ESB Networks Demand Flexibility Consultation

IrDEA Submission | 14 February 2024

Consultation on the ESB Networks Demand Flexibility Consultation

Public Consultation Submission | Irish District Energy Association | 14/02/2024

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Introduction

District energy systems play a crucial role in demand-side management and electricity system flexibility by offering load shifting capabilities, integrating renewable energy, employing CHP technology, participating in demand response programs, and enhancing grid stability and resilience. These benefits contribute to a more efficient, sustainable, and resilient energy system.

An integrated systems-based approach is essential to delivering on Ireland's commitment to decarbonising heat and electricity, and district energy systems are key to any such approach. The Irish District Energy Association (IrDEA), therefore, offers this submission to ensure this vital technology is given full consideration for the wide range of energy system benefits it offers.

We are happy to contribute to this consultation on behalf of our members and those they serve and would be happy to provide any further information or materials that may be of use to those involved in this decision-making process.

About IrDEA

Founded in 2017 to promote the development of low-carbon district energy in Ireland, IrDEA currently represents over 30 member organisations boasting a range of specialisms across the value chain of the district heating and cooling sector both in Ireland and abroad.

We are the only association in Ireland dedicated to supporting and representing the interests of the district energy sector. It is our role to identify and propose solutions to the barriers faced by the sector in meeting the Climate Action Plan 2023 target of supplying enough heat and hot water to serve the needs of up approx. 200,000 homes and 2500 public/commercial buildings by 2030 (i.e., 2.7 TWh of district energy).

Acting on behalf of our members, we support and promote the growth of the district energy sector in Ireland to aid the creation of a new heat market that offers greater opportunities to use indigenous low-carbon and renewable sources of heat.

Our activities include,

- Developing and promoting policy on district heating & cooling.
- Supporting the growth of the sector in Ireland.
- Building and sharing knowledge on district energy in Ireland.
- Stakeholder engagement.
- Commissioning and supporting research on district energy.
- Collaborating with organisations with similar missions to our own in Ireland and abroad, this includes Renewable Energy Ireland and Euroheat & Power.

About District Energy

As of mid-2023, there were just over 17,000 district heating networks across Europe supplying heat to 70 million people (Piel et al., 2023). It is no coincidence that some of the countries with the highest shares of renewable heat across Europe are also heavy users of district energy – they include Sweden, which boasts a renewable heat share of 68.6%, Estonia (61.3%), Latvia (57.4%), Finland (52.6%), and Denmark (51%). By contrast, Ireland has the lowest renewable heat share in Europe at 5.2% (Eurostat, 2023), with less than 1% of heat demand being met by district energy (SEAI, 2022).

SEAI's National Heat Study (SEAI, 2022) provides a comprehensive assessment of the options available to decarbonise Ireland's energy used for heating and cooling homes, businesses, and industry. Published in February 2022, the study indicates that up to 54% of Irish buildings could be suitable for connection to district heating networks.

The total investment required to achieve this is estimated at between €2.7 and 4 billion for the deployment of the heat networks and associated heat production plants (approx. 40% public piping, 20% homes & buildings, and 40% new low-carbon production plants) (Government of Ireland, 2023). With over 30 million homes currently connected to district energy across Europe, we estimate that for Ireland to achieve its 2030 district energy targets, less than 1% of what the industry has already delivered in Europe (Piel et al., 2023).

Beyond the decarbonised heat benefit promised by the sector, the rollout of district energy networks will likely lead to the creation of over 2,000 full-time jobs over the next decade. The skills and training for which already exist at the interface between energy, engineering, and construction. Significant cross-over is likely between the district energy sector and these three broad areas of skills and training, which presents a key avenue for workers seeking to transition from fossil intensive industries to renewables (Vogeley et al., 2020).

Benefits.

Figure 1. Benefits of District Energy (HeatNet NWE, 2021)

District heating has many economic, environmental, and social benefits, such as carbon reduction, reduced maintenance costs, increased comfort, and reduced fuel poverty. Local authorities, building developers, building managers and customers can all benefit from the development of a district heating network in their area, this includes:

1. Easier integration of renewable and low-carbon heat sources without disruption to customers/homeowners as access to each individual dwelling is not required.

2. Lower local air pollution as buildings fossil fuel boilers would no longer be required.

3. Facilitates utilisation of indigenous low-carbon resources which would not make sense at a smaller (individual building) scale such as deep geothermal and industrial waste heat resources – leading to more efficient operation of both industrial plants and heat production and supporting a more circular economy.

4. Provides storage and demand side response for the electricity grid at a fraction of the cost of battery storage when supplied by large-scale heat pumps, electric boilers etc. This also facilitates greater production of renewable electricity (e.g., curtailment of wind turbines can be reduced) due to the flexibility provided by this thermal storage capacity.

5. Increased customer safety as there is no risk of gas leaks or carbon monoxide due to on-site combustion of fuels.

6. Benefits local economy by providing low-cost heating to customers (reduced overheads) and residents (reduced fuel poverty), potential revenue from waste heat for local industries and providing new local employment in the construction, operation, and maintenance of the network.

7. Efficient operation of heat production plants is ensured by constant monitoring, operation and maintenance being carried out by trained professionals – this is not possible with solutions located in individual homes where equipment is often not maintained to regularly achieve high operating efficiencies.

Consultation on the ESB Networks Demand Flexibility Consultation

Public Consultation Submission, Irish District Energy Association

1. Context

The district energy sector is set to deliver on its Climate Action Plan 2023 targets of,

- 2025 – 0.8 TWh (heat demand equivalent of approx. 80,000 homes) (2022, p. 161).
- 2030 – 2.7 TWh (heat demand equivalent of approx. 200,000 homes) (2022, p. 161).
- 2050 – All buildings to either be connected to heat pumps or district energy networks (2022, p. 163).

The sector has been energised by the policy signals that have emerged over the past two years to encourage the establishment and growth of district energy in Ireland. This includes the District Heating Steering Group Report (2023) and Climate Action Plan 2023, and the active commitment to produce a Heat Act. For us, three specific areas of policy will be the key to opening the market and kick-starting the delivery of projects on the ground. They are,

1. A robust and transparent regulatory framework to help de-risk projects and safeguard consumers.
2. An efficient and effective consenting regime to facilitate the rollout of district energy networks under public roads. This is vital to facilitate the connection of individual buildings, campuses, and communal heating schemes to a wider district energy network that can create economies of scale.
3. A funding regime for CAPEX and OPEX to underwrite affordability for consumers choosing heat networks and support the establishment and growth of heat networks across Ireland.

This consultation response ties into these aims by outlining the vital role district energy can play in balancing demand and providing much needed grid flexibility by using thermal energy storage solutions and reducing pressure on electrified renewable heating solutions.

Demand Reduction
District energy systems can employ various strategies to reduce energy demand during peak periods. For example, they can implement energy efficiency measures in their infrastructure, such as optimizing heat transfer processes, improving insulation, or using more efficient equipment like combined heat and power (CHP) units. By reducing overall energy consumption, district energy systems can alleviate stress on the grid during peak demand periods.

Demand Shifting
District energy systems can also shift energy demand to off-peak periods by utilizing thermal energy storage (TES) systems. TES allows excess thermal energy generated during periods of low demand to be stored for later use during peak hours. This flexibility enables district energy systems to align their energy production with demand patterns, thereby reducing strain on the grid during peak times.

Injection of Power
Some district energy systems incorporate renewable energy sources such as solar thermal, geothermal, or biomass, along with conventional energy sources like natural gas or district heating and cooling networks. These systems can generate surplus power beyond their immediate demand requirements. This excess power can be injected back into the grid or used to support local energy needs during peak periods, contributing to overall grid stability and reliability.

Contracted Capacity and Duration
District energy systems typically operate under contractual agreements with their customers or utility providers. These contracts often specify the capacity that the district energy system is obligated to provide and the duration for which this capacity must be maintained. By efficiently managing their operations and employing demand management strategies as mentioned above, district energy systems can meet or exceed their contracted capacity obligations for the required duration, ensuring reliable and consistent energy supply to their customers.

Overall, district energy systems play a crucial role in supporting energy system demand reduction, demand shifting, and injection of power by optimizing energy use, integrating renewable energy sources, and maintaining reliable operation in alignment with contractual commitments.

2. Consultation Question Responses

1. ***What are stakeholder's views regarding allowing and incentivising the multi-market participation (or revenue stacking) of flexible assets?***

   How would the allowance of multi-market participation impact the business case of flexible assets? What other barriers to multi-market participation/revenue stacking for flexible assets may still exist, even if allowed by ESB Networks' market arrangements? Does the allowance of multi-market participation introduce delivery risks for distribution level markets for demand flexibility that should be considered?

   As a key component of Ireland's renewable energy future, heat networks offer significant demand management and energy system flexibility benefits that can only be unlocked trough the facilitation of multi-market participation of flexible assets. District energy systems are primed to participate in multiple energy markets simultaneously, leveraging their flexibility and diverse energy resources. Whether through electricity market use of surplus power generated from CHP units, or through heating or cooling markets benefiting from the supply of thermally stored energy to consumers, including residential, commercial, and industrial buildings, district energy is a strong example of how multi-market participation can allow for an integrated approach to decarbonising our energy system.

   Equally, by diversifying revenue streams, district energy systems can enhance their financial viability and improve cost-effectiveness, which in turn would aid and quicken the sector's ability to deliver on Ireland's heat decarbonisation targets. Cost savings and energy optimization can be achieved through a range of measures including Combined Heat and Power (CHP), Energy Efficiency Measures, Demand Response, and Thermal Energy Storage. For example, CHP technology used in district energy systems can achieve higher energy efficiency by simultaneously producing electricity and capturing waste heat for heating or cooling purposes, resulting in reduced fuel consumption and lower operating costs. Energy efficiency measures enacted within the infrastructure itself can also deliver a broader benefit to the system that reduces energy losses and operational costs, in turn reducing demand pressure.

   District energy systems can go further by participating in demand response programs that leverage their ability to adjust energy consumption patterns in response to grid conditions or price signals. This would ultimately reduce peak demand pressures on the grid and charges to the customer, thereby earning incentives for consumers and distribution providers alike.

   Perhaps of most relevance to the present consultation, Thermal Energy Storage (TES) systems enable district energy systems to store excess energy in thermal form when it is freely available or being produced at a more economical cost and use it during peak demand periods. This results in cost savings by avoiding the need to purchase energy at peak prices and offers the ability to exert downward pressure on the levels of peak demand by using energy that has been stored off the grid. In offering the potential for short, medium, and long-duration energy storage, TES has the potential to offer significant storage capacity to the energy system and must be regarded as a vital component in Ireland's renewable energy future.

In short, TES involves capturing and storing energy in thermal form when it is abundant or being produced at low cost. At the most basic and smallest scale this is done with a domestic hot water tank, but it can range upwards in scale to systems such as pit thermal energy storage systems (PTES), which are essentially insulated underground storage reservoirs of such scale that they can provide seasonal storage for district energy systems. When demand exists for the stored energy, its temperature is lifted to the level needed for distribution to consumers. This is usually done using electric heat pumps or boilers. With a coefficient of production (COP) of approx. 3 being standard for largescale heat pumps on these systems, 4 units of heat can be produced with just one unit of electricity using this method. Vitally, from a demand flexibility standpoint, this application offers a route to market for energy produced at non-peak times allowing for a flattened demand curve and additional energy system storage capacity.

By actively participating in multiple energy markets, stacking revenue streams, and implementing cost-saving measures, district energy systems can achieve significant financial benefits while contributing to overall energy system efficiency and resilience.

2. *What are stakeholders' views regarding the focus on ensuring that procurement of demand flexibility does lead to reductions in system wide carbon emissions?*

It is vital that energy system innovations and developments centre reduced system wide carbon emissions. This is necessary to meet our international commitments, achieve climate change mitigation, reduce negative health and environmental impacts, ensure sustainable economic development, and bring about energy security.

Ireland has made specific commitments to reduce system wide greenhouse gas emissions (GHG) through a range of domestic policy instruments such as the Climate Action Plan 2024 and international agreements at EU and broader international level. To deliver on those commitments it is vital that every opportunity is leveraged to improve environmental sustainability, energy system innovation is a key part of that and any demand flexibility that is procured by ESBN in the short, medium, and long term must aim to deliver reductions in system wide carbon emissions.

When assessing 'system-wide' carbon emissions, ESBN should look beyond the electricity sector as the benefit of district heating is that it will enable electricity to decarbonise the heating sector. To capture this, the assessment must look beyond just the electricity sector when quantifying if a 'system-wide' carbon reduction has been achieved.

3. *What are stakeholders' views on the suite of guiding principles outlined above?*

The primary purpose of flexibility procured by ESB Networks will be the management of distribution system needs, with carbon abatement delivered as a result of this activity.

As a guiding principle, it is problematic that carbon abatement will solely be delivered as a function of distribution system management rather than as an end. It is vital that carbon abatement be regarded more centrally to the commercial choices being made to address demand management and the introduction of greater flexibility to the system. This is important to ensuring that where alternative approaches are under consideration, carbon abatement is a key consideration in decision-making rather than being viewed as a positive bye-product.

As an association dedicated to promoting and supporting the development of district energy to help deliver decarbonisation in Ireland's energy sector, IrDEA is highly committed to the achievement of carbon abatement as early and to the greatest degree possible through all policy mechanisms at our disposal. We urge that this guiding principle be amended to place a greater focus on carbon abatement as an end.

The efficient operation of flexible assets across all markets should be incentivised to minimise the total cost to energy customers.

This guiding principle is welcome.

Insofar as possible, the procurement of demand flexibility should lead to reductions in system wide carbon emissions.

This guiding principle should be strengthened to create a positive obligation to seek reductions in carbon emissions through the demand flexibility options procured. It is understood that an absolute obligation to obtain reduced emissions in all procurement choices would likely be overly restrictive and may reduce the ability to respond to emergency situations and make practical commercial decisions. Nevertheless, it would be possible to shift the emphasis of this guiding principle to require a higher threshold of emissions reduction than a system-wide assessment based on the improved system performance while retaining an element of flexibility.

IrDEA recommends that an obligation be placed within this guiding principle to obtain demand flexibility that results in direct carbon reductions. A caveat should accompany this to allow for derogation where it is not possible for either technological or reasons of economic feasibility to achieve this. The very minimum threshold we should aspire to in the purchase of demand flexibility is the improved energy performance of the system and a resulting reduction in emissions, it is important that this guiding principle set a higher aspiration than this for emissions reduction, while ensuring that the definition of system-wide relates to the energy system as a whole rather than solely electricity, as in many cases the carbon reductions achieved with district energy will be in the heat sector, but using electricity.

Procurement and contracting of demand flexibility should not result in undue risks or costs to the electricity customer.

This guiding principle is welcome.

4. ***What are stakeholders' views regarding how services for demand flexibility will be defined?***
It is welcome that a localised approach will be taken to assessing the demand flexibility needs of the system and an open approach will be taken to defining the parameters of any tendering process resulting from locational analysis. IrDEA urges that within the context of this, district energy systems, including thermal energy storage solutions, be allowed for wherever feasible when tendering parameters are being defined to ensure that this proven, available, and cost-effective storage solution be given the consideration it deserves to form part of Ireland's demand flexibility system.

The case for Thermal Energy Storage (TES)
There is a natural saturation point for any form of storage. It is, therefore, vital to promote the adoption of a variety of options to ensure the most appropriate and efficient use is made of each one across the system. This is particularly the case when it comes to ambitions to move the electricity system to 80% RES-E, as the efficiency profile of storage solutions changes as the RES-E saturation increases. *Per* Figure 2 below, the greater the saturation of intermittent renewables within the system the greater the need for long-duration storage options. Though the present consultation is more focused on medium-term storage solutions, the makes sense to build towards a greater level of long-duration storage capacity in the long-run to achieve longer term results.

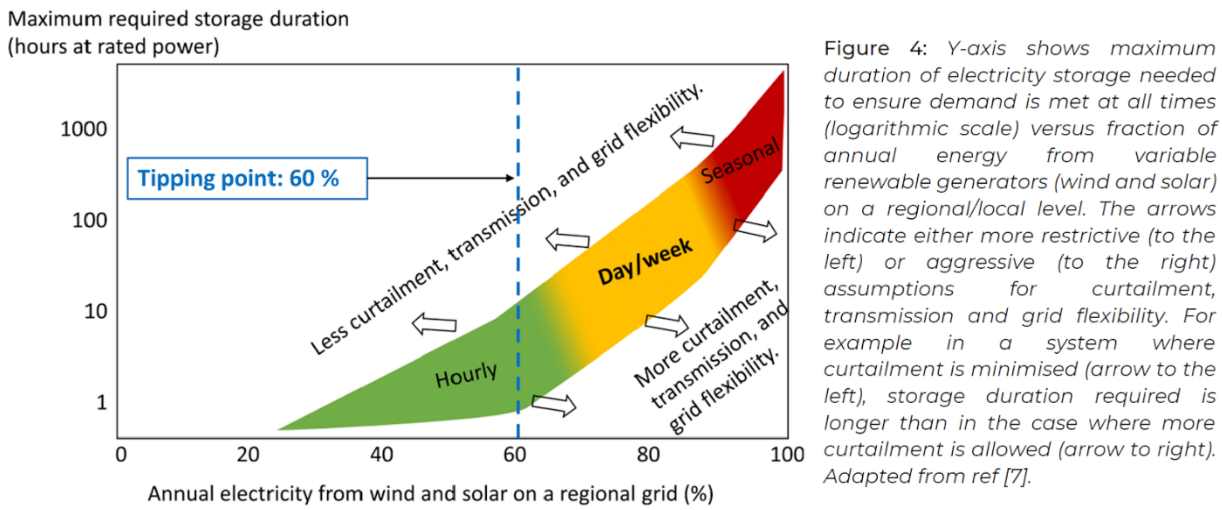

Figure 2. Storage durations for intermittent renewables led electricity generation systems.

The need for storage across various durations (up to 8 hours) is estimated at 2,475MW or 10.8GWh for a 'Central' scenario (Eirgrid, 2022). However, as it currently stands, most battery storage today is limited to durations of 2 to 4 hours as durations beyond this have proven expensive to deliver. While this works for an energy mix of under 40% RES-E, once we move beyond that point longer duration storage is needed to support the system, which requires storage durations of multiple hours to days. Having reached a share of 38.9% in renewable electricity generation in 2023 (SEAI, 2023), never has there been a more pressing need to identify, procure, develop, and deliver long duration storage capacity to support Ireland's energy system.

While battery technology is evolving and advancing at pace with new batteries beginning to offer longer durations than the more established 2–4-hour range, this technology is neither freely available nor well established. This presents a short to medium term problem for the Irish energy system as it gradually ramps upward to a sustained 80% RES-E saturation in time for the 2030 deadline. Alternative forms of long-duration storage are, therefore, needed to meet the storage needs of a system with an increasingly renewables-led energy mix. TES is an established and tested mix of technology; vitally, it is primed and ready for deployment across the Irish energy system alongside the soon to be scaled up district energy system.

Thermal storage is ideally placed to address this gap as larger scale, longer-duration TES systems prove to be more cost effective than shorter term and smaller scale alternatives. If, for example, the Climate Action Plan 2024 targets for District Heating & Cooling are achieved, it could provide 1300MW or 9.1GWh of low-cost large-scale thermal storage to support the electricity grid (between 53% and 84% of the storage capacity required based on the MW and GWh estimates from Eirgrid respectively) by 2030 (Codema, 2023). This is a particularly important function considering the duration limitations on battery storage solutions, which tend to decrease in cost-effectiveness as storage duration is increased. Conversely, TES systems become more cost effective the larger their scale and the longer their duration.

Indeed, largescale TES systems typically cost a fraction of best-case large-scale battery storage, this is in the order of 0.65% - 4.4% or 50 to 100 times less (Hennessy et al., 2019; Lund et al., 2016a). Broadly speaking, these systems add significant value to the energy system. For example, using largescale installations in Irish district energy networks, as commonly seen in countries like Denmark (Ramboll Sverige, 2015; Zourellis, 2022) would cost approx. 0.065% when compared with equivalent battery storage. Further savings can then follow, for example, from making use of lower night-time electricity rates to generate heat for storage. In this case, the capital cost of the storage would only relate to the cost of the controls required to link its operation to signals from the electricity grid operator or market with the necessary response times. Large-scale TES also benefits from reduced levels of degradation through the charge and discharge cycles over its lifespan when compared with battery storage.

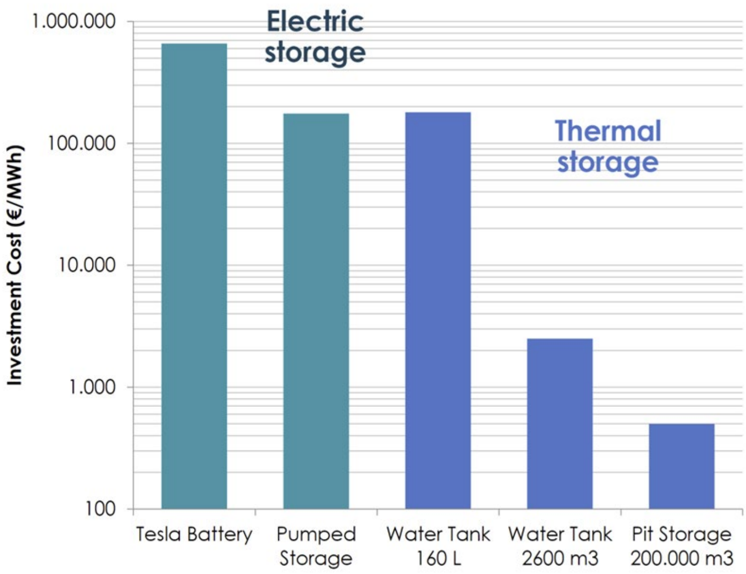

Figure 3. Energy Storage Technology Cost Comparison (replicated with the permission of Codema) (Lund et al., 2016b)

Reduced Curtailment

A further benefit of TES systems is their ability to reduce curtailment of renewable electricity generators by capturing dispatchable demand during low demand periods. These systems provide frequency response to keep the grid stable as the proportion of renewable generation increases. They further help to reduce congestion on the network by introducing flexibility to meet demand (particularly in peak winter when peak heat and electricity demand coincides).

This reduces electricity network constraints by delivering more efficient heat production and by-passing large sections of the lower voltage electricity grid when compared with other forms of electricity integrated heating such as individual building heat pumps. Codema, the Dublin Energy Agency, has estimated a 71% reduction in low and medium voltage grid reinforcement costs when using DHC networks compared with individual building heating solutions based on the Dublin Region Energy Masterplan (O'Shea, 2021).

TES systems can also reduce demand on the grid at times of peak demand by releasing stored energy to flatten peaks, this would provide significant value to the wider energy system from a system security and affordability perspective as it would reduce reliance on flexible thermal generation to provide load balancing.

Evidence from other jurisdictions shows the efficacy of using this form of sector coupling to reduce curtailment in renewable energy generation (IRENA, 2020). Significant gains have been demonstrated at scale in energy systems with high concentrations of district energy systems. For example, with approx. 50 GWh of thermal storage as compared with less than 2 GWh in Ireland, Denmark is well placed to harness a greater proportion of its significant renewable generation potential. When there is excess wind or solar power in Denmark, large-scale electric boilers and heat pumps are activated to produce heat on district heating systems. If there is no demand for the heat at that specific time, it is stored as thermal energy until a heat demand occurs. Wind or solar power that would otherwise be curtailed is instead used to generate heat before it is needed.

The proportion of energy that can be saved in this way is variable contingent on a range of factors. However, solid evidence exists across a range of jurisdictions and project types. For example, a collaborative demonstrator project led by the Birmingham Centre for Energy Storage, funded by the UK Engineering and Physical Sciences Research Council and the Natural Science Foundation of China, was able to pull 80% of its electricity demand, over 5 000 MWh per year, from wind energy sources that would otherwise have been curtailed.

From an Irish perspective, Renewable Energy Ireland (2021) estimated that by 2030 the annual electricity surplus will be approx. 2.8 TWh due to dispatch-down of intermittent renewable generation. However, we need not look to the future to make the case for the need to reduce curtailment. Enough renewable electricity was lost in the first six months of 2020 to power Galway for a year (Wind Energy Ireland, 2020). Yet, if harnessed by large scale heat pumps, with a current efficiency of 300%, 8.5 TWh of renewable heat could be produced cost-effectively as part of a demand-response strategy. Capturing this heat through thermal storage would allow for it to be used within district energy networks, thereby contributing to the decarbonisation of the heat network while simultaneously using a greater level of the potential generation capacity of the renewables feet.

Supporting Flexible Power Generation
Beyond helping to make fuller use of renewable generation capacity, TES also has a role to play in supporting the need for flexible thermal generation that is so integral to underpinning a renewable led system. By capturing waste heat, thermal storage offers a unique chance for thermal generation operators to improve the efficiency of their power outputs by making use of heat that would otherwise be lost. By offering a potential additional revenue stream, this could help to offset some of the considerable operational and capital expenditure costs associated with thermal facilities, thereby adding security to the electricity system, and helping to curb wholesale energy price rises.

As most thermal generation plants currently release heat equivalent to approx. 40% of their fuel input, it is estimated that waste heat could be equivalent to 8.7 TWh per year by 2030. If captured and sent directly to heat networks or stored in TES for later use within district energy systems, this waste heat could be used to boost the energy output of these plants. Such efficiencies have the potential to aid the viability and affordability of flexible thermal generation as the energy system evolves to increase the proportion of intermittent renewable generation in the energy mix.

Energy Price Stability
Despite an ever-increasing move toward renewables, most of Ireland's energy needs are still provided for through fossil imports. The Russian war in Ukraine and the resulting gas and oil shortages in recent years have shown the difficulty this can present both for security of supply and affordability. The greater the amount of local renewable heat and electricity in the energy system, the greater the level of local control and insultation from price and supply volatility.

Thermal energy storage as part of a district energy system allows for greater use of sustainable and renewable energy sources, which can help to reduce pressure on the grid and lessen demand for fossil generated energy. TES has the potential to reduce energy costs by flattening peak demand, which can reduce capital costs as it reduces the headline generation capacity needed to satisfy peak demands. This is of relevance to the current consultation, as it could have a direct effect on the extent of demand flexibility procurement that is ultimately needed to deliver stability in the Irish energy system. It also allows for capitalisation on cheaper rates of energy production as energy can be used to create heat while prices are low and released into the network when demand and costs are higher.

To incentivise investment and ensure energy is affordable for consumers, a balance must be struck between placing sufficient storage on the system and keeping capital costs to a minimum. As one of the most cost-effective storage forms currently available, TES has the potential to help achieve this; for example, when incorporated into a district heating system, TES is approximately 100 times cheaper than electricity grid storage (Lund et al., 2016a).

5. ***What do stakeholders consider is a feasible required energisation date? What is the minimum time required for developers between contract completion and energisation?***
This is contingent upon several factors from both the bidder and ESBN sides. For developers, idealised project delivery timelines can be produced in theory with reference to both international and Irish standard timelines. However, such estimations cannot factor in delays that may be encountered during the planning and consenting processes and any other delays that may be beyond the project developer's scope of control. For that reason, certain safeguards ought to be put in place to protect developers from unavoidable delays relating to the energisation date.

   From an ESBN perspective, the qualification criteria to either bid into the competition (whatever form it takes) and be successfully selected will be instructive of how advanced projects are likely to be at the time contracts are entered into. This in turn should inform how the energisation date is arrived at. Similarly, the time at which vital information such as precise locational requirements etc is provided to prospective bidders will also help to determine how far advanced projects can be before contracts are entered into. This is due to a range of factors, not least of which is supply chain access.

6. ***What are stakeholders' views on the carbon emissions limit the CRU should set to ensure that the procurement of demand flexibility results in a reduction in the carbon intensity of the system?***
Carbon emissions should be a central concern in the decision-making process to ensure the most environmentally advantageous projects are actively incentivised and prioritised by design. The purchase of demand flexibility represents a significant investment both financially and in terms of network capacity expansion. This is much needed, being necessitated by growing demand (both current and

predicted) due in no small part to electrification being relied upon as a means of decarbonising the energy system, including a large share of the heat sector. It would be objectively illogical to procure this additional capacity for the electricity network, which it is planned to operate using 80 RES-E by 2030, with demand flexibility that was not at least in part chosen for its carbon reduction properties.

To do other than place carbon reduction at the centre of this procurement process would be a logical fallacy and would risk the achievement of much needed carbon reductions. This is particularly the case given the eroding carbon budget for this decade and the incremental reductions that will apply in future carbon budgets.

For this reason, we recommend that carbon emissions limits should be carefully set to ensure viable and cost-effective demand flexibility options can be procured while incorporating the most ambitious carbon reduction limits possible. A sliding scale approach should be used to ensure that carbon emissions limits drop in future rounds of procurement in line with technological advancements and the intensified need to cut emissions to meet carbon reduction targets towards the end of this decade and into the next.

7. ***What is the minimum length of time before procurement that potential providers of demand flexibility need to receive a final list of network locations where ESB Networks' will seek to procure demand flexibility?***

This should be done as soon as possible to ensure the maximum number of options can be drawn into the procurement process. At minimum, 24 months' notice should be given to prospective bidders to ensure they can conduct all relevant assessments to determine project parameters and feasibility.

From a district energy standpoint, it is important to have at least this level of lead in for developers to determine whether existing or planned networks can incorporate the storage levels needed to bid into the process. Indeed, where developers are considering a range of locational choices for prospective network development, the potential for revenue stacking that a successful bid may offer could determinative of whether a particular network choice would prove more commercially viable than another.

The longer the lead in time on network locations, the greater the opportunity for district energy developers to progress projects that could meet the needs of heat consumers while also adding much needed demand flexibility to the electricity grid. This would result in improved all around efficiency across the heat and electricity sectors, the achievement of which would be incredibly beneficial for consumers and energy providers alike.

Information exchange and strategic asset development are key components of achieving this form of complementarity across the energy system. For its part, IrDEA would be more than happy to assist by creating part of an informational feedback loop that indicates to key stakeholders where projects are being pipelined for delivery etc. The Irish Heat Atlas (to be found at www.districtenergy.ie) could also be used to identify where heat demand is such that district energy projects are likely to succeed and, therefore, be developed as the Irish market grows.

8. ***What are stakeholders' views on the proposed floor and share revenue model? Does this model strike an appropriate balance between the needs of the energy customer and those of the provider of demand flexibility? Does this approach create risks which the CRU and ESB Networks should consider?***

IrDEA's key priority is to ensure the financial sustainability of district heating systems while maintaining affordability for consumers. We would hope that the potential for revenue stacking with respect to demand flexibility can be achieved, which would help to bear out that aim. Nevertheless, we also support the considered construction of a market that provides predictability and sustainability with respect to future revenue in the interests of consumers, investors, developers, and operators alike.

A floor price for the revenue generated from demand flexibility services would help to ensure the operating and maintenance costs that arise from this form of service provision, including investments in infrastructure upgrades and system maintenance. Setting a floor price helps safeguard the financial viability of district heating and TES systems, thereby providing stability for investors, which is vital to establishing and maintaining an investment-ready market environment. Similarly, ceiling prices can provide comfort to (potential) consumers by providing assurances that excessive tariff increases will not be introduced. This is important in the interests of consumer protection and consumer sentiment, which is, in fact, an important element of ensuring investment certainty for developers. Such ceilings must, however, be set at sustainable levels that allows for a viable and reasonable level of profit needed to attract investment.

Where applied, transparent, and predictable tariff regulation mechanisms are needed to govern floor and ceiling prices. This may involve regular reviews and adjustments of tariff levels based on factors such as changes in energy prices, operating costs, and investments in infrastructure. Transparent tariff regulation helps provide clarity for both consumers and district heating operators and fosters trust in the system. It is vital that tariffs being passed on to the consumer reflect the actual costs of providing heat to consumers (in the case of heat networks) and power to consumers (in the case of electricity). This includes considering factors such as fuel costs, maintenance expenses, investments in infrastructure, and environmental compliance costs. Cost-reflective tariffs help ensure the financial sustainability of district heating and TES systems and encourage efficient use of resources.

9. ***What are stakeholders' views on an appropriate level for the sharing factor? Please provide quantitative evidence, where available, to support any proposed sharing factor values.***
   No comment

10. ***What are stakeholders' views on the proposal for revenues to come in the form of availability payments, rather than utilisation payments? Is this approach also an appropriate enduring market solution or are there benefits in moving to an availability and utilisation payment approach in the future? If the approach should be reconsidered in future, what market indicators should be used to determine when a review of payment structure is necessary?***
    Electing to provide payments on an availability rather than utilisation basis offers both positive and negative elements, particularly for the providers of TES systems. The revenue certainty, simplicity, and risk mitigation benefits of this approach could help underpin business cases for those seeking to develop new TES and district energy systems as the demand flexibility element of their function would be a known quantity. This is an attractive prospect in many respects, particularly given the need for the sector to scale up over the coming decade and the requirement to put in place reliable and sizeable revenue streams in the early years of operation to support initial viability of individual systems. From this perspective, the proposal has merits that may be attractive and ultimately beneficial to bringing increased levels of TES onto the system in future years.

    From a future market viability perspective as any use of TES assets linked to district energy systems would likely be based on a revenue stacking arrangement, this level of commitment may ultimately constrain responsiveness of heat network systems operators to their primary consumer base. One of the key strengths of an optimised TES supported district energy system is its capacity to respond to consumer needs and trends, including consumer base expansion. Flexibility will likely become an important factor for TES and district energy system operators as the market evolves and matures, which may signal a need to phase out of an availability payment system to either a hybrid or solely utilization payment system.

    This would also benefit the wider energy system as utilisation payments can provide additional incentives for asset developers to maximise the use of their flexibility assets, leading to more efficient deployment of resources and potentially lower overall costs for grid operators and consumers. As the market for demand flexibility matures and becomes more sophisticated, utilisation payments may become more feasible and beneficial by aligning incentives with actual performance and utilisation of assets. Advances in technology, such as improved forecasting capabilities, more accurate demand response algorithms, and the integration of smart grid technologies, will likely remove barriers to more simplified utilisation payment systems based on real-time grid conditions and market dynamics. Equally, as the district energy system matures in the Irish context, data on demand, supply, and network expansion patterns will better equip developers, operators, and ESBN alike to reliably determine the level of available capacity for demand flexibility purposes.

    If considering a review of the payment structure in the future, market efficiency, the efficiency of the demand flexibility market in terms of resource utilisation, cost-effectiveness, and overall system reliability must be considered. The extent of advancements in technology that may enable more accurate and reliable utilization payments, such as improved forecasting tools and real-time monitoring capabilities. Changes in energy policy, regulatory frameworks, and market design that may impact the incentives and requirements for demand flexibility services should be taken account of along with the level of competition among flexible asset developers and the impact of payment structures on market participation and innovation. Periodic feedback should be sought from key stakeholders to understand their experiences with the existing payment structure and identify areas for improvement. By regularly monitoring these indicators and assessing the evolving market dynamics, it can be determined whether a review of the payment structure is necessary and opportunities to optimize the effectiveness of demand flexibility programs can be identified.

11. ***What are stakeholders' views on the proposed approach to penalties for non-delivery? Does the proposed approach to penalties create any barriers to revenue stacking (outside of times when not required by ESB Networks) that should be considered?***
    The proposed approach to penalties for non-delivery in the context of demand flexibility services provided to ESBN aims to ensure the consistent provision of flexibility when required. While penalties for non-delivery can

incentivise providers to fulfil their contractual obligations, it is very possible this approach will result in potential barriers to revenue stacking arising, particularly during periods when flexibility services are not required by ESBN.

Providers of demand flexibility services may be reluctant to engage in revenue stacking activities if they perceive the risk of incurring penalties for non-delivery to be too high. This risk aversion could discourage providers from participating in other revenue-generating opportunities, such as participating in additional markets or offering their flexibility services to other grid operators or energy market participants. From a district energy perspective, this is likely to have the reverse effect of discouraging developers and operators from contracting to provide demand flexibility services, or the extent of services that they otherwise could.

Penalties for non-delivery represent a potential financial liability for district energy providers that would have to be weighed carefully against the potential gains to be made by committing to provide demand flexibility to help manage grid capacity. This may affect willingness to engage in what would be a revenue stacking activity that could divert resources or attention away from meeting the needs of their primary consumer base. This would be a poor outcome given the significant potential for heat networks backed by TES to provide a range of demand management-related benefits to the wider energy system.

Overall, while penalties for non-delivery serve the important purpose of ensuring the reliable provision of flexibility services to ESBN, it is essential to carefully consider their potential impact on revenue stacking options for flexibility providers. Balancing the need for contractual compliance with ESBN requirements and the potential benefits of revenue stacking activities is crucial to fostering a flexible and competitive market for demand flexibility services. Regulatory frameworks and contract structures should instead be designed to incentivise providers to maximize revenue stacking opportunities while maintaining reliability and compliance with contractual obligations.

12. ***What are stakeholder's views on the indexation of payments for demand flexibility?***
    Indexing payments is a vital form of inflation protection for the developers and operators of demand flexibility assets. Given the significant CAPEX and OPEX implications of developing the type of assets needed to provide demand flexibility, the greater the level of financial certainty that can be projected at the beginning of the arrangement the better the long-term value for the consumer. In the absence of such an assurance, developers must build inflationary risk into their pricing structures, which would likely increase the overall cost of procuring demand flexibility support.

13. ***What are stakeholders' views on the proposed scheduling approach?***
    No comment.

14. ***What are stakeholders' views on the appropriate contract length?***
    A minimum contract length of 15 years is appropriate in the context of the market and the relevant investments needed to bring demand flexibility on stream. It may be appropriate to provide for the extension of this contract length subject to agreement or subject to the satisfaction of certain conditions, including the appropriateness of the payment regime given prevailing market conditions. This would be beneficial as it would provide a level of flexibility while also allowing for responsiveness to shifts in the market over the lifetime of the original contract.

15. ***What are stakeholders' views on the relative merits of a most economically advantageous tender process versus an auction process?***
    Given the importance of this process to ensuring the delivery of much needed demand flexibility to the grid, it is vital that whichever approach taken to procurement ensures the delivery of capacity in the first instance and an ability to do so in a cost-effective manner to support the needs of consumers. One of the key benefits of the most economic advantageous tender process is the emphasis on the value proposition offered by suppliers rather than solely the lowest price. This can incentivise suppliers to provide innovative solutions, high-quality products, or services, and added value beyond the basic requirements of the contract, which is highly desirable in the present consultation given the openness to drawing in proposals from a wide range of technology types and providers. A simple auction process could have the unintended consequence of narrowing the field of innovation, which could ultimately limit the options and opportunities available to ESBN to respond innovatively to the need for demand flexibility.

16. ***What do stakeholders consider are the metrics and levels of same that would indicate sufficient liquidity to enable a move to a price-based auction?***
    No comment

17. ***What are stakeholders' views on the proposed aims of the assessment criteria (value for money, deliverability and operability)? Are these aims sufficiently comprehensive? Are there other high level aims that the CRU and ESB Networks should consider?***
    Given the imperative to improve system wide efficiency, reduce carbon emissions, and provide for the medium-term needs of the energy system, it is important that these elements are reflected in the assessment criteria.

18. ***What are stakeholders' views on the proposed assessment criteria outlined in the table above? Are there other criteria which should be considered when evaluating the three key aims? Are the assessment criteria sufficiently clear to stakeholders? Do stakeholders consider that they will be in a position to provide evidence relating to the outlined criteria when responding to the procurement process?***
    No comment

19. ***What evidence of a tenderer's ability to deliver to the required energisation date should be required, taking into account the need to balance avoiding speculative tenders that may not deliver while not ruling out early-stage projects that are capable of delivery but require more time?***
    No comment

20. ***What are stakeholders' views on how the aims and assessment criteria should be balanced against one another when ESB Networks are selecting the winning tenders?***
    No comment

21. ***What are stakeholders' views on the proposed locational batching of flexibility procurement? Is this likely to improve competitive outcomes?***
    This approach would be acceptable provided it does not disadvantage bidders that are bound to specific locations due to the nature of the technology concerned. For example, heat networks and the TES facilities incorporated into them are developed and designed with respect to specific geographic areas based on a range of criteria and features including heat demand, consumer base, available heat and energy sources, existing infrastructure, geography etc. While it may be possible for developers and operators of these systems to bid for consideration within location batches, the final location subset would be a factor in formulating the proposal and the bid price. This could be managed provided the bidding process allows for such considerations to be considered.

22. ***Do stakeholders consider there are other approaches that can be used to promote competitive outcomes as the market is developing?***
    No comment

23. ***What are stakeholders' views on the proposed phases in the procurement process?***
    No comment

24. ***What are stakeholder's views on the appropriate timing for each stage? How long in advance of RFT issuance do stakeholders need to receive the final list of locations where demand flexibility will be procured? How long is needed from the RFT issuing to RFT close?***
    No comment

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