SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Community Energy Resource Toolkit

Solar PV

Solar PV

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Disclaimer

Sustainable Energy Authority of Ireland

SEAI is Ireland's national energy authority investing in, and delivering, appropriate, effective and sustainable solutions to help Ireland's transition to a clean energy future. We work with the public, businesses, communities and the Government to achieve this, through expertise, funding, educational programmes, policy advice, research and the development of new technologies.

SEAI is funded by the Government of Ireland through the Department of Environment, Climate and Communications.

Introduction

Welcome to the Community Energy Resource Toolkit. This toolkit has been developed by SEAI to provide guidance and support to communities interested in developing renewable electricity generation projects in Ireland.

The toolkit is one of many resources which will be developed over time to support communities as part of the Community Enabling Framework, implemented by SEAI. This framework provides end-to-end support to create a community energy sector in Ireland that can flourish and one that will deliver meaningful impact to communities nationwide.

The Community Energy Resource Toolkit provides a series of practical guidance modules to support project development and delivery, including technology options, business planning, project development stages and good governance. The full suite of guidance modules will be developed in phases, with the first four modules covering the topics of Onshore Wind; Solar PV; Planning Process and Grid Connection.

These modules have been designed to provide step-by-step guidance through the process of developing a renewable energy project, from determining your goals, to helping you achieve them.

How to Use This Toolkit

This toolkit is designed to be used online. Links are **highlighted in blue** and denoted with this symbol: Click on the highlighted text to activate the link.

Navigation buttons are displayed at the bottom of every page.
The navigation symbols are:

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What is Solar Energy and How it Works

"In 90 minutes, enough sunlight strikes the Earth to provide the entire planet's energy needs for one year." – International Energy Agency.

The light from the sun that reaches the Earth carries energy in the form of radiation. This radiation heats up surfaces and fluids on our planet.

For power production, the light from the sun can be harnessed in two main ways: through solar thermal technologies, or through solar photovoltaics (solar PV). Solar thermal systems use the light from the sun to heat up fluids (like water or oil) for either direct use or to create steam that can be used to generate electric power. Solar PV technologies, on the other hand, use solar cells to transform the light from the sun into an electric current.[1]

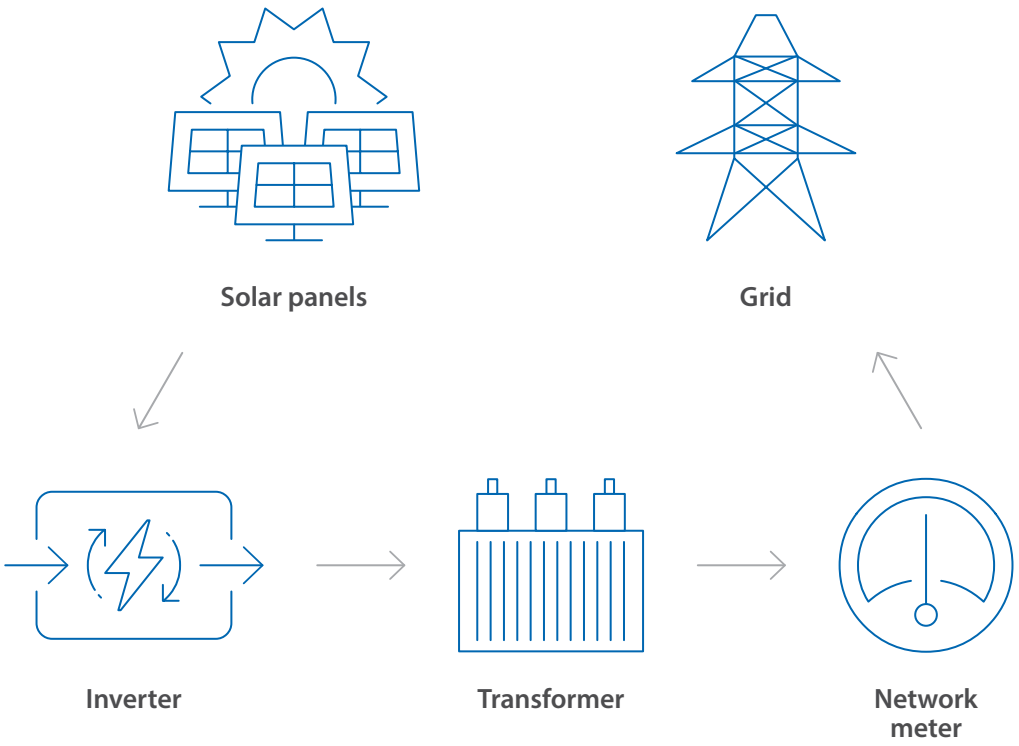
Solar PV has become the most popular renewable energy technology, with more than 1TW currently in operation worldwide and installations growing exponentially.

1 There are many factsheets explaining how Solar Photovoltaic technology (PV) technology works, for example on the **Irish Solar Energy Association or Sustainable Energy Authority of Ireland** websites.

Solar PV Systems

The main element of solar PV systems are solar cells. These solar cells rely on the effect of a semi conducting material, usually silicon. When it is hit by sunlight it creates a voltage difference that, as a result, creates an electric current. Solar panels contain multiple solar cells – currently up to 132 and power outputs of up to 700W per panel.

Figure 1: Typical Solar PV System Configuration



Solar panels are usually set up in arrays that connect multiple solar panels together. The electricity that comes out of a solar panel or array is **Direct Current (DC);** this current is constant in time. This is different to the electricity that flows through the power distribution and transmission networks, which is **Alternating Current (AC),** and varies periodically in time, at a frequency of 50 Hertz in the case of Ireland.

In order to convert the DC produced by a solar panel array to the AC required by the power grid, solar PV systems use inverters, which carry out this conversion, and also try to maximise the power output of the array and increase its quality. Transformers sit between the inverter and the grid and perform the critical function of increasing the voltage to match the network voltage.

Solar Energy in Ireland

Ireland has set a target of meeting 80% of electricity demand through renewable sources and cutting greenhouse gas emissions by at least 30% by 2030 compared to 2005 levels. This will set the path for achieving net zero carbon by 2050. Ireland's electricity system currently has a 40% renewable share, mainly as a result of the installation of onshore windfarms over the last 25 years. Renewable energy will play a key role in achieving our targets and solar PV is likely to be a strong part of the solution.

So far, solar PV capacity has seen relatively slow growth in Ireland compared to other countries, but installed capacity is now growing much faster. There are approximately 2GW of PV either operational or contracted for construction, up from almost no ground mount solar in 2018. For an up to date picture of solar farms under development see **SEAI Solar Atlas**.

Figure 2: Decreasing Cost of Solar PV (Lazard)

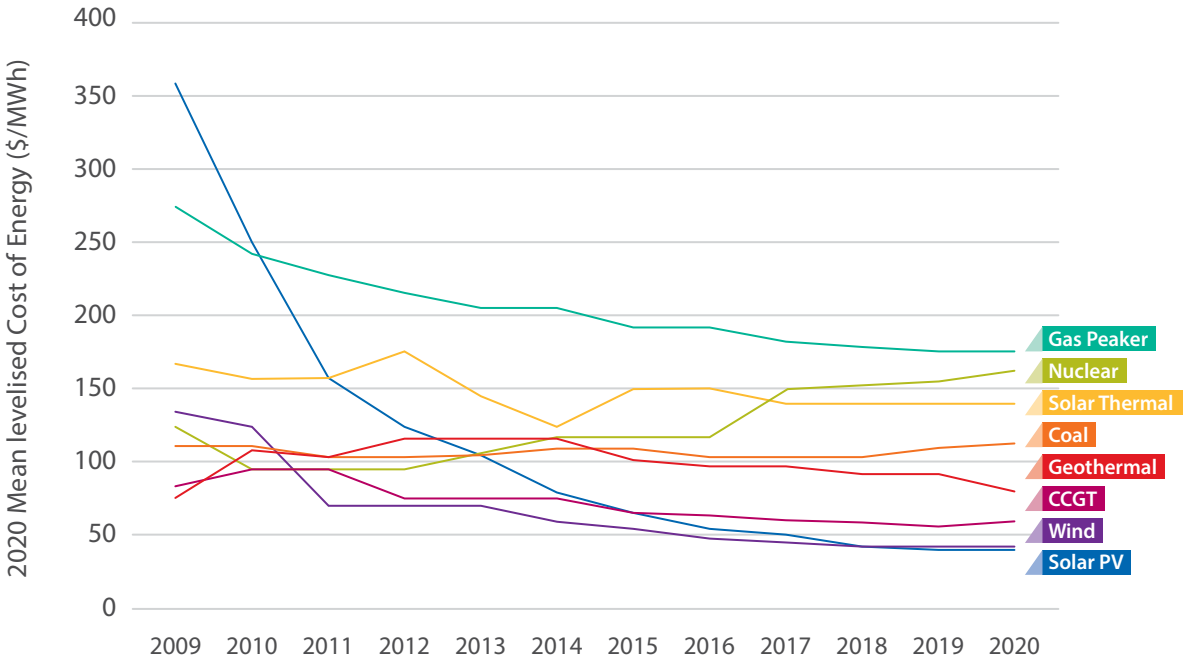
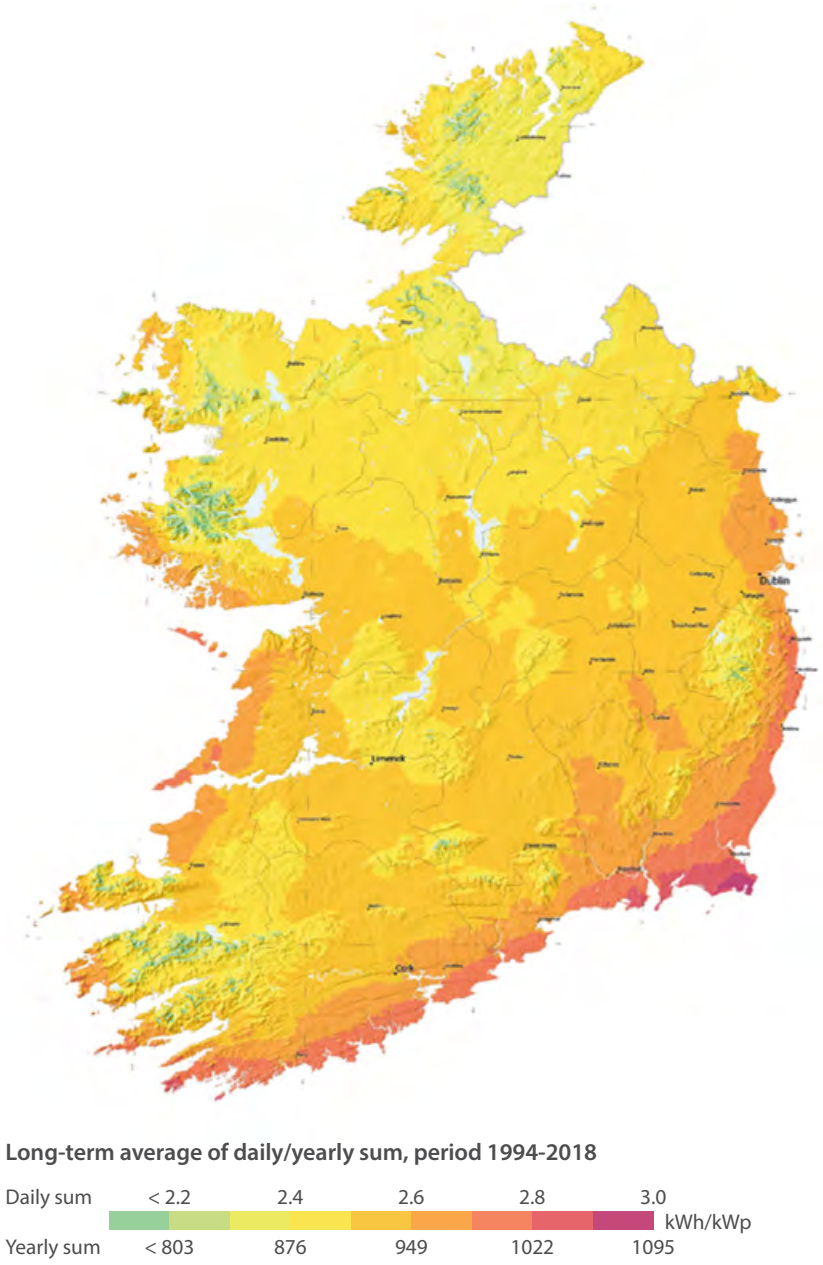


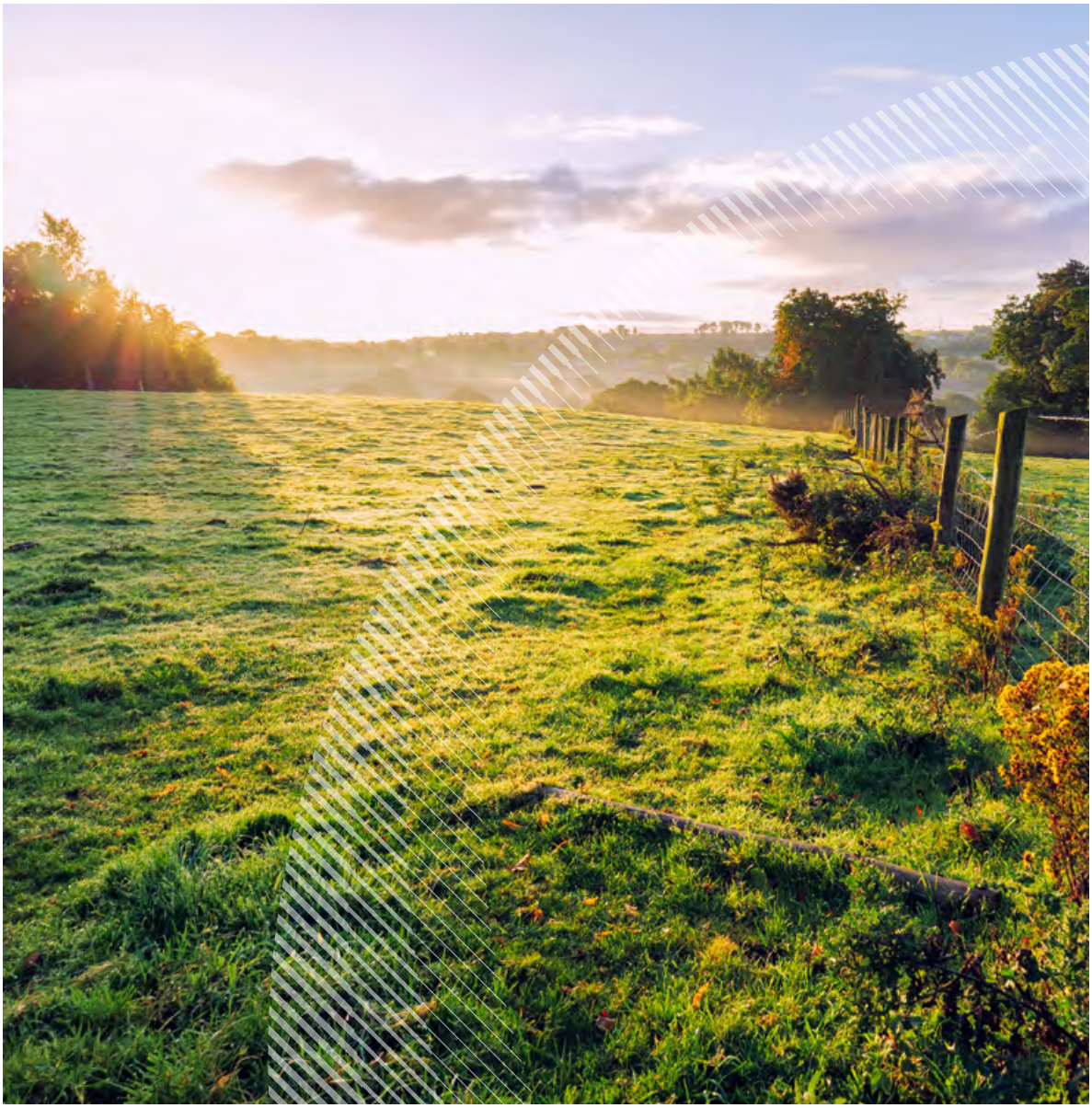
Figure 3: Solar Irradiation Map of Ireland
Source: Solar GIS, used with permission.



Solar PV costs have dropped dramatically over recent decades and it is now one of the most reliable and low-cost electricity generation sources. Solar cells (and panels) and inverters, which are some of the main components of the system, have experienced significant cost reductions. Thanks to the industry's growth and maturity, financing, installation and development costs have also achieved reductions. Grid connection costs and long development timelines in Ireland can increase the costs of solar PV, but due to no moving parts and high reliability, the ongoing running costs of solar projects are low.

Large utility scale solar energy is supported nationally through RESS. This scheme provides financial support for renewable electricity projects over 0.5MW in size in the Republic of Ireland. Support is granted through auctions which are scheduled to be held out to 2025 and that allow projects to secure a fixed revenue independent of the electricity market price. RESS auctions strongly support efforts to meet the country's climate targets and sends a strong signal of confidence in the technology across the country.

A new support called SRESS (Small-Scale Renewable Electricity Support Scheme) has been developed to target smaller scale projects (≤6MW). Support will be provided to these projects through a guaranteed tariff. The SRESS aims to provide an easier route to market for community projects than the competitive RESS auction process. SEAI offers support to community projects under SRESS. It is also worth considering other market avenues such as direct supply to a large user, or corporate Power Purchase Agreements. Further information can be found in the **Irish Electricity Market module of this toolkit**.



Solar PV Development Options and Ownership Structures

Projects can be developed in different ways, each with different levels of involvement, responsibilities and risks allocated to the parties involved. When considering options, it is important for communities to balance risks and benefits. Taking on tasks directly may reduce costs and bring larger benefits but also carries significant risk and responsibilities for the community, while outsourcing and hiring experts may come at a cost but may also significantly reduce risks and responsibilities for communities. Depending on the resources available, some projects may not be feasible, or it can be complicated and risky for communities to undertake the projects, in which case it may be much easier for a developer to do so.

Ownership Options

To be eligible for community-owned supports, 100% of the ownership of community projects must remain within the community. Previously, in the RESS 1 auction, community projects could be either 100% community owned or community led by way of majority ownership in a joint venture with a developer, however the latter option is no longer supported. Eligibility and ownership requirements for the community may vary. We recommend referring to the Terms and Conditions of the specific support framework you are aiming for to make sure your project meets all the necessary eligibility criteria.

Development Options

The main avenue for communities to develop these projects is by leading and owning the project through all of its development. Alternatively, communities can opt for a shared ownership option, yet under this model, projects would not be eligible for the community-owned project supports:

1. **Community leads and owns the project throughout all its phases**
   In this model, the community would lead and oversee all the project stages outlined in this module, acting as the sole project developer. This would mean the community takes on the full commercial, technical and financial risks, but also benefits from potential profits. Community-led projects can avail of support from SEAI to develop their projects. Please visit **SEAI's website** and get in contact with us if you think your project is eligible and would benefit from our support.

2. **Shared ownership**
   Shared ownership projects between communities and developers, in which the community identifies the project but shares further costs and risks are still possible. However, these projects are developed in the normal commercial way without specific community supports.

Overview of Project Development

Phase 1: Developing the Idea
Estimated time: 6-12 months

Step 1: Develop the Vision

Step 2: Seek Advice

Step 3: Initial Viability

Break Point #1

Step 4: Securing Initial Funding

Step 5: Finding a Site

Step 6: Feasibility and Risk Appraisal

Break Point #2

Phase 2: Developing the Project Pre-Planning
Estimated time: 6-12 months

Step 7: Establish a Legal Entity

Step 8: Secure the Site(s)

Step 9: Secure Development Funding

Step 10: Procure Planning and Design Team

Step 11: Grid Application

Step 12: Communicate

Break Point #3

Phase 3: Developing the Project Next Steps
Estimated time: 6-12 months

Step 13: Planning Application

Step 14: Initial Financial Appraisal

Step 15: Derisking and Costing

Break Point #4

Phase 4: Route to Market
Estimated time: 6-12 months

Step 16: Follow Route to Market Process

Step 17: Initiate Project Construction Finance Discussions

Break Point #5

Phase 5: Getting to Financial Close
Estimated time: 6-12 months

Step 18: Procurement Contracts

Step 19: Development Management

Step 20: Senior Lender and Equity and Subordinate Finance

Step 21: Financial Close

Break Point #6

Phase 6: Completing the Project
Estimated time: 6-12 months

Step 22: Construction

Step 23: Community Benefit Fund

Step 24: Operation

Step 25: Governance / Management

Step 26: Decommissioning

This module presents a series of steps and phases in the development of a solar PV project in Ireland. While the module is presented as a sequential and comprehensive series of steps and stages, it is worth noting that, in reality, the process of developing a project may differ greatly from this. This is because timings do not always occur as expected, there may be setbacks and delays during certain steps but, most importantly, because steps should, whenever possible, be taken simultaneously to accelerate the project's development as much as possible. Developing a project is not a straight path, and it is important to keep a proactive and adaptive approach when going through the process.

The module also considers certain break points, at which it is worth evaluating how the process is looking, to determine whether it is worth continuing with the project. While it is important to maintain momentum and push through obstacles that might appear during the development process, it is also important to set reasonable expectations for the project and its timeline and, possibly, to know when it is best not to move forward with the project.

This module is also complemented by other modules in the Community Energy Resource Toolkit. Please make sure to consult with all other relevant resources of this Toolkit which will help you drive your project forward.

Project – Phases, Steps and Break Points

Phase 1: Developing the Idea
Estimated time: 6-12 months

Step 1: Develop the Vision
Step 2: Seek Advice
Step 3: Initial Viability
Break Point #1
Step 4: Securing Initial Funding
Step 5: Finding a Site
Step 6: Feasibility and Risk Appraisal
Break Point #2

Step 1: Develop the Vision

It is important to understand the reasons for wanting to develop a solar PV project so that your goals can be measured against the eventual outcomes. Not having a clear vision of why you want to undertake the project could lead to undesired outcomes later down the projects lifecycle. There are many reasons why you may want to develop a solar PV project, including:

1. Becoming energy independent.
2. An interest in the environment and wanting to reduce carbon emissions.
3. Economic drivers that include offsetting energy prices.
4. Developing community cohesion and leadership.

A community action plan is a great way to develop this vision as it specifies the goals the community group wishes to accomplish, the activities required to achieve these goals, the timeline of events and the resources required for it to be successful. Time and resources are required to ensure all community stakeholders are involved in the process. It helps ensure the actions going forward are agreed by the community, and that any potential benefits are for the community. Some key considerations for an action plan include:

1. What evidence exists around the needs of the community?
2. Categorisation of results – are they optimistic or realistic?
3. Under what timescales are these results achievable (e.g., monthly, quarterly, annually etc)?
4. What are the actions required to achieve these results?
5. Who is responsible for these actions (e.g., the whole community or a particular member)?
6. What are the costs of these actions (e.g., time, monetary, labour etc)?

Considering these steps at the beginning of the project will help activities and outcomes to be aligned.

Step 2: Seek Advice

There are a lot of things to consider when developing a solar PV system. As a result, you should seek advice as early as possible. SEAI's **Sustainable Energy Community Network**, with groups across Ireland is a good place to start. Once you have established a community group, you can join the community network, where a local mentor will be assigned to you to help you set out your aims and ambitions as a group and how best to achieve these.

SEAI also provide regular updates through quarterly newsletters, case studies and upcoming events and webinars to keep you informed and educated on best practices. SEAI has support available for communities to develop renewable electricity projects. This includes financial support and access to expert advisors to provide guidance for communities through the project development stages, as well as a range of online resources, tools and guidance.

Step 3: Pre-feasibility

The pre-feasibility or initial viability stage should act as a high-level screening study to determine the suitability of a site. Note that this does not have to be a specific site but should consider the area in which the project is to be developed. This module describes four key factors to consider:

1. Local authority zoning
2. Local grid capacity
3. Planning constraints
4. Planning history of solar PV in the local area

Local Authority Zoning

Understanding the zoning of local authorities is an important step at the outset of the project. Local authorities grant permission for projects on land within their area. Not all local authorities and their relevant councils have the same policies and guidance relating to solar PV development. Therefore, it is important to examine the local authority development plan and associated zoning maps in the area that you wish to develop a solar PV system to increase the likelihood of your project being accepted through planning.

Local Grid Capacity

Connection to the local energy network is required for projects to come online. It is advisable to investigate local grid networks early to establish broad estimations of local conditions such as:

1. Nearest suitable grid connection point(s). Note that the connection becomes more expensive and difficult the further away the connection point is from the project site.
2. Current and future limitations on the network i.e. future developments that will be using grid capacity within the network region.
3. Costs of connection based on broad estimations of project size, location etc.

Further information on these key steps can be found in the planning and grid connection modules:

- **The planning process**
- **Grid connection**

Although a more detailed design will be required at a later stage, it is important to understand any local network limitations at an early stage as these can have a large impact on the size, location and cost of a project. A good first source for information for this item is **ESB Network's grid capacity heat maps**. These are interactive web-based maps that highlight areas where there is available capacity for additional generation, allowing users to make better informed decisions around where to connect their projects. For community supports, project size must be between 500kW and 6MW of installed capacity.

Planning Constraints

Planning permission from the relevant local authority is required in respect of renewable energy development unless it is exempted development or is Strategic Infrastructure Development in which case consent is required from An Bord Pleanála. Exempted developments are those developments for which planning permission is not required.

Ground-mount projects, which are the focus of this module, generally require planning permission but may be eligible for grid planning exemptions. To avoid any doubt, the development which is considered exempt should seek a 'Section 5' declaration from the planning authority confirming the exemption. The relevant Section 5 legislation **can be found here**.

Most Irish planning authorities have their own guidance addressing the development of solar PV projects and are often open to discussions on development plans. There is a specific public consultation process for each draft development plan before they are finalised. The **planning module** of the toolkit has additional information on planning constraints and important things to consider during this step.

Planning History of Solar PV in the Local Area

The planning history of a solar PV in the local area can be a useful indicator of the likely success of a new project. Successful planning applications generally are a good precedent in the area. However, the impact of renewable developments is cumulative, and the cumulative impact of surrounding renewables development could still hinder the next development. Therefore, it is recommended that you check the local authorities' planning history with solar PV, noting any reasons for rejection at the application stage. This will indicate planning issues that solar PV has been particularly sensitive to in the local area to avoid for your development.

It is advisable, and considered good practice, to reach out informally to local authorities, planners and county councilors to make them aware of the intention to develop the project. This can help identify any additional constraints and could even result in additional support for community projects from these local authorities.

Break Point #1: Does the Project Seem Feasible?

The next step is to reach for initial funds for project development. It is therefore worth considering if the project is likely to move forward – if there is a clear vision, drive and support for pushing the project forward and there are no obvious limitations for construction, such as grid or planning constraints or a lack of appropriate site(s) – before moving past this stage.

Step 4: Secure Initial Funding

Driving the project through the initial development phases may need an investment of roughly €15,000 depending on the size of the project.

Communities can opt for private or government grant funding, private loans, community loans or personal contributions (from members of the community or local organisations), or even crowdfunding. The specific type of financing source will largely depend on the resources available, the parties' appetite for risk and reward and other factors including any repayment obligations.

Communities should reach out to try to find local sponsors not only for funding, but also other kinds of support they might be able to provide. A local energy agency, for example, may support the project by developing a study, and local authorities could help with planning processes, so reaching out to try to find local sponsors is advisable.

Enablement grants will also be available from SEAI for eligible community groups seeking to develop renewable energy projects. Please visit **SEAI's website** for the most up-to-date information on resources available for communities and other ways in which SEAI may be able to support your project.

It is important to keep in mind that the financing should be non-diluting, as ownership of the project needs to remain 100% community-owned, given the regulations applicable to SRESS projects.

Step 5: Find a Site

After a screening of the local constraints **(Step 3: Pre-feasibility),** it is time to begin investigating specific sites.

Site

Solar PV systems are versatile and can be installed in a variety of settings such as building integrated, typically on rooftops, and ground mounted. Large, open spaces with minimal shading should be considered as a priority to maximise generation. It should be noted that buildings that fall under the 'protected structure' category i.e., those with architectural, cultural, scientific, historical or artistic interest, will require further investigation of their suitability for building integrated solar PV. The structural integrity of the ground as a mounting structure should also be considered.

Location

The total generation of the system and therefore the financial viability is dependent on the geographical location, orientation, and tilt of the PV modules.

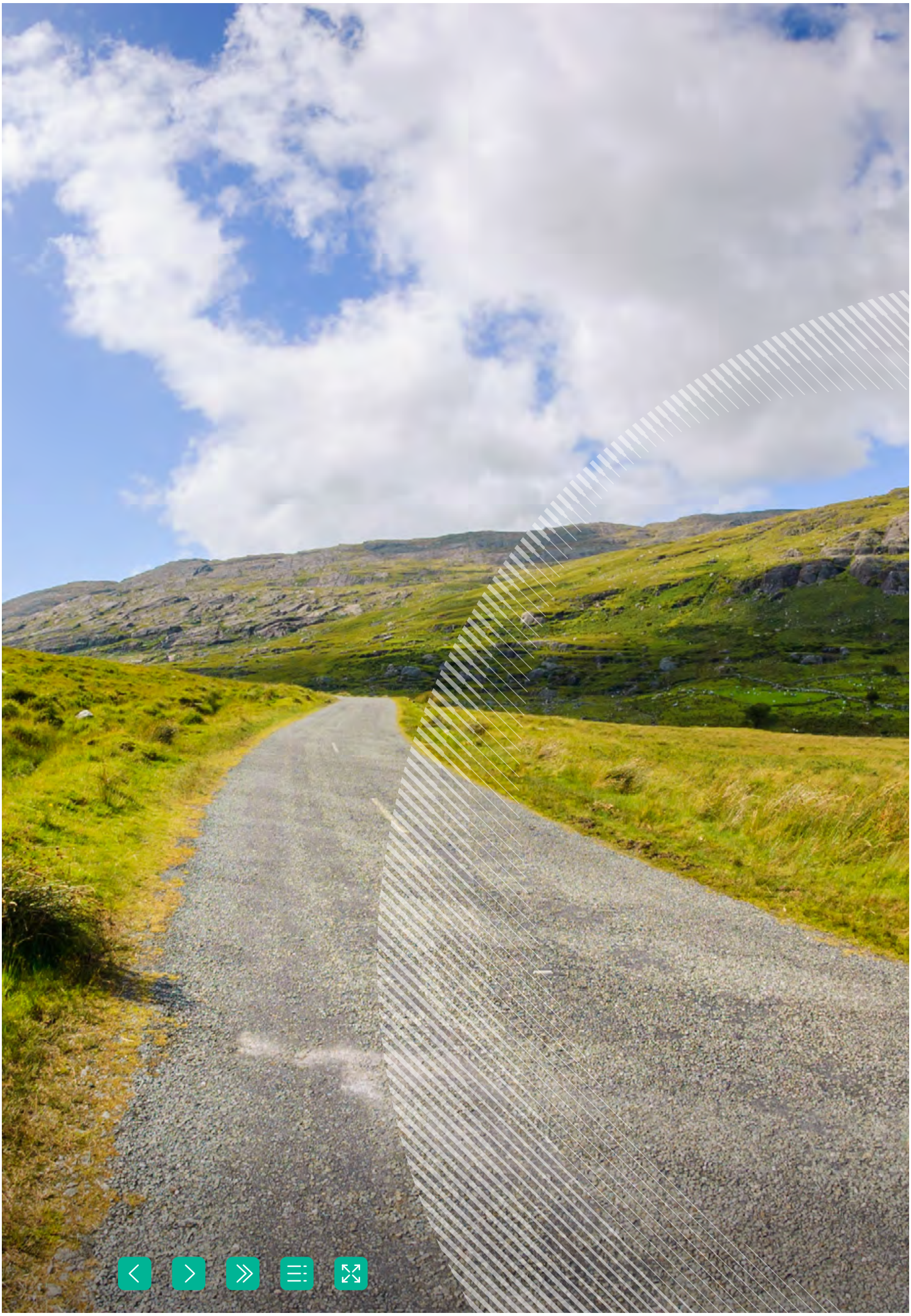
Solar irradiation i.e., the solar resource varies across Ireland, with the southern regions receiving the most sunlight, the eastern and coastal regions in particular. This is measured on both the number of daylight hours and intensity of the solar irradiation.

In Ireland, PV systems should aim to face south (180°) to maximise generation. This means that pitched-roofs facing south or near-south often make the best for roof-mounted systems. For ground-mounted systems, a flat piece of land or land with a slight southerly inclination are the most suitable.

A clear, open space with no or minimal shading should be sought to maximise generation from the system. For roof-mounted systems, areas where nearby trees and other buildings could shade the area designated for solar panels should be avoided. For ground mounted systems, flat and open fields away from vegetation cover with no flooding risk provide the best solution with module rows spaced appropriately to minimise interrow shading.

Access

A site must be accessible both physically and legally to construct and maintain the array. For example, large ground-mounted systems require vehicles to transport large pieces of equipment, such as transformers, inverters and storage containers to the site. It is therefore important to consider access tracks for these vehicles particularly for projects in remote locations. Furthermore, maintenance visits can be costly if the site is difficult to access.



Step 6: Feasibility Study and Risk Appraisal

The next step should begin to assess the more technical requirements for a project, building on **Step 3 (Pre-feasibility)** to assess a specific site rather than a general area. This step will assess the technical, financial and regulatory viability for the site(s) and will act as the main technical assessment before applications are put into planning and the network operator and further costs incurred.

This may be carried out through any available resources, potentially through an external consultant, and may be informed by suppliers or experienced developers. It is important to have a well-formed view of the typical and site-specific development risks. Seeking experienced advisors is recommended. Key studies will include:

1. Sizing of the PV system
2. High-level planning constraints assessment
3. High-level grid connection assessment
4. Feasibility study
5. Risk assessment

Sizing of PV System

Sizing a solar PV system appropriately is crucial to making the project work financially. This stage will involve assessing various parameters, such as grid capacity, amount of available space, infrastructure needed and optimisation. Additional variables such as permits and studies applicable to plants of different sizes, or the volume of capital that can be raised, may also come into play. The Planning Process and Grid Connection modules of this toolkit have additional information that can help establish some of these items and help communities estimate the size of the PV system.

Planning Constraints Assessment

The planning constraints assessment builds on those presented in **Step 3 (Pre-feasibility),** investigating planning constraints that may be present at a specific site. Some common planning constraints subject to solar PV developments are the presence of historic objects or overlap with natural reserves.

Further details on this step and on potential planning exemptions can be found on the **SEAI website** and in the **planning process module** of this toolkit.

Grid Connection Assessment

This assessment acts as a preliminary assessment before making a grid application as explain in **Step 11 (Phase 2).** The main aims of this assessment are to:

1. Understand the limitations around the nearest suitable grid connection point(s).
2. Determine if it is possible to accommodate the proposed system with or without any grid reinforcement works.
3. Determine the likely costs to connect the project to the local grid connection point.

The first step is to identify where the project is likely to be connected to the grid. ESB Networks is the Distribution System Operator for the Republic of Ireland and has existing Network Capacity Maps that can be used to check for the nearest possible grid connection points.

After gathering this information, the next stage is to make an application to ESB Networks. Please refer to the **grid connection module** of this toolkit for additional details and information.

Feasibility Study

The feasibility study assesses the financial viability of the project and considers all costs including:

1. Capital costs (often referred to as "capex") which include equipment, installation, development and grid connection costs.
2. Operation and maintenance costs (often referred to as "opex") which includes a maintenance schedule and budget for any reactive maintenance i.e., maintenance for unforeseen outages or downtime
   a. Solar panels usually have a 30+ year lifetime. They are commonly warrantied for 10 years for materials and labour, and for 30 years for power degradation.
   b. Inverters are usually given with an 8-10 year warranty. Considering the lifetime of the panels, it may become necessary to replace inverters once or even twice during the project life. This would be an additional cost outside of warranty coverage.
3. Rent, insurance, contingency, rates, etc

The feasibility study will be informed by things such as cost benchmarks, supplier quotes, and consultant knowledge around planning applications and grid connections to provide you with the likely financial performance of the proposed system (e.g. payback time) and therefore justification as to whether the project should go ahead.

Risk Assessment

A risk assessment will be a key part of the feasibility study, detailing a range of risks that the project may face along with the likelihood and severity of these impacts on the project viability. Typical risks would include:

1. Regulatory or political risks such as changes to planning guidance preventing project development in a specific area or changes to support programmes.
2. Technical risks such as the inability to connect to the local grid network.
3. Governance risks are especially important for voluntary and part-time boards to consider.
4. Funding risks such as financing and insuring of the project.

Break Point 2: Is There a Reason to Develop?

If a feasible site for developing the project has been identified, initial funding has been secured and no major risks or barriers were flagged, then it would be advisable to advance the project to the following stage: developing the project pre-planning.

Phase 2: Developing the Project Pre-Planning
Estimated time: 6-12 months

Step 7: Establish a Legal Entity

It is imperative for the community to establish a legal entity (or use an existing one) to move the project forward. Establishing this legal entity will allow the community to make funding applications, establish financial vehicles, secure sites, make network connection applications, apply for funding, as well as to receive and manage funds. A legal entity also comes with legal obligations that are beneficial for good governance and transparent reporting.

Once the legal entity has been created, registration for VAT and other applicable taxes should follow, along with the opening of a bank account – while these steps may sound trivial, they can take time, effort and money, and it is advisable to do them early on. Procedures and processes for management of any receipts and expenditure are also important.

The entity can be established through a number of different legal entities, yet the chosen type of entity must always allow for full community ownership of the project. The community group will need to appoint an accountant and a solicitor to help them choose and form the legal entity that best suits the community aims. Solicitors will give advice on the legal structure, on land deals, or other substantial contracts that the community may enter. An accountant will help form the legal entity and then support with annual returns, tax returns, VAT returns and other bookkeeping tasks or statutory reporting obligations.

The legal entity adopted by the community must comply with the definition of a Renewable Energy Community (REC) if requesting community supports. Requirements for the supports included:[2]

- Being based on open and voluntary participation, being autonomous and controlled by shareholders or members based or residing in the vicinity of the project.
- Being established as a non-profit or local community organisation.
- The participation of members or shareholders in the project must not constitute their primary commercial or professional activity.
- The primary focus of the entity must be to provide environmental, economic, societal, or social community benefit to its shareholders or local areas where it operates.

2 Note this has been subject to a public consultation considering changes to define local participation in an REC. Refer to CRU27626 available **here**

- Each shareholder or member is entitled to one vote, regardless of shareholding or membership interest.
- The entity or at least one of its shareholders must be registered as a "Sustainable Energy Community" with SEAI.

One of the most important aspects will be assuring that the legal entity's ownership remains 100% community-owned, as this will be a requirement for specific community supports.

If an existing legal entity will be used, it should be reviewed for alignment with community objectives and potentially modified. Appropriate insurance should also be considered, and appropriate legal protection should be established to protect personal liability.

Step 8: Secure the Site(s)

Once the legal entity and framework have been established, the site(s) should be secured. This will involve agreements between the project developer and the owner of the site (land for ground-mounted or owner of the building for a rooftop PV system). Although it is largely dependent on the site owner, most developments require some form of option to buy or lease the land for the operational life cycle of the PV system.

This stage includes securing all legal agreements for the use of the site for the project to be delivered and maintained. It is recommended that the feasibility study is carried out before this step **(Phase 1, Step 6)** to ensure all of the relevant land rights are included.

Step 9: Secure Development Funding

You will need capital to prepare studies and technical designs, as well as planning and grid connection applications, which are some of the most important milestones in the project's development pathway.

Securing additional funding therefore becomes necessary at this stage. Given that the project is still in relatively early stages, it may be difficult to secure capital from conventional sources, however, depending on the specific project, funding such as enablement grants may be available. Communities are advised to visit the **SEAI website** for information on possible support and other resources.

Step 10: Procure Planning and Design Team

This step involves procuring a professional planning and design team and commencing site appraisals. This step will provide a design that can be presented to the local planning authority. The generation site and the grid connection route(s) should both be included. This should occur as soon as development funding is obtained as the process can take some time, and it allows risks and issues to be addressed as early in the process as possible.

The feasibility study **(Phase 1, Step 6)** already investigates some of the potential issues at site from a high-level i.e. desk-based. This stage builds on the feasibility study by undertaking more detailed system design and site studies rather than the high-level versions likely undertaken previously. Studies include:

1. Topographical surveys
2. Landscape and visual impact studies
3. Traffic and sightlines
4. Glint and glare assessment
5. Potential environmental impacts
6. Further items per typical planning and site-specific requirements

Once the final system design is completed, the appointed planning and design team will provide you with a range of technical reports forming a portfolio that can be used during the planning application stages, as well as informing any grid application.

→ Step 11: Grid Application

It is important to be in contact with the Distribution System Operator as early as possible for a grid application to ensure the project moves along smoothly as it may take some time to secure a grid offer, depending on the volume of connections processed and the frequency of any grid batches. This should happen once the final design is agreed in the feasibility study in Phase 1 **(Step 6)** and the site appraisal **(Step 10).**

Under the Commission for Regulation of Utilities Enduring Connection Policy process (ECP-2), community renewables schemes fall under their own specified category (category C). Communities must submit a **NC5 or NC5A** 🔗 form to the Distribution System Operator which is available on the ESBN website. The form will specify the information required. Once an application has been accepted to be processed, ESBN will review the connection for the project and if appropriate, undertake a detailed connection assessment. This assessment will detail the methods and costs associated with connecting to the grid. The capacity can be held for two years to allow for other processes to take place such as gaining planning permission. After receiving planning permission and paying the balance of the connection application fee, the project will be given a grid connection offer.

More detailed information on the grid application schedule is available from the Grid Connection Module, and in the **ESBN website** 🔗 and their **ESBN community renewables guide** 🔗**.**

Step 12: Communicate

It is important to develop projects responsibly, and this includes undertaking consultation with residents and the wider community early in the project and maintaining open lines of communication with them. Communications with stakeholders must be open and honest and establish clearly what the potential impact and benefits of the project might be.

Appropriate time should be allowed for communities, local organisations and residents to provide feedback and engage with the project. This can greatly facilitate moving the project forward, especially in terms of achieving development permissions and avoiding opposition to the project. Some good practices that can be especially effective for this step include:

- Creating a project website, outlining the project, milestones, required work, as well as potential benefits and points of contact.
- Appointing and sharing contact details of a Community Liaison Officer, who would be the communities' main point of contact and who can attend to the communities' requests or queries.
- Visiting residences in the immediate vicinity of the project to inform them of the project, sharing information with them (i.e. leaflets), and answering their questions.
- Communicating the construction plans and managing any disturbances that may be caused during the construction stage.
- Holding periodic public meetings.
- Reporting on all issues that have been resolved and sharing resolutions with local authorities, community groups and residents.

An important consideration during this step is commercial strategy. There are instances of different communities competing to develop a project in the same location. It is important, therefore, to keep a sensible level of confidentiality and not disclose information that could be harmful for the project whilst also fostering and ensuring community spirit and cohesion is maintained.

Break Point 3: Grid Offer Received and Viable?

It may take some time to receive a grid offer, depending on the volume of connections processed in annual batches. Unless significant barriers or limitations are identified, it is advisable to continue with further steps during this period. If the project secures a grid offer that is financially feasible, then the project can move ahead, but if it is not viable, funding and ongoing activities should cease.

Phase 3: Developing the Project Next Steps
Estimated time: 6-12 months

Step 13: Planning Application

All Irish community projects will require a planning application, as the range for typical community projects is beyond the threshold for exemption. A planning application will need to be made to the local authority with all the relevant information collated for examination. An Environmental Impact Assessment is rarely required for solar, being well below the 300MW mandatory threshold. A planning application would usually be accompanied by an Appropriate Assessment screening, usually carried out by an ecologist to assist the planning authority in deciding whether there are negative impacts on any designated Natura 2000 sites.

Despite not requiring an Environmental Impact Assessment, a thorough set of planning assessments and reports will be required covering aspects generally relevant for solar and the planning considerations relevant to the chosen site. Mitigation measures are sometimes recommended if it is determined that the project could have adverse impacts on certain environmental criteria. Further information on this is available from the **Environmental Protection Agency** and from the **National Parks and Wildlife Service**.

Once these pre-application studies have been completed, the planning application can be submitted to be assessed by the local authority. The local authority will give notice of its decision within eight weeks of the application although it nearly always requests further information on the application before making a decision. Upon deciding, the local authority will provide a decision notice to the applicant, who can appeal any decisions that the local authority makes to An Bord Pleanála for determination. Third parties that made submissions on the planning application may also appeal the decision to An Bord Pleanála.

If a project is refused at planning, the community group can appeal the decision. The **Planning Process Module** of this toolkit has additional useful information and guidance on planning appeals. There will be a number of conditions attached to the planning grant which must be fulfilled by the developer of the project, the majority of which will need to be complied with before construction commences.

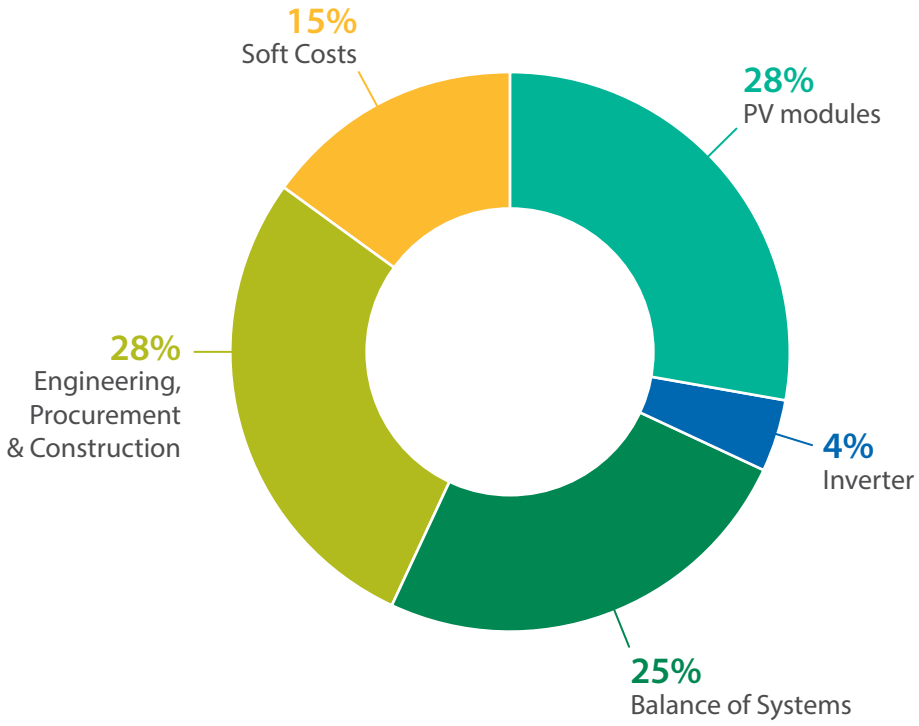
Step 14: Initial Financial Appraisal

Once the grid connection offer, which is a significant component of the total cost of a renewable project, has been received and the planning and design costs have been scoped, there will be enough information to carry out an initial financial appraisal of the project. This appraisal should be undertaken by a suitably qualified consultant or expert. While many of the costs might have been already defined, there will be additional costs and variables still left to determine. It is therefore important to carry out the financial appraisal of the project as thoroughly and accurately as possible with the information available and update it as more costs are defined. Obtaining quotations and contracts will add to the accuracy of the exercise. As a reference, Figure 4 shows the typical composition of the capital costs for utility-scale solar PV plants in Europe. These, however, are typical cost compositions and may vary significantly depending on the specific project.

The scoping of costs should be as exhaustive as possible, covering everything from the most obvious costs (like solar panels and inverters) to the least obvious ones (like those associated with compliance with planning conditions). It should cover all types of costs: from administration and permissions to capital and operational costs. Contributions to the Community Benefit Fund and other legal obligations or expenses should not be overlooked during the analysis.

This will build a solid basis for the financial model, and this will need to be updated as costs become more defined, and as the project status and associated costs evolve over time.

Figure 4: Cost Break-down of Utility-Scale PV Projects[3]



3 Based on Jäger-Waldau, A. (2019). *PV Status Report 2019.* Brussels: European Commission.

Figure 5: Annual Cash Flow for an Example PV Project in Ireland[4]

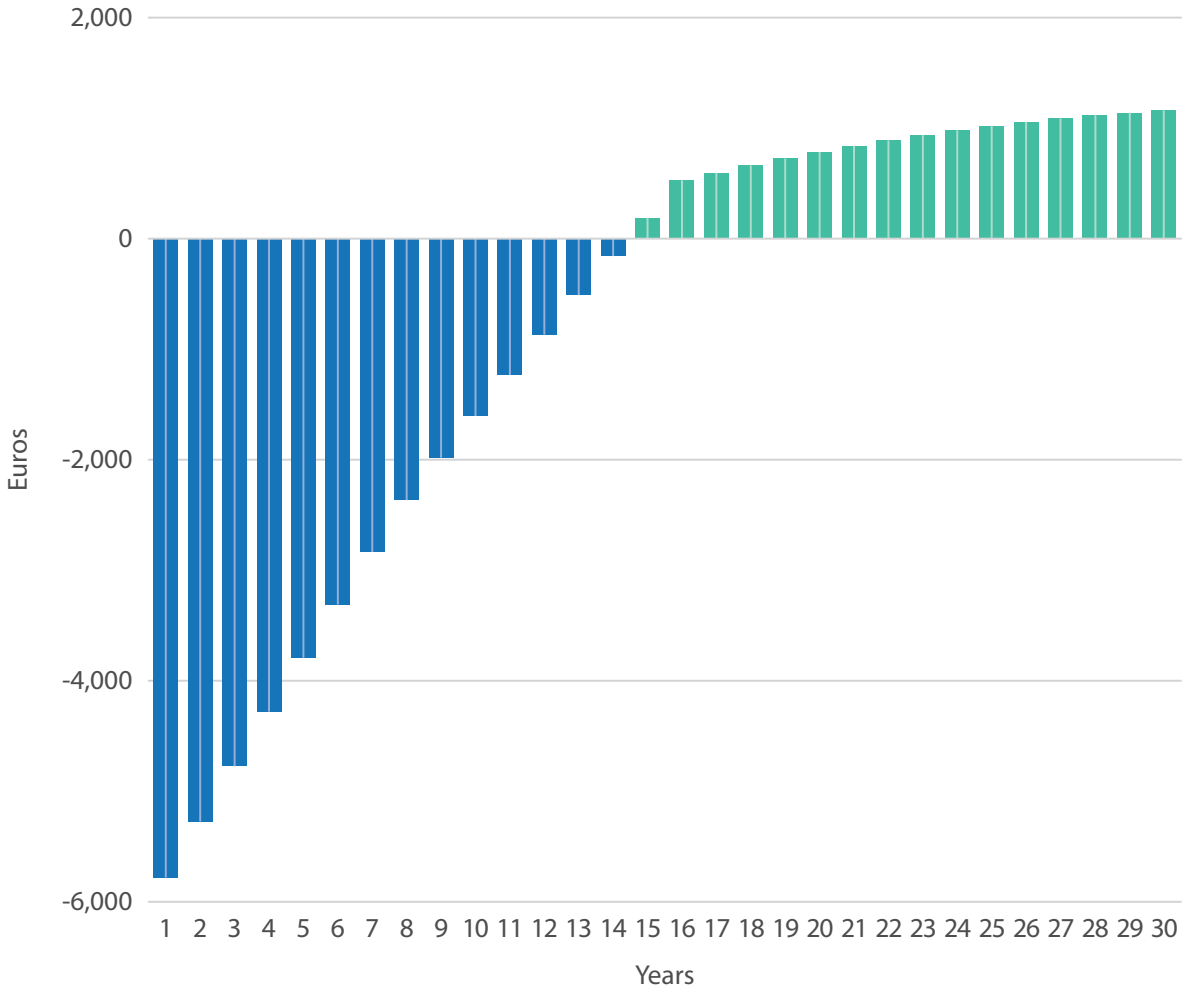


Figure 5 illustrates the expected annual cash flows for a typical 5MW solar farm based on RESS 1 auction result figures and with average construction and financing costs in 2021.

An important aspect is the interest rate of the financing to be used for project development, as this will greatly impact the financing costs of the project, and therefore its repayment period and rate of return on the investment. The speed at which the project is developed, and how fast the project can begin selling power through its intended route to market, will also affect these costs. The faster the project is developed, and the faster it can achieve higher rates for its output, the greater the reduction in its financing costs.

Potential lenders will not only look closely at the project financial appraisal – including its forecasted cash flow and balance sheets – and its supporting information but will likely request to see a full business plan covering the expected lifetime of the project. This financial plan should be a living document updated over time as new information comes to light and increased accuracy is possible.

For additional useful resources on financial modelling, please refer to the Further Information section at the end of this module.

4 From an anonymous project. Supplied by Tom Bruton, Principal Consultant, BioXL Limited.

Step 15: Derisking and Costing

Obtaining planning is a significant milestone, but it does not imply a project is derisked or easily costed. There are several steps that can and should be taken post-planning to reduce risks and improve the prospects for funding the project.

Technology changes over time, panel types and sizes change, and construction practices evolve. It is prudent to undertake design optimisation exercises to see what layout would provide optimum yield within the parameters of the consented layout.

There are usually important and time consuming pre-construction planning conditions which can be addressed. For example, there are often conditions to undertake archaeology testing. It is easier to finance and construct a project knowing that additional archaeology is not likely to be encountered during construction. It also takes time to procure, license and report archaeology testing.

An independent energy yield assessment (EYA) of a credible layout will be a valuable input into financial modelling and will give a good benchmark for any procurement, finance or warranty discussions. This is likely to be replaced by an energy yield assessment for a final construction design and for warranty supporting purposes. An optional item, but advisable to increase yield certainty, is to monitor irradiation on-site where time and budget permits. This typically gives upside in terms of additional energy output predictions.

Ground investigations, notably including pull tests will give confidence to contractors trying to cost works on-site and should be considered during this stage.

A consulting engineer could be appointed at this stage to support design and procurement. The best way to get greater cost and design certainty is to prepare detailed project information, typically by way of a set of design and tender documents. Contractors will engage more supportively and present less conditionality in their offers where robust supporting information is evident.

Break Point 4: Planning Consent Secured?

If the project has been granted full and final planning permission by the planning authority, then the next step is to continue derisking the project and to find and secure a route to market.

When submitting a planning application, the local authority may request additional information which could lengthen the decision process. Appeals to the decision can be made up to five weeks later – this can result in significant setbacks, with some projects experiencing delays of a year or more.

Phase 4: Route to Market
Estimated time: 6-12 months

Step 16: Follow Route to Market Process

Step 17: Initiate Project Construction Finance Discussions

Break Point #5

Renewable energy projects in Ireland can receive revenue through four main mechanisms: the 'merchant' open market price, corporate Power Purchase Agreements, RESS auctions or SRESS. SRESS is the most recently introduced route to market and supports projects ≤6MW. Each of these will have its specific set of requirements, deliver different levels of benefit, and pose a different set of risks.

SRESS tariffs are likely the best route to market for community projects and should be their primary focus. SRESS tariffs allow projects to sell their output at a fixed rates for periods of 15 years. This provides a long-term and stable source of income for projects, greatly facilitating securing competitive funding for their development. The merchant market, due to its uncertainty, volatility, risk, and its relatively low prices, is not a desirable initial source of income for renewable projects. Depending on this as a source of income in the initial years can be a major obstacle to securing project financing, though eventually all projects are likely to end up operating in the merchant market once out of support.

→ Step 16: Follow Route to Market Process

As soon as it is possible, communities or project administrators should prepare the necessary documentation, permissions and other requirements to be able to bid for the chosen route to market. For both tendered or auctioned corporate PPAs and RESS auctions, requirements are published well in advance, giving potential bidders enough time to prepare their applications and fill any gaps that the project might have in order to be eligible for bidding.

For updates on SRESS, check the **Department of Environment, Climate and Communications website**.

Securing the route to market is crucial for the project's financial success. Starting this process early and dedicating sufficient resources is paramount.

Information and analysis gathered during the financial appraisal and modelling of the project will be key in this step. A thorough analysis of project costs, along with sensible reflection on the realistic returns that can be expected from it, are key inputs that will inform the decision of whether a particular cost of electricity will stack up for the project. These can be challenging steps, but they are key to the project's success. SEAI provides guidance and support to communities and guides them through the journey to market.

For more information on SEAI's support, please **visit this link**.

Step 17: Initiate Project Construction Finance Discussions

Discussions on construction funding for the project can be initiated. It is worth noting that financial resources will not be released until the project secures a route to market and reaches financial close.

Communities can access a variety of funding sources but funding sources have to be non-dilutive, as projects must remain 100% within community ownership to be eligible for community supports. Communities can therefore opt for project finance, where the project is financed through a loan that is repaid primarily through the project's generated cash flow, with the project's assets, rights and interests serving as collateral for the loan.

Communities can also opt for other loan types that may be available, for example by:

- loans from community bodies or members of the community,
- issuing shares to members of the community – the details of these arrangements will be dictated by the type of legal entity, or
- other finance arrangements, potentially supported by grants or contributions from potential project sponsors.

Break Point 5: Route to Market Feasible?

If the project has obtained a route to market with a long-term Power Purchase Agreement through which it can sell its power at a stable rate, then it is advisable for the project to progress into the following stages of financing. It is important to keep in mind that a project must do more than break even in order to accrue any financial benefit to the community owner.

Phase 5: Getting to Financial Close
Estimated time: 6-12 months

Step 18: Procurement Contracts

The procurement phase involves finalising the scope and amount of all quotations and confirming and engaging with the suppliers and installers to be used to deliver the solar PV system and all associated works. This is a crucial stage to ensure that the delivery and management of the project throughout its lifecycle are delivered in a timely and efficient manager.

A detailed scope and documentation pack will be needed, and is typically put together by the owner's engineer who runs tender process(es) for the main project components, typically the solar installation and the grid connection works.

It is highly recommended to seek tenders from multiple installers and contractors to ensure competitiveness and a cost effective solution. Although the cost of PV modules is often the single biggest expense, it is also important to examine other costs and benefits associated with different contractors including warranties, cost and frequencies of maintenance schedules etc.

To support procurement and implementation, the appointment of an owner's engineer is recommended. The owner's engineer is essentially a representative, appointed by the community group to ensure that work is done within the technical and legal specifications and requirements. The owner's engineer communicates with the community group directly to report progress. This allows a technical expert to oversee the project delivery, reducing the strain on the community group who may not be familiar with procuring and delivering such a technical project.

The community group can work with the owner's engineer to select suitable turnkey contractors, who offer the most appropriate solution for the solar PV system, accounting for budget, desired generation, detailed design, planning compliance, size of the system etc.

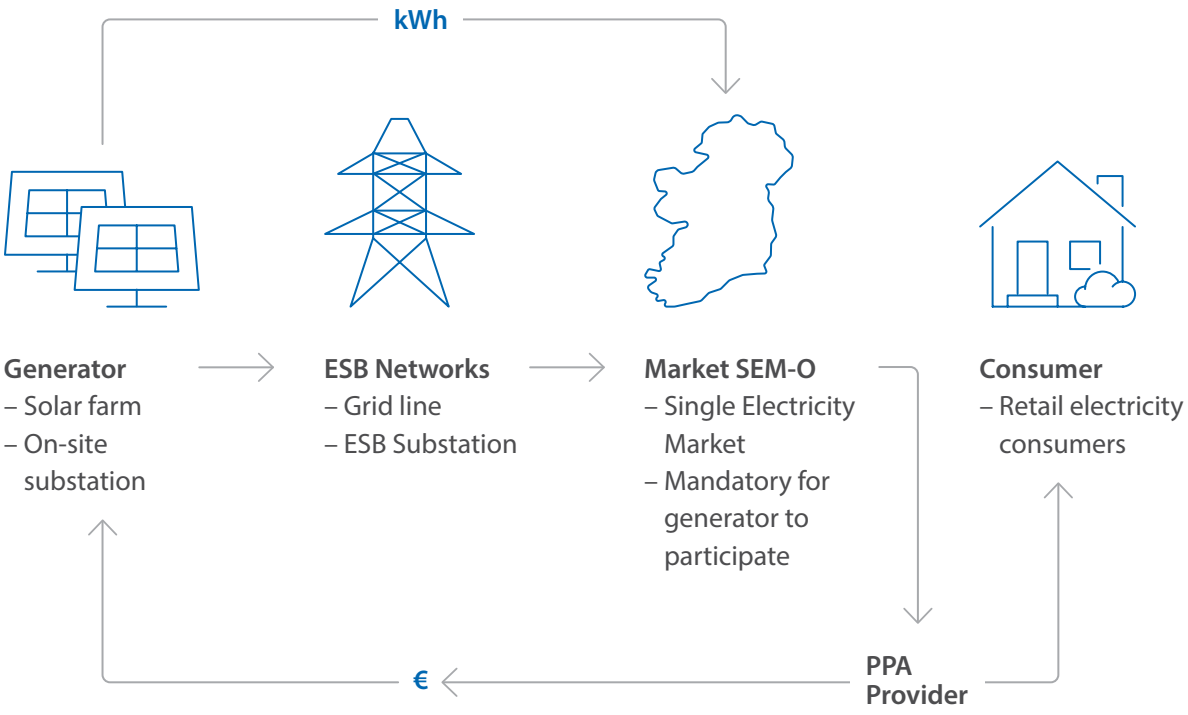
Step 19: Development Management

Many ongoing development tasks occur during this phase associated with the critical implementation steps to progress the project commercially and technically. A wide range of professional support will be required for this phase.

Examples of complex tasks or negotiations that typically occur during this phase are given below. **These steps will also be a pre-requisite of financial close.**

- **A Power Purchase Agreement (PPA)** is required to provide an interface with the Single Electricity Market and electricity customers. A market maker with a strong balance sheet is typically required here, to ensure that all funds are secure at all times and come back to the community-owned generator. Some communities may wish to set up different versions of this, for example setting up a parallel electricity supply company (known as "Supplier-Lite") which is dedicated exclusively to trading the power of the community-owned generator. The typical function of the PPA provider is shown in the diagram below:

Figure 6: Arrangements and Interactions with PPA Provider and the Single Electricity Market Operator



- **A planning decision** will usually come with a series of conditions, which often involve detailed pre-construction tests or studies, such as archaeology tests or ecological surveys that will take time and funding to address prior to financial close. There can be timing consequences; for example, where a field is in established crops, licensed archaeology testing is generally delayed until after the crop is cleared. It may be necessary to submit a new planning application where a design is not compliant with the consented solar farm. For example, this can happen due to a change in regulations, due to obsolescence of the original design or because of changes in the surrounding infrastructure.
- **A grid connection** requires ongoing management and interaction with ESB Networks and other stakeholders. Sometimes it is necessary to apply for planning consent for the grid route (separately to the solar farm). A road opening licence from the local authority may be required and the engagement will be needed with the relevant area engineer from the local authority. Detailed designs need to be prepared and submitted to ESB Networks for approval. ESB Networks request 12 months' notice on certain design items to plan the connection. Substantial stage payments will need to be made to ESB Networks as the project advances.

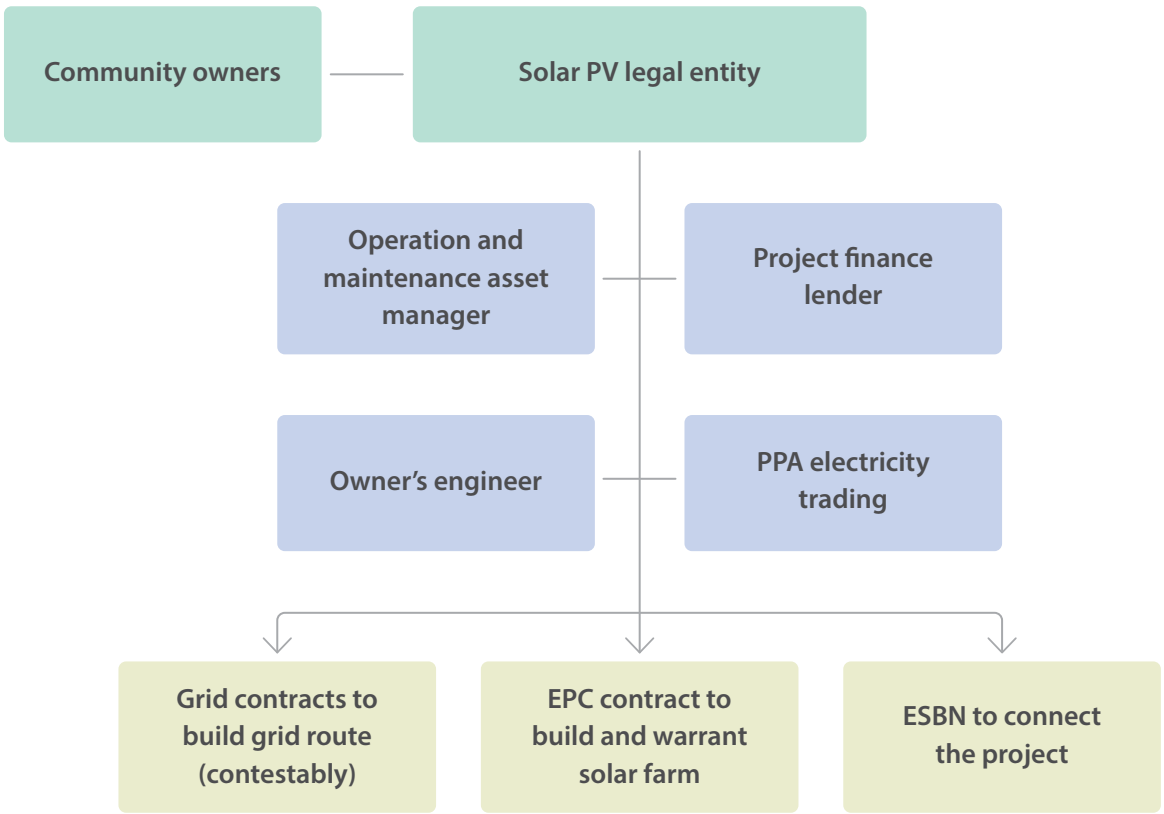
Step 20: Senior Lender and Equity and Subordinate Finance

Typically, a renewable energy project will require project finance from a senior lender (usually a commercial bank) to provide circa 80% of the overall capital requirement on a long term loan. This is a detailed commercial step which will require further financial modelling, due diligence and complex contract drafting and negotiation.

Legal, technical and financial advisors are required to support this key item which is the most important element of financial close. All suppliers, contracts and shareholder arrangements will be carefully scrutinised.

The schematic below shows a typical range of contractual relationships that the legal entity will have entered into prior to financial close.

Figure 7: Typical Range of Contractual Arrangements that the Legal Entity will need to Establish



Step 21: Financial Close

Financial close is the milestone where all contracts and expected costs are agreed and 100% of the funds required anticipated to complete the project are committed and the project can be constructed. This will typically entail rigorous due diligence and legal agreements.

In addition to a senior lender there may be additional equity, grant or loan funding required before the final decision is made to progress with the construction and draw down on funding sources. Detailed agreements will be required for any equity or loan providers who typically sit below the senior lender in priority for repayment.

Note that while the project is much lower risk after financial close, it is not risk-free. There is still significant exposure to construction issues which can in turn lead to cost overruns, e.g. difficulties with ground conditions or undiscovered archaeology encountered.

Break Point 6: Did the Project Reach Financial Close?

If the project has reached financial close, that means that all the most important milestones in the development phases have been cleared – the project now has a green light for starting construction.

Phase 6: Completing the Project
Estimated time: 6-12 months

Step 22: Construction

Construction of the project and connection to the grid can begin once all the aspects of planning and development have been addressed. This includes:

1. Gaining planning permission from the local authority based on the finalised design, location and size of the system and compliance with any pre-construction planning conditions.
2. Finalisation of the project financing.
3. Land agreements have been executed.
4. Grid connection agreement contracted.

With these permissions in place, the construction (also referred to as installation) of the solar PV system can commence.

Two key contracts are typically required for the installation of the solar system. These are with the EPC (engineering, procurement and construction) contractor and the grid contractor, both of which are typically overseen by an owner's engineer. The EPC contractor is responsible for all the installation processes apart from the connection to the grid, including:

1. Preparation of site (e.g., ground engineering works)
2. Purchase and delivery of equipment to the site
3. Final installation of the equipment

Before the EPC contractor has completed the installation of the project, the grid contractor will typically have constructed a substation and grid works to connect the system to the local grid connection point. Grid contractors will be required to submit all designs for approval to ESB Networks prior to construction.

Step 23: Community Benefit Fund

Prior to beginning commercial operations, projects are required to establish a Community Benefit Fund under the RESS Terms and Conditions. The required contribution is currently established at €2/MWh of power output per annum, adjusted by losses, considering both transmission and distribution losses, which is determined by the transmission system operator and distribution system operator.

Outside of RESS or other support schemes such as SRESS, it is good practice to establish a Community Benefit Fund to ensure the wider community has the opportunity to benefit from the project through funding opportunities.

This fund will be aimed at providing additional environmental, social and economic well-being to the local community, and will be registered on the **Community Benefit Fund National Register**.

A Fund Committee, consisting of volunteer community representatives, and the project administrator and developer, needs to be established.[5] A small part of the fund (<10%) can be used to cover administration expenses. Communities should participate in all decisions around how the funds are used, for example, for retrofitting homes to increase their energy efficiency.

It is the responsibility of the community and developer developing the project, as well as administrators to promote and inform about the availability of financial support from the Community Benefit Fund. They can do this by issuing notices in local newspapers, delivering notices to local residents, promoting it through websites and social media, contacting community and voluntary organisations, or other means available. Administrators will also be responsible for assessing all applications to resources from this fund in a non-discriminatory and transparent manner and report this information to SEAI. For mandated Community benefit funds such as those that form part of the terms and conditions of a support scheme like RESS, SEAI will have an oversight and compliance function. A report on the management and disbursements of the community benefit fund must be submitted annually to the SEAI Community Benefit Fund National Register.

For more information on this topic, please refer to the Good Practices Principles Handbook, which was published in July 2021 following a review of a public consultation on the topic. For more reference on this, please visit the DECC website to access the **Handbook**.

Step 24: Operation

The project will need to have a maintenance schedule in place to maintain system performance and financial returns. Maintenance usually comes in two forms undertaken by a contractor: a planned preventative maintenance schedule and reactive maintenance. Planned preventative maintenance activities include:

1. Module cleaning
2. Inverter checks
3. Vegetation management
4. Racking system checks

5 According to the DECC's Good Practices Principles Handbook for Community Benefit Funds

Reactive maintenance (or unplanned maintenance) are activities which react to sudden events such as downtime from inverter failures. A comprehensive planned preventative maintenance schedule however can largely negate the need for reactive maintenance. Communities can monitor the system remotely using specialised monitoring software with a user log in that can be provided by the operation and maintenance company if desired.

An asset manager is typically appointed to oversee the operation and maintenance stage and report periodically to the owners.

Revenue streams should be managed in accordance with the conditions agreed between the owners and the funder of the project. The fixed costs that the project incurs should be paid first e.g. land rent, Community Benefit Fund contributions, load repayments, rates, insurance and maintenance contracts. Should surplus funds arise, the community group will decide according to their community entity mandate how to spend or distribute any funds in line with community aims.

Due to the numerous activities associated with operating and maintaining a solar PV system, it is advised that the community group arranges regular meetings e.g. quarterly to review the project. This could include feeding back to members on recent maintenance visit findings or to flag issues that may be arising e.g. topics discussed at such meetings could include updates on operations and maintenance, budget reporting, allocating of profits and Community Benefit Fund updates.

→ Step 25: Governance / Management

The project will require formal and diligent management through its operation stage. This should cover all aspects of the project: managing revenue and cashflow, meeting operating standards, and overseeing the operation and maintenance of the plant to make sure that equipment is being monitored, repaired and replaced when needed.

For effective management, and to ensure that the project and its funds deliver the benefits they are intended to, it is important to agree on a vision, purpose, mission and define the organisations' values, and following them consistently. Developing, resourcing, monitoring and evaluating plans that follow these objectives can greatly aid in the governance and management of both the project and its funds. When developing these plans, however, it is important for communities to set realistic expectations and effectively allocate responsibilities.

Stakeholder agreements are a key part of governance and management of the project and its funds and can be a way to future-proof the entity. These were probably already in place before reaching the operation stage, as they are usually needed to access funding. These agreements must be followed and upheld to guarantee a smooth governance of the project and its funds through the project's lifetime.

As outlined in Step 23, governance and management should also cover the evaluation and sanctioning of disbursements of the Community Benefit Fund; this responsibility also extends to any surplus funds generated by the project. Surplus funds management should be done according to the best practices available, and adhere to the **Governance Code for Community, Voluntary and Charitable Organisations of Ireland**. An annual Community Benefit Fund report must be submitted annually to SEAI.

The Environmental Protection Agency and The Wheel have developed a guideline document titled **"Sustainable Communities: A governance resource book for small community and voluntary organisations"**, with a very comprehensive guide and resources to carry out responsible and transparent governance of these types of organisations.

The **Governance Code for Community, Voluntary and Charitable Organisations** and **Toolkit** of the **Charities Regulator of Ireland** outlines the minimum standards that should be met to effectively manage and control charities, and provides resources to do so. The SEAI Community Groups and Governance module of this toolkit is available **here**.

This should be done in a fair and transparent manner, seeking to deliver economic, social and environmental benefits to the communities in the vicinity of the project, and fairly address the interests of the legal community entity that owns the project.

Step 26: Decommissioning

At the end of the project lifecycle which is typically 30+ years, the PV array is likely to require removal from the site. If the project required planning permission to be developed, then decommissioning should take place to the timescales proposed within the planning consent, accounting for all practicalities.

Recycling and appropriate waste management during this process are highly important. Most solar panels can be recycled through industrial processes and their disposal is regulated at EU-level by the Waste Electrical and Electronic Equipment Directive. Up to 95% of the glass in solar modules, as well as external metals, can be reused.

Further Information

Solar Development

The following websites provide general information for communities with an interest in solar PV:

- **SEAI solar energy**
- **Irish Solar Energy Association**
- **International Energy Agency**
- **Solar GIS**

Community Ownership

There is lots of interesting information on how a community can own their own energy at the following links:

- **European federation of citizen energy cooperatives (REScoop)**
- **Local Energy Scotland**
- **Community Energy Scotland**

Project Overview

Develop the Vision

You can find community owned energy information booklets at:

- **Community Energy: a Practical Guide to Reclaiming Power**
- **European Federation of Citizen Energy Cooperatives (REScoop) Toolbox**
- **Local Energy Communities**

Seek Advice

The following organisations provide advice and guidance and publish case studies to help others identify suitable groups to approach to gain their insight:

- **SEAI Community Enabling Framework**
- **ESB Networks**
- **Community Power**
- **Local Energy Scotland**

Pre-feasibility

There are several web tools available for determining the viability of a project which would be appropriate to use at this stage of the project development.

- **Grid capacity map from ESB Networks** to see if there is capacity at a nearby substation.

Find a Site

Land direct allows a community to search folio areas and boundaries.
Geohive Mapviewer enables communities to view protected areas.

Secure Initial Funding

- **SEAI Community Enabling Framework**
- **LEADER funding**
- **Community finance and loans**
- **Western Development Commission**

Feasibility Study

A feasibility study will help identify sites that have the potential to be viable, funding is available at the following links:

- **LEADER funding**
- **Local Enterprise Office**

Establish a Legal Entity

- **Become an energy co-op**
- **Become a Charity**
- **Research possible models**

Secure the Site

The CARES module has **draft land agreements and advice** on how to secure a land lease.

Grid Application

- **SEAI grid toolkit**
- **ESB: Connect a Community Led Energy Project**
- **ESB: Connect a Community Led Energy Project Help Centre**

Planning Application

The key applications to complete when developing your project are:

- **SEAI Planning toolkit**

Financial Viability Check

The CARES project **finance model** is an indicative early stage financial model to help community groups understand the potential profitability of community renewable investments. An example of how to fill in the model can be accessed **here.**

Develop Full Financial Model

When finalising the costs and income of the project, it is important to ensure they are completely accurate with enough detail for a bank to make a lending decision. Indicative costs will no longer be accurate enough.

Some useful resources in addition to the CARES financial model mentioned above include:

- **Community Energy Financial Performance Assessment Guide**
- **NREL System Advisor Model (SAM)**
- **PV Financing**

Glossary of Terms

Alternating current (AC)	A type of electrical current whose magnitude and direction varies cyclically in regular intervals (in Ireland, the frequency of change is 50 Hertz).
Balance of system	Represents all components of a PV system other than the panels and inverters.
Community benefit fund	Fund established to be used for the wider environmental, social and economic well-being of the local community.
Direct current	Electric current with a constant voltage that travels in a single direction.
Distribution System Operator	Entity that manages a network that takes energy and transfers it from high-voltage transmission systems to the distribution system and then to the final customer.
Electrical grid	An integrated system of electricity distribution, usually covering a large area.
ESB Networks	Distribution System Operator of Ireland.
Feasibility	Condition in which something is achievable, executable and/or practical.
Generator	Person who is the holder of a licence and any other legal requirement to generate electricity.
Greenhouse gases	Gases that absorb energy in the form of radiation (such as sunlight), and later emit it in frequencies that – completely or partially – cannot go through the atmosphere, causing the greenhouse effect.
Grid Code	The conditions, procedures, provisions and codes governing the planning and operation of the transmission system and the scheduling and dispatch of generation prepared by the pertinent authority.
Installed capacity	Total output capacity of a plant, measured in kW or multiples (MW, GW…). For solar PV plants, this is defined as the output capacity of the inverters.
Inverter	A device that converts direct current electricity to alternating current. In the case of PV systems, it also performs output optimisation to maximise the amount of energy that is harnessed from the solar array.
Kilowatt	Unit of power – or rate of consumption / generation of energy – equivalent to one thousand Watts, usually used in power generation to measure or indicate the maximum capacity of a plant (e.g., a 500 kilowatt plant was installed at the site).
Kilowatt-hour	Unit of energy, equivalent to using or generating one kilowatt for one hour.
Photovoltaic array	group of solar panels interconnected in series.
PPA (Power Purchase Agreement)	Agreement in which a power producer agrees to sell – totally or in part – its power output to an off-taker under a certain price and/or set of conditions.

RESS	The Renewable Electricity Support Scheme, the Irish Government's auction process for supporting the development of large scale grid connected renewable electricity generation in Ireland.
SEAI	The Sustainable Energy Authority of Ireland.
SME	A micro, small or medium-sized enterprise as defined by the appropriate law and statutes.
Solar panel	Group of solar cells ensembled in a single, flat unit, ready for use. Since it is made of solar cells, it also creates a voltage difference when hit by sunlight, which can be used to create an electric current.
Solar PV (photovoltaic)	Technology for electric power generation that relies on radiation from sunlight and the photovoltaic effect of certain materials to provide electric power.
Solar radiation	Energy provided by the sun in the form of radiation that can be used by solar PV technologies to provide electric power.
SRESS	Small-Scale Renewable Electricity Support Scheme; currently under development likely to include fixed price supports for small-scale and community-owned projects up to 6MW
Solar cell	Elemental piece of solar panels which, when hit by sunlight, creates a voltage difference that can be used to create an electric current.
Supplier	Entity licensed by the Regulatory Authority to supply electricity in Ireland.
Sustainable Energy Community	A "Sustainable Energy Community" which is registered as such with the SEAI.
Transformer	Electrical equipment for increasing voltage typically from the solar inverter voltage up to the level required to export to ESB Networks connection points.
Transmission System Operator	"Transmission System Operator" means EirGrid plc in its capacity as transmission system operator pursuant to a licence granted by the Regulatory Authority

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

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