SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Community Energy Resource Toolkit

Grid Connection

Grid Connection

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November 2021

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 through the Renewable Electricity Support Scheme (RESS).

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. For more information on the Framework and supports available please see www.seai.ie/community-energy/ress

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 Photovoltaics (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. The design of the Toolkit is similar to the Community and Renewable Energy Scheme (CARES) Toolkit which was developed by Local Energy Scotland on behalf of the Scottish Government, to support community and local energy projects across Scotland. These very useful resources have been examined and adapted to an Irish context for Community RESS projects.

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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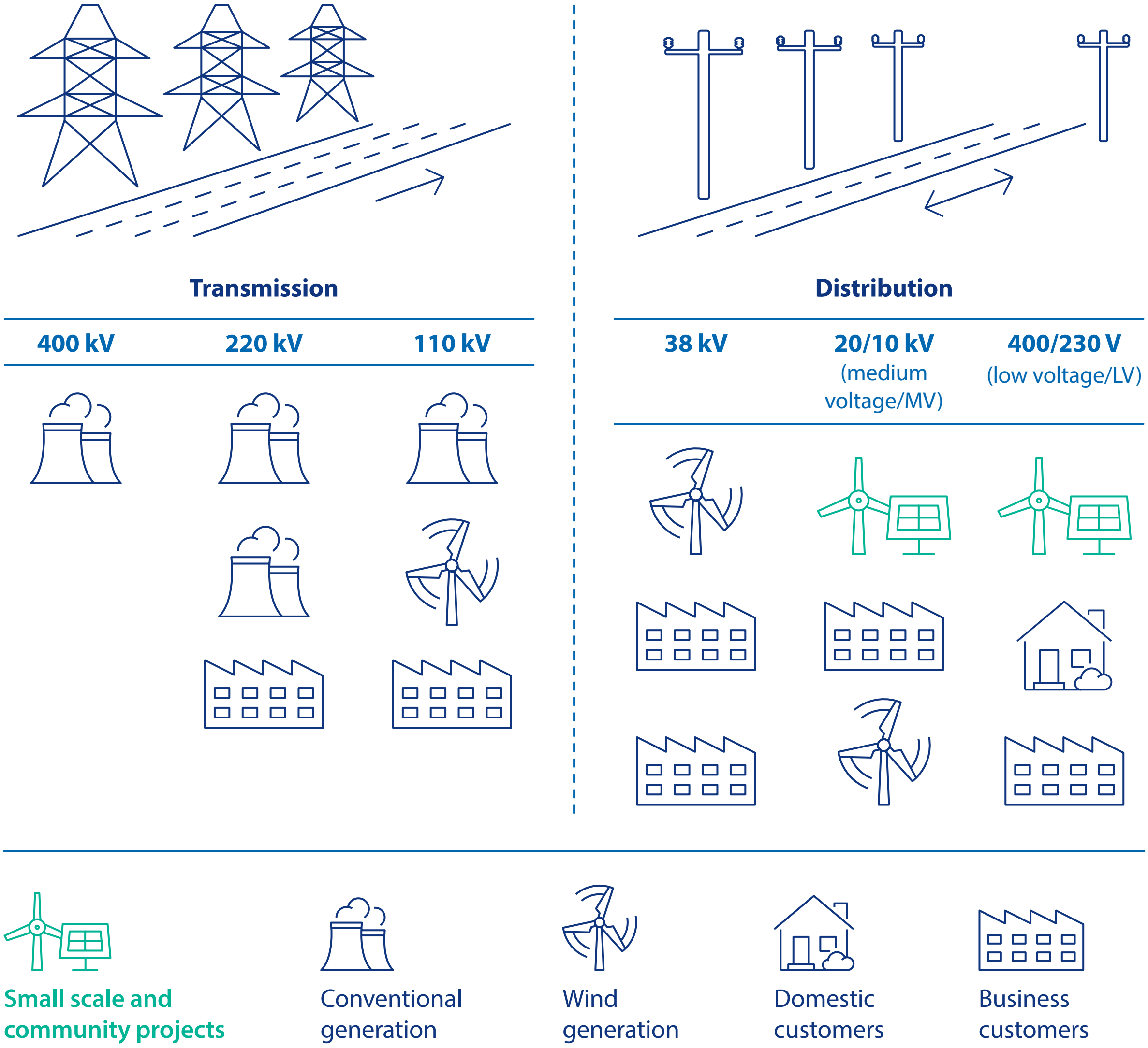
1. The Irish Electricity System

Electricity is transported through the electricity network from generators to demand customers. Previously there was a small number of mainly fossil fuelled power stations providing Ireland's electricity. There is now a growing number of smaller renewable generators providing a substantial capacity of Ireland's renewable electricity. In 2020, 43% of Ireland's electricity was provided from renewable generators.

The Irish electricity network is split into two main components: the distribution and the transmission networks. The transmission system transports large volumes of power over long distances to substations beside large demand centres. The transmission system operates at very high voltage levels. High voltage networks are required to minimize losses as the power is transported over large distances. In Ireland, the transmission network operates at 400kV (400,000V), 220kV and 110kV. Electricity is changed from one voltage level to another through large transformers located in substations. The transmission network is developed and operated by EirGrid and owned and maintained by ESB Networks.

Figure 1: The Transmission and Distribution Networks

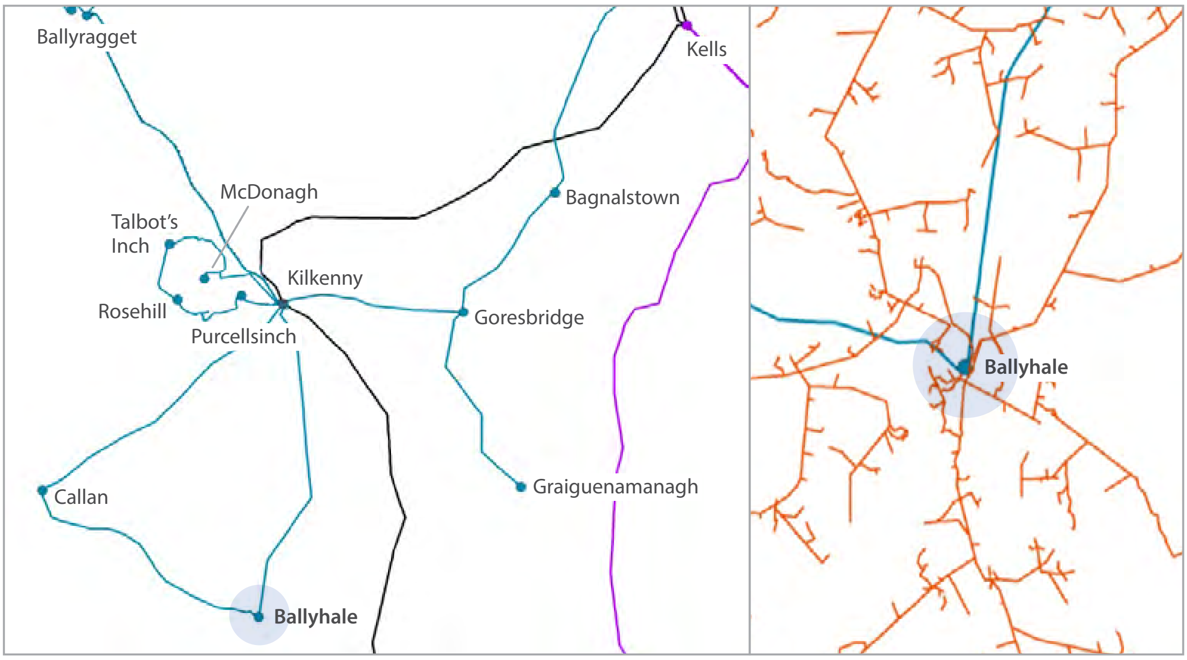


A helpful analogy to visualize the electricity system is to imagine the transmission network as the motorways and dual carriageways and the distribution system as the smaller national and regional roads, see Figure 1.

The distribution network has traditionally taken the power produced by the large fossil fuelled power stations connected to the transmission system and delivered the power to demand customers. The demand customers include approximately 2.3 million industrial, commercial, and domestic customers. There is now an increasing number of renewable generators connecting directly to the distribution network. This can have the benefit of producing the electricity closer to the demand customers, reducing the losses on the electricity system. The distribution network operates at lower voltage levels (voltage is the difference in charge between two points). The distribution network operates at 38kV, medium voltage (MV, 10kV or 20kV) and low voltage (LV) as well as the 110kV network in Dublin. Generally, community scaled projects will be connecting at medium voltage levels.

To further explain the transmission and distribution networks, a simple example of how power could be supplied to Ballyhale, Co. Kilkenny is shown in Figure 2. Included in the larger diagram is the 110kV and 38kV network in Co. Kilkenny. There is a 110kV substation (Electrical installation containing electrical switchgear equipment. It can also include transformers) near Kilkenny city that connects to the wider 110kV and 220kV transmission system. The Kilkenny 110kV substation is equipped with transformers that reduce the voltage from 110kV to 38kV. Kilkenny 110kV substation supplies several 38kV substations around Kilkenny city as well as several smaller towns, such as Ballyhale in the south of the county. These 38kV substations are connected to the 110kV substation with 38kV overhead lines and underground cables. The 38kV substation in Ballyhale includes transformers that reduce the power from 38kV to MV. A number of MV circuits fed from Ballyhale 38kV substation connect all the demand customers in the Ballyhale area to the electricity network. For domestic and small commercial customers there will be medium or low voltage transformers located close to their premises.

Figure 2: The Transmission and Distribution Network in Kilkenny



- MV network
- Existing 38kV overhead line
- Existing 110kV overhead line
- Existing 220kV overhead line
- Existing 38kV substation
- Existing 110kV substation
- Existing 220kV substation

2. Community Scale Generation

The Renewable Electricity Support Scheme (RESS) aims to provide support to renewable generators that will enable Ireland to reach the target set out in the Climate Action Plan and the National Energy and Climate Plan 2021-2030. A number of auctions will be held throughout the lifetime of the RESS scheme. Projects that are eligible, including community projects, can apply for support through these auctions. Community projects are currently permitted to have a maximum export capacity (MEC) between 500kW and 5MW. This is defined in connection policy and in the RESS auction design. Capacity is the term used to define the amount of electricity that can be produced from a generator. It can also be referred to as the rating of the generator. It is usually measured in kW (1,000 watts) or MW (1000kW). A watt is a unit to measure power and describes the rate at which power is being produced. For example, a wind turbine that has a rating of 2MW (2,000kW) could produce 2MW of power at any instance in time under ideal wind conditions. The MEC is the maximum capacity that a generator can export onto the electricity network.

Table 1: Examples of Generator Capacities for Community Projects

Generator	Community Project Capacity	Example
Solar panel	250-500W	
Wind turbine	900kW-4.8MW	

The Maximum Export Capacity is determined by the number of generators installed at the project, i.e. the number of wind turbines on a wind farm or the number of solar panels on a solar farm. A 5MW solar project could consist of 20,000-40,000 panels. Similarly, a 5MW wind farm could consist of one to six wind turbines, depending on the size of each wind turbine. See Figure 3 below examples of potential renewable energy technologies that could be used for community projects. Please refer to the **Onshore Wind** and/or **Solar PV** toolkit modules that discuss these types of community generators in more detail.

Figure 3: Examples of Potential Community Generator

1MW Biogas Generator

4.8MW Solar Farm

4.8MW Wind Farm

3. Grid Connection Feasibility

A grid feasibility study is a report that assesses the technical and economic viability of the grid connection. A feasibility study should be focused and identify any significant issues early in the process before significant time and money are spent on the project. A feasibility study generally would include:

1. Outline of the connection offer process applicable to the project
2. An outline of the existing and planned transmission and distribution network in the locality of the planned project
3. An outline of the existing and planned generation in the locality of the planned project
4. Estimation of spare capacity on the network for new generation
5. Potential connection options for the project based on ESB Networks connection policy
6. Estimated connection costs for each connection option
7. Estimated connection timelines
8. Review of potential transmission network constraints

Most of the background information required to complete feasibility studies can be found in publicly available sources. See a list of these information sources in Appendix A.

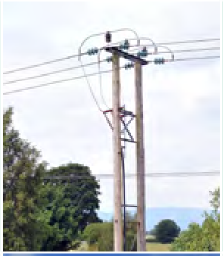
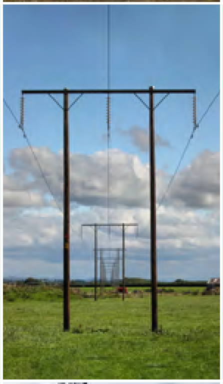
3.1 Identifying Grid Capacity

Grid Capacity is the "space" on the network to accommodate a new generation project. It can be considered that the electricity network is made up of multiple layers. Each layer has to be assessed to determine if there is available capacity for new generation. If there is not availability then the generator will have to pay for the network to be upgraded. The cost of this upgrade could potentially make a project unviable.

If there is not grid capacity on the transmission system, then the output of the generator may be reduced at times. This is known as network constraints or curtailment. If network constraints are expected to be high, it will also impact on the economic viability of the project. All generators greater than 1MW in size can be constrained down by EirGrid. Currently generators less than 1MW are not controllable by EirGrid and therefore do not experience constraints.

Table 2 describes each of these layers. Each layer should be assessed at the feasibility stage. If a layer does not have capacity, then the cost to provide the capacity should be estimated at the feasibility stage. If any layer is deemed unviable then the overall grid connection is likely to be unviable. Later, as part of the connection application process ESB Networks and EirGrid will assess each of these layers in detail.

Table 2: Grid Capacity Tick Box Tool for Community Projects

Layer	Description	Photo Reference	500kW-1MW	1-5MW	Tick Box
MV Network Capacity	These are the 10kV and 20kV circuits (MV) that supply power to demand customers. Generally, generators greater than 1MW cannot connect onto existing MV networks. Community projects 1-5MW will connect with dedicated MV circuits to existing 38kV substations.		Yes	NA	✓ or ✗
38/MV Transformer Capacity	ESB Networks standard transformer sizes are 5, 10 and 15 megavolt amperes. Available capacity for new generation can be determined by considering the rating of the transformer, the electrical demand that is being supplied by the transformer and the generators that are already connected to the transformer.		Yes	Yes	✓ or ✗
38kV Network Capacity (overhead lines and cables)	The available capacity on the 38kV overhead lines and underground cables that connect the 38kV and 110kV substations together. These circuits have technical limitations that limits the capacity of generation that can be connected. If these limits are exceeded, then the 38kV network would have to be uprated with higher capacity conductors. The cost of these upgrades will be charged to the new generators.		Yes	Yes	✓ or ✗
110/38kV Transformer Capacity	ESB Networks Standard transformer sizes are 31.5 and 63 megavolt amperes. Available capacity can be determined by considering the rating of the transformers, the electrical demand that is being supplied from the transformers and the generators that are already connected to the transformer. This includes the generation that is connected to 38kV substations fed from the 110kV substation.		Yes	Yes	✓ or ✗
110 Network Capacity	This is the available capacity of the 110kV overhead lines and underground cables that connect the 110kV substation to the wider transmission system. Available 110kV network capacity is determined by EirGrid. The lack of capacity on the transmission system could result in the output of the generator being turned down at times. This is known as constraints. Generators less than 1MW are not controlled so they cannot experience constraints.		NA	Yes	✓ or ✗

3.2 ESB Network Capacity Maps

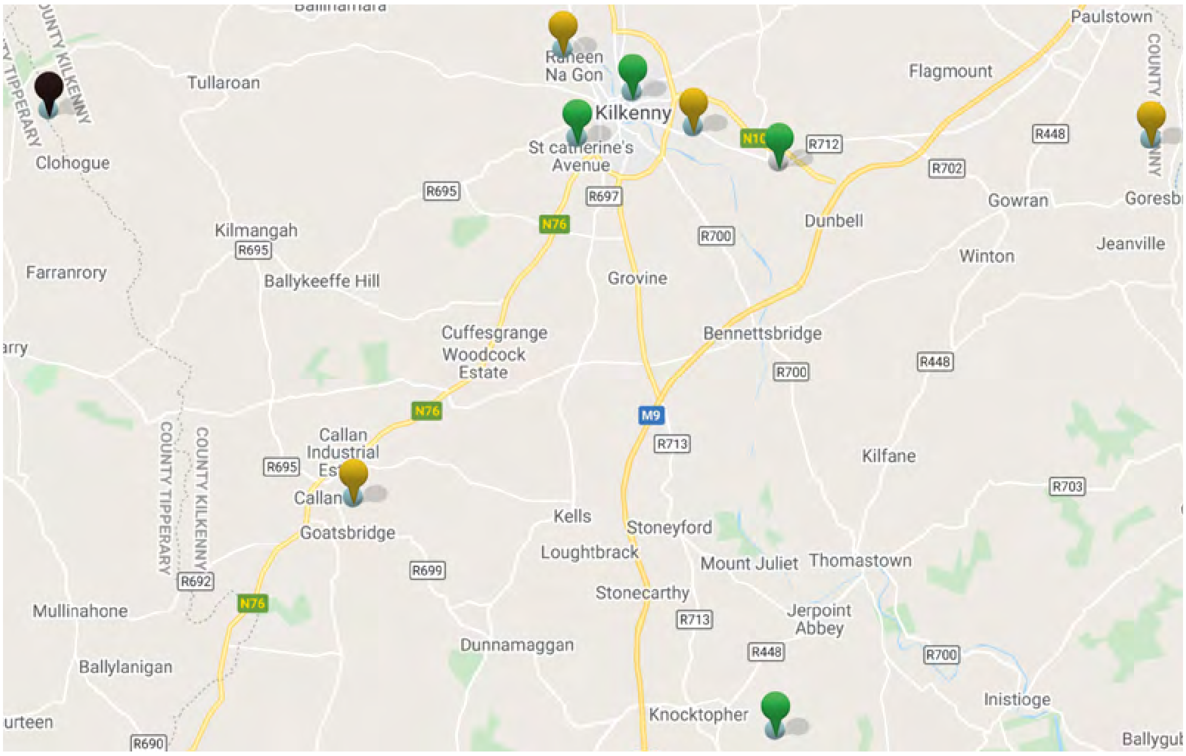
→ ESB Networks publish heat maps to assist potential developers and communities with assessing grid capacity on the distribution system. These are very useful sources of information in determining the viability of new generator projects. The current heat maps assess the capacity of the 38/MV and the 110/38kV transformers on the distribution network. It is important to note that they do not assess all layers of the distribution network for capacity. Each substation in the heat map has been categorized into three colour categories: Black, Amber and Green. See an extract of the heat map in Figure 4. Substations that are green are stated to have available capacity at both the 38kV network and 110kV networks for new projects. Substations that are amber have limited capacity due to existing and planned generation. Substations that are black have no available transformer capacity; this could be due to a lack of transformer capacity on the 38/MV transformers and/or on the 110/38kV transformers.

The heat maps are available on ESB Networks webpage[1]. To access the generator capacity information, it is important to click into the 'Generator View' when you have entered the webpage.

Advantages of the heat maps:

- All substations transformer ratings are listed.
- Excel spreadsheet containing all the mapped information available for download.

Figure 4: ESB Heat Map for Ballyhale and Kilkenny (www.esbnetworks.ie/network-capacity-map)



● High (>15 megavolt amperes) ● Moderate (0-15 megavolt amperes) ● Zero

1 www.esbnetworks.ie/network-capacity-map

What is not included in the heat maps:

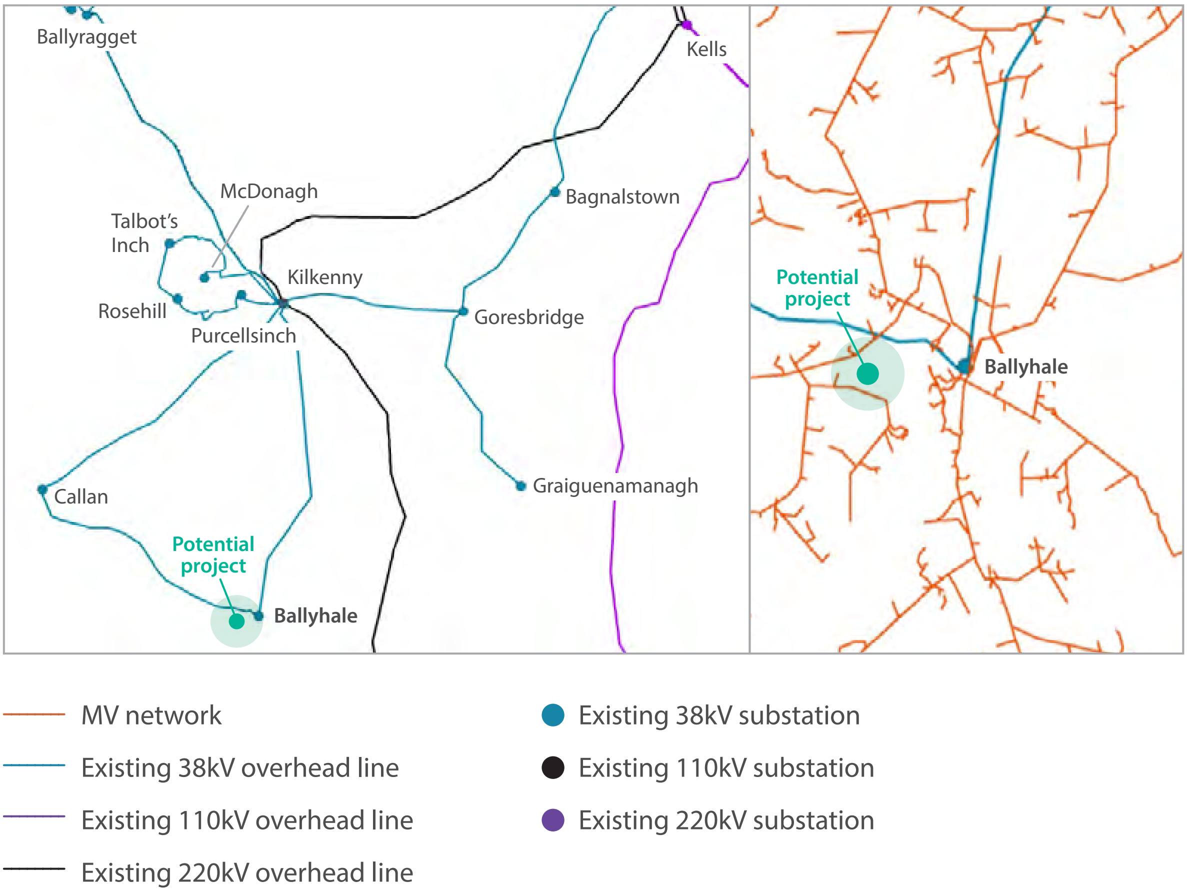
- The transformer capacity information in the heat map only contains generators that have connection contracts with ESB Networks or have been offered contracts by the data freeze date listed on the webpage. Projects that have planning consent but are yet to apply or receive a connection offer are not included in ESB Networks calculations. A substation being reviewed by a community may be listed as having capacity, but in reality, there could be one or more projects with planning consent already being processed or waiting to enter the connection offer process with ESB Networks. Thorough regular reviews of all potential energy projects in the planning process with the relevant local authority or An Bord Pleanala, (including reviews of ESB grid applications and processing lists) are required to establish a better picture of grid capacity. An experienced grid consultant may be required to give further clarity on grid capacity within a specific area.
- The heat map makes no reference to the available capacity on the MV, 38kV or transmission layers of the electricity network. The MV or 38kV circuits in a particular area could be saturated from existing generation. This means that any new generator project wanting to connect in the same area may be required to pay for network upgrades.
- The capacity in a substation could be listed as "Green" but this could be due to a previous generator that was required to upgrade a transformer to provide more capacity. Any new projects that attempt to connect to that substation will be required to pay a share of that upgrade cost.
- The maps do not include any information on the transmission network. Information on the transmission network can be found using EirGrids 10 Year Forecast Statement that is published annually[2]. **www.eirgridgroup.com/site-files/library/EirGrid/All-Island-Ten-Year-Transmission-Forecast-Statement-2019.pdf**

2 **www.eirgridgroup.com/site-files/library/EirGrid/All-Island-Ten-Year-Transmission-Forecast-Statement-2019.pdf**

3.3 Example of Reviewing Network Capacity

→ For this example, a made-up 5MW solar project is proposed near Ballyhale 38kV substation in Co. Kilkenny, see Figure 5. To calculate the available capacity in Ballyhale it is important to first understand the local network in terms of generation, demand and the available transformer capacity in Ballyhale 38kV and Kilkenny 110kV substations.

Figure 5: Example Site Adjacent to Ballyhale 38kV Substation



Ballyhale is equipped with 2 nr.5 megavolt amperes 38/MV transformers and the minimum demand associated with the substation is 2.2MW. This information can be found using ESB Networks Special Load Readings document[3]. Ballyhale substation is connected to the 38kV network on a long 38kV overhead line that starts at Kilkenny 110kV substation, goes to Ballyhale 38kV substation and then via Callan 38kV substation on a return loop to Kilkenny 110kV substation, see Figure 5.

3 www.esbnetworks.ie/docs/default-source/publications/38kv-110kv-station-special-load-readings.pdf?sfvrsn=7b7672ef_13

Using ESB Networks Generation Documents[4] the connected and contracted generation that is associated with the 38kV substations in Ballyhale as well as Kilkenny 110kV substation can be reviewed. Information regarding the generation that has planning consent can be found using the county council website planning portals. Once enough information has been gathered each layer of grid capacity can be assessed, see Table 3.

The review of the Ballyhale site concludes that there is no transformer capacity in Ballyhale 38kV substation for new generation. The cost of a new 38kV/MV transformer is €809k. This will likely make a 5MW solar project unviable from a cost perspective. There is also a high risk of 38kV overhead line upgrades due to the existing generators contracted to connect onto the 38kV network.

Table 3: Example of Reviewing Grid Capacity at Ballyhale 38kV Substation

Layer	Description	Available Capacity	Tick Box
MV Network Capacity	This is not applicable as the MEC of the project is >1MW	Not applicable	Not applicable
38/MV Transformer Capacity in Ballyhale substation	ESB's heat map states that there is 5.4MW of available capacity on the 38/MV transformers based on a data freeze date of September 2020. There is a 4MW solar project scheduled to receive a connection offer to Ballyhale this year through the ECP-2 process. In addition, there is at least 2-3 solar farms with a combined MEC of 12-15MW with consented planning near the substation. The total capacity of these projects will exceed the available capacity on the existing transformers in Ballyhale substation.	0 MW – multiple generators associated with the substation. Likely high upgrade costs	✗
38kV Network Capacity	There is a 4MW MEC community-led solar project contracted beside Callan 38kV substation. This is in addition to the 16-19MW of generation being developed near Ballyhale 38kV substation. Typically, 38kV networks can take c.15-20MW before upgrades are required. It is likely that some uprates will be required to connect all of the contracted and planned generation at Callan and Ballyhale 38kV substation. Therefore, it is likely that a future project connecting to this section of the 38kV network will be required to pay for the uprating of the existing 38kV network.	Low – significant amount of generation on 38kV network. Likely moderate to high upgrade costs	✗

4 www.esbnetworks.ie/new-connections/generator-connections-group/generator-statistics

Table 3: Example of Reviewing Grid Capacity at Ballyhale 38kV Substation (continued)

Layer	Description	Available Capacity	Tick Box
110/38kV Transformer Capacity in Kilkenny Substation	ESB Network's heat map states that there is 62MW of available capacity on the 110/38kV transformers in Kilkenny based on a data freeze date of September 2020. The available capacity listed is assumed to account for 8.3MW of connected and contracted generation. There is an additional 20-30MW of generation being processed by ESB Networks or with planning consent in this area that should be considered in 110/38kV transformer capacity calculations. As a result, there is still capacity for a new 5MW project.	Available capacity	✓
110kV Network Capacity	There are two large renewable projects in the planning process that could connect directly into the 110kV circuits that connects Kilkenny 110kV substation to the wider transmission system. This increased renewable generation in the area increases the potential for network constraints from low to moderate.	Available capacity	✓

4. The Connection Application Process

To connect a generator onto ESB Network's distribution network the developer of the generator has to have a connection agreement with ESB Networks. To receive a connection offer, a generator must apply for a connection through the connection offer process. After a connection offer is accepted it becomes a connection agreement. The rules for the processing of generator connection applications are determined by the regulator of the electricity industry, the Commission for the Regulation of Utilities (CRU). The current connection offer process for the processing of all onshore generators, including Community Projects, is called the Enduring Connection Process (ECP).

4.1 The Enduring Connection Process for Community Projects

The CRU started in 2017 to design a new connection offer process, ECP. The approach was to process applications in groups known as batches. The processing of the first batch of applications, known as ECP-1, is now complete. In June 2020 the CRU published the rules for the second phase of ECP known as ECP-2[5,6]. These documents set out the framework for ECP-2 which encompasses one batch application window per year for three years starting from 2020. The three batches are ECP-2.1, ECP-2.2 and ECP-2.3. See Table 4 below for the indicative timeline of each batch.

Table 4: Indicative Timelines for each ECP Batch

	2020				2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
ECP-1																
– Batch processing	■	■														
ECP-2.1																
– Batch application and confirmation				■												
– Batch processing					■	■	■	■								
ECP-2.2																
– Batch application and confirmation							■									
– Batch processing								■	■	■	■					
ECP-2.3																
– Batch application and confirmation											■					
– Batch processing												■	■	■	■	

5 www.cru.ie/wp-content/uploads/2020/06/CRU20060-ECP-2-Decision.pdf

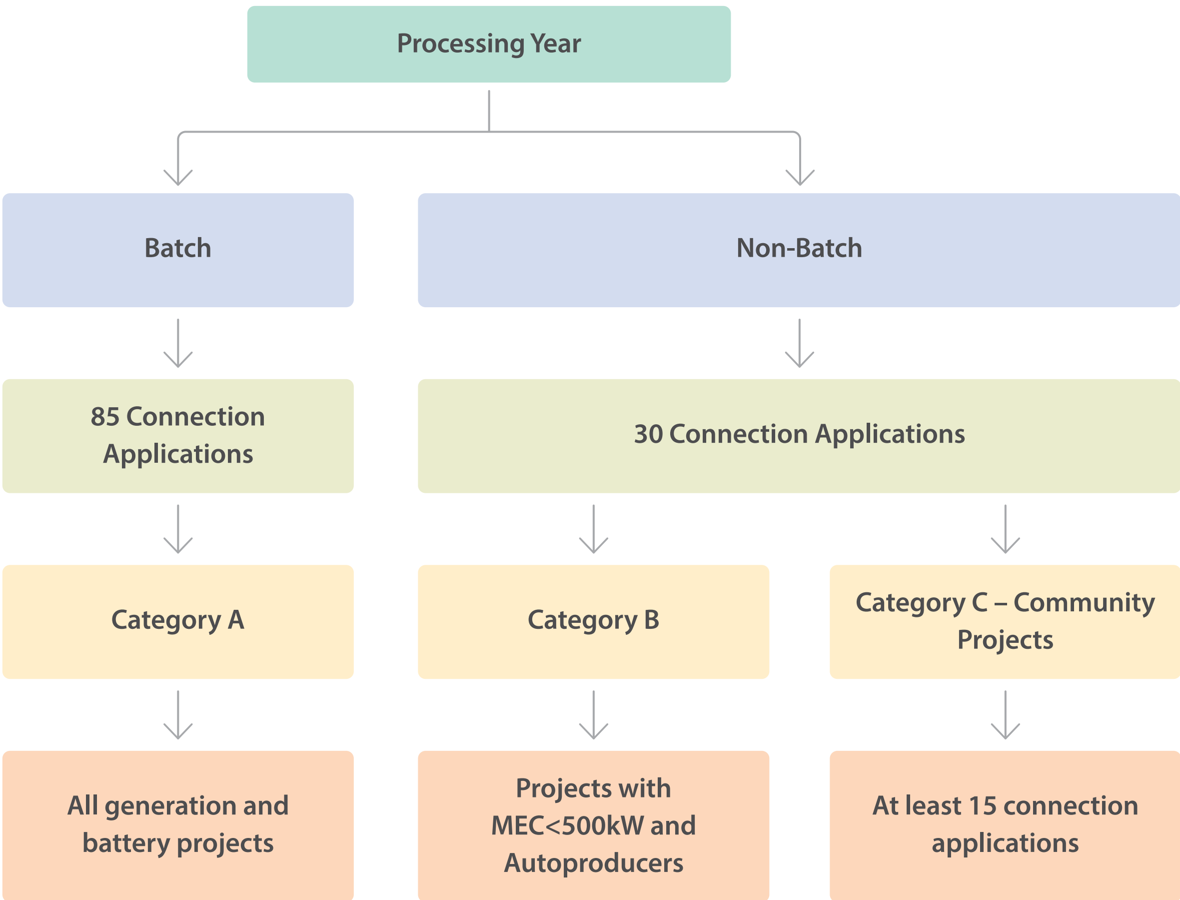
6 www.esbnetworks.ie/docs/default-source/default-document-library/ecp-2-ruleset.pdf?sfvrsn=98f401f0_0

The CRU proposed in ECP-2 a target of 115 connection applications to be processed each year. This included 85 connection applications for generator and battery projects to be processed in each batch. Only projects with planning permission could apply to be included in these ECP-2 batches.

The remaining 30 applications each year are to be processed along-side the ECP-2 batches, in what is referred to as the non-batch process. Community projects (500kW-5MW), generators projects with an MEC of less than 500kW and auto-production projects can apply for the non-batch process. Auto-production is where a generator is located as part of a demand connection, for example a factory with a wind turbine or roof top solar generation.

Of the 30 non-batch applications processed per year at least 15 of these applications will be community projects. If, for example, there is only 10 category B applications then 20 community applications could be processed in that year. As well as having a special category within ECP-2, community projects also have the advantage that they can apply for a grid connection without having planning permission for the generator. All other generators applying for a connection under ECP are required to already have planning permission for the generator.

Figure 6: ECP2 Categories



Once a community project application has been accepted to be processed, ESB Networks will review the connection for the project. They will provide an opportunity to discuss any initial findings by ESB Networks with the community developers in a connection method meeting. If it appears that the grid connection cost will make the project unviable, at this point the community can decide to remove the application and get a 75% refund from the application fees paid. For a community project that pays a €2,000 application fee, this would result in a €1,500 refund.

If the community project decides to remain in the process ESB Networks will then undertake a detailed connection assessment for the project. A connection assessment will be very similar to a connection offer as ESB Networks will complete all of the same studies and issue the document in the same format. This assessment is shared with the community project. At this stage, if the grid connection is not feasible, the community project can decide to withdraw its application. ESB Networks will only issue a formal connection offer after planning permission has been achieved by the project. ESB Networks will hold the capacity on the network for a community applicant for two years to allow time for the project to receive planning permission. If planning permission is not achieved within the two-year period, projects will be re-studied at no additional cost after planning permission is achieved. Community projects that have planning permission at the application stage also have a 2-year grace period after the connection assessment to request a connection offer.

There was no community category in the first ECP batch, ECP-1. A community category was first included along with the 2020 ECP2.1 batch. Community projects could submit applications from the 1st of September 2020. There are 24 community projects bring processed in 2021. This included 13 solar projects and 11 wind projects. The other 6 projects in the non-batch process are made up of auto-production and less than 500kW generator applicants.

New Community applications can be submitted throughout the year. A community project does not need to wait for the batch application window in September each year to submit a connection application. In October-December each year ESB Networks will assess the batch and non-batch applications to be processed in the following year. There are 23 community applications that applied in 2020 but are not being processed in 2021. These projects are in the queue to be processed in the 2022 ECP-2.2. Non-batch process. Community projects with planning will be prioritised to be processed. Otherwise, application are processed based on date order of application.

4.2 Application Fees

→ To apply for a connection under the ECP process a €2,000(includes VAT) initial application fee is required for projects over 500kW. The full application fee depends on the MEC of the project. See table 5 for a list of application fees per MEC category. These application fees are used by ESB Networks and EirGrid to complete all of the detailed studies and assessments required to produce a connection offer. The balance of the application fee for community projects is only required after the system operators have completed the connection assessment for the project and the project has planning permission. For community projects with planning permission, the 2-year grace period to request a full connection offer and pay the balance of the application fee also applies.

Example: For a 5MW community project there is an initial application fee of €2,000. When the project achieves planning permission and within the 2-year grace period, the balance of the application fee, has to be paid. For this example, the balance is €43,672 (including VAT).

Table 5: Community Project ESB Application Fees

Project Size (MEC)	Application Fees (excludes VAT)
>500kW ≤ 1MW	€8,956
>1MW ≤ 4MW	€18,347
>4MW ≤ 10MW	€37,132

4.3 Preparing a Connection Application

→ To apply for a grid connection an applicant must submit a connection application form. This form is called an NC5A[7] application and can be downloaded from the ESB Networks website[8]. Some technical support may be required to complete the grid connection application. The information requested on the form is broken into the following sections:

- Applicant Details: The communities contact information; email address, phone number and billing address
- Site Details: Site name and address. Coordinates of the on-site substation provided in Irish Grid Format. A useful resource for attaining coordinates in the correct format is the Ordnance Survey Ireland co-ordinate converter, see link below.
  https://gnss.osi.ie/new-converter
- Generator Details: MEC, Target Connection Date
- Declarations: Discussed in Section 4.4.
- Maps and Diagrams:
  – 1:50,000 Ordnance Survey map with coordinates of on-site substation and site boundary shown
  – Single Line Diagram: Technical Drawing showing the electrical layout of the project
  – Site Layout Map: A plan of the site showing the proposed generator, buildings and site boundary.

7 www.esbnetworks.ie/docs/default-source/publications/new-generator-connection-application-(nc5a).pdf?sfvrsn=eb0a4bc6_12

8 www.esbnetworks.ie/new-connections/generator-connections-group/renewable-and-embedded-generators

If an applicant is successful with being included in the ECP Non-Batch process, then the applicant's information is published on ESB Networks website. The published information from the application form includes:

- Project name
- Company name
- Contact details; contact name, phone number, email address
- Location and co-ordinates
- Generator Technology

4.4 Application Declarations

→ Community Projects category must complete three declarations as part of the application process:

1. Planning Declaration in NC5A form (only required for community projects already with planning consent)
2. Landowner Declaration in NC5A form
3. Declaration of Community-led Energy Project[9]

The planning declaration requests the developer or community to state all relevant planning information, such as the planning reference number and planning expiry date for the project. A solicitor or registered planning consultant is required to stamp this declaration to confirm that the stated details are correct. The original declaration must be submitted by hard copy to ESB Networks. This declaration is only required if the project has received planning permission.

The landowner consent declaration confirms that all landowner consents are in place. A solicitor is required to stamp this declaration to confirm that the stated details are correct. The original declaration must be submitted by hard copy to ESB Networks.

The community declaration is a document to confirm that the project meets the community led renewable energy project definition. In the 2020 ECP2.1 application it stated:

- At all relevant times, the project must be at least 51% owned by a Renewable Energy Community (the "Relevant REC") either by way of (i) a direct ownership of the ECP project's assets, or (ii) a direct ownership of the shares in the generator; and
- At all relevant times, at least 51% of all expected profits, dividends and surpluses derived from project are returned to the Relevant REC.

On the 3rd of February 2021, Minister for Environment, Climate and Communications, Minister Eamonn Ryan announced *"A new requirement that ensures community projects must be 100% community-owned to gain 15-year support in Government's renewable electricity support scheme (RESS)"*[10]. Therefore, any community project that is not 100% owned by the community will not be eligible to be processed under the Category C framework in future ECP2 rounds. The CRU have revised the **ECP2 decision paper** to reflect this change and ESB Networks have also updated the **ECP2 application information** to support this.

9 **www.esbnetworks.ie/docs/default-source/publications/ecp-2-declaration-of-community-led-energy-project-(100-owned).pdf?sfvrsn=9f212ee2_5**

10 **www.gov.ie/en/press-release/a3abb-minister-ryan-steps-up-ambitions-for-community-energy-sector**

4.5 Interacting with ESB Networks during the Connection Offer Process

After the application has been successful in being included in the ECP process, ESB Networks will review the application and notify the applicant when the application has been deemed complete.

Once the ECP batch and non-batch participants have been finalised ESB Networks will begin to process the applications by generally following a schedule published on ESB Networks website[11]. In the interim period, between application submission and the connection offer being issued it is important that any information concerning the projects grid connection is provided to ESB Networks in a timely manner.

If the community has a preferred connection method this should be confirmed to ESB Networks at this stage. For example, the community project may prefer to connect to the local ESB Networks substation with an underground cable rather than an overhead line. Possible changes to the application post submission are outlined in Table 6.

You cannot increase the maximum export capacity of a project after the application has been submitted. It is not allowed to change the location of the generation more than 100m outside the boundary that was included in the original connection application.

Table 6: Application Alterations

Permitted	Not Permitted
Change of Legal Entity	Increasing MEC
Reduction in MEC	Change of Location
Connection Method Preference	

ESB Networks will provide the community project with a connection method meeting during the connection offer process. ESB Networks will present their proposed connection method and an estimate of the connection cost at the meeting. At this stage, the community project can engage with ESB Networks on alterative connection methods. For example, the proposed method may be an overhead line connection but for local environmental or landowner reasons the community may request a more expensive underground cable connection option. Following the connection method meeting the community will be given a number of weeks to confirm if they want the MV connection as overhead line, underground cable or hybrid of both. They will also be asked if they want a contestable or non-contestable connection, see Section 5.1 for more info on contestability. The connection method can be changed after the connection agreement is in place, but this can require a formal modification. The modification process is discussed further in Section 8.1.

11 www.esbnetworks.ie/docs/default-source/publications/ecp-2.1-category-b-_-c-batch-results-(2020).pdf?Status=Master&sfvrsn=a104a17b_14/%0AECP-2.1-Category-B-_-C-Batch-Results-(2020)

4.6 Accepting the Grid Offer

→ At the end of the connection offer process, and after the community project has received planning consents and paid the full connection application fee, each community project will be issued by ESB Networks with a quotation letter and a connection agreement document. The quotation letter includes the detail of the connection method, costs and any potential upgrades required to connect the project. The connection agreement is a legal document of the terms and conditions of connection. The community then has 90 business days to review the connection offer and decide whether to accept or let the offer lapse. It is important for the community project to understand all the terms of the connection agreement, for example the longstop dates of the contract.

To accept the connection offer the community will be required to pay the first stage payment. The first stage payment is the higher of 10% of the connection costs outlined in the connection offer or €10,000/MW. For example, for a 5MW MEC connection offer with a grid connection cost of €600,000 in the ESB Networks connection offer, the cost to accept the connection offer is €60,000. It is advised that the community project engage with ESB Networks before the offer is accepted on any technical or commercial queries that they may have with the connection offer and agreement documents.

5. Connection Method

ESB Networks are responsible for determining the connection method for the generator during the connection offer process. ESB Networks will also consider any connection methods proposed by the community. These proposed connection methods should be suggested by the community early in the connection offer process.

ESB Networks determine the connection method for a project using the Least Cost Technically Acceptable approach. The Least Cost Technically Acceptable determines the lowest cost connection method that is technically viable based on ESB Networks' connection planning standards[12]. ESB Networks complete detailed network studies on specialised power system software to confirm if the potential connection methods are technically acceptable. Each of the technically acceptable connection methods are costed and the lowest cost method is determined as the Least Cost Technically Acceptable.

There are generally two types of connection methods for community projects depending on the size of the project.

1. **Community Projects less than 1MW MEC**
   Projects of this scale may be able to connect directly into the local MV network. The available capacity on the MV network can only be determined during the connection offer process. Available capacity depends on the length of the existing MV network, the size of the overhead line conductor and the MV voltage (10kV or 20kV). For example, on long 10kV networks there could be as little as 300kW of generation capacity allowed to connect before expensive upgrades or an alternative connection method is required. If a connection onto the local MV network is not viable than the generator will connect with connection option described below.

2. **Community Projects between 1-5MW MEC**
   Projects of this scale will generally connect directly to an existing 38kV substation with a new MV circuit. This MV circuit could be overhead line or underground cable. For community projects like solar it is important to locate near an existing 38kV substation to minimise the length of new MV circuit. Projects that have long MV circuits may not be commercially viable. It is also possible that a community generator may be able to connect to existing 110kV substations. Some of existing 110kV substations have MV assets and can facilitate MV connections. The ESB Network Capacity Heat Map can help identify the 110kV substation with MV assets.

Table 7 outlines the connection assets that could be expected for a 500kW-1MW project connecting on the local MV network. Table 8 outlines the connection assets that could be expected for a 1MW-5MW project connecting to a 38kV substation.

12 www.esbnetworks.ie/docs/default-source/publications/distribution-system-security-and-planning-standards.pdf?sfvrsn=beedd2e5_23

Table 7: Outline of Assets in a Connection Offer for Projects <1MW

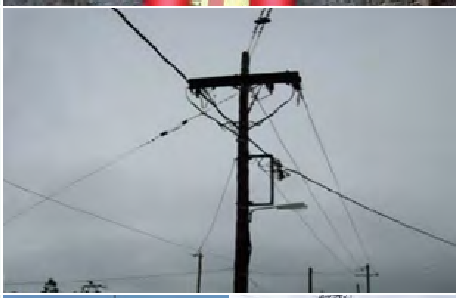
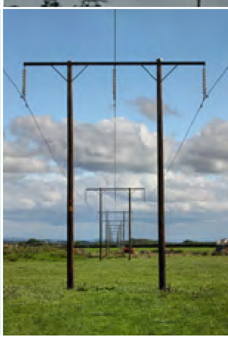
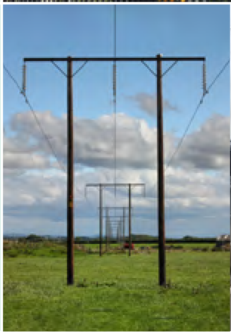
Grid Asset	Description	Photo Reference
Onsite Substation	The onsite substation will include: • Block built building • ESB Networks Metering • ESB Networks Switchgear • ESB Networks Communication Equipment	
Overhead Line Assets	Electrical conductor mounted on wooden poles (approx. 11 poles/km). New circuit required from project to existing MV overhead line.	
Underground Cable Assets	Underground cable is generally used for short lengths or when overhead lines across third party lands is not deemed viable. The electrical cables are installed in ducts typically along the public road network. The ducts are encased in concrete.	
MV Network Upgrades	For projects with an MEC between 500kW-1MW MV network upgrades may be required. This generally entails replacing the existing overhead line with larger conductors.	
38kV and 110kV Network Upgrades	There may be the need for upgrades in an existing ESB networks substation or on the 38kV or 110kV circuits. • 38/MV or 110/38kV transformer upgrades • Protection upgrades • 38kV or 110kV network reinforcements	 

Table 8: Outline of Assets in a Connection Offer for projects >1MW

Grid Asset	Description	Photo Reference
Onsite Substation	The onsite substation will include: • Block built building • ESB Networks Metering • ESB Networks Switchgear • ESB Networks Communication Equipment	
Overhead Line Assets	Electrical conductor mounted on wooden poles (approx. 11 poles/km).	
Underground Cable Assets	Underground cable is generally used for short lengths or when overhead lines across third party lands is not deemed viable. The electrical cable is installed in ducts typically along the public road network. The ducts are encased in concrete.	
Distribution Substation Assets	• MV Cubicle: This is a switch at the existing ESB Networks substation • Electrical Protection Works	
38kV and 110kV Network Upgrades	There may be the need for upgrades in an existing ESB networks substation or on the 38kV or 110kV circuits. • 38/MV or 110/38kV transformer upgrades • Protection upgrades • 38kV or 110kV network reinforcements	 

5.1 Who Constructs the Grid Connection?

Grid connections can be constructed contestably or non-contestably. A non-contestable offer is where ESB Networks are responsible for designing, procuring and constructing all of the grid connection works. It is noted that with a non-contestable connection the generator is still responsible for the civil works for the onsite substation and any civil works required for MV underground cables.

A contestable connection is where the community project employs an electrical contractor to design, procure and construct the electrical equipment in the new substation at the generator site and any MV overhead line or underground cable required for the grid connection. The contractors will construct the grid connection to ESB Networks standards and there will be an ongoing review by ESB Networks during the design and construction process. ESB Networks will take over the assets when constructed and complete the commissioning process.

Contestable connections only permit third party contractors to construct new connection equipment up to existing ESB Networks assets. ESB Networks are responsible for any works required within existing substations or on the existing MV or 38kV network. These are referred to as non-contestable works.

The benefit of contestable connections is that it gives more control to the community project over the delivery of some of the connection works and the potential for reduced connection costs and timelines. It is also possible that a contestable connection could be more expensive. It is recommended that the community project request budget costs from contractors to determine if the contestable connection would be lower than a non-contestable connection. Under both contestable and non-contestable construction options, the equipment in the new MV substation and the MV circuit become part of the ESB Network and is operated and maintained by ESB Networks.

All generators connecting to the ESB Network have to comply with the distribution code[13]. The distribution code is a list of technical requirements that the generator must meet when connected on the ESB Network. It is recommended that the community project ensures that any generator being procured can meet the requirments of the ESB Networks Distribution Code.

Table 9: Contestable vs Non-Contestable Assets

Grid Asset	Contestable	Non-Contestable
Generator Substation Assets	✓	
Overhead Line Assets	✓	
Underground Cable Assets	✓	
MV Network Upgrades		✓
ESB Networks Substation Assets		✓
Other Network Upgrades		✓

13 www.esbnetworks.ie/docs/default-source/default-document-library/distribution-code-version-7.pdf?sfvrsn=bbfb01f0_0

6. Connection Costs

ESB Networks calculate the grid connection costs based on standard costs[14] that are approved by the CRU. This document is updated and published annually. A connection offer can also contain additional costs known as pass through costs. An example of pass-through costs could be civil works that are required in an existing ESB Networks substation to install a new MV cubicle. These civil costs will be estimated by ESB Networks in the connection offer, but they could be materially higher when ESB Networks complete detailed design and complete procurement. It is recommended that community groups engage with ESB Networks on pass through costs throughout the construction process.

Tables 10 are example costs for a 4MW non-contestable generator that is connecting with 1km of MV underground cable to an existing ESB Networks 38kV substation. No network reinforcements or pass-through costs are assumed for this example.

Table 10: Estimated Costs for a Non-Contestable 4MW Underground Cable Connection

Grid Asset	Cost €
Substation Works (civil and electrical)	516,529
Underground Cable (civil and electrical)	204,980
New Assets in existing ESB Networks Substation	215,840
Total estimated connection cost	**€937,349**

Table 11 below are example costs for a non-contestable 750kW generator that is connecting to the existing MV network with 250 metres of new MV overhead line. This example assumes that no network reinforcements will be required.

Table 11: Estimated Costs for a Non-Contestable 750kW Overhead Line Connection

Grid Asset	Cost €
Substation Works (civil and electrical)	192,831
Overhead Line	19,205
Total estimated connection cost	**€212,036**

14 www.cru.ie/wp-content/uploads/2021/04/CRU21035a-ESB-Networks-Standard-Prices-for-Generator-Connections-2021.pdf

It should be noted that the costs included in an ESB Networks connection offer **do not** account for all the connection costs. Some of the additional costs are listed in Table 12. If the project has decided to receive a contestable offer, then the costs of the contestable assets will not be included in the ESB Networks connection offer as they will be procured by the project.

Table 12: Costs not Included in a Connection Offer

Grid Asset	Additional Connection Costs
MV Substation Civils	The civil works required to construct the onsite substation building.
Generator Connection Assets	The connection offer does not account for the generator's switchgear, protection and internal cabling works.
Underground cables	The civil works and road opening licences required to construct an underground cable. There may be the requirement for compensation to third part landowners along the cable route.
Overhead Lines Wayleaves	Any 3rd party landowner compensation that is required to construct an overhead line.
Pass Through Costs	Additional costs incurred by ESB Networks to provide a grid connection will be passed to the generator.

Table 13 list some of ESB Networks standard costs for network reinforcements that could be included in a connection offer. There could be additional pass-through costs included for these network reinforcement works. For example, a new transformer in an ESB Network substation may require substantial new civil works.

It is possible that some of these network reinforcements will be shared with other generators connecting to the network. When the network reinforcements are shared the costs are split on a per MW basis between the generators that require the network reinforcement. These shared costs could include rebates to existing generators that are already connected to the network and had paid fully for network reinforcements that the community project will now benefit from.

Table 13: Example Network Reinforcement Costs

Network Reinforcement Asset	ESB Network Costs
10 megavolt amperes 38kV/MV transformer	€833,490
2x31.5 megavolt amperes transformers to 2x63 megavolt amperes 110/38kV	€3,297,260
MV Line Upgrades	€46,450/km
38kV Line Upgrades	€88,260/km

6.1 Network Reinforcements

→ The connection method and cost included in the connection offer from ESB Networks may also include network reinforcement works. This could include new transformers or protection equipment in ESB Networks substation or upgrades to existing MV, 38kV or 110kV circuits. These reinforcements are required to ensure the generator can export its MEC capacity at all times. It should be noted that ESB Networks do not make any formal determination as to the viability of a project based on the reinforcements required to connect the project. If there is no capacity for a project on the existing network, ESB Networks will determine the network reinforcements required to provide the necessary capacity for the generator. It is not uncommon for MV connection offers to include network reinforcements that make the project unviable from a connection cost perspective. If it appears likely that there are going to be expensive network reinforcements required for a community project ESB Networks will generally highlight this early in the connection offer process.

6.2 Payment Schedule to ESB Networks

→ The connection cost payments to ESB Networks are broken into stage payments. The first stage payment is paid to accept the connection offer. There are three other stage payments that are required. Table 14 provides details of the stages payments.

Table 14: Stage Payment Costs

	Payment	Payment Stage
Initial Application Fee	€2,000	Submitting Application
Balance of Application Fee	Balance of fee based on Table 9	Prior to receiving connection offer
1st Stage Payment	Higher of €10k/MW or 10% of connection costs	Accepting Connection Offer
2nd Stage Payment	Stage Payment: 55% 65% of Non-Contestable connection costs paid accounting for first stage payment	Generally paid when the project is ready to begin construction
3rd Stage Payment	Stage Payment: 25% 90% of Non-Contestable connection costs paid accounting for first, second and third stage payments	One month prior to energisation. Any rebate costs are included in this stage payment.
Final Stage Payment	Stage Payment:10% 100% of Non-Contestable connection costs paid	Post Energisation. This payment will include any final updates to the pass-through costs

7. Designing and Constructing the Grid Connection

7.1 Engagement with ESB Networks

After the connection offer has been accepted and the first stage payment paid, the community will have a kick-off meeting with ESB networks to discuss the process for constructing the grid connection. An ESB Networks project manager will be assigned to manage the construction of the grid connection. At this stage the community project is likely to have appointed its own engineer to assist with the delivery of the project. It is important for the community projects and their advisors to have regular meetings with the ESB Networks' project manager throughout the construction process to discuss the progress of the non-contestable works. The review of the designs and construction of any contestable works will also be discussed at these regular progress meeting. ESB Networks generally provide the minutes from these meetings. It is also important for community projects to request ESB Networks to provide and update a project programme for the delivery of the non-contestable grid connection works.

Before construction starts on the grid connection all necessary planning consents and third party land agreements will need to be in place for the grid connection works. The Planning Process module has more information on the planning consents required for the grid connection works. When the project is ready to begin construction ESB Networks will issue the second stage invoice. When the project enters the construction stage there will be regular on-site meetings between ESB Networks, the community project and their advisors.

7.2 Connection Modifications

If the community wishes to materially alter the connection method, change the generator details or reduce the MEC then a modification application will have to be processed by ESB Networks. An example of a material change of connection method is to change the MV connection from overhead line to an underground cable connection. Depending on the type of modification being requested, ESB Networks will assign a modification level. Each modification level has a different fee required. More information on the level of modification fees can be found on ESB Networks' website[15]. A modification application can take 6-9 months to be processed by ESB Networks. To submit a modification, a modification application form[16] has to be completed as well as a new NC5 application form and supporting documents. The cover letter accompanying the modification application should confirm the changes being requested. It is noted that modifications with changes to the connection method can take more than 6 months to be processed by ESB Networks.

15 www.esbnetworks.ie/help-centre/help-faq/renewable-step-by-step-guide/modification-fees

16 www.esbnetworks.ie/docs/default-source/publications/supplemental-application-for-modifications-to-generation-connection-offers.pdf?sfvrsn=f64b33f0_4

7.3 On-site Substation

→ There is currently a requirement for the onsite substation to be a block-built building. Figure 7 is an example of a constructed MV substation building. ESB Networks require one room for their equipment and at least one room will be required for the generator's electrical equipment. Generators often have a separate switchgear and control room. The current standards for the ESB Networks section of the substation building can be obtained from ESB Networks website upon request[17]. ESB Networks are bringing in new standards to allow the onsite substation to be a containerised substation enclosure. More information on these new standards and the timeline for them to be introduced can be found on ESB Networks website[18].

Figure 7: On Site MV Substation

17 DSOgenerators (ESB Networks) **dsogenerators@esb.ie**

18 **www.esbnetworks.ie/docs/default-source/publications/mv-customer-connection-mv-egip-standard-module-substation.pdf?sfvrsn=c35f01f0_0**

7.4 Obtaining Wayleaves and Easements

Overhead line connections

Wayleave agreements need to be in place between ESB Networks and any third-party landowner along the overhead line route. It is possible that commercial agreements will be required between some landowners and the community project to obtain the wayleave. It is recommended that the community project engages early in the process with any third-party landowner along the proposed route. The community project should consult with their legal advisors on these wayleave agreements.

Underground Cable Connections

Generally underground cable connections go along public road networks. If there is any deviation from the public roads onto third party land it is recommended that this is discussed with ESB Networks. ESB Networks will require easement agreements for any section of underground cable that passes through third party lands. The community project should consult with their contractor on these easement agreements.

7.5 Design and Procurement

For contestable connections the community project will be responsible for the design and procurement of the new contestable assets. All designs must meet the technical requirements outlined in ESB Networks functional specifications. ESB Networks will provide the functional specifications for the MV substation and MV circuit after the connection agreements are put in place. The community project should consult with their technical and legal advisors on the procurement process and form of contract for these contestable works.

7.6 CRU License to Generate and Construct

→ To construct and operate a generator the community project must have a licence to construct a generator and a licence to generate from the Regulator. The Commission for Regulation of Utilities (CRU) are responsible for granting these licences. Only projects with an MEC greater than 1MW are required to have these licenses in place.

To avoid the submission of invalid applications, new applicants should have a pre-application meeting with the CRU. The CRU will outline the application process at this meeting. The expected timeline for the CRU to provide these licences is approximately 12 weeks. Further information on the application process including the application forms can be found on the CRU's website, see link below[19]. The list of supporting information required for the applications is listed in Table 15. Application fees for both licenses are outlined in Table 16[20].

Table 15: Information Required to Complete CRU Licenses

Information Required	Licence to Construct	License to Generate
Application form and confirmation of payment. Note that there are separate application forms for each licence	✓	✓
Financial Information – Evidence that the project has a government support scheme such as RESS or proof of funds if privately funded	✓	✓
Location of Generator – Maps outlining the location of the generator and relevant buildings	✓	✓
Evidence that the project has achieved planning	✓	✓
Evidence of a connection agreement with ESB Networks	✓	✓
Evidence of qualifications and experience of the person or company who will operate the generator	Not applicable	✓

Table 16: Application Fees for Licenses

MEC	Licence to Construct Application Fee	License to Generate Application Fee
>1 MW and < 5MW	€35	€35
5-10MW	€100	€55

19 www.cru.ie/professional/licensing/atc-gl-licensing-2
20 www.cru.ie/professional/licensing/atc-gl-licensing-2/#application-fees

7.7 Testing and Commissioning

The community project is responsible for the testing and compliance process for the generator. The generator must be able to achieve the requirements set out in the ESB Networks Distribution Code. All wind and solar generators greater than 1MW MEC must have their output controllable by EirGrid and ESB Networks. Therefore, all community projects with MEC greater than 1MW will have to undertake testing by both EirGrid and ESB Networks. The compliance and testing process is set out in the document entitled 'WFPS Schedule of Grid Code Tests' available on EirGrid's website[21]. The document sets out the requirements of the various stages of testing and compliance required to achieve an Operation Certificate for the generator. ESB Networks are currently preparing a similar document for all technologies including solar that will be on the ESB Networks website.

Generators with MEC less than 1MW are not controllable and do not have to go through the same testing process by EirGrid and ESB Networks. However, all generators up to 2MW will have to complete G10 protection testing[22] that is witnessed by ESB Networks. These tests can be discussed with the electrical contractor completing the generator installation works and the ESB Networks' project manager during the grid connection construction process.

After the non-contestable and contestable works have been constructed, ESB Networks will commission the connection. For an MV connection it is advisable to assume 6-8 weeks for commissioning. During this time, community projects (>1MW) will schedule the pre-signals and control test. This test will be completed with the assistance of ESB Networks. After these tests are complete to the satisfaction of ESB Networks, the grid connection can be energised.

Post energisation the generators greater than 1MW in MEC must complete the distribution and grid code compliance process. The compliance process includes provision of studies, on site tests, and provision of the required information set out in the WFPS Schedule of Grid Code Tests document. The generator will submit testing templates for approval for each of the required tests.

Once all the studies have been approved, and the tests are completed to the satisfaction of ESB Networks and EirGrid, the generator will receive its Operational Certificate.

21 www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-compliance-test/compliance-testing/power-park-modules

22 www.esbnetworks.ie/docs/default-source/publications/conditions-governing-connection-to-the-distribution-system.pdf?sfvrsn=1073c50d_14

8. Generator Operation

There are a number of ongoing charges and grid factors that impact on the revenue of a generator. These should be included in the financial modelling of the community project.

8.1 Grid Operation and Maintenance Charges

Generators are required to pay an annual charge to ESB Networks for the operation and maintenance of the grid connection works. The annual charges are based on standard charges for each of the connection assets. The charges also include rates contribution to local councils. The operation and maintenance charge will be listed in section 5 of the ESB Networks connection offer letter. Table 17 outlines some of the latest operation and maintenance[23] charges for ESB Network assets that are applicable for MV connections.

Table 17: Operation and Maintenance Fees

ESB Networks Asset	Operation and Maintenance Cost
MV cubicle in 38kV outdoor station	€1,528
MV Overhead Line	€596/km
MV Underground Cable	€556/km
MV Metering	€463-697

8.2 Distribution Loss Factors

Distribution Loss Adjustment Factors apply to all projects, including community projects. Electrical losses occur when transporting power from a generator to the customer. On average domestic and commercial customers connected at low voltage will have losses of approximately 9% on the distribution system and commercial customers connected at medium voltage will have 3.5% losses. Generally, community generators will be embedded into the distribution system, and as they are connected near to demand customers, they will reduce electrical losses on the distribution system.

Community projects that help to reduce the losses on the distribution system will have a Distribution Loss Adjustment Factor greater than 1. The metered output of a generator will be multiplied by the Distribution Loss Adjustment Factor to calculate the payment the generator receives for its electricity. For example, if a community project produces 100 units of electricity and it's Distribution Loss Adjustment Factor is 1.03, it will get paid for 103 units of electricity. Community projects will typically have Distribution Loss Adjustment Factors of 1.030-1.035.

23 www.esbnetworks.ie/docs/default-source/publications/schedule-of-operation-and-maintenance-charges.pdf?sfvrsn=49814bfd_15

The exact Distribution Loss Adjustment Factor for a community generator depends on the connection method of the generator. Distribution Loss Adjustment Factors are calculated for each generator and take into account losses from the connection assets. Project specific Distribution Loss Adjustment Factors are provided by ESB Networks after the project has been energised. The calculation of Distribution Loss Adjustment Factors is set out in an ESB Networks document on their website[24].

8.3 Constraint and Curtailment

→ All community projects greater than 1MW MEC are controllable by ESB Networks and EirGrid. This means that EirGrid can send a control signal to the generator and command it to reduce its output. EirGrid will reduce the output of renewable generators to ensure the electricity system is operating safely and securely. There are generally two reasons that EirGrid will reduce the output of renewable generators. These are local network constraint and system wide curtailment.

Network constraints occur when the local transmission network is unable to take the full output of the renewable generation in that area. EirGrid are developing new transmission infrastructure to increase the capacity of the existing system to accommodate new generation. However, in certain areas the renewable generators connected before EirGrid could complete all of the network reinforcements on the transmission system. Network constraints can also occur when parts of the transmission system are unavailable due to unexpected faults or planned maintenance. The level of network constraint experienced by a community generator will depend on its location on the transmission system. In 2020 the average network constraints was 6.2% of the renewable generators output.

System curtailment occurs at times of high renewable output when there is more renewable electricity on the system than can be safely managed. For system curtailment the location of the renewable generator on the system does not matter. EirGrid are developing the system to safely manage very high levels of renewable generation. There are also existing and new interconnectors with other countries that allow for export at times of high renewable energy in Ireland. In 2020 the average system curtailment was 5.9% of the renewable generators output.

For each ECP batch, EirGrid estimate the levels of constraint and curtailment that renewable generators may experience. These are published in reports and issued to ECP generators and are available on EirGrid's website[25].

24 www.esbnetworks.ie/docs/default-source/publications/distribution-loss-adjustment-factors.pdf?sfvrsn=8be556a8_12

25 www.eirgridgroup.com/customer-and-industry/general-customer-information/constraint-reports-solar


L1
1436

9. Alternative Connections and Support Technologies

9.1 Private Wire Connections

Renewable generators connected into a demand customer's premises is referred to as auto-production generation. Current ESB Networks policy only allows auto-production generation located onsite or on a directly adjacent site to be connected into the demand customers premises. A connection crossing third party lands, including public roads, is referred to as a private network. Private networks are currently prohibited under policy and legislation.

There is an action in the Governments Climate Action Plan[26] to review the private connection policy and revise legislation if necessary.

9.2 Smart Grid Technologies

Smart grid technologies can help to create more capacity on the distribution and transmission system. This can include technologies to help manage demand such as smart meters and smart protection schemes to manage generation. Currently ESB Networks plan connections for renewable generators based on the worse case scenarios. This is lowest demand and highest renewable output. ESB Networks are currently looking into how to move towards a managed network where the output of demand and generation can be monitored and where possible controlled. More information on ESB Networks plan to implement smart networks can be found on their website[27].

EirGrid already operate a smart transmission network. This has helped allow up to 75% of Ireland's demand to be met from renewable generation at times. The smart changes to the transmission system over the last decade were completed under the DS3 (Delivering a Secure, Sustainable Electricity System) programme. There will be an extension of the DS3 programme to help with the future changes required to accommodate even higher levels of renewable generation on the Irish system. More information on the DS3 programme can be found on the EirGrid website[28].

26 www.dccae.gov.ie/en-ie/climate-action/publications/Pages/Climate-Action-Plan.aspx
27 www.esb.ie/tns/brighter-future/smart-networks
28 www.eirgridgroup.com/how-the-grid-works/ds3-programme

9.3 Storage

→ New storage technologies such as batteries are starting to be connected onto the Irish system. These batteries are generally providing system services to help support the high levels of renewable generation on the system. The battery projects receive system service payments from EirGrid. Battery generation could be connected along with community generation projects. However, current connection policy requires battery generation to have it's own meter and MEC capacity. There is ongoing connection policy development to determine if hybrid connections will be allowed. A hybrid connection would allow multi technologies, for example solar and battery generation, to share a grid connection, including MEC.

Currently batteries projects can receive connection offers through the batch process, see Section 4. This process is separate from the non-batch process for community renewable projects.

Abbreviations

Abbreviations

CRU	Commission for Regulation of Utilities
ECP	Enduring Connection Policy
kV	Kilovolt (1000V)
LCTA	Least Cost Technically Acceptable
MVA	Megavolt amperes (1,000,000VA)
MV	Medium Voltage is 10kV or 20kV Voltage in Ireland
MW	Megawatt (1,000,000 watts)
OSI	Ordnance Survey Ireland
RESS	Renewable Electricity Support Scheme

Appendix A: List of Sources

Resource	Link
Detailed Network Information	www.eirgridgroup.com/site-files/library/EirGrid/All-Island-Ten-Year-Transmission-Forecast-Statement-2019.pdf
Declaration of Community Led Generation Project	www.esbnetworks.ie/docs/default-source/publications/ecp-2-declaration-of-community-led-energy-project-(100-owned).pdf?sfvrsn=9f212ee2_5
Government Press Release regarding Community Led Generation Projects	www.gov.ie/en/press-release/a3abb-minister-ryan-steps-up-ambitions-for-community-energy-sector
ECP2 Decision Paper	www.cru.ie/wp-content/uploads/2020/06/CRU20060-ECP-2-Decision.pdf
ECP2 Ruleset	www.esbnetworks.ie/docs/default-source/default-document-library/ecp-2-ruleset.pdf?sfvrsn=98f401f0_0
ESB Networks Website for New Generator Applicants	www.esbnetworks.ie/new-connections/generator-connections-group/renewable-and-embedded-generators
ECP-2.1 Category B and C Successful Applicant List	www.esbnetworks.ie/docs/default-source/publications/ecp-2.1-category-b-_-c-batch-results-(2020).pdf?Status=Master&sfvrsn=a104a17b_14/%0AECP-2.1-Category-B-_-C-Batch-Results-(2020)
Connected and Contracted Generation at each Substation in Ireland	www.esbnetworks.ie/new-connections/generator-connections-group/generator-statistics
ESB Networks Technical Substation Information	www.esbnetworks.ie/docs/default-source/publications/38kv-110kv-station-special-load-readings.pdf?sfvrsn=7b7672ef_13
ESB Network Capacity Map	www.esbnetworks.ie/network-capacity-map
ESB Networks Connection Policy	www.esbnetworks.ie/docs/default-source/publications/distribution-system-security-and-planning-standards.pdf?sfvrsn=beedd2e5_23
ESB Networks Distribution Code	www.esbnetworks.ie/docs/default-source/publications/distribution-code-version-7.0.pdf?sfvrsn=6ac3c597_10
NC5A Application Form	www.esbnetworks.ie/docs/default-source/publications/new-generator-connection-application-(nc5a).pdf?sfvrsn=eb0a4bc6_6
ESB Networks Contact	DSOgenerators (ESB Networks), dsogenerators@esb.ie
ESB Networks Standard Connection Costs	www.cru.ie/wp-content/uploads/2021/04/CRU21035a-ESB-Networks-Standard-Prices-for-Generator-Connections-2021.pdf

Resource	Link
Modification Application	www.esbnetworks.ie/docs/default-source/publications/supplemental-application-for-modifications-to-generation-connection-offers.pdf?sfvrsn=68b2a835_13
Modification Application Fees	www.esbnetworks.ie/help-centre/help-faq/renewable-step-by-step-guide/modification-fees
Proposed Containerised Substation Solution	www.esbnetworks.ie/docs/default-source/publications/mv-customer-connection-mv-egip-standard-module-substation.pdf?sfvrsn=1c89bf7a_16
CRU Licenses to Construct and Generate	www.cru.ie/professional/licensing/atc-gl-licensing-2
CRU Licenses to Construct and Generate Fees	www.cru.ie/professional/licensing/atc-gl-licensing-2/#application-fees
EirGrid Generator Testing Documents	www.eirgridgroup.com/customer-and-industry/general-customer-information/grid-code-compliance-test/compliance-testing/power-park-modules
Conditions Governing Connection to the Distribution System at Medium Voltage-Including G10 Testing Requirements	www.esbnetworks.ie/docs/default-source/publications/conditions-governing-connection-to-the-distribution-system.pdf?sfvrsn=1073c50d_14
ESB Networks Operation and Maintenance Charges	www.esbnetworks.ie/docs/default-source/publications/schedule-of-operation-and-maintenance-charges.pdf?sfvrsn=49814bfd_15
Distribution Loss Adjustment Factors	www.esbnetworks.ie/docs/default-source/publications/distribution-loss-adjustment-factors.pdf?sfvrsn=8be556a8_12
EirGrid ECP-1 Constraint Reports	www.eirgridgroup.com/customer-and-industry/general-customer-information/constraint-reports-solar
Climate Action Plan	www.gov.ie/en/publication/6223e-climate-action-plan-2021
Smart Meters	www.esbnetworks.ie/existing-connection/meters-readings/smart-meter-upgrade
Smart Networks	www.esb.ie/tns/brighter-future/smart-networks
DS3 Programme	www.eirgridgroup.com/how-the-grid-works/ds3-programme
Grid Coordinate Finder	https://gnss.osi.ie/new-converter

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