Cost and financing aspects of community renewable energy projects

VOLUME I: MAIN REPORT

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IEA-RETD
Renewable Energy Technology Deployment

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Executive Summary containing conclusions and policy recommendations

The key barriers faced by community Renewable Energy Source (RES) projects are generally well understood. They generally relate to three areas:

a) The skills, expertise and technical capabilities of community groups to plan, develop, negotiate contracts, finance, build and then operate RES projects;

b) The challenges of setting up a community organisation and securing the wider support of other local residents that are not members or investors in the community organisation;

c) The difficulties in obtaining finance for the project.

Whilst each of these aspects has been dealt with in a qualitative, discursive manner there is much less information available about the actual costs and financing implications of community energy projects. **Therefore, the overall objective of the report is to identify, document and assess the costs and corresponding financial impacts faced by community-owned RES projects compared to commercial RES projects.** The project has reviewed the costs faced by communities in five countries (Australia, Canada, Denmark, Germany and the UK) and separate stand-alone case studies have been prepared in **five Volume II reports**.

The Case Studies were prepared in the Summer and Autumn of 2015. This report provides a brief update of any significant policy changes in each of the five countries between the date of each Case Study report and information available as at mid-December 2015, so does not refer to any policy changes that may occur after this date.

A decision was made to compare solar photovoltaic (PV) projects and wind projects as both have low operating costs (compared to biogas projects where different countries will have different costs of feedstocks), and have mature standardised technologies (unlike hydropower where the cost and electricity generation varies significantly depending on the characteristics of the site and water flows).

Methodology

Through interviews with communities we obtained quantitative cost and revenue numbers from 26 community wind projects and 39 community solar projects.

We had difficulty obtaining many responses from communities involved in shared ownership projects because shared ownership solutions are uncommon in many countries, and if they exist cost information may be commercially sensitive or unknown. Only five of the 26 community wind projects were shared ownership ones, with no solar examples. As two of the shared ownership projects (both in the UK) lacked sufficient cost data that made our wind dataset 24 projects in total. **Therefore our conclusions are focused on costs for 100% community owned projects**.

Most community projects we interviewed were commissioned between 2011 and 2015, but in a few cases we had to obtain information from older projects. This therefore creates a problem, particularly in the solar sector where PV module prices have fallen significantly in the recent years. However to account for the fact that community projects were of different sizes and were commissioned over different periods of time we also asked communities **qualitative** questions whether they thought the costs would be different had the project been fully built by a commercial entity.

Whilst sometimes people and companies responding to surveys may not state actualised values if they perceive benefits to understating or overstating results (e.g. to overstate costs to portray a worse financial position) the respondents to our questionnaire were very open and we believe very honest in the sensitive information they provided, although as with any response there is always the risk of unintentional errors in the information provided.

Therefore, aside from the issues of community project cost data spanning a number of years, we contend the data set is robust and the meta messages discovered by this research are strong. This confidence is strengthened because the messages coming from each Case Study were remarkably consistent, as explained below.

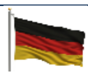
We obtained commercial costings from International Energy Agency (IEA), International Renewable Energy Agency (IRENA) and reports prepared in individual countries by governments or trade associations.

Using the qualitative and quantitative community results we were able to evaluate whether the key cost components (development costs, construction costs, operating costs, financing costs and corporation taxation costs) are different for community and commercial RES projects of a similar size.

After analysing the cost component differences we then used a bespoke version of the **Ricardo Accessible Finance Tool™** (**RAFT™**) project finance model to model the costs and revenues to estimate the project post-tax pre-finance Internal Rate of Return (IRR) for each community project, i.e. the project return based on the amount of money left to pay financiers (whether they are shareholders or lenders) once construction, operating and taxation costs have been paid. These results were compared to the commercial hurdle rates of return typically seen in each market, and importantly allowed us to understand how material any cost differences are, whether they be development costs, construction costs, financing costs or corporate taxation costs.

Key research findings from Case Studies

The tables below present the key **quantitative** costs the communities gave compared to the commercial cost data we obtained, with blue up arrows (▲ and ↗) indicating commercial costs were higher and blue down arrows (▼ and ↘) commercial costs are lower.

WIND *					
Number of community projects	2	2	6	5	9
Development costs	▼	↗	▲	▼	▼
Construction costs	↘	≈	↘	≈	↘
Operating costs	▼	▼	↘	▲	▼
Commercial post-tax pre-finance IRRs	7.3%	5.8%	8.5%	4.1%	9.2%
Number of community projects with post-tax IRRs greater than commercial hurdle rate	0	Both	2 of 6	All 5	All 9

SOLAR *					
Number of community projects	6	4	1	13	15
Development costs	▼	▼	▼	▼	▼
Construction costs	≈	▼		↘	
Operating costs	↘	↗	▼	↘	≈
Commercial post-tax pre-finance IRRs	6.6%	6.3%	7.5%	4.1%	7.3%
Number of community projects with post-tax IRRs greater than commercial hurdle rate	2 of 6	2 of 4	0	8 of 13	13 of 15

Symbols:

▲ >30% higher ↗ 10-30% higher ≈ Within +/- 10% ↘ 10-30% lower ▼ >30% lower

* To aid clarity some of the assumptions underlying this dataset are provided in Section 4.5 of this report.

From these two tables the main quantitative messages are:

- Development costs are higher for community wind and solar projects, with the exception of Canadian community wind projects (but this could be because (a) there were only two projects, and (b) the comparative commercial development costs included costs that were included in the Canadian community construction costs) and Danish wind projects (but this could again be because of the way of ascribing costs between the development and construction phases);
- Construction costs are similar or slightly lower for commercial wind and solar projects;
- Operating costs are lower for commercial wind and solar projects with two exceptions being German wind projects (where for tax reasons commercial companies may overstate operating costs) and for Canadian solar projects where communities will sometimes maintain and clean panels at little cost.

For the qualitative questions the results were that most communities thought the development costs would have been lower, but the construction and operating costs about the same. We also asked qualitative questions about the costs of finance.

By analysing all the quantitative and qualitative results, and accounting for the materiality of differences the overall conclusions are:

- Although community projects are often supported by goodwill and a lot of volunteer time, **development costs tend to be higher for community projects than commercial projects**. This is partly because developing a RES project is difficult (especially anything larger than small rooftop PV installations where community development costs may be lower), and requires an understanding of planning rules, financial analysis, procedures for licensing electricity, negotiating Power Purchase Agreements (PPAs), negotiating with solar or wind turbine manufacturers, securing grid connections, finalising legal contracts with landowners, etc. Commercial developers are more likely to have this expertise. As well as the complexities communities tend to be open and democratic, and this can extend the time, and therefore the costs of developing community projects;
- **The construction and operating costs prices tend to be similar to the prices quoted to commercial developers.** Where commercial developers can secure discounts though is if they bulk purchase assets and have a strong established relationship with a supplier. There is also hearsay evidence that communities tend to negotiate prices less aggressively than commercial developers do, so communities may want to try to negotiate better deals with their main suppliers;
- **Debt finance is more expensive for communities**, or if not more expensive, there is anecdotal evidence that banks will lend smaller amounts (a lower debt: equity ratio) to community developers. This is partly because of the poor reputation of community projects in some countries, but also because communities tend to have few assets and cash resources to offer as security;
- Offsetting the higher debt costs, **equity can often be cheaper to secure** as community investors are often happy to receive a rate of return slightly above bank saving rates;
- Depending on the financial structure of community projects **the overall financing cost message is that often commercial and community investors end up having a similar weighted average costs of capital**;
- We asked communities whether they paid corporation tax, and with the exception of the UK (where some community groups are structured to be corporate tax free or donate their remaining ‘profits’ to a charity as a ‘community dividend’) **communities in other countries often pay corporation tax, so this is not a differentiator**.

It is therefore relevant that as the two main differences appear to be in development costs, and an ability for some community projects to be corporate tax exempt, **the overall impact on the project viability should not be materially different between whether it is pursued by a commercial or community organisation as:**

- **Development costs make up only a small proportion of the total project cost (circa 10% for wind projects and 5% for solar);**

- **Corporation tax is only levied on profits** which means the project is covering all of its operating costs and interest payments, **so taxes should have little impact on whether to invest in a project or not, as presumably other investments would have the same taxes applied to them.**

Policy recommendations

Thus, on the cost side the research has found that, apart from corporate tax considerations, the only real differences appear to be in development costs which only make up a small proportion of total project costs. However, subsumed within this are a host of important policy messages that stakeholders and community developers told us about. **For it is pertinent that all three of the challenges noted for community RES projects - notably (a) the lack of skills, expertise and technical capabilities to deliver RES projects, (b) the time taken for setting up a community organisation and securing wider support; and (c) difficulties in raising finance - have been identified as having a direct development cost impact as well**. These challenges manifest themselves in longer more protracted development phases, and with that higher costs, whether from communities making mistakes along the way or the higher costs for communities to search for and raise money, e.g. having to convince banks or pay the expensive up-front costs for share offers.

The policy recommendations for governments to reducing community RES costs can be grouped into two sub-headings:

1. Acknowledge that communities are different and need financial assistance and certainty

As explained, communities tend to be cash poor so raising even small sums of finance during the development phase is harder. Also, as explained community entities often take longer to form, make democratic decisions and get projects commissioned which exposes them to greater risk of policy change during the development phase, and with that the challenges of raising construction finance. To address these two issues:

- **Governments could consider offering grants to cover early stage feasibility work**, and **ensure there are entities that can provide finance for all the development stages after early feasibility work.** For example, some countries have social lenders, and Germany has its public development bank (KfW) which lends at very low interest rates;
- **Governments should provide policy certainty, and with that certainty over levels of electricity support if the project proceeds**. With this policy certainty raising money for the later stage development costs, when there is still a chance the project may flounder, becomes easier as at the moment it can be very difficult for cash poor communities to pay for any electricity grid deposits (if needed and required to be paid by the generator) and any deposits on wind turbines. For example, governments may want to consider giving communities longer to pre-accredit projects, meaning that communities are able to secure certain levels of subsidies if they can get their project built and commissioned by a certain future date.

2. Reduce community development costs through knowledge enhancement

Although as explained development costs tend to make up only a small proportion of the total project costs (circa 10% for wind projects and 5% for solar), if the governments want to see a plurality of enterprises developing, to help level the playing field renewable projects they should:

- If possible **provide government paid development experts to reduce costs**;
- **Work with the community sector** to ensure there are authoritative 'how to' guides available; encourage the preparation of lists of accredited technical, legal, financial and project management specialists; encourage information dissemination between communities of what works and what does not; and encourage successful communities to develop second, third and fourth projects;
- **Prepare standardised legal contracts for shared ownership projects** to reduce legal fees;

- **Provide clear, easy to read guidance on what different legal community entities can and cannot do** (e.g. around dividend distribution, or needing to engage with authorised financial intermediaries), possibly having regulatory exemptions for community projects whilst acknowledging the need to protect uniformed investors from downside risks.

3. Policy recommendations to improve the revenue position of community projects

What this study has found is that more than costs, revenues for commercial and community projects are probably the biggest differentiator, as often commercial projects are able to secure higher revenue streams, and with that higher profits. The anticipated profits also can affect the cost of finance, for lower revenues make projects a more risky financial proposition as there is a higher chance of defaulting on financial covenants. The reasons for communities not being able to secure higher revenues are threefold:

i) When governments develop support tariffs for renewables they are implicitly deciding which areas of a country renewable projects can be built. For if subsidies are designed so only those projects with optimal environmental conditions (e.g. windy hillsides or the sunniest places) are viable, then communities away from these locations will be unable to build renewable projects. However, commercial developers will normally evaluate a number of sites in a country or region to find those where environmental conditions (and hence electricity generation and thus revenues) can be maximised. They will often then be simultaneously negotiating with different landowners to get the best deal, balancing off locations where although environmental conditions may not be perfect (e.g. wind project sites on slopes of hillsides rather than the tops of hills) the costs of connecting to the electricity grid are very low;

ii) Commercial developers are likely to be better at securing higher priced PPAs to sell their electricity, or just to be more aware of the appropriate PPA structure to select, e.g. fixed price, variable price, different tariffs at different times of the day, etc.;

iii) In some jurisdictions there are opportunities for RES generators to sell directly to consumers, rather than to the large energy supply companies. This allows RES generators to benefit from higher PPAs, whilst enabling the consumer to purchase 'green energy'. However, as electricity pricing and electricity licensing is complex, often small players (which communities tend to be) find that the benefits they could secure are offset by transaction costs.

Suggested solutions are:

a) To address the first (i) point **governments need to decide whether they want community projects to be limited to these 'optimal' locations or whether they want community projects to be spread across the country.** For if it is the latter, as well the recommendations in **(1)** and **(2)** governments may need to give preferential community revenue support, e.g. higher Feed in Tariffs;

b) To address the second (ii) point some countries, such as Denmark, have cooperatives that negotiate PPA deals on behalf of communities. Governments could **encourage similar social ventures to form to help communities negotiate better electricity PPAs**. In other places, such as Ontario in Canada, the Independent Electricity System Operator, rather than the Canadian Government, gives RES generators a fixed tariff, helping to simplify the transaction;

c) To address the third (iii) point **governments could consider how they can find ways to allow community projects to enter into innovative deals with local electricity consumers,** in effect enabling generators to receive prices closer to retail prices, by simplifying licensing restrictions and transaction costs. For if this can be done even small community projects that are not in 'optimal' locations should be able to proceed.

These last two recommendations are similar to the recommendations in **(2)** above to levelise the playing field, but from the revenue side rather than the cost side.

The conclusion is therefore that with some targeted development stage support, possibly some revenue support, and a levelled playing field even if community projects can only be viable in those areas with optimal environmental locations, they will find ways to compete with commercial developers, whilst also generating the many extra social and wider economic benefits community projects deliver.

Table of contents

1 Introduction

The key barriers faced by community Renewable Energy Source (RES) projects are generally well understood. They generally relate to three areas:

a) The skills, expertise and technical capabilities of community groups to plan, develop, negotiate contracts, finance, build and then operate RES projects;

b) The challenges of setting up a community organisation and securing the wider support of other local residents that are not members or investors in the community organisation;

c) The difficulties in obtaining finance for the project.

Whilst each of these aspects has been dealt with in a qualitative, discursive manner there is much less information available about the actual costs and financing implications of community energy projects. Therefore, the overall objective of the report is to identify, document and assess the costs and corresponding financial impacts faced by community-owned renewable energy projects compared to commercial renewable energy projects. The project has reviewed the costs faced by communities in five countries - Australia, Canada, Denmark, Germany and the UK.

This Report is been based on information available as at mid-December 2015 and does not refer to any policy changes that may occur after this date.

The key questions addressed by the research are:

1) What types of project development and technology deployment costs are faced by existing local renewable energy projects broken down by model (community-led, shared ownership, fully commercial) and scale?

2) What are the external factors that could impact the costs of community-led renewable energy projects (e.g. tax relief, government incentives)?

3) Are there specific constraints and related cost/ financing implications that could apply only to community-led/ shared ownership projects, but not to commercial ones?

4) Of the types of cost which were common to all model types, are any community-led and/or shared ownership project costs invariably higher than commercial costs? If so, why?

5) Are there any costs that are lower for community-led projects? For example, does government backing to community projects reduce perceptions of risk and therefore lower capital in some respects?

6) What might these costs be in the years up to 2020, assuming the sector expands in line with the expected potential?

7) Where community-led and/or shared ownership projects faced additional or higher costs, are there opportunities to reduce or avoid them for future projects? How can this be achieved?

1.1 Definitions of community ownership

In writing this report it is acknowledged that each country has slightly different definitions of what community means. However, as a generalisation a community RES investment is where a group of individuals (whether living nearby, or possibly further afield) and/ or organisations (e.g. other cooperatives, local municipalities) develop, or contribute to the building of, a RES project and have voting rights in how the project is run. Sometimes this may be in the form of shared ownership partnerships with commercial developers (e.g. local utilities, local project developers, farmers), although depending on the shared ownership structure the community may have no voting rights.

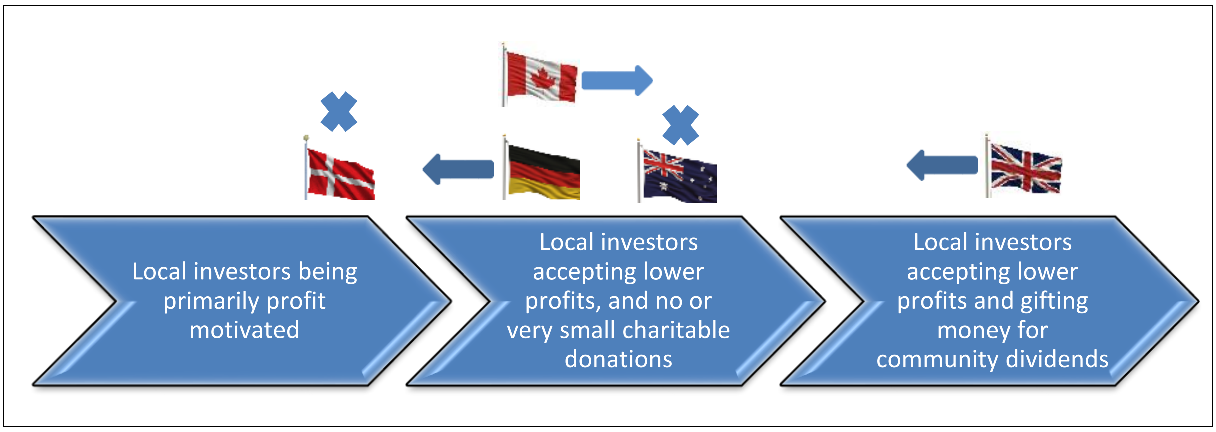
What is noticeable is that in different countries the driver for community involvement is different with:

- At one end countries such as the UK where community RES is steeped in a tradition where local investors expect to receive returns much lower than commercial developers would require with surplus ‘profits’ being a ‘**community dividend**’ and used for community benefit activities, such as creating jobs in the locality or supporting a local charity;

- In the middle countries such as Denmark and Germany where the community could be three farmers forming a cooperative to build a wind turbine who will receive all the profits themselves with no wider community benefit;
- At the other end, given an increasingly competitive market for communities to engage (particularly in Denmark), some governments are introducing requirements for large RES projects to offer some of the shares in the project to local residents. For example, the Danish Government has introduced a rule that locals must be given the opportunity to buy 20% of the shares in any medium to large scale wind project. There is evidence that local investors are considering such opportunities much as they would other investment options (e.g. depositing money in a bank or buying shares in a company) so are increasingly profit motivated. In these cases, there will be little or no wider community benefit, and no real collective community identity amongst investors.

Figure 1 gives a graphical illustration of where each of the five countries are on this spectrum at the time each of the Case Studies were written (which range from May 2015 to September 2015). There is also an indication of whether there has been a movement in each country since the five Case Studies were written and mid-December 2015. Further information about each of the five countries is included in Section 3.

Figure 1: Indications of what community involvement means in different countries *



* In this figure the flags are an interpretation of where the country lay on the continuum at the time of writing each of the Case Studies, with blue arrows (→) indicating the direction of travel of the country from the date each Case Study was written and mid-December 2015. Blue crosses (X) show where there has been little perceptual movement.

1.2 Why the five countries were chosen for the Case Studies?

We chose the five countries as Case Studies to exemplify a number of important differences, including:

- Whether they have an active community RES policy (Canada, Denmark, Germany and the UK) or not (Australia);
- Having a variety of approaches and understandings as to what constitutes a community project, illustrated by the continuum in Figure 1;
- Showing communities finding different solutions to realise their ventures, for example Canada has a diverse set of circumstances (different provinces with differing policies and remote off-grid communities) and in Australia, given the lack of support, community projects are normally run as commercial Energy Services Companies (ESCOs);
- Countries which have seen significant changes in their approach to community energy. For example, Denmark has historically been the leader of community energy but has recently had very few new wholly community owned RES projects coming to market.

Also relevant were more practical issues such as:

- Whether communities would be open in providing us confidential commercial information about costings;

- Whether there are a sufficient number of community RES projects in that country. For example, this ruled out Ireland and France as we perceived there would be difficulties finding six community RES projects.

We wanted to include a developing country example of community RES projects, but had great difficulty finding a possible country. This was primarily because few developing countries have any specific policies encouraging community ownership.

1.3 Technologies chosen for comparison

Given the size of the study and the number of interviews that were planned, it was decided to focus on two of the most common renewable energy technologies, namely solar PV projects and wind projects.

The advantage of wind and solar photovoltaic (PV) technologies is their costs are globally much more consistent, which has enabled stronger evidence-based conclusions to be drawn around the differing costs of deploying projects by community or commercial developers. The problems with analysing some of the other renewable technologies are:

- Small scale hydropower projects undertaken by community groups and other developers have widely varying costs depending primarily on the conditions of the river (e.g. the head of water and the seasonality of rainfall), which means results even within one country are not very comparable. This also meant that some countries, such as Norway which has community hydropower projects, but few community wind of solar PV projects, were not considered for this study;
- Anaerobic digestion (biogas) is heavily dependent on the feedstock used, whether that be municipal organic waste, slurry, crops or crop residues, so even different projects in one country may have different feedstocks meaning a few survey results may not be very representative;
- Concentrated solar power is only being developed on a large commercial scale;
- Tidal and wave technologies are new, and still at the experimental stages.

1.4 Report structure

This **Volume I: Main Report** draws together the responses to these seven questions from each of the five case studies (that are included in five **Volume II Case Study** reports). It is structured as follows:

- A methodology section, explaining our approach to data gathering and engaging with communities, how we obtained information on the costs for commercial RES, and our financial modelling approach to compare community and commercial projects on a like-for-like basis;
- A section which includes a brief description of the policy landscape and the level of community RES engagement in each of the five Case Studies to provide context to the differing results presented in the later section;
- A section that attempts to answer the above seven questions at a meta-level with the benefit of the five case studies. In particular emphasis is given to the seventh question, summarising what is needed to boost community energy from a policy perspective.

  Also a new subsection is added as this report was only initially tasked with looking at cost differences. The addition is the consideration of revenue drivers, for revenues and costs determine profitability and with that the costs of finance. For example, a bank is much more likely to lend cheaply if the anticipated profits are high, as there is less risk of failing to meet repayment commitments even if electricity generation is slightly lower than projected.

Rather than have a conclusions section which would be largely replicated in an Executive Summary the conclusions have been incorporated into the Executive Summary at the start of this report.

Lastly, it is important to note that this study has not considered the many other benefits of community energy which are briefly summarised in Box 1.

Box 1: Wider economic and social benefits from community energy

From a community perspective, renewable energy projects offer a range of potential benefits beyond cash returns to investors.

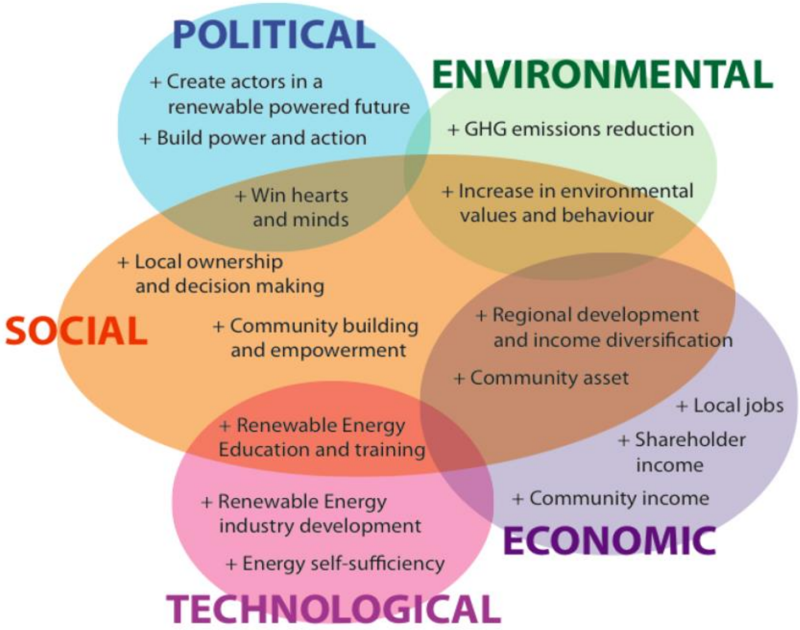
If set up to distribute financial returns above a certain percentage to charitable causes (like in the UK, some Danish projects, some Canadian projects and some Australian projects) community renewable energy projects can offer significant local benefits to the wider local community. For example community dividends are used to help fuel poor locals install energy efficiency improvements in their homes.

Renewable energy projects can also create local jobs — often creating more employment than conventional energy production per unit of energy produced. For instance, one study has found that wind power and solar PV create 40% more jobs per dollar than coal production[1]. By generating energy locally, renewable energy projects can help keep money in the local economy, and thus increase local value added.

A UK Department of Energy and Climate change report states "*The community projects installed will offer between 12-13 times as much community value re-invested back into local areas as would be achieved through 100% commercial models.*"[2]

Community renewable energy projects can offer other benefits, including building community capacity for deployment and maintenance of innovative technologies, and serving as a source of community pride.

Finally, community leadership or participation can mitigate or avoid 'not in my backyard' (NIMBY) barriers to renewable energy project development. For local discontent with RES projects can be highly costly and indeed fatal for projects, which makes shared ownership models an attractive option for commercial developers to reduce development risk. From the point of view of community project developers, partnering with commercial developers may also offer a better chance of accessing affordable financing options with longer terms and lower interest rates. The following diagram summaries the breadth of wider benefits.



Source: Sing, Virinder et al. "The Work That Goes Into Renewable Energy," *Renewable Energy Policy Project Research Report, 13.* 2001.

[1] Sing, Virinder et al. "The Work That Goes Into Renewable Energy," *Renewable Energy Policy Project Research Report*, 13 (2001) http://www.repp.org/articles/static/1/binaries/labor.pdf

[2] Capener. P. *Community Renewable Electricity Generation Potential Sector Growth to 2020: Methodology, Detailed Assumptions and Summary of Results*. Department of Energy and Climate Change. January 2014.

2 Methodology

This section of the report is split into two subsections, the first on how information and data was collected, the second on how comparisons of costs and profitability was calculated.

2.1 Data collection

2.1.1 Information and metrics needed

In order to be able to compare the costs of commercial and community projects there was a need to gather data on key cost metrics - development phase costs, construction phase costs and operating costs as well as financing and taxation costs. The metrics are shown in Table 1.

Table 1: Cost data collected

	Units
Development phase costs, ideally split into feasibility studies, planning costs, project management costs, and advisory fees (legal, financial, technical)	National currency
Construction costs, ideally split into capital cost (e.g. cost of the wind turbine/s or solar panels), installation / construction cost, substation/ transformer and other Balance of Plant (BoP) costs, and grid connection cost	National currency
Annual fixed operations costs (including any fixed land rental)	National currency
Land rentals linked to revenue (i.e. variable operating costs)	Percent revenue
Annual inflation rate on operating costs	Percent
Development phase start date and number of quarters – used to determine the financing costs (e.g. interest charges) during the development phase	Quarters
Construction phase start date and number of quarters to commissioning – used to determine the financing costs (e.g. interest charges) during the construction phase	Quarters
Asset life of renewable energy asset	Years
Percentage split between the different financing routes, including grants, loans, community shares structured to give a fixed interest rate per year, community cash reserves and any other equity	Percent
Interest rates on any loans	Percent
Length of any loans	Percent
Where community shareholders are being given a fixed interest rate the interest rate	Percent
Tax rates including corporate tax and regional tax – for some community structures in some countries the tax rate is zero (0%)	Percent

The cost of finance is partly driven by how profitable projects are likely to be. For example, a bank is more likely to lend money cheaply to projects that are projected to make high profits, for the bank's risk of default will be much lower. For this reason it is important to understand the revenue drivers as well, for if a project is not projected to be profitable irrespective of what the costs are it is unlikely to go ahead. Therefore, the revenue drivers summarised in Table 2 were also collected.

Table 2: Revenue data collected

	Units
Total MWh generated in typical year of operations	MWh
Total price for each MWh electricity sold, including any government support	National currency
Other revenues (e.g. credits for green energy)	National currency
Annual inflation rate on revenues	Percent

2.1.2 Community research

As there is limited publicly available information on the costs faced by community renewable energy projects the focus of the project was to undertake interviews with communities to try to elicit this information. To do this we used our own network of contacts, engaged with our partners **Ecologic Institute** in Germany, the **Pembina Institute** in Canada and the **Institute for Sustainable Futures** at the University of Technology Sydney in Australia, spoke to trade associations and government contacts and used the internet to find the contact details of community organisations.

In some countries there are not many community renewable energy projects, so the priority was to maximise the success rate in obtaining information. Through initial phone calls we selected eligible and willing project representatives, and followed up with a questionnaire (an example of the UK questionnaire is in Appendix 2) that communities could either return or have a second phone call to discuss their responses.

The objective of the study was to consider both the costs of wholly owned community projects, but also shared ownership projects, which are explained in Box 2.

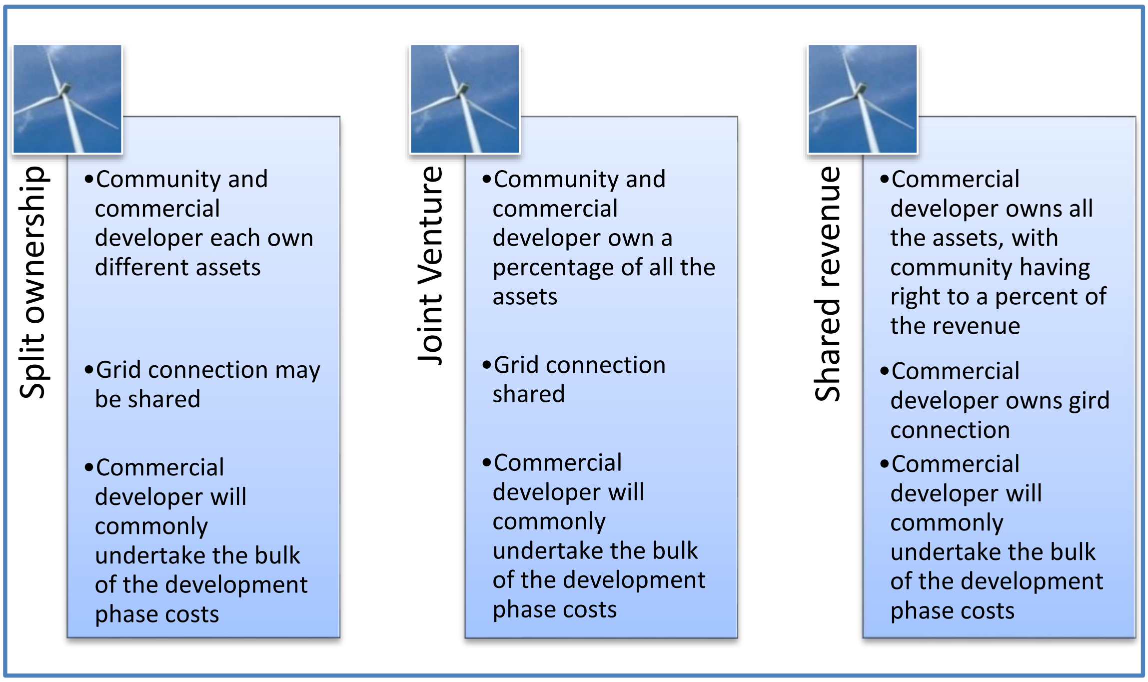
Box 2: Shared ownership – the options

The main types of shared ownership models, summarised in the diagram below are:

i. **Shared revenue.** Here the commercial developer owns all the assets, with the community having a right to a percentage of the revenues or net revenues (i.e. revenue less operating costs but before any interest payments and dividend payments). The community has no shares and therefore cannot vote on issues, although the commercial developer may well involve them in discussions. The community will have to raise all the finance for their proportion of the revenues they are purchasing.

ii. **Split ownership.** At the opposite end of the spectrum is split ownership. Here a commercial developer may approach a community and ask if they want to buy some of their assets, so that the community and commercial developer each own different assets. For example, the community may own 20 solar panels and the commercial developer 80 solar panels. There is likely to be an interparty agreement on sharing the grid connection and sharing the operating costs (e.g. maintenance), but for all other intents and purposes the assets are separately owned. Like the shared revenue model the community will have to raise all the finance for the assets they are buying from the commercial developer. Another scenario could be that a community decides to build a solar farm, and asks a commercial developer if it wishes to buy some of the solar farm from it. Either way, it is likely that one party will pay for the bulk of the development costs, will negotiate the purchase of renewable assets and act as the project manager, with the other party becoming involved later in the project development cycle.

iii. **Joint Venture.** Lying in between shared revenue and split ownership is the joint venture. Here each party owns a percentage of the assets, with the company set up as a Special Purpose Vehicle (SPV).



We had difficulty obtaining many responses from communities involved in shared ownership projects because shared ownership solutions are uncommon in many countries, and if they exist cost information may be commercially sensitive or unknown. For example:

- As explained in Section 1.1 in some countries (e.g. Denmark, and now planned in a state in Germany) any wind farm developer is obliged to offer 20% of the shares in the project to local investors who may see the investment proposition more as an arm's length investment opportunity, and may therefore be less open in disclosing investment costs;

- In shared ownership transactions the community or individuals will normally be offered the investment opportunity once the project is commissioned, so may not even know the construction and development costs that the lead developer paid.

Table 3 summarises the number of communities we spoke to and the number of projects we obtained information about, with the numbers of shared ownership projects shown in red font. As can be seen we were only able to obtain information on one shared ownership project in Canada, two shared ownership projects in Denmark, and very limited information on two shared ownership projects in the UK, so our conclusions are therefore focused on costs for 100% community owned projects.

Table 3: Summary of interviews with wholly owned community projects and shared ownership projects (shown in red)

	Australia	Canada	Denmark	Germany	UK
Number of communities contacted	10+	8	22	20+	20+
Number of respondents	8	5 (+1)	6 (+2)	5	7 (+2)
Number of wind projects surveyed	2	1 (+1)	4 (+2)	5	9* (+2)
Number of solar projects surveyed	6	4	1	13	15

* In the UK we were fortunate to obtain data for 8 Scottish community wind projects from data gathered and contributed by the James Hutton Institute and Scene Consulting through a ClimateXChange project entitled '*'The Comparative Costs of Community and Commercial Renewable Energy Projects in Scotland'* funded by the Scottish Government.

We were impressed at the openness of communities in sharing commercially sensitive cost information, to which we are thankful. Whilst sometimes people and companies responding to surveys may not state actualised values if they perceive benefits to understating or overstating results (e.g. to overstate costs to portray a worse financial position) the respondents to our questionnaire were very open and we believe very honest in the information they provided, although as with any response there is always the risk of unintentional errors in the information provided.

2.1.3 Commercial research

To gather country specific data for the costs of commercial wind and solar projects is more difficult as commercial entities are typically less forthcoming with commercially confidential information. Therefore, for the commercial data we reviewed international reports prepared by the International Renewable Energy Agency (IRENA), the International Energy Agency (IEA), specialist consultancies and government sources to try to obtain a database for the five countries. Figure 2 and Figure 3 present the commercial results, with the costs in American dollars.

The information for solar costs is for commercial projects of less than 1 MW, a size determined appropriate for comparison to community projects which will tend to be sub 1 MW roof mounted systems. An IRENA report provides costs for commercial wind projects, but unfortunately it is unclear the size of wind farms the costs are based on.

More data was available for wind from a report prepared by IEA Wind that provided detailed cost and financing breakdowns for wind in seven countries (Denmark, Germany, Netherlands, Spain, Sweden, Switzerland and the United States). At an international level there was no comparable data on the different costs for financing solar projects.

Figure 2: International comparison of commercial wind costs using data from IRENA, IEA Wind and KPMG datasets

	Australia	Canada	Denmark	Germany	UK
Development costs (USD $/MW)	190,000 [˘]	230,000 [˘]	N/A	200,000 [˘]	187,000 [˘]
Construction costs (USD $/MW)	1,710,000 [˘]	2,066,000 [˘]	N/A	1,799,000 [˘]	1,687,000 [˘]
Operational costs (USD $/MW/year)	N/A	N/A	46,085 [ˆ]	67,000 [ˆ]	N/A
Typical debt: equity ratio	N/A	80:20 [a] [*]	80:20 [a]	70:30 [a]	N/A
Cost of debt (%)	N/A	6% [a] [*]	5% [a]	5.5% [a]	N/A
Length of loan (years)	N/A	15 [a] [*]	13 [a]	13 [a]	N/A
Cost of equity (%)	N/A	7.5% [a] [*]	11% [a]	9.5% [a]	N/A
Tax rates (2015)	30.0% [°]	26.5% [°]	23.5% [°]	29.7% [°]	20.0% [°]
Post-tax weighted average cost of capital	N/A	5.0% [!]	5.3% [!]	5.6% [!]	N/A

Sources:

[˘] IRENA. *Renewable Power Generation Costs in 2014*. January 2015. Table 4.3 has total installed costs (USD $/MW) for Australia, Canada, Germany and the UK. Further, Figure 4.2 shows that development costs are typically 9%-13% of total project cost. An assumption of 10% is made. For Australia a range of USD $1,427,000 - $2,384,000 is given, so an average of $1,900,000 is used.

[ˆ] IRENA. *Renewable Power Generation Costs in 2014*. January 2015. Table 4.4 which has the O&M costs for Denmark and Germany. The operations and maintenance costs for Denmark are on a USD $/kWh basis and are 0.0152 – 0.019. With an average full load hours of 2,695 (source IEA Wind. *IEA Wind Task 26: Multinational Case Study of the Financial Cost of Wind Energy*. March 2011. Table 1.2) this equates to USD $40,964/MW - USD $51,205/MW or USD $46,085/MW on average.

[a] IEA Wind. *IEA Wind Task 26: Multinational Case Study of the Financial Cost of Wind Energy*. March 2011. Table 1.3.

[*] Debt and equity data for Canada was assumed to be the same as the US data in the IEA Wind Task 26 report.

[°] 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx

[!] The post-tax weighted average cost of capital (WACC) formula is {percentage of project debt financed x interest rate x (1 – tax) } + { proportion equity financed x equity return }

Figure 3: International comparison of commercial scale (<1 MW) solar costs using data from IEA, KPMG and UK Department of Energy and Climate Change datasets

	Australia	Canada	Denmark	Germany	UK
Development costs ($/MW)	85,000 [˘][a]	245,000 [˘][a]	90,000 [˘][a]	90,000 [˘][a]	120,000 [˘][a]
Construction costs ($/MW)	1,615,000[˘][a]	4,655,000[˘][a]	1,710,000[˘][a]	1,710,000[˘][a]	2,280,000[˘][a]
Operational costs ($/MW/year)	36,000 [˘][*]	98,000 [˘][*]	36,000 [˘][*]	36,000 [˘][*]	48,000 [˘][*]
Typical debt: equity ratio	N/A	N/A	N/A	N/A	N/A
Cost of debt (%)	N/A	N/A	N/A	N/A	N/A
Length of loan (years)	N/A	N/A	N/A	N/A	N/A
Cost of equity (%)	N/A	N/A	N/A	N/A	N/A
Tax rates (2015)	30.0% [°]	26.5% [°]	23.5% [°]	29.7% [°]	20.0% [°]
Post-tax weighted average cost of capital	N/A	N/A	N/A	N/A	N/A

Sources:

˘ IEA. *Technology Roadmap. Solar Photovoltaic Energy. 2014 edition.* September 2014. Total costs of installation by country are shown in Table 2. It is assumed total cost for Canada was the same as the USA and Denmark the same as Germany. IEA. *Technology Roadmap. Solar photovoltaic energy*. October 2010, p.10 defines commercial scale solar as up to 1 MW and utility based solar as greater than 1 MW.

[a] Based on Ricardo Energy & Environment studies, development costs make up approximately 5% of total cost of installation. This covers feasibility work, planning permission and other related development costs.

* The international operating costs were sourced from a UK report by Department of Energy and Climate Change. *Electricity Generation Costs 2013*. July 2013, p. 66. The DECC report states operation and maintenance costs are approximately 2% (per year) of total cost of installation for large scale solar PV installations. Operation and maintenance costs include inverter replacements (approximately every 7-10 years), ongoing installation project management, insurance, cleaning and basic repairs.

° 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx

As shown in the two figures, with the exception of commercial German wind data, there was insufficient information to complete the dataset. Therefore, in each country additional research was undertaken to create a fuller dataset for the modelling that drew on specific reports prepared for that particular country. In most cases we ended up using these country specific reports for comparison purposes as the reports were often more detailed, even for German wind. The respective country specific datasets are in the appendixes for Australia (Appendix 4), Canada (Appendix 5), Denmark (Appendix 6), Germany (Appendix 7) and the UK (Appendix 8).

However, whether the country specific reports or the commercial information in Figure 2 and Figure 3 is actually closer to reality of course depends on the different sampling approaches and methodologies the authors of all these reports used, as well as issues of intentional or unintentional bias.

2.2 Cost and profitability comparisons made

In order to answer the question of whether the costs faced by community organisations are different from those faced by commercial organisations two comparisons are made:

- Firstly for each of the main costs (development, construction and operating costs) comparisons need to be made, where the data is available;
- Secondly, even if there are differences in development, construction and operating costs the materiality of the differences is important. For example, even if it is found that development costs are 50% higher for community projects than commercial projects, if development costs are only 5% of total project costs the impact on returns will be marginal;

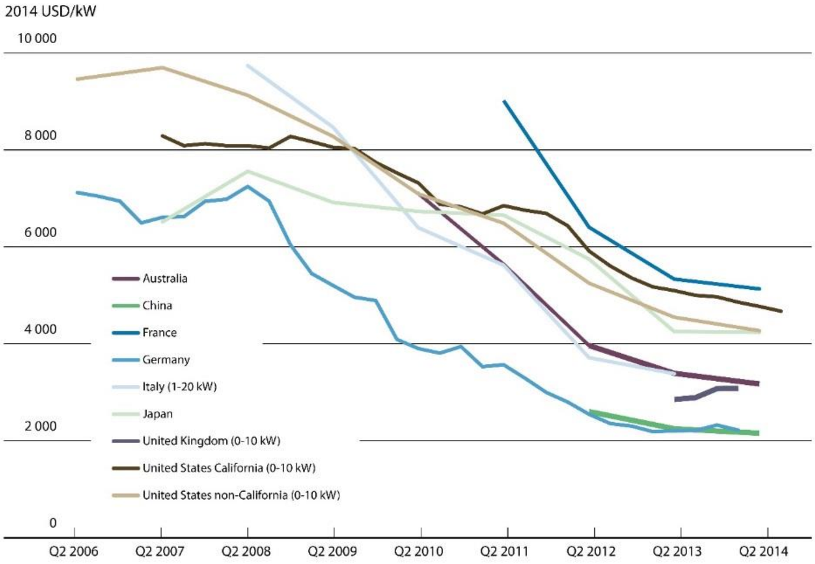
  In order to be able to make this comparison, and estimate the different financing costs, there was a need to build a financial model. For the impact of financing costs (e.g. interest rates and equity return requirements) and tax rates can often be much more significant than differences in some of the development, construction and operating costs.

2.2.1 Comparisons of costs

The first approach was therefore to compare the main costs, to pick up any differences on a cost /MW or for operating costs on a cost /MW /year basis, and comment on the robustness of the results. As costs for larger wind and PV projects will tend to be lower per MW (due to economies of scale) we attempted to compare community projects (which tend to be of a smaller scale) to commercial projects of an equivalent size, but in some countries commercial data for smaller scale projects was not available.

As in many countries the number of community renewable energy projects is low we had to collect data from projects commissioned in 2010, 2011 and 2012 rather than more recent projects, and in a few cases (most notably in Denmark) from before 2010. As illustrated in Figure 4, the costs of residential solar PV modules have fallen significantly in the last five years, and these trends are similar for larger scale solar developments. This means that construction costs for community solar PV modules may be higher purely because some of the projects were undertaken when PV module prices were higher.

Figure 4: Average total installed cost of residential solar PV systems in different countries – 2006-2014 ($/kW)



Source: IRENA. *Renewable Power Generation Costs 2014*. 2015, p.88. Figure 5.10 drawn from IRENA Renewable Cost Database; CPUC, 2014; GSE, 2014; IEA PVPS, 2014; and Photon Consulting, 2014.

Qualitative Considerations

As project costs do vary over time, we also asked communities whether they thought that had their project been built to exactly the same specifications by a commercial developer whether the commercial developer's costs would have been different. This is question 20 in the questionnaire in Appendix 2.

2.2.2 Comparison of impacts of costs

For the second check we then ran the financial models for each of the community projects to see if the community projects are projected to be profitable. A bespoke financial model for this project was built from the **Ricardo Accessible Finance Tool (RAFT^{TM})**, and is available on the IEA-RETD website.

The indicative financial model is based on a standard dynamic project finance model modelled quarterly in the developmental and construction periods and on a semi-annual basis in the operational period. For the interested reader, Appendix 3 explains some of the assumptions underpinning the model and how to run the model. Table 4 explains how to interpret the results.

Using our research of the returns expected by commercial investors (taking account of common debt: equity ratios, banking terms and equity requirements) we were able to compare the commercial hurdle rates with the anticipated returns community projects will make. Apart from in the UK where most community organisations are structured to be tax free, in the other four Case Studies most community RES projects pay corporate tax. Therefore, it was decided that in these four countries the post-tax Weighted Average Cost of Capital (WACC) was the most comparator. The post-tax WACC is also called the post-tax pre-finance Internal Rate of Return (IRR) and is the annualised return the project makes after paying off corporate tax, but before paying off financing costs (e.g. interest and loan repayments, dividends, equity repayments and any payments for community benefit projects).

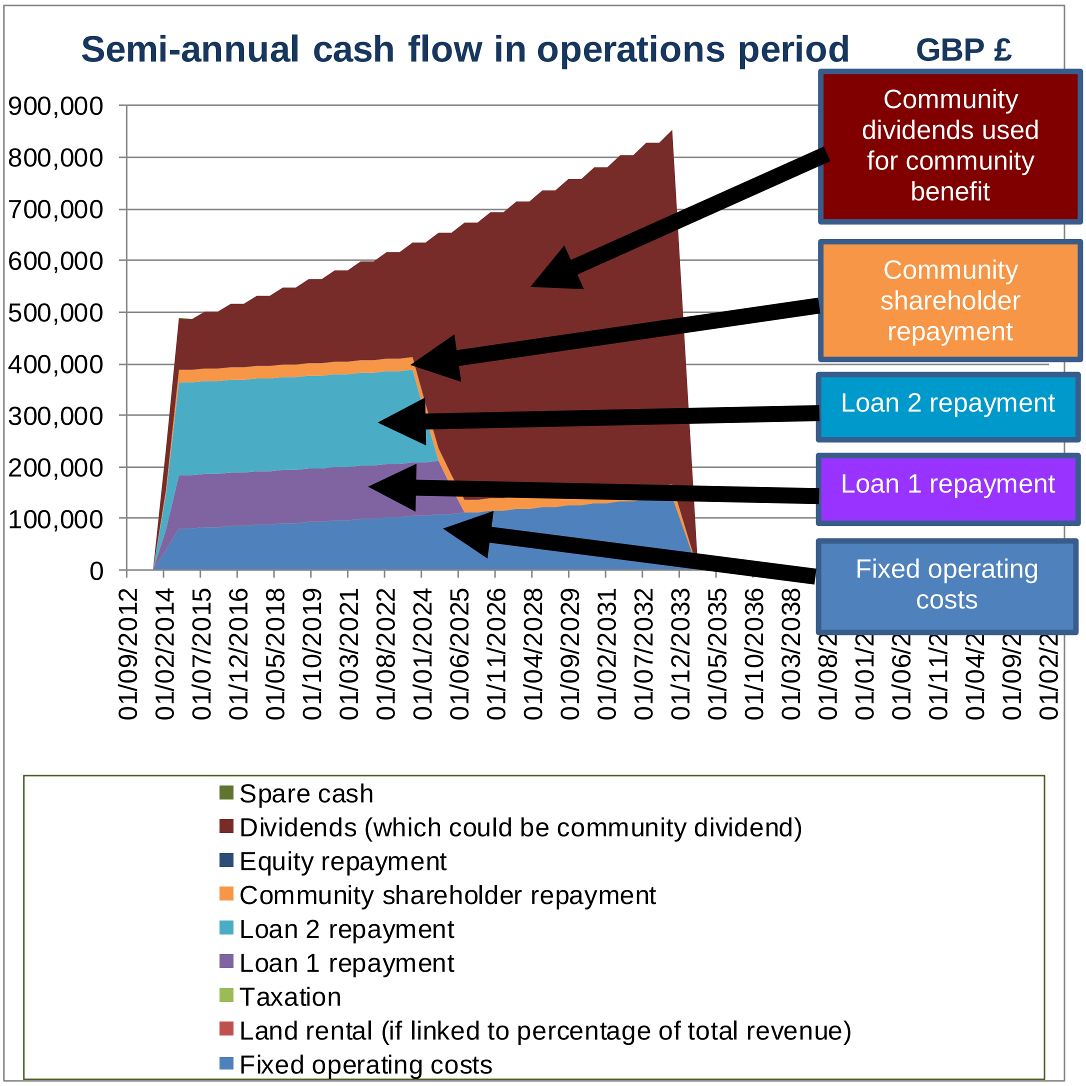
The reason for focusing on the post-tax WACC rather than the equity return requirements is because projects can be financed differently with different amounts of debt and equity. So if a project was geared with 70% debt and 30% equity the returns the equity investor would hope for each Euro (€) invested are going to be different to the equity returns that would be expected if the project was structured 50% debt and 50% equity.

Table 4: Explanation of graph generated by the financial model

It is easiest to explain the graphs that are generated by the bespoke financial model and shown in Appendix 2 of each Case Study by showing an actual project. The following graph illustrates the results for a wind community wind project in the UK (wind project 1 in the UK Case Study). The IEA-RETD Model has a scenario 21, which is this model.

The headline total cost (development plus construction cost) is £5,347,889 and the annual operating costs are £157,000 rising by 3% inflation each year given the UK Government's projection that the Retail Prices Index (RPI) will rise by 1% more than the 2% Consumer Prices Index target.[3] The project is financed with £561,000 of grants, £1,667,021 with an 11 year loan at a 5.75% interest rate, £2,503,573 with a 10 year loan at 7.5%, and £616,294 with a community share offering 5% a year.

UK Community Wind Project 1



This graph shows that the project will generate sufficient cash in every period to pay the operational costs (shown in the darker blue area ■), repay the two loans (shown in the lighter blue ■ and mauve areas ■), pay the community investors the 5% return they have been offered (shown in orange areas ■) and still leave community dividends, shown in the purple areas (■). By distributing all the community dividends to a charity no corporation is due. As with most project finance models the level of the community dividends is lower in the first 11 years as loans are repaid, and once all the bank loans have been repaid the level of community benefit is significant.

[3] Office for Budget Responsibility. *Economic and Fiscal Outlook*. March 2015, p. 62.

3 High-level country by country situation

In order to provide context to the results and findings there is a need to understand each country's situation in more detail. For example, in those countries where community projects may just be three farmers forming a cooperative to build a wind turbine their approach to development may be very different to a community of 100 different investors building a turbine that will donate the bulk of the profits to address fuel poverty in the locality. Three differences may be:

- The farmers may quickly employ a qualified project manager who has built similar projects elsewhere in order to expedite the development and commissioning phases. On the other hand the community of 100 investors may take longer to make decisions and try to undertake some of the work themselves;
- The farmers may negotiate very hard with RES suppliers even on small points like payment terms, whereas the community of 100 small investors may be reluctant to negotiate everything;
- The farmers may already have sufficient free cash resources or they may be able to borrow money very cheaply by mortgaging some of their other farm assets, whereas a community may find it much harder to find the finance required, and also take much longer capital raising.

The different types of government support and the social fabric of the country will also be important.

The detail for each of the five countries is included in each separate **Volume II Case Study**. However, five Appendixes in this report (Appendix 4 for Australia, Appendix 5 for Canada, Appendix 6 for Denmark, Appendix 7 for Germany and Appendix 8 for the UK) have copies of the Executive Summaries of each Case Study, followed by a brief overview of significant policy developments in each country after the Case Studies were written (particularly relevant to Germany and the UK) and tables showing the country specific commercial cost data we gathered.

Figure 5 therefore draws together all this information to summarise the particular government support to RES and community RES in particular (e.g. grants and higher levels of revenue support for community projects, or specific tax breaks which reduce costs).

Drawing on Figure 1 which attempts to explain the social fabric of the country and the motivators for community investment, Figure 6 provides a typology of the different levels of RES support is given, based on these two dimensions, with on the:

- Vertical axis the strength of government support to RES generation;
- Horizontal axis, mirroring Figure 1, a scale which varies on the left hand side to community engagement only being about locals investing in RES projects to maximise returns, all the way to a more egalitarian concept on the right where the level of community investor returns is capped, with any remaining profits being gifted to the wider community as a 'community dividend', therefore enabling those individuals with limited means to also benefit from the project.

As well as plotting where the country lay at the time the Case Studies were written Figure 6 also includes an attempt to define where each country is heading in the future (shown by dotted arrows (▬ ▬ ➔), based on:

- Policy announcements since each of the Case Studies were written;
- Feedback from stakeholders in each country.

The situation in each country can be summarised as follows:

3.1 Australia

Although in the past Australia has had a lot of support for renewables (e.g. a highly successful Feed in Tariff (FIT) for rooftop solar which increased roof top solar from less than 200 MW in 2010 to over 4 GW solar by 2014, but has now been stopped) there is still support for renewables to help to meet Australia's renewable energy targets. However, this support is mostly targeted at the larger, commercially driven projects. What this means is that most community RES in Australia are innovative community solar developers who install solar panels on local businesses roofs and 'go behind the meter' to earn electricity prices close to the high Australian retail prices for the first 7-10

Figure 5: Support for community RES projects

					
COSTS					
Grants	✓	✓✓	X	X	✓✓✓
Preferential loans, e.g. from social lenders	X	✓	✓	✓ !	✓✓
Technical facilitation, expertise and support	✓	X	✓	X	✓
Technical 'how to' guides	✓✓✓	X	✓✓	✓✓	✓✓
Income tax incentives for community investors	X	✓ a	X	X	✓✓
REVENUES					
Revenue support for any small (e.g. <5 MW) project, whether commercial or community	✓✓	✓ °	✓	✓✓	✓
Additional revenue support for small community projects	X	✓ °	✓ *	X	✓ "
Revenue support for large (e.g. 5 MW+) projects, whether commercial or community	✓✓	✓✓ "	✓	✓✓	? *
Additional revenue support for large community projects	X	X	✓ *	X	X
Ability to fix revenue support rates ahead of paying grid deposits and other deposits in order to secure post-planning, pre-financial close loans	X	X	X	X	✓✓

Symbols:

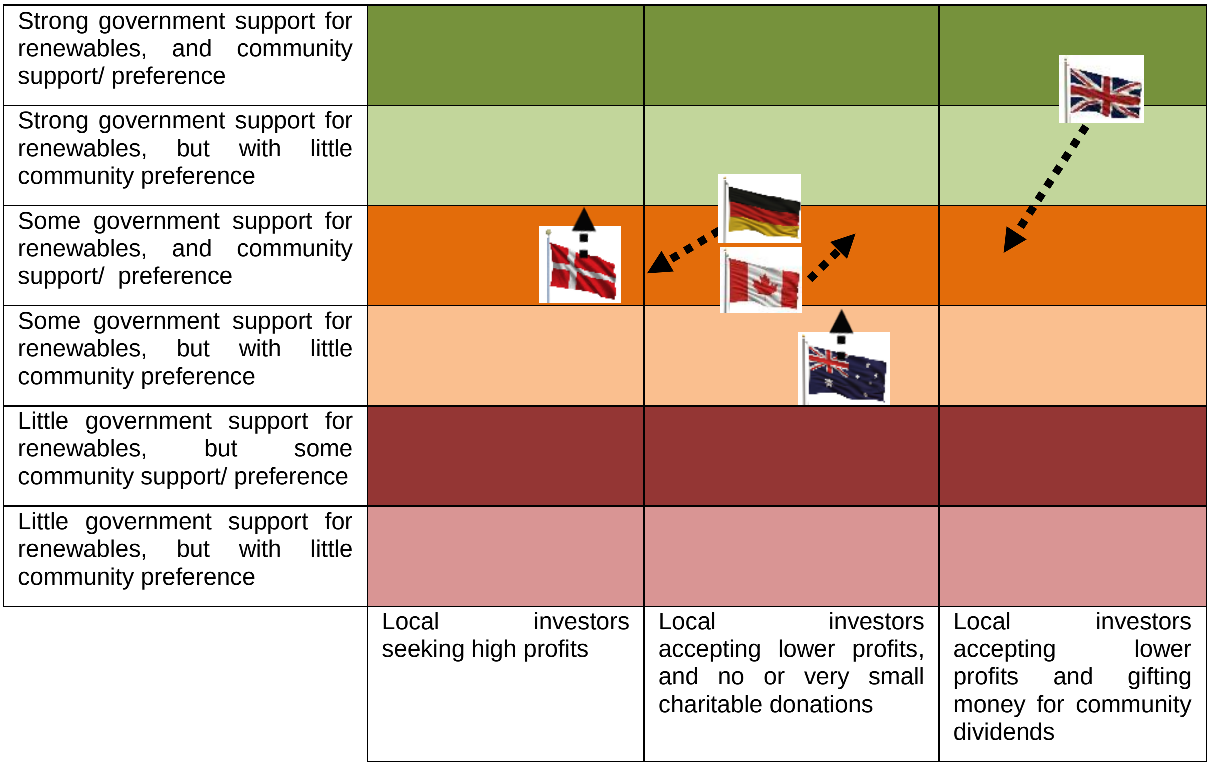
✓✓✓ Plenty ✓✓ Some ✓ A few ? Questionable X None

[a] In Nova Scotia there are income tax breaks for investing in small, community RES projects.
° In Canada there is a FIT in Ontario and in the city of Banff, Alberta. In Ontario there are additional payments on top of the Ontario FIT specificallt for community projects, but in other provinces there is nothing.
" In different Canadian provinces there are different incentives to promote renewable energy generation, mostly from large installations
* In Denmark there is an obligation for any large wind farm development to offer 20% of the equity in the project to the local community. Although this is not revenue support, it does enable locals invest in larger projects.
! In Germany the German Public Development Bank (KfW) will lend any renewable developer (whether they are a community or a commercial developer) up to €25 million at very low interest rates.
" Opportunity for communities and commercial operators to develop a combined 10 MW solar project, with each party having 5 MW each and each rely on FITs.
* A question (?) sign is put against the UK revenue support for large projects because the second Contracts for Difference auction has been postponed, with no further details known at this stage.

years before gifting the panels to the local business. Although financial returns are low, there are cases where local investors can receive returns greater than the equivalent returns they could make in bank through ethical ventures such as these. To date many of these ventures have gifted small sums of money for charitable causes, although the tight margins limit how much can be distributed.

The reason for the direction of travel being slightly upwards is because many community energy advocates have spent significant time pushing community renewable energy onto the policy agenda and this is now just starting to gain traction, particularly at a state government level in New South Wales (NSW), the Australian Capital Territory (ACT) and Victoria. There has also recently been an announcement that the Government's own Clean Energy Finance Corporation (CEFC) is now investing in commercial wind farms – an indication more support for renewables in general may be forthcoming.

Figure 6: Typology of RES support and community engagement



3.2 Canada

In Canada RES policy is driven more by individual provinces than the federal level. There is limited revenue support for RES projects, apart from Ontario where Ontario's Independent Electricity System Operator operates a FIT that is available for any RES project less than 500 kW. Additional support on top of the FIT rate is given to community projects. There is also a FIT in the city of Banff, Alberta, and in the past there were FITs in British Colombia and Nova Scotia.

There are grants available for community projects. In a climate of limited revenue support, going forward the greatest opportunity for community RES lies in remote off-grid areas, where communities can develop RES projects that enable the community to offset expensive retail electricity prices.

The direction of travel is upwards and to the right (i.e. more support for RES projects and for community RES projects) as a result of the changes in the political administration in October 2015 and announcements to reduce the use diesel generation in remote off-grid communities.

3.3 Denmark

Denmark has traditionally had a strong community renewables focus especially for wind projects in the years 1990 to 2002, but now because of declining Government support to renewables and increased competition from commercial actors for land fewer and fewer 100% community owned RES projects are coming to market. As a result of the 2009 legal requirement for any wind farm developer to offer residents living near wind turbines the opportunity to buy shares in the project, local investors are now seeing these projects more as a financial investment rather than an ethical investment undertaken by local community members, or a return they are entitled to receive for the perceived disamenity of having wind turbines near their houses.

Nevertheless, the direction of travel is slightly upwards as the Government is keen to avoid any further backlash at onshore wind in particular.

3.4 Germany

In Germany there is not a tradition of community energy projects supporting local charities, rather the projects are often developed by a number of farmers, or a group of individuals with the aim of protecting the environment and being independent from the big four electricity suppliers. Local investors into these projects accept that returns may be low, but are keen to support them as it is an ethical investment and in line with the Government's EnergieKonzept which is for cleaner, more sustainable energy generation with less fossil fuels and nuclear power.

There is limited specific support for community RES, although most RES projects that cost less than €25 million, whether they are developed by a community or a commercial investor, can access low cost loans from the German Public Development Bank (KfW).

From 2016 fixed price FIT support is only available for small RES projects up to 100 kW, with and a tendered market premium system for installations above 100 kW. This, combined with a move to direct marketing (where electricity generators need to find and negotiate deals to sell the electricity generated), is worsening conditions for the commissioning of the typical projects that cooperatives built in the past as more time needs to be spent negotiating and understanding systems. Further, one State has just approved a rule, similar to that in Denmark, where any wind farm developer needs to offer 20% of the ownership in the project to individuals living nearby.

For these two reasons of a harder market for wholly owned community projects to operate in, and the push to shared ownership the direction of travel is pointing slightly downwards and towards investors wanting higher returns, as the investors in the shared ownership projects may see the projected returns as some form of 'compensation' for having a wind farm nearby. However, it is heartening to hear that in the second round of tendering for the market premium some small scale (2 MW) solar projects secured support, and the Government is considering having some special tendering conditions for small and micro projects (e.g. from Small and Medium Enterprises (SMEs)) in order to guarantee the plurality of actors in the RES sector in Germany.

3.5 United Kingdom

In the UK nearly all community renewable projects have the concept of 'community dividends' where once financiers have been paid, any surplus monies are given as a 'community dividend' for community benefit causes, whether that be support for households living in fuel poverty, creating local employment in rural communities or supporting local charities.

When the Case Study was written the UK community sector was thriving, with strong revenue support through a FIT, as well as specific assistance to communities in the form of development phase grants, tax breaks for investors, 'how to' guides, technical assistance and a host of other instruments. However, since June 2015 there have been a number of announcements that will significantly reduce the number of smaller projects (that community projects tend to be). For example the FITs for some scales of technologies (e.g. ground mounted solar projects less than 5MW) are being reduced by as much as 80%. The commercial renewables industry is also waiting for a second round of tendering for the contracts for difference (a form of market premium) that is targeted to large scale developments. The date of announcement of this second round has been delayed a number of times, leading to uncertainty.

It is for these reasons that the direction of travel is downwards (less Government support for renewables and community renewables), and also towards communities being able to gift much lower community dividends for community benefit causes as many community projects that were being developed will be stopped (as they won't be able to break even), and those that remain viable will be operating on much more slender margins so there will be less 'free' cash to distribute.

Nevertheless, communities will find solutions to profitability deliver projects, either by locating in favourable locations (high wind speeds or solar insolation levels, cheap grid connections, easy accessibility and cheap land rentals) or by finding solutions where electricity generated can be sold directly to end consumers, or offset against higher retail electricity prices.

4 Answers to the research questions

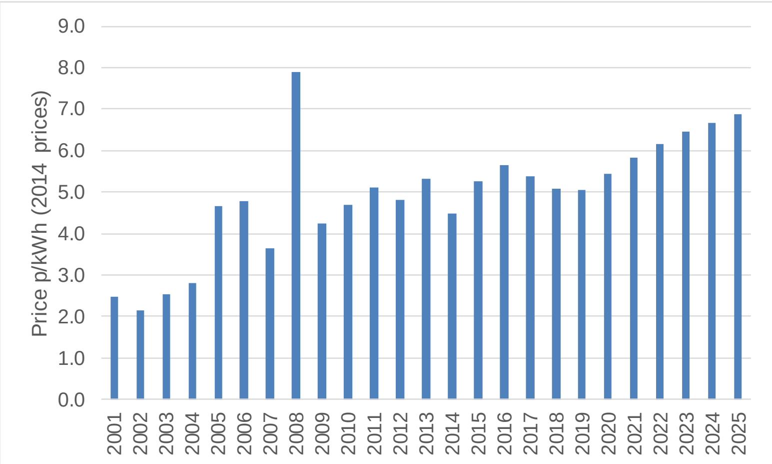
There were seven questions that need to be answered, that relate to the costs of community renewables versus commercial renewables. However as explained in Section 1.4 (page 11) of the Introduction the revenues community projects can secure is also important. Therefore this point is explained first with then sections 4.2 - 4.8 answering the seven questions.

4.1 Revenue maximisation

To focus just on costs for community projects is to miss out on the other essential point for projects to be viable, namely maximising revenue from sales of electricity. It is also the case that the costs of finance will in part be determined by the strength of the revenues, for banks are much more likely to lend on favourable terms if the project is projected to make high profits, for the risk of a loan default is much lower.

There are very few instances where renewable energy has reached 'grid parity' although countries have projections for future wholesale electricity prices to assist them estimate when that point will be, as illustrated for the UK in Figure 7.

Figure 7: UK projected wholesale electricity prices (p/kWh) in 2014 real prices



Source: Department of Energy and Climate Change. *Updated energy and emissions projections 2014*. September 2014. Appendix M.

When renewables reach grid parity it will be the large scale renewables that reach parity first, although countries are now starting to consider charging electricity generators that cannot produce electricity when needed higher grid balancing charges. For example, if a country has many wind turbines (that by definition only produce electricity intermittently when it is windy) then if a country is quite small it is highly likely that all the wind turbines in the country will be generating electricity at approximately the same time. If this coincides with a period of lower electricity demand (e.g. midday or midsummer) then as electricity cannot be easily stored the transmission and distribution networks will need to balance loads by asking other electricity generators to turn off their power stations which can be costly.

Due to the inherent difficulties for communities with few assets and limited cash reserves raising tens of millions of Euros (€s), and also because of the idea of local generation to match local demand, most community schemes tend to be small scale (less than 5 MW). Nevertheless, there have been a few large community schemes, such as the Middelgrunden Wind Cooperative in Denmark which owns 20 MW of a larger 40 MW scheme. Therefore, with declining levels of revenue support from governments, shared ownership arrangements on large multi-MW schemes are likely to become more and more common as the solution that can deliver financially attractive propositions to communities.

Yet many governments are keen to have a mix of organisations also developing more costly smaller RES projects (e.g. for energy security reasons), so commonly governments have higher levels of revenue support for smaller schemes. Different countries have varying ways of compensating small scale renewable generators; some have FITs which act as a fixed 'top up' that generators receive in addition to the prices they can sell electricity at, other countries have a market premium that effectively sets the total price that generators receive for each kWh or MWh produced, with the governments then providing the generator the difference between this price and the average wholesale price for the period; whilst in Australia Small-scale Technology Certificates (STCs) are received by small generators when they start generating electricity. Here the Australian generator is given an upfront sum of money (effectively a grant) for the value of these certificates at the date of commissioning the asset.

As projects take time to bring to market, some governments allow prospective renewable developers to lock-in to revenue support at a price per MWh even before the project has been fully commissioned. For example, the UK has pre-accreditation mechanism where small scale community RES projects can lock into electricity prices twelve months ahead for solar projects and eighteen months ahead for wind projects. This helps to give price certainty, and with that makes raising finance easier.

Irrespective of whether projects are large or small, communities have five particular challenges in maximising revenue:

- Communities by their very nature as geographically located, often in places without optimal environmental conditions, e.g. the highest levels of insolation in the country or the windiest places. Commercial developers on the other hand are rarely fixed to one location and at any time may be negotiating with different land owners to find optimal locations, or locations where although wind speeds may be a bit lower the costs of connecting to the electricity grid are very low. Therefore, even if communities are offered the same levels of revenue support (€/MWh) if a commercial project can be sited in a place with 5% higher electricity generation it will generate 5% more revenue, and even more importantly the P90 values (the projected electricity generation in the worst year out of 10 years) may have a smaller variability, for it is P90 values that banks tend to lend against allowing higher debt: equity ratios and lowering the WACC;
- Developers are likely to be better at securing higher priced Power Purchase Agreements (PPAs) to sell their electricity. For there may be economies of scale or they may be able to sell the combined generation from multiple sites in different geographies offering a smoother load profile. Even the difference of €2/MWh or €3/MWh can be significant. Also, communities may not even be aware of different types of PPAs, for example a two-year fixed price deal or a five-year fixed price deal or a PPA with different prices at different times of the day;
- In some jurisdictions there are opportunities for RES to sell directly to consumers, rather than to the large energy supply companies. This can enable RES generators to sell electricity at higher PPAs, whilst enabling the consumer to purchase '*green energy*'. However, as electricity pricing and electricity licensing is complex, often small players (which communities often are) find that the benefits they can secure are offset by transaction costs; whilst more experienced commercial developers can spread initial transaction costs of setting up such deals over more projects, again disadvantaging community RES projects;
- Because of their poor balance sheets communities have difficulties securing finance to pay for deposits (e.g. grid deposits or turbine deposits) before financial close (the date all contracts are signed, construction commences and financiers provide the monies, with banks taking security over the assets being built and the projected cash flows). Whilst the ability to lock-in future revenue support is welcomed by commercial developers, for communities in a world of policy uncertainty having a locked in tariff (or policy certainty) can be the difference between financiers offering money for deposits or financing the full deal and not offering any money;
- As evidenced in the Case Studies community projects can take years to reach fruition, and there are numerous examples of community projects which would have gone ahead, but policies changed right at the end meaning the project had to be cancelled. Had they been a commercial developer the scheme would have gone ahead as it would have been developed more quickly. Thus any delay leads to greater risks of policy change in the intervening time.

This then leads to the question, beyond the wider economic and social benefits referred to in Box 1 (page 12), why does the government want community renewable generation? Two hypotheses are suggested.

4.1.1 To compete with commercial projects

If the answer is to give another sector the opportunity to generate electricity, but only if it can compete with commercial investors who can locate projects in optimal locations (i.e. government revenue support is only sufficient to incentivise those projects located in the best locations) then the government will have to acknowledge that communities will only come forward if they are in locations with favourable environmental conditions, e.g. on windy coastlines or in windy hilly areas. There is a risk that communities in these areas may not have the social cohesion, finance or will to develop risky projects on their own. This is why some jurisdictions encourage in shared ownership (e.g. England and Wales), strongly recommended it (e.g. in Scotland[4]) or even make it a legal obligation for any developer of large projects (e.g. as happens in Denmark, and potentially now in the state of Mecklenburg-Vorpommern in Germany).

> Although the number of locations with high wind speeds may be constrained for physical, practical (grid connection) or planning permission reasons, there is much more gradation with solar PV sites. Very often the sunniest places will cover a wider area, e.g. the south of Germany or Britain, so there will be many more suitable sites that community solar projects can be progressed.

If the intention is only to incentivise community projects in optimal locations, then for those communities fortunate to live near areas with high insolation or high wind levels community RES installations need to be given a chance of securing projects. Governments can do this by trying to unblock supply inefficiencies in the market, e.g. giving financial and technical support with the risky development phase, and ensuring there is nothing in the revenue support rules that penalise communities (e.g. that penalise communities just because the democratic nature of community projects means they nearly always take longer to come to fruition that commercial projects).

Importantly, if governments can create a 'level playing field' by reducing high transaction costs of negotiating favourable deals to sell electricity to locals near the community, the possibility for wide-scale decentralised community RES projects even in suboptimal locations becomes more realistic given the large differentials between wholesale and retail electricity prices.

4.1.2 Particular assistance for communities

If on the other hand the government wants to give communities preferential treatment compared to commercial developers (e.g. structuring the support mechanisms so commercial renewable projects can only happen in areas with very favourable environmental conditions, while community ones can still be profitable in less favourable locations) then governments need to create specific rules for communities.

A few countries have additional revenue support available specifically for small scale community projects compared to any small scale RES project. The two examples from the case studies are the FIT scheme in Ontario, Canada where a higher FIT tariff is available for community projects, and in the UK where the largest RES project that can attract FITs is 5 MW, but there is a possibility for a commercial and community developer to each build a 5 MW project next to each other and still claim FITs, enabling both parties to benefit from economies of scale.

Even if there is preferential revenue support, or grants and favourable loans, it is still important that the government has the right enabling environment to encourage communities, and tries to remove supply side inefficiencies so that communities can operate on a level playing field.

4.2 Cost components for different ownership options (community-led, shared ownership and fully commercial)

This sub section answers the first of the seven research questions "*What types of project development and technology deployment costs are faced by existing local renewable energy projects broken down by model (community-led, shared ownership, fully commercial) and scale?"* As shown in Figure 8, all models of ownership (community-led, shared ownership and fully commercial) will have similar costs to develop and operate projects, with the exception that:

[4] Local Energy Scotland on behalf of The Scottish Government. *Scottish Government Good Practice Principles for shared ownership of onshore renewable energy developments*. September 2015.

- Community organisations will often have costs involved in community engagement;
- The exact split between costs faced by communities and commercial companies in shared projects will depend on the exact project arrangements. However, indications are that with shared ownership options the community will often be brought in later into the project, so will not (or only partly or at a later stage) incur the initial feasibility costs and planning permission costs. Despite this community entities will need to get legal and financial advice on the proposal and need to reach agreement on the specifics of the proposition;
- Different jurisdictions have different positions on the tax liabilities of community entities. In some jurisdictions community entities are not taxed, in others they are, but sometimes communities can reduce their tax liabilities by gifting any surplus profits to charities as a 'community dividend'. Hence a question mark (?) against corporate taxation;
- Communities often benefit from 'free' volunteer time, so delving into the actual costs by accounting for the 'free' volunteer time will affect the total costs.

Figure 8: Different costs faced by different ownership models

	Community	Shared community involvement	Shared commercial involvement	Commercial
Development costs				
• *Initial feasibility*	✓	×	✓	✓
• *Planning permission preparation*	✓	×	✓	✓
• *Project management costs*	✓	✓	✓	✓
• *Other advisory*				
• *Community consultation*	✓	✓	×	×
Construction costs	✓	✓	✓	✓
Operations costs	✓	✓	✓	✓
Corporate taxation costs	?	?	✓	✓

4.3 External factors that can affect the costs of community-led and shared ownership projects

This sub section answers the second of the seven questions "*What are the external factors that could impact the costs of community-led renewable energy projects (e.g. tax relief, government incentives)?"* Figure 5 on page 23 of the report summarises the external factors that can affect the profitability of community-led and shared ownership projects, with the cost ones summarised as:

a) **Grants** – whilst these are not a cost, they can be seen as offsetting costs. Grants to assist with the initial feasibility and development phases are particularly welcomed given the inherent riskiness of this stage;

b) **Preferential loans**, e.g. from social lenders. These will reduce the cost of borrowing, for communities often have great difficulty in securing loans both for the highly risky development phase, but also for the construction phase.

   - Development phase. Whilst communities have difficulty securing these monies, commercial developers will often have resources to pay development phase costs and any deposits accepting some of the projects in development will not proceed. Therefore communities will have to approach financiers, or rely on grants. Commercial banks are unlikely to lend development phase money because planning permission may not have been secured and they have little security if the project does not proceed.

Again, as mentioned in Section 4.1, as well as the money for undertaking all the initial studies, securing planning permission and preparing financial models, with larger projects manufacturers often ask for deposits to guarantee that the project will go ahead so they can manufacture the equipment. Although the sums of money are comparatively small, maybe 10% or 20% of the construction costs, again financiers are often loath to lend the money for they have no security that the project will go ahead. The same is true for electricity grid deposits that are often requested before financial close.

This is why soft or attractive loans from social lenders and others are vitally important to get community projects to market.

- Construction phase. For the construction phase community projects tend to be quite small, typically ranging from €50,000 for small scale solar PV projects to €2,000,000 - €3,000,000 for 1 – 2 MW wind turbine projects. Before lending commercial banks have to undertake a lot of due diligence and the fixed costs of doing this often mean that commercial loans become very expensive, or even means that commercial banks will only lend on bigger (€3 million plus) projects. For these smaller projects loans from social lenders are welcomed by the community RES sector. For example, in Germany KfW will lend up to €25 million on very attractive terms.

Nevertheless, one positive development seems to be in some jurisdictions there is an increasing ability to secure monies for the whole community project directly from the local community, rather than rely on other lenders as well; in effect sidestepping some of the upfront fees banks charge for all their due diligence and instead providing lighter due diligence evidence to local investors. For example, interviewees in the UK stated that in today's market achieving a community share offer of £1 million is comparatively easy, £2 million is harder unless the area is affluent and above £2 million requires a very dedicated community. As well as directly targeting local investors there are also more opportunities to draw on money secured through crowd funding websites;

c) **Technical facilitation, expertise and support** – whilst small scale solar roof top projects are quite easy to develop (with the main issues being securing finance and grid connections, negotiating any deals to rent roofs, finding a competent contractor and installing the solar panels); with larger scale wind projects there are many more additional issues to deal with including installing meteorological masts to measure wind speed over a year, planning permission applications, possibly environmental permit procedures, finding money for any deposits for pre-ordering wind turbines, technical challenges of getting the turbines to the site (especially if the location is rural with poor road links), and project managing the whole project.

Commercial developers will have the skills to do this, but communities often lack these skills, and do not know where to start. During many of the interviews communities said that having an expert to help them would have both reduced costs and accelerated the project. In some places such as Scotland through its Community and Renewable Energy Scheme (CARES), there are regional development officers paid by the Scottish Government who have experience with these and many other issues and can help guide communities through challenges they may face.

In other areas communities who have done their own project sometimes help other communities for free or at low prices. Another idea is for governments or the community sector to have a pre-approved list of project managers that communities can employ to assist them.

In places with a lack of support sometimes developers step up to offer a turn-key packaged service where they will, in participation with the community, plan, develop and install equipment. Examples of this exist in Germany and the UK.

As well as support from competent project managers and people with expertise, communities also welcome 'how to guides' that assist them to understand complex issues, such as all the steps that are needed to develop projects, what information banks require to undertake due diligence, how to secure a grid connection, how to negotiate PPAs with energy suppliers, and find insurance;

d) **Constraints of different community structures** – most countries have a number of legal structures communities can choose when developing projects. Once one structure has been chosen it can sometimes be difficult to change legal status of an entity. For example, some entities can approach the market for local community investors, but other legal entities have certain rules and procedures they must follow when approaching the market for finance, e.g. using qualified or accredited financial advisers or being able to use crowdfunding websites. Some legal structures can also make it hard to repay shareholders their initial injections. These are all complex issues that communities need to deal with, many requiring legal advice, something that will be much simpler for standard commercial investment vehicles;

e) **Income tax incentives for community investors** – An income tax incentive for investors should reduce the costs of community projects, as investors should be prepared to accept lower returns. Although such opportunities are welcomed by local investors (e.g. the Community Economic Development Investment Fund in Nova Scotia, Canada and the various Enterprise Investment Schemes and the Social Investment Tax Relief in the UK), as Box 3 indicates some thought may need to be given as to their Value for Money, given that revenue support for RES schemes is normally paid for by electricity consumers, rich and poor alike.

Box 3: Effectiveness of income tax breaks

Income tax breaks are quite a blunt instrument as they are in effect a grant given to investors. It is recommended there is merit in governments undertaking an analysis of how successful community share offers have been and how important the tax breaks have been in stimulating this investment. For example, some community share offers have been fully subscribed within a few days so a case could be made that income tax breaks may not have needed to be as generous.

4.4 Constraints and related cost/ financing implications that only apply to community-led and/ or shared ownership projects

This sub section answers the third of the seven questions "*Are there specific constraints and related cost/ financing implications that could apply only to community-led/ shared ownership projects, but not to commercial ones?*" There are few constraints and related cost/ financing implications that only apply to community projects, with the main three being:

- As explained in Section 4.3, many community RES entities form with limited capital, and will be in general risk averse so raising money for the risky development phase can be much harder. On the other hand, commercial developers will often have a number of projects being planned and developed at any one point, and may be having discussions with other landowners about other projects. Therefore, commercial developers will commonly have available resources to cover these development stage costs. On several occasions this has resulted in communities giving up a large ownership share to a developer who is more able to raise the necessary capital with acceptable conditions;
- Sometimes there is a negative reputation of cooperatives and other forms of community ventures, so that when communities prepare RES projects there are sometimes difficulties raising finance, as lenders at times incorrectly assume that all community projects are poorly run. There is also evidence of banks offering lower amounts of debt (higher debt: equity ratios) than commercial developers receive, which means communities need to find larger amounts of equity. This is where organisations who assess projects purely on their merits, such as KfW in Germany, can be crucial;
- As already explained, community projects tend to have a more democratic decision making process than commercial projects, and this can slow down the speed decisions can be made, with resulting cost pressures. For example, many community organisations have unclear governance processes;
- In many countries the rules for cooperatives and other legal forms of community projects sometimes restrict how they can raise money, as explained in Section 4.3.

4.5 Whether some of the cost components are invariably higher for community-led and/ or shared ownership projects

This sub section answers the fourth of the seven questions "*Of the types of cost which were common to all model types, are any community-led and/or shared ownership project costs invariably higher than commercial costs? If so, why?"*

Figure 9 presents the qualitative community wind results from the five case studies. The evidence from the five case studies is that commercial development, construction and operating costs tend to be lower than community projects, sometimes by more than 30%. The only exceptions are:

- Canada where it appears that community development costs are lower, but it could be the way costs are ascribed between the development and construction phase;
- Likewise in Denmark it appears that community development costs are lower, but again it could be the way costs are ascribed between the development and construction phase;
- Germany where commercial operating costs appear to be higher. However, having higher operating costs reduces the taxable profits of projects, so commercial companies may be slightly overinflating their costs for tax reasons.

Figure 9: Comparison of commercial wind projects to community wind projects

					
Number of community projects	2	2	6	5	9 *
Development costs	▼	↗	▲	▼	▼
Construction	↘	≈	↘	≈	↘
Operating costs	▼	▼	↘	▲	▼
Commercial post-tax pre-finance IRRs	7.3%	5.8%	8.5%	4.1%	9.2%**
Number of community projects with post-tax IRRs greater than commercial hurdle rate	0	Both	2 of 6	All 5	All 9

Symbols:

▲ >30% higher ↗ 10-30% higher ≈ Within +/- 10% ↘ 10-30% lower ▼ >30% lower

* In the UK we obtained information on 9 wholly owned community wind projects, and on two shared ownership wind projects, but we were not able to gather sufficient information on these two shared ownership projects to include them in the information provided here.

** The UK is the only country where all the communities we interviewed were structured to be corporate tax free, so for the other four Case Studies we compared the community and commercial post-tax pre-finance IRRs. In the UK Case Study we presented the pre-tax pre-finance IRRs for community and commercial projects as that was deemed more appropriate, even though the community pre- and post-tax pre-finance IRRs will be identical. However, in order to retain consistency across the five case studies in this Figure the UK post-tax hurdle rates are shown.

However, we further acknowledge that obtaining commercial data on a like-for-like basis is difficult, particularly as the datasets we had for commercial wind projects tend to be for larger projects where there will be economies of scale, and the community projects spanned a number of years. And as explained in Section 2.1 (page 13) any data source will have required some assumptions.

Figure 10 presents a similar qualitative summary for solar projects, with the Danish column highlighted in light red shading because the sample size was one, so the results cannot be taken as significant.

Figure 10: Comparison of commercial solar projects to community solar projects

					
Number of community projects	6	4	1	13	15
Development costs	▼	▼	▼	▼ [a]	▼ "
Construction costs	≈	▼		↘ [a]	
Operating costs	↘	↗	▼	↘ [a]	≈ "
Commercial post-tax pre-finance IRRs	6.6%	6.3%	7.5%	4.1%	7.3%*
Number of community projects with post-tax IRRs greater than commercial hurdle rate	2 of 6	2 of 4	0	8 of 13	13 of 15*

Symbols:

▲ >30% higher ↗ 10-30% higher ≈ Within +/- 10% ↘ 10-30% lower ▼ >30% lower

[a] Depending on the scale of the German solar PV projects (small c.30 kW, medium, c.500 kW and large >5 MW) there are varying percentage differences. What is presented is the generalised message from the German Case Study.

" The development and construction costs for UK commercial solar projects have been combined, hence the comparison is for the combined sum. However, 14 of the 15 community solar projects have an average capacity of 25 kW, whereas the commercial number is for 5 MW+ solar projects. Therefore the comparison is heavily caveated.

* The UK is the only country where all the communities we interviewed were structured to be corporate tax free, so for the other four Case Studies we compared the community and commercial post-tax pre-finance IRRs. In the UK Case Study we presented the pre-tax pre-finance IRRs for community and commercial projects as that was deemed more appropriate, even though the community pre- and post-tax pre-finance IRRs will be identical. However, in order to retain consistency across the five case studies in this Figure the UK post-tax hurdle rates are shown.

As with wind projects, the general message is that commercial solar projects have lower development, construction and operating costs compared to community projects. Nevertheless, even more so than wind projects, solar PV costs have fallen significantly so making a true comparison of capital costs inherently difficult.

When we approached the communities and asked for their perceptions of whether development, construction and operations costs would be similar for identically sized commercial projects the general response was that they thought development costs would be lower, but construction and operating costs similar.

Although there are nuances between some of the case studies, and between the quantitative and qualitative responses each country, the overall conclusion made is that commercial and community RES projects of similar scale:

- Will have similar construction and operating costs. No evidence could be found of wind turbine or solar panel manufacturers differentiating between the legal statuses of the developer. However, this is not to say that commercial developers cannot get lower prices, they can but only if they are able to negotiate bulk order discounts, i.e. can benefit from economies of scale. Also, there is anecdotal evidence that communities will often be loath to enter into protracted negotiations to secure discounts, even if the discounts are just on payment terms. The conclusion is caveated though because in some countries with an immature community RES sector there is evidence that construction and operating costs may be higher than commercial operators, as was found in Australia where there are only two community wind projects in existence, for there will be learning effects even for the construction;
- Will have higher development costs, even though communities believe that their development costs are much lower than commercial developers because of the free time and support community members contribute. This is for a number of reasons, notably:
    - The extra time required for democratic decision making;

- The fact that communities will often need to secure a number of grants to finance the development phase, with each grant application taking time;
- For small scale RES projects, e.g. small rooftop PV projects, development costs may be lower for communities, purely because such projects are not difficult to develop and the free time community members offer can make cost savings. For example, this is found in the mature German community PV market. However, for larger scale projects, and wind projects in particular, development costs are higher, because of the complexities of such deals – wind studies, grid connection discussions, planning permission applications, etc.

  This is compounded by fact that many communities are doing projects for the first time so there is a lot of ‘first time learning’. For example, it can be expected that in countries that are introducing tendering schemes small companies and communities who will only develop one project are likely to be at a competitive disadvantage as they cannot spread the ‘sunk cost’ of learning about tendering over a number variety of projects if their bid is unsuccessful.

These findings have been found by other authors too, for example in a pairwise comparison of similar sized community and commercial projects in Scotland[5].

As well as the development, construction and operating costs finance costs are also relevant. The evidence appears to be that communities tend to be offered higher interest rates by banks, or lower proportions of debt. However, this is counterbalanced by the fact that communities can often secure equity cheaper so the overall effect on the WACC is similar.

Linked to the point about revenue maximisation in Section 4.1, communities will often have a limited area within which to search for land for projects. Commercial developers will not be geographically constrained, so they will be able to balance the benefits of higher wind speeds and higher insolation levels against some of the other costs, such as distance to the electricity grid or the capacity/ strength of the grid. They will normally be considering a number of locations at any point in time. Typically, communities will have much smaller search areas and will not want to locate a project too far away from their area so even if they have optimal environmental conditions (e.g. high wind speeds or insolation levels) they may be located in areas with weak grid connections, meaning they have to pay for grid upgrades. However, if a commercial developer wanted to locate a project in the same location that a community is considering there is no evidence that electricity grid operators would charge different prices for connection. In other countries, e.g. Germany, the cost of grid strengthening is not directly borne by the developer.

4.6 Whether some of the cost components are invariably lower for community-led and/ or shared ownership projects

This subsection answers the fifth of the seven questions “*Are there any costs that are lower for community-led projects? For example, does government backing to community projects reduce perceptions of risk and therefore lower capital in some respects?”* From the evidence gathered there appear to be a number of areas where costs are invariably lower but it will vary by country. The main ones are:

- Corporate tax breaks, that are available in some countries if communities can be set up to be tax free as if common in the UK;
- Costs of raising equity. Often community investors are prepared to accept returns that are slightly higher than the returns they can receive on bank savings, compared to the higher returns commercial developers pursue. This is sometimes supported by generous income tax breaks for community investors. However, depending on the debt: equity ratios the effect of lower equity costs is sometimes offset by the higher debt costs, as referred to in Section 4.5.

As to particular country nuances:

- In Germany often communities can rent land, or purchase land at reasonable rates due to well established contacts of cooperative members to local administrations or other organisations. In Germany there is also an incentive for commercial companies to inflate their

[5] ClimateXChange. *Comparative Costs of Renewable Development: Community vs Commercial Projects*. July 2015.

operating costs for tax reasons, and this may be why community operating costs appear to be lower;

- In the UK there is anecdotal evidence that on those projects that are part financed by a commercial bank and part financed by a Government supported bank (e.g. the Scottish Government backed Renewable Energy Investment Fund) that commercial lenders will offer terms that may be lower than those that would be offered to a commercial lender. This may purely be because the Government backed bank will be acting as a junior lender, so the commercial lender's risk is reduced. There is also circumstantial evidence that having a government supported bank helps to resolve commercial issues, meaning again commercial banks are able to lend money at lower rates or become involved when they would normally not entertain small £1 million or £2 million loans;
- In Australia and Canada (especially in remote First Nation areas) there is evidence that communities can sometimes secure discounts on products because they are a community organisation, and for simple solar PV projects can sometimes have lower operating costs than their commercial counterparts as volunteers clean and maintain the panels and insurance may not be required.

4.7 Cost projections to 2020

This subsection answers the sixth of the seven questions "*What might these costs be in the years up to 2020, assuming the sector expands in line with the expected potential?*" The main cost component for many RES projects are the construction phase costs. The IEA estimate that roof mounted solar projects' construction costs are forecast to decrease by 18.6% in real terms between 2015 and 2020[6].

There is no available data on operational costs, but they are likely to remain flat in real terms. Operational costs will include land rentals, insurance, cleaning and replacing inverters every seven to eight years. So whilst the costs of inverters will fall, it is likely that the other operating costs will remain similar, giving an overall similar cost profile.

These solar trends are likely to be replicated in three of the five Case Studies. In Australia the recent falling exchange rate means costs may rise as many solar panels will be imported, and in Canada the low exchange rate and high tariffs on Chinese solar panel imports may push up prices.

For onshore wind projects, the IEA forecasts capital expenditure costs will drop at an annual nominal rate of 2.2%, due to a consistent reduction of wind turbine prices[7]. A report by KIC InnoEnergy estimates that operational costs are expected to fall by about 6% between 2014 and 2025. Therefore, an assumption is made that between 2015 and 2020 annual operational costs will only fall by 3% in total. This small reduction in costs is due to advances in maintaining wind turbines, although other operational costs (e.g. insurance, rentals, etc.) are likely to remain flat[8].

As with the solar trends, these wind trends are likely to be replicated in three of the five Case Studies, although in Australia and Canada the falling exchange rate may push costs up a bit.

The one area that may change will be the development costs for community versus projects. In all countries many of the community development cost components are predicted to fall, with the introduction of 'how to guides', communities sharing best practices and some communities doing a second or third project, benefiting from the experience on the first projects to reduce costs. However, offsetting these costs are development costs that may rise including:

- The need to undertake more accurate environmental assessments, for example wind studies or solar insolation levels. For there are countless RES projects that are built that are based on inaccurate wind or solar projections, with even a 5% lower level of energy resources (and therefore electricity generation) having a significant impact on project viability. Therefore, financiers (in particular commercial banks) are requiring better environmental assessments;

[6] IEA. 2014. *Technology Roadmap – Solar Photovoltaic Energy*. 2014, p. 23 (Figure 11). Retrieved from: https://www.iea.org/publications/freepublications/publication/TechnologyRoadmapSolarPhotovoltaicEnergy_2014edition.pdf
[7] IEA. 2013. *Technology Roadmap – Wind Energy*. Retrieved from: https://www.iea.org/publications/freepublications/publication/Wind_2013_Roadmap.pdf
[8] KIC InnoEnergy. *Future Renewable Energy Costs: Onshore Wind*. 2014. Retrieved from: http://www.kic-innoenergy.com/wp-content/uploads/2014/09/KIC_IE_OnshoreWind_anticipated_innovations_impact.pdf

- securing planning permission, which is becoming harder in many jurisdictions as public sentiment towards wind turbines in particular hardens making planning applications and appeals processes longer and more costly;
- needing to negotiate separate PPAs, e.g. through the direct marketing and price premium tendering routes in Germany.

4.8 Opportunities to reduce community-led and/ or shared ownership costs

This subsection answers the seventh question "*Where community-led and/or shared ownership projects faced additional or higher costs, are there opportunities to reduce or avoid them for future projects? How can this be achieved?"*

Section 4.1 has explained some of the solutions to improve the revenue of community projects, which should reduce the financing costs, especially bank borrowing costs. This subsection therefore focuses on cost differences.

1. As has been explained there are appear to be few differences in construction costs for a community developer or a small commercial developer, such as a farmer. The only two recommendations are:
    - Communities should be encouraged to negotiate harder with equipment providers and construction companies, even if the only savings are different payment terms. However, the idea of negotiating very hard may be something incongruent to the community ethos;
    - Communities should be encouraged to develop more than one project, and if they can start to develop a number of projects they may find they can secure savings in the cost of building projects with discounts available for bulk purchases;
2. There appear to be few differences in operational costs, although the formation of cooperatives and other socially based ventures that can help communities negotiate good PPAs, such Vindenergi DK in Denmark, can reduce these operational costs (and boost revenues);
3. There is evidence that community projects are sometimes charged higher interest rates to borrow money from banks, or banks may offer a lower debt: equity ratios reducing their exposure. Further, as many commercial banks may be reticent to lend money to community RES projects as they have few assets, there is merit in governments promoting the growth of socially backed lenders. Germany has KfW. However, offsetting the higher debt costs communities can often secure equity much more cheaper than commercial developers can, in effect giving communities and commercial players similar WACCs;
4. Therefore the main recommendations are governments should help communities try to reduce the development phase costs.

> As development phase costs commonly represent a very small proportion of total costs, then even a 50% reduction in development phase costs will have an immaterial impact on the profitability of community projects.
>
> However, the reasons for focusing on the development phase is because many communities in highly attractive locations, e.g. in high wind speed areas, will be put off from even considering projects as they perceive finding the money to pay for the development phase too arduous, or it being too hard to build RES projects.

The case studies have pointed to at least twelve ways these development phase costs can be reduced. Some of these can be promulgated by community groups and associations themselves, others will require involvement of countries, provinces or other public sector actors:

4.8.1 By the community sector or by government

- Encouraging communities who have successfully built one project to consider second, third or fourth projects;

- Countries making sure there are high quality 'how to' guides available to help communities, whether these are prepared by governments or, as in Germany, by associations;
- Promoting information sharing between community projects, especially in large countries such as Australia or Canada where face-to-face knowledge dissemination may be harder;
- Governments or associations preparing lists of organisations that have helped communities in the past with the project management and planning of projects.

4.8.2 By governments and other public sector entities

The recommendations can be split into two main areas, the first about acknowledging that communities are different and need more financial assistance and certainty that commercial developers, and the second about trying to level the playing field by upskilling communities engaged in RES projects.

Acknowledge that communities are different and need financial assistance and certainty

- Governments could consider offering grants to cover early stage feasibility work, and ensure there are entities that can provide finance for all the development stages after early feasibility work. For example, some countries have social lenders, and Germany has its public development bank (KfW) which lends at very low interest rates;
- Governments should provide policy certainty, and with that certainty over levels of electricity support if the project proceeds. With this policy certainty raising money for the later stage development costs, when there is still a chance the project may flounder, becomes easier as at the moment it can be very difficult for cash poor communities to pay for any electricity grid deposits (if needed and required to be paid by the generator) and any deposits on wind turbines. For example, governments may want to consider giving communities longer to pre-accredit projects, meaning that communities are able to secure certain levels of subsidies if they can get their project built and commissioned by a certain future date.

Reduce community development costs through knowledge enhancement

- If possible provide government paid development experts to reduce costs. An alternative idea, explained in the Canadian Case Study is for a government body to offer training courses to develop a cadre of community RES project facilitators who could bring experience and contacts from other projects;
- Work with the community sector to ensure there are authoritative 'how to' guides available; encourage the preparation of lists of accredited technical, legal, financial and project management specialists; encourage information dissemination between communities of what works and what does not; and encourage successful communities to develop second, third and fourth projects;
- Prepare standardised legal contracts for shared ownership projects to reduce legal fees;
- Provide clear, easy to read guidance on what different legal community entities can and cannot do (e.g. around dividend distribution, or needing to engage with authorised financial intermediaries), possibly having regulatory exemptions for community projects whilst acknowledging the need to protect uniformed investors from downside risks;
- In countries with poor environmental data, e.g. wind speeds or insolation levels in particular places, having a central body collect data and disseminate it to the market to assist with site selection, and avoid abortive ideas;
- In Canada it has been found that if communities are both generating electricity and also consuming most of the electricity generated, as may happen in remote off-grid locations, it may make sense for the community to promote energy efficiency programs first, and then the RES project. For example, in one Canadian community that was interviewed, solar PV panels were installed and after that energy efficiency measures introduced (e.g. low energy lighting) which resulted in much lower demand. Had the energy efficiency measures been implemented before the PV installation, the number of PV panels required would have been lower.

Appendices

Appendix 1: Glossary

ACT	Australian Capital Territory
BoP	Balance of Plant
CARES	Community and Renewable Energy Scheme
CfD	Contracts for Difference
DECC	Department of Energy and Climate Change
ESCO	Energy Services Company
FIT	Feed in Tariff
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
IRR	Internal Rate of Return
kW	Kilowatt
KfW	German Public Development Bank
kWh	Kilowatt hour
LCOE	Levelised Cost of Energy
MW	Megawatt
MWh	Megawatt hour
NGO	Non Governmental Organisation
NIMBY	Not In My Back Yard
NSW	New South Wales
PPA	Purchasing Power Agreement
PV	Photovoltaic
RAFT™	Ricardo Accessible Finance Tool
RES	Renewable Energy Source
RPI	Retail Prices Index
SME	Small Medium Enterprise
SPV	Special Purpose Vehicle
STC	Small-Scale Technology Certificates
WACC	Weighted Average Cost of Capital

Appendix 2: Example of UK questionnaire

RICARDO-AEA

20th April 2015

To whom it may concern

International Energy Agency Renewable Energy Technology Deployment (IEA-RETD) has commissioned a project to collect and analyse cost data for community renewable energy projects, comparing this with the cost for commercial scale developments across six countries – UK, Ireland, Germany, Denmark, Canada and Japan. The Department of Energy and Climate Change (DECC) is one of the international project steering group members.

This IEA-RETD project is being led by ourselves along with our partners Ecologic, and we have prepared a questionnaire to send to community organisations in the six countries. The survey asks 25 questions which include general questions about communities' operational projects, their motivations for the investment, their costs to get the project operational, and the financing terms.

The UK is required to carry out a periodic review of the Feed-in Tariff (FIT) in 2015 in order to meet EU State Aid approval. As part of this, DECC is currently collecting data from small scale generators. However, the questionnaires sent out on behalf of DECC did not distinguish community projects from other commercial projects.

We are contacting communities directly, and would appreciate if you could respond to the questionnaire. This is an important opportunity to provide evidence on the particular costs faced by community renewable projects such as yours.

When we call you, you'll be given the option to either respond over the phone or submit your responses electronically. Our timeframe for collecting the UK data is tight, the 7th May 2015.

We are aware that some of the data you provide may be commercially sensitive which is why all information will be anonymised by ourselves. If you participate we will share the full anonymised report with you.

Your cooperation would be welcomed.

Yours sincerely

[redacted]

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a) What technology is your project? ☐ Wind ☐ Solar roof mounted ☐ Solar ground mounted
☐ Other (please explain) ………………

b) Ownership. Is the project? ☐ 100% community ownership ☐ Shared ownership

If shared ownership, what percentage is community owned? ……..%

And who is/ are the other shareholder/s? …………

c) How many community shareholders are there? …………………………………

d) What is the legal structure for the community part of the project (see (2) above)?

☐ Registered Society: Community Benefit Society (BenCom)*

☐ Registered Society: Co-operative*

☐ Community Interest Company (CICs)

☐ Private Company Limited by shares (CLSs)

☐ Private Company Limited by guarantee (CLGs) which can include a charitable company limited by guarantee

☐ Charitable trust

☐ Charitable incorporated organisation (CIO) which can be an association or foundation CIO

☐ Other (please explain) ……………………………………………….

* Prior to 2014 Registered Societies were called Industrial and Provident Societies (IPSs)

e) Has the community ownership structure changed over the life of the project? ☐ Yes ☐ No
If yes, what has happened and why? ……..………………………………………………..

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

f) For the part that is community owned (see (2) above), what is the rated kW of the renewable energy project? ………………………………

g) What were the main reasons (motivators) for community investment?
☐ Profit

☐ Environmental

☐ Energy independence / autonomy

☐ Other (please explain) ……………………………………

h) Which year did you start spending money planning the project? ……………..

i) When was the project operational (mm/yyyy)? ……. / …………..

j) Development and construction costs (£'000) excluding VAT for the part that is community owned (see (2) above). Please split the costs into:

	£'000
Development phase	
Development costs - ideally split into feasibility studies, planning costs, project management costs, and advisory fees (legal, financial, technical) • *Initial feasibility costs* • *Costs to prepare planning permission application* • *Project management costs* • *Other advisory fees (legal, financial and technical)*	£ *£* *£* *£* *£*
Construction phase	
Capital cost (e.g. cost of the wind turbine/s or solar panels)	£
Installation / construction cost (if cost quoted separately)	£
Substation/ transformer and other Balance of Plant (BoP) costs (if cost quoted separately)	£
Grid connection cost (if cost quoted separately)	£
TOTAL	£

k) For the part that is community owned (see 2 above) how much professional time do you estimate has been given freely to get the project operational? ………… days

l) What are the average annual operating costs (£'000) excluding VAT for the part that is community owned (see (2) above), if possible split into maintenance and insurance, and land rental?

	£'000	
Maintenance and insurance	£	
Land rental (or if percentage of revenue please state %)	£	Or % …..
TOTAL	£	

m) If there any other costs that haven't been included in (10) or (12) what were these for and how much were they?
Type of cost……………………………………How Much (£)……………………………………………
Type of cost……………………………………How Much (£)……………………………………………
Type of cost……………………………………How Much (£)……………………………………………

n) In a typical year how many MWh does, or will, the community owned part (see 2 above) of the project generate? ……………… MWh

o) What total price (p/kWh) do you receive for every kWh generated (including the FIT/ RHI/ ROC rate, the price you get in your Purchasing Power Agreement and any Levy Exemption Certificates)?
…..p/kWh

p) What sources of finance did your community use to finance the development phase (feasibility studies, planning permission, project management and professional advisory fees) and what return was required?

Source of funding	Return required
☐ Grant (please describe) …………………………………	N/A
☐ Existing community money	N/A
☐ Loan (please describe from whom) …………………………	…..%
☐ Other (please describe)	…..%

q) Did your community have any challenges raising money for the development phase? ☐ Yes ☐ No

If yes, what were the challenges? …………………………………………………………………

………

r) Looking at the project overall, for the part that is community owned (see (2) above), how were all the project costs (including the development phase and then the construction phase) shown in (10) financed?

	£'000
Grants (please explain which grant organisation/s) ………………	£
Main loan (provide name of bank) …………………………………	£
Second loan if relevant (provide name of bank) …………………………	£
Equity (existing cash and/ or community share offer)	£
Other (please explain) ………………………………………………..	£
TOTAL - to match total in (10)	£

s) Financial requirements for the community owned part (see (2) above).

a. What is the rate of interest on the main loan (%)? …………%

b. How long is the main loan for (years)? ……….. years

c. If there were two loans what is the interest rate on the second loan (%)? ……..%

d. If relevant how long is the second loan for (years)? ………years

e. What return are the community shareholders hoping to get (%)? ………..%

f. After community shareholders have been paid how much (if anything) are you hoping can be given to the community **each** year as a community benefit?

Yrs 1–5 operations = £	Yrs 6-10 operations = £	Yrs >10 = £

g. What will the community benefit money in (f) if there is any be used for?

☐ Reinvestment into other renewable energy projects

☐ Supporting local charities or other community ventures

☐ Promoting energy efficiency

☐ Subsidising certain energy users

☐ Other (please explain) ……………………………………..……

t) Had the project been built fully by a commercial entity do you think:

The time from concept to commissioning would have been:	☐ Quicker ☐ Similar ☐ Slower
Developmental costs* would have been:	☐ Higher ☐ Similar ☐ Less
Capital costs would have been:	☐ Higher ☐ Similar ☐ Less
Installation/ construction costs would have been	☐ Higher ☐ Similar ☐ Less
Substation/ transformer & other BOP costs would have been:	☐ Higher ☐ Similar ☐ Less
Grid connection costs would have been:	☐ Higher ☐ Similar ☐ Less
Loans would have been:	☐ Cheaper ☐ Similar ☐ Dearer
Equity finance would be:	☐ Cheaper ☐ Similar ☐ Dearer
The amount of the loan would be:	☐ More ☐ Similar ☐ Less

* Development costs include feasibility studies, project management, planning and advisory fees

u) What factors facilitated the community investment?

FIT/ RHI rates	☐ Yes
Government grants and loans*	☐ Yes
• Other grants	☐ Yes
• Favourable tax rates/ exemptions	☐ Yes
• Local people with interest or expertise in renewable energy	☐ Yes
• Help from similar community energy groups	☐ Yes
Other (please explain) …………………………………………………………………………………	

* There are various government grants and loans available for community renewable energy projects, for example:

- In England there is the English Rural Community Energy Fund and the English Urban Community Energy Fund
- In Scotland there is the Community and Renewable Energy Scheme (CARES) Programme
- In Wales there is the Ynni'r Fro Community Programme

What factors hindered the community investment?..……………………………………………
……
……………………………………………………………………………

v) If you were to replicate your project again do you think you could reduce the costs of the project (e.g. capital costs with better negotiation, lower finance costs)? ☐ Yes ☐No

If yes what savings could you have made (£s or lower costs of finance %)?
………
………
……..

w) What could the Government or other public bodies do to make community energy projects cheaper?
………
………
……..

x) Is there anything else you want to say? ………………………………………………………………….
………
………
………
………

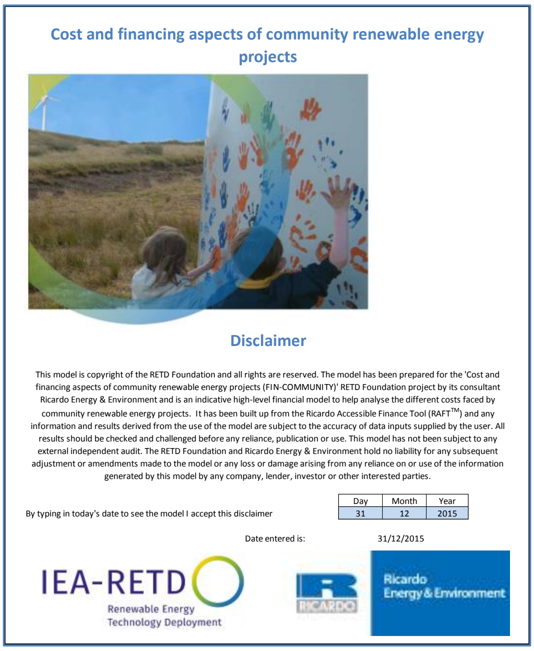
Appendix 3: Financial modelling methodology

A bespoke financial model for this project was built up from the **Ricardo Accessible Finance Tool (RAFT™)**. This financial model is available on the IEA-RETD website. The bespoke indicative financial model is based on a standard dynamic project finance model modelled quarterly in the developmental and construction periods and on a semi-annual basis in the operational period. Apart from the cells in light blue shading [ ] which are input cells all the other cells have been locked to avoid model corruption.

There are seven worksheets in the model summarised as follows.

I. Worksheet 'Disclaimer Acceptance Page'

On opening the model the user is required to read and accept the following disclaimer on this page by entering in today's date. By entering in today's date the cells in worksheets 'Inputs' and 'Financial calcs' change from all black to visible.



Disclaimer

- The model was prepared for the *'Cost and financing aspects of community renewable energy projects (FIN-COMMUNITY)'* RETD Foundation project by its consultant Ricardo Energy & Environment and is an indicative high-level financial model to help analyse the different costs faced by community renewable energy projects. Any information and results derived from the use of the model are subject to the accuracy of data inputs supplied by the user. All results should be checked and challenged before any reliance, publication or use. This model has not been subject to any external independent audit. The RETD Foundation and Ricardo Energy & Environment hold no liability for any subsequent adjustment or amendments made to the model or any loss or damage arising from any reliance on or use of the information generated by this model by any company, lender, investor or other interested parties.

II. Worksheet 'Inputs' – this is the only worksheet the user can enter values in

The inputs in Table 1 (page 13), and Table 2 (page 14) were entered. The main model assumptions are:

- Any loans and repayment of community shareholders (when the community share offers are structured as **debt** instruments paying a fixed return/ or capped return per year) are repaid on an annuity basis, so in every period over the length of the loan the repayments are equal, much in the same way that household mortgages have equal instalments in each month. Being debt any interest costs are assumed to be tax deductible;
- The assets are depreciated on a straight line basis;
- All revenues and operating costs rise each 1st April;
- Any grants are allocated to the project over the length of the project, so if there is a grant of €100,000 and the project is for 20 years, then in each year €5,000 is released to the income statement (also called the profit and loss account in some countries);
- As corporate taxation is a very complex area it is assumed that 100% of all development and construction costs are tax deductible and that the annual taxation allowances mirror the straight line depreciation policy.

There is space for 21 different scenarios to be entered with the ability to 'toggle' between different scenarios by changing the drop down box in cell F7. However, it is not possible to change scenario 21 which it a model check to make sure that the model has not been corrupted. Scenario 21 is the UK community wind 1 project that has been anonymised. Table 4 on page 21 explains how to interpret the results.

Table 5 is a summary of the main input cells (shown in the light blue shading ▮▮▮▮▮▮), with an explanation of what is needed in each of these blue cells in *italics*.

Table 5: Summary of model inputs

Project name		Cell to type in	
Scenario in use (drop down)		**21**	**UK Wind 1 model - client confidential. Dividends should be GBP £14,835,229**
Scenario number			**1**
Scenario name			*The name of the scenario*
Rated KW of technology		Confidential	*The kW that is used to calculate the development, construction and operating costs per MWh*
Currency	Name	GBP £	*The currency*
Development phase			
Start of month (drop down)	Apr, Jul, Oct or Jan	Jan	*The start of the quarter*
Year	Year	2008	*Year*
Equivalent start date	Date	01/01/2008	
Duration (max 20 quarters)	Quarter(s)	20 Qtr(s)	*Number of quarters – note it is assumed the development costs are split proportionately between the numbers of quarters*
End date	Date	31/12/2012	
Development costs			
- Initial feasibility costs	GBP £	111,000	*The various costs*
- Costs to prepare planning permission application	GBP £	64,000	*The various costs*
- Project management costs	GBP £	0	*The various costs*
- Other advisory fees	GBP £	543,000	*The various costs*
Total if split	GBP £	718,000	
Total if not split	GBP £	0	*The costs if not split*
Professional time 'freely' given	Days	1,310	Number of days
Equivalent day rate of 'free' professional time	GBP £	120	Approximate day rate (Currency / day)
Value of professional days 'freely' given	GBP £	157,200	
Include professional time 'freely' given (1 = Yes, 0 = No)		0	*As explained*
Total development costs used	GBP £	718,000	

Construction phase starting with financial close

Start date	Date	01/01/2013	
Duration (max 8 quarters)	Quarter(s)	4 Qtr(s)	*Number of quarters – note it is assumed the construction costs are split proportionately between the numbers of quarters*
End date	Date	31/12/2013	
Construction costs			
- Capital costs	GBP £	2,737,000	*The various costs*
- Installation / construction cost	GBP £	0	*The various costs*
- Substation / transformer and other Balance of Plant	GBP £	965,000	*The various costs*
- Grid connection cost	GBP £	561,000	*The various costs*
Total if split	GBP £	4,263,000	
Total if not split		0	*The costs if not split*
Total construction costs used	GBP £	4,263,000	

Financial year

Financial year start month	Apr, Jul, Oct or Jan	Apr	*As it says*
First modelled financial year start		01/04/2007	
First modelled financial year end		31/03/2008	
Construction phase financial year start		01/04/2012	
Construction phase first financial year end		31/03/2013	

Operations phase

Start date	Date	01/01/2014	
Asset life	Year(s)	20 Yr(s)	*As it says*
End date	Date	31/12/2033	

Date for inflation increases on operating costs and revenues

Date for annual inflation increases on all operating costs and revenues		1st April every year	**<- An assumption**
Base year for all operating costs and revenues			
- Start date		01/04/2013	
- End date		31/03/2014	

Electricity

- Electricity generated	MWh	8,871	*The estimated MWh generated allowing in the first year of operations, after allowance is made for the parasitic load (the amount of electricity the renewable asset uses to operate)*
- Increase/ decrease in electricity	Percent	0.00%	*If the electricity is projected to*

generated per year			*increase or decrease per year – normally set to zero (0%)*
- Sale price for 1 MWh in first year of operations (GBP £)		106.50	*The price received from selling the electricity (or the user can combine government subsidies and the electricity price if both last for the same length of time and both are projected to rise by the same inflation rate)*
- Increase in electricity price per year	Percent	3.00%	*The projected annual increase/ decrease in the electricity price.* ***Note it is assumed the electricity will be generated for the life of the asset.***
Other output (if relevant)			
- Output name		Feed in tariff	*A cell that allows the User to enter other revenue received, whether that be government subsidies, or other revenues*
- Output unit		MWh	*The output unit*
- MWh of Feed in tariff in equivalent first full year of operations	Number	8,871	*The estimated output in the first year of operations*
- Increase in quantity of Feed in tariff per year	Percent	0.00%	*The increase/ decrease in the number of units*
- Sale for one MWh of Feed in tariff (GBP £)	GBP £ / MWh	50.00	*The price per unit of output*
- Increase in Feed in tariff price per year	Percent	3.00%	*The increase / decrease per year in the operational period*
- Number of years of operations revenue for (max asset life)	Years	20.00 Yr(s)	*The length this second revenue stream lasts for, which can be for less than the asset life.*
Operating costs			
Fixed operating costs			
Maintenance and insurance (GBP £)	Maintenance	157,000	*The various costs*
Fixed land rental (GBP £)		-	*The various costs*
Other (GBP £)		-	*The various costs*
Total operating costs not linked to defined input or outputs	GBP £	157,000	
- Inflation rate on operating costs	Percent	3.00%	*The annual projected inflation rate*
Land rental (if linked to percentage of total revenue)	Percent	0.00%	*As it says*
Financing			
Development phase		Checks	
- Grant amount	GBP £		*The appropriate value*
- After grant (if one) percent development loan	Percent	100.00%	*The model only allows one development phase loan and*

			assumes the loan is capitalised (i.e. no interest is paid, but the interest is added on to the loan amount) until the end of the development phase and then in effect repaid at the end of the development phase by securing construction phase finance
- After grant (if one) percent community money / equity finance	Percent	0.00%	*Likewise the model assumes the project will release equity at the end of the development phase (which can then be reinvested) and then in effect repaid at the end of the development phase by securing construction phase finance*
Sum of debt and community money/ equity		100.00% Ok	**<-A check to make sure adds to 100%**
- Loan interest rate per year (%)	Percent	8.25%	*The annual interest rate for the development loan*
- Loan interest rate per quarter (%)	Percent	2.00%	
- Required community money / equity return per year (%)	Percent	0.00%	
- Required community money / equity return per quarter (%)	Percent	0.00%	*The equity return required (if relevant)*
Remaining project finance			
- Grant amount	GBP £	561,000.00	*Relevant number*
- After grant (if there is one) percent Loan 1	Percent	35.00%	*Relevant percentages needing to add to 100%*
- After grant (if there is one) percent Loan 2	Percent	52.00%	*Relevant percentages needing to add to 100%*
- After grant (if there is one) percent community share offer	Percent	13.00%	*Relevant percentages needing to add to 100%*
- After grant (if there is one) percent community own funds / other equity	Percent	0.00%	*Relevant percentages needing to add to 100%*
Sum of loans, community share offer and community own funds		100.00% OK	**<-A check to make sure adds to 100%**
Loan 1			
- Loan 1 interest rate per year (%)	Percent	5.75%	*Relevant interest rate*
- Loan 1 semi-annual interest rate (%)		2.83%	
- Loan 1 interest rate per quarter(%)		1.41%	
- Loan 1 length of loan from operations	Year(s)	11	*Number of years, remembering if construction period is 4 quarters an 11 year*

			operations loan is actually a 12 year loan
Loan 1 end date		31/12/2024	
- Loan 1 repayment profile		This indicative model assumes Loan 1 is repaid on an annuity basis over the length of the loan	
Loan 2			
- Loan 2 interest rate per year (%)	Percent	7.50%	*Relevant interest rate*
- Loan 2 semi-annual interest rate (%)		3.68%	
- Loan 2 interest rate per quarter (%)		1.82%	
- Loan 2 length of loan from operations	Year(s)	10	*Number of years*
Loan 2 end date		31/12/2023	
- Loan 2 repayment profile		This indicative model assumes Loan 2 is repaid on an annuity basis over the length of the loan	
Community share offer			
- Community share offer interest rate per year (%)	Percent	5.00%	*Relevant interest rate*
- Community share offer semi-annual interest rate (%)		2.47%	
- Community share offer interest rate per quarter (%)		1.23%	
- Community share offer length from operations	Year(s)	20	*Number of years*
- Community share offer end date		31/12/2033	
- Community share repayment profile		This indicative model assumes the community share offer is repaid on an annuity basis over the length of the loan	
Community own funds / other equity			
- Number of years at the end of the community money/ other equity repaid over	Years	5	*Note that unless the equity investment is very small the equity will need to be repaid over a number of years before the project end so that each period has sufficient net cash flow*
- Community money / other equity repayment start		01/01/2029	
Accounting policy			
Depreciation policy		The asset is depreciated on a straight line basis over its life	
Grant policy		The income/ profits from a grant are spread over the asset life	
Taxation			
Tax rate	Percent	0%	The corporate tax rate (if relevant)

Tax allowance	Determining taxation allowances (in the UK called capital allowances) is a complex area. This indicative model makes the simplifying assumption that 100% of all development and construction costs are tax deductible (in the UK called attract capital allowances) and the annual taxation allowance (in the UK called the annual write down allowance) matches the straight line accounting depreciation schedule.

III. Worksheet 'Calculations pre operations'

This worksheet is on a quarterly basis and works out the total project costs until the point of commissioning, which is the:

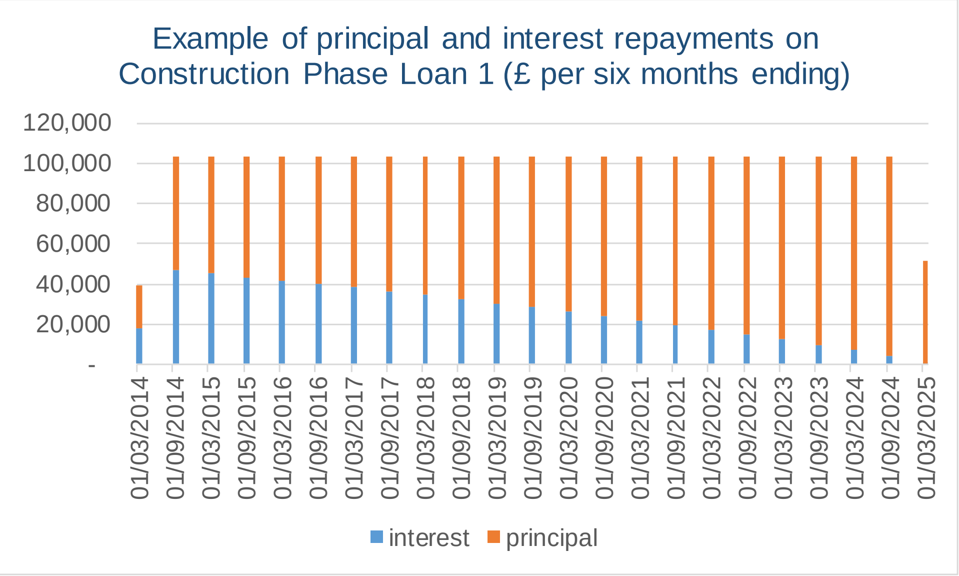
- development cost;
- financing of the development costs, where any development phase loans and any development phase equity investment is assumed to be repaid at financial close with finance raised for the construction phase;
- construction costs;
- capitalised construction phase financing costs, i.e. any interest payments due on loan 1, loan 2 (if there is one), and any dividends due on community share offers are not paid, but rather added on to the principal total loan and community share amount.

It then converts all the quarterly cash flows into a semi-annual basis.

IV. Worksheet 'Main project financing'

This worksheet calculates the interest and principal repayments on Loan 1, Loan 2 (if there is one), and the community share offer. For simplicity it is assumed each of the repayments are main each six month on an annuity basis. Figure 11 shows the six monthly annuity repayment in Scenario 21 of the model, which is UK Wind Project 1. As can be seen the annuity repayment is a constant £103,280. The last six month period is only three months, hence half the amount. The first three month period is actually less than half the amount as the project is still in the construction phase, so not all the loan is drawn by the start of the period.

Figure 11: Example of annuity in Scenario 21 of model



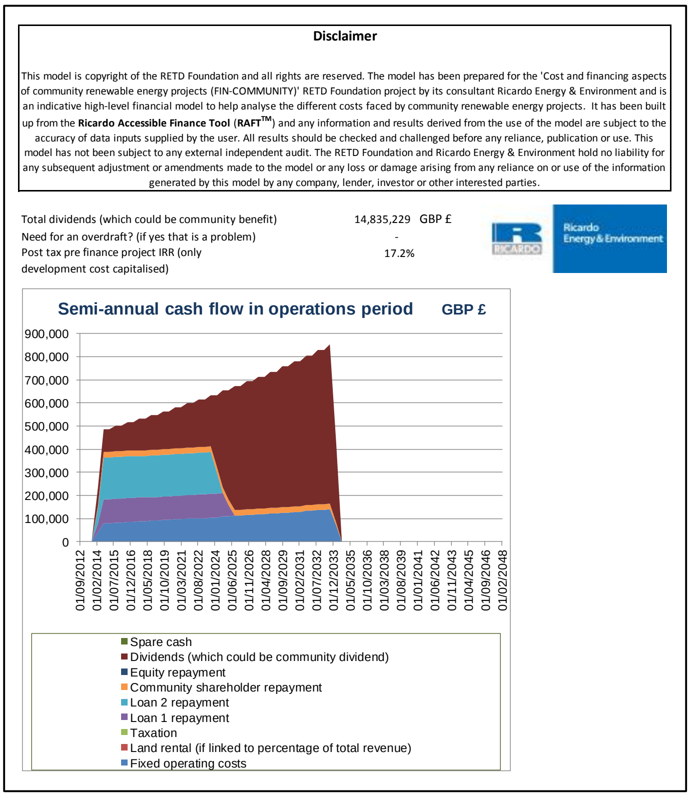
V. Worksheet 'Financial calcs'

This is the main results page which works out the six monthly cash flow statements, income statements (sometimes called the profit and loss account) and the balance sheets. Rows 165 – 180 show the returns figures, both the post-tax pre-finance IRRs which is the project IRR, and then the equity return.

VI. Worksheet 'Outputs'

The model three outputs being:

- The total level of dividend payments;
- Whether there is a need for an overdraft – i.e. the project is not generating sufficient cash inflows in any period. Project financiers dislike projects with overdrafts as they will not get repaid their loans in certain periods;
- The post-tax project IRR before financing costs gives the returns available to repay loans and shareholders after taxes have been paid. The model calculates equity returns, but as different projects have different financing structures a comparison of equity returns is not valid. For example, for two identical projects, one with an 80:20 debt to equity ratio, and another with a 90:10 debt to equity ratio the former is likely to have a lower equity return. To accommodate these different structures the post-tax pre-finance IRR is the most comparable measure.



There is then the graph which shows the allocation of cash flows in each six month period, explained in Table 4 on page 21.

VII. Model assumptions

This is just a worksheet which includes numbers and text that are used for the drop-down boxes in worksheet 'Inputs', and simple numbers like the number of semi-annual periods in a year (2).

Appendix 4: Australian Executive Summary, Policy Update and Cost Data

Executive Summary

The report summarises the legal, social and policy influences on the economics of community energy projects in Australia compared with to the Australian commercial renewable energy sector. This Case Study has been based on information available as at the middle of August 2015 and does not refer to any policy changes that may occur after this date.

Australia's energy sector faces a unique set challenges for community renewable energy project developers. A significant consumer appetite for rooftop solar was stimulated in part by generous Feed-in Tariffs (FITs), support that has now been removed. Plateauing consumer demand, against assumptions for upgrading generation capacity, has led to a significantly oversupplied market both in terms of generation and network capacity.

Further, Australia's National Electricity Market is the most geographically spread out in the world, covering some 2,000 kilometres from Tasmania in the South to tropical rainforest in Queensland. This means the market has one of the widest gaps between wholesale and retail prices in the world due in part to the high network charges. For example, some AUD $47 billion was spent on network upgrades in the last five years after a period of little investment in the 1990s.

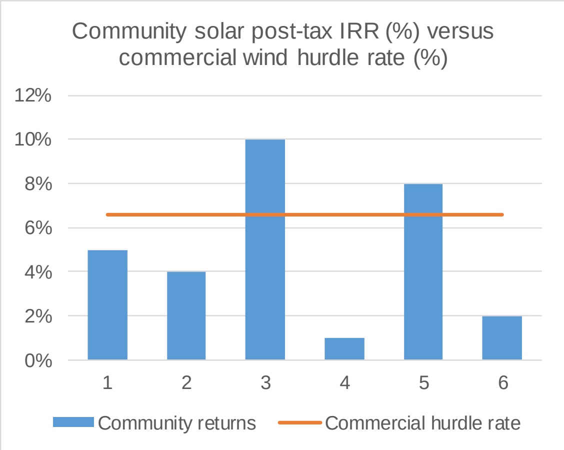
This gap in pricing opens up opportunities for renewable projects to benefit from '*behind the meter*' sales, where electricity sold/ used can offset high retail prices. However, opportunities to sell electricity to local enterprises nearby are limited. There is research looking into this and a Local Network Credit rule change proposal has been submitted, but this is really only for projects with firm capacity so this is unlikely to benefit renewable energy projects.

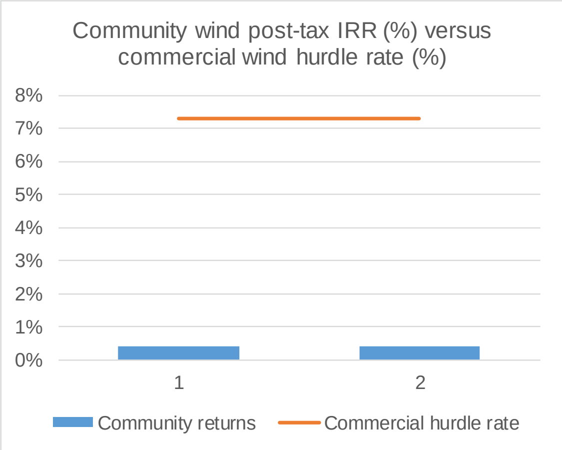
In this challenging context, 23 community energy projects have been developed. The Australian community energy sector is unique insofar as:

- The Community Energy sector is very small, with few projects in operation despite widespread enthusiasm. We were able to get information from two wind projects and six solar energy projects;
- Due to low wholesale prices if proponents relied entirely on wholesale prices, many of the projects would not be financially attractive. However, some community solar PV proponents are acting as a developer with a host site (building) to sell energy '*behind the meter'* usually with 7-10 year deals;
- The lack of FITs means there is no need for project proponents to rush, allowing innovative ideas to be generated;
- None of the proponents have a retail license (retail license exemptions exist for supply behind the meter solar), unlike in the UK where groups tend to retain solar assets and sell electricity into the market;
- The Australian community sector lacks economies of scale. Groups are doing only one or a few projects, compared to commercial solar companies operating regionally or nationally at scales of tens or hundreds of projects with costs spread accordingly.

Cost Data Comparison

Through direct interviews and obtaining data from recent projects we have data for eight community projects, two wind and six rooftop solar PV ones. Using the data on costs and income we have calculated the post-tax pre-finance Internal Rate of Return (IRR) for each project, shown below:





It is noticeable that the IRRs for two community solar projects pass the commercial hurdle return of 6.6%, meaning they would be financially attractive to commercial developers. However, neither community wind project passes the commercial hurdle rate of 7.3%, both with IRRs of about 0.4%. Nevertheless, as both of the wind projects relied on large grants the post-tax post-grant pre other finance IRRs rise to 1.6% and 5.2%.

Even returns around 5% are higher than retail investors can get on bank savings, meaning there are opportunities for community energy projects to expand as an attractive ethical investment.

In Australia, modelling shows evidence of similar costs for small scale 50kW rooftop solar projects, although development costs are higher. However, the modelling shows higher development, construction and operations costs for community wind projects, but this could be because the two wind projects surveyed were the first community wind projects in Australia.

Conclusions

These modelling results reflect the small size of the community energy sector in Australia. Furthermore, the findings suggest that there are intangible benefits to community energy projects unrecognised in the model.

From a policy perspective, the Australian community energy sector has grown slowly, with little policy support beyond some grant funding. So the sector has been highly collaborative (see the Coalition for Community Energy (http://www.c4ce.net.au/) and the Embark Wiki (http://www.embark.com.au/) as examples).

The report shows where significant cost reductions can be realised, particularly through business model replication. Legal costs for producing the first project are greatly reduced upon replication. Furthermore, administrative issues such as compliance with company registration also hold potential for reduction with policy change. Therefore, we recommend that:

- more grants are made available for creating business models and tools (legal contracts, financial models, etc.) that can be adapted and replicated;
- resourcing is made available to facilitate information sharing and collaboration; and
- grants are made more widely available for the initial feasibility stages.

This focus on formulating adaptable community energy business models means that the development costs of projects is likely to decrease over time, which will boost the community energy sector as often it is the lack of finance for the riskier development phase that is holding back more community projects. For if the development stage costs are lower, correspondingly the amount of finance that needs to be raised will be less.

Brief update on policy developments since August 2015

Since the Australian Case study was written there have been no major policy developments, although following the United Nations Climate Change Conference (COP 21) the Government's Clean Energy Finance Corporation (CEFC) is now investing in commercial wind farms, having recently the committed AUD $67m to Australia's third-largest wind farm project in Ararat, Victoria[9].

[9] Guardian Newspaper. Malcolm Turnbull lifts Abbott ban on government finance for wind power. 13 December 2015. Accessed at: http://www.theguardian.com/australia-news/2015/dec/13/malcolm-turnbull-lifts-abbott-ban-on-government-finance-for-wind-power

Figure 12: Additional commercial Australian data: Wind

	International Australian data (USD $)	International Australian data (AUD $) at AUD $1 = USD $0.73 exchange rate	Additional : Australian data (AUD $)
Development costs (Currency/MW)	$190,000 [˘]	AUD $259,000[˘]	AUD $252,000[≈]
Construction costs ($/MW)	$1,710,000 [˘]	AUD $2,332,000[˘]	AUD $2,272,000[≈]
Operational costs (Currency/MW/year)	Not available	Not available	AUD $70,400[ˆ]
Typical debt: equity ratio	Not available	Not available	70:30 [!]
Cost of debt (%)	Not available	Not available	6.0% [a]
Length of loan (years)	Not available	Not available	Not available
Cost of equity (%)	Not available	Not available	14.5%[═]
Tax rates (2015)	30.0% [°]	30.0% [°]	30.0% [°]
Post-tax weighted average cost of capital	Not available	Not available	7.3%[¬]

Sources:

[˘] IRENA. *Renewable Power Generation Costs in 2014*. January 2015. Table 4.3 has total installed costs ($/MW) ranging from USD $1,427,000 to USD $2,384,000, so an average of USD $1,900,000 is used. Figure 4.1 shows that development costs are typically 9% - 13% of total project cost. An assumption of 10% is made.

[≈] Australian Government Bureau of Resources and Energy Economics. *Australian Energy Technology Assessment 2012.* July 2012. p. 46. An assumption is made that development costs are 10% of total project costs. Inflation between 2012 and 2015 is 7.4% (https://www.ato.gov.au/rates/consumer-price-index/) so the costs have been increased proportionately.

[ˆ] Australian Government Bureau of Resources and Energy Economics. *Australian Energy Technology Assessment 2013 Model Update*. December 2013. p. 28. The report states fixed operating costs are AUD $32,500/MW, and variable operating costs are AUD $10/MWh. Australian Government Bureau of Resources and Energy Economics. *Australian Energy Technology Assessment 2012.* July 2012. p. 46 gives a typical load factor for onshore wind of 38%, or (8,760 x 38% * $10) AUD $33,300/MW. Therefore total operating costs are AUD $65,500/MW. Inflation between 2012 and 2015 is 7.4% (https://www.ato.gov.au/rates/consumer-price-index/) so the costs have been increased to 2015 prices.

[!] Commonwealth Bank. *Group Energy Exposures and Assessed Carbon Emissions of Project Finance Energy Sector*. February 2015. (accessed at: https://www.commbank.com.au/content/dam/commbank/assets/about/who-we-are/sustainability/2015-02-05-group-energy-exposure-and-finance-emissions-energy-sector.pdf) reports debt: equity ratios of 70:30 for all projects in the electricity generation, oil and gas production and coal mining sectors. It has been assumed this same gearing is used for lending to all renewable projects.

[a] The Australian Financial Markets Association reports 10 year interest rate swaps at circa 3% (http://www.afma.com.au/data/BBSW) on 8th October 2015. Assuming a 3.0% margin (higher than the 2.5% for solar) that equates to wind loans at 6%.

[═] Frischknecht, I. *Renewable Energy Finance Matters Clean Energy Week*. Australian Renewable Energy Agency. July 2014. Post tax equity IRRs for solar are shown as about 13%. Wind energy projects often have an equity return about 1 – 2% higher, so 14.5% is assumed.

[°] 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx

[¬] The Post-tax weighted average cost of capital is given by the formula:

[gearing × cost of debt × (1 – tax rate)] + [equity return x (1 – gearing)] =

{ 70% x 6% x (1-30%) } + {30% x 14.5%} = 7.3%.

Figure 13: Additional commercial Australian data: Solar

	International Australian data (USD $)	International Australian data (AUD $) at AUD $1 = USD $0.74 exchange rate	Additional : Australian data (AUD $)
Development costs (Currency/MW)	$85,000 [˘][a]	AUD $115,600 [˘][a]	AUD $80,000[≈][a]
Construction costs (Currency/MW)	$1,615,000 [˘][a]	AUD $2,196,400[˘][a]	AUD $1,520,000[≈][a]
Operational costs (Currency/MW/year)	$36,000 [˘][*]	AUD $26,640 [˘][*]	AUD $26,850[≈]
Typical debt: equity ratio	Not available	Not available	70:30 [!]
Cost of debt (%)	Not available	Not available	5.50%"
Length of loan (years)	Not available	Not available	Not available
Cost of equity (%)	Not available	Not available	13%[‾]
Tax rates (2015)	30.0% [°]	30.0% [°]	30.0% [°]
Post-tax weighted average cost of capital	Not available	Not available	6.6% [¬]

Sources:

[˘] IEA. *Technology Roadmap. Solar Photovoltaic Energy*. 2014 edition. Total cost of installation by Country are sourced from Table 2.

[a] Based on Ricardo Energy & Environment studies, development costs make up approximately 5% of total cost of installation. This covers feasibility work, planning permission and other related development costs.

[*] The international operating costs were sourced from a UK report by DECC. *Electricity Generation Costs 2013*. July 2013. p. 66. The DECC report states operation and maintenance costs are approximately 2% (per year) of total cost of installation for large scale solar PV installations. Operation and maintenance costs include inverter replacements (approximately every 7-10 years), ongoing installation project management, insurance, cleaning and basic repairs.

[≈] Solar Choice. *Commercial Solar PV Price Index*. August 2015. Available at: http://www.solarchoice.net.au/blog/commercial-solar-pv-system-prices-august-2015. The price for a 50 kW system in the New South Wales area (all participating community solar projects are based in NSW) is AUD $1,520,000. On top of that meter installation fees and additional costs, such as grid connection studies need to be added, to give an approximate cost of $1,600,000/MW. This cost is cheaper than the AUD $2,200,000/MW in 2016 given by Australian Government Bureau of Resources and Energy Economics. *Australian Energy Technology Assessment 2012.* Jul 2012. p. 43, but this is because these projects will be larger ground mounted arrays.

[ˆ] Australian Government Bureau of Resources and Energy Economics. *Australian Energy Technology Assessment 2013 Model Update.* December 2013. p. 28. The report states fixed operating costs are AUD $25,000. Inflation between 2012 and 2015 is 7.4% (https://www.ato.gov.au/rates/consumer-price-index/) so the costs have been increased to 2015 prices.

[!] Commonwealth Bank. *Group Energy Exposures and Assessed Carbon Emissions of Project Finance Energy Sector.* February 2015, reports debt: equity ratios of 70:30 for all projects in the electricity generation, oil and gas production and coal mining sectors. It has been assumed this same gearing is used for lending to all renewable projects.

[“] The Australian Financial Markets Association reports 10 year interest rate swaps at circa 3% (http://www.afma.com.au/data/BBSW) on 8th October 2015. Assuming a 2.5% margin that equates to loans at 5.5%.

[°] 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at: http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx

[‾] Frischknecht, I. *Renewable Energy Finance Matters Clean Energy Week.* Australian Renewable Energy Agency. July 2014. Post tax equity IRRs for solar are shown as about 13%.

[¬] The Post-tax weighted average cost of capital is given by the formula: [gearing × cost of debt × (1 – tax rate)] + [equity return x (1 – gearing)] = { 70% x 5.5% x (1-30%) } + {30% x 13%} = 6.6%.

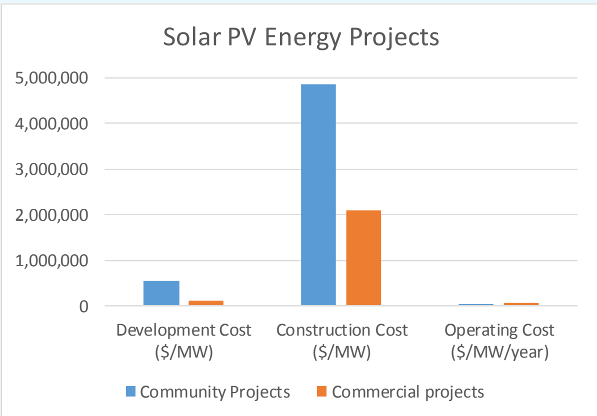
Appendix 5: Canadian Executive Summary, Policy Update and Cost Data

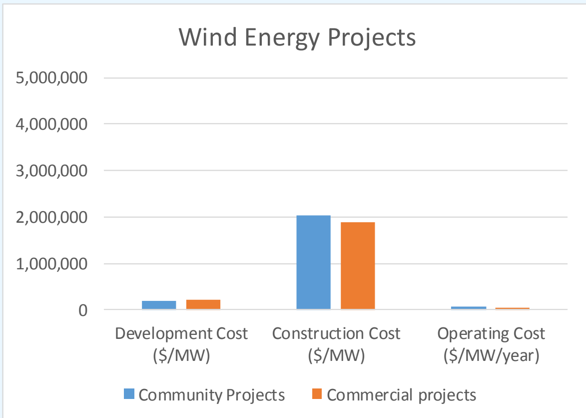
Executive Summary

This Case Study report presents the results of data collection and analysis on community and commercial wind and solar photovoltaic (PV) installations in Canada. It has been based on information available as at the end of July 2015 and does not refer to any policy changes that may occur after this date.

Cost Data Comparison

Through direct interviews and desk research we have financial and qualitative data from six community projects (four solar projects and two wind projects) and have obtained commercial data from the International Renewable Energy Agency (IRENA), IEA (International Energy Agency) and other Canadian specific reports. The average kW capacity of the community solar projects was 950 kW - of comparable magnitude to the commercial solar data we obtained which was for solar projects less than 1 MW. The average kW capacity of the two wind projects was 2,640 kW, but we are unsure of the average capacity of the commercial Canadian wind project data. However, as individual wind turbines tend to be sized in the 2 – 3 MW capacity range, the findings should be quite comparable. The actual cost comparison per development, construction and operating phases is shown below.





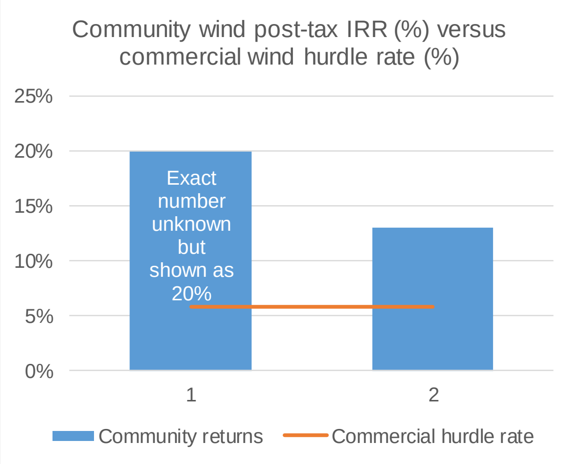
Comparing the commercial wind project data with the community projects provides evidence that development, construction, and operation costs are broadly comparable for community and commercial projects. However, qualitative responses from the interviewees representing the different projects indicate that the developmental costs are likely to be higher for community projects.

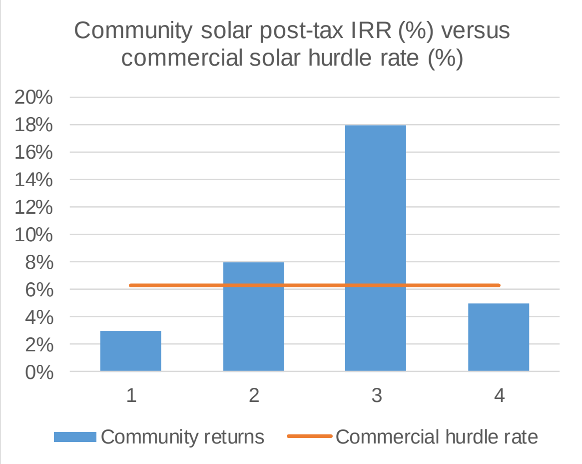
A comparison of community solar project data shows more variation, with construction and development costs tending to be significantly higher than commercial projects. One of the reasons is that one of the solar projects was commissioned in 2009, when PV units were much more expensive, which brings up average prices.

Although most community projects in Canada are structured to be corporation tax free, some pay corporation tax, and for this reason the post-tax pre-finance Internal Rates of Return (IRRs) for the community projects are compared to the post-tax pre-finance commercial hurdle rates. Only one of the six projects we interviewed had to pay corporation tax, with the community receiving about 1.25% of the revenue from this commercial venture. After paying off the community investors, remaining profits were used for education programs related to the wise use of sustainable energy. The IRRs are shown below.

As can be seen, whilst the community wind returns were higher than the commercial hurdle rates.

However, again for solar there is more of a mixed message, driven significantly by the downward trend in feed-in-tariff (FIT) rates — specifically in Ontario — and again the falling cost of solar PV units. With the exception of one First Nation solar project in British Columbia, all other projects are in Ontario and have been supported by Ontario's FIT payments.





Qualitative comparison

The main messages from the qualitative research questions are:

- Community renewable energy system (RES) projects may offer host communities a range of potential benefits, including enhanced economic opportunities and benefit sharing including improved public health outcomes, and strengthened community cohesion;
- Debt financing is expensive for communities due to the risks perceived by commercial investors — banks, pension funds and insurance companies. Financing is particularly difficult for communities, partly because of the historically poor returns of cooperatives, and the perception that RES cooperatives will also offer poor returns;
- Long-term community RES revenue from guaranteed revenue through Power Purchase Agreements (PPAs), programs such as Ontario's FIT, and formerly from Nova Scotia's Community FIT (COMFIT) are a necessary pre-requisite to access financing, unless an innovative behind the meter arrangement can be found where electricity is sold directly to users (or the community) at retail prices;
- Partnering with commercial developers makes access to affordable debt easier, but often decreases the share owned by the community, and hence the benefits. Partnering also imposes new challenges in terms of framing the partnership and engaging on an equitable footing with better-resourced and more-experienced commercial developers and financiers;
- For a commercial partner, community leadership or co-ownership may offer a range of counterbalancing incentives, such as access to grants and lower-cost finance, easier ability to secure planning permission and social acceptance, reduced barriers to grid access, volunteer support and outright political encouragement that offset the financing challenges impeding their development.

From a policy perspective:

- Provincial and territorial clearinghouses would be helpful in distributing not only '*how-to guides*', standardized developer-community agreements and fundraising guides, but also in providing a one-window single point to obtain an up-to-date summary of public funding mechanisms in place. A clearinghouse could also offer training for the development of a cadre of community RES project facilitators who could bring experience and contacts from other projects. National co-ordination of clearinghouses could further assist with sharing of best practices and financing opportunities;
- Due to the limited investor experience with community RES in Canada, public-backed loan guarantees are a useful mechanism for lowering the cost of capital. It is critical to think about the sustainability of such a program over time in the event of success, including clearly defined thresholds for reducing levels of support. As an example, the Federation of Canadian Municipalities already has its Green Municipal Fund targeted to municipal projects,

and it could create a separate program specifically for community RES projects;

- A key opportunity for advancing community RES projects in Canada would be through aggregation of electricity generation across multiple communities. An important upside of aggregating projects is that it delivers ‘mother’ electricity generation projects and could enable a higher electricity price to be secured. Joint funding of multiple projects during the development phase is also an effective means of obtaining lower cost financial support;
- Significant paid or unpaid man-hours are needed to acquire funding and manage multiple funders. Professionalization of these functions could be prioritized, to accelerate the process of securing finance and negotiating long-term purchase agreements including Renewable Energy Credits;
- The recently announced Pan-Canadian Task Force to Reduce Use of Diesel for Electricity in Remote Communities offers an opportunity to support development of community RES projects in these remote communities;
- There is a high degree of variance between provinces, between on- and off-grid projects, between aboriginal and non-aboriginal projects. This study exposes the need for a more-detailed, wider assessment of community RES experience across these diverse domains.

Brief update on policy developments since July 2015

Since July 2015 there have not been any formal policy commitments, but three points to note:

a) In late July 2015 the governments of Manitoba, Quebec, Newfoundland and Labrador, The Northwest Territories, Yukon, and Ontario announced they are establishing a Pan-Canadian Task Force to reduce the use of diesel fuel to generate electricity in remote communities[10];

b) The second biennial Renewables in Remote Microgrids (RiRM) conference was organised by the Pembina Institute and hosted by the Government of Northwest Territories in September 2015. It focused on non-technical barriers to development in these remote locations. Participants included 25 First Nation community representatives; research institutions; all levels of Canadian Government; the U.S. Government (federal and Alaska); utilities; technology, engineering, mining, and manufacturing firms; project managers; and environmental Non-Governmental Organisations (NGOs). Suggestions made to accelerate the use of renewables included:

   - a multi-community project facilitation model as already used by British Colombia Coastal First Nations and The Northwest Territories’ Arctic Energy Alliance;
   - bringing in private finance through loan guarantees and long term power purchase agreements;
   - modular plug-and-play systems to reduce the Balance of System (BoS) costs[11];

c) The Liberal Federal Government, elected in October 2015, has made combatting climate change and redressing the needs of First Nations and Metis communities two of their top priorities. Its election mandate said the newly elected Government “*will establish the Canada Green Investment Bond to support both large- and community-scale renewable energy projects. The bond will leverage the federal government’s ability to provide more affordable loan guarantees for clean energy projects, and provide Canadians with the opportunity to invest in clean technologies. The focus of investment will be reducing the costs for commercially viable projects and helping to level the playing field with fossil fuel energy sources*”[12].

[10] Government of Ontario. *Provincial & Territorial Ministers Working Together to Reduce Use of Diesel for Electricity in Remote Communities.* 21 July 2015. Accessed at: https://news.ontario.ca/mei/en/2015/07/provincial-territorial-ministers-working-together-to-reduce-use-of-diesel-for-electricity-in-remote.html

[11] Pembina Institute. Bringing renewables to remote microgrids. 30 September 2015. Accessed at: http://www.pembina.org/blog/bringing-renewables-to-remote-microgrids

[12] Liberal. *Real change: A new plan for Canada’s environment and economy*. July 2015, p. 7. Accessed at: https://www.liberal.ca/files/2015/08/A-new-plan-for-Canadas-environment-and-economy.pdf

Figure 14: Additional commercial Canadian data: Wind

	International Canadian data (USD $)	International Canadian data (CAD $) at USD $1 = CAD $1.25	Additional : Canadian data (CAD $)
Development costs (Currency/MW)	$230,000 [ˇ]	CAD $287,500 [ˇ]	CAD $210,000 [≈]
Construction costs ($/MW)	$2,066,000 [ˇ]	CAD $2,583,000 [ˇ]	CAD $1,890,000 [≈]
Operational costs (Currency/MW/year)	N/A	N/A	CAD $51,900 [≈]
Typical debt: equity ratio	80:20 [a *]	80:20 [a *]	70:30 [ˆ]
Cost of debt (%)	6% [a *]	6% [a *]	5% [!]
Length of loan (years)	15 [a *]	15 [a *]	7 – 20 [!]
Cost of equity (%)	7.5% [a *]	7.5% [a *]	9.6% - 11.7% [“]
Tax rates (2015)	26.5% [°]	26.5% [°]	26.5% [°]
Post-tax weighted average cost of capital	N/A	N/A	5.8% [¬]

Sources:

[ˇ] IRENA. *Renewable Power Generation Costs in 2014*. January 2015. Table 4.3 which has total installed costs (USD$/MW) for Canada. Further, Figure 4.2 shows that development costs are typically 9%-13% of total project cost. An assumption of 10% is made.

[a] IEA Wind. *IEA Wind Task 26: Multinational Case Study of the Financial Cost of Wind Energy*. March 2011. Table 1.3.

* Debt and equity returns data for Canada was assumed to be the same as the US data in the IEA Wind Task 26 report, as were loan lengths.

[°] 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx Depending on the province, the combined general corporate income tax rate ranges from 25% to 31%. Lower corporate income tax rates are available to Canadian-controlled private corporations (CCPCs) on their first CAD $500,000 (CAD $350,000 / CAD $425,000 for certain provinces). For simplicity the 26.5% is used.

[≈] McGarrigle, P. *Alberta WindVision Technical Overview Report*. 2013. Table 4. Development cost is assumed to be 10% of Capital Cost (see note re figure 4.2 of IRENA report above). Operating costs are CAD $47,300/MW/year plus a variable cost of CAD $1.5/MWh. If a wind turbine operates at a 35% capacity factor that equates to 3,066/MWh/year or CAD $4,600/MWh/year to give a total operating costs of CAD $51,900.

[ˆ] Debt to Equity Ratios vary substantially across developers in Canada. TransAlta Renewables is the largest wind power developer in Canada and reports a debt-to-equity ratio of approximately 70%.

[!] KPMG. *Wind Energy in Canada: Realizing the Opportunity Issue*. 2 July 2013. Available at http://www.kpmg.com/Ca/en/IssuesAndInsights/ArticlesPublications/Documents/Clean-Energy-Report-Issue-2-FY13-FINAL.pdf

[“] Dalton, J. *Financing of Renewable Electricity Projects in Atlantic Canada*. PowerAdvisoryLLC, 2012. p.28. http://energy.novascotia.ca/sites/default/files/aeg_financing_of_renewable_electricity_projects_in_atlantic_.pdf

[¬] Post-tax weighted average cost of capital is given by the formula:

[gearing × cost of debt × (1 – tax rate)] + [equity return x (1 – gearing)] =

{70% x 5% x (1- 26.5%)} + [30% x 10.65%] = 5.8%.

Figure 15: Additional commercial Canadian data: Solar (<1 MW)

	International Canadian data for solar < 1 MW (USD $)	International Canadian data (CAD $) at USD $1 = CAD $1.25	Additional : Canadian data (CAD $)
Development costs (Currency/MW)	$245,000 [˘ a]	CAD $306,250 [˘ a]	CAD $110,000[≈]
Construction costs (Currency /MW)	$4,655,000 [˘ a]	CAD $5,831,250[˘ a]	CAD $2,090,000 [≈]
Operational costs (Currency/MW/year)	$98,000 [˘ *]	CAD $122,500 [˘ *]	CAD $59,000 ["]
Typical debt: equity ratio	N/A	N/A	70:30[ˆ]
Cost of debt (%)	N/A	N/A	5.25% - 6%[═]
Length of loan (years)	N/A	N/A	7 – 20 [!]
Cost of equity (%)	N/A	N/A	10 – 13% [═]
Tax rates (2015)	26.5% [°]	26.5% [°]	26.5% [°]
Post-tax weighted average cost of capital	N/A	N/A	6.3%[¬]

Sources:

[˘] IEA. *Technology Roadmap. Solar Photovoltaic Energy. 2014 edition*. 2015. Total cost of installation by Country are source from Table 2 and it is assumed US data and Canadian data are similar.

[a] Based on Ricardo Energy & Environment studies, development costs make up approximately 5% of total cost of installation. This covers feasibility work, planning permission and other related development costs.

[*] The international operating costs were sourced from a UK report by DECC. *Electricity Generation Costs 2013*. July 2013, p. 66. The DECC report states operation and maintenance costs are approximately 2% (per year) of total cost of installation for large scale solar PV installations. Operation and maintenance costs include inverter replacements (approximately every 7-10 years), ongoing installation project management, insurance, cleaning and basic repairs.

[≈] IEA. *National Survey Report of PV Power Applications in Canada: 2014*. September 2014, p.10. Table 7: Turnkey Prices of Typical Applications – local currency. For a grid connected >250kW commercial rooftop PV a price per watt of CAD $2.20/ watt for 2013-14 is given. It is assumed development costs are 5% of capital cost.

["] NREL. *Best Practices in PV System Operations and Maintenance*. 2015. Available at: http://www.nrel.gov/docs/fy15osti/63235.pdf. Operation and Maintenance costs are assumed to be lower based on cost of maintenance for fixed-mount panels, not tracking panels.

[ˆ] Debt to Equity Ratios vary substantially across developers in Canada. TransAlta Renewables is the largest wind power developer in Canada and reports a debt-to-equity ratio of approximately 70%, which is assumed for solar.

[═] Canadian Solar Industries Association (CanSIA). *2013 OPA FIT Price Review – Stakeholder Feedback.* April 2013. CanSIA reports that for ground-mounted commercial PV, the cost of debt is 5.25-6.0%; The cost of Equity is 10%-13% (leveraged, post-construction); and the cost of equity pre-construction tends to be significantly higher.

[!] KPMG. *Wind Energy in Canada: Realizing the Opportunity Issue*. 2 July 2013. Available at http://www.kpmg.com/Ca/en/IssuesAndInsights/ArticlesPublications/Documents/Clean-Energy-Report-Issue-2-FY13-FINAL.pdf An assumption is made the solar loans are of a similar length to wind loans.

[°] 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx

Depending on the province, the combined general corporate income tax rate ranges from 25% to 31%. Lower corporate income tax rates are available to Canadian-controlled private corporations (CCPCs) on their first CAD $500,000 (CAD$350,000 / CAD $425,000 for certain provinces). For simplicity the 26.5% is used.

[¬] The post-tax WACC is estimated by the formula {gearing x interest rate x (1 – tax) } + { (1- gearing) x equity return} = {70% x 5.5% x (1- 26.5%)} + [30% x 11.5%] = 6.3%.

Appendix 6: Danish Executive Summary, Policy Update and Cost Data

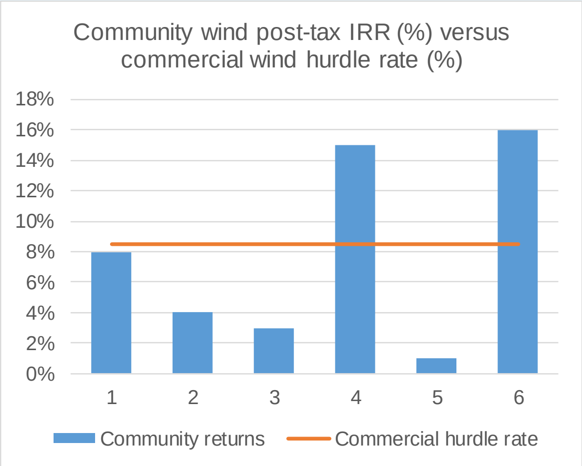
Executive Summary

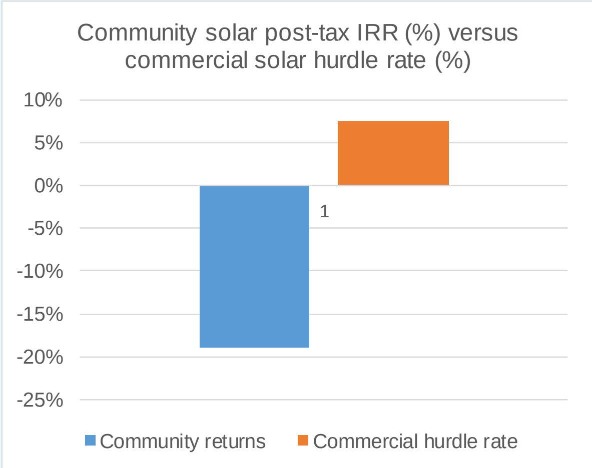
This Danish Case Study report presents the results of data collection and analysis of community and commercial wind and solar PV installations in Denmark. It has been based on information available as at the end of September 2015 and does not refer to any policy changes that may occur after this date.

Results of the interviews and the literature research show that there were major changes in the ownership structure of renewable energy resource (RES) projects in the past 25 years mainly based on the changes in the support scheme and the general legal framework for RES projects and community led projects in particular.

Cost Data Comparison

Through direct interviews with communities we have data for seven community projects, six wind and one solar PV. We chose to collect data on completed projects – so that the cost data represented actual, rather than predicted, costs. Using the data on costs, electricity prices and other forms of Government support we have calculated the post-tax pre-financing Internal Rate of Return (IRR) for each of the seven community projects, shown below:





This shows that only two wind projects are projected to meet the hurdle rates of return commercial investors seek. This puts into question why so many of the Danish community projects (5 of 7 interviewed) appear to be predicting returns lower than commercial developers, for the evidence is that community projects pay similar project costs (development and construction costs) and similar operating costs to similarly sized commercial developments. It could be because the projects tend to be located in sites that are sub-optimal (e.g. lower wind speeds or lower levels of insolation), it could be because volatile and low electricity prices mean even commercially led projects are suffering, or it could be because larger commercial projects are able to benefit from economies of scale when buying wind turbines and arranging maintenance agreements, that smaller developers (whether they are community or commercial) cannot secure.

Conclusions

Denmark is a very interesting case study, given its pioneering role in community RES projects in the 1980s and 1990s, and now the move to fewer RES projects. This is partly because public opinion seems to be hardening towards wind power in Denmark, particularly on-shore wind power. What also seems to be happening is that the sense of community involvement has shifted. For now there seem to be very few new wholly owned community RES projects where the community conceptualises, plans, builds, finances and operates RES assets, but a number of cases where individuals close to new commercial wind farms are offered the opportunity to invest up to 20% in the commercial venture. Because the shared ownership projects are commercially led, the tentative conclusions are that local investors are becoming more financially minded, wanting to secure high returns with less consideration of delivering community dividends (also called community benefit) in the form of charitable assistance.

Where community RES projects are still happening, there is evidence that the new fixed price premium system, with a need to negotiate wholesale electricity contracts, is complex to understand for new entrants. This makes it harder to secure financing. Nevertheless it seems that wind power cooperatives as well as individual owners of wind turbine shares have mitigated exposure to market risks through joint cooperative actions, such as the foundation of the independent trading cooperative Vindenergi DK, and cooperating with financially strong partners.

However, interview partners mentioned a possibility to reduce risk could be to move to a sliding premium, similar to that done on offshore wind projects. In this case, the support mechanism would guarantee a minimum payment and reduce market risk exposure. This is especially relevant in an energy market with increasing amounts of RES and thus more volatile wholesale prices.

With respect to the rising land rental costs interview partners mentioned the possibility to set an upper limit or to make the State responsible for buying and preparing sites for wind power exploitation and then installing a bidding procedure for the wind power project investors (as is already done for offshore wind power projects).

Brief update on policy developments since September 2015

Since the Case Study for Denmark was written there have been no further policy developments.

Figure 16: Additional commercial Danish data: Wind

	International Danish data (USD $)	International Denmark data in Euros at €1 = USD $1.15 exchange rate	Additional : Danish data in Euros (€)
Development costs (Currency/MW)	N/A	N/A	€120,000[≈]
Construction costs ($/MW)	N/A	N/A	€1,080,000[≈]
Operational costs (Currency/MW/ year)	$46,085[ˆ]	€40,075[ˆ]	€29,784*
Typical debt: equity ratio	80:20 [a]	80:20 [a]	N/A[≈]
Cost of debt (%)	5% [a]	5% [a]	N/A[≈]
Length of loan (years)	13 [a]	13 [a]	N/A[≈]
Cost of equity (%)	11% [a]	11% [a]	N/A[≈]
Tax rates (2015)	23.5% [°]	23.5% [°]	23.5% [°]
Post-tax weighted average cost of capital	5.3%[=]	5.3%[=]	8.5%[¬]

Sources:

[ˆ] IRENA. *Renewable Power Generation Costs in 2014*. January 2015. Table 4.4 has the operations and maintenance (O&M) costs for Denmark which are on a USD/kWh basis and are $0.0152/kWh – $0.019/kWh. With an average full load hours of 2,695 (source: IEA Wind. *IEA Wind Task 26: Multinational Case Study of the Financial Cost of Wind Energy*. March 2011. Table 1.2) this equates to $40,964/MW - $51,205/MW or $46,085/MW on average.

[a] IEA Wind. *IEA Wind Task 26: Multinational Case Study of the Financial Cost of Wind Energy*. March 2011. Table 1.3.

[=] Post-tax weighted average cost of capital is given by the formula:

[gearing × cost of debt × (1 – tax rate)] + [equity return x (1 – gearing)] =

[80% x 5% *(1 - 23.5%)] +[20% x 11%] = 5.3%

[≈] Danish Energy Agency and Energinet.dk. *Technology Data for Energy Plants. Generation of Electricity and District Heating, Energy Storage and Energy Carrier Generation and Conversion*. May 2012, updated in March 2015, p. 87. The capital cost (presumably including the development cost) for a 3 MW wind turbine is reported at €1,200,000/MW. IRENA. *Renewable Power Generation Costs in 2014*. January 2015. Figure 4.2 shows that development costs are typically 9%-13% of total project cost. An assumption of 10% is made, equating to €120,000/MW for development costs and €1,080,000/MW for the actual construction costs.

* Danish Energy Agency and Energinet.dk. *Technology Data for Energy Plants. Generation of Electricity and District Heating, Energy Storage and Energy Carrier Generation and Conversion*. May 2012, updated in March 2015, p. 87 reports operational costs of €10/MWh. This report provides an average capacity factor of 34%, so every 1 MW of installed capacity will have a cost of (34% x 8,760 x €10) €29,784/MW.

[°] 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx

[¬] NERA Economic Consulting. *Changes in Hurdle Rates for Low Carbon Generation Technologies due to the Shift from the UK Renewables Obligation to a Contracts for Difference Regime.* Department of Energy and Climate Change. 9 December 2013, p.115 provides a Danish nominal post tax return ranging from 7% - 10%, so an average of 8.5% is reported.

Figure 17: Additional commercial Danish data: Solar (<1 MW)

	International Danish data for solar <1 MW (USD $)	Denmark data in Euros at €1 = USD $1.15 exchange rate	Additional : Danish data in Euros (€)
Development costs (Currency/MW)	$90,000 ˇ [a]	€78,250 ˇ [a]	N/A
Construction costs (Currency/MW)	$1,710,000 ˇ [a]	€1,487,000 ˇ [a]	N/A
Operational costs (Currency/MW/year)	$36,000 ˇ *	$31,300 ˇ *	N/A
Typical debt: equity ratio	N/A	N/A	N/A
Cost of debt (%)	N/A	N/A	N/A
Length of loan (years)	N/A	N/A	N/A
Cost of equity (%)	N/A	N/A	N/A
Tax rates (2015)	23.5% °	23.5% °	23.5% °
Post-tax weighted average cost of capital	Not available	N/A	7.5%⌐

Sources:

ˇ IEA. *Technology Roadmap. Solar Photovoltaic Energy. 2014 edition.* September 2014. Total cost of installation by Country are sourced from Table 2 and an assumption was made that Danish costs are the same German costs. Page 10 of the IEA. *Technology Roadmap. Solar photovoltaic energy*. October 2010, p.10 defines commercial scale solar as up to 1 MW and utility based solar as greater than 1 MW.

[a] Based on Ricardo Energy & Environment studies, development costs make up approximately 5% of total cost of installation. This covers feasibility work, planning permission and other related development costs.

* The international operating costs were sourced from a UK report by DECC. *Electricity Generation Costs 2013*. July 2013, p. 66. The DECC report states operation and maintenance costs are approximately 2% (per year) of total cost of installation for large scale solar PV installations. Operation and maintenance costs include inverter replacements (approximately every 7-10 years), ongoing installation project management, insurance, cleaning and basic repairs.

° 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx

⌐ NERA Economic Consulting. *Changes in Hurdle Rates for Low Carbon Generation Technologies due to the Shift from the UK Renewables Obligation to a Contracts for Difference Regime.* Department of Energy and Climate Change. 9 December 2013, p.115 provides a Danish nominal post tax return for wind ranging from 7% -10%, so an average of 8.5% is reported. The author has assumed that the post-tax weighted average cost of capital for solar projects is approximately 1% less than the wind returns, given the lower risks.

Appendix 7: German Executive Summary, Policy Update and Cost Data

Executive Summary

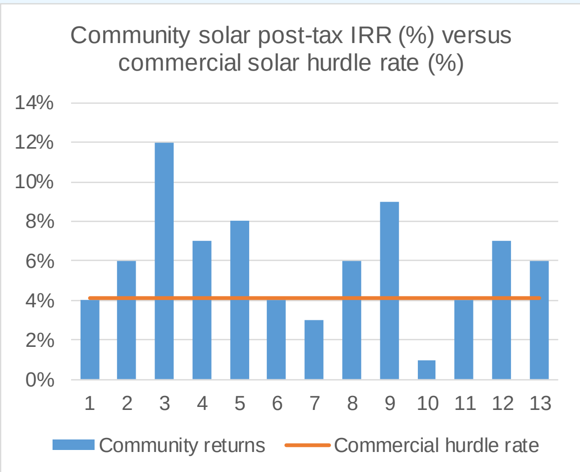
This German Case Study report presents the results of data collection and analysis of community and commercial wind and solar photovoltaic (PV) installations in Germany. It has been based on information available as at the end of May 2015 and does not refer to any policy changes that may occur after this date.

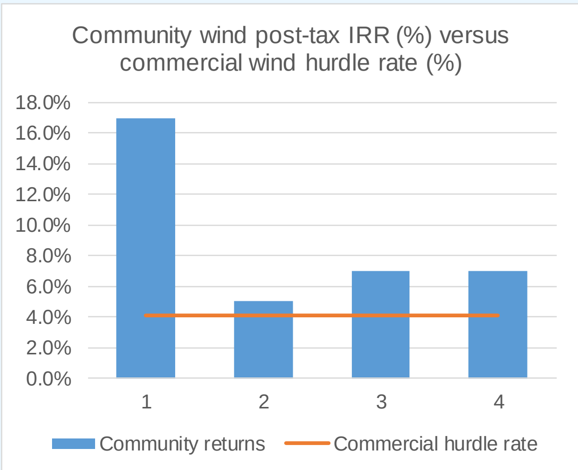
Whereas other countries have explicit policy support for community organisations, in Germany there is no explicit policy support (e.g. generous fiscal incentives) apart from at the regional level where there is regional political support for example in finding and providing suitable roofs for solar roof mounted solar installations, or suitable areas for wind projects. This is evidence that the community renewable sector is often competitive with commercial developers, and testimony to the maturity of the community renewable energy sector.

One reason why community projects are successful in Germany is because the definition of community if broad. For example, some countries define community projects as giving direct benefit to local communities, such as supporting households improve the energy efficiency of their properties or supporting local charities. However, in Germany community investors are often different, commonly a group of farmers or community members; but rather than the profits being used for community benefit activities, the profits are given to the investors. It is for this reason that community renewable energy projects pay German corporation and trade tax.

Cost Data Comparison

Through direct interviews and questionnaires we have data for 17 community projects, 13 being solar and four being wind projects. Using the data on costs and income we have calculated the post-tax pre-financing Internal Rate of Return (IRR) for each of the 17 wholly community owned projects shown below:





The fact that five solar projects had a post-tax hurdle rate lower than the rates a commercial developer would require is a signal that communities are often prepared to earn less than commercial developers for they are often undertaking their project for other non-financial reasons, including community support and meeting their environmental aspirations, or alternatively are using some of the electricity themselves offsetting high retail electricity prices. However, the four community wind projects meet or exceed the commercial hurdle rate of return, evidence they have been located in areas of strong wind speed.

On cost comparisons, for community and commercial projects of similar sizes there is evidence that community small scale (e.g. 30 kW) solar projects have lower cost for developing the project to the point of construction commencement. It may well be that development costs are lower for communities for simpler smaller rooftop PV projects given the 'free' professional time that shareholders, or other community members provide.

However, for larger scale solar projects and wind projects, the development costs are higher for communities. Nevertheless, development costs are a very small proportion of total costs. For example, if the community development costs are 50% cheaper than commercial development costs, the difference in project returns will be immaterial as development costs only make up around 2-4% of total project costs.

Regarding construction costs there is evidence that community solar projects and wind projects have higher construction costs, more than offsetting any lower development costs. This leads to the conclusion that overall community projects may be slightly more expensive to reach the commissioning point, but not significantly higher. As operating costs for solar and wind projects represent such a small percentage of total development and construction costs any slight differences in operating costs do not have a material impact on the profitability of projects.

Conclusions

Mindful of the limitations of the community survey size - four wind projects all above 2 MW, two larger (greater than 400 kW) rooftop PV projects, one large (5 MW+) ground mounted PV project and 10 smaller rooftop PV projects (average about 43 kW) - there is some evidence that larger community wind and solar PV projects (circa 500 kW+) have higher development and construction costs than commercial projects, although the differences are not significant. In particular, the solar projects interviewed were commissioned between 2011 and 2015, and there have been significant reductions in the prices of PV units as solar approaches grid parity.

Results from interviews show that in general the raising of capital and the financing of the RES projects has not posed a problem for the RES community led projects, in particular because communities and commercial ventures alike can access low cost loans of up to €25 million from the German Public Development Bank (KfW). Constraints, according to interview partners, were more of a political or administrative nature.

The guaranteed feed in tariff (FIT) in combination with the possibility of favourable KfW loans was and still is very important also for the development of community led RES projects as it gives greater certainty around revenue stream.

As policy recommendations the main one is that most of the interview partners fear that the current changes in the support schemes will most notably:

- Fixed FIT support will only be available for projects up to 100 kW from 2016 onwards (down from projects up to 500 kW), in effect worsening conditions for the development of the typical projects that cooperatives have built in the past, i.e. larger than residential but still nevertheless small compared to other commercial projects;
- For installation above 500 kW (and 100 kW from 2016) the market premium and direct market rules require new RES entrants to negotiate Purchase Power Agreements (PPAs) with distribution companies. This is particularly burdensome to communities, as communities often only do one project, and cannot learn from experience;
- The uncertainty surrounding planned tendering system, being introduced from 2017 onwards, which when tested for the first time for PV ground mounted installations did not result in any cooperatives or smaller players being selected. This was because they either offered too high a price or did not correctly complete the application forms;
- Several interview partners pointed out that 'de minimis' thresholds or an obligatory financial and/ or conceptual participation of local citizens in shared ownership models may be a solution to keep the community sector alive.

Brief update on policy developments since May 2015

Since May 2015 there have been the following main policy developments:

- The Federal Government´s second solar PV tender for 150 MW received 136 bids and was oversubscribed four-fold. This time a uniform pricing method (or marginal cost approach) was employed, meaning the price for all solar projects is determined by the highest price of the last successful bidder. This is different to the first round pay-as-bid process, where developers who bid between €84.8/MWh and €94.3/MWh received the price they bid. 33 bids totalling 159 MW were successful in the second round. Multi project bids were particularly successful. In addition to experienced project companies like IBC Solar and Enerparc, energy companies including E.ON and EnBW were awarded projects. While cooperatives or individuals (e.g. farmers) were not awarded projects, one civil-law partnership was successful for the first time. Most (26 of the 33) of the awarded projects have a capacity larger than 2 MW;
- The third round bid period for 200 MW ground-mounted PV installations ended at 1 December 2015. Again, the price for generated energy will be determined by a uniform pricing method;
- Exemption clauses from the already existing and planned tenders, as well as specific assistance with the tender procedures and particular participation conditions, are currently being discussed for small and micro enterprises in order to guarantee the plurality of actors in the RES sector in Germany;
- The state of Mecklenburg-Vorpommern just approved the proposed citizens' Participation Act. Wind power investors according to this act will be obliged to offer neighbouring communities and individuals living within a radius of five kilometres shares with a maximum price of €500 each in wind turbines totalling 20 percent. Alternatively, discounts on electricity can be granted. It is planned to adopt this act in early 2016, however, some (legal) issues still remain open.

Figure 18: Additional commercial German data: Wind

	International German data (USD $)	International German data (€) at €1 = USD $1.15 exchange rate	Additional : German data (€)
Development costs (Currency/MW)	$200,000 ˘	€173,900 ˘	€68,000 ≈
Construction costs ($/MW)	$1,799,000 ˘	€1,564,350 ˘	€1,499,000 ≈
Operational costs (Currency/MW/ year)	$67,000 ˆ	€58,250 ˆ	€70,515 ≈
Typical debt: equity ratio	70:30 [a]	70:30 [a]	80: 20 ≈
Cost of debt (%)	5.5% [a]	5.5% [a]	3.8% ≈
Length of loan (years)	13 [a]	13 [a]	15 ≈
Cost of equity (%)	9.5% [a]	9.5% [a]	>8% ≈
Tax rates (2015)	29.7% °	29.7% °	29.7% °
Post-tax weighted average cost of capital	5.6% *	5.6% *	4.1% * !

Sources:

˘ IRENA. *Renewable Power Generation Costs in 2014*. January 2015. Table 4.3 has total installed costs ($/MW) for Germany. Further, Figure 4.1 of the IRENA report shows that development costs are typically 9%-13% of total project cost. An assumption of 10% is made.

ˆ IRENA. *Renewable Power Generation Costs in 2014*. January 2015. Table 4.4 has the Operations and Maintenance (O&M) costs for Germany.

[a] IEA Wind. *IEA Wind Task 26: Multinational Case Study of the Financial Cost of Wind Energy*. March 2011. Table 1.3.

° 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx

≈ Leipzig Institute for Energy. *Progress Report 2014 Wind power scientific report on behalf of the Federal Ministry of Economy and Energy.* July 2014. Available at: https://www.bmwi.de/BMWi/Redaktion/PDF/XYZ/zwischenbericht-vorhaben-2e,property=pdf,bereich=bmwi2012,sprache=de,rwb=true.pdf

* The post-tax WACC formula is {gearing x interest rate x (1 – tax) } + { (1- gearing) x equity return}

! The Leipzig Institute for Energy reports equity returns greater than 8%. An equity of return of 10% is assumed.

Figure 19: Additional commercial German data: Solar (<1 MW)

	International German data for < 1 MW (USD $)	International German data (€) at €1 = USD $1.15 exchange rate	Centre for Solar Energy and Hydrogen Research Baden-Württemberg		
			30 kW	500 kW	> 5 MW ground mounted
Development costs (Currency/MW)	$90,000 [ˇ] [a]	€78,300 [ˇ] [a]	€52,400 [≈]	€47,200 [≈]	€39,200 [≈]
Construction costs ($/MW)	$1,710,000 [ˇ] [a]	€1,487,000 [ˇ] [a]	€1,257,600 [≈]	€1,132,800 [≈]	€940,200 [≈]
Operational costs (Currency/MW/ year)	$36,000 [ˇ] [*]	31.300 [ˇ] [*]	€35,000 [˟]	€17,700 [≈]	€14,700 [≈]
Typical debt: equity ratio	N/A	N/A	62.5 : 37.5 [≈]	75 : 25 [≈]	75 : 25 [≈]
Cost of debt (%)	N/A	N/A	2.85% [≈]	3.05% [≈]	3.05% [≈]
Length of loan (years)	N/A	N/A	15 [≈]	15 [≈]	15 [≈]
Cost of equity (%)	N/A	N/A	7% [≈]	>8% [≈]	>8% [≈]
Tax rates (2015)	29.7% [°]	29.7% [°]	29.7% [°]	29.7% [°]	29.7% [°]
Post-tax weighted average cost of capital	N/A	N/A	3.9% [¬]	4.1% [¬] [!]	4.1% [¬] [!]

Sources:

[ˇ] IEA. *Technology Roadmap. Solar Photovoltaic Energy*. 2014 edition. Total cost of installation is provided for Germany (Table 2).

[a] Based on Ricardo Energy & Environment studies development costs make up approximately 5% of the total cost of an installation. This covers feasibility work, planning permission and other related development costs.

[*] The international operating costs were sourced from a UK report by DECC. *Electricity Generation Costs 2013*. July 2013, p. 66. The DECC report states operation and maintenance costs are approximately 2% (per year) of total cost for installing large scale solar PV installations. Operation and maintenance costs include inverter replacements (approximately every 7-10 years), ongoing installation project management, insurance, cleaning and basic repairs.

[°] 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx

[≈] Centre for Solar Energy and Hydrogen Research Baden-Württemberg. *Progress Report 2014 Solar power scientific report on behalf of the Federal Ministry of Economy and Energy*. May 2014. Figure 14 (p. 25) and Table 4 (p. 27). Available at: https://www.bmwi.de/BMWi/Redaktion/PDF/XYZ/zwischenbericht-vorhaben-2c,property=pdf,bereich=bmwi2012,sprache=de,rwb=true.pdf Further, the report assumes solar operating costs are 1.5% of total development and construction costs.

[˟] Operational costs for small scale (c.30 kW) projects are estimated by the Fraunhofer Institute to be €35,000/MW per year. Fraunhofer Institute. *Stromgestehungskosten Erneuerbare Energien.* Studie. November 2013. Retrieved from: http://www.ise.fraunhofer.de/de/veroeffentlichungen/veroeffentlichungen-pdf-dateien/studien-und-konzeptpapiere/studie-stromgestehungskosten-erneuerbare-energien.pdf

[¬] The post-tax WACC formula is {gearing x interest rate x (1 – tax) } + { (1- gearing) x equity return}

[!] The Fraunhofer Institute reports equity returns for 500 kW+ projects of 8%. An equity of return of 10% is assumed.

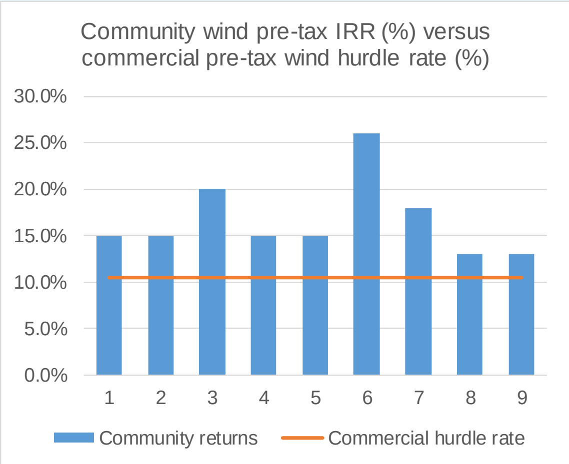
Appendix 8: UK Executive Summary, Policy Update and Cost Data

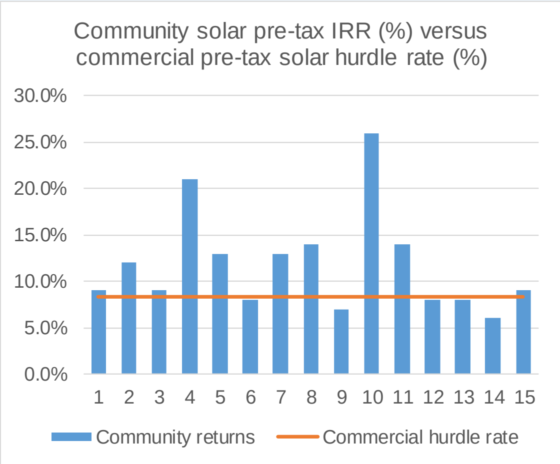
Executive Summary

This UK Case Study report presents the results of data collection and analysis of community and commercial wind and solar photovoltaic (PV) installations in the UK. It has been based on information available as at the end of June 2015 and does not refer to any policy changes that may occur after this date.

Cost Data Comparison

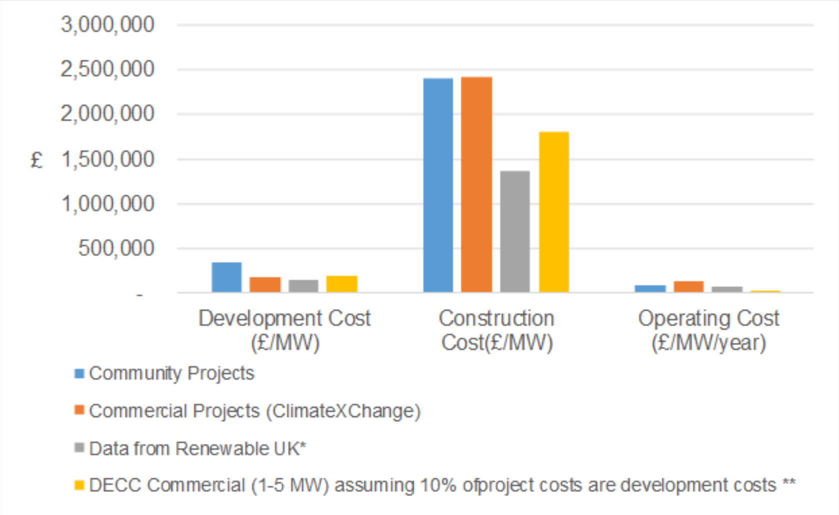
Through a combination of interviews and obtaining other data from recent community projects we have data for 26 community projects - 11 wind (two being shared ownership deals between communities and a commercial developer) and 15 solar PV - plus 11 smaller- and medium-scale commercial wind projects. Using the data on costs and income we have calculated the pre-tax pre-financing Internal Rate of Return (IRR) for each of the 24 wholly community owned projects, cognisant that as all the community projects were structured to have no corporation taxes their pre- and post-tax pre-financing IRRs will be the same. These returns are compared to the commercial hurdle rates, shown below:





This shows that for wind and solar technologies communities are selecting projects that will be profitable, with 19 of the 24 projects meeting or exceeding the commercial hurdle rates. There is a pattern of lower IRRs for some of the community solar projects, with five of the 15 not projected to pass the commercial solar hurdle rates. Therefore a case can be made that communities will sometimes invest even if returns are projected to be below commercial rates, for communities will invest for many other reasons (e.g. energy security, generating wider social benefits, etc.). This is more likely to be the case for smaller sub 50kW solar projects which can be easily replicated. Communities are also sometimes able to secure grants, which will boost the effective returns that can be made.

Comparing the 11 small to medium commercial wind projects with the community wind projects provides evidence that development costs, even excluding the ‘free’ professional time, will often be lower for commercial projects than community projects, but then backs up the hypothesis that community and commercial projects will have similar construction costs and similar operating costs, as shown below:



In conclusion, drawing together the community data we collected from our interviews and from other sources, and comparing it to data we obtained from the DECC review of Feed in Tariffs (FITs) and other DECC sources the main message is that development costs are higher for community projects, but operating and construction costs are not significantly different. This message needs to be nuanced though because the data we gathered for community projects spanned five years, and was still comparatively small.

Qualitative comparison

The main messages from the qualitative research are:

- Communities are often constrained in where they can develop their project, so will normally be developing renewable projects in sub optimal situations with lower wind speeds or less solar insolation, which to be profitable require grants, free time given by local community members, attractive loans, or to find other innovative ways to support the project, like selling the electricity at retail as opposed to wholesale prices to local consumers;
- Development costs (even excluding 'free' volunteer time) tend to be higher for community projects;
- Some community developers have done more than one project, and have been able to do the second project more quickly. This is significant because the quicker projects can be commissioned, the higher the FIT that can be secured, and therefore the more financially attractive community projects can be;
- Communities tend to be very risk averse, and are reluctant to invest community monies until there is certainty that the project will go ahead. This makes the raising of finance to get to the point of financial close when the project starts to be built very challenging, which is where development grants and attractive loans have been very effective;
- There is no evidence of higher construction or operating costs for similarly sized commercial and community projects.

Whilst there is evidence of higher development costs which is supported by other research there are some costs that are lower, notably:

- All the community projects interviewed were able to structure their projects to be corporate tax free, therefore avoiding this cost;
- Many community projects interviewed raised some of their money from a community share offer. The effective interest rates on community share offers was between 4% and 5%, much lower than the hurdle returns required by commercial developers. The preferential tax treatment offered to taxpayers through various structures (e.g. EIS, SEIS and CITR) may be a key driver for the availability of funds at this low interest rate. However, even though the cost of equity may be lower, communities reported that commercial banks may sometimes charge higher interest rates or offer lower debt to equity ratios compared to commercial

developers. This means that the post-tax Weighted Average Cost of Capital is not that different for a community relying on a part debt/ part equity finance solution, compared to a commercial developer with a similar structure;

- There is also anecdotal evidence that on those projects that are part financed by a commercial bank and part financed by a government supported bank (e.g. the Scottish Government backed Renewable Energy Investment Fund (REIF)) that commercial lenders will offer terms that may be more attractive than those that would be offered to a commercial lender, granting this may be because the Government supported bank is acting as a junior lender, in effect significantly reducing the exposure of the commercial bank;
- Although the evidence is that community development costs are higher than those faced by a commercial developer the costs would have been even higher had volunteer time been charged for. Five communities said that without the volunteer time many projects would not have progressed. Two of the projects interviewed also benefited from a government funded development officer that avoided some additional project management costs;
- Some communities will own the land they develop the project on, but if they do not there is anecdotal evidence that communities often end up paying more to rent the land than a commercial developer could negotiate as a commercial developer will often be negotiating with a number of land owners in different locations to secure the best deal.

Conclusions

It is clear that community projects have much higher development costs – which may in part be balanced by lower costs of finance and lower operating costs. It is also clear that the community projects in the sample make acceptable investment returns – though this is a sample that was chosen to show real projects, and hence only shows successful projects.

From a policy perspective:

- The key Government support packages (the Community and Renewable Energy Scheme (CARES) in Scotland, the Rural Community Energy Fund (RCEF) and Urban Community Energy Fund (UCEF) in England and the Ynni'r Fro Programme in Wales) that offer development stage grants and loans are targeting a key barrier and are making a significant difference for community projects;
- Part of the higher cost of development is the longer timeframe as communities are democratic organisations that often take longer to make decisions and secure finance. This is reflected in current policy that offers community projects a longer construction period following preliminary accreditation for the FIT;
- At the point of financial close when finance to pay for building the project is released by financiers all the necessary consents will have been obtained, e.g. planning permission, lease arrangements and grid connections. If the future FIT cannot be contractually agreed before commissioning (e.g. with FIT pre-accreditation) financiers will be more reluctant to lend, and will need to run downside sensitivities of further FIT reductions and gather very strong evidence that the build will be managed professionally and quickly to mitigate risks.

  However, often before financial close deposits are needed to secure grid connections or to order wind turbines. This creates a real challenge as communities tend to have few (if any) cash reserves so finding money to pay for deposits before financial close very difficult. Lenders will be very reluctant to lend monies as at this point not all the consents may have been secured so there are many unknowns. Although some of the Government funds, e.g. UCEF and CARES, can be used to pay for grid deposits, there remains uncertainty about whether this is possible with RCEF and Ynni'r Fro loans. This is exacerbated by the fact that the loans available through each body are a maximum of about £130k-£250k, and geared towards detailed studies and securing necessary consents, rather than grid deposits.

  Deposits for turbines are not available as that would be viewed as State Aid, although in Scotland REIF is able to offer loans for turbine deposits.

  It is for all these reasons that long FIT pre-accreditation periods are seen by many communities as essential to give other financiers comfort around the tariffs (revenue streams) where communities need to pay deposits, so financiers can then focus their attention on making sure there is a clear plan to get projects operational in time;

- Although not so much a cost, but rather a revenue driver, there is anecdotal evidence that the costs for communities to be able to sell electricity directly to local consumers through a Licence Lite route often outweigh the higher electricity sale prices. Thought could be given to further reducing the costs for direct sale to consumers, especially for smaller scale generators who may want to sell electricity to local companies or residents;
- Income tax incentives for investors enable community projects to access lower cost finance, although it is questioned how effective community share offers would be without income tax breaks. Further, in terms of increasing wider community benefits, other policy options could be better placed to deliver benefits – as income tax incentives for investors will not target local or social issues;
- At a wider level, shared ownership could be a more efficient means of delivery of renewable energy and local economic benefits, though the investors would need to be local to ensure that local benefits are realised locally.

Brief update on policy developments since July 2015

Since July 2015 there have been five main policy developments:

- The Renewables Obligation for onshore wind will close a year earlier, from April 2016 rather than April 2017, with only projects that had planning permission, an accepted grid connection offer and land rights in place before 19 June 2015 being allowed to complete.[13] As most 100% owned community projects are sub-5 MW (and therefore reliant on FITs) this is unlikely to have much impact on the community sector, but has potentially stopped some shared ownership medium scale (5 – 50 MW) wind projects that were intending to commission after April 2016;
- The Contracts for Difference (CfD) scheme is replacing the Renewables Obligation with the second round CFD auction that was planned for the autumn 2015 being postponed[14];
- A consultation on major changes to the FITs was announced on 27 August 2015[15]. The Government responded on 17 December 2015 announcing a large reduction in the FIT rates, with the intention of closing the scheme for new entrants by the end of 2019[16]. Back solving the FITs with typical costs for wind and solar projects it can be seen that the only way smaller schemes will be able to be developed is if they are located in attractive locations which will be a mix of:
    - high energy resources, e.g. wind speeds above 7m/s on the west coasts of Scotland, Wales, Northern England and the Cornish peninsula, or in the sunny south coasts of England and Wales;
    - easy accessibility for installing equipment;
    - near to a cheap grid connection;
    - locations where a low land rental can be negotiated.

  Since May 2015 securing planning permission in many places may have become more difficult, as local authorities get to have the final decision on all sizes of projects, so the hunt for suitable 'optimal' sites will become harder. The only other way to find attractive sites is to find ways to sell electricity to locals at prices closer to retail prices, whether this is by going behind the meter (i.e. using electricity on site) or negotiating attractive deals;
- There was a consultation of FIT pre-accreditation, which resulted in a period from 1st October

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[13] Department of Energy and Climate Change. Renewables Obligation (RO) grace period for new onshore. October 2015. windhttps://www.gov.uk/government/publications/renewables-obligation-ro-grace-period-for-new-onshore-wind

[14] Eddie. DECC postpones next Contracts for Difference auction. 22 July 2015. http://www.edie.net/news/6/Contracts-for-Difference-CfD-2015-auction-postponed-by-DECC/

[15] Department of Energy and Climate Change. Consultation on a review of the Feed-in Tariffs scheme. 27 August 2015. Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/467074/Consultation_on_a_review_of_the_feed-in_tariff_scheme.pdf

[16] Department of Energy and Climate Change. *Review of the Feed-in Tariffs Scheme. Government Response*. 17 December 2015. Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/487300/FITs_Review_Govt__response_Final.pdf

2015 – 8th February 2016 where pre-accreditation is suspended;

- The Government has announced that income tax breaks (e.g. the Enterprise Investment Scheme, Seed Enterprise Investment Scheme and Venture Capital Trusts) for all RES investments (whether community or not) will end on 6 April 2016.[17] The explanation to the draft 2016 Finance Bill then states that "*it is intended that these energy generation activities will also be withdrawn from the Social Investment Tax Relief when this scheme is enlarged at a later date*."[18]

The implications of all these changes are that opportunities for new community ventures have reduced, but there is still potential if communities are located near these good locations, or can find ways to sell electricity generated at prices closer to retail prices. Likewise, opportunities will continue to exist for partnerships and shared ownerships solutions with commercial developers on well located sites, although this pends the second round of CfDs.

Further, as the community share offer market has expanded communities have been able to secure larger amounts of money from these share issues, which are often cheaper than bank debt. Therefore, if the removal in the various income tax breaks does not significantly impact the sector too detrimentally and community share offers of £1 million+ can be successful the indications are that the future of community energy in the UK may become smaller scale (e.g. sub 250kW rooftop solar projects and sub 1.5 MW wind turbine projects) with a proportion if the electricity being generated by these smaller assets being used on site, or sold to locals if licensing rules for selling electricity are relaxed, for at the moment small generators are still finding it too costly to try to arrange deals to sell their electricity at prices closer to retail electricity prices.

[17] HM Revenue & Customs and HM Treasury. *Draft Clauses & Explanatory Notes for Finance Bill 2016*. 9 December 2015 RC. Explanatory Note Clause 6: EIS, SEIS and VCTs: exclusion of energy generation. Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/484216/Draft_explanatory_notes_clause_6.pdf

[18] Ibid.

Figure 20: Additional commercial UK data: Wind

	International UK data ($)	International UK data (£) at £1 = USD $1.55 exchange rate	Additional UK data (£)
Development costs (Currency/MW)	$187,000 ˘	£120,650 ˘	£149,598 *
Construction costs (Currency/MW)	$1,687,000 ˘	£1,088,400 ˘	£1,360,053 *
Operational costs (Currency/MW/year)	N/A	N/A	£68,557 *
Typical debt: equity ratio	N/A	N/A	70% ≈
Cost of debt (%)	N/A	N/A	6.5% ≈
Length of loan (years)	N/A	N/A	15 ≈
Cost of equity (%)	N/A	N/A	17.4% [a]
Tax rates (2015)	20.0% °	20.0% °	20.0% °
Post-tax weighted average cost of capital	N/A	N/A	9.2% [a]

Sources:

˘ IRENA. *Renewable Power Generation Costs in 2014*. January 2015. Table 4.3 which has total installed costs ($/MW) for the UK. Further, Figure 4.1 shows that development costs are typically 9%-13% of total project cost. An assumption of 10% is made.

° 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx

* RenewableUK. *Onshore Wind: Economic Impacts in 2014.* April 2015. Tables 1, 4 and 8. The total development and construction cost of £1,509,651 is close to the central point £1,600,000 estimate for 5 MW+ windfarms in Department of Energy and Climate Change. *Electricity Generation Costs: 2013.* July 2013, p. 60. The RenewableUK report relied on analysis by the consultancy Biggar Economics. However, the operational costs in the DECC report at £44,610 is lower than the RenewableUK report.

[a] Department of Energy and Climate Change. Electricity Generation Costs: 2013. July 2013, p. 50 reports a pre-tax real weighted average cost of capital of 8.3% for projects commissioned with Renewable Obligation Certificates. Assuming inflation is 2% that equates to 10.5% pre-tax weighted average cost of capital. To convert to a post-tax number there is a need to multiply by the technology specific Effective Tax Rate (ETR) which for onshore wind is 12% (Department of Energy and Climate Change. *Electricity Market Electricity Market Reform. Review of effective tax rates for renewable technologies.* July 2013. p.29) to give a post-tax weighted average cost of capital of 9.2%. As the debt equity ratio is 70:30 and debt costs 6.5% this equates to a cost of equity of approximately 17.4% (Equity return= [1- gearing (70%)] x [Post tax WACC (9.2%) – { gearing (70%) x interest rate (6.5%) x (1 – tax (12%)})

≈ Department of Energy and Climate Change. *Electricity Market Electricity Market Reform. Review of effective tax rates for renewable technologies.* July 2013. p.39.

Figure 21: Additional commercial UK data: Solar (<1 MW)

	International UK data ($)	International UK data (£) at £1 = USD $1.55 exchange rate	Additional UK data (£)
Development costs (Currency/MW)	$120,000 [˘] [a]	£77,400 [˘] [a]	£1,000,000 for development + construction combined [!]
Construction costs (Currency/MW)	$2,280,000 [˘] [a]	£1,471,000 [˘] [a]	See above
Operational costs (Currency/MW/year)	$48,000 [˘] [*]	£31,000 [˘] [*]	£22,600 [!]
Typical debt: equity ratio	N/A	N/A	70% [≈]
Cost of debt (%)	N/A	N/A	6.5% [≈]
Length of loan (years)	N/A	N/A	15 [≈]
Cost of equity (%)	N/A	N/A	11.0% [═]
Tax rates (2015)	20.0% [°]	20.0% [°]	20.0% [°]
Post-tax weighted average cost of capital	N/A	N/A	7.3% [═]

Sources:

˘ IEA. *Technology Roadmap. Solar Photovoltaic Energy.* 2014 edition.

a Based on Ricardo Energy & Environment studies, development costs make up approximately 5% of total cost of installation. This covers feasibility work, planning permission and other related development costs.

* The international operating costs were sourced from a UK report by DECC. *Electricity Generation Costs 2013*. July 2013, p. 66. The DECC report states operational and maintenance costs are approximately 2% (per year) of total cost of installation for large scale solar PV installations. Operation and maintenance costs include inverter replacements (approximately every 7-10 years), ongoing installation project management, insurance, cleaning and basic repairs.

! DECC. *Electricity Generation Costs 2013.* July 2013. p.66. The £ sterling actual numbers for combined UK large scale (5 MW+) solar development and construction costs are given, as are the actual number for operations costs.

≈ Department of Energy and Climate Change. *Electricity Market Electricity Market Reform. Review of effective tax rates for renewable technologies.* July 2013. p. 39 gives a typical debt equity ratio for onshore wind as 70:30 and 15 year loans at 6.5% interest rate. Similar values are assumed for solar.

═ Department of Energy and Climate Change. *Electricity Generation Costs: 2013*. July 2013, p. 45 reports a pre-tax real weighted average cost of capital for large scale (5 MW+) solar projects that rely on Renewables Obligation Certificates of 6.2%. Assuming inflation is 2% that equates to 8.3% pre-tax weighted average cost of capital. To convert to a post-tax number there is a need to multiply by the technology specific Effective Tax Rate (ETR) which for solar is 12% (Department of Energy and Climate Change. *Electricity Market Electricity Market Reform. Review of effective tax rates for renewable technologies*. July 2013. p.31) to give a post-tax weighted average cost of capital of 7.3%. As the debt equity ratio is 70:30 and debt costs 6.5% this equates to a cost of equity of approximately 11%.

° 2015 corporate tax rates are sourced from KPMG's Corporate Tax Rate Tables available at http://www.kpmg.com/Global/en/services/Tax/tax-tools-and-resources/Pages/corporate-tax-rates-table.aspx

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