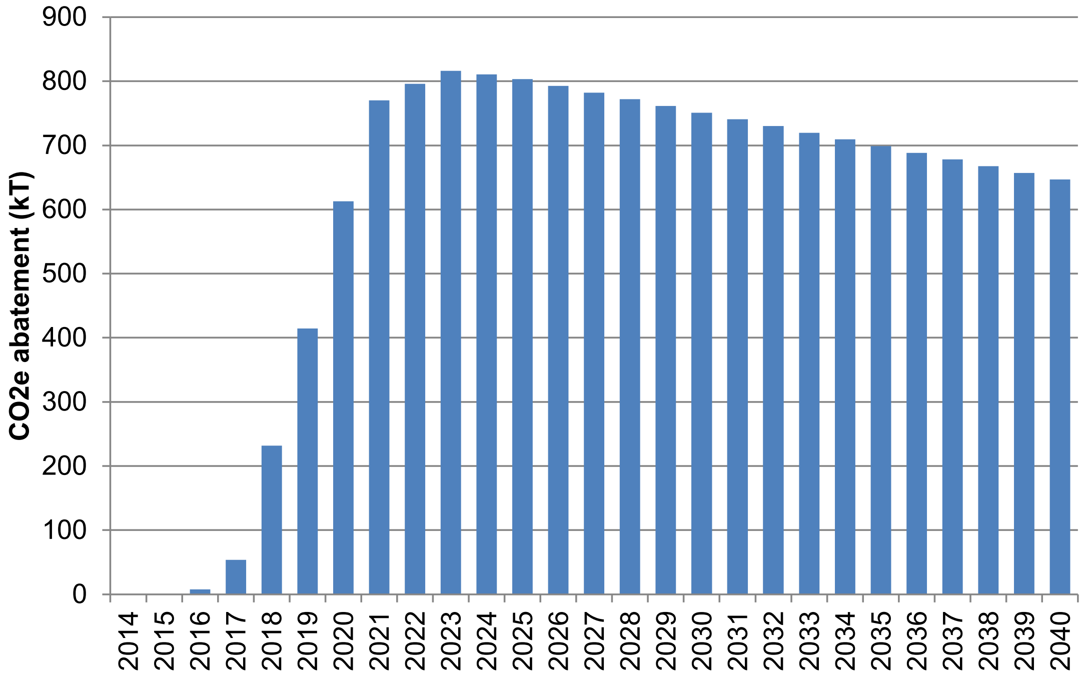
Figure 10 Total capital expenditure cumulative by year and funding ratio ($50M Fund)



4.4 Carbon Emission Abatement

Figure 11 below shows the carbon abatement for the Medium CRE project portfolio.

Figure 11 Carbon Abatement 2015 to 2040



The decline in abatement is the result of the drop in the overall carbon emission intensity of electricity generation in Australia as gas and renewable generation become a larger part of Australia energy mix. The peak annual abatement is 816kT each year which is equivalent to removing over 188,000 cars from the road.[1] The average reduction between 2016 and 2040 is 644kT each year.

[1] Base on a 4.3tonne/year/car emission sourced from Clean Energy Council, *WIND FARM INVESTMENT,EMPLOYMENT AND CARBON ABATEMENT IN AUSTRALIA*, June 2012

5. Appendix 2 - Low funding Results

Figure 12 Low CRE grant funding - Generation

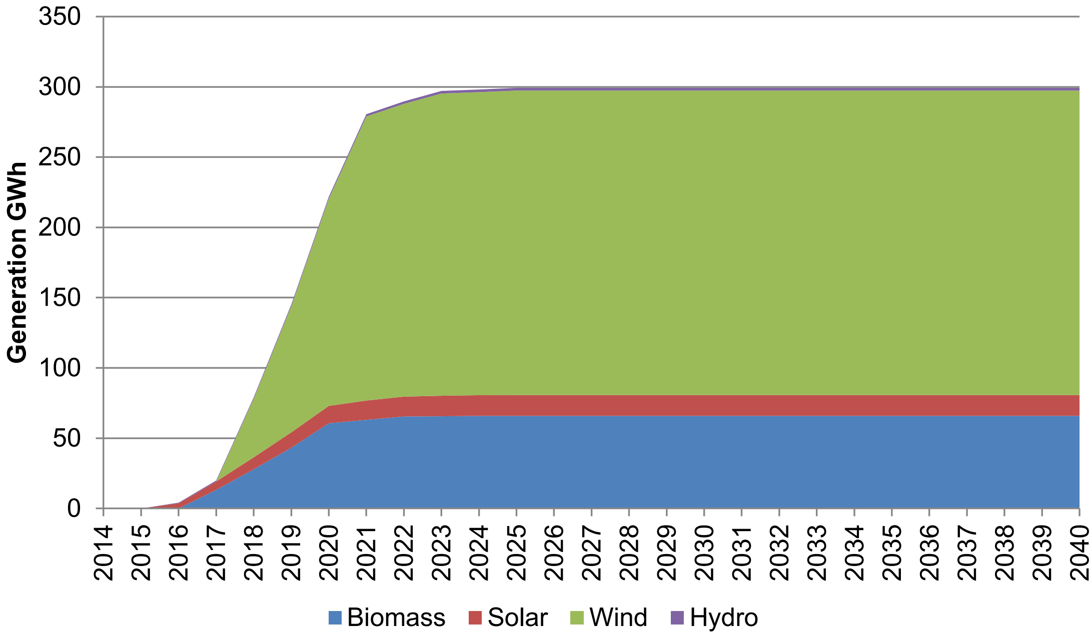


Figure 13 Low CRE grant funding - Employment

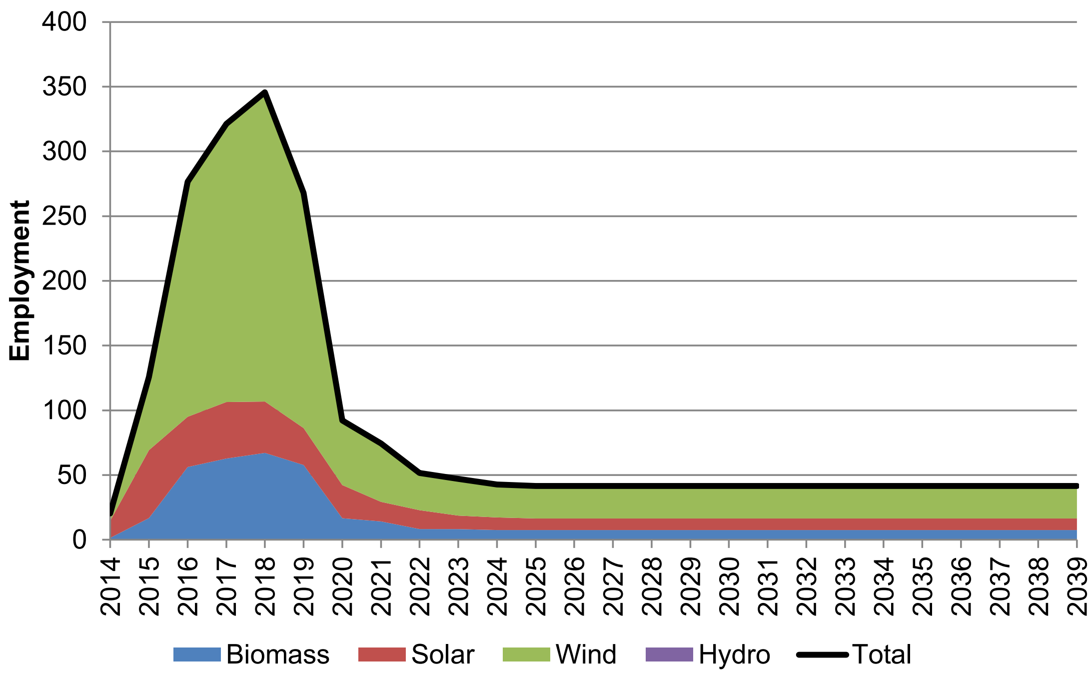


Figure 14 Low CRE grant funding – Carbon abatement

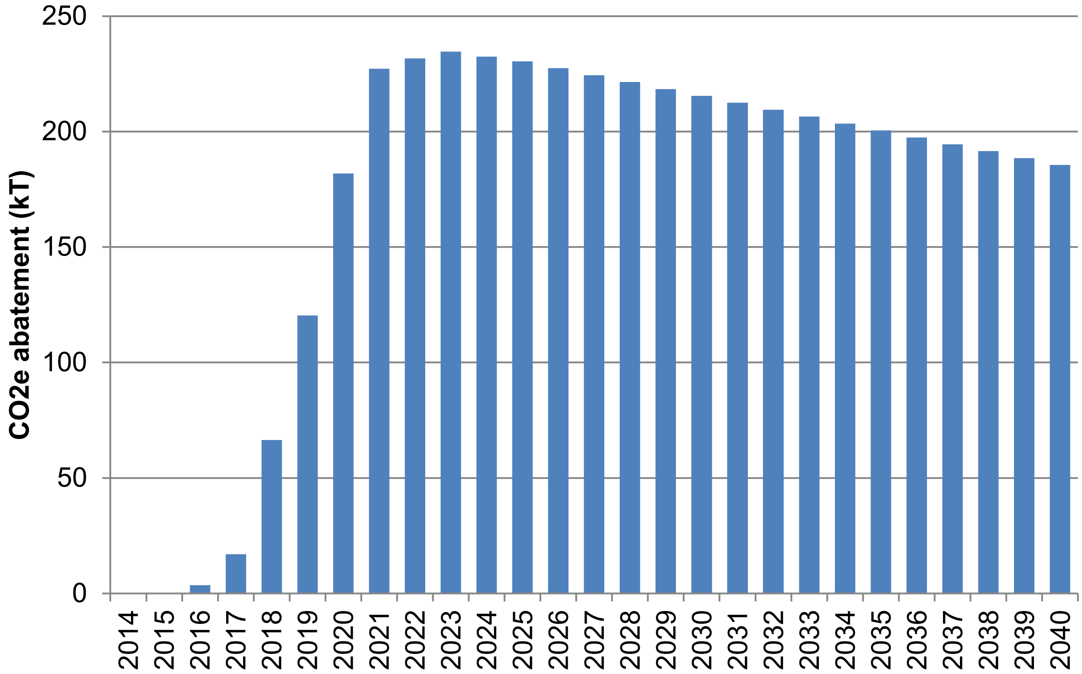
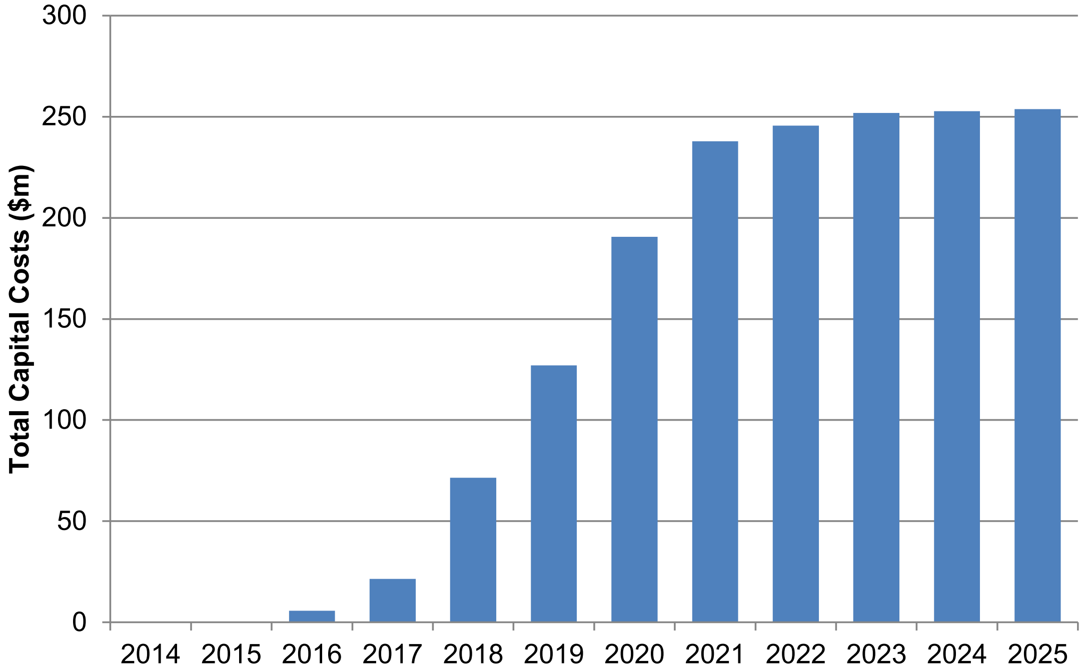


Figure 15 Low CRE grant funding – Total capital expenditure cumulative by year



6. Appendix 3 - High funding Results

Figure 16 **High CRE grant funding - Generation**

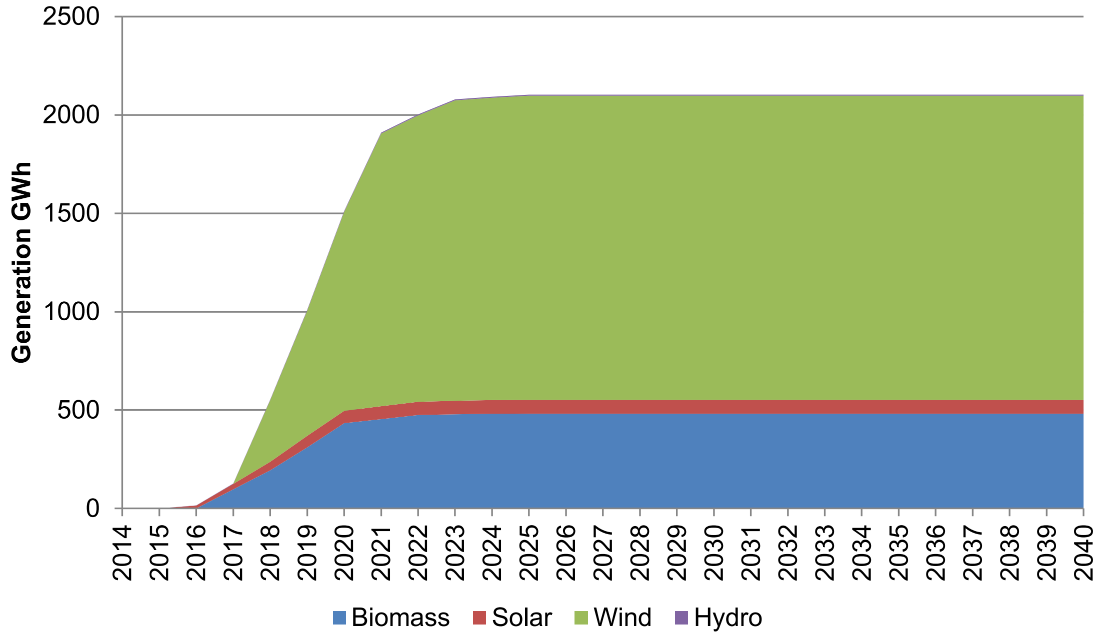


Figure 17 **High CRE grant funding - Employment**

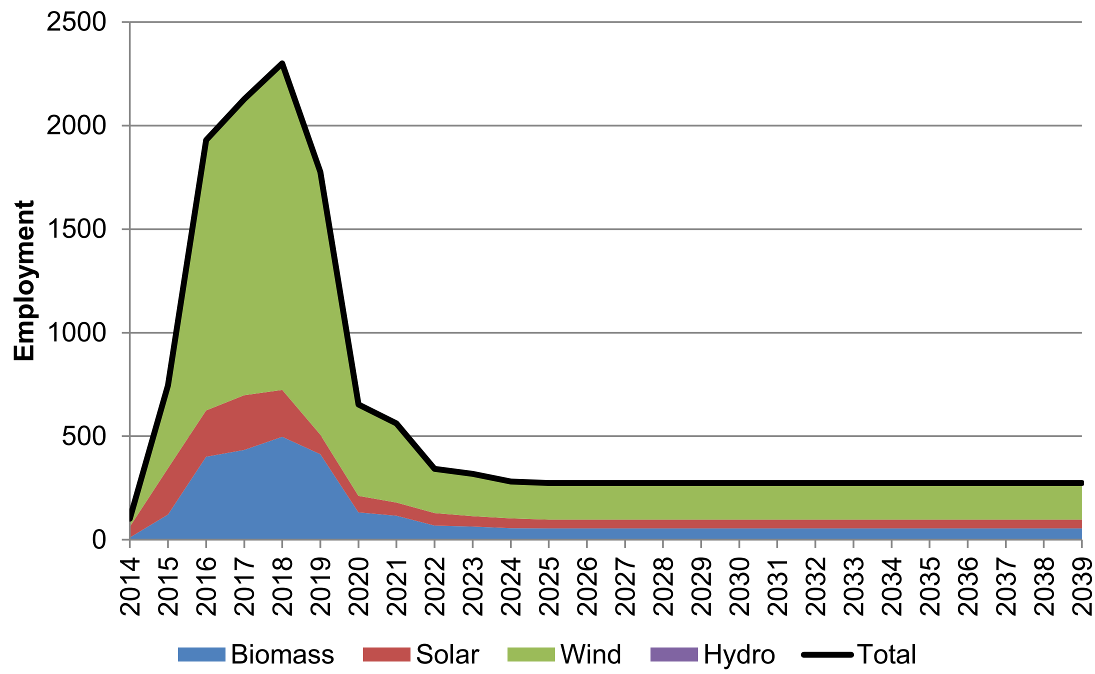


Figure 18 **High CRE grant funding – Carbon abatement**

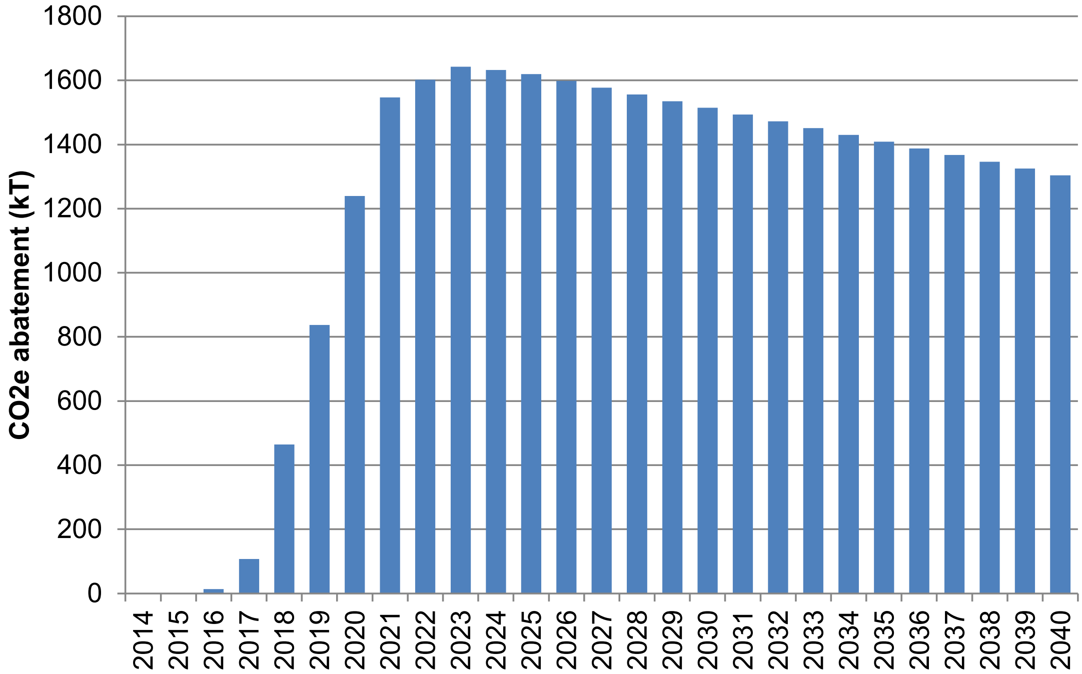


Figure 19 **High CRE grant funding – Total capital expenditure cumulative by year**