SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Community Energy Resource Toolkit

The Irish Electricity System: A Community Generation Guide

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SEAI Community Energy Resource Toolkit

June 2023

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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.

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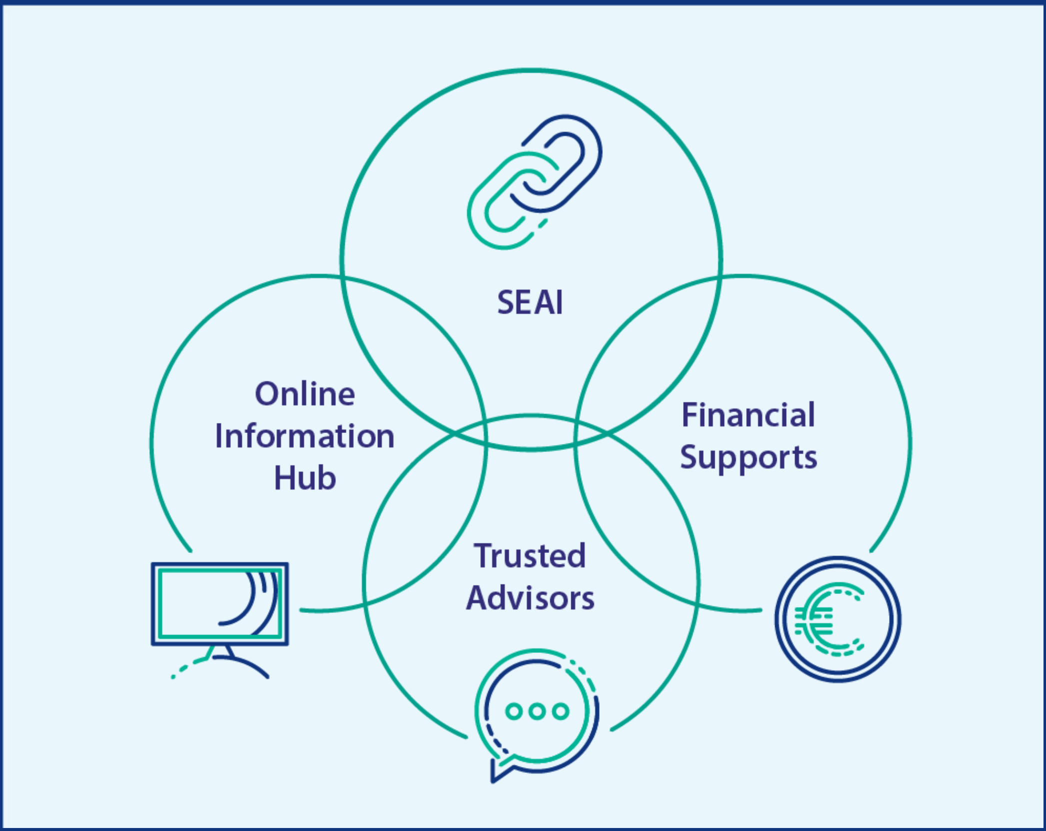
Introduction

→ The Sustainable Energy Authority of Ireland (SEAI) is developing an online information warehouse to provide step-by-step support and useful resources for communities that are interested in learning more about developing their own renewable energy generation projects.

A key part of these resources is a Community Energy Resource Toolkit, which will provide a suite of practical guidance modules across different areas (including technology options, business planning, project development stages, setting up an organisation/governance) to support project development and delivery.

This Toolkit provides accessible information about the electrical network and electricity market for any stakeholder considering a community renewable electricity generation project.

Figure 1: SEAI Community Enabling Framework



Background to community renewable electricity generation

In 2018, the Irish Government approved the high-level design of the Renewable Electricity Support Scheme (RESS)[1] including its ambitious community provisions. The design was based on public consultation, the ambition set out in Ireland's Energy White Paper[2] to support communities, and the emergence of energy communities as a key function of the recast Renewable Energy Directive within the EU Clean Energy Package. The Government decision noted that the scheme would deliver on a broad range of policy objectives, including "the provision of pathways and supports for communities to participate in renewable energy projects". While there have been other types of support schemes to speed up the deployment of renewables, none contained any specific community ownership pathways.

Under RESS, a new dedicated community category was established, with an allocation of 15-year fixed price guarantees exclusively for community-owned projects. This category was targeted towards smaller-scale projects of 0.5 MW to 5 MW in scale. In RESS 1, the first round of seven community-owned projects were successful at the auction stage and this increased to ten projects for RESS 2.

RESS was the first policy to directly support community-owned generation projects. It is recognised that the RESS auction format and strict timeline for delivery are not suited to all community projects and further policies are being developed to provide more flexible opportunities for communities.

One of the key provisions of government electricity support schemes is the Community Enabling Framework for communities. This provides end-to-end support to create a community energy sector in Ireland that can develop sustainably over time and one that will deliver meaningful impact on communities nationwide. The Department of Environment, Climate & Communications (DECC) assigned SEAI to be the implementation body for elements of this framework. These will provide a range of supports including (but are not limited to) advice, guidance, financial support and mentoring to Renewable Energy Communities (RECs), as well as support to maximise the local benefit from renewable energy projects through realising a stake in a commercial project, or maximising the community benefit.

As stated in the RESS terms and conditions, a REC means a legal entity:

(a) which, in accordance with applicable law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located (in the case of small and medium-sized enterprises (SMEs) or local authorities) or resident (in the case of natural persons) in the proximity of the RESS project that is owned and developed (or proposed to be owned and developed) by that legal entity;

(b) the shareholders or members of which are natural persons, SMEs, local authorities (including municipalities), not-for-profit organisations or local community organisations;

[1] www.gov.ie/en/publication/36d8d2-renewable-electricity-support-scheme/

[2] www.gov.ie/en/publication/550df-the-white-paper-irelands-transition-to-a-low-carbon-energy-future-2015-2030/

(c) for any shareholder or member (with the exception of 'Sustainable Energy Communities' as registered with SEAI), that shareholder or member's participation does not constitute their primary commercial or professional activity;

(d) the primary purpose of which is to provide environmental, economic, societal or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits;

(e) in respect of which, each shareholder or member is entitled to one vote, regardless of shareholding or membership interest; and

(f) which is, or which has at least one shareholder or member that is, registered as a 'Sustainable Energy Community' with SEAI.

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:

- Page back
- Page forward
- Jump to next chapter
- Jump to contents page
- Enter full screen mode

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Overview of the Irish Grid

The island of Ireland essentially acts as a single network, which is electrically separated from mainland Great Britain. The all-island aspect adds to the complexity, with a change in jurisdiction, currency and legislature for the different market stakeholders north and south of the border between Northern Ireland (NI) and the Republic of Ireland (ROI). While much of the information remains relevant regardless of location, the focus of this toolkit is ROI.

The electricity network transports electricity from generators to demand customers. The grid architecture was traditionally defined along centralised generation, transmission and distribution of power to customers. There were a few, mainly fossil-fuelled, power stations providing Ireland's electricity.

Ireland's electricity system is now transforming. The transition is towards a more decentralised system where, in some cases, customers can use, generate and store electricity. There is now a growing number of smaller renewable generators providing a substantial capacity of Ireland's renewable electricity. In 2020, renewable generators provided 43% of Ireland's electricity. The transformation will continue with Ireland aiming to have 80% of its electricity from renewables by 2030 and then move towards a zero-carbon energy system.

The Irish electricity network is split into two main components: the **Distribution network** and the **Transmission network**.

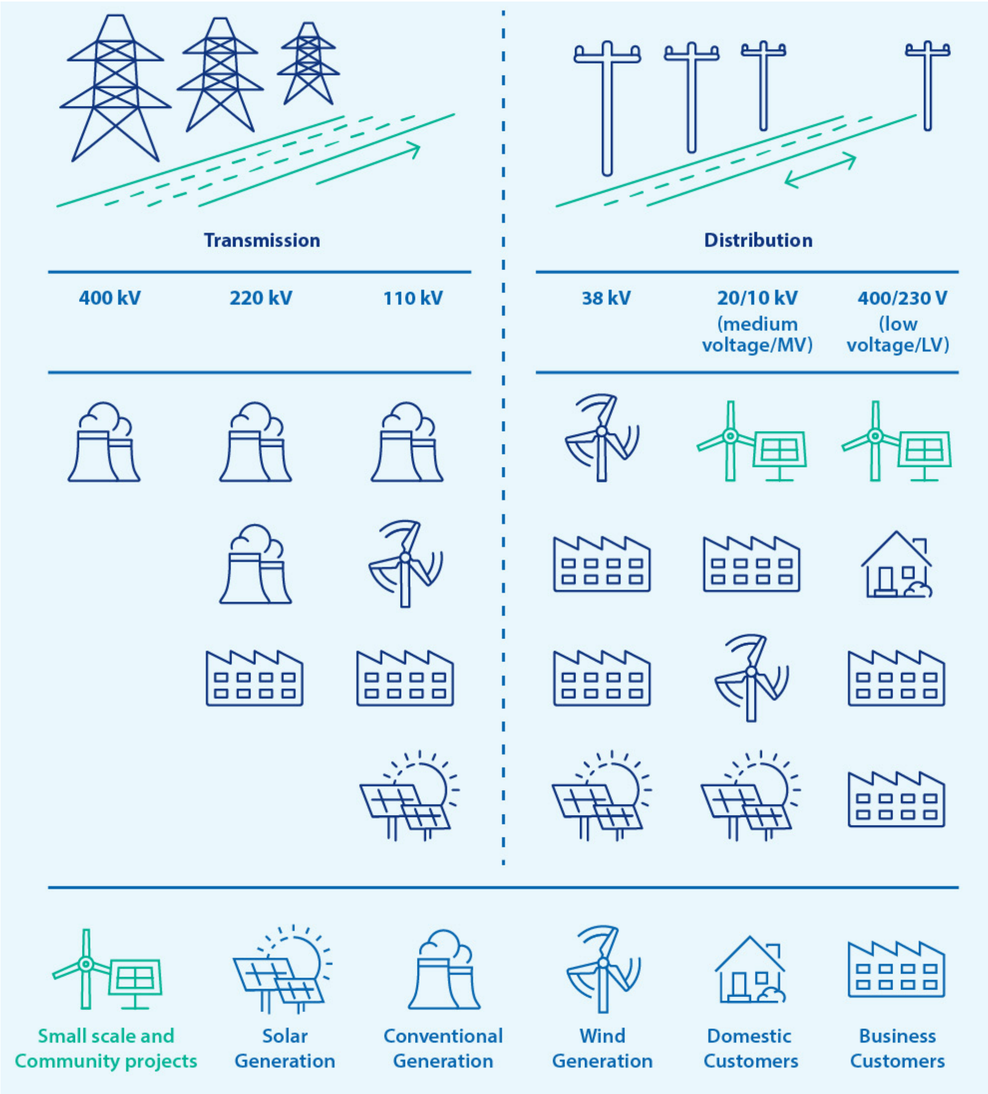
The transmission system transports large volumes of power over long distances to substations beside large demand centres. The transmission system operates at very high voltage levels. High voltage networks are required to minimise losses as the power travels over long distances. In Ireland, the transmission network operates at 400 kV (400,000 V), 220 kV and 110 kV. Large transformers located in substations change the electricity from one voltage level to another. The transmission network is developed and operated by EirGrid and owned and maintained by ESB Networks. A helpful analogy to visualise 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 (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 it 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 (38 kV), medium voltage (MV; 10 kV or 20 kV) and low voltage (LV) as well as the 110 kV network in Dublin. Generally, community-scale projects will be connecting at MV levels, which are typically 5 MW or less.

To support the transition to a zero-carbon system, the transmission and distribution systems will have to become a fully smart network , and cater for a system with lots of smaller generators at customer premises, while maintaining a stable and secure network. In the last decade, the transmission system undertook a radical transformation through the EirGrid DS3 (Delivering a Secure, Sustainable System) programme)[3] to allow it to operate with an average of 40% renewable electricity and a peak of 75% at times. ESB Networks have now started a similar radical programme of transforming the distribution network. This programme is called National Network, Local Connections.[4]

3 www.eirgridgroup.com/how-the-grid-works/ds3-programme/
4 www.esbnetworks.ie/who-we-are/national-network-local-connections-programme/national-network-local-connections-programme

Figure 2: The Transmission and Distribution Network



Constraints, curtailment and oversupply

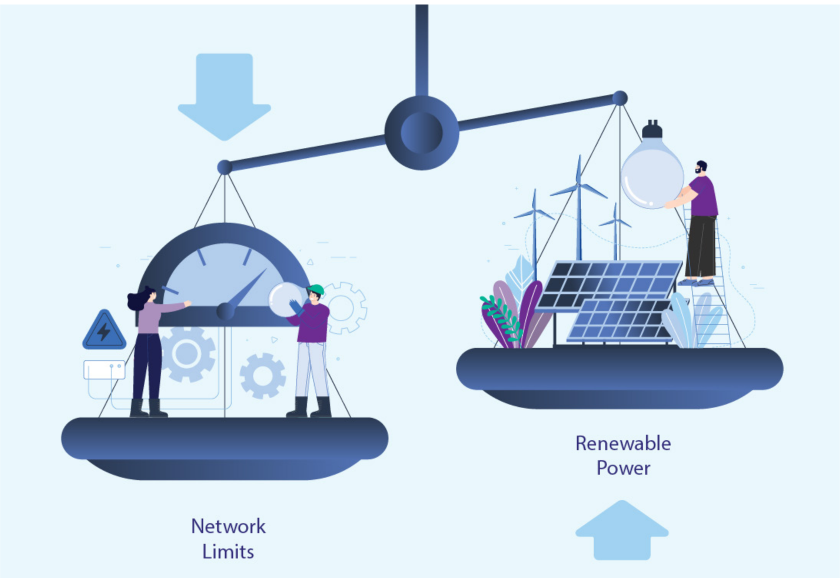
All generators, including community projects greater than 1 MW maximum export capacity (MEC) , are controllable by ESB Networks and EirGrid. This means that EirGrid can send a control signal to the generator and command it to reduce its output. EirGrid will reduce the output of renewable generators to ensure the electricity system is operating safely and securely.

There are generally three reasons that EirGrid will reduce the output of renewable generators – local network constraints, system-wide curtailment and oversupply – collectively known as dispatch down.

Local network constraints

Network constraints occur when the local transmission network cannot take the full output of the renewable generation in that area. As shown in Figure 2 , the transmission operator has to balance the competing needs of more renewable generators with the limitations of the network. Often lines are limited in their capacity and EirGrid is 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 necessary network reinforcements on the transmission system and this is referred to as a constraint. 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.

Figure 3: Balancing network limits with increasing renewable generation



In 2021, the average level of network constraints was 4.8% of a wind generator's output.[5] Depending on location, the constraints levels varied from 0% (in the North East) to 7.2% (in the West).

System-wide curtailment and oversupply

System curtailment and oversupply occurs during high renewable output when there is more renewable electricity on the system than can be safely managed. The location of the renewable generator on the system does not matter. Oversupply refers to when renewable generation is greater than demand. System curtailment is when renewable generation is above the limits that can safely and securely operate on the system.

EirGrid is developing the electricity system so it can safely manage very high levels of renewable generation. There are also existing and proposed interconnectors with other countries that allow for export at times of high renewable energy in Ireland. In 2021, the average system curtailment and oversupply was 3.2% of the renewable generators' output.

Note that consideration is being given under RESS 3 to compensate generators for unrealised available energy, which would include compensation for oversupply and curtailment.[6]

Dispatch down levels

To date, dispatch down levels for wind generation have been higher than for solar generation. This is due to the high capacity of existing wind generation connected on the system. As the capacity of solar generation increases on the system, its level of dispatch down will increase to levels closer to wind generation. Based on 2021 levels, the average dispatch down was 8% of a generator's output. However, this is forecast to increase.

EirGrid estimates the levels of dispatch down that renewable generators may experience and publish these levels in reports and issue them to new generators. The reports are available on EirGrid's website.[7]

5 www.eirgridgroup.com/site-files/library/EirGrid/Annual-Renewable-Constraint-and-Curtailment-Report-2021-V1.0.pdf
6 www.gov.ie/en/consultation/8c644-consultation-on-the-third-onshore-renewable-electricity-support-scheme-ress-3-auction-design-and-implementation/
7 www.eirgridgroup.com/customer-and-industry/general-customer-information/constraint-reports-solar/

There are reports for each region of the transmission system so proposed generators can check the expected levels of dispatch down in their area.

The EU's 2019 Clean Energy Package includes rules and regulations of how to allocate dispatch down to renewable generators, and if, and how, they should be compensated. Renewable generators connected before June 2019 will maintain their priority dispatch status from previous EU directives. This type of policy is often referred to as 'Grandfathering' where an existing rule is maintained for existing participants. Renewable generators connecting after June 2019 will have non-priority dispatch status. The Regulator and EirGrid are still determining how to implement the Clean Energy Package rules for dispatch down in Ireland. There is a risk that new renewable generators with non-priority dispatch status will have higher dispatch down, particularly for oversupply and network constraints, than older renewable generators which would keep priority dispatch status.

SEAI recommends community projects review EirGrid's dispatch down reports and discuss with their grid advisors the potential level of dispatch down at their sites.

Policymakers are aware of dispatch down levels and their potential impact on generator revenue. If necessary, they can support the adjustment of market rules or alternative initiatives to help mitigate the negative impact on wind and solar generator output.

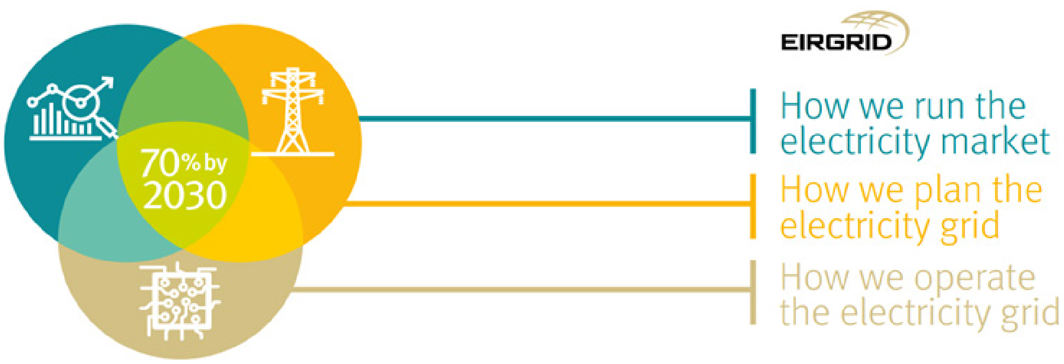
As noted above, consideration is being given under RESS 3 to compensate generators for unrealised available energy, which would include compensation for oversupply and curtailment, thus reducing the dispatch down risk significantly.

Future of the Irish Grid

Ireland is preparing the Irish electricity grid to achieve the 80% renewable electricity target by 2030. To support the achievement of this target, there are multiple grid-related actions set out in the Government's 2021 Climate Action Plan.[8] The ongoing development of policy, processes and infrastructure to support the development of renewable generation should be strongly supported by community energy projects and their representative groups. New connection policies in the Climate Action Plan include innovations like private wire networks and hybrid connections. These policies will provide more options for how community projects can be connected efficiently onto the electricity system.

EirGrid's strategy roadmap is called 'Shaping our Electricity Future' (SOEF).[9] This sets out the development plans for the transmission network and system to enable Ireland to achieve its 2030 renewable electricity target. These plans will be critical to helping reduce the need to dispatch down renewable generation. The roadmap is being updated to consider the Government's decision in 2021 to increase the 2030 renewable electricity target from 70% to 80%.

Figure 3: Eirgrid consultation on 'Shaping Our Electricity Future' to meet 70% by 2030 target

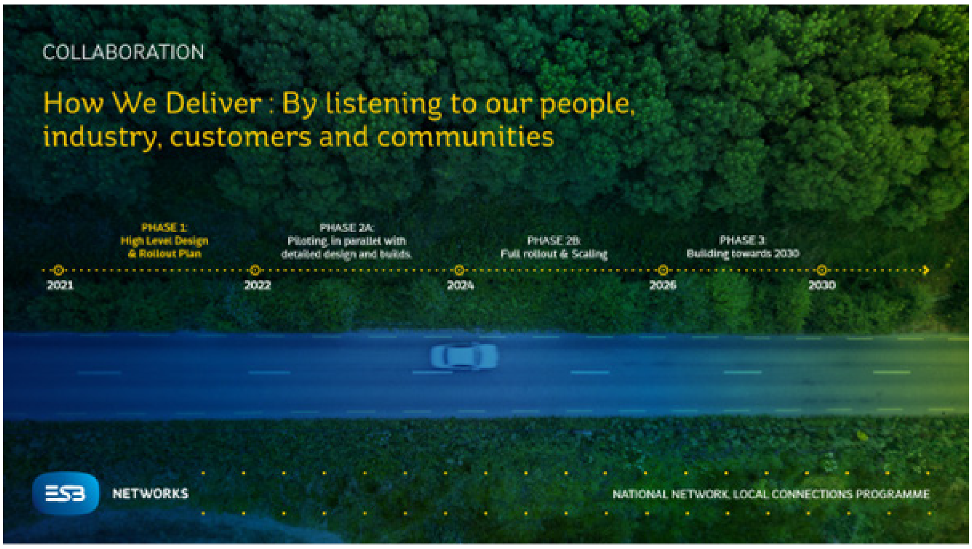


8 www.gov.ie/en/publication/6223e-climate-action-plan-2021/
9 www.eirgridgroup.com/the-grid/shaping-our-electricity-f/

The 2021 EirGrid strategy roadmap document had a strong focus on meeting the 2030 targets primarily with offshore wind generation. To support the development of onshore renewable generation, including community projects, further development of transmission infrastructure in areas with potential for onshore renewable generation will be required. Community generation stakeholders should engage with EirGrid and other relevant government stakeholders to keep abreast of opportunities and to provide input and respond to public consultations on new policy ideas that are in the best interests of community-owned renewables.

ESB Networks also have a programme intended to transform the distribution system to support Ireland's Climate Action Plan. This programme is called 'National Network, Local Connections'.[10] The aim of the multi-year programme is to transform management of energy on Ireland's electricity distribution network. This should help the distribution network accommodate significantly increased renewables generation and meet the rising demand driven by the electrification of heat and transport. The programme has multiple phases as set out in Figure 4. During this period, there will be the opportunity for community projects to take part in pilots that could provide opportunities for cheaper and/or quicker grid connections. In the later stages of the programme, ESB Networks envisage the new approach to managing the distribution system will enable a more flexible approach to the connection of renewable generation.

Figure 4: ESB Networks' National Network, Local Connections Programme



The current EirGrid and ESB Networks strategies and plans mainly focus on supporting the development of 2030 renewable targets. There will also be the need to consider what developments are required on the transmission and distribution systems for the net zero emissions energy system. In the Climate Action Plan, the Government has committed to developing a roadmap for the electricity sector for net zero carbon. This is to be published by Q2 2024. To support the development of this roadmap, EirGrid will lead on analysing pathways to develop the electricity system for net zero emissions, supported by ESB Networks and the Commission for Regulation of Utilities (CRU) .

[10] www.esbnetworks.ie/who-we-are/national-network-local-connections-programme/national-network-local-connections-programme

Electricity market

This section summarises the key stakeholders in the electricity market, with separate sections for the public stakeholders, the groups responsible for market oversight, and the market participants themselves who generate, supply, trade or otherwise actively participate in the market.

→ Main public stakeholders

The governance, management and participation in the Irish electricity market involves a complex array of stakeholders.

The all-island aspect adds to the complexity, with a change in jurisdiction, currency and legislature for the different market stakeholders north and south of the border between NI and ROI.

Table 1 lists the primary public sector stakeholders, their role, and links to further information.

Table 1: Primary public stakeholders

Stakeholder	Role
An Roinn Comhshaoil, Aeráide agus Cumarsáide Department of the Environment, Climate and Communications	**Ministerial Government Department responsible for Energy Policy** www.gov.ie
EIRGRID	**Transmission System Operator (TSO) for ROI** • Manage, develop and operate the transmission grid • Forecast when and where electricity is needed – hour-to-hour, day-to-day, and year-to-year • Plan and manage new network development • Connect large generators and some large energy users to the grid • Regulated by the CRU www.eirgridgroup.com
SONI	**System Operator Northern Ireland** • TSO for NI • Part of EirGrid Group since 2009 • Regulated by the Utility Regulator in NI www.soni.ltd.uk
ESB Networks	**Distribution System Operator (DSO) for ROI** • Manage, develop and operate the 38 kV, medium and low voltage electricity infrastructure, including distribution stations, overhead lines, poles and underground cables • Connect new customers and generators to the grid • Also, Transmission Asset Owner (TAO) – maintains the transmission network and builds new transmission assets • Regulated by the CRU www.esbnetworks.ie

Stakeholder	Role
Northern Ireland Electricity Networks	**Distribution System Operator (DSO) for NI** • Manages, develops and operates the 33 kV, medium and low voltage electricity infrastructure • Connect new customers and generators to the grid. • Acquired by ESB in December 2010, operates as an independent organisation with its own board and management teams. • Also, Transmission Asset Owner (TAO) – maintains the transmission network and builds new transmission assets • Regulated by the Utility Regulator for NI www.nienetworks.co.uk
CRU	**Commission for Regulation of Utilities (CRU)** • Ireland's independent energy and water regulator • Aim is to protect the interests of energy customers, maintain security of supply, and to promote competition covering the generation and supply of electricity • Regulates the Public Service Obligation levy, which is a key funding instrument for policy initiatives to support decarbonisation of electricity generation • Joint responsibility for Single Electricity Market (SEM) with Utility Regulator in NI www.cru.ie
Utility Regulator ELECTRICITY GAS WATER	**Utility Regulator** • Regulating the electricity, gas, water and sewerage industries in NI • Joint responsibility for SEM with CRU www.uregni.gov.uk
SEM	**Single Electricity Market (SEM)** • Wholesale dual-currency electricity market for island of Ireland • Mandatory participation for generators (greater than 10 MW), suppliers and interconnectors • Projects less than 10 MW may opt to participate indirectly, such as via an electricity supplier • Also referred to as Integrated Single Electricity Market (I-SEM) • Governed by SEM Committee www.semcommittee.com/sem
SEM committee	**SEM Committee** • The decision-making authority for the SEM on the island of Ireland • Majority committee members from CRU and Utility Regulator NI www.semcommittee.com
semo	**Single Electricity Market Operator (SEMO)** • Role is to operate the Capacity Market and the balancing and settlement function of the SEM (see section 4) • A joint venture between EirGrid plc and SONI Limited www.sem-o.com
semopx	**SEMOpx** • Nominated platform for day-ahead and intraday electricity market trading • Source of current and historic SEM market price data www.semopx.com

Policy and regulatory oversight

There is an all-island electricity market covering both ROI and NI jurisdictions. The Single Electricity Market (SEM), governed by the SEM Committee, comprises both CRU (Ireland regulator) and Utility Regulator (NI) representatives and independent members. The SEM incorporates the pool for wholesale trading between participating generators and suppliers.

Any variations in market design or parameters are considered, often with public consultation periods and decided upon by the SEM Committee.

The primary document that governs SEM is the SEM Trading and Settlement Code.[11] It provides the rules by which the market and its participants may operate, setting out the detailed rules and procedures concerning the sale and purchase of wholesale electricity in the market.

The CRU was established in 1999 as an independent body and has a legislative remit to protect consumer interests.[12] The CRU protects the short and long-run interests of the public by ensuring:

- Energy is supplied safely.
- Empowered and protected customers pay reasonable prices.
- There is a sustainable, reliable and efficient future for energy safety.
- There is a secure, low carbon future.

The CRU is accountable to the Minister for Environment, Climate and Communications. The CRU role and mandate are periodically updated to reflect government policy or after transposing and implementing European legislation.

The Utility Regulator NI has a similar role in Northern Ireland and is jointly responsible with the CRU for regulating SEM.

Market participants

Table 2 describes the most important market participants. There is further detailed information and training for those interested in exploring the topic further at the SEMO website.[13]

Table 2: Main participants in SEM

Type of market participant	Description
Generator	Generators supply electricity to the grid using both fossil fuel and/or renewable resources. They are licensed by the CRU and register with SEMO for market participation.
Dispatchable generator	A type of generator with continuous availability that can be controlled by the network operator, e.g. a gas power plant which can be run continuously if needed.
Variable generator	A type of generator with fluctuating output due to weather that cannot be continuously relied upon by the network operator, e.g. wind or solar generation which are obviously highly weather dependent.
Supplier	Suppliers buy 'wholesale' electricity in SEM from generators for onward sale to customers. Suppliers are licensed by the CRU and register with SEMO for market participation. Suppliers will typically enter into a Power Purchase Agreement (PPA) with an independent generator to manage their position in the electricity market and manage any agreed long-term offtake (such as RESS support or a corporate agreement). This would include, for example, most community-owned generators.

11 www.semcommittee.com/trading-and-settlement-code
12 www.cru.ie/home/about-cru/corporate-information/
13 www.sem-o.com/training/

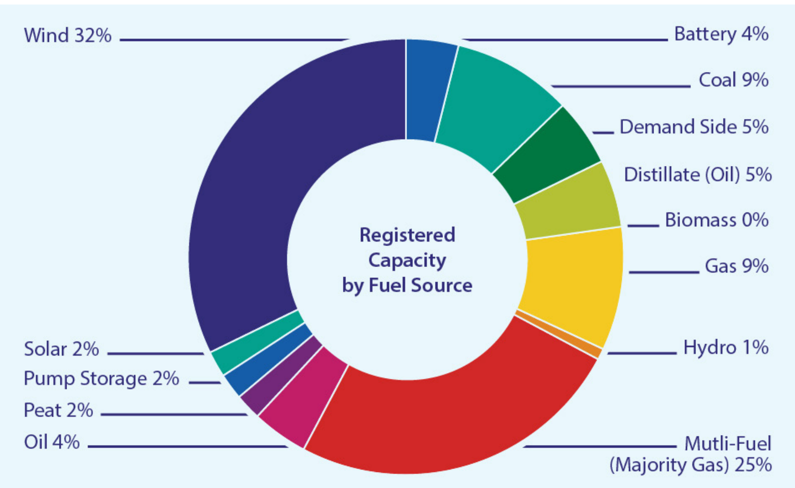
Type of market participant	Description
Customer	Customers do not generally participate in the SEM, but purchase electricity from a registered supplier through a meter, so have no direct market role.
Interconnector	The wires that connect ROI and NI with other electricity markets participate in the capacity market and settlement of the Balancing Market (BM). Power can flow in either direction, which often has a significant impact on both market pricing and security of supply.
Energy storage	Both long- and short-term energy storage units, such as batteries or pumped hydro, have a significant market role. They can purchase and sell energy at different times of the day, taking advantage of price difference (known as arbitrage) as well as providing capacity and other non-energy system support.
Assetless trader	Take financial positions in the markets but do not have physical assets. For example, several traders use the interconnector between Ireland and the UK to trade on price differences between jurisdictions.
Capacity Market Unit (CMU)	Larger dispatchable generators (>10 MW) that are generally obligated to participate in the capacity market. The majority of fossil fuel generators and some renewable generators are registered CMUs and participate in the Capacity Market. Also, most energy storage units and demand side units are CMUs. CMUs receive an annual payment for being available to supply the network during periods of power scarcity.
Demand Side Unit (DSU)	A type of capacity market unit that is typically a large electricity user which agrees to reduce electricity demand during peak periods. From a network perspective, a reduction in demand is equivalent to extra generation ('Capacity') coming online when it is required. DSUs receive an annual payment for giving the network control over an agreed reduction in demand at their site. For example, electricity customers with large refrigeration units often agree to be DSUs as they have a good degree of flexibility about when to turn on their coolers.

Profile of generators in SEM

The following information summarises the diverse range and type of generators registered in the market. This naturally changes over time when introducing new projects and technologies, and the exit from the market of older or obsolete generators.

There are 326 market units registered in the all-island capacity market (SEMO Registered Capacity Report August 2022).[14] There are 15,468 MW of all-island registered capacity (12,041 MW in ROI), their breakdown by fuel source is shown in Figure 5.

Figure 5: Registered capacity by fuel source (SEMO August 2022)



[14] www.sem-o.com/publications/general-publications/

Market trading

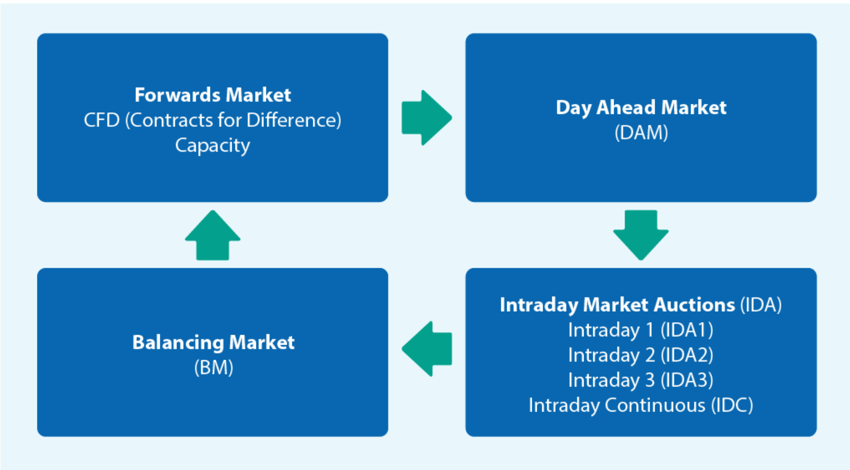
→ Community-owned generators, like any other type of generator, must participate in the trading of electricity into the market, and will need to understand how. Most small and/or community-owned generators will use the services of a registered supplier in the market to carry out the trading on their behalf and represent them in the market. Nonetheless it is important to understand the way a generator will receive revenue and, if entering into a Power Purchase Agreement (PPA) with a supplier, to understand and receive professional advice on this key contract. Section 5 describes how generators sell electricity in practice.

The SEM is the wholesale electricity market for the island of Ireland where electricity is traded in large quantities by the generators that sell the power and the suppliers that purchase it, as well as traders and other market participants. It covers the Day-Ahead Market (DAM), Intraday Markets (IDM) and the Balancing Market (BM).

There are numerous training modules on the SEMO website for current or potential market participants: www.sem-o.com/training/ .

The SEM comprises separate electricity trading arrangements in different timeframes, as illustrated in Figure 6.

Figure 6: SEM energy market timeframes



Trading in the forwards market is financial only and does not entail physical delivery of power. It does, however, provide market participants with the opportunity to lock in future prices and protect against price risk or volatility through forward contracts. The financial instrument is a Contract for Difference (CFD), typically a contract between two market participants agreeing an off-market settlement between the forward market and the realised DAM price. Corporate PPAs between a generator and a large electricity user are a good example of this type of off-market CFD agreement (see section below).

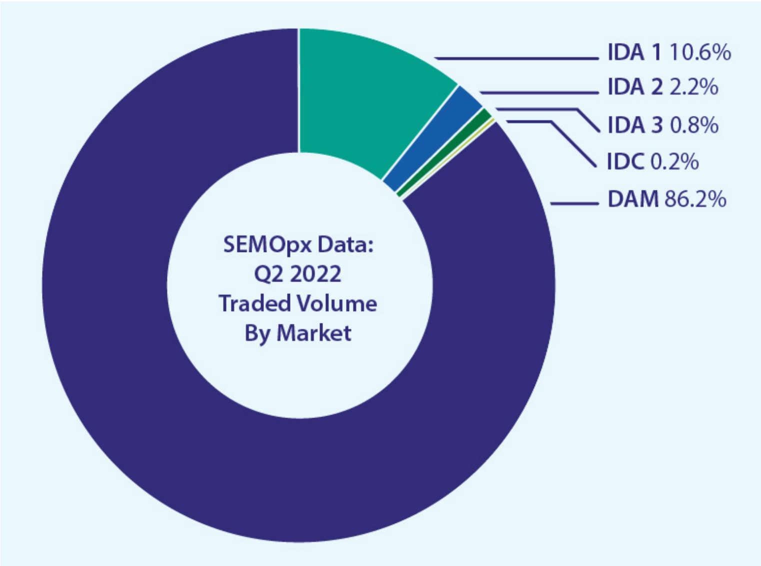
Capacity contracts (see further below on the capacity market) are also a forward market operated by SEM based on the projected system needs in several years' time.

Day-Ahead Market

Participation in the DAM is not mandatory. While parties can choose to wait until closer to the time of actual electricity delivery to customers, the majority do participate in the DAM.

The vast majority of generation is traded under the DAM. This is the preference of generators who wish to secure revenue ahead of time and minimise exposure to intraday fluctuations and imbalances between supply and demand.

Figure 7: SEMOpx data – Q2 2022 traded volume by market



The DAM is a daily auction at 11:00 each calendar day.[15] In this auction, Exchange Members may trade electricity in 24 one-hour trading periods for the timeframe, starting at 23:00 that evening and finishing at 23:00 the following day. This auction timeframe is commonly referred to as a 'trading day'.

The Order Book for a Day-Ahead Market auction opens at 23:00, 19 days before the auction and closes at 11:00 on the day the auction takes place.

Intraday Market

Following the DAM, the Intraday Auctions (IDA)[16] enable participants to adjust their market trading position closer to real time and for decreasing auction durations.

A generator may have additional information about their own anticipated production, or additional information about the market need which allows them to adjust their offered volume and pricing within the IDM accordingly. This can be either with a view to reducing risk or maximising revenue opportunities. There are four different windows either just ahead of (from 17.30) or within the trading day to adjust the IDM position. Within the IDA, the trading unit duration is 0.5 hours (vs 1 hour in the DAM). Additional information is available within the SEMO training materials.[17] The market position can also be adjusted after the market period ends by the System Operator through the BM, which is further explained below.

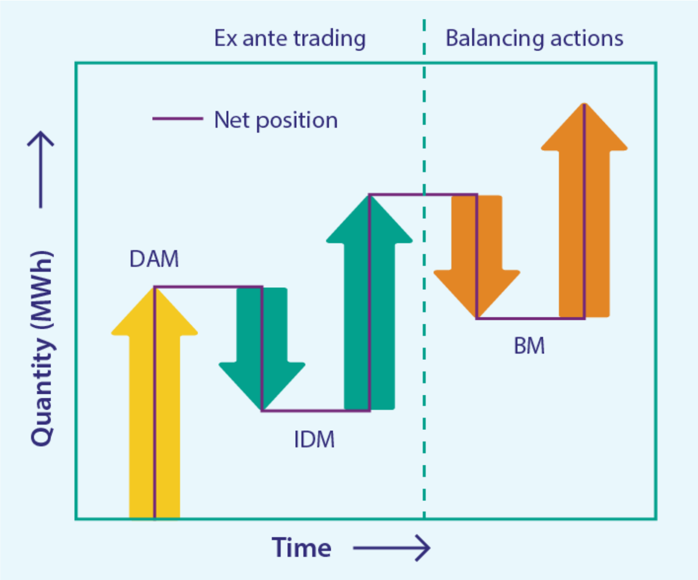
Balancing Market

The BM is the closest thing to 'real time' delivery of electricity in the market. Generators and suppliers offer energy balancing services into the BM. The Transmission System Operator (TSO) then determines the use of these services. For example, they might instruct a generator to increase its output to meet demand where a generator is flexible to respond to this. The generator will be paid through the BM for the extra energy used to balance the grid.

15 www.semopx.com/markets/day-ahead-market/
16 www.semopx.com/markets/intraday-market/
17 www.sem-o.com/training/

A participant's net energy position is the accumulated volume of its trades in the ex-ante markets (i.e. DAM and IDM) and any balancing actions. As shown in Figure 8, this can either increase or decrease the volume of energy (megawatt-hour or MWh) and price exposure that a generator has over time leading up to (i.e. the ex-ante) point of delivery and in 'real time' or afterwards (i.e. balancing actions).

Figure 8: Net energy position after balancing actions (SEMO training)



As an example, a generator could offer all of their projected output in the DAM at a price of their choosing. They may then adjust this position up or down in the IDM from 17.30 onwards in the first Intraday Auction (IDA1), which actually refers to the period beginning at 23:00 later that evening. This adjustment could be for a wide variety of reasons; for example, in response to a changed weather forecast or a generator outage or some new piece of information about their own generator or the overall market context.

SEMO may well issue an alert if they are aware of issues that will affect the supply/demand context, as a recent example below shows:

Dear Market Participant

Based on forecast system conditions and the latest information available to the TSOs, there will be tight generation capacity margins in the SEM on Tuesday 22 November 2022. The TSOs forecast a dependence on imports from Great Britain into SEM via the EWIC and Moyle Interconnectors from mid-afternoon and through the evening peak.

Please be aware that the TSOs may be required to take measures at high prices which may impact on the Balancing Market prices.

Kind regards, SEMO Team

As seen above, where the normal auction outcome differs materially from what is offered, the TSO adjusts the price after the fact, through balancing actions in the BM. This may result in a positive or negative outcome, but it is out of the control of the individual generators.

Participation in SEM and exposure to auction price risk is mandatory for generators with an export capacity above the minimum threshold. It is voluntary for dispatchable generators below that threshold, i.e. below 10 MW. However, an intermediary (i.e. a PPA provider) will generally be responsible for BM participation below the threshold and will ensure contractual arrangements reflect their balance responsibility.

The BM operates in 5-minute pricing periods, settled in blocks of six 5-minutes to match the 30-minute trading period of the DAM and IDM.

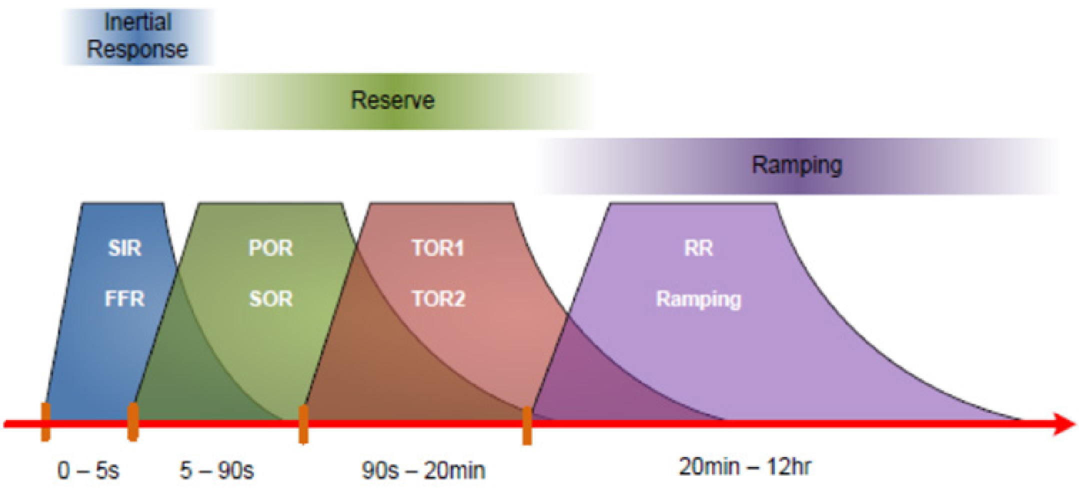
Wind or solar generators rarely provide energy balancing services. It is more likely to come from flexible generators such as gas peaker plants, batteries or other gas or coal power plants that are not at full load and can increase or reduce their output more easily.

Non-energy balancing services

The TSO can also call on non-energy balancing services. These might include voltage regulation or energy reserves. For example, there are several energy reserve products which are based around the ability to respond quickly to any sudden loss of power, frequency or voltage on the system. The range of products range from a response within seconds to several hours. These are referred to as 'system services' and are a critical part of the electrical network integrity. Figure 9 provides a graphical representation of a range of system services. Batteries can typically supply some of the fast-response services, while longer duration or inertia-based services typically come from gas-fired power plants or other suitable units, but generally not variable wind or solar generators. Further information about these electrical system services is available from the EirGrid website.[18]

Some wind or solar generators can achieve a small additional revenue from short duration System Service products. This is not typically relevant to generators below 10 MW.

Figure 9: Range of short and long-response System Service products (Eirgrid DS3 programme)



Negative pricing

One risk associated with market exposure for generators is that occasionally the electricity price is negative (i.e. the generator owes SEM money). This is generally an important market signal to discourage oversupply when many generators are producing and the electricity is not required. However, for variable renewable generators which are price-takers (i.e. cannot choose when they generate), this creates short production periods where there is no revenue, or even a liability. This risk should be considered within business planning. Consideration is being given under RESS 3 to compensate generators for oversupply, including periods where the DAM price is negative. This is referred to as Unrealised Available Energy Compensation (UAEC). See RESS 3 terms and conditions for details.[19]

18 www.eirgridgroup.com/how-the-grid-works/ds3-programme/
19 www.gov.ie/en/consultation/8c644-consultation-on-the-third-onshore-renewable-electricity-support-scheme-ress-3-auction-design-and-implementation/

Capacity market

The capacity market is a vital component of SEM. In order to ensure continuity of electricity supply throughout the year, the TSO will regularly forecast minimum levels of generation.

For security of supply, the TSO places a particular emphasis on dispatchable generators, which can be made available on an as-needs basis to respond directly to the electricity consumption of demand customers. The typical dispatchable generator is a gas-fired power plant which can be turned on or off and ramped up and down to respond to fluctuations on the power network due to the 24/7 availability of natural gas.

All dispatchable generators must register in the capacity market and participate in regular capacity auctions. These are typically run on a 4-year horizon (T-4) and a 1-year horizon (T-1). Under T-4 auctions, the capacity provider must start providing capacity 4 years after the auction process has run. This is to allow time to build out new generators and associated infrastructure during this 4-year period.

Capacity providers receive a fixed annual payment for providing reliability to the system. Participants typically include gas, coal and oil fired power plants, demand side units, energy storage systems and a few renewable generators.

The capacity market is not especially relevant for new variable renewable energy generators such as wind and solar. These generators are intermittent and not given a high rating for security of supply purposes. Their participation in the capacity market is not mandatory. Some wind farms that are not participating in government support contracts (such as RESS or its predecessor REFIT) can and do take part in the capacity market for additional revenue. For example, 'merchant' wind farms that no longer receive government support or renewable generators that enter into a corporate PPA instead of RESS are then eligible for support via the capacity market. Capacity payments, like RESS or REFIT, are a form of State aid with price guarantees so a generator cannot receive both types of guarantee.

How generators sell electricity

Market pricing and settlement

Most smaller-scale generators, such as community generators, will not register directly as a generator or supplier in the market, but will give this important role to a registered supplier who trades their power in the market and takes responsibility for settlement of all trades. CRU maintains the list on their website of registered suppliers, currently 16.[20]

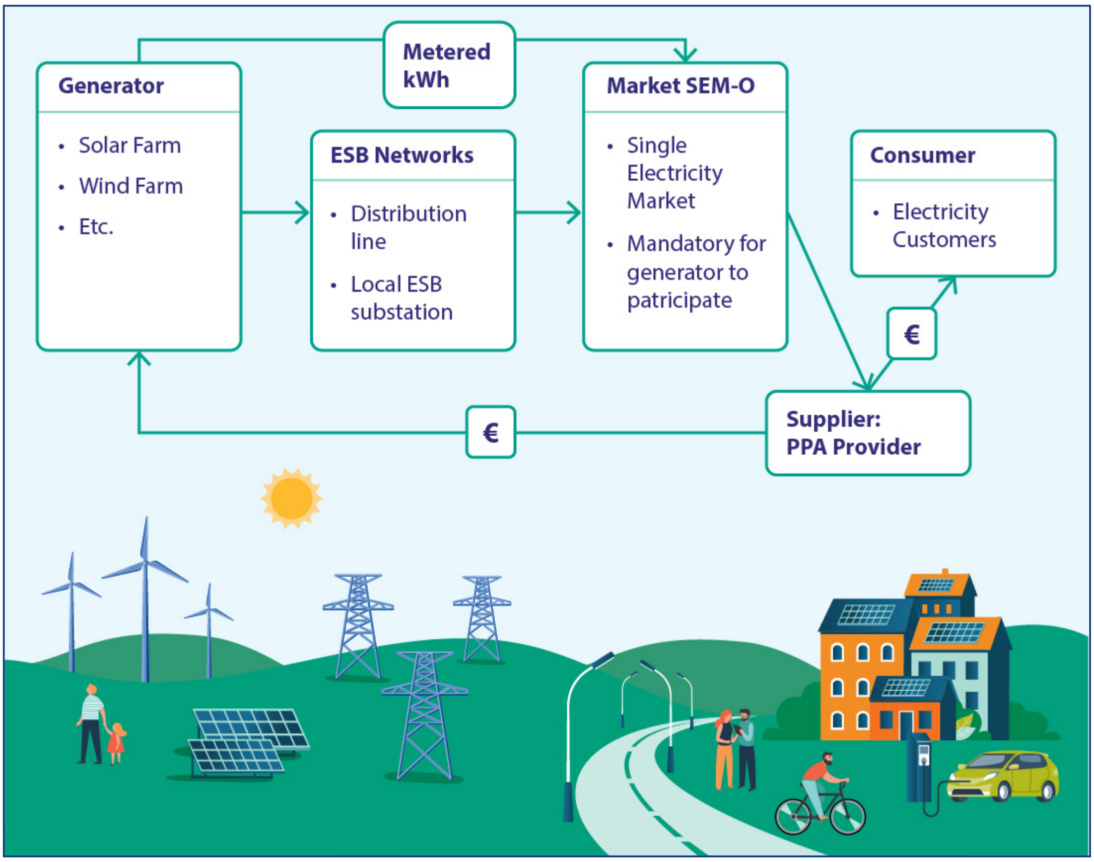
Larger suppliers will have a professional team available 24/7 to manage market participation, and will have a portfolio of generators and customer demand to manage.

The generator will enter into a Power Purchase Agreement (PPA) with the supplier. This contract should govern all commercial aspects of market participation and will also specify how both the supplier and the generator are paid. There are large collateral requirements to taking part in the market and a supplier is expected to have a healthy balance sheet to ensure collateral is in place throughout.

There are many variations of PPAs, and it is vital that independent professional legal and commercial advice is sought when negotiating a PPA for a community project.

Figure 10 shows the central role of the supplier as PPA provider. In this representative schematic of a distribution connected generator, the physical flow of power is shown from the generator via ESB Networks and ultimately to the consumer (transmission not shown). The PPA provider is the key interface that reconciles the electricity supplied to consumers with the metered output from the generator, and pays the generator for their power output.

Figure 10: Market participation concept



[20] www.cru.ie/home/customer-care/energy/communication/

RESS and Contracts for Difference

Background to RESS

The Renewable Electricity Support Scheme (RESS) is an auction-based scheme, which invites renewable electricity projects to bid for a 15-year contract. The contract guarantees successful applicants a fixed strike price for the electricity they generate for 15 years. The fixed strike price is the price bid into the RESS auction by the generator.

The scheme is open to a range of renewable technologies, including wind and solar. There are provisions to couple renewables and storage capability at project sites. A combination of generators and/or battery storage will require a hybrid grid connection, possibly with different legal entities involved in developing each component. The presence of more than one entity creates complexity for connecting projects and the system operators, and the CRU are working on solutions which should soon be put forward for public consultation. Further information is on the EirGrid website.[21] The full range of eligible technologies are in the specific terms and conditions of each RESS auction, published by the Department of Environment, Climate & Communications (DECC), as done most recently for RESS 2.[22] The RESS 3 auction is currently being prepared with the terms and conditions subject to an ongoing consultation, which considers a number of changes to the auction.[23]

The frequency of RESS auctions depends on the renewable electricity project supply pipeline, along with evolving market, locational and technological considerations.

The second of a minimum of five envisaged auctions, to occur between 2020 and 2025 to deliver on 2030 targets, took place in 2022. These auctions provide pathways to market for renewable developers including community projects. There are also dedicated auctions planned for offshore wind projects.

DECC published a schedule of future RESS auctions in December 2021, set out in Table 3.

Table 3: Indicative schedule of RESS auctions

Auction type	Indicative auction volume (GWh)	Indicative auction dates	Indicative auction commercial operation dates
Onshore RESS 2	1,000 – 3,500	Q2 2022	2024
Onshore RESS 1	7,500 – 10,000	Q4 2022	2027
Onshore RESS 3	2,000 – 5,500	Q2 2023	2025
Onshore RESS 2	15,000 – 25,000	2024 –2025	2029
Onshore RESS 4	1,000 – 5,000	2024	2026

RESS support mechanism

As outlined above, RESS offers fixed price support for 15 years. This is through a two-way floating feed-in premium (FIP) mechanism. Under this mechanism, a generator bids a fixed strike price in an auction which, if successful, they receive for 15 years. The generator enters into a Contract for Difference (CFD), which allocates the difference between the strike price and the market reference price (MRP). This is settled by a supplier, who sits between the generator and the market as the PPA provider to the RESS generator.

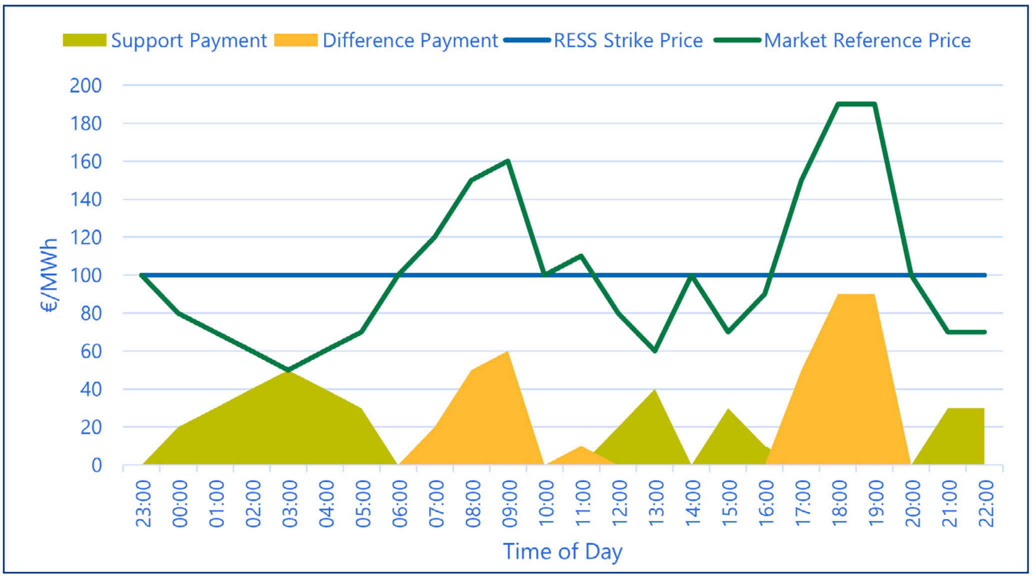
[21] www.eirgridgroup.com/site-files/library/EirGrid/FlexTech-Multiple-Legal-Entity-Response-to-Consultation.pdf
[22] www.gov.ie/en/publication/7f0bb-renewable-electricity-support-scheme-2-ress-2/
[23] www.gov.ie/en/consultation/8c644-consultation-on-the-third-onshore-renewable-electricity-support-scheme-ress-3-auction-design-and-implementation/

Any support required under RESS is funded from the Public Service Obligation (PSO) Levy on all electricity customers. A budget is forecast annually for supporting renewable energy under the PSO.

- If the MRP is below the strike price, payments flow from the PSO monies via the supplier to the generator. This is called a Support Payment.
- If the MRP is above the strike price, payments flow to the PSO monies via the supplier from the generator. This is called a Difference Payment.
- The MRP for variable generators (i.e. wind and solar generators) is the hourly Day-Ahead Market (DAM) under RESS auctions to date, though this may change in future auctions.

The two-way support mechanism is best illustrated by an example across a trading day, as shown in Figure 11.

Figure 11: Illustration of RESS two-way FIP across a trading day



In this hypothetical example, the strike price is €100/MWh. Between 23:00 and 06:00, demand for electricity is low and the MRP is typically below the strike price, sometimes as low as €0/MWh. The price could be negative when there is a lot of renewable energy being supplied into the network. In this example, the lowest MRP price is €50/MWh. During this and the other periods where the MRP goes below the strike price, the Market Operator will owe a Support Payment to the generator.

Similarly, between 16:00 and 20:00, the MRP is well above the strike price. In this example, the highest priced period is €190/MWh. During this and other periods where pricing exceeds the MRP, the generator will owe a Difference Payment to the Market Operator.

There is a monthly reconciliation between Difference Payments and Support Payments, the net result of which is the generator receives the strike price at all times. Any deficit or surplus goes back to the TSO and ultimately is reconciled against the PSO levy. Further detail is available in the RESS terms and conditions. The CRU budgets for the PSO levy annually, further details on the process are available on the CRU website.[24] For the coming year, the PSO is forecast to be negative (i.e. money refunded to electricity customers). The forecast for PSO Year 2022/23 is €491.25 million, representing a decrease of €754.95 million (-286.3%) from the 2021/22 PSO levy funding requirement of €263.7 million.
The negative PSO levy for this year arises from the design of the RESS support scheme. This means renewable generators return market revenues above a certain level to levy customers, and also from the return of overpayments from a previous period when wholesale prices and revenues increased above forecast levels.

24 https://www.cru.ie/about-us/news/cru-publishes-public-service-obligation-levy-for-202223/

Corporate Power Purchase Agreements

Due to current elevated electricity market prices, there is increasing interest in Corporate Power Purchase Agreements (CPPA) between renewable generators and industrial or commercial electricity customers, to fix electricity prices directly between a generator and a customer over the medium to long term . It is not dissimilar to RESS, except the fixed price is underwritten by a corporate customer rather than state-backed. See the examples for a typical CPPA arrangement below. Procurement of renewable power will also help meet the sustainability goals adopted by many businesses to reduce or offset their carbon footprint. For example, so far under the RE100[25] initiative, over 370 companies have made a commitment to go 100% renewable.

CPPAs are relatively common in other European countries, but not so common in Ireland to date. A few large-scale CPPAs, such as those publicly announced between Brookfield (now Orsted) and Facebook (now Meta), have been agreed.[26] In this instance, a wind farm in Tipperary supplies a data centre in Meath via a virtual CPPA.

A more recent example is between the Irish bank AIB and the development company NTR to procure the output from two solar farms. The two solar farms at Enniscorthy and Gorey combined will result in 21.4 GWh of new renewable energy being placed in the Irish grid. This will provide up to 80% of AIB Group's electricity needs.[27]

So far there has been little or no track record of CPPAs for smaller or community-scale projects, but this should be about to change. In 2022, DECC published a Roadmap for CPPAs[28] with core principles and policy steps to help develop the CPPA market, along with further information. SEAI have also produced a detailed report on policy options for CPPAs in a recent consultation paper.[29]

The following section explains a typical CPPA arrangement.

Typical Corporate Power Purchase Agreement arrangement

There are multiple variants of CPPAs. The flexibility to agree different contractual terms is somewhat an advantage over fixed policy-led schemes such as RESS. However, a corporate buyer may not offer the same duration and price security of a RESS contract. Where a shorter duration CPPA is offered, this could impact the ability to borrow capital for the project.

Generally, a corporate buyer will only want to be engaging with well-advanced projects, such as already having grid contracts, planning permission and a tendered, fully costed and ready-to-build design.

Most CPPAs are 'virtual'. Under a typical virtual CPPA, the properties are not physically linked; the generator and customer both connect to the electricity network. They may be on opposite sides of the country (e.g. a wind farm in Donegal supplying a university campus in Dublin), and each independently pays for use of the distribution and transmission network. The generator gives the customer a Guarantee of Origin (GOO) Certificate attaching to each unit of renewable electricity.[30]

The customer can continue to procure electricity from their supplier in the normal manner through a regulated, metered supply point. The generator continues to export electricity through a regulated meter onto the electricity network. The generator will bid its power output into the DAM. The CPPA will stipulate that revenue from the DAM will pass through to the customer. The customer can thus get a fixed hedge against electricity costs for a medium- to long-term period (usually 10 or 15 years).

25 www.there100.org/
26 www.irishtimes.com/business/energy-and-resources/facebook-agrees-irish-wind-farm-deal-with-brookfield-in-tipperary-1.4324582
27 www.ntrplc.com/news/article/irish-bank-aib-announces-agreement-with-ntr-to-buy-energy-from-two-new-solar-farms-providing-80-of-aibs-energy-requirements
28 www.gov.ie/en/publication/a0d2e-renewable-electricity-corporate-power-purchase-agreements-roadmap/
29 www.seai.ie/consultations/RECPPA-Study-Consultation.pdf
30 www.cru.ie/professional/energy/energy-market/renewables/#guarantee-of-origin-go

The customer will have an upside in electricity cost savings as long as the market price is above the CPPA strike price (as shown in Figure 12). The generator has a contracted price for a relatively long time period (anything from 1 to 20 years), which, other than perhaps annual indexation, is fixed for the duration. Figure 13 shows the other scenario where the market price is below the CPPA strike price.

A CPPA will require agreement of legal contracts with binding commitments on both parties to ensure that the agreement remains intact for the duration.

Figure 12: Virtual PPA concept with market price above CPPA cost (net cost decreases)

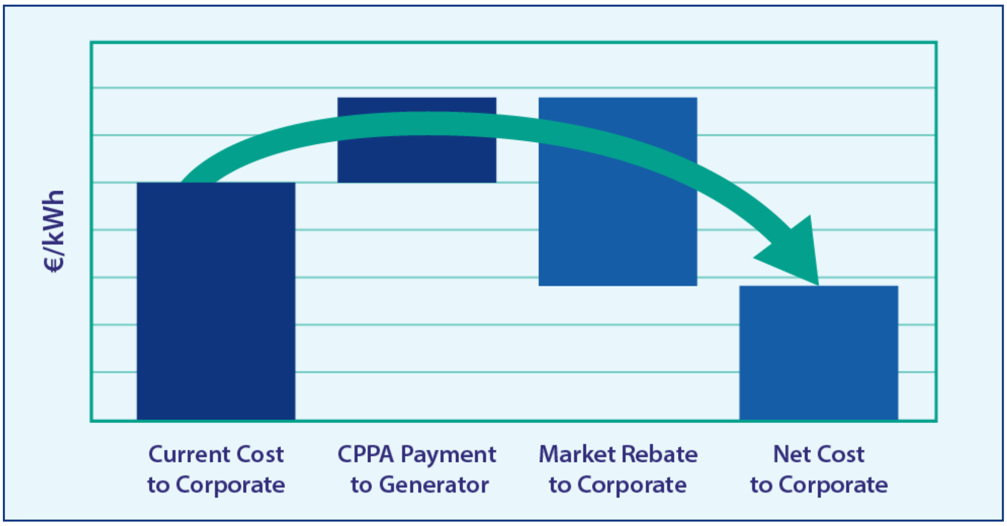
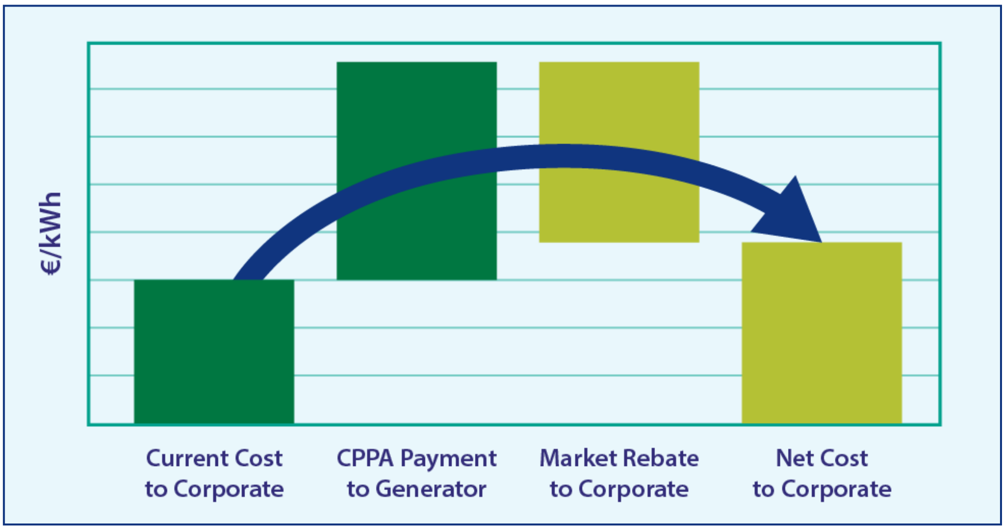


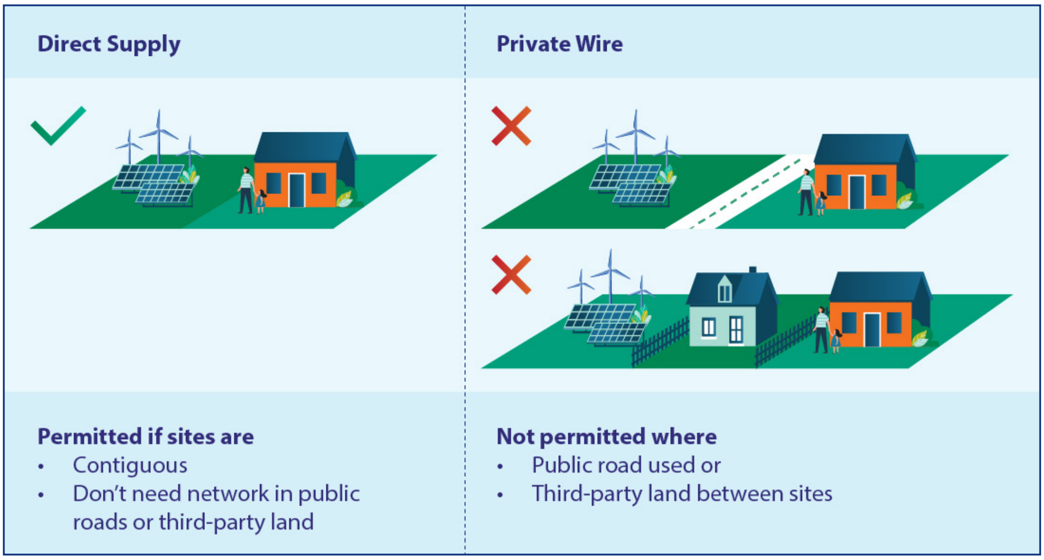
Figure 13: Virtual PPA concept with the market price below CPPA cost (net cost increases)



Private wire supply

Private wire arrangements are where a generator and customer are not within the same property but are close enough to create a physical connection for their own internal dedicated supply of electricity, thus by-passing the public distribution network. Direct supply is possible and there are examples of this in Ireland, see section below.

Figure 14: Difference between direct supply and private wire



Private wire supply arrangements, where the generator and customer properties are not the same or directly beside each other, are not possible at present under Irish legislation. However, it is possible in several other EU countries.

There is a commitment in the Climate Action Plan 2021 (Action 115) to *"Review the policy position on the development of private networks/direct lines"*. DECC and/or CRU will publish any updates on this.

Private wire arrangements would improve the business case and speed of development and construction for generators where they can match their output to nearby electricity user(s) and avoid constructing network infrastructure.

Typically, the desired outcomes from a physical private wire network[31] are:

- The ability to supply an electricity customer directly without requiring a licensed supplier as an intermediary. This could be a large energy user, such as a factory, a data centre or any user with a consistent 7-day electricity demand across all seasons.
- A reduction in the network charges (such as Distribution Use of System (DUOS) charges) associated with using the public distribution system (although the private wire network operator is still responsible for the maintenance and operational costs of their own system).
- Reduced electric connection cost.
- The ability to generate in an area where generation would otherwise be constrained or curtailed.

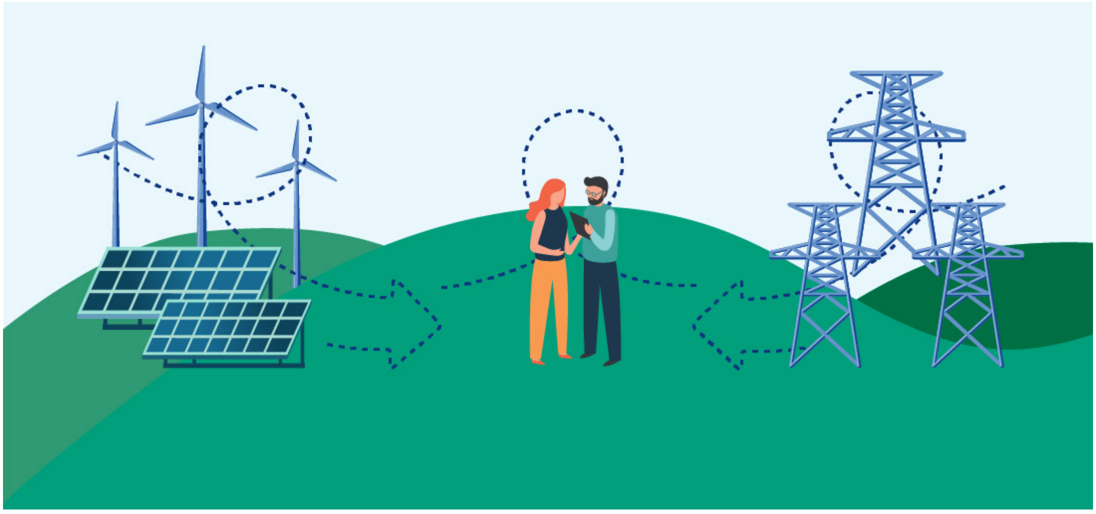
The following figures show the basic premise of a private wire supply arrangement. Figure 15 shows the typical linear supply from generator to customer through the network. In Figure 16, the generator and the customer directly connect behind the network (also known as behind the meter). The demand customer will still retain a connection to the distribution network, which provides backup in case the generator is offline, and also covers periods of zero or low output where the generator is intermittent (i.e. wind or solar).

It is typically the case that distribution network operators will wish to have mandatory connection of all customers through the distribution network and supporting the revenue and maintenance for same.

[31] www.spenergynetworks.co.uk/userfiles/file/ARC_Learning_Report_Potential_Commercial_Arrangements_for_Virtual_Private_Wire-Systems_Feb_2017.pdf

Figure 15: Existing typical network hierarchy

Figure 16: Typical private wire network hierarchy



Direct supply

Where properties are directly adjacent or do not require public roads to connect, the generator can supply electricity directly to the customer.

There are several examples in Ireland, one prominent example being the Eli Lilly[32] site in Kinsale, County Cork. In this example, a 16-acre solar farm built in 2021 is directly supplying a large proportion of the adjacent pharmaceutical manufacturing plant. A further 10 acres were added in 2022 bringing the installation to 10 MW.

Some of the obvious benefits are:

- No power is exported. There is no need for an ESB Networks grid connection, saving substantial cost, time and space.
- As there are no use-of-network charges or grid connection cost, the economic model can be attractive, leaving room for both generator and customer to benefit.
- This project and similar ones internationally are important for the manufacturing site to support their corporate sustainability goals and their membership of RE100.

[32] www.lilly.com/news/stories/lilly-solar-farm-in-ireland-reducing-carbon-emissions

Figure 17: Eli Lilly direct supply from solar farm to adjacent manufacturing plant

Photo courtesy of Enerpower

Virtual private wire

Neither physical nor virtual private wire arrangements are possible under current Irish electricity regulations, but are explained here for information only.

Some countries have implamented a 'virtual' private wire arrangement. A CPPA can be considered a form of 'virtual' private wire arrangement where the link is purely a financial instrument assigning the power between generator and customer, but still using and paying for the use and maintenance of the public network.

Another type of virtual private wire is where the link is somewhat more tangible and can be demonstrated. For example, a virtual private wire could be considered within a geographic limit (e.g. 5 km from the generator) and there is an obvious link and/or physical proximity between the generator and customer. Here the local distribution network (i.e. ESB Networks or NIE Networks) is still relied upon for physical delivery of electricity, the use of which is either a cost or subsidy to the virtual private wire parties. If the generator or supplier does not pay for the distribution, then it is a subsidy, also referred to as Virtual Net Metering (VNM). Due to the proximity between the demand customer and the generator, there can be embedded benefits to the system, for example reduced network losses and sometimes reduced network investment at transmission and distribution levels.

The benefit of this type of policy is where it is not physically possible to locate a renewable generator (e.g. a wind turbine) directly adjacent to a large consumer, a renewable generator can still be considered as supplying a local large consumer. For example, this policy is implemented in Massachusetts, USA where it is referred to as VNM and limited to renewable generators less than 2 MW if privately owned and less than 10 MW if publicly owned.[33] This is not possible in Ireland and would require regulatory and policy change.

Technical communication controls can also be put in place to ensure that generators can only export when the associated consumer requires the power.

Further financial arrangements can be made to allow customers to pay different tariffs depending on whether they receive their power from the 'virtually' connected generator or via the electricity network from another supplier.

[33] www.mass.gov/guides/net-metering-guide

Generation options for communities

This section explains some market opportunities primarily from the perspective of community-owned generators. Note that, apart from a dedicated Renewable Electricity Support Scheme (RESS) community category, all options are open to renewable generators, regardless of ownership.

The primary focus of the toolkits is to provide accessible information for community-owned generators from 500 kW up to 5 MW. However, some additional information is given about small scale and micro-generation to consider where larger scale projects may not be practical or commercially viable.

RESS community category

In 2018, the Irish Government approved the high-level design of the RESS. It included a commitment to have a specific community-owned subcategory within each auction, the overall RESS auction framework.

The certainty of a government-backed 15-year Power Purchase Agreement (i.e. a RESS PPA) is the most attractive, lowest risk and, for the moment, the most viable route to market for community-owned projects, though other routes to market are now also emerging such as corporate PPA and the SSG scheme.

Despite the attraction of a 15-year RESS, there are significant market risks for participants in bidding and implementing RESS contracts, such as supply chain and construction inflation, which can jeopardise the viability of projects. Under the RESS 1 and RESS 2 conditions, the strike price is fixed for 15 years without indexation.

The RESS 3 auction is currently under preparation with the terms and conditions subject to an ongoing consultation, which considers several changes to the auction.[34]

It is essential that community groups seek independent expert advice in the development of a RESS-scale project to ensure that risks are adequately understood and accounted for in decision-making. This may lead to difficult decisions for community projects that are midway in their development journey.

The results of the first RESS community category rounds are further outlined below.

RESS 1 community category

Under the first auction round (RESS 1) in July 2020, a volume of 30 GWh was reserved for community-owned projects, representing 1.5% of the overall auction volume. Eight projects bid into the community category; seven were awarded contracts.

The weighted average strike price for the community category was €104.15/MWh, which was significantly above the 'All' and Solar categories in the same auction.

It could be anticipated that the community strike price is higher than the 'All' category, due to the smaller scale of community projects (5 MW and above) and the competitive disadvantage that community groups have, such as in procurement and financing in particular.

Figure 18: RESS 1 weighted average strike prices

[34] www.gov.ie/en/consultation/8c644-consultation-on-the-third-onshore-renewable-electricity-support-scheme-ress-3-auction-design-and-implementation/

An important element of auction design is a competition ratio, which essentially means there must be sufficient projects qualified for the auction to ensure both winners and losers in the auction process. A competition ratio above 1.0 ensures a competitive auction, but it also means not every project will be awarded a contract.

CRU undertakes competitive analysis in the run-up to each auction to set the competition ratio. In the run-up to the RESS 1 auction, it decided (CRU20074) to set the competition ratio at 1.3 for both the community category and the 'All' project category.

Table 4: Competition ratios RESS 1

	All projects	Solar category	Community category
Competition ratio	1.3	2.0	1.3

The seven community category projects awarded contracts included a mix of onshore wind and solar technologies, and are located in five counties.

Under RESS 1, community groups could partner with private individuals or entities who could hold up to 49% interest in the relevant project.

Table 5: Awarded community category participants in RESS 1

Technology	No. of projects	Total MW awarded
Solar	5	21
Wind	2	3.4

RESS 2 community category

The RESS 2 auction took place in May 2022. The community category was expanded with ten projects awarded contracts, some of which were extensions of the RESS 1 projects.

A change to the terms and conditions specified that projects participating in the community category shall be 100% owned by a Renewable Energy Community (REC).

In the run-up to the RESS 2 auction, CRU set (CRU202236) the competition ratio for the community category at a high level, due to common ownership of a large proportion of projects within the community category. The competition ratio was increased from 1.3 to 1.82 between RESS 1 and RESS 2, which in practice has led to a higher number of unsuccessful community category bids in RESS 2.

Table 6: Competition ratios for RESS 2

	All projects	Community category
Competition ratio	1.37	1.82

The attrition rate at the auction stage for RESS 2 was higher for community groups than in RESS 1. Of the qualifying community-owned projects, 5 out of 15 were unsuccessful at RESS 2 auction results stage.

A further change to the auction under RESS 2 was applying an Evaluation Correction Factor (ECF). The ECF reflects the relative benefits that each type of technology (and the diversity that they bring) has for the stability and efficiency of the electricity network. For RESS 2, this meant in practice that solar received a 10% favourable pricing adjustment prior to settling the auction result. The project still received the strike price they bid, the ECF only impacted the auction outcome through the use of an adjusted price to decide the successful (i.e. lowest adjusted) bids.

Table 7 provides a hypothetical example of settling two competing bids using the RESS 2 ECF. In this example, although the bid price submitted by the solar project is €5/MWh higher than the wind project, solar is ranked ahead of wind in the auction outcome, but still reverts contractually to the higher bid price submitted.

Table 7: Example of auction ranking using ECF in RESS 2

Technology bidding	Bid submitted	ECF-adjusted price	Auction rank	Contract price
Solar	€105/MWh	€94.5/MWh	1	€105/MWh
Wind	€100/MWh	€100/MWh	2	€100/MWh

The weighted average strike price for the community category was €116.41/MWh, which represents a 12% increase over RESS 1, and not far below the maximum bid price across all categories of €120/MWh. This defines a natural ceiling as any bid at the limit would automatically be the least competitive participant in an auction, where there are defined competition ratios.

Figure 19: RESS 2 weighted average strike prices

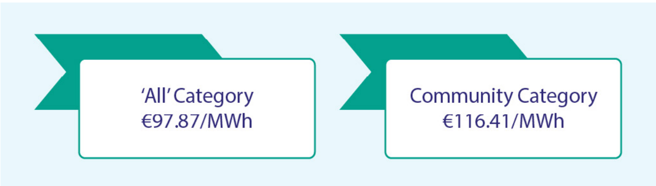


Table 8: Awarded community category participants in RESS 2

Technology	No. of projects	Total MW awarded
Solar	8	28.3
Wind	2	2.5

Observations on RESS community category

Based on both RESS 1 and RESS 2 community category results, we can see that:

- Solar is the primary technology under consideration by community groups.
- Many of the projects started as private commercial developments and subsequently transferred ownership to community groups.
- There is a pipeline of community projects taking part in RESS auctions, and community groups are becoming more mobilised and interested in developing their own renewable electricity generation projects.
- The auction format of RESS has been challenging for some communities both in terms of participation and implementation.

The suitability of an auction format for communities is being discussed and more suitable forms of support are under development, such as the Small Scale Generation (SSG) scheme (discussed further in).

Small Scale Generation support

It is recognised that not all proposed community sites will be of a scale or otherwise to be suitable for RESS. Alternative policy options are under consideration for projects that are ineligible or unsuitable for RESS participation.

DECC recently held a public consultation on policy options[35] to support SSG, the outcome of which should be available soon.

The scope ranges from 50 kW to 1 MW or 6 MW depending on the type of applicant.

Recent changes to State aid guidelines[36] allow 100% SME-owned or REC-owned projects to introduce alternate support mechanisms (i.e. not RESS auctions) up to 6 MW.

The SSG support would build on / align with the work done for the MSS, where appropriate, offering:

- a Clean Export Guarantee (CEG), for renewable self-consumers, i.e. not relevant to export-only sites;
- a Feed-in Premium (FIP), i.e. a tariff in addition to the CEG.

The proposed FIP is a potential market route for export-only community-owned renewable generators. Compared with RESS, it would provide a simpler support structure. Communities would not need to submit competitive tenders for a fixed price contract as required under RESS.

The support level would be defined by an independent analysis of the viability gap – i.e. the difference between what the exported electricity can be sold at and the price which would give a reasonable economic return. The consultation paper proposes a support lifetime of 15 years, which matches the RESS contract duration.

The assumed revenue for export-only sites is a key input. The high and low projections for the DAM price to 2050 used by SEAI in the ongoing consultation are shown below for information.

Figure 20: SEAI Day-Ahead Market projections to 2050

35 www.gov.ie/en/consultation/353f2-consultation-on-a-small-scale-generation-support-scheme-ssg-in-ireland/

36 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2022.080.01.0001.01.ENG

Figure 21: Vestas V44 wind turbine 600 kW at Balrath, County Meath

Photo courtesy of Bioxl

Private wire

As mentioned in Private wire supply, a new private wire policy is under consideration by DECC . If introduced, it would open up new opportunities for community-owned renewable energy generators to supply a local electricity user directly. It would likely reduce complexity, time and cost for the development of a community-owned project, as well as improving the business case.

There should be an added interest for corporate or public organisations in knowing that the counter-party is a 100% community-owned generator, with benefits retained for the benefit of the local community.

If this market route becomes a reality, careful consideration must be given to the obligations of direct supply, and consequences of any downtime / failure to perform of the generator. Equally, the continued operational existence and need for electricity of the consumer are critical to the business case for the generator.

It will be important to enter a well-considered PPA, with the benefit of professional commercial and legal advice for private wire / direct supply arrangements.

Corporate Power Purchase Agreements

From a slow start, there is a rapidly emerging and growing market for CPPAs in Ireland.

Where a corporate customer engages in a tendering process for a PPA, it will be difficult for smaller-scale and community-owned projects to compete on price grounds alone with larger projects. This is because larger projects typically have lower-cost finance, benefit from procurement at a larger scale and will generally have a lower levelised cost of electricity (LCOE) over the project's lifetime.

The LCOE is a measure of the average net present cost of electricity generation for a generator over its lifetime. It compares different methods of electricity generation and different individual projects on a consistent € per MWh basis.

The possible benefits and challenges of a CPPA with a smaller community-owned generator are:

- There should be an added interest for corporate or public organisations in knowing that the source of their renewable electricity is a 100% community-owned generator, with benefits being retained for the benefit of the local community, including the corporate's own employees and nearby residents.
- A corporate customer may also wish to have a dedicated smaller project with output matched to their own demand, to allow exclusive procurement of all the output from a particular project.
- Translating these benefits into a financial premium is likely required for a CPPA to prove financial viability for community-scale projects.
- The risk in the development and negotiation phase lies very much with the generator. It would be prudent to consider potential CPPA candidates that genuinely have a local or community mandate to contract with a smaller-scale project (i.e. less than 5 MW).
- As for any type of PPA, it will be important to enter a well-considered contract, with the benefit of professional commercial and legal advice.

Micro-generation Support Scheme

The recently launched Micro-generation Support Scheme (MSS) aims to deploy up to 380 MW[37] of new generation from renewable self-consumers (including an export payment for all micro-generators).

The scheme is initially targeting solar photovoltaic (PV) up to 50 kW but may extend to further technologies in due course.

The key features of the scheme are:

- Domestic applicants can apply to the Sustainable Energy Authority of Ireland (SEAI) for a grant towards the cost of installing solar PV equipment. Capital grants are currently available up to a maximum of €2,400.
- The maximum eligible domestic system size is 6 kW.
- For domestic applicants, homes built pre-2021 are eligible.
- For domestic applicants, buildings do not have to meet a minimum Building Energy Rating standard.
- Non-domestic applicants such as businesses, farms, schools and community buildings can also apply for a grant for installations up to 6 kW, at the same grant amounts as domestic customers.
- Non-domestic applicants can apply for a Clean Export Premium (CEP) feed-in tariff to support installations between 6.1 kW and 50 kW. In 2023, the CEP feed-in tariff will be €0.135/kWh . The CEP is fixed for the applicant for 15 years and eligible volumes are capped at 80% of generation capacity to encourage self-consumption.

[37] www.gov.ie/en/press-release/bfe21-homes-farms-businesses-and-communities-to-benefit-as-minister-ryan-announces-the-micro-generation-support-scheme/

- Supports under the MSS will gradually reduce over time from 2024 to account for reducing system capital costs.

Further information is available from the Department of Environment, Climate & Communications (DECC) website.[38]

Figure 22: Non-domestic solar installation at Cork City Council 50 kW AC

Photo courtesy of Alternative Energy

Figure 23: Solar inverters (2 x 25kW) installed at Cork City Council

Photo courtesy of Alternative Energy

[38] www.gov.ie/en/publication/b1fbe-micro-generation/#micro-generation-support-scheme-ms

Glossary

AC	Alernating current
BM	Balancing Market
CEG	Clean Export Guarantee
CEP	Clean Export Premium
CFD	Contract for Difference
CMU	Capacity Market Unit
CPPA	Corporate Power Purchase Agreements
CRU	Commission for Regulation of Utilities
DAM	Day-Ahead Market
DECC	Department of Environment, Climate & Communications
DSO	Distribution System Operator
DSU	Demand Side Unit
DUOS	Distribution Use of System
ECF	Evaluation Correction Factor
EWIC	East West Interconnector
FIP	Feed-in premium
GOO	Guarantee of origin
GWh	Gigawatt-hour
IDA	Intraday Auction
IDC	Intraday Continuous
IDM	Intraday Market
KW	Kilowatt
LCOE	Levelised cost of electricity
LV	Low voltage
MEC	Maximum export capacity
MRP	Market reference price
MSS	Micro-generation Support Scheme
MW	Megawatt
MWh	Megawatt-hour
MV	Medium voltage
NI	Northern Ireland
PPA	Power Purchase Agreement
PSO	Public Service Obligation
PV	Photovoltaic

REC	Renewable Energy Communities
REFIT	Renewable Electricity Feeding Tariff
RESS	Renewable Electricity Support Scheme
ROI	Republic of Ireland
SEAI	Sustainable Energy Authority of Ireland
SEM	Single Electricity Market
SEMO	Single Electricity Market Operator
SME	Small and medium-sized enterprises
SONI	System Operator Northern Ireland
SSG	Small Scale Generation
TSO	Transmission System Operator
UAEC	Unrealised Available Energy Compensation
VNM	Virtual Net Metering

Rialtas na hÉireann
Government of Ireland

Sustainable Energy Authority of Ireland
3 Park Place
Hatch Street Upper
Dublin 2
Ireland
D02 FX65

e info@seai.ie
w www.seai.ie
t +353 1 808 2100

@seai_ie