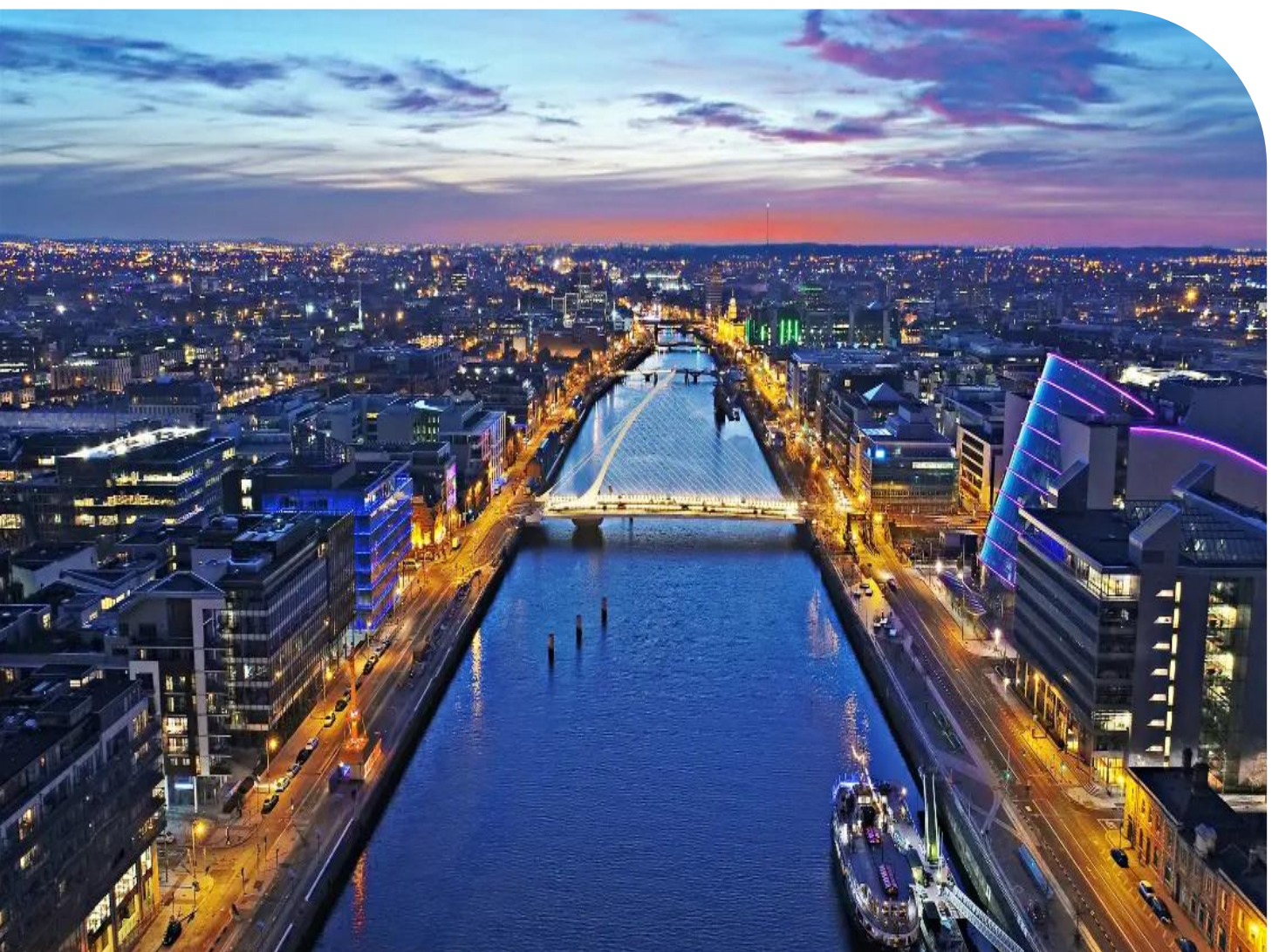


HeatNEWS Policy and Market Roadmap

Enabling Flexibility in Heating for Ireland's Electricity Grid



HeatNEWS Policy and Market Roadmap

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1. Executive Summary

1.1 How thermal energy storage plays an important role in Ireland energy system

1.1.1 Carbon emissions savings provided by TES

TES has been shown to reduce CO₂ emissions¹ from electrical heating by 21.2%, 29.7%, 1.2% for DH, domestic heating and industrial heating respectively² compared with the same installations without TES.

Electrification of the heat sector can provide greater CO₂ savings compared with sectors whose consumption remains more stable throughout the year. This is due to greater heat demand being met during winter months when the electricity grid is cleaner.

Average hourly CO₂ intensities across the day stay within +/-5% when looking across the whole year (annual average profile). There is quite a big variance when comparing summer and winter CO₂ intensities, with the carbon intensity typically being 21% higher in summer compared to winter. The biggest hour-to-hour differences also occur in the summer. This combined with the new EU Directive³ which allows separate suppliers/supply contracts for different sub-metered assets (heat pumps, EVs, etc.) may open up different types of tariff structures which align better with the CO₂ intensity variances in the grid, to help drive decarbonisation

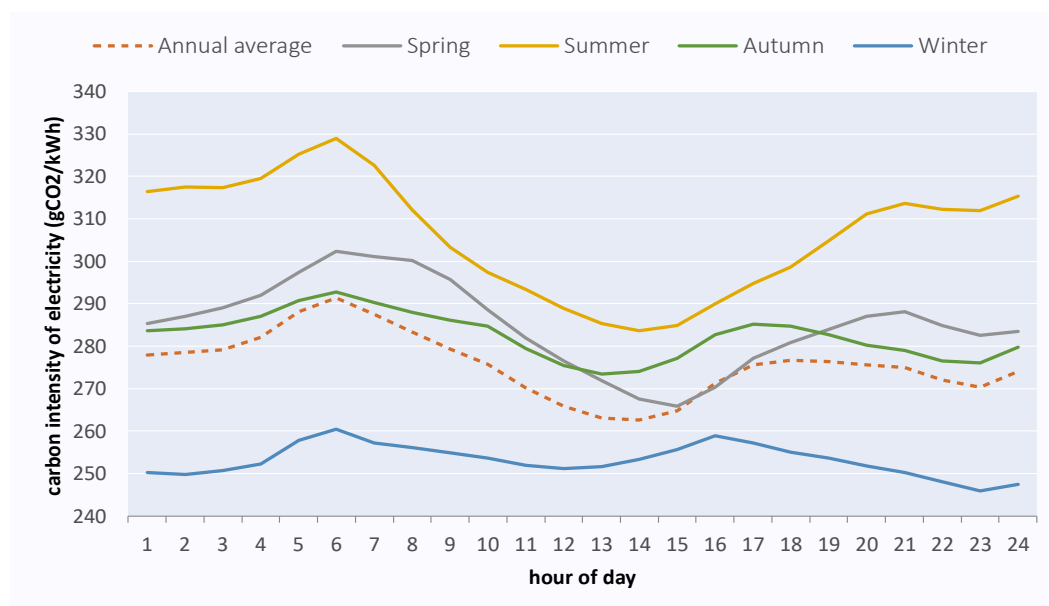


Figure 1: Electricity CO₂ intensity across different times of the day and season

1.1.2 Peak electrical demand and electrical grid stress reductions due to TES

While electrical grid upgrades will be required to support the roll-out of renewable electricity generation and the electrification of heat and transport, TES allows 997MW of this demand to be moved to off-peak periods, freeing up capacity when the electrical grid is under most stress. With TES installed the overall peak electrical demand only increased by 12.8% (682MW) compared with a 31.6% increase (1,679.8MW) without TES when the CAP24 heat targets were included.

¹ Based on 15-minute carbon intensity factors from Eirgrid for 2023

² Based on the most financially viable TES sizes for this use cases – further CO₂ reductions are possible for larger size TES but the decision to increase the size would be for environmental benefits rather than cost benefits unless new tariffs which consider the carbon intensity of electricity are adopted

³ [Directive \(EU\) 2024/1711 on electricity market design \(June 2024\)](#)

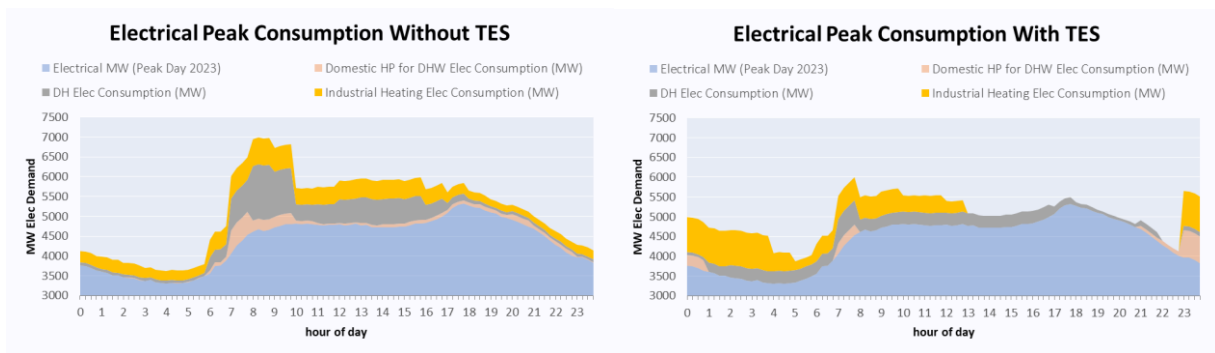


Figure 2: Difference in national peak electrical consumption both with and without TES

1.1.3 TES contribution to the CAP flexible demand target

TES can provide 76% of the Climate Action Plan flexibility target (20-30% of demand by 2030)⁴ if the electrification of heat targets (no. of domestic heat pumps, heat demand supplied through efficient DH networks and electrification of industrial heat from CAP) are achieved, making the electrification of heat a two-fold solution when combined with TES.

1.1.4 How does TES compare with large-scale battery energy storage systems

TES is more efficient than the equivalent size battery energy storage systems in terms of cost (typically 99% lower), space (90% lower) and raw materials (66% lower)⁵

1.2 Where is the value for thermal energy storage asset owners

Implicit flexibility i.e. flexible operation driven by variations in electricity price (smart tariffs) provide the biggest opportunity for those with thermal energy storage, accounting for 74 - 90% of heat production cost reductions for Industrial and district heating sectors. For the domestic sector where explicit flexibility cost reductions are currently more limited this can be up to 100%. The figure below indicates the value stack for the optimally sized TES in each of the industrial, district and domestic heating sectors. Please note that these values are based on operational revenues/savings and do not include benefits from reducing the peak electrical demand (e.g. lower grid connection costs and lower MIC charges)

⁴ The corresponding MW of storage for this target (2,475MW across different durations) calculated by Eirgrid for this target are shown here - <https://www.gov.ie/pdf/?file=https://assets.gov.ie/245172/2c2fd729-261b-4b64-af5e-c7f5f8d18924.pdf#page=null>

⁵ based on the comparison between large-scale battery energy storage systems and large-scale tank thermal energy storage

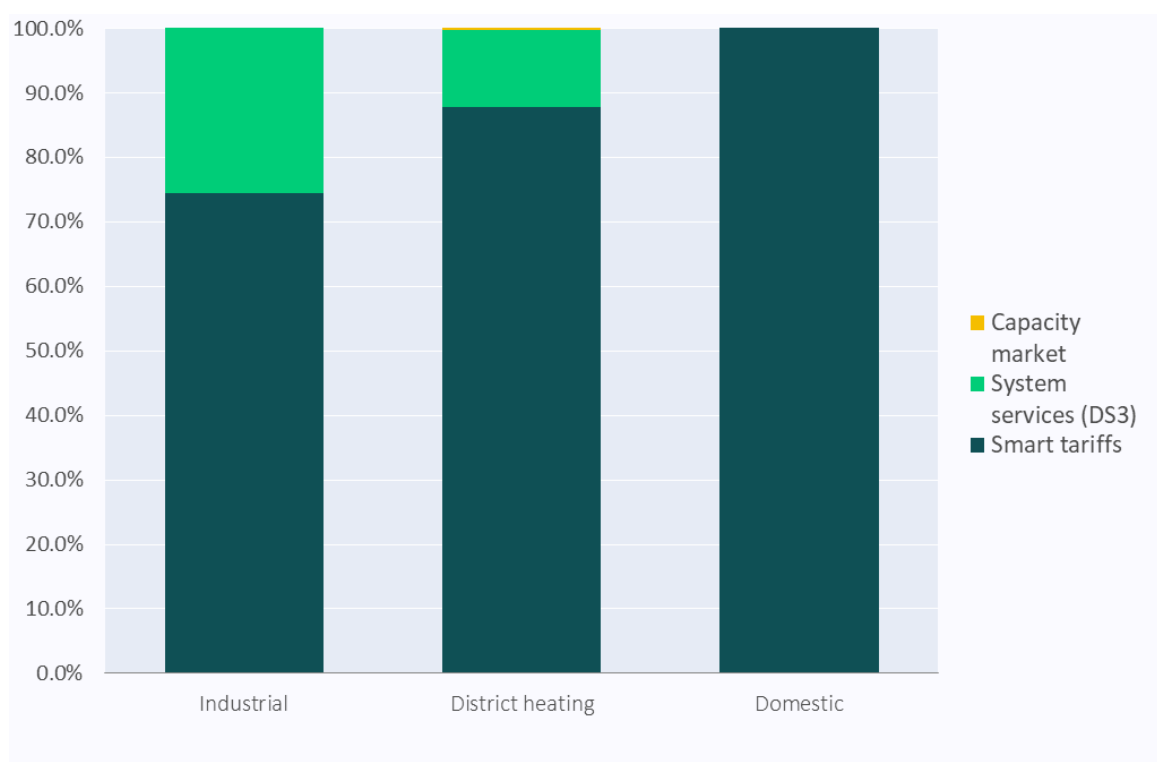


Figure 3: Thermal energy storage revenue/savings stack for different heating sectors

1.3 Heating system suitability for providing system services (DS3)

Electrified heating systems connected to TES can provide a broad range of grid supports. The table below indicates the heating technologies suitable for providing current system (DS3) services - indicated by a green tick. Any installation that is marked with an orange 'a' in the table indicates the likely need for aggregation of multiple installations to provide the required capacity to provide this service. It should be noted that for smaller installations (of less than 200kW flexible electrical load for individual sites or less than 100kW for a site that is part of a group of sites with the same owner⁶), the cost, time and effort required to aggregate them for ancillary services can present a significant challenge. The phone symbol (☎) in the table indicates that asset owners should contact their heat pump manufacturer in order to find where within this likely range the response time for their specific heat pump lies.

Table 1: Heat production equipment typical suitability for providing ancillary services

Ancillary Services		FFR	POR	SOR	TOR 1	TOR 2	RRD	RM1	RM3	RM8
District heating and Industrial	Heat pump	X	☎	☎	☎	✓	✓	✓	✓	✓
	Electric boiler	X	✓	✓	✓	✓	✓	✓	✓	✓
Commercial ⁷	Heat pump	X	☎	☎	☎	a	a	a	a	a
	Electric boiler	X	a	a	a	a	a	a	a	a
Domestic	Heat pump	X	☎	☎	☎	a	a	a	a	a
	Immersion	X	a	a	a	a	a	a	a	a

⁶ Based on discussions with demand response industry experts

⁷ The expected heat capacity of commercial heat pumps is assumed to be 45kW to 1MW, in line with the SEAI Heat Pump Implementation Guide. This can be converted to electrical input using the appropriate CoP.

1.4 Heat production cost reductions due to TES

Thermal energy storage tackles energy affordability by reducing the cost of heat production by up to 28.4%, 45.5% and 28.1% for industrial, district heating and domestic heating installations respectively. For the most economically viable TES installations (i.e. those with the best rate of return) the electricity savings are 22.5%, 38.1% and 28.1% respectively.

1.5 How does TES compare across different scales and sectors

Large-scale TES is more cost, space and energy efficient⁸ than domestic scale TES with the ability to make a greater proportion of heat demand flexible due to it being connected to both hot water and space heating demand where domestic TES is typically connected to hot water only

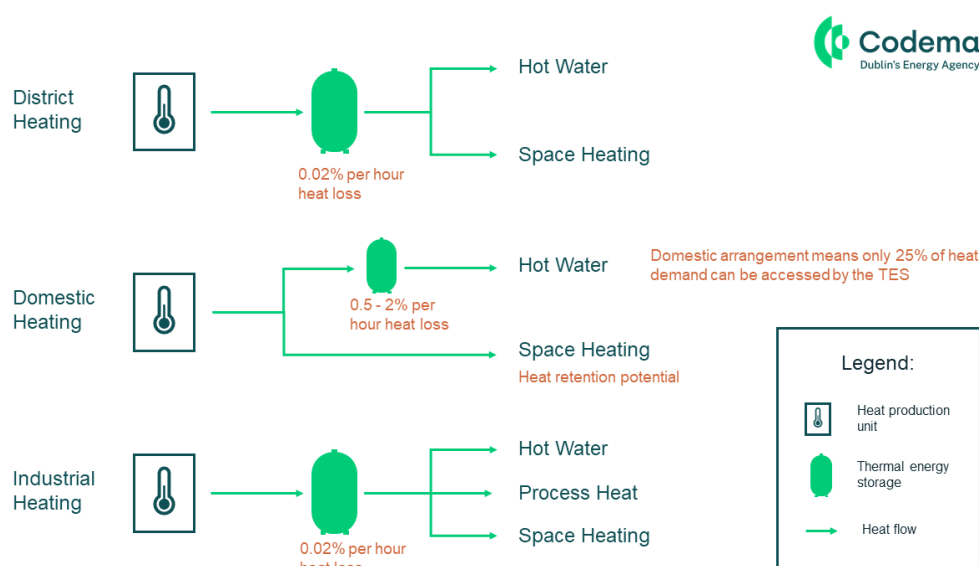


Figure 4: Typical heat loss and heat demand access across different scales

The majority of electricity prices paid by customers are fixed costs that do not change with changes in consumption. This fixed cost proportion is increasing. This limits the ability of implicit flexibility to drive changes in consumption patterns

⁸ Heat losses from domestic hot water tanks are typically 50 -100 times higher than largescale storage tanks due to the difference in volume to surface area ratios and the increased level of insulation used on large-scale thermal storage tanks (typically 300mm insulation)

2. Recommendations Summary

1: Make Electrified Heating Affordable and Competitive

- **Close the spark gap** by rebalancing electricity and gas pricing:
 - Reform taxes and levies to reflect falling electricity CO₂ intensity.
 - Eliminate fossil fuel subsidies and reinvest in low-carbon heating (e.g. heat pumps, DH, geothermal).
 - Adopt TES to make greater use of cheaper off-peak electricity, reduce cost associated with putting stress on the grid (connection costs, MIC) and enable greater use of more efficient heat production units to reduce heat production cost
- **Reduce fixed electricity charges**, enabling more dynamic pricing that rewards flexible demand.
- **Ensure TES is eligible for funding support**, similar to current grant support for battery systems through relevant mechanisms such as the SSRH, EXCEED, home energy upgrade grants, electrical grid reinforcement funding, etc. This should include both short and long duration thermal energy storage
- **Include electricity price reduction as a CRU goal** to incentivise electrification.
- **Deploy low-cost renewable power** to reduce/stabilise electricity prices and reduce exposure to global fossil fuel volatility.
- **Consider the role of TES in the Energy Affordability Action Plan⁹ and align with the Energy Poverty Reduction (Use the Surplus Renewable Energy) Bill¹⁰** by:
 - Prioritising low-cost electricity for TES in DH and heat pump systems serving those at risk of energy poverty (e.g. in social housing or older households).
 - Emphasising the use of TES that can access space heating (not just hot water) to maximise benefits to residents suffering from energy poverty.
 - Recognising the ability of large thermal energy storage (typically connected to district heating networks) to store heat energy over longer durations allowing free curtailed electricity to potentially cover the full heating demand for those suffering from energy poverty

2: Unlock Flexibility Through Tariffs, Smart Devices, and Data Access

- **Launch communication campaign for heat asset owners on how to provide flexibility** to the grid and earn benefits - the guides produced as part of this study can support this
- **Enable dynamic and smart tariffs** by:
 - Making smart tariffs the default for smart meters (with opt-out).
 - Supporting public awareness campaigns to encourage participation.
- **Provide open access to electricity price forecast data** (e.g. SEMOpx, EirGrid) via API to support flexible operation and optimisation. To enable greater use of heat operation planning tools like energyTRADE¹¹ or similar
- **Introduce flexible network charges** that align system costs with actual temporal use of the network, encouraging demand shifting.
- **Explore 'low-carbon tariffs'** that vary based on real-time grid emissions (CO₂ intensity)
- **Mandate smart-ready domestic heat pumps** capable of responding to APIs and price signals.
- **Address lack of subsurface data** to enable the development of underground TES
- **Continue the roll-out of smart meters** in homes and businesses

⁹ Due to be developed by the National Energy Affordability Taskforce by December 2025 - https://assets.gov.ie/static/documents/NEAT_Agreed_Terms_of_Reference_002.pdf

¹⁰ <https://www.oireachtas.ie/en/bills/bill/2025/6/>

¹¹ <https://www.emd-international.com/software/energytrade>

3: Recognise and Integrate Thermal Energy Storage (TES) into Grid and Market Design

- **Recognise/explicitly define TES as a grid asset** in planning and operations, in line with REDIII.
 - Include TES in the required **National Flexibility Needs Assessment**¹² as non-fossil storage and demand-side flexibility.
 - **Ensure TES in national energy models and studies** such as the National Comprehensive Assessments, Eirgrids Future Energy Scenarios, the TIMES Ireland Model etc.
- **Enable TES participation in energy markets:**
 - Allow **negative notifications** for storage assets in the balancing market.
 - Ensure **access to new flexibility/demand-up services** under DASSA for electrified heating + TES
- **Use TES to reduce grid reinforcement costs** by integrating waste heat and renewable heat sources for local supply.

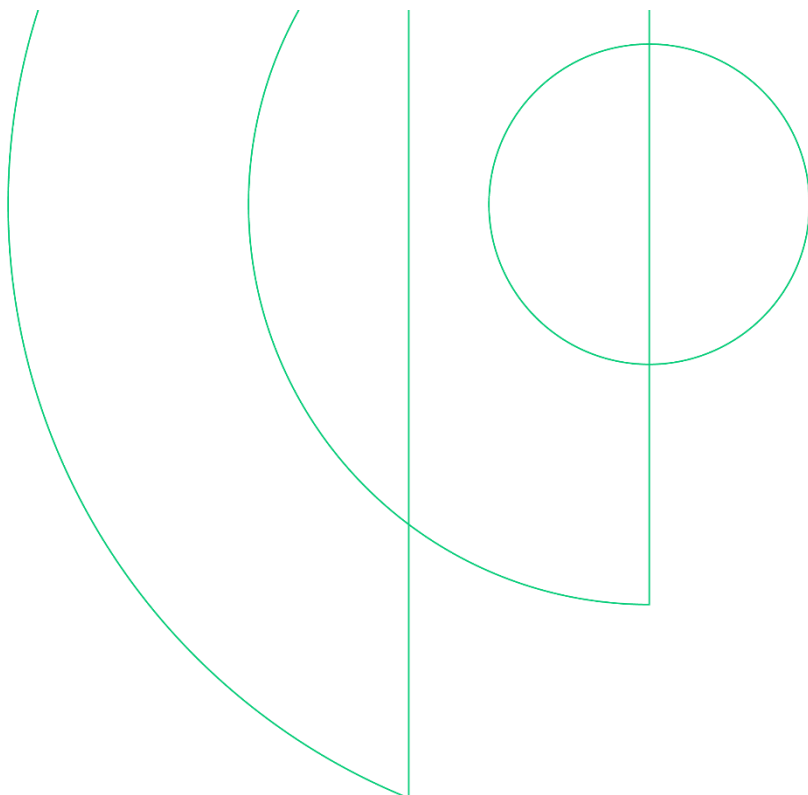
4: Enable Infrastructure and Market Access for Flexible Heat Assets

- **Streamline grid access** for heat technologies:
 - Coordinate between ESB Networks and EirGrid for **faster, non-firm connections**.
 - Enable **flexible connections** that support dispatchable loads like electric boilers.
- **Implement the EU Electricity Directive on sub-metering:**
 - Allow separate electricity suppliers/tariffs for devices like heat pumps (and EVs).
 - Consult the heat sector on enabling business models using this framework.
- **Simplify and shorten permitting procedures for TES** - in line with Article 16 of REDIII where TES projects are recognised as 'renewable energy projects'

5: Scale Equitable and Visible Low-Carbon Heating Solutions

- **Showcase Irish TES demonstration projects** to build public and political awareness.
- **Adopt stronger Renewable Heat Obligation (RHO) targets** and promote **Heat Purchase Agreements for renewable heating, not just credits for renewable heating fuels** to accelerate investment in renewable and waste heat installations which are not fuel based.

¹² Required under the European Electricity Market Design Reform Regulation (EU) 2024/1747



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