FEASIBILITY STUDY FOR A COMMUNITY SOLAR FARM

Clár Éifeachtacth Fuinnimh

February 2020

Clár Éifeachtacht Fuinnimh

Ag Obair as Lámha a Chéile

Northern Periphery and Arctic Programme 2014–2020

An tAontas Eorpach
Ciste Forbartha Réigiúnach na hEorpa

LECo
Local Energy Communities

Údarás na Gaeltachta

Contents

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Peer Review and other professional input provided by Plan Energy Ltd – www.planenergy.co.uk.

List of Acronyms

Listed as they appear in the report.

ISEA	Irish Solar Energy Association
RESS	Renewable Energy Support Scheme
IRENA	International Renewable Energy Agency
CARES	Community and Renewable Energy Scheme
BRE	Building Research Establishment
DCCAE	Department of Communication Climate Action and the Environment
DCENR	Department of Communications Energy and Natural Resources
NPF	National Planning Framework
REC	Renewable Energy Community
MEC	Maximum Export Capacity
ESBN	ESB networks
NHA	Natural Heritage Area
pNHA	proposed Natural Heritage Area
PPA	Power Purchase Agreement
CRU	Commission for Regulation of Utilities

Bibliography

IRENA Project Navigator – Technical Concept Guidelines Utility Scale Solar PV

International Finance Corporation (World Bank) - Utility Scale Solar PV Power Plants: A Developer's guide.

CARES – Community & Renewable Energy Scheme Project Development Toolkit; Solar PV Module Rev 5.

BRE - Agricultural Good Practice Guidance for Solar Farms.

BRE - National Solar Centre Biodiversity Guidance for Solar Developments.

BRE - Planning guidance large scale ground mounted solar PV systems.

DCCAE – Climate Action plan (2019).

RESS Ireland Draft Terms and Conditions (2020).

Distrubution HV Substation Transformer Capacity & Load ESB Networks in June 2016

The Galway County Council 2015-2021 Development plan

Galway County Council Landscape and Character assessment

Archaeology Service of Ireland – National Monunument Service.

IRENA – Renewable Energy Power Generation Costs 2017

European PV technology platform steering group – PV LCOE in Europe 2014-30 final report.

Acknowledgements

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Local Power Ltd – For the providing and permitting the use of images detailing site solar farm infrastructure.

1. Introduction

Captis Ltd were appointed by Clár Éifeachtach Fuinnimh (part of Comhairle Ceantar na nOileán teo), acting on behalf of Údarás na Gaeltachta, to undertake a feasibility study for a Community Led Solar Farm in Leitir Mór Co. Galway. The feasibility study was to be funded by Interreg LECo through Údarás na Gaeltachta.

Comhairle Ceantar na nOileán teo is a committee of 13 members that have been elected to promote local development and preserve the area of Ceantar na nOileán. The area comprises a group of 5 Islands off the Connemara coast connected to the mainland by a series of bridges. The islands are Annaghvane, Lettermore, Garumna, Lettermullen and Furnish.

Community led renewable energy projects are a feature of other European countries – notably our near neighbours Scotland and England – and, based on recent policy proposals, are to become more of a feature of the renewable energy landscape of Ireland.

The purpose of this feasibility study at appointment was primarily to assess the suitability of landbanks that were available to Clár Éifeachtach Fuinnimh on Leitir Mór for the development of a community led Solar Farm. Following initial assessment of these sites the scope of the feasibility was broadened to include other landbanks, not located on the islands, that may be suitable for a community led scheme.

The feasibility study is set out as follows:

- A background to commercial Solar PV Ireland.
- Policy background and guidance documents.
- Site selection criteria.
- Grid capacity.
- Review of Clár Éifeachtach Fuinnimh Leitir Mór sites.
- Alternative sites.
- Key financial criteria.
- Potential community ownership models.
- Recommendations and Conclusions.

2. Background to Commercial Solar PV Ireland.

Solar power is a radiant energy emitted by the sun. This energy can be harnessed and used to replace fossil fuel energy as source to provide heat and power to homes, businesses, public buildings and transport. The energy harnessing process is mainly achieved through Solar PV and Solar Thermal.

Solar PV converts the sun's energy to electricity. Solar PV cells do this by creating an electric field across which electricity may flow. The greater the intensity of light shining on the cells the greater the electricity generations. A common misconception with regard to solar PV is that the sun needs to be shining in order for the cells to generate electricity. This is incorrect. If the day is bright, even with cloud, then the Solar PV cells will generate electricity.

Over the last decade (2010 to 2019) there has been an upsurge in grid connection and planning applications for commercial solar farms. There have been more than 300 valid planning applications for commercial scale solar farms between 2014 and 2019. Whilst the number of planning applications is falling from the 2016 high of 120 the scale of the applications being made is increasing. In 2019 in the region of 45 valid applications were made with a total generation capacity of 801MWs – an average of c. 18MWs per project.

Despite the large number of planning applications none of the commercial scale projects have been developed as of yet. In a statement to the Joint Committee on Climate Change in December 2019 ISEA noted that "more than 500 MWs of solar projects across Ireland have been ready to build since 2017" these projects have failed to be delivered as a result of a lack of a support mechanism to provide a tariff for the electricity produced by these projects.

With the new Irish Renewable Energy Support Scheme (RESS) auctions imminent (estimated Q2 2020) and the reduction in cost of finance and panels (estimated 80% reduction in panel cost over the last 10 years – source ISEA) it is envisaged that there will be a rapid deployment of commercial scale solar projects over the next 5 years. These projects will be supported by tariffs awarded by the RESS auctions and also through corporate power purchase agreements (PPAs).

3. Policy Background and Guidance Documents

Ireland has yet to deploy its first large scale solar project however there are multiple countries across the world that have seen the installation of both large, small and community led Solar PV projects. Most recently the UK have gone through a recent boom which was supported by the UK Renewables Obligation scheme (this scheme closed for new generation projects May 2017). As such, albeit limited experience in an Irish context, there is a wealth of guidance documentation available from other jurisdictions upon which developers and communities can rely when considering undertaking a commercial scale Solar PV project. Guidance documentation readily available includes:

- IRENA Project Navigator – Technical Concept Guidelines Utility Scale Solar PV
- International Finance Corporation (World Bank) - Utility Scale Solar PV Power Plants: A Developer's guide.
- CARES – Community & Renewable Energy Scheme Project Development Toolkit; Solar PV Module Rev 5.
- BRE– Agricultural Good Practice Guidance for Solar Farms.
    - National Solar Centre Biodiversity Guidance for Solar Developments.
    - Planning guidance large scale ground mounted solar PV systems.

These guidance documents have been consulted as part of the preparation of this feasibility study. In particular the financial model and site selection criteria have been informed by the relevant sections of the above referenced documents.

There are extensive policy documents in Ireland, and indeed at EU and international level, that support the development of renewable energy projects in suitable locations. Relevant national policy documents would include:

- National Renewable Energy Action Plan (2010)
- DCENR – Energy White Paper – Ireland's Transition to a Low Carbon Energy Future (2015).
- National Adaptation Framework (2018).
- Draft Renewable Electricity Policy and Development Framework (2016)
- National Development Plan 2018-2027.
- National Planning Framework – Ireland 2040 Our Plan.
- DCCAE – Climate Action plan (2019).
- RESS Ireland Draft Terms and Conditions (2020).

Whilst all national policy is relevant in the context of any development, for the purposes of this feasibility study, the most pertinent for this study is the most recent – the Climate Action Plan and the RESS Ireland Draft Terms and Conditions.

The Climate Action Plan states a clear ambition to deliver a step-change in our emissions performance over the coming decade, so that Ireland will not only meet its EU targets for 2030, but will also be well placed to meet the mid-century decarbonisation objectives. The plan sets out clear targets for 2030 under a number of headings – including Electricity targets. Table 3.1 lists the Climate Action Plan actions with respect to Electricity that are deemed most relevant to this study.

Table 3.1 – Relevant Climate Action Plan Actions.

Action #	Detail
14	Ensure ESBN and Eirgrid Plan network and deliver on connecting renewable energy sources to meet the 2030 70% RES-E target.
19	Ensure that the next phase of renewable connection policy is fit for purpose to deliver on renewable energy targets and community projects
22	Further consider facilitation of private networks/ direct lines.
23	Assess the network development required to integrate higher levels of RES-E and develop a high-level network development to (and beyond) 2030.
28	Design and implement RESS auctions to ensuring that frequency and volume meet the 2030 70% RES-E target.
29	Ensure that 15% of electricity demand is met by renewable sources contracted under corporate PPAs (power purchase agreement)

The Draft RESS Terms and Conditions were published late 2019 and have gone through a consultation phase in January 2020.

The draft Terms and Conditions provide for community participation in the renewable energy market in 3 ways:

- Mandatory Community Benefit Fund to be established by developers of Renewable Energy Projects.
- Mandatory opportunity for Community members to invest in developer Renewable Energy Projects and
- Provision of a community led project criteria as part of the Auctions.

The third element is the most relevant in the context of this study. The draft Term and Conditions sets out the following requirements, among other items, for community led projects:

a) At all relevant times be at least 51% owned by a Renewable Energy Community (REC).
b) At all relevant times, at least 51% of all profits, dividends and surpluses derived from the RESS 1 Project are returned to the Relevant REC.
c) At all relevant times, the Relevant REC is entitled to appoint at least one director to the board of the Generator (if applicable).
d) The relevant REC must have a minimum of 150 shareholders and have a maximum allotted share capital of €20,000.
e) Each share in a relevant REC will entitle the holder to one vote.
f) Community led projects must include a Sustainable Energy Community.
g) An MEC cap of 5MWs for community led projects.

In addition to this, the DCCAE has set out a number of supports that they intend to provide RECs including:

- The appointment of trusted intermediaries and advisors to provide support to RECs.
- Support for early stage project development.
- Provision of early stage project finance which has the potential to convert to a grant should the project fail at a later stage of development.

3.1 Conclusions

In light of the recent publication of the Climate Action Plan (2019) and also the Draft RESS terms and conditions it is clear that there is a commitment at government level to the delivery of clean renewable energy in order to achieve Ireland's 2030 70% Renewable Electricity target. The RESS draft Terms and conditions set out provisions to enable communities to participate in achieving this target through investment schemes and also through community led renewable energy projects. Community led renewable energy projects will initially be enabled through government support and participation in the RESS auctions and, with regard to action 22 of the Climate Action Plan (Electricity), with the potential facilitation of private networks/ direct lines (where buildings can directly use energy generated by a nearby project through the use of a private network or a private line).

4. Key Criteria in the Selection of a Favourable Site for the development of a Solar Farm

Ground mounted Solar Farms, when appropriately sited, can blend well with surrounding landscapes and can be largely screened from nearby neighbours. They are made up of relatively few components with limited civil works required. Solar Farm components include, inter alia:

- Solar panels and associated mounting systems and foundations,
- Inverters – to convert the electricity generated from DC to AC
- Transformers – to transfer the electrical energy
- On site customer and network operation substation
- Security arrangements – fencing and CCTV
- Access tracks
- Landscaping.

Some images of typical infrastructure are provided below

Solar Farm Inverter and Transformer Station, panel mounting System in the background – image provide by Local Power Ltd.

Solar Farm customer and network operator substation – existing tree/hedgerow boundary and stock proof perimeter fence visible in background. Image provided by Local Power Ltd.

Example of solar farm string inverters. Image provided by Local Power Ltd

When undertaking a project feasibility and carrying out an initial assessment of a site in the context of its suitability to accommodate a commercial Solar Farm a number of criteria need to be considered including:

- the scale of the land available,
- the number of landowners associated with the proposed site
- proximity to the grid,
- site topography and ground conditions and
- key planning and environmental considerations.

On the assumption that the land that is being assessed for suitability to accommodate is of sufficient scale to accommodate a community led project (RESS draft Terms and Condition have capped community led projects at 5MWs) and the number of landowners is tolerable (ideally one landowner) the key focus in terms of the suitability of the site should be with regard to:

- Proximity to the Grid and available capacity

  A critical governing factor in relation to the viability of a solar farm is its proximity to the nearest Grid node – i.e. how close it is to the nearest ESBN/Eirgrid substation – and the available capacity at that node to accept the generation.

  Grid connections are costly. These costs are driven by the length of the grid connection, the nature of the grid connection (overhead/underground), the requirement for additional infrastructure at the ESBN/Eirgrid substation to facilitate the connection and finally any upgrades required to the substation/network to accept the additional generation (e-g. extension to bus bar, transformer upgrades, line reinforcement etc.).

  Generally speaking, and as can be confirmed by financial modelling, a sub 5MW Solar Farm would need to be located within 1km of the substation and require no upgrade to the substation/network in order to be viable.

- Site topography and ground conditions.

  Another key governing factor in relation to a site suitability is the site topography and the ground conditions. In relation to the site topography South/ South West facing slopes are required in order to maximise the solar gains and therefore energy yield of your installed plant. Also, it is preferably that the site would be broken up with few natural boundaries and hedgerow. This enables the length of Solar arrays to be maximised and provides a site that is more efficient in terms of achieving the installed capacity. However, it should be noted that some natural boundaries and hedgerows can be important to break up sites and provide screening where there is potential for impacts from a landscape and visual perspective. This can be considered further at a more detailed pre-screening stage.

  Solar arrays can accommodate changes in topography across a site as they are made up of a number of panels that are connected to form the array. These arrays would be supported by a number of foundations and therefore, generally speaking, can be installed following the existing on-site gradients. In addition to this foundation types can vary across a site depending on the different ground encountered. Solar arrays cannot however accommodate abrupt changes that result from outcropping rock and generally uneven ground. In circumstances such as this ground clearance and levelling works would have to be undertaken prior to installation of the proposed solar farm. This would represent and increased cost in the Civil works element that may make the project unviable from a financial perspective.

As stated above different foundation types may be used depending on the ground conditions encountered. There are several different types of foundation for solar arrays. These include:

- Concrete piers cast in-situ – These are most suited to small systems and have good tolerance to uneven and sloping terrain. They are costly and therefore should only considered where absolutely necessary (bedrock close to surface/ large sub-surface obstacles) and at a small scale – i.e. not for the entire Solar Farm
- Driven piles – These are the lowest cost foundation type for Solar Farm installations. They require very specific ground conditions in order to be suitable as they involve a beam or pipe being driven into the ground. They are not suitable for ground where rock is at or near the surface.
- Ballast foundations - This type of foundation can work at a large scale for sites where rock is at or near the surface. The large scale can result in economies of scale being achieved as a result of the foundations being pre-cast off site and installed on site.
- Pre-drilled screw pile foundation/ Earth screws – these would be considered the second most economic foundations type. They can tolerate a little more ground variance than the driven pile foundation and can be installed at shallower depths.

The exact type of foundation used is selected based on the nature of the ground conditions and will be determined at the detailed design stage of the project following a detailed site investigation. Careful consideration needs to be given to ground conditions at design stage in order to ensure the long-term stability of the Solar Farm and ensure that the construction works have been properly costed. At early stage feasibility a high-level assessment of ground conditions/ topography is required in order to ensure that there is no easily identifiable topography/ geotechnical issue that would prohibit the development of a Solar farm on the subject site.

- Planning and Environmental Considerations

  Important elements from a planning an environmental perspective to consider at early feasibility/ planning screening stage include the following:

  - Land zoning
  - Existing and historical planning applications in the vicinity.
  - Proximity to Natura 2000 sites, NHAs and pNHAs.
  - Proximity to archaeological and cultural heritage features.
  - Proximity to flood zones.
  - Scenic Views.
  - Landscape character.
  - Potential for Glint and Glare impacts.
  - Traffic and transport considerations.

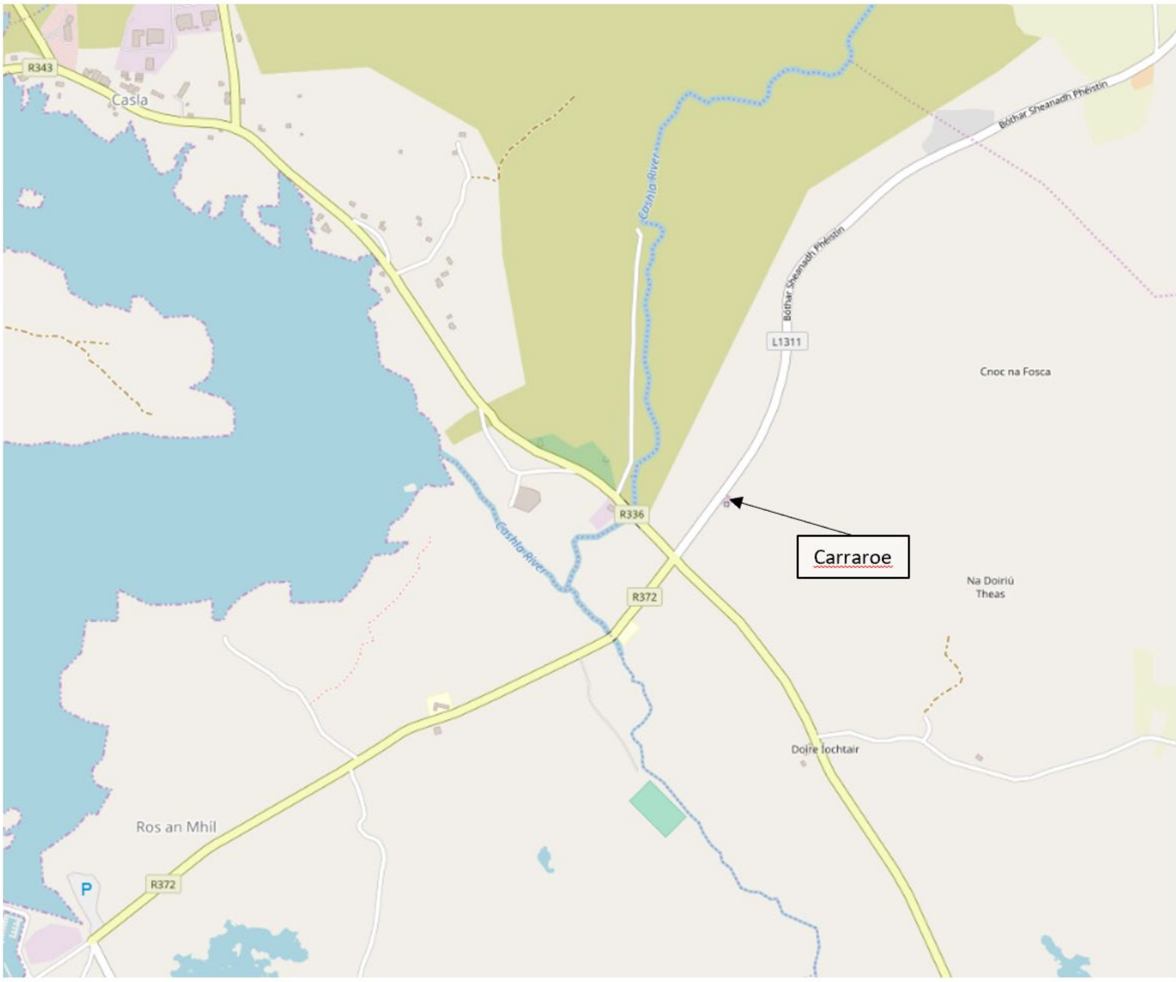
5. Assessment of the Capacity of the Substations in the locality.

The 2 substations that were assessed for the purposes of this feasibility study were:

- Screebe
- Carraroe

5.1 Carraroe

Carraroe Substation is located on Bóthar Sheanadh Pheistin approx. 2 km from Rossaveal Harbour. It is a 38kV substation with a secondary voltage of 10kV. It is feeding the Galway 110kV substation. As reported by ESB Networks in June 2016 the Carraroe Substation has 1 no. 5MW transformer and a summer valley of 1.32 MWs (the lowest demand placed on that transformer from a supply perspective). There are no other known generators proposed to connect to the Carraroe Substation. As such, in theory, it has capacity for a 6.32MW capacity generator. However, it should be noted that it only has one transformer. On this basis it may be advisable to maintain any proposed renewable project that is to connect to Carraroe at a maximum export capacity (MEC) of in the region of 1.5 MWs.

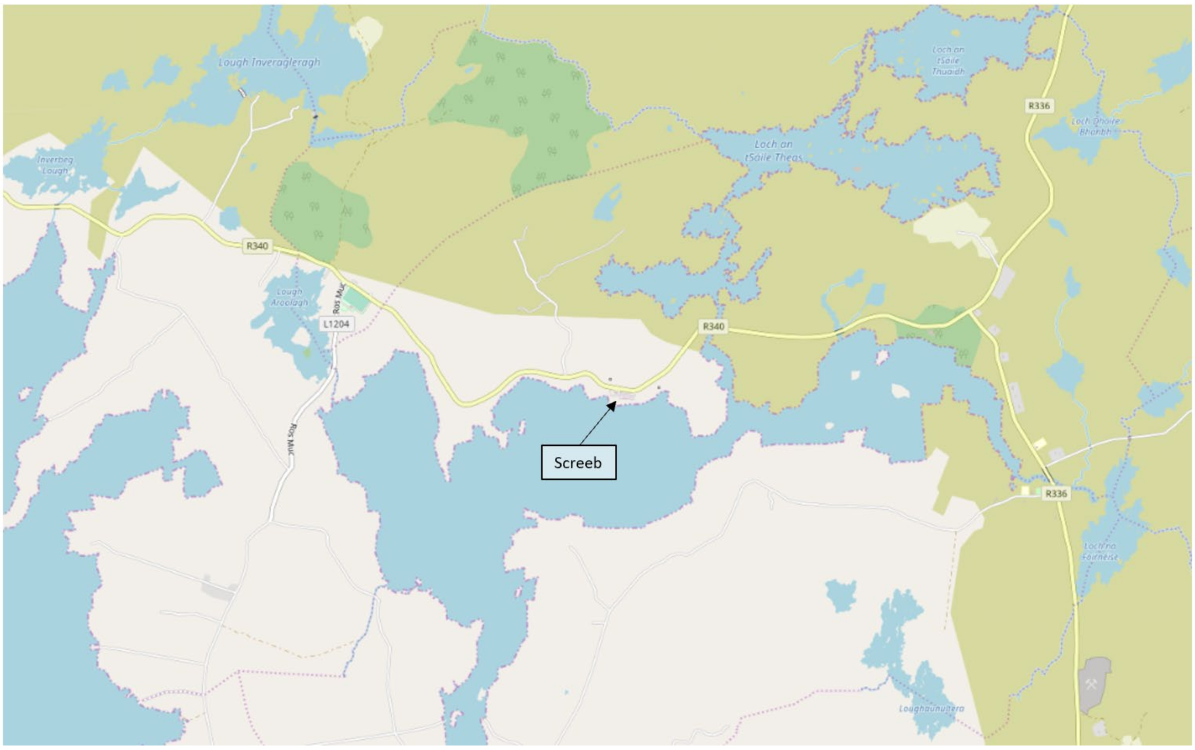


Carraroe Substation Location

Carraroe Substation

5.2 Screebe

Screebe substation is located on the R340, North of Leitir Mór. Screebe is a 110kV substation. Historically there was a 5MW peat fired generation station at this location. In the ESB report – Distribution Capacity Enquiry 2017 – the substation had a 10Kv and 38kV supply side. In the case of a community solar farm the capacity of lower voltage side of 10kV is what should be assessed The ESB Distribution HV Substation Transformer Capacity & Load Information published in 2016 states that the substation has 2 transformers 1x5MWs and 1x2MWs. It has a summer valley of 0.63 MWs. Taking the capacity of the smaller transformer as being available and adding the summer valley to that capacity at total available capacity of 2.63MWs is calculated. Therefore, it is reasonable to assume, in the absence of any other generators connecting to the substation, that there is capacity for a 2.63 MW MEC Community led renewable energy project to connect.



Screebe Substation Location

Screebe 110kV Substation

5.3 Summary of situation with local Substations

There would appear to be capacity at the local substations for a community led renewable project in the region of 1.5 MWs MEC and 2.6 MWs MEC. At the next stage of the project development this capacity should be verified with ESB and/or a specialist grid consultant.

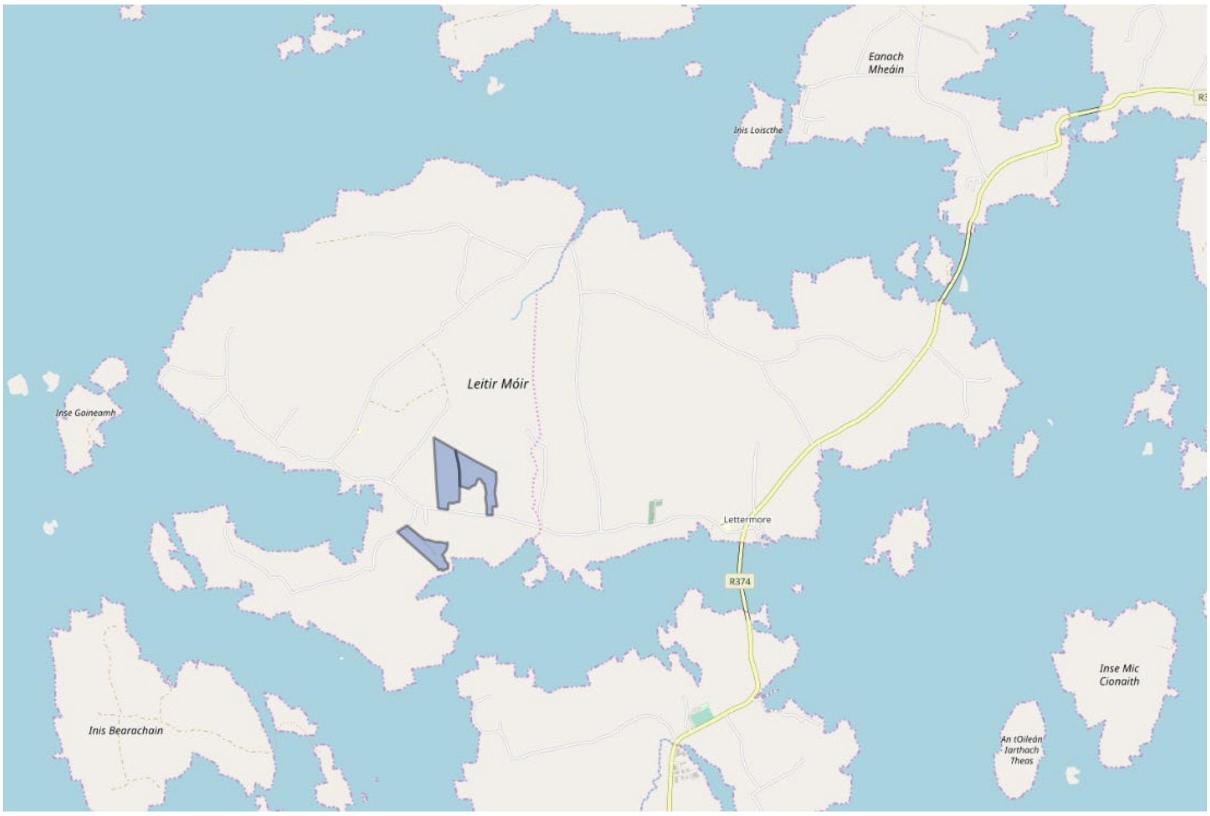
6. Site selection

Three sites have been reviewed as part of this study.

6.1 Leitir Mór Sites

As part of the feasibility study 3 sites on Leitir Mór were assessed in terms of their suitability for a community based solar farm. These sites were discounted based on the following reasons:

- Distance from the grid – sites were approx. 17kms to Screebe substation and 13kms from Carraroe. Therefore approx. costs to construct the grid connection alone (based on ESB published rates), assuming an overhead arrangement (it should be noted that there are some portions of the grid connection that would be required to be underground) would be €850,000 and €650,000 respectively.
- Nature of the ground on site – the ground at the three sites assessed was similar to the general area in Leitir Mór - a specific feature that contributes to the special landscape character there. The ground is uneven with extensive outcropping bedrock. As such an advance ground works contract would have to be undertaken in order to make the site ready for the installation of a solar array.



OpenStreetMap contributors

Community Site Locations Leitir Mór

Typical ground conditions - Leitir Mór

The cost associated with an advanced ground works contract coupled with the grid connection costs result in the sites being unviable for a community led renewable project at the moment.

Future factors that may change this situation: the possibility of the islands being be able to create a micro grid for utilisation of the energy in the local area (Private line development) or ESBN considering allowing generation to connect at MV substation level.

6.2 Carraroe Site

A site was identified in the vicinity of Carraroe Substation. The site looked favourable as it was near the substation. In addition to this, following a site walkover, the site appeared good from a ground conditions perspective. On this basis discussions were entered into with the landowner.

Carraroe Site and General Terms Offered:

- Total Landholding: 16.4 acres
- Area to be leased: c. 8 acres (50% of landholding)
- Solar Farm size:

  - 1.5MWs installed

  - 1 MWs MEC

- Rent payable under lease: €600/ acre/ annum = €4,800.
- One off payment of €600 upon signing lease option.
- One off payment at commissioning of site = 1 year rent.
- Term of lease: 25/30 years.
- All reasonable legal costs covered.
- Next Steps: Secure expression of interest, agree Lease terms and execute Option to Lease.

Outcome of the discussions:

The landowner is currently using the site for cattle and was not interested in converting to a solar farm usage and the land not being available for 25/30 years. There was also an indication that the level of financial remuneration proposed was not conducive to them changing the current land use.

Lessons learned from this discussion:

Given that the community solar farm is small in scale the level of financial remuneration will always be relatively small. On this basis it will be important to find land that is not currently being used for productive reasons or it may be necessary to increase the per acre rent proposed in order to make the offering more attractive. This should not exceed €1,000 per acre as that is in the region of the current market rate offered for commercial solar farm lease.

6.3 Other Alternative sites.

Screebe

Several potential sites have been identified in Screebe. In order to achieve a site with an MEC of 2.6 MWs approx. 15 Acres is required to be leased (this would require an installed capacity on site of 3.6MWs).

The sites identified are near the substation. Initial contact has been made with a landowner who is favourably disposed to the development. An initial feasibility in the context of topography and planning and environmental was undertaken with regard to a site in the general Screebe area. The findings of this initial feasibility are presented in Section 7 of this report.

7. Initial feasibility screening of potential Screebe site:

The initial screening for the potential community solar site in Screebe was undertaken using the criteria and headings outlined in the previous sections of this report.

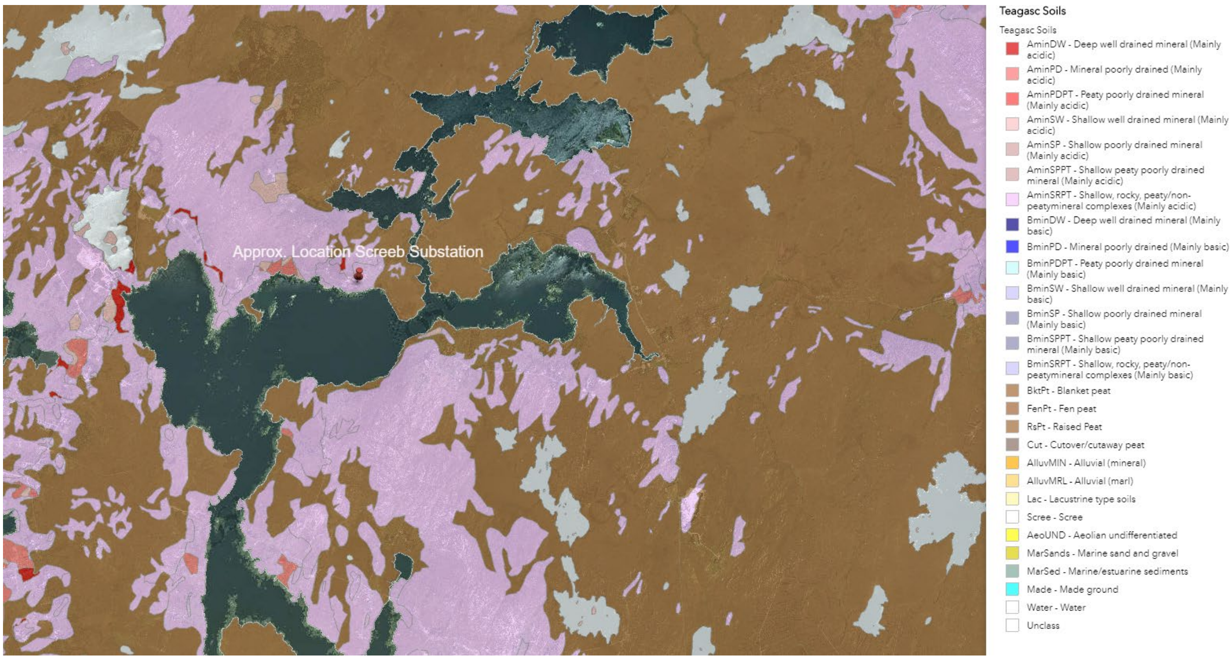
Grid

The site is located within 1km of the Screebe substation. There appears to be capacity for the connection of approximately 2.6MWs of generation at 10kV. This capacity should be verified as part of the next stage of the project development.

Topography and ground conditions

The site generally slopes in a southerly direction. Ground level is relatively flat for the most part with an elevation range of approx.6m OD to 1m OD.

The soils in the area are a mixture of Blanket Peat and Shallow soils with a peat surface/horizon. Further geotechnical analysis will be required with respect to the final proposed site. This assessment should focus on the peat's ability to support the construction traffic associated with the project build and also to determine the depth of foundation required in order to prevent foundation pull out. Subject to the findings of this analysis it is envisaged that a screw pile foundation will potentially be suitable for the blanket peat area. Ballast or concrete piles may be required for the shallow soils. Upon determination of the required foundation the financial model for the project should be revisited in order to determine impact.



Approx. Location of Screebe Substation relative to surrounding Teagasc Soil Types (Source: DCENR Groundwater Data Viewer)

Environmental screening

The general Screebe area is surrounded by environmentally sensitive sites. The relevant Natura sites include the Connemara Bog Complex SAC and the Kilkieran Bay & Island SAC. In addition to this the Leam West National Park is located approximately 7km to the North East. As part of the site selection it will be necessary to avoid the areas covered by these SACs. The site identified is not located within any designated site. Nor is it envisaged that the development of a solar farm on the identified site will result in any significant effects to the Natura sites. This is as a result of the nature of the works associated with the construction of a Solar Farm and the short duration associated with same (the construction programme of a 5MW Solar would typically not exceed 6 months). A detailed ecological survey of the proposed site is required in order to identify and map any relevant habitats and an ecologist should be appointed to undertake an Appropriate Assessment screening for the project as soon as an outline design is available.

The locations of the relevant Natura Sites in the general Screebe area is provided in Appendix A of this report.

Solar Farm Development Planning History in County Galway

Since 2016 there has been a total of 15 valid planning applications made to Galway County Council with respect to commercial scale Solar development.

Of these 15 applications 10 have been consented, 3 have been refused and 2 are pending decision. The 2 applications pending decision relate to modifications to previously consented developments.

Of the 10 consented developments – 2 relate to roof top mounted arrays and the remaining 8 are ground mounted. Proposed developments are generally in the region of 4/5 MWs with one having a capacity of 35MWs.

A plan is provided in Appendix B of this report detailing the location of these planning applications in the County.

Based on the consent rate of 10 out of 13 it can be derived that Galway County Council are favourably disposed to the development of Solar Farms in well sited locations.

Galway County Council County Development Plan

The Galway County Council 2015-2021 Development plan is generally supportive of Renewable Energy projects. The plan recognises the necessity of having high quality energy and communication infrastructure in order for County Galway to progress in the context of social and economic development. Key strategic aims include the reduction in the County's dependence on fossil fuels, ensuring security of energy supply throughout the County and reducing the County's overall CO_2 emissions. The plan sets out energy and renewable energy policies and objectives. Policy ER3 – Security of Supply - provides for the promotion and support of the provision of secure and efficient energy supply and storage including electricity, gas and renewable energy include wind, wave/tidal, solar, bioenergy and heat energy distribution. Objective ER4 – Electricity - outlines a commitment to support and facilitate the sustainable development and use of appropriate renewable energy resources and associated infrastructure within the County including, amongst others, Solar Energy.

With specific reference to the location of the proposed project – the Gaeltacht area. Objective GL3 Economic Development in the Gaeltacht outlines the council's objective to promote and support developments that contribute to the economic development of the Gaeltacht in a sustainable manner at suitable locations within the Gaeltacht area.

Therefore, it is considered that a community led Solar project would, in principle and subject to appropriate siting and planning, be well received by the County Council.

Landscape and Visual

The Galway County Council Landscape and Character assessment identifies the area as Peat bogs with a predominantly flat landform. The area is highlighted as open for consideration for windfarm development. The area falls into area category 17 – Carraroe (Cashla Bay to Glenoh). There are some identified views within the general area of the Screebe substation however these are limited in number and overall extent. Galway County Council has designated the landscape Value as being High and the Sensitivity rating as Special.

Notwithstanding this High Value and Special sensitivity rating development in areas such as these would not be considered precluded and would have to be assessed on a project by project basis. Given that the overall topography of the area is defined as flat and the ability to effectively screen solar farm development with native hedgerow planting it is considered that a small community led solar farm could potentially be effectively assimilated into the landscape. Early stage engagement with a Landscape consultant will be required in order to inform the overall design of the project and the screening to be applied to same.

Glint and glare are not expected to be an issue due to the small number of dwellings in the general area of Screebe and also the nature of the road network. A detailed glint and glare assessment will be required in order to support any future planning application once the final site is selected and the outline design for same is available.

Transport Links

Transport links are considered to be good with Rossaveel harbour being located approx. 15km to the south of Screebe via the R336 and Kilary Harbour being located approx. 50km to the north of Screebe also via the R336.

Flood Risk

No flood risk is associated with the Screebe area is detailed on the OPW flood information portal.

Cultural Heritage

The main cultural heritage feature in the general Screebe area is the Screebe Bridge dating back to 1800-1840. It is not envisaged that a development in the area would impact on this bridge however consideration will need to be given to it in the context of any proposed construction transport route to site and the overall landscape and visual impact assessment.

Screen Bridge located on the R340.

Conclusion.

In principle the initial feasibility screening supports the development of a small community led renewable project within the Screebe area. The proposed site needs to be secured through a landowner agreement. At that stage further assessment is then required with respect to confirming the actual available capacity at the Screebe substation and a more detailed assessment is required with respect to the geotechnical aspects of developing on Peat. In addition to this the early engagement of an ecologist and a landscape architect is also advised.

8. Biodiversity Opportunities

There are opportunities when developing commercial scale ground mounted solar farms to enhance local biodiversity. The Bre National Solar Centre Biodiversity Guidance for Solar Development provides a clear outline of how biodiversity enhancement measures can be incorporated. Clár Éifeachtach Fuinnimh have expressed an interest in making provision for beehives as part of the development given the extensive heather in the vicinity of the project area. Biodiversity enhancement opportunities include:

Hedgerows – existing or installed to screen project

Hedgerows support a wide variety of wildlife. Existing natural hedgerow should be utilised for screening and bolstered where necessary to fill in any gaps. Additional screening should be provided through the use of native trees and shrubs.

Field Margins

Field margins in the region of 7-10m can provide areas for enhanced biodiversity as part of the overall development – in the case of the proposed project in Screebe these areas can include additional heather planting to support a colony of bees on site.

Wildflower meadow

Wildflower meadows can be sown beneath the solar arrays or alternatively in strips within field margin buffers. The wildflower meadow should consist of a seed mix suitable to the climate and soil type. This seed mix can be advised by an ecologist. The plants selected can include pollinator/nectar friendly species to further support any future bee colony established with the project boundary. In addition to this wild bird seed mixes can be included as part of the overall seed mix or for a designated area on site.

Roosting and nesting

Bird, bat and small mammals can be encouraged within the developed site through the provision of artificial nesting and roosting structures. Usually the nesting and roosting boxes are located within hedgerow and woodland however, suitable habitat can also be created within the solar array itself.

The preparation of a biodiversity management plan as part of the overall design for the solar farm will ensure that all the biodiversity enhancement objectives, including the creation of a bee colony, will be appropriately provided for and progressed as part of the overall development of the Solar Farm.

9. Cost of the Development of a Solar Farm

The cost of developing Solar Farms is reducing year on year with the cost of panels reducing significantly over the past 10 years. The most recent financial data published on the price of panels would suggest a cost of €0.35 per watt peak. In terms of the Balance of systems (BoS) on site, from review of IRENA published documentation, the BoS costs can be as low as 20% of the overall cost for a simple grid connected solution or as high as 70% for an off-grid solution. The Balance of systems include civils, electrical, comms, security, inverters etc. In this instance it is reasonable to assume a 50% split between the cost of panels and the cost of the BoS. This results in an approx. development cost of €700,000 per MW installed capacity (excluding grid connection costs). This development cost may not be realised for smaller project procuring at the small scale that will be associated with Community led project. The reason for this being that it is assumed that the lower cost of panels is associated with large scale developer driven projects purchasing at sufficient scale to drive prices down.

Solar farms can provide a steady return to investors when well designed and installed, as is evidenced from financial models. However, the models associated with Solar Farms (particularly those for smaller scale projects) are very sensitive to changes in certain model inputs.

Cost elements that form that basis of a Solar Farm financial model should include the following Capital Expenditure (CAPEX) and Operational Expenditure (OPEX) items:

CAPEX

- Panel procurement
- Balance of Systems Costs (Electricals, Comms and Civils)
- Inverters (if not included in the Balance of Systems)
- Grid Connection.

OPEX

- Land rent payable
- Operation and Maintenance
- Asset Management (in the case of a community led project this may be undertaken by the community)
- Maintenance Reserve Account (to cover general maintenance and inverter refurbishment)
- Insurance
- Grid fees
- Rates (payable to council)
- Balance of Costs (costs associated with communications and any power import requirement)

The revenue generated by the Solar Farm will be in the form of a fee paid for the electricity generated.

The current market rate for electricity is c.€0.055/ kWp. Some renewable energy projects will receive additional support through the RESS auctions. Other projects have entered into commercial power purchase agreements (PPAs) with corporations.

A financial model has been prepared for a sample community led project in Screebe Co. Galway and an extract for same has been provided in Table 8.1. It is clear from this financial model that the level of support received for projects of this nature in the form of feed-in tariffs will need to be substantially above the current market rates and also above the rates that will likely be paid to developers through the RESS Auctions.

Based on the Financial model prepared, sub 5MW community led renewable projects may require a minimum tariff of €0.09/ kWp.

The main other aspects that affects the financial viability of these smaller projects is the overall CAPEX, grid connection fees, operation and maintenance fees and the solar plant yield.

In addition to the assumed minimum tariff payable to community led Solar Project a low rate has been included for Asset Management. It is assumed that the communities will be actively involved in the management of their project from an asset perspective and as such it is deemed acceptable to provide a lower commercial rate.

No Council rates have been included in the financial model at this stage – given that these projects will be community led by volunteer groups it is hoped that there will be a waiving of the normal commercial rates. Clár Éifeachtach Fuinnimh are a not for profit organisation/community and do no currently pay rates on its buildings or land.

Table 8.1 Typical Financial model

Community Solar Farm Financial Model

Constructed Plant Size	Wp	3640000
MEC	MWs	2.6
Project Area	acres	14
Solar Plant yield	kWh.KWp	950
Feed in Tariff	€/kWp	0.09
Market price	€/kWp	0.055
Rate of Inflation	annual	1.50%

OPEX

Land Rent	€/acre	850
*O&M	€/Wp	0.01
*Asset Management	€/Wp	0.005
Panel degradation	annual	0.30%
maintenance reserve account	Over initial 10 yrs	€264,264
*Balance of costs	annual	3600
*Insurance	% of CAPEX	0.50%
*Grid fees	Gross Turnover	0.3%
rates	Not included	

CAPEX

	€/Wp	Total
panel cost	0.35	€1,274,000
Balance of Systems	0.35	€1,274,000
Grid Connection		€350,000
	CAPEX Total	€2,898,000
	CAPEX excl. Grid	€2,948,400

Project Net Present Value @ 6% Rate of Finance **€196, 660**

Note: *figures assumed for the purposes of this study– require industry verification

The Net Present Value represents the current value of the project once all income and expenses have been accounted for over a 30 year project lifetime at a rate of finance/ return on investment of 6%. Therefore, it could be considered that, based on the figures presented in this financial model, c. €6,555 will be available for community investment year on year. Should the rate of return for investors (potentially community based)/ debt be reduced even by 1% and additional c. €9,500 would be available for community investment year on year.

The Solar Plant yield included in the presented financial model has been calculated in the online European Commission PVGIS tool for a site location in Screebe, with an angle of tilt of 30 degrees, and azimuth angle of 1 degree and assumed losses of 14%. An approx. average of the results produced using different solar radiation databases was selected for the calculation of the solar plant yield. Outputs for the 4 PVGIS models are provided in Appendix C of this report.

Development costs that have not being included in the financial model are the cost associated with bringing the Solar Farm project to shovel/finance ready. These costs will include the legal agreements required to secure the land for the project, Costs associated with the preparation of a planning application for the project and grid application fees.

Typical envisaged costs associated with project development to finance ready are provided in table 8.2

Table 8.2 Typical Development Costs to Finance Ready

Item	Cost
Legals	€5,000
Planning	€50,000
Grid Application	€10,000 (€7,000 + consultancy services)
Total	€65,000

It should be noted that it is considered, given that the project is a proposed community solar farm, that planning costs may be reduced. In addition to this it is hoped that the grid application fee for community solar farms will also be less than that for commercial farms.

9.1 Conclusion

In theory Community led Solar Farms are viable (subject to a number of criteria) and if designed and installed correctly can provide a steady return to investors. In the financial model prepared as part of this study return is in the region of 6%. In addition to this there would also be an annual payment for community related projects. There is also the potential for community employment opportunities in the form of Asset management and Operation and Maintenance of the Community led Solar Farm – where financial liabilities associated with the Farm become community opportunities.

The theoretical financial viability of Community Solar Farms (sub 5MW projects as defined by RESS) will be subject to a number of criteria which include:

- Economies of scale being achieved at procurement stage in order to enable Community led Projects to benefit from reduced panel and BoS costs. This can be achieved through community groups joining together for the procurement phase or a government led procurement process to serve community led projects.

- Supports for community led projects in the form of increased feed in tariff and reduced grid connection costs.
- Reduced project finance costs where additional financing/support is required – a requirement to deliver greater returns (6% modelled as part of this study) will significantly reduce the project financial viability.
- Financial support for community groups to deliver project development to the point that the project is finance ready.
- Government led training to communities to upskill and deliver operation and maintenance services.

10. Community Ownership models

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The RESS-E high level design was published in 2018. This high-level design indicated strong support for community led solar farms. This support has been confirmed and is now provided in the Draft RESS Terms and Conditions that were published at the end of 2019.

From the high-level design paper, the draft Terms & Conditions and the associated workshops the DCCAE facilitated during the consultation phase associated with same we know the following:

- There will be financial support for community led projects across early phases of project development.
- Financial support will also deliver key supports such trusted advisor and trusted intermediaries.
- Financial risk mitigation is identified as being crucial in assisting communities to realise local energy projects – this is likely to be provided in the form of project finance that can revert to grant funding should the project collapse or become loss making for any reason.
- There will be a separate community category in the RESS auction- Community led projects will be required to meet certain criteria in order to qualify for this category.
- Measures to be identified with the CRU to support community led projects.
- DCCAE to work with industry representative groups and community reps to ensure detailed model developed works for Irish communities and project developers.
- Community led projects will be exempted from auction bid bond requirements.

On the basis of the foregoing it is understood that there will be substantial support for community led projects and there is a commitment to de-risk projects for communities.

From existing grant schemes that are available for communities we know that it will be the communities that are ready to move forward with their projects that will be in the best position to avail of whatever supports are put in place by the DCCAE.

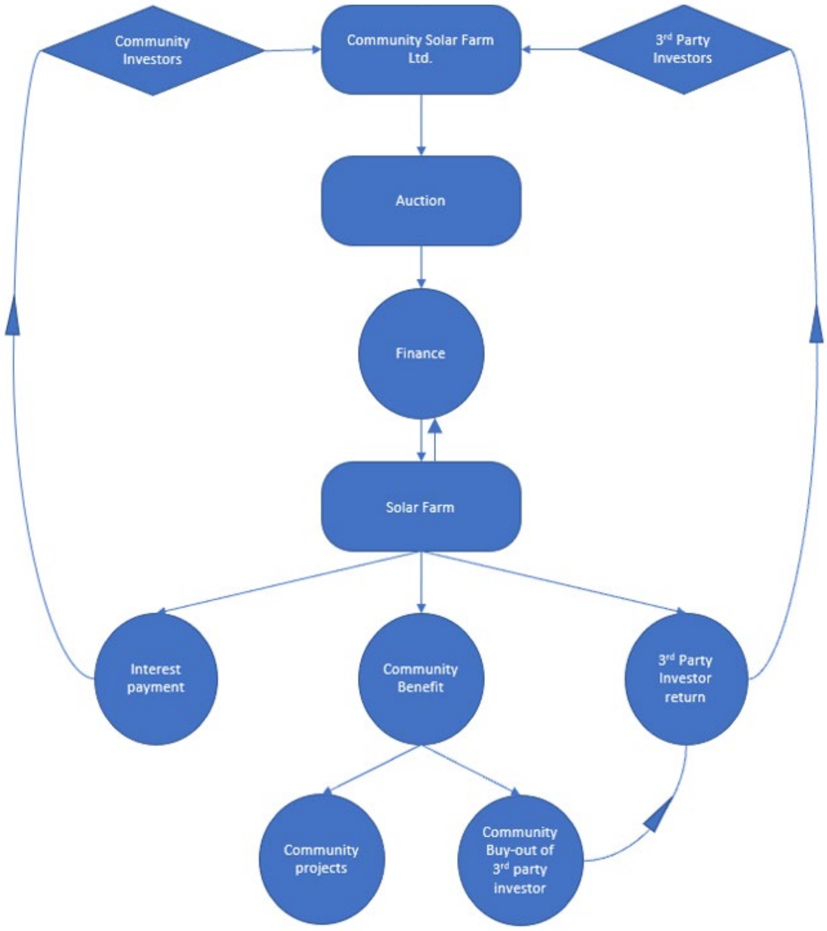
There are several community ownership models that could be applied to a potential solar farm project. The Community and Renewable Energy Scheme (CARES) Project Development Toolkit for Solar Photovoltaic presents 5 different ownership models. These include wholly community owned right through to developer lead with an annual payment to the community.

Based on the details provided in the Draft RESS Terms and Conditions in order for a project to be deemed a Community project in an Irish context they must:

a) At all relevant times be at least 51% owned by a Renewable Energy Community (REC).
b) At all relevant times, at least 51% of all profits, dividends and surpluses derived from the RESS 1 Project are returned to the Relevant REC.
c) The relevant REC must have a minimum of 150 shareholders (resident or located in the proximity of the project) and have a maximum allotted share capital of €20,000; and
d) The primary purpose of the REC is to provide environmental, economic, societal or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits and which reinvests surpluses into achieving such benefits.
e) Must include at least one shareholder or member that is registered as a Sustainable Energy Community (SEC).

A sample structure for a model that could be applied to a community owned solar farm project is included in this feasibility study

Sample structure for potential community solar farm



11. Conclusions and Recommendations

It is considered that a community solar farm is a viable project for Clár Éifeachtach Fuinnimh (subject to a number of requirements). The development of a community solar farm can provide a return for community investors whilst also providing an annual community benefit return and potentially creating employment opportunities in the form of asset management positions and Operation and Maintenance positions. It is also clear that Clár Éifeachtach Fuinnimh are well positioned to qualify as a REC as they are already established as an SEC and are active in terms of current SEAI grants.

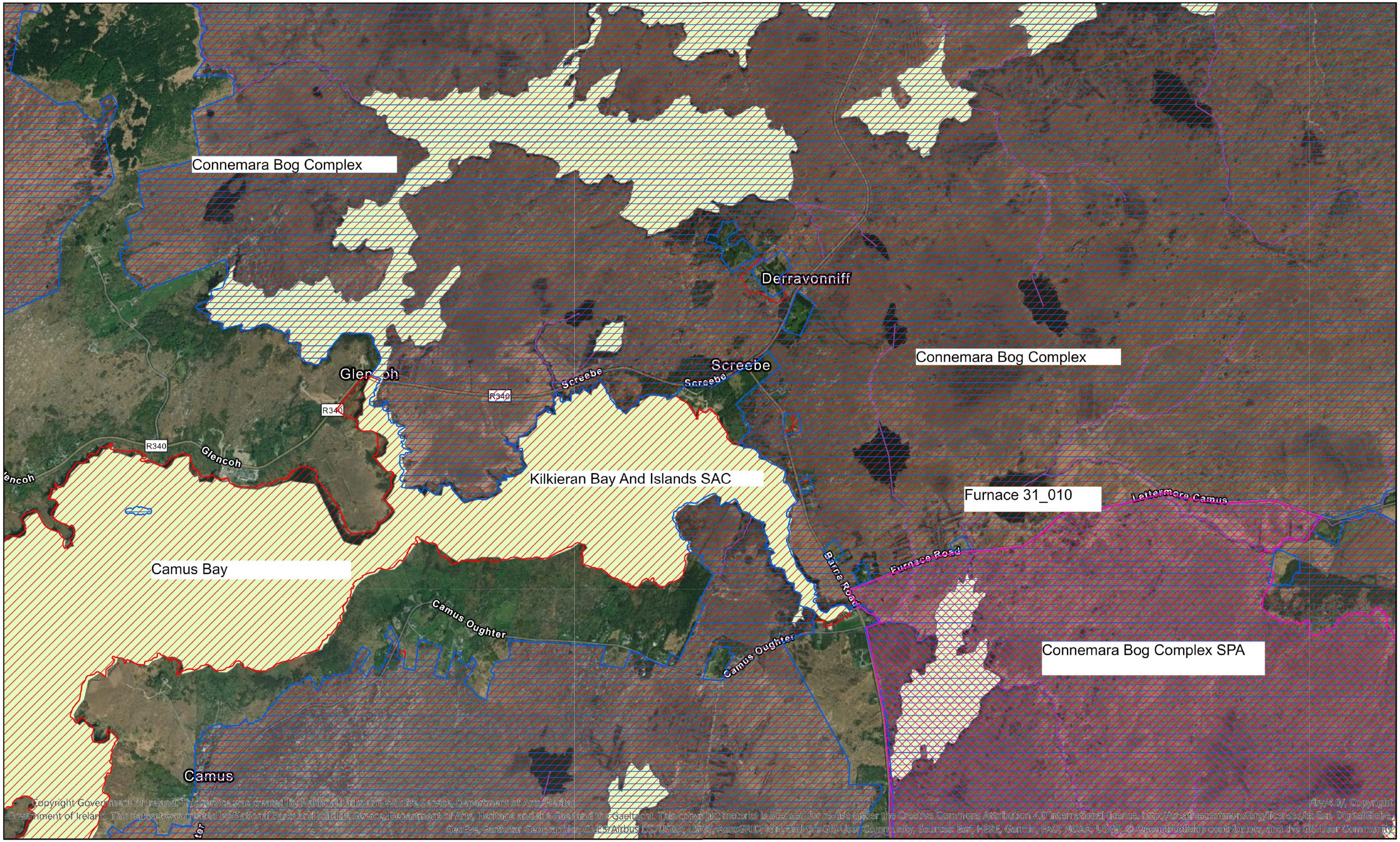
As set out in this report the viability of this project will be dependent on a number of technical, financial and general policy requirements. These include:

- Agreeing Lease option terms with the relevant landowners and securing the project site.
- Undertaking a detailed assessment of the items that have been highlighted in this report as requiring further assessment – these include geotechnical assessment with respect to constructing on peat, confirmation of grid availability and environmental assessment.
- Support being made available for the next stages of project development in order to bring the project to finance ready – it is anticipated that this will be provided through local grant schemes and also supports provided by DCCAE as part of the delivery of the RESS auctions.
- Reduced fees being applied to Community projects for grid connection application and works.
- Reduced commercial rates being applied to the project at Council level.
- Economies of scale being achieved with respect to the procurement of materials and works associated with the project. This will ensure cost effective project delivery.
- A Favourable tariff being awarded to the project.
- Project finance/ investment rate being reasonable.

The next steps to progress this project includes:

- Secure landowner agreement to develop a community led solar farm in a location near the Screebe substation (sample expression of interest form included in Appendix D).
- Review next stage grants that are available to progress the project – including supports that are likely to be delivered as part of the RESS auctions.
- Confirm available capacity at the substations.
- Undertake the detailed assessments recommended as part of this study.
- Update financial model with site specific details and confirm the business case.
- Assess the potential to build a community co-op. This will ensure economies of scale at procurement stage for community solar farms.
- Appoint consultants to apply for a planning application for the community solar farm.

Appendix A

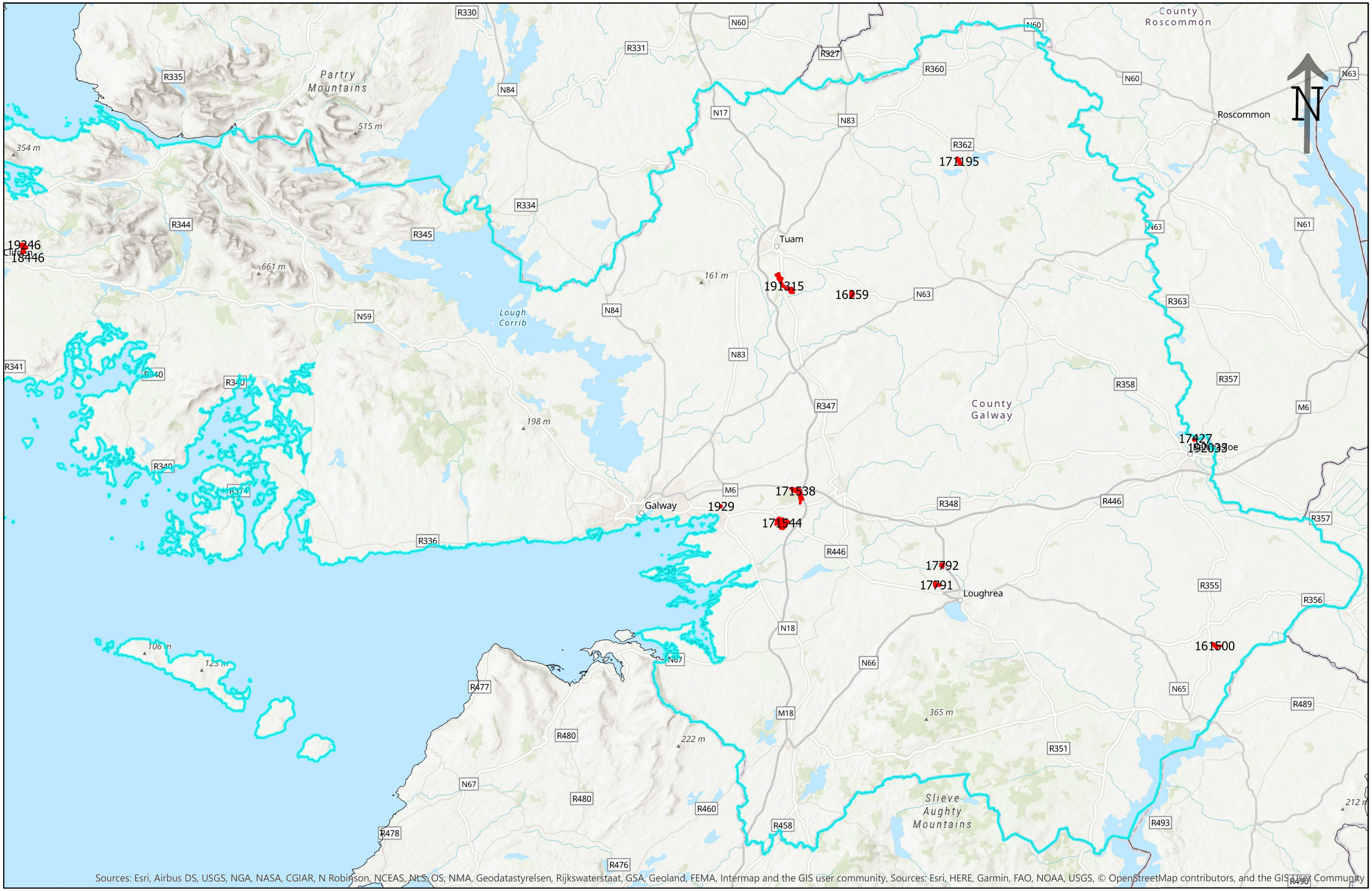


NPWSDesignatedAreas

- Special Protection Areas
- Proposed Natural Heritage Areas
- Natural Heritage Areas
- Special Area of Conservation
- WFD_RPA_SACCOHRWBPolylines
- WFD_RPA_SACCOHRWBPolygons

planenergy

Appendix B



GALWAY COUNTY COUNCIL SOLAR FARM PLANNING APPLICATIONS

planenergy

1665683178158.70 16656317.4

Appendix C

Performance of grid-connected PV

PVGIS-5 estimates of solar electricity generation:

Provided inputs:

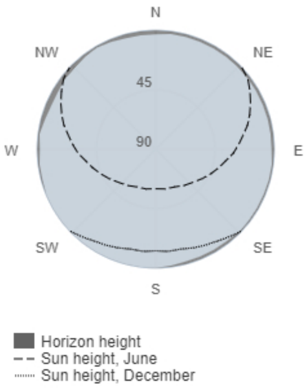
Horizon: Calculated
Database used: PVGIS-CMSAF
PV technology: Crystalline silicon
PV installed: 4200 kWp
System loss: 14 %

Simulation outputs

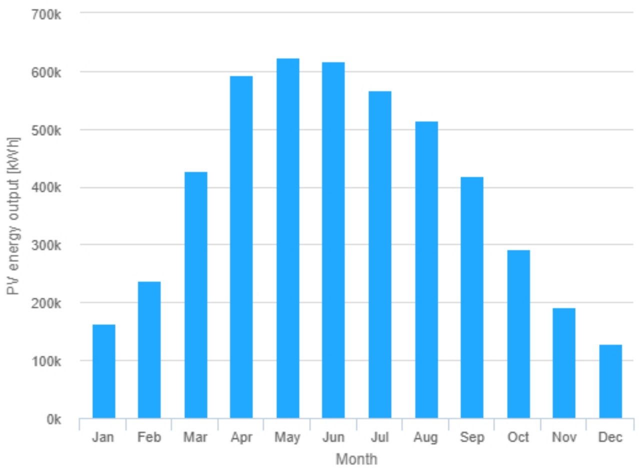
Slope angle: 30 °
Azimuth angle: 1 °
Yearly PV energy production: 4776563.66 kWh
Yearly in-plane irradiation: 1375.59 kWh/m²
Year to year variability: 209294.76 kWh
Changes in output due to:
- Angle of incidence: -3.17 %
- Spectral effects: 1.72 %
- Temperature and low irradiance: -2.4 %

Total loss: -17.32 %

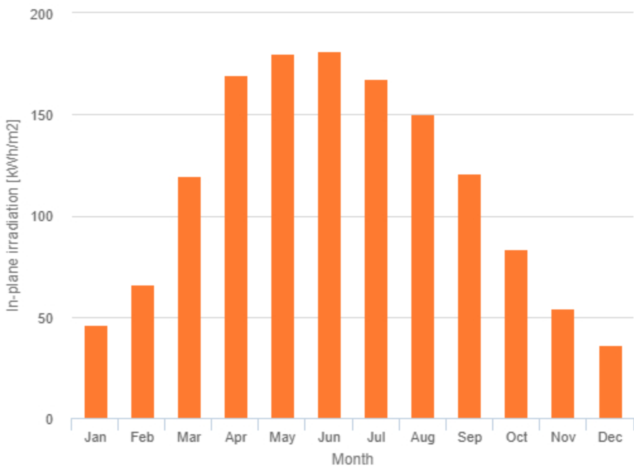
Outline of horizon at chosen location:



Monthly energy output from fix-angle PV system:



Monthly in-plane irradiation for fixed-angle:



Monthly PV energy and solar irradiation

Month	E_m	H(i)_m	SD_m
January	164207.2	46.1	37313.3
February	237526.1	66.3	33517.2
March	428217.9	119.8	46201.3
April	592952.1	169.4	45816.5
May	624477.2	180.1	37791.0
June	617543.4	181.4	46892.0
July	566378.5	167.4	45659.4
August	514108.1	150.1	60799.9
September	418593.8	121.0	41210.7
October	292031.0	83.5	29113.6
November	192318.3	54.2	23680.5
December	128209.5	36.2	32200.7

E_m: Average monthly electricity production from the given system [kWh].
H(i)_m: Average monthly sum of global irradiation per square meter received by the modules of the given system [kWh/m²].
SD_m: Standard deviation of the monthly electricity production due to year-to-year variation [kWh].

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Performance of grid-connected PV

PVGIS-5 estimates of solar electricity generation:

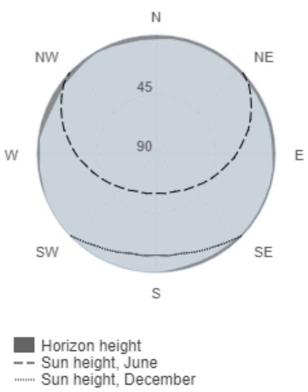
Provided inputs:

Horizon:	Calculated
Database used:	PVGIS-SARAH
PV technology:	Crystalline silicon
PV installed:	4200 kWp
System loss:	14 %

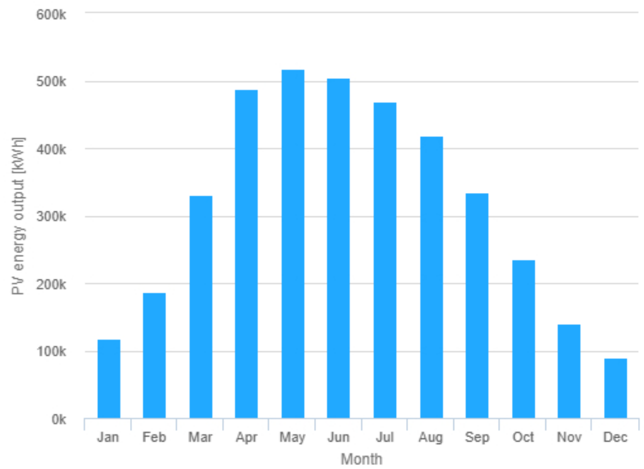
Simulation outputs

Slope angle:	30 °
Azimuth angle:	1 °
Yearly PV energy production:	3833442.46 kWh
Yearly in-plane irradiation:	1112.26 kWh/m²
Year to year variability:	242867.11 kWh
Changes in output due to:	
Angle of incidence:	-3.29 %
Spectral effects:	1.69 %
Temperature and low irradiance:	-2.98 %
Total loss:	-17.94 %

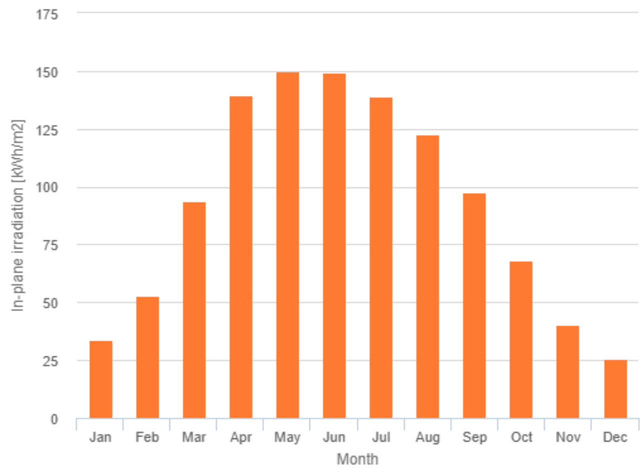
Outline of horizon at chosen location:



Monthly energy output from fix-angle PV system:



Monthly in-plane irradiation for fixed-angle:



Monthly PV energy and solar irradiation

Month	E_m	H(i)_m	SD_m
January	117503.3	33.6	36373.2
February	186940.1	52.7	31447.9
March	331521.2	93.7	53223.3
April	487068.5	139.4	51169.8
May	517417.2	149.8	36442.4
June	505580.6	149.2	53075.8
July	468532.7	139.3	57313.5
August	418284.6	122.8	52218.6
September	335399.8	97.8	36481.3
October	235839.0	68.1	27080.4
November	139954.2	40.1	19579.9
December	89400.9	25.9	22435.8

E_m: Average monthly electricity production from the given system [kWh].
H(i)_m: Average monthly sum of global irradiation per square meter received by the modules of the given system [kWh/m²].
SD_m: Standard deviation of the monthly electricity production due to year-to-year variation [kWh].

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Performance of grid-connected PV

PVGIS-5 estimates of solar electricity generation:

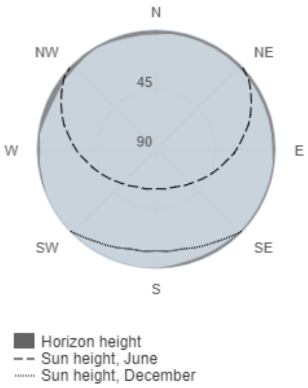
Provided inputs:

Horizon:	Calculated
Database used:	PVGIS-ERA5
PV technology:	Crystalline silicon
PV installed:	4200 kWp
System loss:	14 %

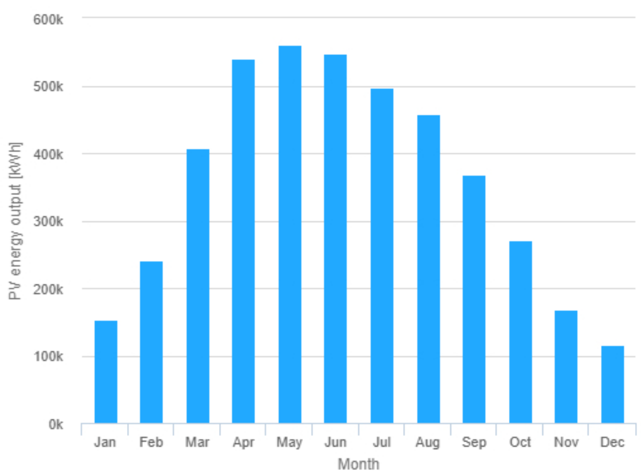
Simulation outputs

Slope angle:	30 °
Azimuth angle:	1 °
Yearly PV energy production:	4327867.16 kWh
Yearly in-plane irradiation:	1241.4 kWh/m²
Year to year variability:	145020.44 kWh
Changes in output due to:	
Angle of incidence:	-3.04 %
Spectral effects:	1.73 %
Temperature and low irradiance:	-2.14 %
Total loss:	-16.99 %

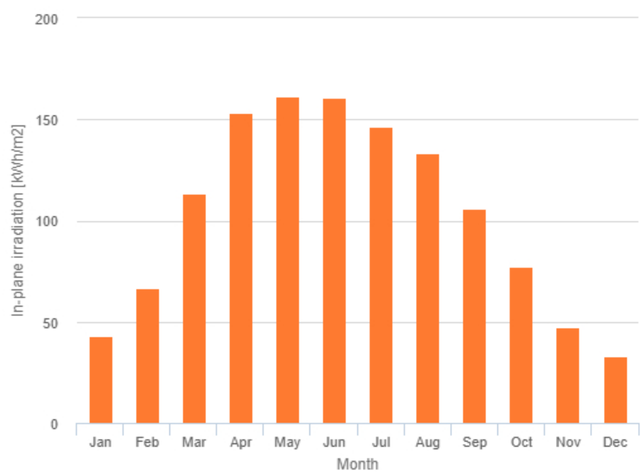
Outline of horizon at chosen location:



Monthly energy output from fix-angle PV system:



Monthly in-plane irradiation for fixed-angle:



Monthly PV energy and solar irradiation

Month	E_m	H(i)_m	SD_m
January	153249.3	43.0	20760.0
February	241286.6	66.8	33601.8
March	406753.8	113.2	30182.2
April	540516.4	153.5	29991.6
May	561177.3	161.3	35686.7
June	548566.9	160.6	44887.2
July	496389.3	146.4	46275.5
August	458527.6	133.2	43277.1
September	368014.7	106.0	39367.0
October	270373.4	77.1	32177.0
November	167818.5	47.4	18437.6
December	115193.1	32.8	18817.3

E_m: Average monthly electricity production from the given system [kWh].

H(i)_m: Average monthly sum of global irradiation per square meter received by the modules of the given system [kWh/m²].

SD_m: Standard deviation of the monthly electricity production due to year-to-year variation [kWh].

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Performance of grid-connected PV

PVGIS-5 estimates of solar electricity generation:

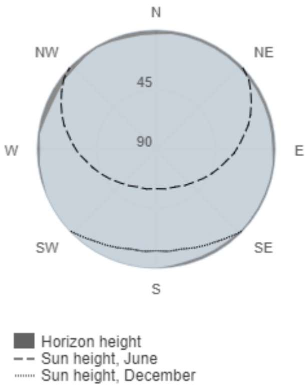
Provided inputs:

Horizon:	Calculated
Database used:	PVGIS-COSMO
PV technology:	Crystalline silicon
PV installed:	4200 kWp
System loss:	14 %

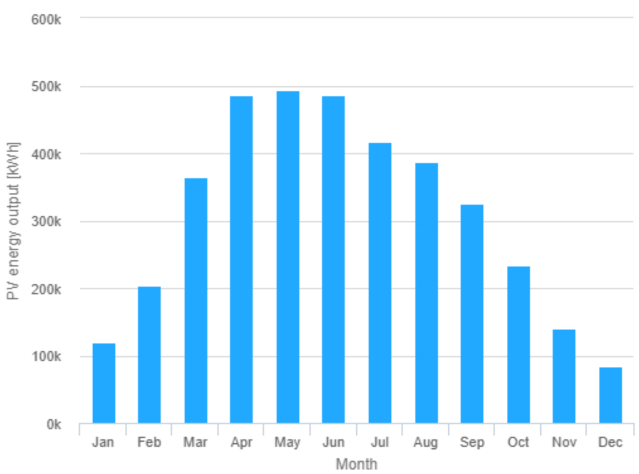
Simulation outputs

Slope angle:	30 °
Azimuth angle:	1 °
Yearly PV energy production:	3740425.6 kWh
Yearly in-plane irradiation:	1082.18 kWh/m²
Year to year variability:	209293.94 kWh
Changes in output due to:	
Angle of incidence:	-3.05 %
Spectral effects:	1.71 %
Temperature and low irradiance:	-2.95 %
Total loss:	-17.71 %

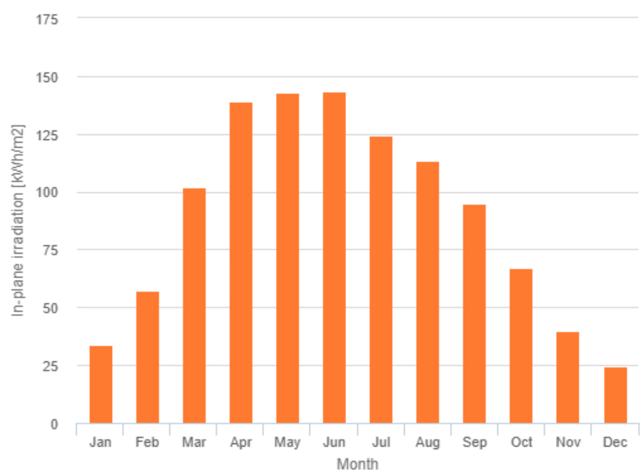
Outline of horizon at chosen location:



Monthly energy output from fix-angle PV system:



Monthly in-plane irradiation for fixed-angle:



Monthly PV energy and solar irradiation

Month	E_m	H(i)_m	SD_m
January	118978.8	33.9	27431.1
February	204264.5	57.0	38343.8
March	364078.1	102.0	44648.9
April	485750.7	139.0	27890.3
May	494223.6	142.9	53966.1
June	486820.1	143.6	58007.6
July	415926.7	124.1	42189.5
August	386622.3	113.5	64069.8
September	325775.9	94.7	58873.3
October	233437.6	67.0	33309.1
November	140414.0	40.0	20656.3
December	84134.8	24.5	21292.1

E_m: Average monthly electricity production from the given system [kWh].

H(i)_m: Average monthly sum of global irradiation per square meter received by the modules of the given system [kWh/m²].

SD_m: Standard deviation of the monthly electricity production due to year-to-year variation [kWh].

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Appendix D

Comhairle Ceantar na nOileán teo.
Clár Éifeachtach Fuinnimh

Tír an Fhia, Leitir Móir, Gaillimh. H91 W529
Fón: 091-551922/091-551761 Faics: 091-551921
r-phost: ceantarnanoilean@eircom.net

Oifigeach Forbartha: Máirín Uí Ráinne

FOIRM LÉIRIÚ SPÉISE

Ainm an Togra: Feirm Solar

Ainm: ____

Seoladh: ____

____

____

Uimhir Gúthán: ____

Ríomhphost: ____

An bhfuil suim agat sa togra thuasluaite: Tá/Níl ____________________

Síniú: ____

Dáta: ____________________________

Ar Son agus ar Mhaithe le Pobal an Cheantar