Renewable Energy Assessment

Report Description

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Contents

1. Executive summary

There are a number of challenges to delivering community-focused renewable energy generation within the Ffestiniog Valley area. These include constraints in connection in the local electricity network, and lack of suitable sites for community level schemes. This report has explored energy generation, generation potential, demand and business model approaches to new generation. This report should be read in conjunction with report P3705 Energy Capacity Study which considers local network constraints in more detail.

A number of business models for renewable energy investment in the Ffestiniog valley have been considered against key decision criteria. These have been produced based on input from stakeholders at a workshop held in February 2019 as part of this study.

These criteria are:

- Reasonable scheme payback period
- Total investment capable of being crowdfunded from local community
- Benefits local domestic consumers in fuel poverty
- Utilises local resources
- Achievable within local network constraints

Based on the options considered, the Energy Local model is the most appropriate means of delivering local renewable energy scheme within the Ffestiniog Valley, meeting all of our identified criteria.

Energy local model

Energy Local has designed a means to have a local market in power via Energy Local Clubs. This enables households to club together to show when they are using local clean power when it is generated. The scheme gives generators a better price for the power they produce, reflecting its true value more closely, keeps more money locally and reduces household electricity bills, potentially benefiting local households in fuel poverty by reducing their energy costs. This scheme has been trialled within North Wales at Bethesda.

Generators and demand are connected at the same voltage and local generation and demand are matched as far as possible, such that generation sent back upstream is minimised. This would not be seen as a major issue by SPEN. Engagement with SPEN would nevertheless be important to bring forward this type of scheme, as modelling of the network by the DNO would be required to determine the precise impact.

Criteria	
Reasonable scheme payback period	✔
Benefits local domestic consumers in fuel poverty	✔

Utilises local resources	✔
Achievable within local network constraints	✔

Other potential renewable schemes

The other approach for delivering new renewable generation would involve coordination between local commercial users and generators committing to power purchase agreements with a new generator over a private wire connection. This would need business commitment to a long term contract, however there are successful examples of this. Large-scale (>1 MW) generation could be deployed close to Trawsfynydd, the only part of the local area where generation could be freely exported to the local network. A community scheme of this scale could be challenging to secure funding for. However if there is a sufficient business case there is the option to apply for loans. There are many examples of larger scale community projects like the 50MW Sandwick East Street in the Western Isles[1].

Recommendations

In order to take forward a community focused renewable energy generation scheme in the Ffestiniog Valley a number of recommendations on next steps have been set out. Greater detail on this is available in section 6.

1. Take forward further feasibility on identified generation sites
2. Liaise with SP Energy Networks
3. Develop Energy Local Club for Ffestiniog Valley
4. Establish interest in investment community vehicle for investment in local generation
5. Secure funding for project and move forwards with chosen commercial model

[1]https://www.pressandjournal.co.uk/fp/news/islands/western-isles/1532623/western-isles-townships-announce-plans-to-develop-community-owned-wind-farms/

2. Introduction

Arloesi Gwynedd Wledig, in partnership with Cwmni Bro Ffestiniog, wishes to identify viable options for the production, storage and use of renewable energy in the Vale of Ffestiniog area. This report explores options and presents a strategy to enable this. This report should be read in conjunction with report P3705 Energy Capacity Study.

In March 2019 the Institute of Welsh Affairs published a plan to enable Wales to meet its projected energy demands entirely from renewable sources by 2035[2]. These aspirations align with the Ffestiniog community's goals, and if recommendations included as part of this report were implemented it would facilitate the development of local generation, with focus placed within the report on the importance of community ownership or part-ownership of new renewable generation.

Priorities set out as part of this include:

- **Fund the future:** Wales' new First Minister should commit to 12 to 18 months of low carbon economic stimulus funding to immediately accelerate action on renewable energy and energy efficiency
- **Use local land for local benefit:** ensure that planning regulations and public land are used to support new renewable energy schemes and maximise local gains
- **Future-proof the electricity grid:** ensure the grid is ready to meet Wales' energy aspirations

In order to encourage future renewable energy generators to invest in the local area, it needs to be understood who and what is currently operating to see if this can be expanded. It is also important to understand what the local energy demand is currently and what is predicted to be developed in the coming years so as to match this where possible with local generation. This report sets out a strategy that will promote best practice and a workable solution for those looking to develop more renewable capacity in the area.

The study area that has been considered is shown in red below, with local authority boundaries in North Wales shown in blue.

[2] https://www.iwa.wales/click/2019/03/a-plan-for-wales-renewable-energy-future/

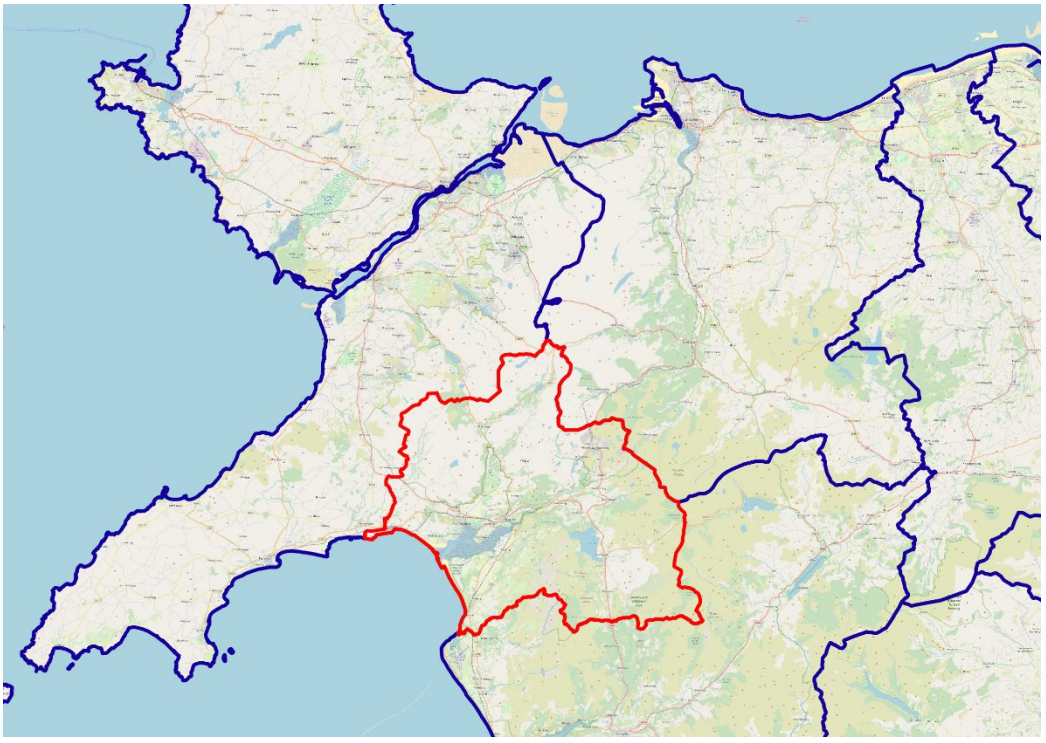

Figure 1: Study area around Ffestiniog Valley

Scope of the study

The study is intended to be a desktop research output, collating and critically analysing a number of previous studies done in this area and producing a feasible local energy strategy based upon the findings. Whilst the previous studies and other datasets used are complimented by ongoing stakeholder engagement, the study is intended to identify the specific opportunities that will require further investigation before any benefits can be realised.

3. Energy Sources

3.1. Current renewable generation

Renewable generators within the study area have been identified and mapped within the following section.

3.1.1. Hydro-power

Considering the biggest contributor, hydro-power, there are 2 major sites within the study area. Looking at Figure 3 below the largest sight is Maentwrog which has a capacity of 30MW. The second largest site within the study area, Cwm Dyli, has a capacity of 9.8 MW, the other five sites are all less than 1MW.

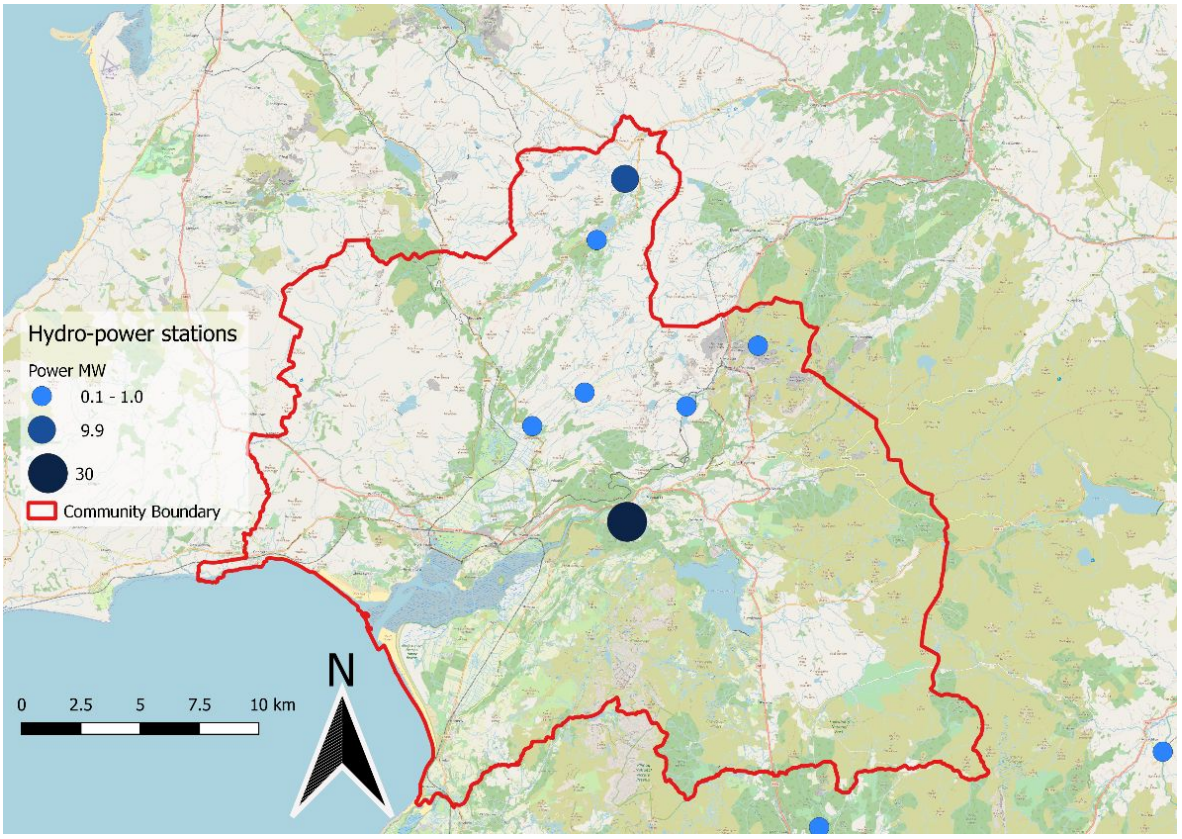

Figure 2: Hydro-power stations in study area

Table 1 below gives detailed figures for the annual generation per site. The annual generation was calculated using a typical capacity factor for hydro generation in the area.

Table 1: Annual hydro generation within the study area

Location	Capacity (MW)	Annual generation (MWh)
Maentwrog	30	60,617
Cwm Dyli	9.8	19,801
Bryn Fedw	0.7	1,414
Cwm Croesor	0.5	1,010
Cwm Llan	0.44	889
Cwmorthin	0.42	839
Maenofferen	0.2	404

The largest of these, Maentwrog, is owned by Magnox on behalf of the Nuclear Decommissioning Authority. Maentwrog is a 30MW hydroelectric station on the banks of the Dwyryd Estuary near Blaenau Ffestiniog. It has been operating since 1928 and generates electricity using turbines at Trawsfynydd lake. The water is carried by a pipeline to drive two turbines, which generate enough electricity to power around 12,000 local homes each year.

The turbines do not operate constantly, instead typically for 7 to 8 hours each day during peak demand periods from 3-4pm until 11pm to midnight. This generation site is connected to the network at the 33kV level.

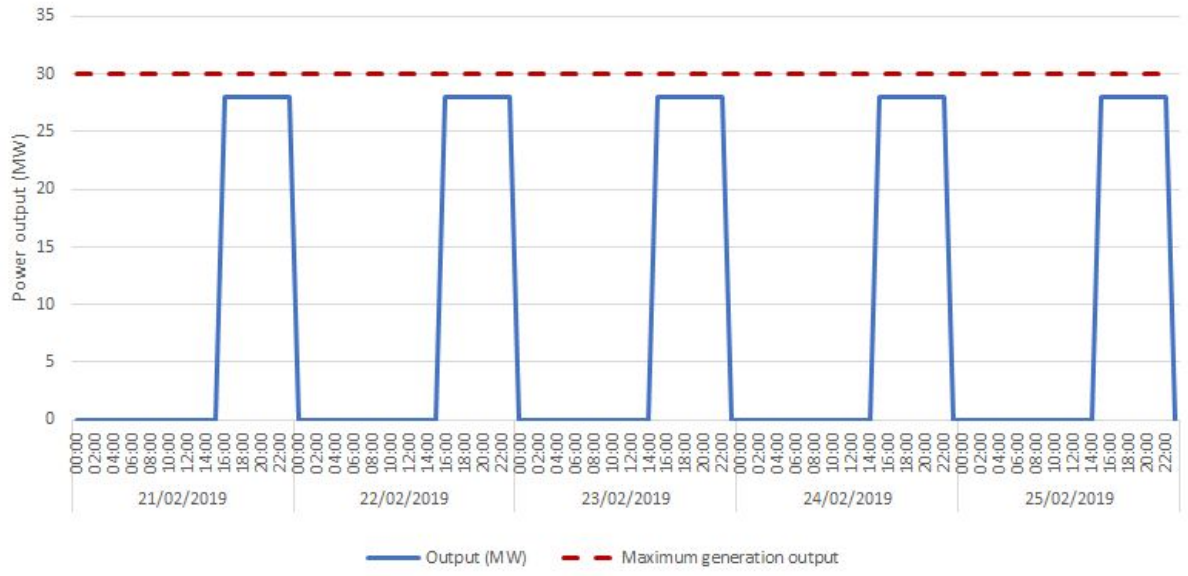

Figure 3: Typical Maentwrog generation power output

3.1.2. Other renewable energies

Figure 4 below represents all other renewable energy sources in the study area identified over 100kW. In the centre there is a 240kW solar farm in Garreg, and towards the East is a 30kW farm in Pentrefelin.

There is a CHP Anaerobic Digestion plant producing 110kW in Porthmadog. The Biomass site is a 300-500kWth site in Penrhyndeudraeth. There were no identified on-shore wind turbines within the study area.

This data has been collated using the Renewable Energy Planning Database and Gwynedd planning data.

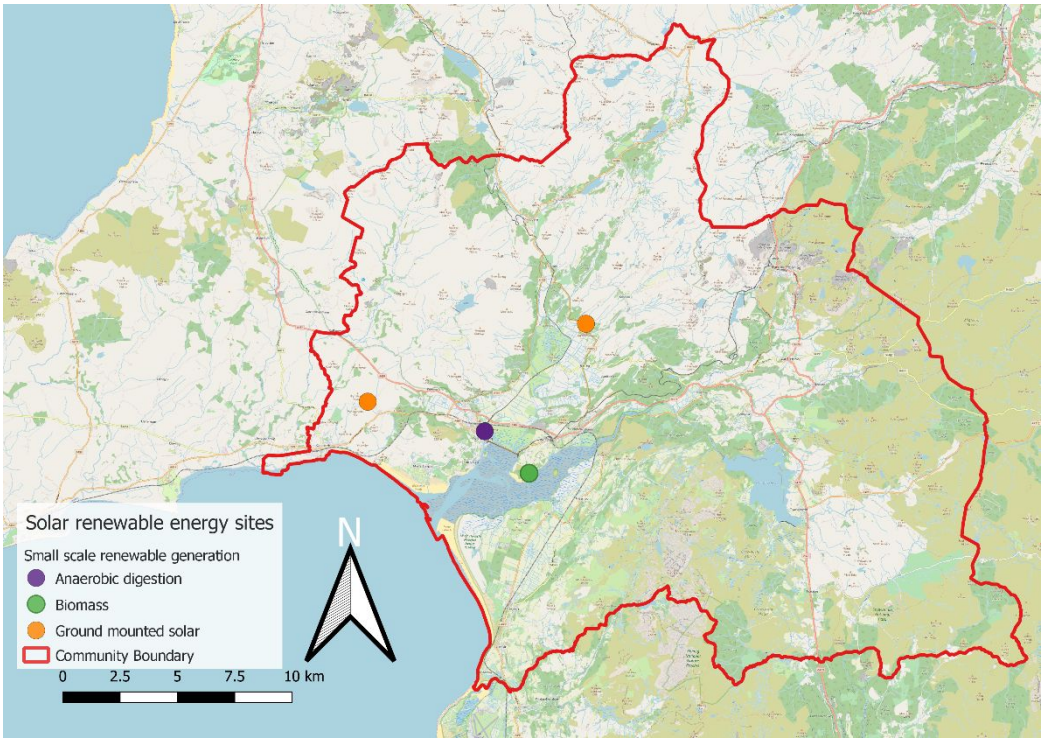

Figure 4: Anaerobic digestion, solar and biomass sites within study area

Table 2 below details the annual electricity generation of the 2 solar sites using capacity factors from Table 1. The biomass site in Penrhyndeudraeth is not included as the energy produced is in heat form and not electrical.

Table 2 Generation for solar sites

Location	Capacity (MW)	Annual generation (MWh)
Garreg	0.24	485
Pentrefelin	0.03	61

3.2. Future potential generation resource

3.2.1. Potential hydro-power

Potential hydro generation sites have been identified as part of a previous study that considered Gwynedd as a whole. Two sites were identified within the study area, shown in Figure 5 below, which outlines the potential hydro-energy in the area. These were Llyn Cwmystradlyn reservoir, around 5km north of Porthmadog, and Llyn Morwynion reservoir, around 3km east of Llan Ffestiniog. Although the area has ideal topography for this kind of renewable generation, hydro-power sites have to consider many variables. Most importantly these sites have to have the least environmental impact whilst still producing enough electricity to justify the high investment costs. The sites mentioned above were identified as the most suitable taking into consideration all of the factors.

It indicates that there are only 2 sites with less than 0.1MW capacity with a maximum annual electrical generation of 1.8 GWh. Nearly all of the potential resource has been tapped into; it would appear that the most viable sites have already been developed, the remaining identified sites may be technical viable but have other barriers such as permitting with the environment agency.

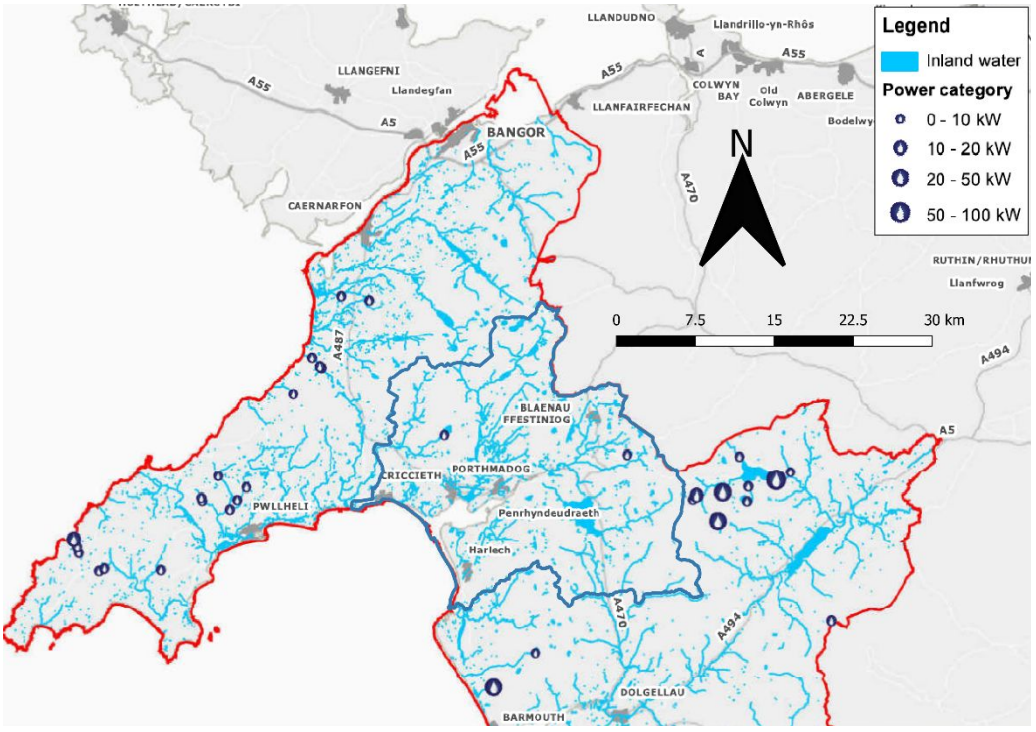

Figure 5: Potential hydropower sites[3]

Stakeholders have suggested multiple small-scale hydro generators within Ffestiniog itself may be a potentially workable scheme, with smart energy management to match local demand with the generation. This resource has not been highlighted within any of the literature reviewed as part of this study, and so further detailed feasibility would be required in

[3] Gwynedd Council Scoping Renewable Energy Opportunities in Gwynedd Final Report 2012

order to progress this. The Teigl river south of Blaenau Ffestiniog may have potential that can be investigated further.

3.2.2. Potential resource - other renewables

Potential renewable energy resource has been assessed for other renewables through reference to the available literature and studies in this area.

Table 3 below is a summary of potential electrical generation for the study area, estimated from figures for Gwynedd generation as a whole[4]. It considers the largest potential resource being on-shore wind. Wind is one of the most abundant renewable sources in the UK and North Wales is particularly well-suited for onshore wind farms. However, the national park designation of much of the area may make achieving this challenging due to additional planning restrictions.

Table 3: Potential renewable resource for the study area

Resource	Potential Capacity (MWe)	Potential Annual Generation electricity (GWh)
Wind	20.2	47.2
Solar	6.7	5.7
Anaerobic digestion	0.1	0.5
Energy from Waste	0.6	4.6
Biomass	0.9	7.3

Solar has large potential because it can easily be used in a domestic context. However, the government will be stopping feed in tariff support for solar PV by March 2019, this will have a negative impact on commercial viability. It is clear this resource still has large technical potential for producing electrical energy for local use, in order for this to be realised subsidy-free models will need to be developed to support this development. The assessment did not, however, include assessment of the potential for solar farm development.

A report produced by LUC produced in July 2016 for the assessment of potential Solar PV farms in Gwynedd and Ynys Mon looked at the criteria needed for solar farm development. It considered the substations in the area, the amount of land available, and solar irradiance, amongst other factors. Taking all these variables into consideration the report identified no sites with significant potential for solar farms within the Ffestiniog Valley study area, with the nearest one being about 8km west of Porthmadog[5].

[4] Gwynedd Council Scoping Renewable Energy Opportunities in Gwynedd Final Report

[5] https://www.gwynedd.llyw.cymru/en/Council/Documents---Council/Strategies-and-policies/Environment-and-planning/Planning-policy/Examination-Documents/DA020b.pdf

Anaerobic digestion has a lower potential due to the complexity and subsequent high capital cost of digesters. Biomass can have constraints due to the competition for agricultural land, use of the crops for biodiesel (instead of biomass) and slow replanting rate.

Table 4 compares current annual generation with potential annual generation in the region, for each renewable resource. It is important to note the potential is the maximum achievable based on sensible assumptions made on their uptake. For example, for wind, the potential is quite large due to the resource not being fully exploited. Solar potential is assuming only microgeneration with the idea that existing homes would be slow to uptake due to the costs and disruption to install solar PV panels. The potential generation does not include ground mounted solar farms which would show a significant increase in potential, due to limitations with the methodology of the original study.

Table 4 Current vs. Potential electrical generation from medium scale generators and above

Resource	Current estimated annual electrical generation (GWh)	Potential annual Generation electricity (GWh)
Wind	0.0	47.2
Solar (microgeneration)	0.2	5.7
Anaerobic digestion	0.6	0.5
Energy from Waste	0.0	4.6
Biomass	0.0	7.3

The projected 'potential generation' figures for AD are lower than the 'current generation' figures as the source of data for potential is older than the source for current. So, the calculated potential figure was underestimated at the time of publication. At present, various financial incentives such as Anaerobic Digestion Land Fund (ADLF) and Green Investment Group, formerly known as the Green Investment Bank (GIB), have made digesters a more attractive option, which means their uptake has increased to a higher level than projected.

For Energy from Waste there are a lot of different sources of waste such as commercial and industrial, cattle slurry and food waste. Due to the range of different sources there is a wide range of factors that influence potential production. This can include things such as pigs and cattle being under cover for 6 months of the year so collection of the waste is about 50% of the year. Furthermore, organic food waste potential is not fully being utilised on a domestic scale due to lack of infrastructure for local authorities to utilise.

Biomass has a current generation that is so small it is considered negligible. There is a lot of potential woodland in the area it gives a perfect source of feedstock hence the large potential figure. Again, like wind energy it is in abundance so has massive potential if technologies develop and research and developments make this a more cost-effective solution.

The potential is clear, there is large scope for additional generation. This is however technical potential, not commercial potential, and whether or not this can be realised depends on numerous factors such as planning constraints, public perception/adoption and cost of technology. Community ownership may mean that it is easier to secure planning permission, providing a means to mitigate potential local complaints; buy-in from local people could change how people perceive this technology.

3.3. Most suitable generation options

For the Vale of Ffestiniog, the following renewable resources are considered the most suitable:

- Hydro
    - Identified hydro sites as per Figure 5 that have not been progressed to date
    - Micro-hydro within Ffestiniog Valley that has yet to be explored in detail
- Solar
    - Small scale solar development on domestic and commercial rooftops
    - Medium scale solar development on land close to local demand

Onshore wind is not considered suitable due to the national park designation of much of the Ffestiniog area and the challenges of bringing this forward. The supplementary planning guidance for onshore wind energy from Gwynedd Council states that wind turbines that harm the National Park's special features and character will not be approved[6].

This only applies to the national park and there are other areas within the study area where this would not apply such as Blaenau Ffestiniog and Porthmadog. As such there are applications for wind turbines in these areas but no significant potential.

6 https://www.gwynedd.llyw.cymru/en/Council/Documents---Council/Strategies-and-policies/Environment-and-planning/Planning-policy/Unitary-Development-Plan/SPG-Onshore-Wind-Energy-June-2014.pdf

4. Energy demand

In order to establish a scheme involving connection of generation to local demand, it is important to understand what current electricity demand looks like and what potential future demand might look like.

4.1. Domestic electricity demand

Domestic electricity demand has been mapped based on data at Lower Super Output Area (LSOA) level, this is a geographical unit that contains between 400 and 1,200 houses.

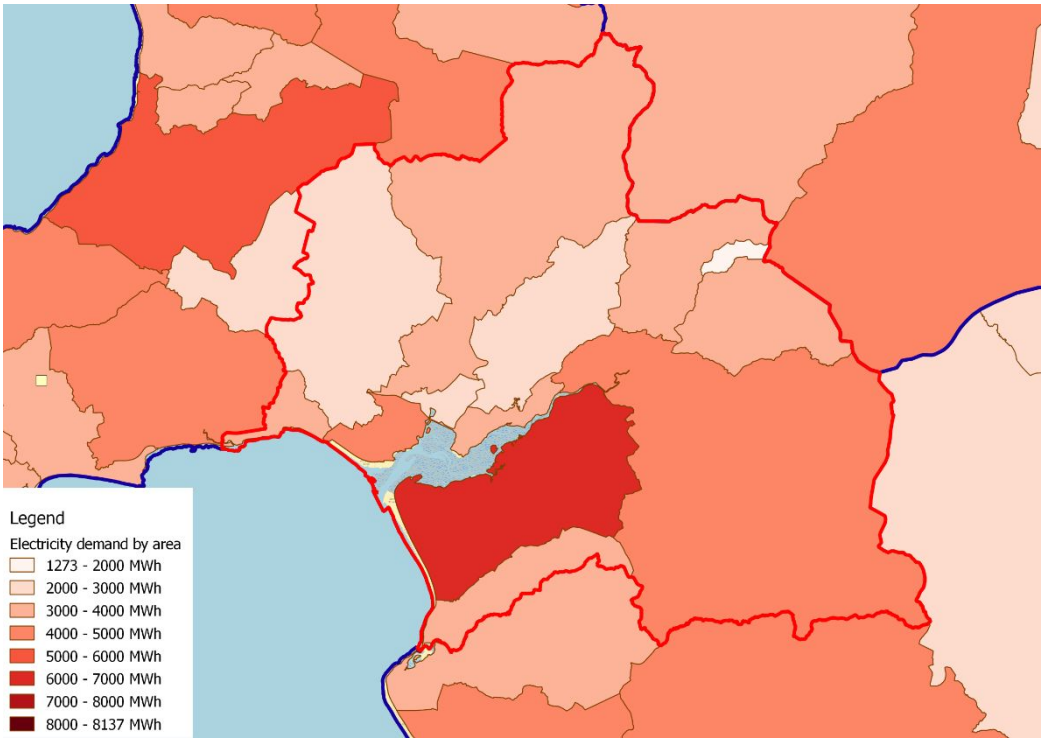

Figure 8: Domestic electricity demand by LSOA

From Figure 8 we can see the spread of electricity demand, in particular the concentration in a few areas, in particular around Harlech and Porthmadog. We have then also reviewed this data on a demand per electricity meter basis (shown in Figure 9), looking for the areas where average demand for each property is highest, which can be seen below

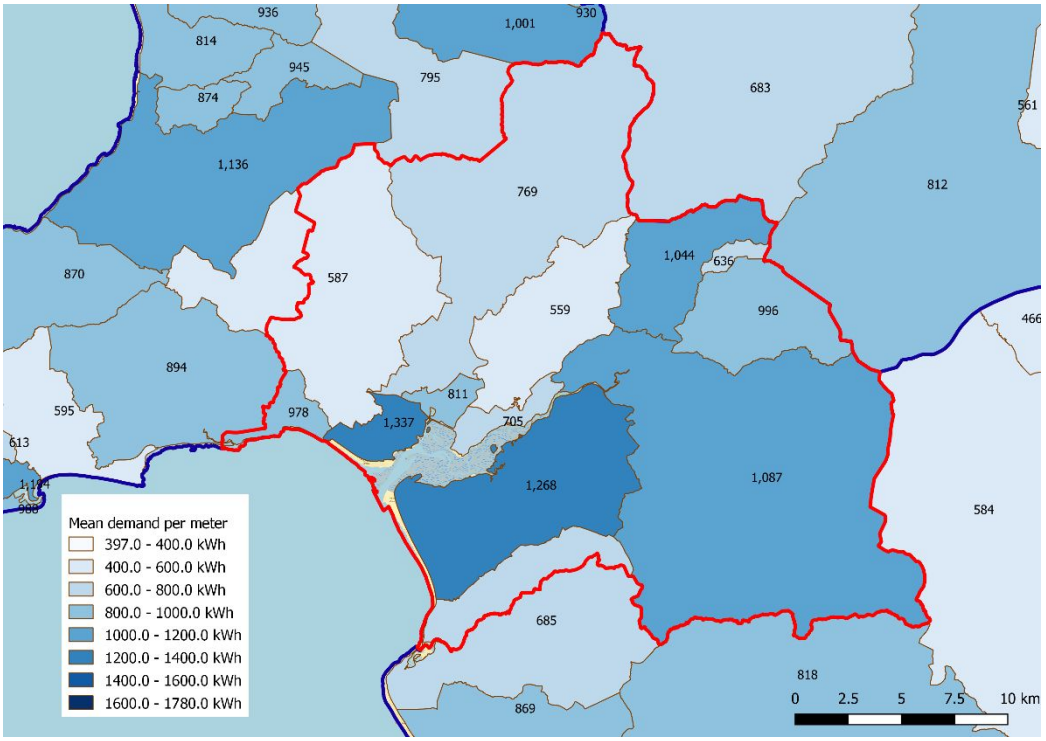

Figure 9: Domestic electricity demand per meter by LSOA and number of meters

The results look similar on this basis, but the area around Blaenau Ffestiniog now also stands out as having relatively higher electricity demand per household. The number of meters is likely to be an overestimate of the number of households in the area, as some small businesses with low electricity demands may fall under the threshold below which customers are assumed to be domestic. From this we can nevertheless get an idea of the potential number of domestic customers within each area.

4.2. Industrial demand

Industrial and commercial electricity demand data is available at Middle Super Output Area (MSOA) level, which gives a high-level picture of demand. This is a unit of geography that covers between 2,000 and 6,000 households, so does not give very granular outputs, however it allows aggregate demand to be considered.

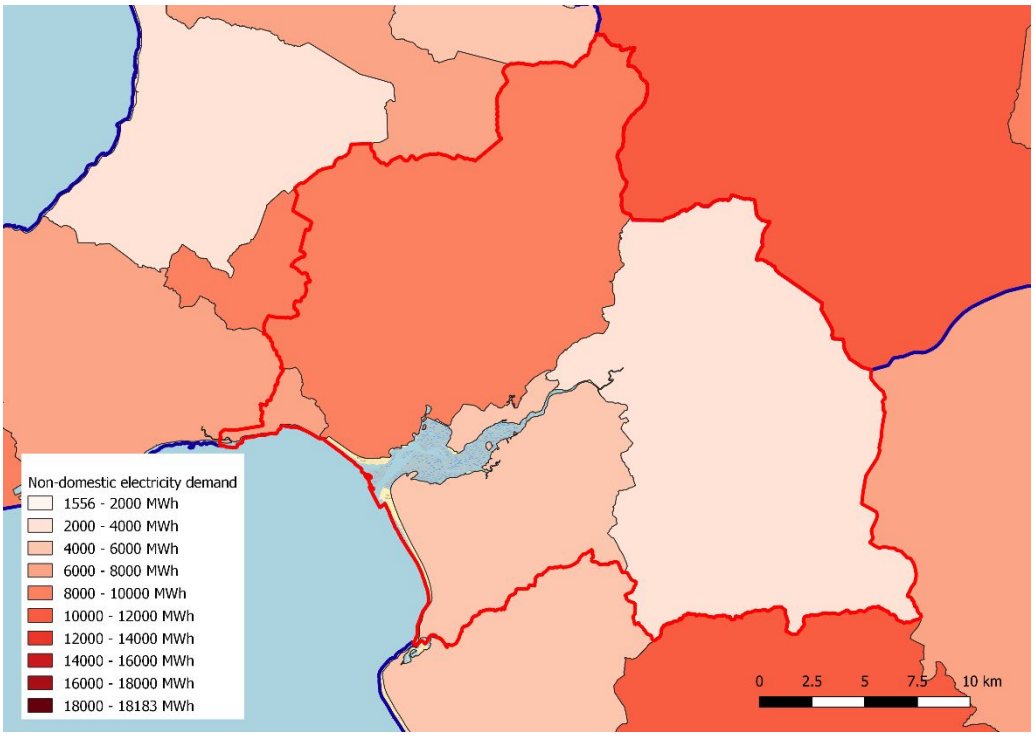

Figure 10: Non-domestic electricity demand by MSOA

Figure 10 shows non-domestic demand across the Ffestiniog valley, with highest demand seen in the area including Porthmadog, with lower demand seen around Blaenau Ffestiniog. Business demand has also been considered on an individual basis.

Potential connections have been identified on the basis of their size and kind of activities undertaken on the site. These include:

- Rehau, Blaenau Plastics, Blaenau Ffestiniog
- Breedon Minffordd Quarry & Asphalt Plant, Penrhyndeudraeth
- Zip World, Blaenau Ffestiniog
- Meddyg Care Nursing Home, Porthmadog

4.3. Additional future demand

Within Anglesey and Gwynedd's Joint Local Development Plan, new commercial development sites to be brought forward are identified. The table below shows the relevant sites which are within the boundary of the study area. These sites are to be delivered within out to 2026

Type	Site	Total area (ha)
Primary - Urban Service Centre	Business Park, Penrhyndeudraeth	11.5

Primary - Urban Service Centre	Business Park, Porthmadog	13.5
Primary - Local Service Centre	Former Site of Ysbyty Bron y Garth, Penrhyndeudraeth	1.6
Secondary - Local Service Centre	Griffin Industrial Estate, Penrhyndeudraeth	4
Secondary - Sub-regional Centre	Tanygrisiau Site, Blaenau Ffestiniog	7.4

New homes within the Ffestiniog Valley study area will also add additional energy demand. The Joint Local Plan identifies over 7,000 new homes to be delivered in Gwynedd and Anglesey from 2011 to 2026, however only a small number are likely to be within the study area, with developments concentrated in larger settlements elsewhere.
Only 155 homes are planned to be delivered within Blaenau Ffestiniog itself and none in Porthmadog, with a further small contribution from developments in Local Service Centres and villages. This indicates new demand from housing is likely to remain fairly low within the study area, below 500 new homes out to 2026, with corresponding low impact on energy demand.

4.3.1. Electric Vehicles & Electric Heating

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With current market share of EVs increasing rapidly and the government's commitment to stopping all fossil fueled vehicle sales post 2040 there will be a key growth in electricity demand.

In the 2019 Spring Statement the Chancellor also announced that there will be no fossil fuel heating systems in new homes built after 2025. This will have a major impact, likely leading to greater uptake of heat pumps even in areas close to the gas network.

Both of these will mean there is a greater future demand for electricity. Current supply of electric vehicle charging points is limited, so this may present a barrier to local people adopting electric vehicles in the short term, however in the medium to long term they are expected to become the dominant form of passenger transport.

5. Business models for energy investment

The following section presents a number of business models for renewable energy investment in the Ffestiniog valley considered against key decision criteria. These have been produced based on input from stakeholders at a workshop held in February 2019 as part of this study.

These criteria are:

- Reasonable scheme payback period
- Total investment capable of being crowdfunded from local community
- Benefits local domestic consumers in fuel poverty
- Utilises local resources
- Achievable within local network constraints

5.1. Subsidy-free generation, power exported to the network

Standalone renewable energy generation schemes have been developed across North Wales, as shown in Section 2. These are typically designed to export their power to the grid rather than use it locally. These developments have historically been supported by the Feed-In Tariff, which pays generators for every unit of renewable electricity they generate. The benefits from this scheme have been reducing over time, and the scheme will be closed completely by March 2019, so this support will not be available for future renewable generation schemes.

Subsidy-free solar generation schemes have been delivered elsewhere in the country already, however this approach can't necessarily be replicated in all cases, as it can require a specific set of circumstances.

Clayhill solar farm, located in Milton Keynes, was developed by Anesco and opened in September 2017. It includes solar and energy storage technology, with 10MW of solar PV co-located with 5 energy storage units totalling 6MW. The economies of scale brought by developing such a large scheme were crucial to getting this project to stack up, this would be difficult to replicate in North Wales.

Network constraints in the Ffestiniog area also restrict the potential for large-scale generation to be connected to the network, with limitations on the amount of power that can be exported to the grid, in many areas. This is explored in further detail in the accompanying report P3705 Network Constraints.

Criteria	
Reasonable scheme payback period	?

Total investment capable of being crowdfunded from local community	?
Benefits local domestic consumers in fuel poverty	?
Utilises local resources	✔
Achievable within local network constraints	?

5.2. Private wire connection – direct use of generation

Developing local generation utilising direct connection customers rather than selling power to the grid can be an attractive way of bringing forwards new schemes.

Power Purchase Agreements (PPAs) for renewable energy are now very common as they guarantee the developer an income for their generated electricity while offering commercial businesses cheaper electricity than they can purchase from their local electricity supplier. While generators may be able to be paid 4-5p/kWh per unit exported to the grid, they can secure a higher price from a local commercial partner connected by private wire.

These schemes are simplest when connecting a single generator to a single point of demand, for example a business with high electricity demand. This is because a private wire connection from the generator to the user would need to be installed independent of the existing electricity network, so the longer the distance of this, the greater the added capital cost.

While this approach would benefit the business that could secure lower power, and the generation developer, there would be no benefit to local domestic consumers. The business would also need to be willing to commit to a long-term contract for electricity purchase from the generator in order to reduce the risk for the developer. Community benefit could be secured from this approach if the investment in the local generation was by a community-owned company that put together a share offer for local people to invest in the scheme.

Criteria	
Reasonable scheme payback period	✔
Total investment capable of being crowdfunded from local community	✔
Benefits local domestic consumers in fuel poverty	?
Utilises local resources	✔

Achievable within local network constraints	✔

5.3. Energy local model

Energy Local has designed a means to have a local market in power via Energy Local Clubs. This enables households to club together to show when they are using local clean power when it is generated. The scheme gives generators a better price for the power they produce, reflecting its true value more closely, keeps more money locally and reduces household electricity bills. This scheme has been trialled within North Wales at Bethesda.

5.3.1. Cyd Ynni scheme

This scheme involves over 100 households near Bethesda linked to a local hydro generator. When these households use power at the same time the hydro is generating, the generator receives 7p/kWh. The energy the hydro produces is shared evenly between all homes using electricity at that time, with each household paying the same 7p/kWh for their portion of generated energy.

In the Cyd Ynni trial, each household has an 'Energy Dashboard' that can be viewed on a tablet or smartphone where they can see when are good times of day to use power. Households can see when they used power half-hour by half-hour and a forecast of the hydro generation so that they know when it's cheapest to use power. They can also see the total energy demand of the households involved in the trial. Figure 6 shows an example of this online dashboard, and the detailed historic and forecast data available for demand and generation that allows users to try to plan their consumption where possible for times when they will maximise the benefit gained from this.

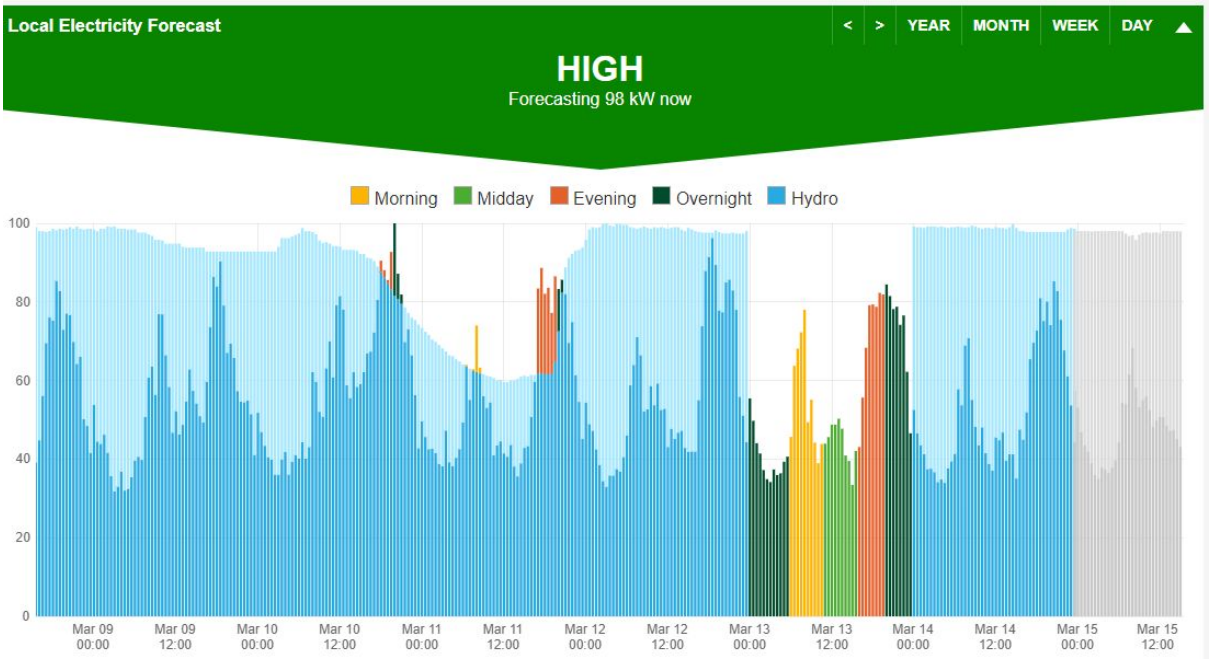

Figure 6: Energy Local online dashboard showing hydro generation forecasts alongside forecast and historic demand

Energy local have a partner energy supplier in Co-op Energy that households purchase excess electricity from, that isn't supplied by the local generation. This is also offered on a time of use basis, with electricity costing different prices at different times of day, better reflecting the costs of electricity purchase.

Generators and demand are connected at the same voltage and local generation and demand are matched as far as possible, such that generation sent back upstream is minimised. This would not be seen as a major issue by SPEN. Engagement with SPEN would nevertheless be important to bring forward this type of scheme, as modelling of the network by the DNO would be required to determine the precise impact.

Key considerations:

- Identifying a suitable site to bring forward at the right scale
- Co-op Energy only do domestic electricity sale, so could not involve an industrial/commercial customer with them as the supplier
- Commercial/industrial customers also purchase electricity in bulk at lower costs than domestic customers, so an attractive purchase price for domestic customers may not be appealing for business customers.
- Revenue generation is key to making a business case stack up - without the support of the Feed-In Tariff prices for domestic consumers may need to be closer to 11.5p/kWh rather than 7p/kWh in order to make the economics of the scheme stack up. This would still represent a 25% saving on typical tariffs

Criteria	
Reasonable scheme payback period	✔
Total investment capable of being crowdfunded from local community	✔
Benefits local domestic consumers in fuel poverty	✔
Utilises local resources	✔
Achievable within local network constraints	✔

5.4. Recommended option

Based on the options considered above, the Energy Local model is the most appropriate means of delivering local renewable energy scheme within the Ffestiniog Valley, meeting all of our identified criteria.

6. Recommendations and next steps

1. **Take forwards further feasibility on identified generation sites**
   Further feasibility should be undertaken to consider the potential generation sites in more detail.

2. **Liaise with SP Energy Networks**
   Ongoing contact should be made with SP Energy Networks regarding connection of new generation and the establishment of an Energy Local scheme to ensure that this will work within their constraints. The effect of an Energy Local generation model in the area is not expected to be significant, as long as generation and demand connected at the same voltage, however SPEN will need to model the scheme to determine what the impact will be.

3. **Develop Energy Local Club for Ffestiniog Valley**
   Cwmni Bro Ffestiniog should engage with Energy Local for support in establishing an Energy Local Club. This would be legally a cooperative to manage the local scheme. Engagement with local households will be key to generating enough interest to make the scheme work. Other similar schemes exist, Smart Fintry is another example of where renewable energy produced locally is sold directly to residents thus reducing electricity costs and its carbon impact. Ynni Cymunedol Twrog is an example of a recently established local community group in the Maentwrog area which could provide a blueprint for Cwmni Bro Ffestiniog to follow.

4. **Establish interest in investment community vehicle for investment in local generation**
   Cwmni Bro Ffestiniog needs to determine whether there is sufficient interest from the local community to participate in a community share offer to fund investment in local generation, and what the potential maximum size of the investment fund would be. If this is not sufficient to develop the generation then further external funding will need to be sought. A good driver could be Community Energy Wales who are a not for profit organisation that assist community groups by offering advice and guidance.

5. **Secure funding for project and move forwards with chosen commercial model**
   There may be opportunities for external project funding to contribute to the development of this scheme, in particular funding from WEFO, Renew Wales or Welsh Government for further development of renewable generation. Capital investment costs not covered by community investment could be met using ‘green loans’ for investment in renewable energy available from some high street banks. There are also banks specifically operating to support companies which focus on ethical outcomes such as the environment. Examples of this are Triodos, a bank whose mission is to help create a society that protects and promotes quality of life and human dignity for all. Other investment firms that invest in socially positive projects are Abundance and Ethex.

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