ireland electrified

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Flexible Grid Connections and Their Role in Supporting Electrification in Ireland

A Policy Position Paper by Ireland Electrified

Recommendations

Flexible connections can facilitate better use of the existing electricity grid and allow customer seeking to grow their electricity demand or electrify their existing demand to connect to the network quicker and more affordably.

Flexible grid connections, if delivered, could significantly accelerate electrification across multiple sectors as well as contributing to Ireland's targets to achieve at least 25% demand flexibility by 2030. They can accelerate Ireland's decarbonisation, reduce consumer costs and our reliance on imported fossil fuels.

To fully unlock the potential of flexible connections in Ireland, we recommend the following actions:

1. **Implement the EU's Electricity Market Design Directive regarding flexible connections** - DCEE should immediately complete the overdue transposition of the EU's Electricity Market Design Directive 2024/171. Article 6a sets out the requirements for member states to develop a framework for flexible connections which will provide a mandate to relevant bodies such as the CRU, EirGrid and ESB Networks.
2. **Establish clear and equitable connection charging policy -** The CRU, as the body responsible for connection costs and network charges, should establish clear and equitable policies covering how charges apply to the flexible element of a connection. Without this, customers face commercial uncertainty, accepting curtailment risk alongside connection costs that may not be cost-reflective, undermining confidence in flexible arrangements.
3. **Establish a flexible connection application process -** EirGrid and ESBN should develop clear and transparent processes for customers to apply for flexible connections and provide up to date network information on the capacity & locations where flexible connections are available. Customers taking up flexible connections may wish to avail of a firm connection in future, so they should be given clear contractual options and defined timelines for eventually receiving a firm connection if needed.

4. **Develop appropriate price incentives** – The CRU and DCEE should consider the introduction of flexibility markets, grant supports and reforms of network charges and imperfections costs to send more appropriate price incentives to flexible demand customers. Currently network charges and imperfections impose high costs on demand users and could be reformed through time of use or locational signals to incentivise the use of flexible demand and reduce costs for customers seeking to electrify. Flexibility markets and grant supports for EV charging hubs, thermal storage, heat pumps and electric boilers will also help support the take up of these technologies.
5. **Implement necessary monitoring and control systems** – As discussed in this paper, the implementation of flexible connections will require advanced monitoring and control systems on the part of EirGrid and ESB Networks to ensure compliance and maintain system stability. These systems should be developed in parallel with the flexible connection application process and should be supported through any necessary funding by the CRU, if required.
6. **Expand deployment beyond generation shortfall areas -** Current deployment of flexible connections by the System Operators – ESB Networks and EirGrid, only target locations of generation shortfall i.e. locations where users are required to reduce their demand at certain times to relieve network congestion. Future iterations must look beyond this, making use of existing grid infrastructure and available renewable electricity to decarbonise the broader economy. Flexible connections should be made available to a range of potential users, including EV charging hubs, electric boilers, thermal storage, heat pumps, battery storage systems, and large industrial loads.

Introduction & Context

Ireland Electrified is a trade association promoting the electrification of heat, domestic and industrial, as well as transport. This transition to electric heat and transport represents a cleaner, more secure energy source, and can provide many benefits to the electricity grid as well as Irish consumers. We advocate for decarbonising our economy in sectors currently heavily reliant on largely imported fossil fuels with greater electrification from renewable energy sources. This means increased energy security, less exposure to volatile fossil fuel prices, and a more sustainable energy source for householders, businesses, transport and large industry.

Ireland's transition to a low-carbon energy system is accelerating as electrification expands across transport, heat, and industry. Electric vehicles (EVs), electric boilers, heat pumps, and new industrial loads are increasing electricity demand while the system simultaneously integrates higher shares of renewable generation. These

trends are placing growing pressure on Ireland's electricity network, particularly at the distribution level.

The Dispatch Down Problem — and the Opportunity It Creates

The turning off, or turning down, of available renewable generation (dispatch down) in Ireland increased from 7.4% in 2021 to 14% in 2024 — against a backdrop of just 5 GW of installed wind capacity. With Government targets of 22 GW of wind and solar by 2030, dispatch down will intensify dramatically unless large-scale flexible demand is brought onto the system. Every megawatt-hour of wind and solar energy dispatched down is a unit of zero-carbon indigenous energy wasted, while Ireland continues to import and burn fossil fuels for heat and transport.

The scale of the opportunity is significant. Ireland's industrial heat sector consumes approximately 5 GW of energy on a near-continuous basis, almost entirely from fossil fuels. This is not a future opportunity — it is existing demand that could, with the right market signals and regulatory enablers, be absorbed by renewable electricity in hours of surplus generation. Electric boilers, heat pumps and thermal storage systems can absorb tens of megawatts per site, are commercially available today, and can respond in sub-second timeframes. Similarly, Ireland's growing fleet of electric vehicles represents a large, distributed, and flexible load that can be charged when renewable generation is abundant and prices are low.

Flexible connections are the essential enabling mechanism for this transition. By allowing industrial heat users and EV charging operators to connect — or expand capacity — without waiting for full grid reinforcement, flexible connection frameworks can unlock gigawatts of renewable-following demand that would otherwise remain stranded. The prize is a direct reduction in dispatch down, a structural shift away from fossil fuel imports, and a material contribution to Ireland's 51% carbon reduction target by 2030.

What is a Flexible Connection?

Traditional grid connections are designed to provide firm capacity at all times. This type of connection guarantees that a customer will have 24/7 access to the grid. However, this approach can require significant network reinforcement and long lead times which often adds substantial costs for commercial and industrial customers looking to electrify or increase their electricity demand.

Flexible grid connections (otherwise known as non-firm or interruptible connections) offer an alternative solution by allowing customers to connect earlier while accepting certain operational constraints on their grid access during periods of congestion. These arrangements are becoming an important tool for enabling faster electrification while optimising the use of existing network infrastructure.

ESB Networks, through the National Network, Local Connections (NNLC) programme, have begun trialling flexible connections for several industrial customers which allow connection to the grid while mandating that the user must be prepared to reduce their demand at certain pre-defined times, or on the instruction of ESB Networks, if the local grid is congested.

These types of connections provide a valuable mechanism for expediating demand connections to the grid and should be rolled out further, but Ireland Electrified would also like to see this framework expanded to include flexible connections that are 'renewable-following' i.e. rather than guaranteeing full capacity at all times, the system operator may enable additional consumption during periods of surplus renewable generation. This would mean that the customer with a flexible load turns into a service provider to the electricity grid, helping to reduce dispatch down and system balancing costs and reducing the need for transmission grid reinforcement.

Who Needs Flexible Connections?

Flexible connections are relevant for demand users seeking to connect to the grid in Ireland due to several structural factors:

- Rapid growth in renewable generation creating periods of surplus
- Increasing electricity demand from transport and heat electrification
- Localised network constraints in urban and rural areas
- Long timelines and costs for firm-connections and network reinforcement

Relevant user types include:

- Large industrial heat users
- EV charging hubs and bus depots
- Battery storage systems
- Large commercial loads

By enabling these loads to connect under managed conditions, flexible connections allow better utilisation of existing infrastructure while reducing the need for immediate capital investment.

How Do Flexible Connections Work?

For most commercial and industrial electricity users with demand below approximately 20 MVA, connection applications are submitted to ESB Networks as the Distribution System Operator (DSO). Larger projects connect directly to the transmission network operated by EirGrid.

The connection process typically follows several stages:

1. Application and Capacity Assessment

Applicants submit a connection request to ESB Networks specifying the expected electrical demand and the required Maximum Import Capacity (MIC). MIC represents the firm upper limit of electrical load that a premises can draw from the grid at any given time and is a key determinant of connection design and charges.

2. Network Study and Connection Method

ESB Networks evaluates whether sufficient network capacity exists locally to accommodate the requested load. Where the network has limited capacity, reinforcement works such as transformer upgrades, new feeders, or substation expansion may be required. This process can take between 1 – 2 years.

3. Connection Offer

If the application is feasible, ESB Networks issues a connection offer outlining:

- The agreed MIC
- Technical connection requirements
- Any reinforcement works
- Associated connection charges

The connection offer forms the contractual basis for the project's grid connection. There is a ~3-month quotation period for the applicant to accept an offer.

4. Construction and Energisation

Once the offer is accepted and payment is made, the construct can commence. Construction can take up to 5 years, depending on network reinforcement needs. These may include customer-side infrastructure and network upgrades carried out by ESB Networks before the connection is energised.

Below is a summary of the connection process and approximate timelines:

Standard process for connections below ~20 MVA via ESB Networks (DSO)

1) **Application & Capacity Assessment**

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2) **Network Study & Connection Method**

Timing: *~1–2 years*

▼

3) **Connection Offer**

Timing: *~3-month applicant acceptance period*

▼

4) **Construction & Energisation**

Timing: *Up to ~5 years depending on network reinforcement needs*

Note: *Timings are indicative and can vary depending on local network constraints, required reinforcement works, and project complexity.*

The existing connection process, while providing certainty regarding available capacity, can also lead to long ambiguous timelines, unnecessary overbuilding of the grid, and additional costs for customers where network reinforcement is required. Traditional Irish commercial businesses are reluctant to commit millions of euros to projects of unknown cost and an unknown duration possibly extending into the second half of the next decade.

What Types of Flexible Grid Connections Are Currently Available?

There are several forms of flexible connections that are currently being rolled out internationally and should be made available in Ireland:

1. **Timed Connections**

   Timed connections are one of the simplest forms of flexible connection. Under this arrangement, a customer's electricity demand is restricted during predefined periods, typically during network peak hours. These predefined periods would typically be set out in the customer's connection agreement with the system operator. Timed connections are particularly suitable for predictable loads that can shift energy consumption without affecting core operations.

   For example, large EV charging depots or electric heating systems may be permitted to operate only outside certain peak periods. This ensures that the network is not overloaded during times of highest demand while still enabling electrified loads to connect.

   The downside of timed connections is that they do not enable dynamic use of electricity and the periods where increased demand is allowed may not align with market price signals or system conditions including times of high renewable generation.

2. **Curtailable Connections**

   Curtailable connections allow a customer to access full capacity most of the time but accept the possibility of temporary curtailment during network congestion events.

   Under this model, the system operator can instruct the customer to reduce demand or generation when network limits are approached. These events are usually infrequent but provide a valuable tool for managing system constraints. Curtailable connections are widely used for renewable generation projects and may also be applied to large industrial loads such as data centres or energy storage systems.

   The downside of these types of connections is that they may not provide the necessary certainty or predictability for demand customers in terms of access to the grid.

3. **Active Network Management (ANM) or Dynamic Connections**

   Active Network Management systems use real-time monitoring and control to dynamically manage network capacity. Rather than relying on fixed pre-defined

time periods, ANM allows the operator to adjust connection limits based on real-time network conditions and communicate these in advance to the customer.

For example, a connection may be permitted to operate at full capacity when local demand is low or renewable generation is high but restricted when network constraints arise. The system operator would communicate the forecast availability of the connection to the customer at least a day in advance.

This essentially involves communicating what times the maximum import capacity will be available. ANM systems rely on advanced monitoring, communications infrastructure, and automated control technologies.

While these types of connections bring benefits in terms of more dynamic use of electricity reflecting system conditions and market signals, they are more complex to implement requiring monitoring and communication equipment between the System Operators and demand users to ensure compliance.

How Do Flexible Connections support Electrification?
Transport Electrification

The deployment of large EV charging hubs, electric bus depots, and fleet electrification infrastructure can require substantial electrical capacity. Flexible connections allow these facilities to connect to the grid earlier while managing peak demand periods. For instance, an electric bus charging depot may seek a timed connection where they only require access to their full grid capacity at night when they are charging their fleet — a period that naturally aligns with lower system demand and, increasingly, with overnight wind generation.

Electrification of Heat

Industrial heat is Ireland's single largest decarbonisation opportunity in the near term. Sites across the dairy, pharmaceutical, food and drinks sectors consume heat on a near-continuous basis, currently sourced almost entirely from natural gas. Industrial and commercial heat electrification using heat pumps, electric boilers or thermal energy storage can create large flexible electrical loads, drawing on renewable electricity when generation is abundant and reverting to gas only when needed.. Flexible connections could enable these systems to operate in a way that aligns with network capacity and renewable generation availability. For instance, an electric boiler could utilise an ANM/dynamic connection where they can access the full available

grid capacity (beyond their firm MIC), reduce curtailment of renewable generation and access dynamic electricity tariffs.

For instance, Germany has introduced a use instead of curtail scheme for large demand users where flexible customers in regions of renewable dispatch down are incentivised to consume additional electricity when there is excess wind or solar being generated in their area. The flexible load is exempted from grid charges and customers are eligible to receive a lower electricity price for this consumed energy.

At scale, industrial heat electrification represents gigawatts of renewable-following flexible demand — directly reducing dispatch down and fossil fuel imports simultaneously.

The barrier is not technology — it is the inability of the current market and network framework to dispatch flexible consumption in real time, and the level of non-market charges that prevent electrified heat from being competitive with gas even when wholesale electricity prices are near zero. Flexible connection frameworks, combined with reformed Use of System charges, are essential enablers for this transition.

Integration of Energy Storage

Battery storage systems and thermal energy storage can play an important complementary role. Charging during periods of surplus capacity and discharging during peak periods mitigates network constraints and improves system flexibility. Storage assets can also participate in flexibility markets, providing additional services to system operators. Thermal storage in particular can convert curtailed electricity into heat, making it an ideal partner for flexible industrial heat connections.

What are the Current Challenges?

Despite their benefits, flexible connections introduce several challenges which need to be addressed:

- Regulatory frameworks
    - Clear CRU policy is needed on how network charges apply to flexible connections, on contractual terms, and on the pathway to firmness.
    - Clear market structures and incentives are required to encourage participation;
- Operational complexity:
    - Requires advanced monitoring and control systems in the system operators.

    - Absence of dispatch capability for flexible consumption. EirGrid's scheduling and dispatch systems were built for generation, not consumption. Until the TSO can issue real-time dispatch instructions to flexible demand, these users cannot participate in the balancing market or deliver their full value to the system.

- Commercial:
    - Network charging uncertainty - The application of use of system network charges to flexible consumption remains a critical barrier. The current UoS charge of €63.30/MWh in 2025/26 means electrified heat is uncompetitive with natural gas even at near-zero wholesale electricity prices — a market distortion that must be addressed.
    - Imperfection costs are fixed per MWh at a flat rate and do not send an appropriate price incentive for users to shift their demand. Reforming imperfections charges to send a price signal for flexible demand would help reduce down balancing costs on the system.

Who Is Responsible for Implementing Flexible Connections?

Delivering flexible connections at the scale Ireland requires is a shared responsibility across government and the regulatory and network bodies:

- The CRU sets overall connection policy and is responsible for deciding the framework for connection costs and network charges for both demand and generation.
- The System Operators, ESB Networks and EirGrid, are responsible for the connection process, developing flexible connection methods, and working with customers on getting connected to the grid.
- DCEE is responsible for giving a clear mandate to ESBN and EirGrid and is in the process of transposing Electricity Market Design Directive 2024/1711, of which article 6a sets out specifically the requirement for Member States to develop a framework for flexible connections.
- SEAI and the EPA are responsible for carbon reporting methodologies relevant to electrification.

The Large Energy User Action Plan (LEAP) — Policy Alignment

In January 2026, the Government published the Large Energy User Action Plan (LEAP), a cross-government strategy to co-locate energy-intensive industrial developments

with indigenous renewable energy supply. LEAP sets out 17 enabling actions across five themes: energy infrastructure delivery, regulatory certainty, enhanced planning coordination, new routes to co-location, and strategic opportunities. When delivered, these actions will have a material impact on Ireland's ability to electrify at scale and reduce dispatch down of renewable generation.

Ireland Electrified and its members are most directly engaged with four of the LEAP objectives, which together form a coherent policy basis for the deployment of flexible connections for heat and transport electrification.

Objective 3 — Demand Flexibility (ESBN, CRU, EirGrid, due 2027). LEAP commits to the design of flexible and non-firm contracts and hybrid connections for large energy users that maximise utilisation of available grid infrastructure and renewable electricity. This is the single most important near-term enabler for members seeking to connect electric boilers, heat pumps, and EV charging infrastructure under managed conditions. The action explicitly recognises that existing and new infrastructure will be more efficient and lower carbon if large energy users can consume when renewables are plentiful and step back when the grid is constrained. Ireland Electrified urges that implementation prioritise renewable-following, demand-turn-up arrangements — not simply demand-turn-down products — and that the framework be made available to industrial heat users and transport operators as a matter of priority.

Objective 4 — Markets and Tariffs that Unlock Demand Flexibility (CRU, aligned with the revised NEDS due 2026). LEAP commits to reform of energy network tariffs, market operation rules, and the grid code to deliver genuine demand flexibility. This is directly relevant to the charging barrier that currently prevents electrified heat from being competitive with natural gas even when wholesale electricity prices are near zero. The revised National Energy Demand Strategy must address the UoS charge distortion as a central priority: at €63.30/MWh in 2025/26, the current charge structure locks in fossil fuel consumption even in hours of renewable surplus. Ireland Electrified supports the LEAP commitment and calls for NEDS implementation to proceed without delay, with reformed tariff structures in place before the 2030 renewables target requires the flexible demand that current charges are actively suppressing.

Objective 14 — Facilitate Direct Engagement with Regional Green Energy Park Proposers (DCEE, DETE, EirGrid, ESBN, GNI, from 2026). LEAP commits Government Departments and system operators to engage directly with proposers of developer-led green energy park projects. Ireland Electrified members — including operators of large industrial heat loads distributed across Ireland's regions — are precisely the class of developer this action is designed to reach. Many such sites are already connected

to the medium-voltage grid, consume heat on a near-continuous basis from fossil fuels, and could, with the right connection framework and dispatch signal, absorb tens of megawatts of otherwise curtailed renewable electricity. Ireland Electrified calls on DCEE, EirGrid, and ESBN to prioritise outreach to industrial heat users as part of this engagement, recognising that they represent the fastest and lowest-cost route to large-scale flexible demand.

Objective 16 — Enterprise Support for Innovation in Energy Management (EI, IDA, 2025 workplan / 2026 implementation). LEAP commits Enterprise Ireland and IDA Ireland to support innovation in energy management and storage for large energy users, including through consideration of regulatory sandboxes. Ireland Electrified strongly supports this objective. The deployment of hybrid heat systems — electric boilers operating alongside existing fossil fuel boilers, drawing on renewable electricity when available — is commercially proven but requires system-level innovation in dispatch, metering, and real-time market participation. Regulatory sandboxes that allow trialling of non-firm import capacity, real-time dispatch signals, and reformed UoS arrangements for participating sites would accelerate commercial deployment significantly. Ireland Electrified encourages EI and IDA to engage with industrial heat operators and their technology suppliers as priority participants in any sandbox programme.

Collectively, these four LEAP objectives, if delivered on time and with genuine ambition, would remove the principal barriers to flexible electrification of industrial heat and transport in Ireland. The window to deploy this demand at the scale required before 2030 is narrowing. Ireland Electrified will engage actively with the implementation of each of these actions and calls on the responsible bodies to treat industrial heat and transport electrification as first-order beneficiaries of the LEAP framework

Conclusion

Flexible grid connections are not a niche technical instrument — they are a critical enabler of Ireland's decarbonisation strategy. The dispatch down of renewable generation, now running at 14% of output, will worsen significantly as the renewable fleet grows toward the Government's 22 GW target unless large-scale flexible demand is brought onto the system. The electrification of industrial heat and transport represents the fastest, lowest-cost route to creating that demand, using commercially available technology and existing grid infrastructure.

The policy framework to deliver this is now taking shape. The Government's Large Energy User Action Plan commits to flexible and non-firm connection contracts,

reformed network tariffs, direct engagement with regional energy park proposers, and enterprise support for innovation in energy management — each of which directly addresses the barriers that have prevented renewable-following electrification from scaling to date. These are welcome and necessary commitments. The test now is implementation speed and ambition.

The policy actions proposed in this paper, and those already committed to in LEAP, are concrete, deliverable, and urgent. The window to deploy flexible demand at the scale needed before 2030 is narrowing rapidly. Ireland Electrified is committed to working with the CRU, DCEE, ESB Networks, and EirGrid to make this a reality — and calls on each of those bodies to implement a flexible connection framework supporting the electrification of industrial heat and transport in Ireland.