CARES Toolkit: Local energy supply

LOCAL ENERGY SCOTLAND

Module structure

The CARES Toolkit is intended to be used as a reference by CARES clients of all kinds, including community groups, community-based businesses, and rural businesses. This module is one part of a series of documents forming the CARES Toolkit and is designed to cover all sizes of project, although the scale and complexity of multi-MW projects may require more detailed evaluation than smaller projects. Other modules that may also be of particular interest to those reading this module are as follows:

- Establishing a community group
- Project finance
- Procurement
- Securing the site
- Grid Connection
- Individual technology modules.

As the renewable energy market across Scotland changes, with reduced Government support, and higher grid connection costs, community groups must look to new more innovative ways to develop community renewable energy.

This module provides guidance on different business models that might enable a project to deliver a grid connection between generator and consumer, secure additional revenue from the sale of electricity and provide the greatest community benefit. This includes information on different commercial arrangements for selling power, for example, through selling directly to communities through a White Label agreement with a supplier, or even siting a project close to a commercial load and selling power through a private wire to a customer on a long-term contract.

This module is structured in seven parts to act as a guide and reference document for CARES clients in the development of community renewable energy projects in Scotland.

Background

A background as to why local energy supply needs to be considered for community renewable energy projects.

Distributing electricity to consumers

A brief introduction to electrical connections.

Supplying electricity to consumers

An overview of the basic business model available to community groups and the smart export guarantee.

Alternative supply models

A more detailed look at different supply options which are potentially available to community groups.

Battery storage

An introduction to maximising income through Energy storage options

Finding the best option

An overview of the considerations that community groups should make whilst choosing their business model.

Further information

Appropriate links, definitions, and references to other information, collated for quick reference.

Background

The end of the Feed-in-Tariff (FiT), and the closure of the Renewable Obligation Certificate scheme (ROCs) means there is an increasing need for renewable energy projects to revaluate how the electricity they produce is sold to the wider market, and what the cost implications of connecting to the electrical grid are on the financial viability of the project. Today, across large areas of Scotland the existing electrical grid is constrained and without significant works cannot accommodate increases in generation capacity, which means for many community groups an expensive Schedule of Works to allow connection to the grid and a lengthy connection date.

There are an increasing number of different ways that renewable energy project scan be commercially structured and technically designed to be financially viable. To improve financial viability the community group may want to consider alternative revenue streams due to the end of the FiT and UK Government set export tariff rate, and an expensive connection or constrained grid availability.

Distributing electricity to consumers

The electricity network comprises two linked systems: transmission and distribution.

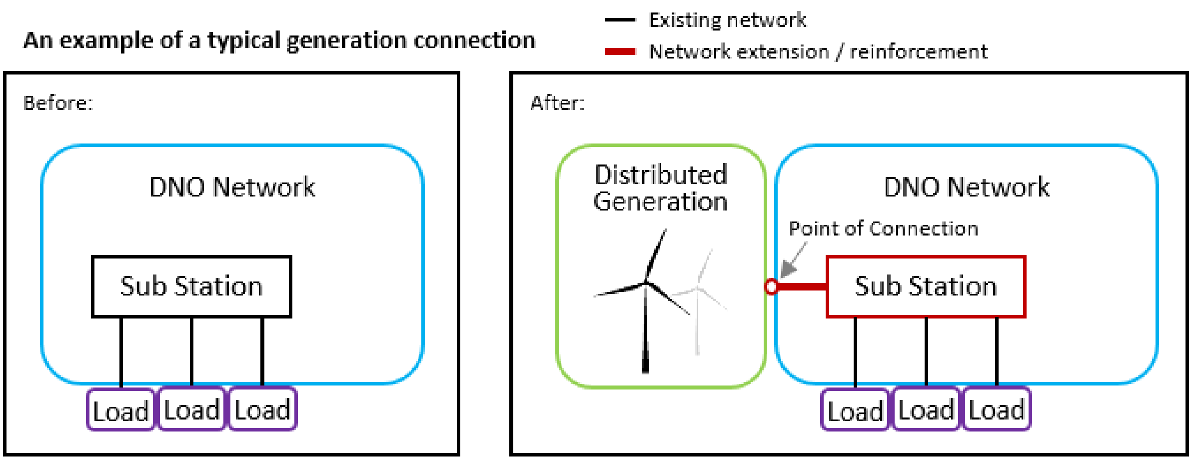
Electricity transmission transports electricity over long distances across the country at a high voltage to reduce losses. The transmission network includes network at 400kV, 275kV, and (in Scotland) 132kV, and is owned and operated by the Transmission Owners (TOs).

Electricity distribution takes power from the transmission network and distributes it to consumers. The voltage is reduced to the correct supply voltage for the loads. In England and Wales, these networks operate at 132kV and below. Most residential customers are supplied at 230V, whilst some larger consumers may have a 3-phase 415V supply or higher. These networks are owned and operated by licenced Distribution Network Operators (DNOs – Scottish and Southern Energy Networks and Scottish Power Energy Networks) who are each responsible for the network within a geographic area.

In a traditional power system, large power stations feed into the transmission network, and the electricity is then transported to the distribution networks. The distribution networks carry the electricity to loads, such as homes and businesses. However, increasing numbers of distributed generators are connecting directly to the distribution network.

Any community that is considering installing a renewable energy scheme is likely to connect to the distribution network, rather than the transmission network. Therefore the DNO will be the main point of contact for connection. In Figure 1, the generation is connected to the DNO network via a (hopefully short) network extension, and local substation may need to be reinforced (for example with a larger transformer). Note that in some cases, equipment further up the network may also need to be reinforced.

Figure 1: A typical renewable generator grid connection



A number of technical standards govern the requirements for grid connection. These standards serve several purposes, including:

- to ensure that the generator will be able to operate safely on the network, and will not cause any issues with network protection or power quality (such as voltage level and frequency), and
- to protect the generator from any faults that may occur on the distribution network.

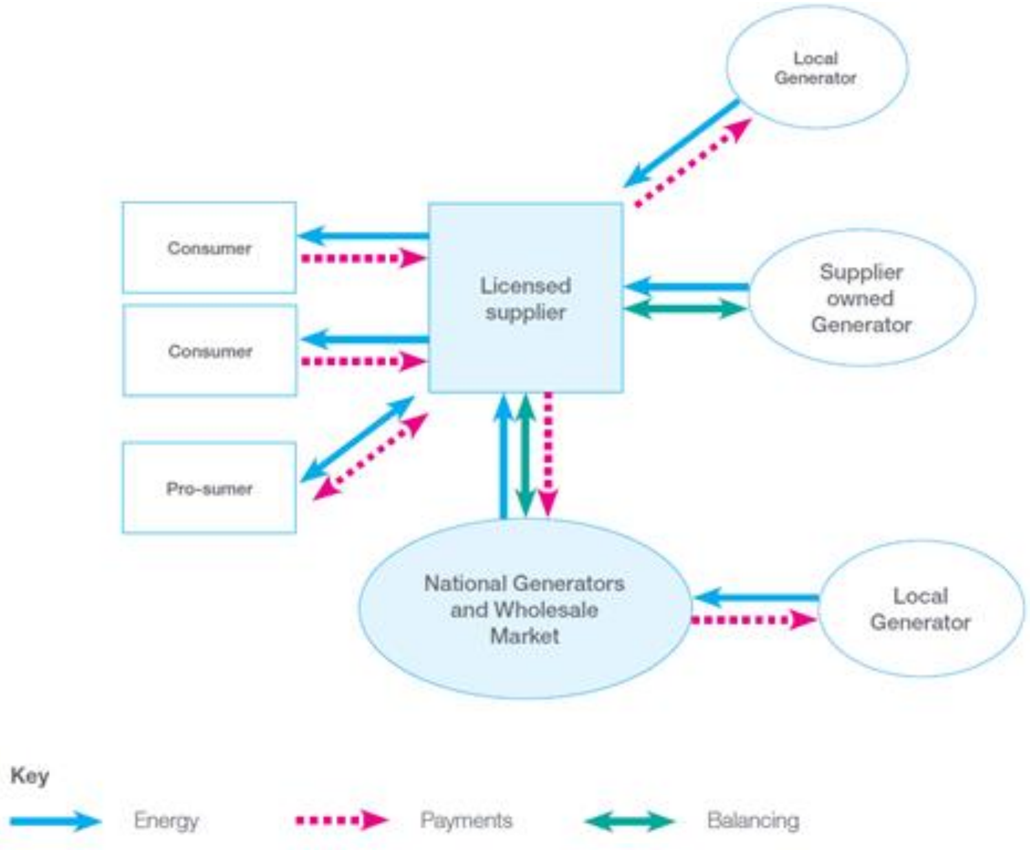
The processes used for connection of embedded generation depend on the size of electricity generator and falls under two sets of Engineering Recommendations (EREC);

G98 and G99. For further details on this and further information on applying for a grid connection, please refer to the Grid connection module.

Supplying electricity to consumers

Figure 2 shows the conventional supply model. The consumers are shown being supplied by a licenced supplier via the distribution network and the licenced supplier being paid in return. Within this model the generator supplies the licenced supplier and is in turn paid for the Electricity supplied. The Electricity produced by the generator is not directly supplied to the consumer as it enters the wider distribution network.

Figure 2: Traditional business model for the supply of electricity
(Source: Local Electricity Supply: Opportunities, archetypes and outcomes – Dr Stephen Hall and Dr Katy Roelich)



Historically the business model for community renewable developments, less than 5MW in capacity, was for the electricity produced to be exported the grid and receive the standard FiT Generation Tariff (appropriate to the technology and size) and FiT Export Tariff (fixed across all technologies and sizes). Previously this model worked well for all technologies across a range of scales as the level of incentives available ensure the financial viability of the projects.

The FiT closed to new applications on 1 April 2019 which has changed the way in which generators can supply energy to consumers; what were alternative supply models have now become the new normal.

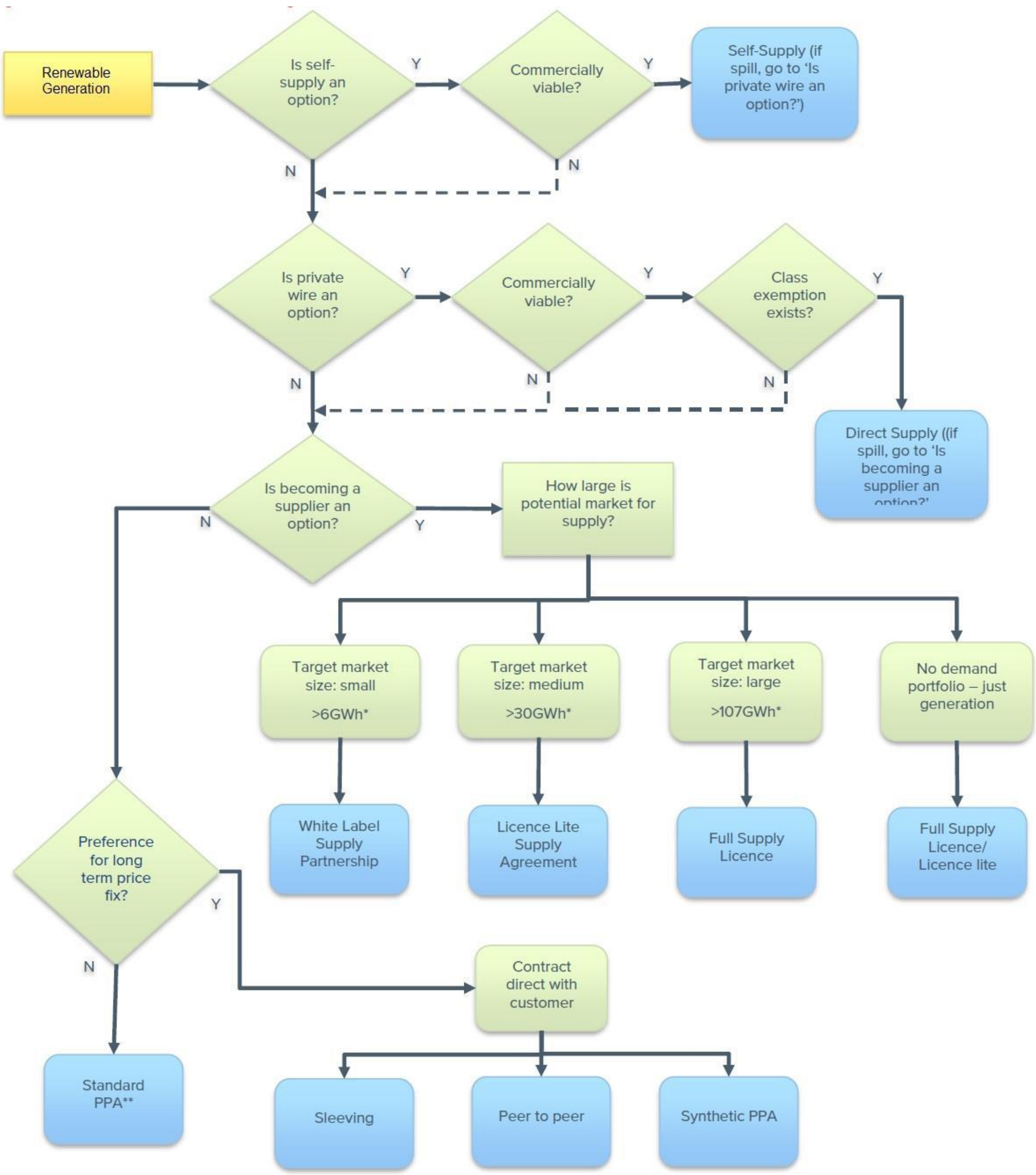
Supply Models

Supply Options

The electricity market includes organisations that generate, distribute, or supply power to consumers. To get more value from electricity, these organisations can provide more than one of these services.

The codes and standards for generating electricity are different from those for distributing or supplying electricity. Selling electricity to customers is a heavily regulated activity through the licensing regime run by Ofgem.

Figure 1: Decision tree for routes to market[1]



The decision tree shown in Figure 3 lists the wide range of supply options available to renewable generators, not all of the supply options will be suitable for communities as the generation level required is too high, ie Licence Lite and Full Supply Licence.

[1] Cornwall Insights / Lux Nova, (Heat Network Electricity Revenues and Licensing Guidance, published 8 Nov 17)

Energy Supply Pricing

Generators sell to suppliers at a wholesale price (in 2020, this averaged 2pper kWh) and suppliers sell to customers at retail prices (in 2020, ranging from12 or 24p for domestic customers). The retail price covers the costs of additional services, shown in Table 1. Costs will vary by size of customer, and over time (for example, in 2017 Ofgem is reviewing how the Distribution Use of System is charged).

Table 1: Indicative elements of a typical total electricity retail price

Element	Price (p/kWh)	% of total
Charge for electricity	4.8	46%
Distribution Use of System	1.8	17%
Transmission Use of System	0.7	7%
Balancing Services Use of System Charges	0.4	4%
Losses	0.2	2%
Supplier margin and metering charges	1.0	9%
Levies (CfDs RoCS Green Deal)	1.0	9%
Climate Change Levy	0.6	5%
Indicative for a small /medium commercial user	10.5	

Selling electricity to customers is a regulated activity, Table 2 shows a number of ways to meet the regulatory requirements. In some cases, this requires a specific supply licence, however in others there are no license requirements. Each of these options is then described in more detail below.

Table 2: Alternative business models for the supply of electricity

Model		Summary
Self Supply	Onsite use	The energy generated is used to offset the consumption on the same site or via a private wire but owned by the community/generator.
Option 1	Standard PPA	The customer is a Licensed Supplier. All licence obligations are fulfilled by a Supplier who charges a margin to do this (prices will be comparable to wholesale energy prices)
Option 2	Virtual Private Wire (wheeling, peer to peer or sleeving)	The customer is a single site (or corporate group) and the customer and generator have to have a contract with the same Supplier. This approach provides some savings against Use of System Charges (process would be comparable to wholesale market prices plus a small amount, likely to less than an extra 1ppkWh

Option 3	Synthetic PPA	A synthetic PPA is a price arrangement between the generator and energy customer, this secures a long-term energy price and is a financial agreement rather than the sale of energy between parties. A further PPA selling the energy is required to export the energy to market.
Option 4	Direct Supply/ Private Wire	The customer is a single site and there is no intermediary, but they have to be physically close enough to connect directly. This approach provides the highest level of additional benefit available, and usually over the life of the generator, meaning the indexing method needs to be agreed, but best indexed to wholesale electricity prices. However there are additional costs to conclude a more complex legal agreement and install connection.
Option 5	White Label	The customer is a licenced supplier, with the licensed supplier fulfilling all the regulated functions. The electricity is sold to customers directly on behalf of the generator and charges a margin for this.
Option 6	Licence Lite	Licence Lite allows the generator to obtain a licence to sell directly to consumers. This is hard to achieve because of the license conditions. Only worth it if a generator has many customers (and possibly owns and operates more than one generator or more than one type of generator with a different generation profile)
Option 7	Full Supply Licence	Full supply licence sets up the generator as a fully commercialised supplier, competing with the big six suppliers. This requires all activities associated with a full supply licence to be undertaken meeting all industry codes and conditions.
Option 8	Unlicensed Supply	A license exemption has yet to be granted in the UK by the Secretary of State, but there are operators who are operate under the class exemption because of their size. This option is viable where the generator has the potential for many customers.

Option 1 Standard Power Purchase Agreement

One option that generators have is to sell power via a Power Purchase Agreement (PPA) which some (often larger) schemes already do. A PPA, or offtake agreement, is a contract between the owner of the generator of the electricity (the seller) and the purchaser of the electricity (the supplier). Agreements can typically run from 3 months to 20 years or more, though in most cases contracts are 1-3 years. There are a range of PPA products that can be broadly classified as shown in Table 3: Power Purchase Agreement (PPA).

Table 3: Power Purchase Agreement (PPA) Structure Options (DECC, 2013)

Structure	Summary
Tolling Agreement	The independent generator is paid an agreed fee for making the generation plant available to the offtaker (the supplier) for the purposes of generating Electricity.
Fixed Price/Floor	The independent generator agrees to supply all power generated by the plan and the offtaker (the supplier) agrees to buy that power and pay a fixed price or a minimum, price per unit output.
Route to Market	The independent generator agrees to supply all power generated by the plant and the offtaker (the supplier) agrees to buy that power and pay the prevailing market price (less a trading fee) for each unit of output.
Trading Style	The PPA provider/offtaker (the supplier) agrees to manage and sell the power produced by the independent generator, and to allow the generator to hedge price risk by contracting future positions.

The PPA is a contractual agreement to buy and sell electricity, so the rates and terms of the contract will change from supplier to supplier. It is good practice to negotiate and call a number of different suppliers when looking to secure a PPA in order to obtain the best rates possible. Details of companies and organisations that are known to seek PPA's are in the 'Further Information' section.

These organisations specialise in placing power derived from renewable energy schemes with customers who value it for example as part of their corporate responsibility policy.

Further information on this is available in our Guide to Power Purchase Agreements; ask your local development officer for information.

How does it work?

PPA providers will usually handle all the administration associated and will provide a tariff to the generator. Most PPA providers offer a range of products based on different contract lengths. This gives the generator the option to 'lock in' to a provider and a tariff for a short or long period and to switch PPA providers in response to changing market conditions.

How this is implemented

To obtain a PPA the community group should first consult with their finance provider, to establish any potential issues with contract length or security. The finance provider may be averse to greater price risk, but many larger schemes use this route, so lenders will be familiar with this option.

If the finance provider agrees that the community group can pursue the PPA option, they may insist on some specific requirements being met. These are likely to include due diligence on:

- the mechanism for selecting the best PPA and for reviewing PPA performance relative to market conditions in the future

- the PPA provider, especially for smaller providers who may also be offering the best tariff
- Independent review of the contractual basis on which the PPA is offered
- the payment terms
- contract length
- a risk assessment.

Option 2 Virtual Private Wire and Virtual Private Networks

Approaches are being developed that seek to maximise benefits to community owned generators whilst allowing savings to be made by local consumers without the cost of installing wires.

Virtual Private Wires has in the past also be known as 'Wheeling', or 'Sleeving', but both terms can have several meanings. Virtual Private Wires allows generation on a site in any given half hour period to be offset against the consumption of another site (or group of sites). This will therefore still require the involvement of a licenced supplier (and the same supplier for both the generator and consumer) to cover the regulatory issues around the Balancing and Settlement code.

In a **Virtual Private Network**, the metered volumes from participating generator and consumer connected to the public network could be aggregated to create a single Virtual MPAN (Metering Point Administration Number). The imbalance of demand and supply is no longer the individual sites, but the aggregate electricity flow of the participants. A well-balanced scheme could minimise the exposure to transmission network charges, balancing services charges and transmission losses (perhaps 1-2p/kWh depending on whether the customer was commercial or domestic). In such an arrangement, there would be set up costs.

Using a Virtual Private Network allows retail competition to be maintained and allows each customer to join or leave the scheme. As different technologies generate power at different times a well-balanced scheme may include more than one type of renewable energy technology, like solar and wind, or solar and hydro. Such schemes have, to date, been developed with residential customers, who alternatively would pay a higher retail price than commercial customers, and so could save more with local energy supply. Non-domestic customers have different load profiles, higher consumption, and pay less for retail electricity, but already have half hourly metered consumption. Schemes have not yet been implemented for non-domestic customers.

Case study Virtual Private Network

In a conventional PPA agreement, Ynni Ogwen sold at less than 5p/kWh whilst at the same time local residents were buying electricity at retail prices two or three times higher. The Ogwen community is not getting the full benefit of the local generation. With Energy Local, the community wanted to try a new system. Participants have formed an Energy Club, Cyd

Ynni – Ynni Lleol. Working with the energy supplier, Cooperative Energy, each participant has had a smart meter installed to show when they are using power, as well as how much power they are using. The system thus knows whether they were using power when the hydro was operating; Cyd Ynni – Ynni Lleol have agreed residents will pay 7p/kWh, so the benefits are shared locally, - the hydro gets more income than they would through a PPA, and participants get lower bills than buying from a supplier.

Cooperative Energy sells participants the balance of power not generated locally, and for this balance, charges different prices at different times of day – more expensive at tea-time, but cheaper at lunch time and during the night. There is an incentive for householders to shift their electricity demand to when the hydro projects are generating.

Option 3 Synthetic PPA

A synthetic PPA is typically administered as a contract for difference (CfD), where the renewable generator and a consumer are entering into an agreement securing the price of power sold and bought. This is a financial arrangement separate to the PPA arrangement which sells the energy generated, and the purchase agreement a consumer would enter. As with a typical CfD arrangement the synthetic PPA price can fluctuates (up and down) with the market energy price.

Option 4 Private wire supply

Electricity produced by a generator can be sold to a specific customer or customers using a dedicated private wire physically linking these customers to the generator.

How does it work?

A physical connection is created between the generator and end user, this can be installed as a retrofit to existing projects. Depending on the length of connection this process can potentially be costly. Table 4 details an estimated associated with a private wire connection. This cost can be equal to or higher than a standard grid connection, the costs can be potentially shared between the generator and user.

Table 4: Costs of Private Wire Connection

Private Wire Connection Requirements		Typical Cost
Switchgear	Customer side switch, at the voltage produced by the generator	Estimate £5k
Transformer		Estimate £12k
Connection	Connection is cost dependent on distance as well as civils works. Simple costs are: • £40/m for cable • Trenching cost estimate around £30-50/m soft dig and £90-120/m for roads • Wayleave agreements (legal and rental payments).	Assume by way of illustration 1000m *£120/m = £120k
Switchroom	A commercial site may already have an existing switchroom. Whilst many configurations are possible, the most likely option is two ring main units, one at each end of the connection. RMUs can easily be controlled by SCADA to integrate with generator operation.	Each Ring Main Unit (RMU) is around £15k, so total £24-30k.
Exporting	Export Meter	Estimate £15k
Ancillary connection requirements	Potential costs include design fees (£5k), surveys (including routes and earthing studies) (£5k), mobilisation (£5k), documentations (£1k) and project management (£5k).	Estimate £21k
Contingency	Contingency is difficult to estimate. There are lots of causes of uncertainty for a conventional grid connection that also apply here such as difficult ground conditions. Additional forms of uncertainty include cost of Wayleaves if the route crosses land not owned by one of the parties to the project; and reconfiguring the customers grid connection to allow export	Estimate 20%
Legals	A PPA needs to be agreed over a long period of time, and which includes access to export to the grid if the site does not take power, and a mechanism to inflate prices compared to Electricity price inflation.	Estimate £25k
Total in this instance around £250k, but this is dependent on-site specifics including voltages, distance to connect to site, arrangements within the site, legal costs and any network reinforcement needed.		

The customer will then pay an agreed tariff direct to the community groups for the electricity supplied by the scheme.

The community group will need to raise (or share the cost of) the additional finance required to pay for a private wire network to be installed, the potential costs can potentially be offset against the value of the increased revenues that will result.

How this is implemented

To be the most advantageous for the community group private wire power purchase agreements should normally be the same length of time as the planning consent of the project.

if the contract is shorter, then the lenders or investors should discount any benefit beyond the length of the contract, and in this case, any additional costs must be repaid over a shorter period.

The savings between the retail price and the generation price can be shared between generator and consumer in whatever form is agreed within the PPA.

Over the longer period covered by a private wire PPA, electricity retail price inflation is likely to be significantly above general inflation, and the contract will thus require an arrangement to index link power prices in some way. Using CPI or RPI would benefit the consuming site across a long-term agreement. To make this fairer for the generator pegging the contract price to the price of power in other electricity supply agreements to the site.

The customer should be a sound counter party to a long-term agreement, otherwise, if a lender doubts the security of the agreement, future benefits may be significantly discounted back to the wholesale price of power (making sure that in extremis power could still be exported to the network). Water companies, public sector organisations, or companies in a large commercial group make good counter parties. On the other hand, such companies often have a significant purchasing power and can pay less for power than smaller companies. There is some evidence that lenders generally require an offtaker to have a BBB credit rating[2].

A development which is located nearby to potential industrial users, or near to an identified user will potentially benefit the development both in reducing the private wire costs and by influencing other development factors, and thus should be a consideration in site selection from the start.

Other factors that could be influenced are:

- Workers at the site served could form a community of employees to work with a community of residents (though such sites can also be near to communities which, if not directly involved can become a source of organised opposition).
- Planning consent is often easier in a landscape which is already heavily influenced by human activity, both in terms of landscape and impacts on amenity. Industrial and commercial sites also tend to have good existing road access for construction.

[2] Something to be considered in the initial design process is the voltage at which customers are supplied, relative to the voltage at which the electricity is generated. The cost of additional transformer technologies must be assessed on a site-by-site basis and an estimated cost for this is provided in Table 4.

Where there are existing developments, or a development which is already approved but not yet finalised, there is a potential high electricity user nearby retrofitting private wire might be a viable option to bolster existing revenues. When considering private wire as a local energy supply option it is important to liaise with potential financial providers to ensure the commercial model will meet with lending criteria. It may be that for new developments, the option of private wire is integral to the financial and physical design of the scheme and may influence site selection from the beginning of the design process.

Sale of electricity by private wire: case study

Whilst not a community scheme, the Michelin tyre factory in Dundee has two wind turbines owned by Ecotricity and installed in 2006[3]. The turbines are 2MW each (around £4m investment) and have a hub height of 85m and a rotor diameter of 71m (overall height 120.5m). Power is sold by Ecotricity to Michelin in a private wire PPA.

Option 5 White Label

The next three models each allow export to more than one site or customer by the generator, via the distribution network. Of the three models, a ‘White Label’ supplier model is simplest with Licence lite and unlicensed supplier options being more complex due to the regulatory commitments.

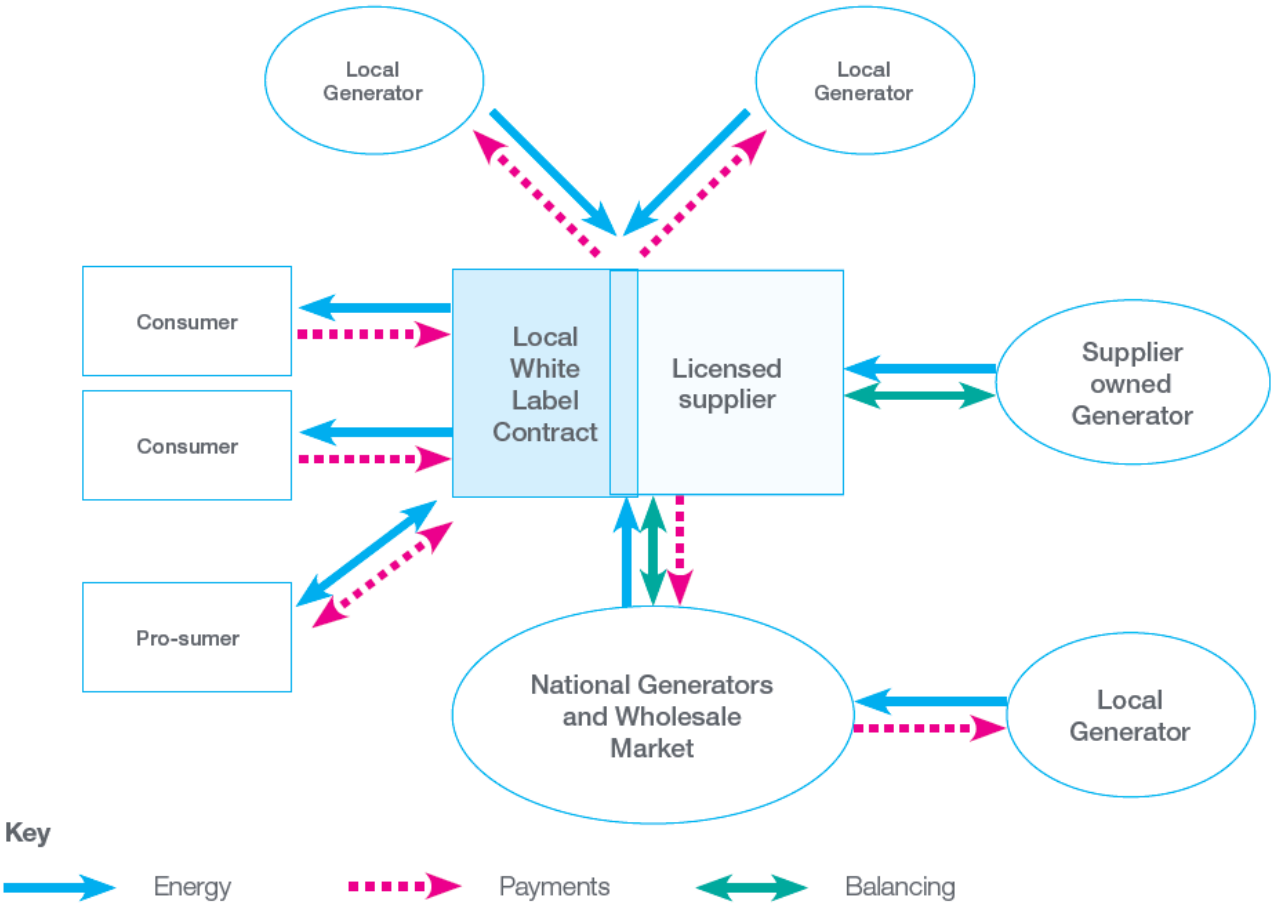
How does it work?

The White Label supplier (the community group) works in partnership with a Third Party Licenced Supplier (TPLS) who provides back office services, metering and compliance with industry codes. Meanwhile, the White Label supplier (the Community) acts under its own brand, offering their own tariffs and setting up their own marketing strategy and target customers.

There are many different kinds of TPLSs who may be interested in such partnerships, such as OVO (Community Energy Hub), Good Energy, Octopus or Eon. Figure 5 details the relationship between the generator, supplier and consumer.

[3] Wind turbines at Michelin, Dundee pass milestone – Ecotricity

Figure 6: White Label business model (Source: Local Electricity Supply: Opportunities, archetypes and outcomes – Dr Stephen Hall and Dr Katy Roelich)



A case study of White Label electricity provision

Ovo Energy partner with a number of local groups. These partnerships are focused to a significant extent on reducing costs to alleviate fuel poverty as much as benefit new renewable energy projects.

White Label partnerships include:

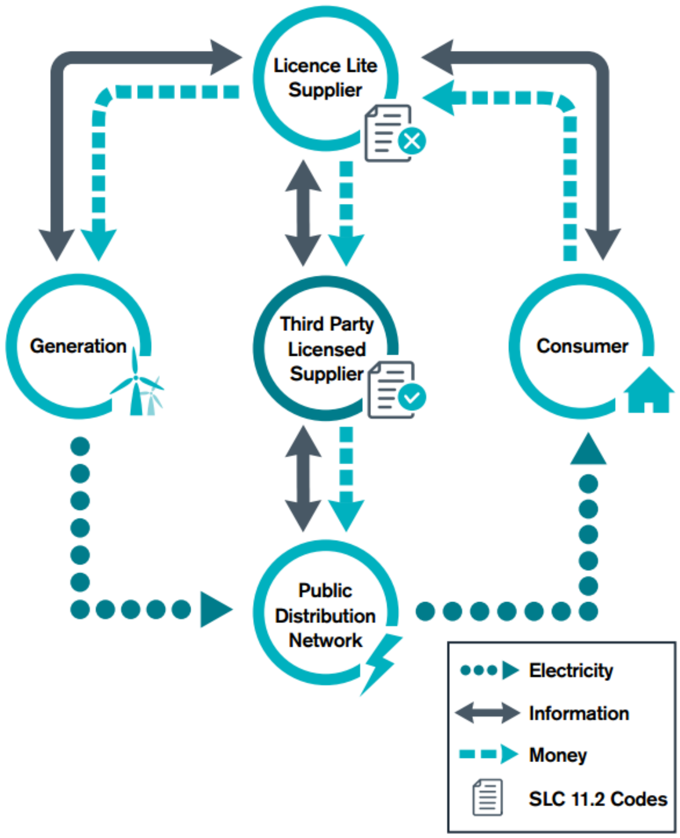
- **Fairerpower –** This white label option is available in Cheshire East region. Profits taken by Cheshire East Council for this initiative, are re-investing it to ensure the scheme is helping people who need it most, the scheme is available to all postcodes in the Borough.
- **Peterborough Energy** – This has been created in partnership with Peterborough City Council to help reduce fuel poverty in the region. Available to all postcodes within the Peterborough City Council boundary.

- **Southend Energy -** This is available to residents through a partnership with Southend-on-Sea Borough Council to try to tackle fuel poverty in the borough, and is available to all residents within the Southend-on-Sea Borough Council boundary.
- **EnergySW** - This white label option is available to residents in the South West of England through a partnership with social housing consortium Advantage SW to allow social housing tenants and their neighbours access to competitively priced, fairer electricity.

Option 6 - Licence Lite

Licence Lite was created in 2009 by the UK Government in order to allow small generators and communities to become licenced suppliers without the need to comply with certain industry code obligations. Although the industry codes will still have to be met, the Licence Lite supplier will partner with an existing TPLS who will provide the services required to meet the codes. This arrangement is illustrated in Figure 6. This is harder to achieve than the White Label arrangement in that the Licence Lite supplier will be required to comply with some of the industry code obligation.

Figure 7: Licence Lite scheme (Source: [Ofgem: An introduction to Licence Lite](#)).



There are currently no case studies or examples of this model. This option will only be applicable for a very few specific (and well resourced) renewable generators. The Greater London Authority was the first authority to apply for this scheme, but the process has suffered delays due to its complexity, GLA is currently exploring White Label energy supply[4].

Option 7 - Full Supply Licence

The full supply licence supply option requires the generator to gain a full supply licence. The generator must comply will all relevant industry codes and licence conditions, establishing dataflows with the national settlement systems. The generator will also be required to establish a brand, set up tariffs and infrastructure systems to interact with customers.

Establishing as a full supply licence supplier is complex and detailed process, which few companies or generators undertake. This process is unlikely to be a viable option for a community to bring forward due to the complexity and the required expenditure of gaining a full supply licence.

Option 8 - Electricity supply as an unlicensed supplier

Licences are required for any generator, distributor or supplier who wants to enter into the electricity market. However, there are some circumstances where the Secretary of State can grant an exemption from the requirement to hold a generation, supply, or distribution licence under the “Class Exemption Order” (The Electricity Order 2001 - Class Exemptions from the Requirement for a Licence[5]).

The Class Exemption Order was created to release generators, distributors and suppliers in those cases where the cost and the complexity of regulations formed a barrier for the development of certain technologies and businesses.

For example:

- Small scale generators who want to sell their output to local suppliers
- Industrial suppliers wishing to sell the excess electricity to local commercial or domestic consumers or public buildings, via a distribution network
- Operators of low carbon technologies wishing to operate their own distribution network and supply electricity to local consumers.

This exemption provides an opportunity for distributed small generators to sell the excess electricity to local consumers, without having to comply with the high technical and financially demanding requirements of a Licenced Supplier.

The licence exemptions covered under the Class Exemption Order 2001 include:

[4] Current News
[5] Electricity Licence Exemptions – Gov.uk

- Under supplier exemption, supply of up to 5MW throughout the public distribution network (of which no more than 2.5MW to domestic consumers)
- Under distribution exemption, distribution of electricity for supply that does not exceed 2.5MW, with a maximum of 1MW to domestic consumers.

Under this model, the price charged by the small generator would be close to the retail price, less the cost of using the local distribution network, charges for metering, and for system balancing. This will require contracts and payments to be in place with a licenced supplier who in return will cover compliance with the Balancing and Settlement code. It is important to note that there is no obligation on any licenced supplier to provide this service, so a community may need to seek out the best offer.

How does it work?

The generator can sell its power to a range of customers and will handle sourcing metering, billing and payment services. This option is only sensible if the development is large enough to supply multiple customers, or many households. Directly supplying commercial consumers is easier and less regulated than supplying multiple domestic consumers. This would allow opportunities such as setting up locally branded power in support of other ventures such as tourism or supply the local community.

How this is implemented

The generator must apply for the exemption to the Secretary of State. The community group would need to contract a licenced supplier, and to arrange for meter readings, billing, and cash collection. The generator will need to factor in provisions to cover overdue payments or to recover moneys owed if a default situation occurs. The value from the sale of electricity would in this model be closer to the retail price for the consumer. As with the previous model options, the finance provider must agree any new commercial model and their focus will may be on risk.

No generator has been granted an exemption by the Secretary of State, because generally the Government takes the view that the protections offered by licencing are important, but generators are operating without a licence because they fall under the class exemptions due to their size. However, the market is changing and the previous focus on schemes which achieve FiTs and ROCs may now turn to a focus on other ways to maximise value. The complexity of the regulatory system will require specialist regulatory and legislative advice, which comes at a cost. This route is only likely to be worth exploring for larger well-resourced generators, or for local authorities who wish to set up an energy supply business. That said there are other options, even for such organisations.

Battery Storage

An option which is becoming more available to the local energy supply market is battery energy storage, with technological advances making batteries more cost effective. Highly efficient battery systems are being developed to support the emerging electric vehicle market and has created the potential to store electrical energy at a range of scales. This opens up a number of new opportunities to generate income which many investors are now investigating.

A battery store should be located close enough to the site of the generator to utilise the same grid connection. The battery system is typically housed in a shipping container style enclosure. Since a battery can be considered both a source of load and a source of generation, the agreement of the grid connection and conditions of operation need significant discussion and agreement with the DNO to ensure that the connection and local network can accept this additional capacity.

Further information on this is available in the Storage Module.

How does it work?

The primary services and thus income streams from implementing battery storage alongside a renewable energy development include:

- **Frequency response** - When demand on the network is greater than supply, the frequency of the alternating current starts to fall, and when supply is greater than demand, frequency increases. National Grid (and increasingly the DNOS in a new role as Distribution System Operators) are buying services to balance demand and supply providing more stability to the network. Traditional approaches include gas fired power generation providing this function, or major users offering to take load offline. However, battery storage systems are ideally suited for this role as they can produce or take power with short response times. This approach is most suitable for medium to large scale developments.
- **Exploiting time of day tariffs** - There are periods in the day when power costs are low, and times when they are very high. Charging a battery at times of low price, to supply to a licenced supplier or customer at times of higher price provides a further income stream by 'arbitraging' between the two prices.
- **Overcoming export constraints** - In areas where the network is constrained and the proposed generation development will be limited by the size of the export connection, battery storage can be a useful solution. The storage medium can be used to absorb all power above the export limit for use during periods of lower generation and to avoid constraining the generator. Battery storage also has uses in off-grid situations where there is no grid to export to.

There are variations on these approaches, but different revenue streams under contracts with different parties can potentially be 'stacked' to provide an overall income compared to costs. Energy storage could be further combined with several of the options outlined within this module. The value of this approach is that the grid connection costs, or private wire costs, may not change significantly with storage and generation on the same connection, but the costs are being made to work harder by providing two functions.

The costs of batteries are falling, however at October 2017, storage options are only economically viable in very specific circumstances and are not economically viable at community scale.

How this is implemented

The community group will need capital to be raised to cover the cost of the battery, connections, metering, etc. The cost of this will vary depending on the scale of energy storage system selected. A minimum connection size is needed, Frequency Response services to National Grid Transco require a 33kV connection and 10MW minimum capacity, but the market is changing, and smaller schemes may be possible in future. The energy storage market is changing rapidly with both the cost of equipment and the value of services in flux.

The community group will need planning consent, grid connection, and commercial agreements for the battery container units. The size of the battery and thus the level of investment will be dictated by the added value of electricity sales. As with previous local energy supply models opportunities for operating an energy storage scheme should be discussed with financial providers. The support from lenders will likely be dictated by the market model being adopted, with the financier being risk averse.

Finding the best option

Each of these options are based on expanding the role of the community group from being a simple generator supplying electricity to the distribution network to offering a more technically complex, direct or storage-based supply method. The community group will have to manage an increased project scope, and depending on the supply option pursued, an additional project cost.

There is further scope for projects which have existing connections to add local supply options or through continued supply to a licenced supplier (eg Virtual Private Wire, or White Labelling approached). However, options such as private wire and storage are best designed in from the start because they may vary the location, design, and yield of a project; affect the costs, benefits and risks and hence finance of a project; and influence the design and planning consent.

The costs, as well as the benefits need to be explored on a site-by-site basis, to ensure project viability this should be done as part of the initial option appraisal, or in a new option appraisal.

In a market where the available tariffs are reducing or being phased out, with ROCs having already been discontinued and FiTs ending in 2019, new options may need to be explored to make projects viable. There has been and will continue to be significant innovation in this market, and this guide is but an introduction. If you have a project which may benefit from some of these arrangements, you may wish to discuss them with your local Development Officer.

Further Information

- For more information about typical network connections, see the Grid Connection Module.
- Further information can be found from REGEN SW though this may not be so appropriate to Scottish schemes.

More information on Power Purchase Agreements is available from:

- DECC
- EDF Energy
- Good Energy

More information on:

- OVO's community energy offer.

Communities that have looked at various options include:

- West Harris and Barvas, though at the time of writing this is yet to be implemented
- Isle of Hoy (at time of writing yet to report).