Egni Trefin Energy

A INTRODUCTION

Trefin Energy was the name used for a three-month project to explore the potential of developing a renewable energy strategy for Trefin and the surrounding area. It was funded by Cwmpas (Cwmpas, 2022) through a grant of £10,600 and was managed by Llanrhian Community Council in partnership with Gwelliant Trefin Improvement (GTI). This document aims to offer an overview of the outcomes of the project and to summarise the comprehensive Feasibility Study, undertaken by Cwm Arian Renewable Energy (CARE) on behalf of the Project Management Group.

B PROJECT OBJECTIVES

The focus of the project can be summarised as:

> ***To commission a feasibility study into launching a community-led renewable energy project which will benefit the villagers of Trefin or the wider Llanrhian Community Parish as a whole.***
>
> ***Its objective was to explore ways of harnessing local energy sources aiming in the longer term, to reduce energy bills, create a community benefit fund, contribute to energy security and to reduce carbon emissions, preferably through a locally-led enterprise which can plan and control developments in the interests of and with the input of local residents.***

A tender exercise was undertaken inviting other community energy groups or consultancies with relevant experience to bid for parts, or all aspects, of the feasibility study work. Cwm Arian Renewable Energy Ltd, as an established community renewable energy organisation with in-house development expertise, were awarded the tender on April 14th 2023.

The feasibility report is a comprehensive and very detailed 90 page document which can be accessed electronically through the following link: https://neilprior.co.uk/2023/08/04/community-renewable-energy/

Alternatively, hard copies of an English and Welsh report are available from Llanrhian Community Council or Gwelliant Trefin. The report offers advice, based on research and surveys, and highlights the renewable energy project possibilities in the Llanrhian Parish, including the villages of Trefin, Porthgain, Croesgoch and Llanrhian. It focusses on the area's resources and takes into account the views of residents, derived from comprehensive surveys and public engagement. Ultimately the report provides information and conclusions on initiatives which may be prioritised and with and recommendations for how to do so. The report also highlights the challenges to be faced, eg planning constraints. This paper represents a summary of the Feasibility Study.

The Project Management Group wishes to record its gratitude to the following for their excellent support and professionalism and for writing the Feasibilty Study Report:

Daniel Blackburn, Renewable Energy Project Co-ordinator, CARE

Alex Ferraro, Renewable Energy Project Officer, CARE

The following sections summarise the content of the report and are offered to members of the wider community, for information. Those who are interested in supporting the initiative in any way, are invited to contact Llanrhian Connected Community at croeso@connectedcommunity.wales

Cllr. Neil Prior Chair of the Project Management Group

Huw Morris Secretary of the Project Management Group August 2023

This section offers a summary of the main outcomes of the Feasibilty Study report, on subjects including the establishment of the Community Energy Organisation, which is necessary to progress the ambition to harness local energy sources and to generate renewable energy for the benefit of the communities of Trefin, Porthgain, Llanrhian and Croes Goch.

1 EXECUTIVE SUMMARY

[The following text has been taken directly from the Feasibility Study Report (p4) and it represents a summary of the outcomes of the research undertaken by Cwm Arian Renewable Energy]

"The 3 month, Cwmpas funded,"Trefin Energy" feasibility study, jointly run by Llanrhian Community Council and Gwelliant Trefin Improvement culminates in the production of this feasibility report and its findings.

Through the online survey and community meeting it was found that the local community, across the Parish, and not only within Trefin, have a strong desire and resource to enact change and create wealth, resilience and community enhancement, parish wide through a potential community owned renewable energy project. There were few outright objections, but plentiful curiosity and informed concern of what, where, who, and how.

It was found that the parish is blessed with multiple identified energy resources at different scales including: micro-hydro; solar; wind; and marine, reflecting its diverse landscape. The identification and quantifying of these resources gives legitimacy to the idea of community energy projects of different scales in the area. Of these resources, solar PV and wind represent the greatest and most accessible resources on which to base a community energy project.

Taking into account all techno-economic implications, a medium scale wind power initiative, coupled with novel income model and domestic consumer supply scheme "Energy Local", outperformed all other project scenarios. Such an initiative could deliver the key goals and opportunities of the community energy organisation. It is a clear signal that medium-scale wind would be a favourable project to pursue at this stage in the community projects infancy. If successful, it would then provide a sustainable platform by which other community energy endeavours could be explored and progressed, such as solar and, possibly, hydro power."

Please see Section 9 below for the recommendations.

2 COMMUNITY ENERGY

A section within the report (p20) emphasises the importance given by the Welsh Government and local authorities to community energy initiatives and it reviews the policy framework within which community energy exists within Wales. It also outlines the many benefits (p22) of Community Energy Organisations (CEOs), their potential organisational legal structure and sources of funding and support for their work (p29).

The aspirations of Egni Trefin confirms that the initiative falls within the Welsh Government's definition of community energy. Egni Trefin's objectives also align with those of the Welsh Government's strategy in this area and any future project should be eligible for government grants. The Welsh Government define community energy ownership,

"...as a renewable energy or renewable storage development located in Wales, which is wholly owned by a social enterprise whose assets and profits are committed to the delivery of social and/or environmental objectives." (Gov.Wales, 2019)

Interestingly, the Welsh Government has recently launched Ynni Cymru, a publicly-owned energy company for Wales, which over the next two years aims to expand community-owned renewable energy generation. It is an organisation which will support CEOs within a national strategy and framework through grant funding and advice.

It is clear that community energy delivers a huge array of benefits in many areas and at many different levels, including economic benefit, community resilience and vitality. It brings control and management to the community. The Welsh Government provides clear encouragement for communities to become involved and for individuals, community organisations, businesses, local charities and government agencies, to support communities in this important area.

3 ESTABLISHING A COMMUNITY ENERGY ORGANISATION

The first task which needs to be undertaken is to agree on establishing a Community Energy Organisation (CEO) and to determine what would be an appropriate legal structure for the CEO. The report lists the options available and provides examples of CEOs which are already operating (p29). Without a formal CEO in place, it will not be possible to apply for funding to support any future initiatives. As has been mentioned above, the Welsh Government is encouraging communities to establish Community Energy Organisations, since communities retain control of developments locally and it means that any financial gain can be re-invested in the community. It is a means of creating employment locally and to enhance the local economy, while at the same time assisting in tackling the challenges associated with climate change.

Many companies from outside Wales have developed energy parks which go contrary to the views of local residents, and very little benefit is returned to the local communities. Establishing a CEO means that local control and ownership is secured.

Recommendation 1: The community needs to agree on establishing a CEO covering the parish, and including Trefin, Croes Goch, Porthgain and Llanrhian

One important task is to agree on a name for the CEO. As has been mentioned, any future project will not be confined to Trefin, but will encompass neighbouring villages. Consequently, it is appreciated that "Egni Trefin", might not be an appropriate name for the venture as we progress to the next stage of developments. To assist the appropriate officers in naming a future CEO, members of the community are invited to suggest names, preferably of a "neutral" nature. It has been suggested that the famous mill in Trefin could be an inspiration for the name of the organisation, and it would be preferable if it had a Welsh name, Ynni is the preferred Welsh word for "energy".

Recommendation 2: The community be asked to propose names for the Community Energy Organisation

The following are examples of structures for community organisations, but their suitability for future organisations in the Llanrhian Parish will depend on the goals of the group. (More details in the report):

- Community Benefit Society (BenCom)
- Co-operative Society.
- Community Interest Companies (CICs)
- Charities, run by trustees
- Joint Ventures

Often a community group may begin as one type of organisation but require the set up of other types to facilitate a particular project or idea.

Recommendation 3: The community needs to determine the nature of the CEO and the priorities for such an organisation

It is also essential to determine an appropriate governance structure, again one which is suitable for the community and the nature of the planned initiative. A strong Management Board would be needed, made up of Board Members who can: represent the views of the community (all four villages); introduce

vision; share expertise and knowledge in renewable energy; bring relevant other expertise to the organisation, such as legal, planning, financial; can speak Welsh and can relate to local residents, respecting their history and culture.

Recommendation 4: The community needs to set up a Strong Management Board

4 FUNDING SOURCES

As has been mentioned above, the Welsh Government is keen to support local communities in establishing CEOs and funding is available to underpin such initiatives. The report has a comprehensive list of organisations and Government bodies which could be approached for financial support and expert advice. (p30) These include Ynni Cymru, UK Shared Prosperity Fund, Welsh Government Energy Service, Cwmpas, Cymunedoli, Ynni Cymunedol Cymru, Egin. Applications have been made to Cwmpas for consultancy support and advice on an appropriate structure for a local Community Energy Organisation, and to Egin for pump-priming funding to establish such an organisation.

The Feasibility Study has given the community a solid basis for moving forward and for progressing to the next stage of development. Ultimately, the Management Board will need to determine the strategy and prioritise projects. Based on the agreed approach, it is anticipated that applications will be made to appropriate organisations for substantial funding, to support new posts and to embark upon a journey to generate local renewable energy for the benefit of the community.

5 COMMUNITY ENGAGEMENT

The report offers a comprehensive summary of the outcomes of the community engagement, conducted through an on-line survey, door-to-door discussions and also at an open community meeting (p35-19). 61 respondents shared their views by means of the survey and nearly 40 people attended the open community meeting. In the interest of brevity, the results of the survey are not reproduced in this summary report, but the details are accessible in the main report and in the appendices to the Feasibility Report. The following are offered as headlines:

- The community is most concerned about their household bills
- There is a strong feeling for the importance of net-zero Wales
- Many in the community are considering technologies for their home, in particular solar, heat pumps, batteries and insulation.
- The primary views on potential benefits to Trefin was to reduce household bills, creating a community benefit fund, followed by reducing local business bills
- The project ideas with most support, in order, were:

    - Micro-hydro
    - Insulating & smart energy solutions
    - Field scale solar PV
    - Domestic solar PV
    - Medium scale wind turbine and followed by
    - Local business solar PV

- The highest concerns the community had were regarding:

    - The impact on wildlife
    - Missing out due to lack of time or capital
    - Noise
    - Securing permissions

What was very positive was the strong appetite for investment within the community with the majority wanting to invest in a CEO. Very little opposition or objections to the project's aims, were voiced, a fact which gave the Project Management Group confidence in progressing with the initiative. This positive support, was also reflected in the open community meeting.

A series of presentations were made by representatives from key energy-related organisations in Wales, at the open community meeting. The short presentations were most informative, but more importantly, strong networking links were created with these influential bodies, such as:

- The Welsh Government
- Pembrokeshire County Council
- Community Energy Wales
- Cwm Arian Renewable Energy
- Transition Bro Gwaun
- Pembrokeshire Coastal Forum and Marine Energy Wales
- Eco Dewi

The desire to establish a community energy initiative, managed and driven by a locally run Community Energy Organisation was clear and it was unanimously agreed that the whole parish should be incorporated into the initiative.

PART TWO – THE CHALLENGES, CONSTRAINTS AND PRIORITIES

This section offers a summary of the conclusions of the Feasibility Report which refer to the constraints and challenges which will be faced by a future Community Energy Organisation, particularly relating to planning restrictions. It also refers to the results of the extensive surveys undertaken in the area, to identify locations for harnessing energy in the four villages and to assess the suitability for different sources of energy..

6 PLANNING ISSUES

Planning is a critical issue for the projects of Community Energy Organisations (CEOs) right across the UK. With a climate emergency declared by Pembrokeshire County Council (PCC) and by both Welsh and UK Governments, local planners are more welcoming of renewable energy projects and especially those by CEOs. The Feasibility Report refers to the main general considerations for renewable energy projects requiring planning permissions in the Llanrhian parish. (p6 onward) It also points out where projects of CEOs are encouraged via planning policy and guidance. The report is comprehensive, and its detailed analysis of the planning issues will be extremely useful for the new Management Board, when it is established. The Board will need to weigh up the restrictions, and planning constraints in determining a future strategy and in prioritising renewable energy projects. The three main bodies which will influence a future strategy are:

- The Welsh Government
- Pembrokeshire County Council and
- Pembrokeshire Coast National Park Authority

6.1 Welsh Government

The National Planning Policy Wales (PPW) Edition 11 (2021) is the main planning document for Wales and it mentions community energy in its section on "Local Involvement and Community Benefit" - paragraphs 5.9.24 - 5.9.28 (Gov.Wales, 2021. Whereas it states that planning authorities should be as accommodating as possible [in regard to the particular assistance CEOs may require navigating through the planning system], the policy nevertheless states that "planning decisions must be based on an assessment of the impacts of the proposed development, irrespective of who the applicant is". In summary, in relation to the CEO aspect of PPW it can feel that the policy lacks much bite and requires local planners to enter into the spirit of the words of these paragraphs to favour the developments of CEOs.

The following extract from the National Planning Policy Wales, is relevant to the Egni Trefin initiative:

Paragraph 5.7.14: "The Welsh Government has set targets for the generation of renewable energy: for Wales to generate 70% of its electricity consumption from renewable energy by 2030; for one Gigawatt of renewable energy capacity in Wales to be locally owned by 2030; and for new energy projects to have at least an element of local ownership.

The planning system has an active role to help ensure the delivery of these targets.

6.2 Pembrokeshire County Council (PCC)

The main local basis for planning decisions in Pembrokeshire is PCC's Local Development Plan (LDP), adopted on 28th February 2013 (PCC, 2013). This is a document that has a Vision and Objectives for Pembrokeshire, which it aims to achieve via Strategic Policies (SPs). The renewable energy developments and work of CEOs align with all three of these elements of the LDP which provides material weight in planning terms for their developments. It can be seen that the work of CEOs aligns with the Local Development Plan vision, which states:

> "To ensure that Pembrokeshire is prosperous and that it remains vibrant and special by creating: a network of strong ..... rural communities in ..... Service Centres, Service and Local Villages supported by a robust, sustainable, diverse high value-adding economy underpinned by the Area's unique environment, maritime access to the Milford Haven Waterway and Fishguard Harbour and internationally important energy ..... opportunities."

Given the content of the Feasibility Study Report, it can also be seen that Community Energy Organisation developments in the county have the ability to contribute to 7 out of 10 of the LDPs strategic objectives:

i. Mitigating and responding to the challenge of climate change
ii. Delivering design excellence and environmental quality
iii. Sustaining and enhancing the rural and urban economy
iv. Developing vibrant communities providing a range and mix of homes and local services
v. Building on the County's strategic location for energy and port related development
vi. Improving access to goods and service
vii. Protecting and enhancing the natural and built environment

The LDP also states that "The planning system provides for a presumption in favour of sustainable development".

Despite these positive and encouraging strategic messages, the Feasibility Report wars that the planning process and route will be laborious and challenging and yes, frustrating! (p9 – 11)

6.3 Pembrokeshire Coast National Park Authority

The northern 1-3km of coast of Llanrhian Community Parish lies within the boundary of the Pembrokeshire Coast National Park. Large parts of Trefin an Porthgain fall into the National Park and therefore planning restrictions will apply if schemes are to be developed in those villages. For both these villages supplementary Conservation Area Planning Guidance have been issued by the National Park and these have a more restrictive nature rather than enabling.

The National Park status is designated in order "to conserve the natural beauty, wildlife, and cultural heritage of the area". In additions, The Pembrokeshire National Park Authority (PCNPA) has produced Supplementary Planning Guidance for Renewable Energy (PCNPA, 2021) which was published in May 2021. It provides an explanation of potential technologies at various scales giving key sensitivities and guidance for the Park in general. The Feasibility Study Report provides maps and details of planning definitions, guidelines and restrictions and to understand the implications fully they should be read (p11).

For instance, ground mount solar and wind projects might impact the sensitivity of specified Landscape Character Areas (LCAs) within the Park, and therefore specific guidelines for these technologies have been published for developers, as to what may be permissible In essence they "should not adversely affect the special qualities of the National Parks".

Overall the PCNPA is aligned with Welsh Government net-zero targets, stating:

> "Designated landscapes must contribute to a sustainable low carbon economy for Wales, for example, through enabling the generation of renewable energy at an appropriate scale, water management and carbon sequestration"

Of particular relevance to the Trefin and surrounding are feasibility study is the following statement supporting community energy schemes:

> "Communities should be supported to bring forward appropriate renewable energy schemes which have the potential to reduce dependence on carbon-based energy and be a source of revenue for the community"

Therefore, in summary, although the planning guidelines for the above authorities are enabling and, in a general sense, refer in a positive way to community renewable energy developments, there are also very restrictive elements, which are likely to block certain developments in named conservation areas. The authors of the Feasibility Study have taken these into account as they present recommendations on possible future initiatives in the Llanrhian area. However, it would be a sensible investment of time, if the newly formed Management Board of the new Community Energy Organisation were to engage with officers of the three organisations referred to above, as they set priorities and identify potential projects.

Recommendation 5: ***That the new Board of the CEO arrange meetings with representatives of the Welsh Government. Pembrokeshire County Council and the Pembrokeshire Coast National Park Authority***

PART THREE – RENEWABLE ENERGY – AN ASSESSMENT OF POTENTIAL SOURCES

This section summarises the conclusions to an assessment of each potential renewable energy projects. It comments on which projects might be best suited to various locations, taking into account the planning constraints and views of local residents – thus offering recommendations to be considered by the future Management Board of the CEO and the community.

7 POTENTIAL RENEWABLE ENERGY PROJECTS

The Feasibility Study presents an assessment of all potential renewable energy sources in the four villages, and presents details on the feasibility of each option. In addition to the technical assessment of each option, there is a financial analysis of whether the options are viable. Those interested in analysing the data are advised to refer to the assessments in the report. (P39 onward).

The following options were assessed by colleagues from Cwm Arian, taking into account the planning implications, residents' views, suitability of the surrounding areas, financial viability etc:

7.1 Micro-Hydro

Micro-hydro power is a form of hydroelectricity generation that utilises the flow of water from a higher to a lower level to produce energy. The energy available is proportional to the flow rate of water and vertical drop or head. It encompasses plants from 500W to 100kW, some of which may only provide

power to a single home. A "run of river" micro-hydro scheme normally requires several key elements including consistent and adequate source of water within the river and sufficient water depth.

The turbine, generator, and supporting equipment are typically housed in a small shed called the turbine house. Providing protection and security for the equipment and electricity connection. After passing through the turbine, the water is returned to the watercourse.

The conclusion of the research and assessment was that this was not a viable option in Trefin, although there was a possibility that it could be a long-term option for Porthgain. (Please refer to the detailed assessment in the report).

There are options to use new technology for hydro power such as PowerSpout Turbines and Buzz Hydro.

7.2 Field-scale Solar PV

Field scale solar PV refers to solar PV developments that are ground mounted utilising areas of land from 1 acre to over 5 hectares, typically from 100kW to over 5MW in capacity. They consist of groups of panels at ~400Watt each, mounted in multiple arrays, which form rows and columns with intervening gaps between them for access purposes and to prevent shading of the rows behind. Layouts vary from site to site depending on the characteristics. The arrays are mounted on aluminium frames which are then secured to the ground using multiple methods such as pilings or ground screw anchors. The arrays usually face south, held at a fixed angle between 20-40° from horizontal, to maximise the irradiation available from the sun. The height of the panels can vary between 1-4m off the ground level depending on the desired uses of the land beneath i.e. for continued grazing or wildflower growing.

The main issue to consider relating to field-scale solar PV relates to planning (especially within the National Park) and the availability of an appropriate site and also grid connection. The latter poses considerable challenges for renewable energy developments throughout Wales. In terms of planning permission, again areas within the National Park will face major challenges and might influence the strategic approach which might be favoured by the Management Board.

There was considerable support within the community for field-scale solar PV.

The Feasibility Study Report presents a financial appraisal of field-scale solar PVs and it concludes that this option is certainly worth pursuing. Whether such developments could be considered within the National Park would be an issue to be discussed with the National Park authorities.

7.3 Community Building Rooftop Solar PV

Opportunities exist for community energy groups to improve their local area and services by aiding in the reduction of the cost of running the community buildings where these services and events are provided. Buildings such as village halls, sports club houses and schools are crucial focal points of community life and if burdens on them are lessened or removed then they in turn invigorate the community utilising them. There are generally two ways by which community buildings can be helped:

a. Community energy groups can encourage, aid and advise, or even apply on behalf of the organisations that use, lease, or own small community buildings with relatively low electricity demands, to seek grant funding from suitable funding sources to secure improvements to those buildings that reduce energy bills. Improvements such as insulation, heat pumps, and solar PV systems are possible through this route. The community organisations then own these materials or systems outright and will benefit from the savings they create for years to come. Identified community building for grant opportunities within Llanrhian Parish include:

i. Trefin Community Sports Clubhouse - 5kWp solar PV system installed in conjunction with a new roof that is already funded. This would produce in the region of 4,450kWh/year.
ii. Llanrhian Church Hall - 5kWp solar PV system. The Grade II listed building status of this hall will require careful design considerations and permissions.

b. Larger community buildings such as schools have a higher electricity demand and as such require larger interventions to reduce their electricity bills proportionately. This opens up opportunities for community energy organisation to provide a proportion of that consumption from on-site rooftop solar PV owned by the community. The building landlord leases the roof space to the community organisation to install the building connected solar PV system. Electricity consumed from the solar PV system is sold to the building occupier at a negotiated rate much less than grid import rate to create significant savings on the occupier's electricity bills, and also high enough to be financially viable for the community energy group. Any surplus electricity is exported to the grid under an export PPA. Schemes such as this already exist in Wales. Most notably Pembrokeshire Council have collaborated with Egni Co-op (EG n.d.), UK's largest rooftop solar PV co-op based in Aman Valley, to provide solar PV systems to 6 schools across the county.

c. In a similar method to the above, community groups can work collaboratively with local businesses, with suitable rooftops and levels of consumption, to install community owned solar PV systems on their roofs to provide reduced rate solar electricity to the business premises. Businesses see savings on their electricity bills while income is raised for community benefit. The community energy organisation owns and maintains the solar PV systems for 20-25yrs before gifting them to the business. There are multiple small business in the Parish that may be suitable, some are listed below. Farms in the area, with large consumption and large rooftops also present collaboration opportunities for systems above 50kWp but are not listed below.

i. The Ship, Trefin - 13kWp solar PV system - generating ~9,900kWh/year
ii. Caffi y Ragna - 12kWp solar PV System - generating ~ 9000kWh/year
iii. The Old School Hostel - Replacing solar thermal with solar PV + hot water diverters
iv. Several Church of Wales Chapels (though many are Grade II listed)
v. Square and Compass Inn - 12kWp solar PV system - generating ~ 10,200kWh/year
vi. The Shed (Ty Mawr, grade II listed), Porthgain - 20kWp solar PV system- generating ~ 17,000kWh/year
vii. The Sloop, Porthgain - 15kWp solar PV system - generating 11,000 kWh/year
viii. Antramont Arms, Croesgoch - 8kWp solar PV system - generating 6,500 kWh/year

This short list already creates a total renewable energy capacity in the region of 100kWp, generating approximately 85,000kWh per year, offsetting 19.8 tonnesCO2e annually.

7.4 Domestic Solar PV

Domestic solar PV has been supported in the UK through the provision of the Feed-in Tariff from 2010 to March 2019. It provided a financial incentive for homeowners to invest in retrofitting solar PV to their homes by paying a tariff for every unit of electricity generated. More recently installations on properties with low Energy Performance Certificate (EPC) values and those vulnerable or on low incomes have been funded via government and local authorities through "Nest" and "Energy Company Obligation" grants, which is currently open for application on it's 4th iteration as "ECO4" (PCC n.d.). Currently, owners of domestic PV systems are able to save on their electricity bills and also export onto the grid and receive payments for it, enabled by smart metering, via the Smart Export Guarantee, to pay back the capital cost of the system. A community energy group could provide information, encourage, and advise residents to take advantage of all of the above to increase domestic solar PV proliferation in the Parish in general.

Domestic solar PV schemes are therefore not an established model for community energy organisations. Reasons for this are included in the report. (p55). However, if a financial and administrative model is possible, numerous community benefits could be unlocked.

Rooftop solar PV systems are a permitted development right in Wales (WG n.d.). However, the National Park has additional powers to ensure the "special qualities" of the Park are not damaged by the development of rooftop solar PV in particular within Conservation Areas such as those in Porthgain and Trefin. The guidance for this has been outlined in the Feasibility Report. This would be a possible discussion topic with the National Park authorities.

A detailed assessment of the financial and community benefit of rooftop solar PVs is given in the report (p60).

7.5 Medium-scale Wind

Wind turbines are widely recognised and well-understood as a reliable form of renewable energy, and have become the mainstay of community energy development in Wales. They harness the lift forces of the wind to spin aerodynamic blades, which in turn rotate a rotor, creating a mechanical force that generates electricity. The energy produced by a wind turbine depends on the speed of the wind and the surface area covered by the rotating blades. Consequently, a larger swept area allows the turbine to generate more power. Typically, wind turbines are granted planning permission for a period of 25 years, although there is the possibility of re-powering, which involves replacing the existing turbines with a new generation of equipment. Wind turbines can be deployed individually, in small clusters consisting of 2 to 5 turbines, or in larger groups known as wind farms, which typically comprise 5 or more turbines. Within the confines of Pembrokeshire, deployment options are limited to single turbines or, in specific instances, small clusters of 2 to 3 turbines. Regardless of their configuration, wind turbines consist of several essential components, including the tower, hub, blades, nacelle (which houses the generator and gearboxes), and a transformer. The transformer may either be situated within the nacelle itself or at the base of the tower. In addition to the turbines themselves, large-scale wind energy projects require specific infrastructure elements. These include establishing road access to the site, typically through a bell mouth or a similar access point connected to the main road. Further details of the requirements are offered in the report (p64).

Medium-scale wind turbines require planning permission, and, again, the support of the National Park would be essential if it was an intention to erect such turbines within the designated area. Grid connection would also be needed, and naturally a suitable site would need to identified, and the support of the landowner secured. The Feasibility Study offers a scientific assessment of suitable sites in the area, outside the National Park, but no further action has been taken eg approaching the landowners. The community attitude was positive, and the financial assessment was healthy. (p70 onward). The assessment concludes that this is the most realistic option for the new Community Energy Organisation.

7.6 Micro-Wind Power

Micro Wind Power Micro wind power is considered to be all turbines with a capacity of under 10kW with tip heights of below 25m tip height. These are property connected at 230/400V hence do not need a separate grid connection. Opportunities exist in rural areas to use micro wind to power community buildings or businesses, as there is sufficient surrounding space compared to urban areas to site the turbine appropriately and attenuate any noise to acceptable levels for nearby dwellings. Wind power also complements the increased energy consumption of buildings over the winter seasons compared to solar PV. Planning permission for turbines with tip heights less than 11.1m and swept areas under 9.6m2, amongst other conditions, fall under permitted development in Wales (WG n.d.). Turbines above this size require planning permission from the local authority but are not expected to provide the same level of study and documentation as medium-large scale wind projects. Full details are offered in the report (p74).

7.7 EV Charging

EV charging is the provision of charge points for electric vehicles to encourage the rollout of this type of transportation technology. Supporting EV charging provides a service to the local community, car clubs and rural transport organisations to enable them to have the confidence to make the switch to a greener form of transport. When the electricity for charge points is provided by community renewables then this can both potentially benefit CEOs through energy sales and ensure that electricity for charging is from a renewable, local source. The Feasibility Report presents the limitations of EV Charging points (p77) but this is an option which can be considered by the Management Board of the new CEO.

7.8 Marine Energy

Marine energy (wave, tidal stream, tidal lagoon) has remained in the research and testing phase for much longer than other renewable energy technologies as it faces many more technical challenges than on-shore technologies or offshore wind power. Viable commercialised marine energy developments are yet to be developed by private organisations or community owned organisations. Despite the long road, Wales is aiming to be a marine energy leader in the UK with test areas and developments being supported by a dedicated industry body Marine Energy Wales (MEW n.d.) funded by Welsh Government & Milford Haven Port, with £104 million invested in the last year and now supporting over 400 employees in the sector. The report concludes that at this stage, this is not an option for the new CEO, unless it becomes involved in testing/research work (p80).

PART FOUR – CONCLUSIONS AND RECOMMENDATIONS

8.0 CONCLUSIONS

The technical and financial appraisal of the most feasible generation projects for Llanrhian Community Parish indicates that, as with many community energy groups, a medium scale wind turbine would be the optimum project to explore in greater depth at this time. The summary points of medium scale wind are:

- It is one of the cheapest forms of renewable energy.
- Llanrhian Parish has an excellent wind resource.
- It provides the highest modelled Internal Rate of Return.
- Wind power has an established community energy blueprint to follow. There are many supporting organisations to aid in it's development.
- Wind power at this scale has planning permission precedent in the area.
- A wind power project is able to provide investment opportunities through a community share offer as well as household bill reduction opportunities through Energy Local.
- It can create community benefit across the whole Parish.
- Is most likely to create a sustainable organisation cashflow to support future endeavours and their business case to attract grant funding or development/capital loans.

This conclusion does not suggest that other project options, such as micro-hydro, micro-wind, solar PV or EV charging should not be discussed periodically in future to determine if more favourable financial conditions can be found. Depending on the capacity of the community energy organisation and their skillsets, or negotiations with landowners/landlords, a different project may come to the fore as the leading opportunity. However, it must be noted that development of a community renewable energy generator takes resources, time, focus, and tenacity. A medium scale wind turbine could take 2-6 years to reach the point of operating and commissioning for instance. It is key to ensure that resources are continually direct towards the main goal/purpose of the organisation to achieve success.

Recommendation 6: **The Management Board of the new Community Energy Organisation is invited to consider the assessments of each potential energy source in the parish of Llanrhian and to develop a strategy, identifying priorities and aspirations.**

9.0 RECOMMENDATIONS

Recommendation 1: ***The community needs to agree on establishing a CEO covering the parish, and including Trefin, Croes Goch, Porthgain and Llanrhian***

Recommendation 2: ***The community be asked to propose names for the Community Energy Organisation***

Recommendation 3: ***The community needs to determine the nature of the CEO and the priorities for such an organisation***

Recommendation 4: ***The community needs to set up a Strong Management Board***

Recommendation 5: ***The new Board of the CEO might arrange meetings with representatives of the Welsh Government. Pembrokeshire County Council and the Pembrokeshire Coast National Park Authority***

Recommendation 6: **The Management Board of the new Community Energy Organisation is invited to consider the assessments of each potential energy source in the parish of Llanrhian and to develop a strategy, identifying priorities and aspirations.**

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