



2026 Annual Heatropolis Horizon Scan

March 2026



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Introduction to Horizon Scan

Introduction to Heatropolis: unlocking flexibility from heat networks

Overview:

- Heatropolis is a four-year SIF Beta project (2024–2028) led by UK Power Networks and funded by Ofgem and Innovate UK.
- It is pioneering technical and commercial solutions to unlock flexibility from electrified heat networks.
- It will drive better outcomes between heat networks and electricity networks.
- It will enable more efficient use of electricity network capacity so that heat networks can decarbonise faster.

Impact:

- Driving heat network innovation.
- Maximising use of network capacity.
- Lowering consumer bills.

Funded by:



Partnership:



Horizon Scan Purpose & Outline

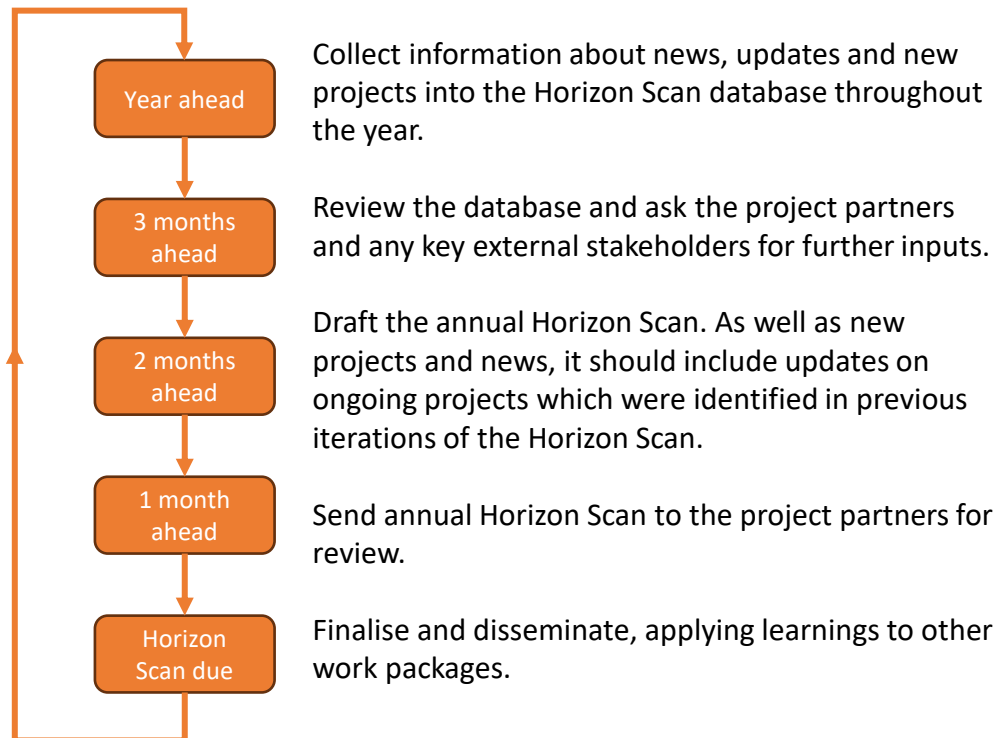


Document Purpose

- The purpose of this document is to track projects, policies, market design and regulation relevant to Heatropolis. Heatropolis Beta Phase will run over four years which could see policy and regulatory changes regarding many areas relevant to the project delivery, such as heat network regulation and roll out. To ensure the solutions Heatropolis tests reflect reality, it is important to keep up to date with current and upcoming developments.
- There are many projects working on different aspects of the electrification of heat, flexibility and commercial arrangements, and this Horizon Scan will ensure Heatropolis takes on learnings from other such projects and countries to avoid duplication of effort. It will also enable the identification of opportunities for dissemination and knowledge sharing with other projects who could benefit from Heatropolis learnings.
- This document gives an overview of the state of heat network deployment and decarbonisation in the UK. It then identifies and documents relevant projects in the UK and Europe including approach, outcomes and key relevant learnings. Finally, it provides an overview of current and upcoming relevant regulation and policy in the UK and analyses the potential impacts of these.

Horizon Scan Methodology

Over the course of each year, we will maintain a database of news articles, announcements, and key documents to compile into the annual Horizon Scan, ensuring we are building a strong pipeline of content and spreading the effort. We will employ the research approach depicted on the right to feed the database.



Research Approach

Desk based research

We will use a search engine to look up projects using key words “heat networks”, “flexibility”, “thermal storage”, etc. We will also target specific websites for relevant content, such as the ENA portal, ADE website and energy news sites like Utility Week and Energy UK.

Stakeholder inputs

Project partners will contribute to the database of relevant news and projects, especially where they have industry specific or expert knowledge that other partners may not have access to otherwise. We will also note any insights from external stakeholder engagements.

Newsletters

By signing up to newsletters from key organisations and news outlets, we will ensure we receive industry updates as they arise and add them to the database.

Conferences and webinars

Representatives from the project team will attend any relevant presentations, webinars and conferences (e.g. ADE heat networks forum) throughout the year and share relevant learnings with the wider project team, feeding into the Horizon Scan where appropriate.

Heat Network Deployment

Current State

There are currently approximately **14,000 heat networks** in the UK, providing heat to approximately **480,000 consumers**, or approximately **3% of the UK's current heat demand**. According to the ADE, ~91% of the UK's heat networks are in England, and ~6% are in Scotland.

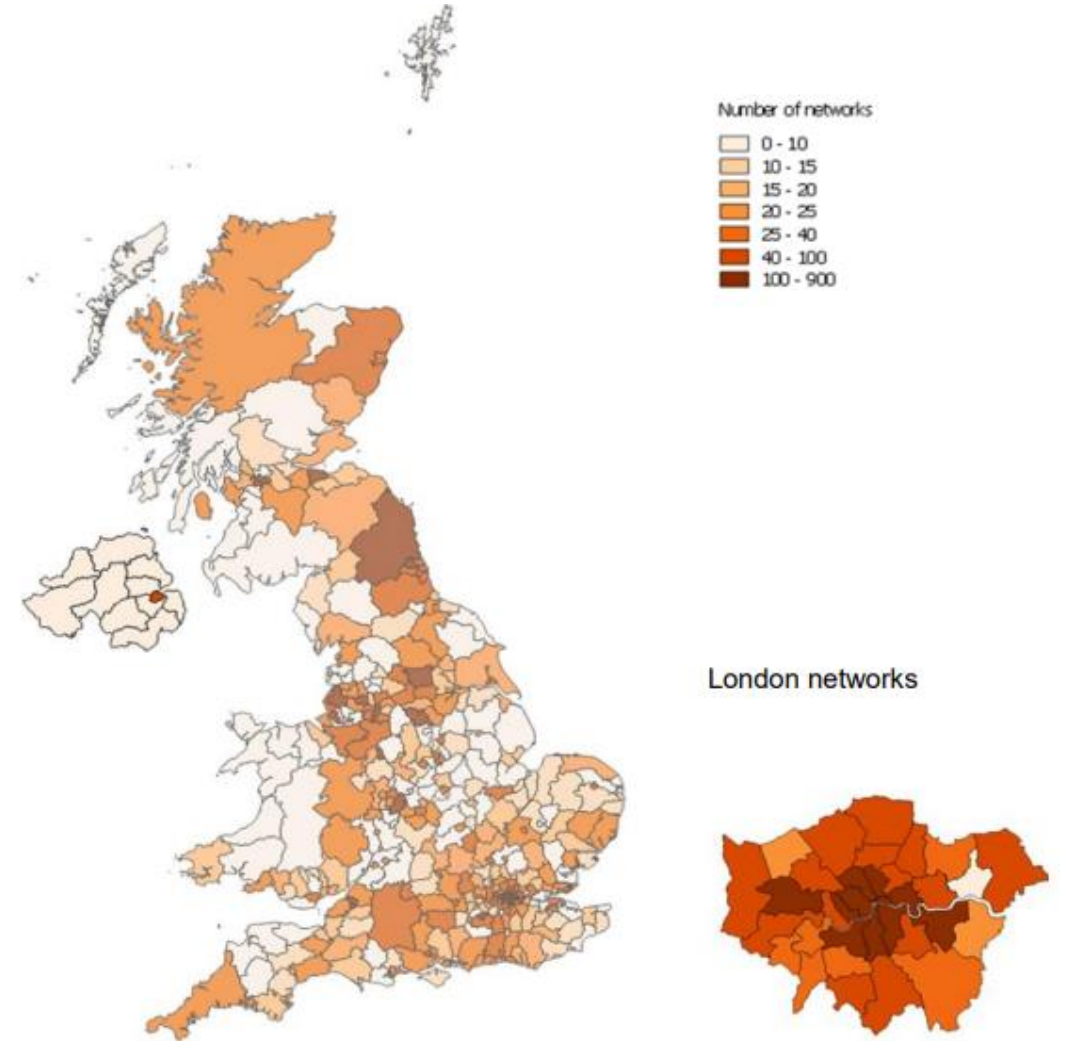
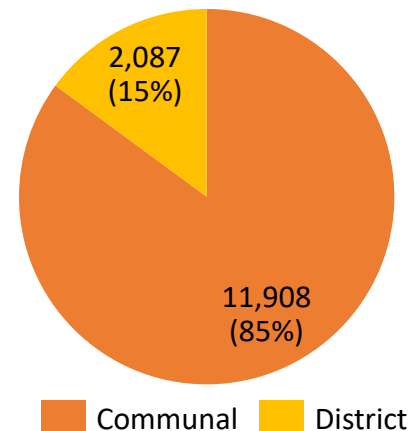
This data dates from 2018, when DESNZ (then known as BEIS) commissioned The National Measurement and Regulation Office to collect and analyse the data submitted by heat network suppliers when the Heat Network (Metering and Billing) Regulations came into force in 2014. Updated statistics from the reporting requirements have not been published since that report. It is interesting to note that **3,000 notifications were excluded** due to missing data, suggesting the 14,000 number is an underestimate, and the actual number may be closer to 17,000.

The most frequently updated data source is DESNZ's **Heat Networks Planning Database**, which is updated on a quarterly basis and tracks the progress of communal and district heat networks from inception to planning, construction, operation and decommissioning. The database has been going since 2021 and the most recent version contains 1400 rows, 10% of the total number of heat networks in the UK

Split of heat network consumers

Consumer Type	Number	%
Domestic	439,549	92.2%
Commercial	28,054	5.9%
Retail	3,226	0.7%
Light industrial	217	0.05%
Industrial	77	0.02%
Education	1,164	0.2%
Public	602	0.1%
Other	4,062	0.9%

Split of heat network by type*



Number of heat networks by local authority, source: [BEIS 2018](#)

*District is more than one building, while communal is only one building. It is therefore important to note that the majority of heat networks in the UK are a “Heatropolis archetype 3”.

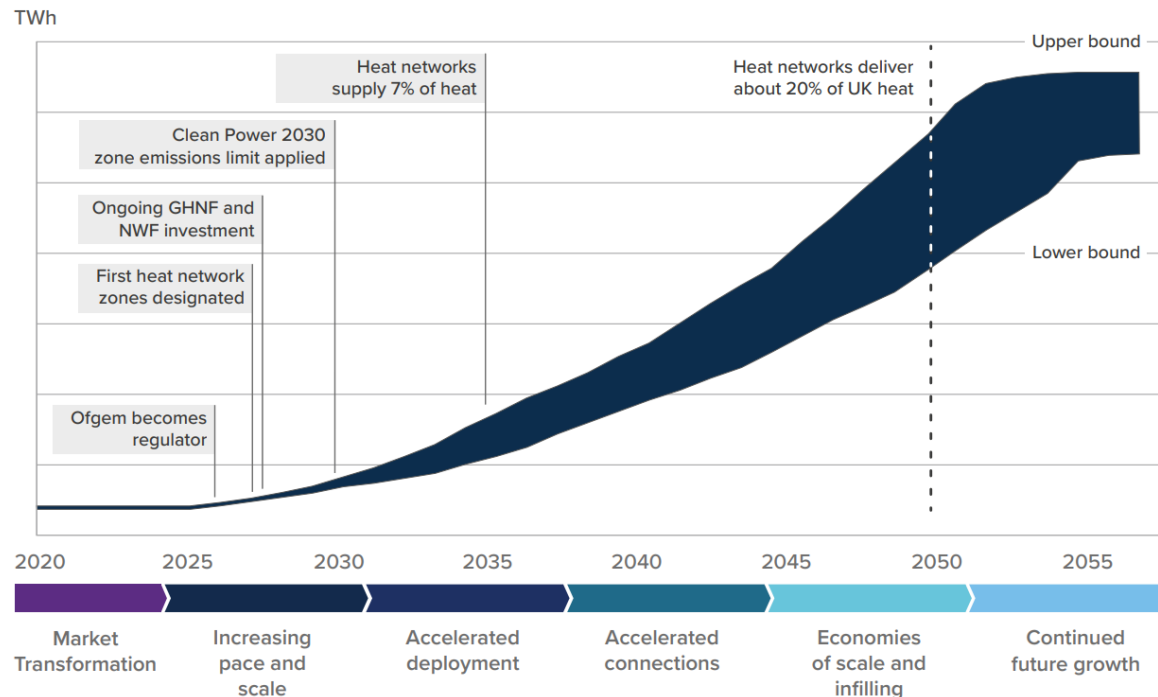
Targets and Pipeline

Deployment of new heat networks

The government has set a target in the 2026 Warm Homes Plan to double the amount of heat demand met via heat networks in England to **7% (27TWh) by 2035** with them expected to provide a fifth of all heat by 2050.

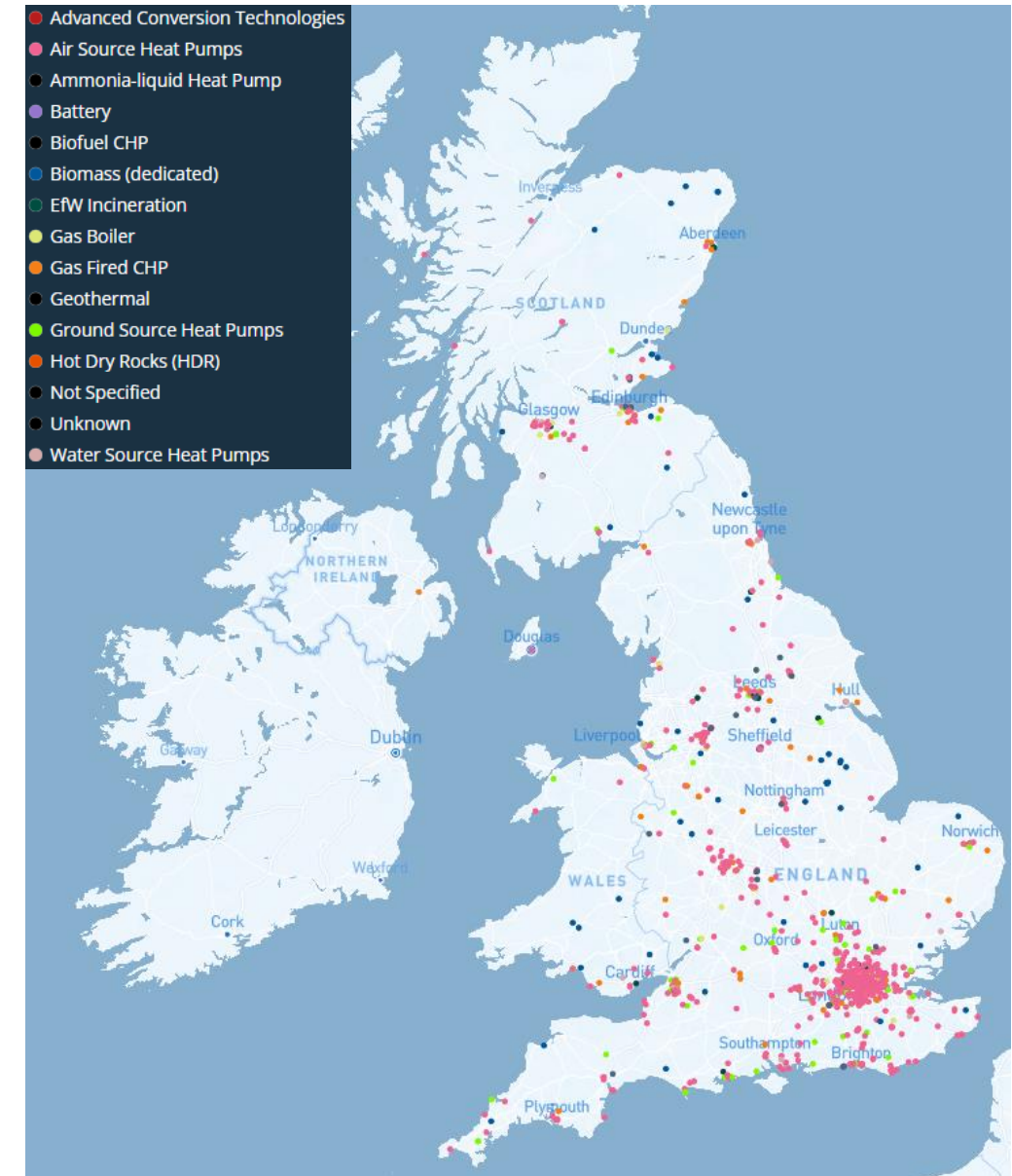
Decarbonisation of existing heat networks

90% of existing heat networks use at least some natural gas. The Seventh Carbon Budget¹ set out ambitious milestones for **40% of existing heat networks to be decarbonised by 2030**, and **100% by 2040** in the Balanced Pathway. UK Government is supporting this through various funds.



Stages of growth for English heat networks to 2050, source: [DESNZ](#)

¹[The Seventh Carbon Budget](#), CCC



Map of heat networks in development as of Q4 2025, source: [Barbour-ABI](#)

Relevant Projects & Studies

Project coverage: key themes and geographic scope

Key Themes



Flexibility

The Horizon Scan includes projects looking at flexibility from the electrification of heat, especially in relation to heat networks, although one project on flexibility from individual heat pumps has also been included due to its relevance to large scale trials involving end customers.



Storage

Projects looking at the use of different types of energy storage technologies with heat networks have been included as storage is a key part of the Heatropolis solution. Most are looking at the use of storage for optimisation of heat loads and flexibility, which is highly relevant to Heatropolis.



Decarbonisation

Projects focused on the decarbonisation of existing heat networks. This range from strategies to increase renewable energy and waste heat sources to whole system approaches improving the integration between heat, electricity and gas networks to accelerate decarbonisation.



Customer Connections

Alongside the three main themes, this Horizon Scan also includes one project relevant to customer connections tools. Heatropolis is looking at improving the electricity connection process between heat networks and Distribution Network Operators, making this theme highly relevant.

Geographic scope



Heatropolis is a UK based project, therefore this Horizon Scan focuses on the UK, as well as large-scale projects in Europe as these markets are sufficiently similar to draw valuable learnings. This iteration of the Horizon Scan includes projects across 14 countries.

List of relevant projects

 The 2026 Horizon Scan covers 7 new projects and provides updates to 2 projects identified in the previous 2025 Horizon Scan.

#	Project	Country	Organisation(s)	Description
9	RE-PEAK	Multiple EU countries	Energie Institut, Tal Tech, Euroheat & Power	The transition of heat networks must be supported by a better understanding of the challenges and options associated with peak heat loads.
17	EQUINOX	UK	National Grid + partners	This project aims to develop novel commercial arrangements and supporting technologies that unlock flexibility from residential low carbon heating (heat pumps), while meeting the needs of all consumers, including the fuel poor and vulnerable.
18	Geogrid	UK	Northern Power Grid + partners	GeoGrid is exploring the use of geothermal heat as long-duration, inter-seasonal energy storage to support heat networks.
19	HeatScape	UK	UK Power Networks + partners	HeatScape is mapping and modelling current and future heat network growth and decarbonisation, improving forecasting and informing network planning.
20	InteGradeDH	Multiple EU countries	EURAC Research + partners	InteGradeDH assesses cost-effective strategies to enable reliable, low-carbon heat supply and scalable replication across conventional district heating systems.
21	FlexVal	Multiple EU countries	VTT Technical Research Centre + partners	FlexVal investigates the impacts of measures increasing the flexibility of heat networks, including costs, emissions, utilisation of renewable and excess heat resources, and changes throughout the value chain.
22	Power Optimised Waste Heat Recovery (POWER)	UK	SPEN + partner	POWER is developing a techno-economic assessment of recovering waste heat from SPEN's transformer fleet to support heat networks.
23	THERMOS	UK & 7 EU countries	Centre for Sustainable Energy + partners	THERMOS addresses key planning barriers to low-carbon district heating and cooling by developing high-resolution energy mapping, optimisation methods, and a free open-source software tool.
24	Road to Power	UK	National Grid + partner	Road to Power is developing a self-service tool for temporary connections, focusing on flexibility and interruptible connections. This tool will extend existing self-service connection tools, providing improved functionality with a consistent user experience.

9. RE-PEAK



Project Overview

Description: IEA funded project aiming to better understand the challenge of supplying peak heat loads in a decarbonised heat network and identify carbon-free energy sources suitable for peak heat supply. [More info.](#)

Countries: Austria, Belgium, Estonia

Organisations:



Dates: November 2023 – April 2025

Approach

- Used modelling to derive a taxonomy of peak heat loads, classified according to criteria such as temperature level, network size and maximum load.
- Used literature review, techno-economic modelling, and an international survey of district heating operators and experts.
- Collected empirical data through engagement and surveying with heat network operators to understand their internal definitions of peak heat load and their perceptions on transitioning to climate neutral peak heat supply.
- Delivered a decision-support and self-assessment framework, including a SWOT-like matrix, to help district heating operators and policymakers compare peak decarbonisation options and identify feasible transition pathways.

Outcomes

- Technical analysis undertaken revealed that the duration of peak heat load is undefined. The actual duration in a specific network has implications on the optimal technology to cover peak heat loads. For short duration, electric boilers are most suitable and for long duration, heat pumps are more relevant.
- The peak heat load surveyed proved that, on average, fossil units are the dominant source of peak heat loads today and 50% of heat networks have a net zero strategy which mostly include peak heat load provision.
- Thermal energy storage is the most mentioned option for decarbonisation, but a high share of survey respondents combine technologies.

Learnings for Heatropolis

- The results of the research done on heat network operators' direction and attitude to decarbonise heat load provide useful context for future heat supply technologies and how these could be incorporated into the Heatropolis solution.
- Shows that district heating operators currently favour proven technologies and incremental change, suggesting that new solutions (including flexibility) must be framed as low-risk and system-integrated to gain traction.
- Highlights that thermal energy storage and peak shaving are critical enablers of decarbonisation, supporting the role of flexibility-led approaches aligned with Heatropolis objectives.

17. EQUINOX (Equitable Novel Flexibility Exchange) **EQUINOX**

Project Overview

Description: This Ofgem funded project aims to develop novel commercial arrangements and supporting technologies that unlock flexibility from residential low carbon heating (heat pumps), while meeting the needs of all consumers, including the fuel poor and vulnerable. [More info.](#)

Countries: United Kingdom

Organisations: SP Energy Networks (SPEN), Octopus Energy, PassivUK, nationalgrid, Welsh Government, West Midlands Combined Authority, Sero and Guidehouse

Dates: March 2022 – December 2025

Approach

- Three trial phases over 3.5 years, building from 300+ participants in the first trial, 1,000+ in the second trial and 900+ in the third trial.
- The trials are deploying experimental design principles to divide customers into representative groups and test the suitability and effectiveness of different commercial arrangements and processes in unlocking HP flexibility on a large scale.
- Crossover Randomised Control Trial (RCT) enabled robust statistical analysis.
- The first trial was a proof of concept that focused on recruiting customers and producing a clear value proposition for heat pump flexibility, the second trial expanded the scale and refined commercial arrangements based on the findings of trial 1, and the third trial was focused on filling in the gaps in our understanding across the first two trials to allow for smooth BaU integration.

Outcomes

- The EQUINOX project has shown that heat pump behavioural change can provide meaningful demand shifting out of the evening peak period.
- External temperature is a strong driver of demand response - slightly more customers chose to opt in on warmer event days, but the average demand response is slightly higher on colder days.
- Demand response was consistent across commercial arrangements, notice periods and event times.
- Automated control of heat pumps is not necessary for the delivery of flexibility.
- Minimal impact on thermal comfort was reported by EQUINOX participants, with the majority of participants reporting no change or a slight change in comfort.

Learnings for Heatropolis

- EQUINOX provides a good example of a project successfully recruiting customers to live trials testing different commercial arrangements and comfort levels.
- Nearly all trial 2 participants controlled their heat pumps manually or remotely via an app, suggesting that automated control is not a requirement for customer participation. Trial 3 participants showed they were more willing to participate in daily flexibility with remote control, showing that improving accessibility to remote control methods could be important for sustained flexibility, something that could also apply to Heatropolis smart controls.
- The iterative trial design enabled EQUINOX to build on insights at each step ensuring that learnings became directly implementable for BaU adoption. This is an example of iterative trial design that can be used for Heatropolis.

18. GeoGrid

GeoGrid

Project Overview

Description: This SIF funded project explores geothermal heat storage as a form of Long Duration Energy Storage (LDES) to support the electrification of heat networks. By discharging during peak demand periods, GeoGrid aims to lower curtailment costs, reduce network congestion, and reduce potential reinforcement costs. [More info.](#)

Countries: United Kingdom

Organisations:



University of Leeds, Leeds City Council, E.ON, STAR refrigeration and LCP Delta

Dates: January 2025 – July 2025

Approach

- Structured delivery across five work packages: stakeholder engagement and project management; geothermal source analysis; system optimisation; cost-benefit analysis and commercialisation; reporting and dissemination.
- Used a case study at the University of Leeds (UoL) as the primary test system for modelling. The design modelled is planned on being in construction in 2026/27.
- Assessed scalability and risk across GB, comparing options such as shallow vs deeper aquifers and borehole thermal storage, and used site selection criteria recognising broad geological suitability beyond Leeds.
- Mapped potential flexibility value streams and outlining contractual and governance considerations for heat networks with geothermal storage.

Outcomes

- Showed that geothermal storage can reduce curtailment, congestion and reinforcement needs while improving heat network resilience and efficiency.
- Based on modelling optimal geothermal storage operation, 8.7% annual electricity consumption and 9.2% annual cost reduction was demonstrated at the UoL site.
- Long storage cycles allow for seasonal shifts in demand but reduces effectiveness over time so it is important to top up the store on weekends during the heating season for optimal performance.
- Sites planning open-loop ground source heat pumps could see £350k lifetime benefit estimated per MW by adapting the system for storage. The value of this is sensitive to depth of flexibility markets at that time and site-specific factors.

Learnings for Heatropolis

- This project is exploring UK specific flexibility benefits for heat networks.
- Geogrid demonstrated that flexibility value streams are highly dependent on the benefits realised and willingness for private investments. Similar challenges are expected for Heatropolis, and these market, regulatory and investment barriers will be explicitly addressed within the iterations of the Heatropolis business case throughout the project.
- GeoGrid's stakeholder engagement showed strong interest in geothermal storage and flexibility for heat networks which reinforces the relevance and interest of the Heatropolis solution.

19. HeatScape

Project Overview

Description: This Ofgem funded project aims to explore the impact of electric heat networks on the grid and how DNOs can manage them flexibly. The project will provide a more accurate picture of potential heat network uptake using modelling.
[More info.](#)

Countries: United Kingdom

Organisations:



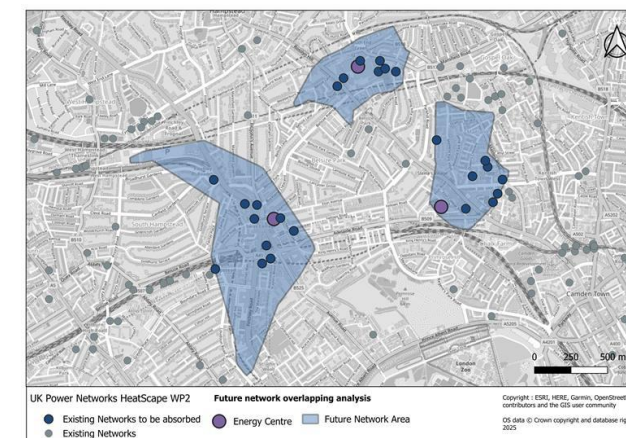
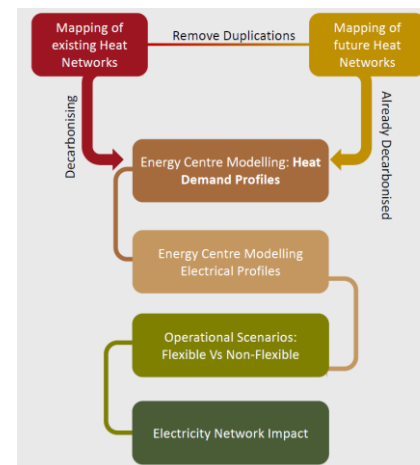
ARUP



Dates: April 2025 – March 2026

Approach

- HeatScape is understanding the electricity network impact of heat network decarbonisation.
- The project has mapped how many heat networks currently exist as well as future heat networks. It has mapped their location, size, customer types and technologies. This was done through collating London heat maps, heat network planning database and local area energy plans to identify areas in UK Power Networks' area that have plans for heat networks or are likely to develop them.
- Heat demand profiles were used to derive electricity demand profiles for decarbonised energy centres, which were then modelled across three flexibility scenarios.
- The flexibility analysis is designed to be network wide and integrate into UK Power Networks' Strategic forecasting tool.



Outcomes

- Identified 4,913 existing heat networks across UK Power Networks' licence areas, with 34 planning to decarbonise via alternatives to electrification.
- 91 future heat networks out of 96 modelled locations, with 5 locations not resulting in a viable network- representing 7.2 TWh of Network Heat Demand.
- Heat network electrification introduces a new, material peak demand driver, with strong load-shifting potential (~30% peak reduction) enabled by thermal storage
- Successful integration of the three scenarios into the Strategic Forecasting System, to assess network impacts and inform ED3 planning decisions

Learnings for Heatropolis

- This project provides a UK specific assessment of heat networks and the potential role of flexibility.
- By identifying where heat networks are likely to emerge and how different flexibility scenarios affect network planning outcomes, HeatScape provides a system-level evidence base that reinforces the relevance of Heatropolis' trials.
- Heatropolis is actively engaging with HeatScape as HeatScape results can help Heatropolis define the size of the solution and help understand the scale up requirements for Heatropolis.

20. IntegrateDH

Project Overview

Description: InteGradeDH assesses cost-effective strategies to enable reliable, low-carbon heat supply and scalable replication across conventional district heating systems. [More info.](#)

Countries: Italy, Germany, Sweden

Organisations:

eurac
research

HAWK


ivl
Swedish Environmental
Research Institute

Dates: April 2024 – March 2026

Approach

- Focuses on the large-scale integration of low grade renewable and waste heat sources into existing heat networks using heat pumps and seasonal thermal energy storage.
- Developing simplified techno-economic models to assess combined systems including geo-thermal, waste heat, heat pumps and seasonal storage.
- Exploring operating temperature optimisation, heat pump configurations and storage charge and discharge strategies to balance efficiency, flexibility and costs.
- Exploring two representative case studies in Germany and Italy to apply the model framework to.

Outcomes

- Deliver a simplified open-source techno-economic modelling framework to assess the performance, efficiency and levelised cost of heat of integrated geothermal, waste heat, heat pump and seasonal storage systems.
- Identification of optimal system configurations and controls schemes.
- Quantitative assessment of trade-offs between storage temperature, energy density, system efficiency and waste heat recovery, supporting more system design.

Learnings for Heatropolis

- This project is exploring storage and integrated with controls schemes in the energy centre. The learnings from InteGradeDH on the optimisation of storage charge and discharge strategies can provide learnings for determining the thermal store charge strategies in the Heatropolis solution.
- [Check on updates and published results in the 2027 Horizon Scan.](#)

21. FlexVal

Project Overview

Description: FlexVal investigates the impacts of measures increasing the flexibility of heat networks, including costs, emissions, utilisation of renewable and excess heat resources, and changes throughout the value chain. [More info.](#)

Countries: Finland, Denmark, Sweden, Belgium

Organisations:



Dates: October 2023 – March 2026

Approach

- The project is examining flexibility impacts across heat supply, storage, demand, pricing and network structure. It combines large scale heat storage, heat pumps and digital building services.
- The project is specially investigating the impacts of increasing the flexibility of heat networks, including costs and emissions.
- The work will be based on concrete case studies.
- A flexibility assessment will be completed alongside a study of the impact of difference pricing alternative on the flexibility and their value.

Outcomes

- The main outcome of the project is an assessment of the existing and potential flexibility measures and options that heat networks can provide to overcome the challenges associated with renewable and fluctuating electricity generation.
- Full final report is yet to be published.

Learnings for Heatropolis

- Similarly to Heatropolis, FlexVal assesses flexibility across the full value chain and focuses on the commercial aspect. The outcomes of this project can inform Heatropolis' cost benefit analysis.
- Check on updates and published results in the 2027 Horizon Scan.

22. Power Optimised Waste Heat Recovery (POWER)

Project Overview

Description: Ofgem funded project to assess the feasibility of recovering waste heat from high voltage transformers and using it to support low carbon heat networks.

[More info.](#)

Countries: United Kingdom

Organisations:



Dates: October 2025 – May 2026

Approach

- The project takes a techno-economic, asset-led approach, focusing on transformer fleets as a decentralised heat source for heat networks.
- The project will be mapping and characterising waste heat availability from transformers across SPEN's network.
- It will develop economic models to quantify the levelised cost of capturing and upgrading transformer waste heat to usable temperature levels
- The project considers the full value chain from heat source to customer, including viable heat pricing, regulatory considerations and flexibility offerings.

Outcomes

- The project aims to deliver techno-economic models that demonstrate how project viability varies depending on: heat offtake configuration at the energy centre, integration with heat pumps and other low carbon technologies, local demand characteristics and pricing structures.
- Identify the key areas to deployment such as: business model uncertainty, mismatch between heat supply and demand and regulatory considerations associated with selling waste heat.

Learnings for Heatropolis

- Waste heat from electricity assets represents a significant complementary flexibility opportunity for heat networks. POWER reinforces the value of treating heat networks as system assets that can absorb low-grade heat and support wider decarbonisation objectives which is directly aligned with Heatropolis' focus on flexible, smart-controlled heat systems.
- [Check on updates and published results in the 2027 Horizon Scan.](#)

23. THERMOS

THERMOS

Project Overview

Description: EU Horizon 2020 project designed to accelerate the planning and deployment of low carbon district heating and cooling systems by addressing the cost and time associated with traditional heat network planning. [More info.](#)

Countries: United Kingdom, Spain, Portugal, Latvia, Denmark, Germany, Romania, Poland

Organisations:



Aalborg University, Imperial College London, Local Governments for Sustainability (ICLEI), Deutsche Energie-Agentur, Polish National Energy Conservation Agency (KAPE), Latvian Environmental Investment Fund (LEIF)

Dates: October 2016 – March 2021

Learnings for Heatropolis

- THERMOS shows that reducing planning friction is essential to accelerating deployment of low carbon heat networks complementing Heatropolis' focus on operational flexibility and smart control for electrified networks.

Approach

- THERMOS developed a standardised, high-resolution energy mapping methodology producing address level heat demand and supply maps. The project used this data to combine strategic planning and optimisation of heat network planning around heat demand.
- The tool and methodology were iteratively tested with pilot and replication cities, supported by extensive training and engagement with energy planners to ensure real-world usability.

Outcomes

- Planning tool that enables pre-feasibility assessment of heat networks.
- A free, open-source GIS based software tool that uses fast optimisation algorithms to assess thousands of network configurations and identify most effective solutions.
- THERMOS identifies where low carbon heat networks work by using address level heat demand and supply mapping.
- The THERMOS tool has enabled planners to assess new low carbon heat networks as well as the refurbishment and expansion of existing systems.
- THERMOS is designed so that planners without deep technical expertise can assess and prioritise low carbon heat network options, widening the pool of organization able to deliver projects.

24. Road to Power

Project Overview

Description: This Ofgem funded project is developing a self-service tool for temporary connections, focusing on flexibility and interruptible connections. This tool will extend existing self-service connection tools, providing improved functionality with a consistent user experience. [More info.](#)

Countries: United Kingdom

Organisations:







Dates: October 2024 – April 2025

Approach

- SIF Alpha project that built on the Discovery Phase which identified construction sites as ideal candidates for flexible and interruptible connections, due to their predictable but time-varying demand profiles across the day and year.
- Developed a proof of concept self service connection tool which extends existing self serve tool to support temporary, flexible and interruptible demand connections.
- Designed the tool to support agility over reinforcement, recognising that construction customers often prefer faster, flexible access to power rather than long delays associated with reinforcement works.

Outcomes

- Delivered a working concept tool that demonstrates how flexible and curtailed demand connections could be assessed and offered automatically at HV level through the tool.
- Demonstrated how flexible demand profiles can unlock headroom on constrained networks, allowing connections to proceed without or ahead of reinforcement, reducing time and cost barriers.
- Through the tool users can now easily see the network around their planned connections.
- Tool offers a preliminary offer, and users are encouraged to discuss with NGED.
- Benefits include reduction of further information requests, reduced time to connect and increased customer awareness.

Learnings for Heatropolis

- This project is highly relevant for Heatropolis as Heatropolis is looking at improving the electricity connection process and to support ongoing operation coordination between Heat Network Operators and Distribution Network Operators. The tool from the Road to Power project does similar but focusses on construction sites rather than heat networks.
- Road to Power demonstrates how flexible, time-profiled electricity demand and improved digital connection processes can unlock faster connections and better DNO and customer coordination, learnings tropolis. The benefits from Road to Power can inform the development of customer connection tools for heat networks.

Technology providers scan

Technology providers scan: Overview

Objective

This scan identifies and evaluates technology providers offering platforms for district heating network management, optimisation, and decarbonisation.

The purpose of this scan is to compare other technology provider options against NODA. **NODA is a technology provider specialising in smart controls** and optimisation. On the Heatropolis project, NODA is providing and operating commercial building-level smart controls, evaluating how coordinated control of multiple buildings can optimise heat demand and unlock electricity network flexibility.

This scan includes technology companies that provide services to heat networks. It includes services from network design and build to operations.

Providers Reviewed

Veolia

Ramboll

Guru Systems

Chirpy Heat

Gradyent

CROSSBREED

Technology providers scan: Provider profiles



Although no provider is directly comparable to NODA, we plan to engage with these providers to support scalability of the Heatropolis solution to BaU. Based on the scan, CROSSBREED, Gradyent and Guru systems would be the most relevant to engage with.

Veolia

AI-powered network modelling & efficiency

Veolia employs AI software on Sheffield's Heat Network that ingests real-time network and external data for full heat network modelling and scenario planning. The system identifies heat losses in underground pipes and plant rooms and optimises building energy consumption. The underlying technology provider is not publicly disclosed and it may be in-house. [Find out more.](#)

Ramboll – District One

Optimised heat network design & build

District One by Ramboll is a specialist design and planning platform for district heating infrastructure. It is focused on the pre-construction phase which helps engineers model, optimise, and plan network topology. It is less focused on live operational management and does not appear to include real-time monitoring or AI optimisation features. [Find out more.](#)

Guru Systems

Hardware & data analytics for heat networks

Guru Systems provides a combination of metering hardware and an analytics platform tailored to heat networks. Their analytics tools help operators identify and resolve performance issues, while a separate platform enables remote configuration of Heat Interface Units (HIUs) for optimisation. [Find out more.](#)

Chirpy Heat

Data-driven compliance & performance management

Chirpy Heat's data services help heat network operators improve performance and meet compliance requirements. The platform identifies data gaps and anomalies to enhance efficiency, tariffs, and contract management. It provides a virtual Heat Manager that continuously monitors performance and benchmarks against trends. [Find out more.](#)

Gradyent

Real-time digital twin for heat network optimisation

Gradyent offers a real-time Digital Twin Platform that simulates heat network scenarios to improve system control and operational decision-making. The platform is specifically designed to help decarbonise heat networks by guiding operators on how to reduce emissions through system optimisation and control strategies. [Find out more.](#)

CROSSBREED

AI-driven demand flexibility for heating companies

CROSSBREED connects building heating systems to AI to enable active demand management. The platform allows heat demand to be shifted during periods of power shortages or grid stress, improving network resilience and sustainability. This demand response approach makes it particularly relevant to Heatropolis. [Find out more.](#)

UK Policy & Regulatory Landscape

Heat Network Policy & Regulatory Updates

Ofgem Regulation of heat networks [officially began](#) on the 27th January 2026. These initial regulations are focused on consumer protection rules. All heat network operators and suppliers must register by 26th January 2027.

Heat Network Technical Assurance Scheme (HNTAS) Draft Code documents have been published and are under [consultation](#) from January to April 2026.

These documents detail:

1. The Technical Specifications
 - This covers technical requirements to be met, performance monitoring requirements to be met, key failures to be avoided and evidence requirements to be provided to demonstrate conformity with HNTAS.
2. The Assessment Procedures
 - This covers the assessment activities to be undertaken to provide assurance that the obligations in the Technical Specifications are fulfilled.

In addition, the **Warm Homes Plan** was [published](#) in January 2026, reiterating government targets for heat networks to provide 20% of heat demand by 2050. The plan highlighted the lower electricity system costs and enhanced energy security heat networks can bring (compared to individual heat pumps), and the additional savings possible with smart operation of flexible heat networks.

The **Clean Flexibility Roadmap** ([published](#) July 2025) also highlighted the potential benefits of flexible heat networks and stated that Government will “set out a clear route to unlocking heat network flexibility”.

The government have published their [response](#) to their 2023 **Heat Network Zoning** consultation. The response confirms a nationally consistent framework overseen by a new heat network zoning authority which will coordinate zoning across England.

Local Authorities will be central to the delivery as part of zone coordination bodies responsible for designating zones, appointing developers and overseeing delivery. Outputs from the National Zoning Model will be hosted and published on a new heat network zoning digital service prior to the zoning implementation regulations coming into force.

From 2030, all zone heat networks will be required to meet a carbon emissions limit based on a benchmark scenario assuming 85% of heat is delivered by low-carbon air source heat pumps using electricity and 15% is supplied by gas boilers. The emissions limit will be reviewed and updated every 5 years.

Finally, government also published their [response](#) to their 2023 **Future Homes and Buildings Standards** consultation and new supporting documents. The response acknowledged potential interactions between these standards and other relevant legislation impacting the carbon emissions of heat networks (i.e., Heat Network Zoning and the Energy Act (2023)). The new Approved Documents outline how new buildings connected to a new or existing heat network will need to demonstrate compliance.

Appendix: Project deep dives from previous scans

1. Heat networks as flexible grid assets

Project Overview

Description: UKRI funded projects aimed to use heating demand variability and the inherent heat storage of buildings to allow heat networks to benefit from energy price variability and provide flexibility. [More info.](#)

Countries: United Kingdom

Organisations:



Dates: April 2020 – December 2021

Approach

- Used Minibems' real-time data driven control capability to innovate on ways to provide load shifting options.

Outcomes

- The project showed how enhanced energy management systems for heat networks could use the way buildings heat up and cool down to flex heating demand, increase efficiency and deliver benefit from cost savings.
- It demonstrated the savings that could be achieved by load shifting the heating demand.
- In March 2023, heat network control company Minibems merged with heat network equipment supplier Evinox to advance their position in the energy-efficient heat networks sector.

Learnings for Heatropolis

- This project provides evidence that cost savings can be achieved through shifting the demand profile to times of lower energy costs, using the thermal mass of the building and enhanced controls alone.
- Little information is publicly available so WP7 should consider engaging with Evinox to further understand key learnings and if this solutions has been rolled out beyond the project.

2. Storage and flexibility: thermal energy storage for heat networks

Project Overview

Description: As part of the Innovating to Net Zero programme, Energy Systems Catapult looked into existing thermal storage technologies and investigated their feasibility alongside heat networks. [More info.](#)

Countries: United Kingdom

Organisations:



Dates: 2020

Approach

- Reviewed existing and innovative thermal storage technologies and investigated policy and regulatory barriers to the deployment of thermal energy storage alongside heat networks.
- Developed an Excel-based modelling tool to assess the feasibility of thermal storage in heat networks.

Outcomes

- The project produced a series of policy recommendations to overcome barriers to using thermal storage within heat networks, including increased R&D support, clear guidance for the design and planning of thermal storage within heat networks, and improved cross-vector integration of heat and power systems.
- Key barriers to deployment of thermal storage were identified as high investment costs, space constraints and customer acceptance.

Learnings for Heatropolis

- This project provides evidence that high investments costs are currently a barrier to thermal storage in heat networks, supporting the case that further incentives such as flexibility payments would be required for heat networks to do this.
- Centrally located thermal storage can also provide value to heat networks by reducing the size of heat generation needed.
- In terms of different types of thermal storage, this project found that while sensible heat thermal energy storage (e.g. hot water tanks) is cost effective, at small capacities where space is a premium, latent heat thermal energy storage (phase-changing material-based) could be cost competitive or even comparable.

3. ThermaFLEX

Project Overview

Description: Aims to develop strategies and measures for making heat networks more flexible and increase the proportion of renewable heat used. [More info.](#)

Countries: Austria

Organisations:
Consortium leader



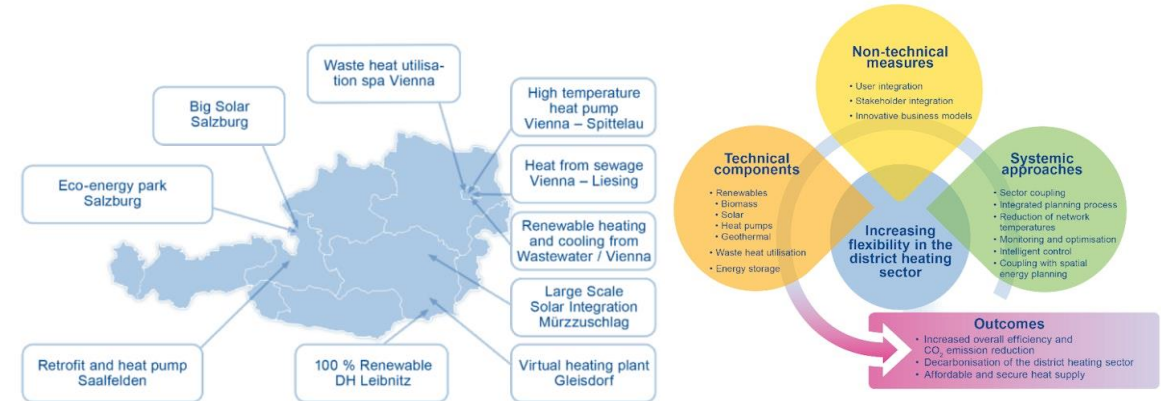
28 partners from the energy industry, R&D and technology providers

Dates: November 2018 – October 2022

Approach

- Every fourth house in Austria is already supplied by a heat network so a key driver for the project was ensuring heat supply remains affordable, secure and resilient.
- The project focused on 10 demonstrator heat networks in Austria to test and evaluate various technical, non-technical and systemic measures.
- The project utilised a wide range of heat sources and flexibility elements, with a central emphasis on heat storage, energy sector and infrastructure coupling, smart control concepts, large-scale heat pumps, solar thermal energy, and the utilisation of locally available heat and waste heat sources.
- Note that, in this case, flexibility does not refer purely to electric load shifting but more broadly to the ability to adapt to different heat sources, smart controls, operating temperatures and conditions.

Project
concluded



Outcomes

- The project delivered a set of Best Practices outlining promising measures and demonstrating the technical, economic and ecological benefits of the concepts.
- The measures deployed resulted in a significant increase in the share of renewable energy, as well as the decarbonisation and diversification of the demonstrator heat networks.
- The project demonstrated the feasibility of implementing large-scale solutions within relatively short timeframes.

Learnings for Heatropolis

- ThermaFLEX provides wide technical and non-technical knowledge for the flexibilisation of heat network systems, as well as their planning and operation.
- The project showed that individual technologies are not as effective as combining different ideas to get the best out of innovation.
- Extensive stakeholder engagement and dissemination was key to the project success and significantly increased the reach and impact of ThermaFLEX.

4. Flex heat networks

Project Overview

Description: NIA project investigating how electric heat networks could affect the power grid and how the Distribution Network Operator can manage them flexibly.

[More info.](#)

Countries: United Kingdom

Organisations:

Arup, Bring Energy, ERM



Dates: July 2023 – April 2025

Approach

- Identified Bring Energy and its Olympic Park heat network as a case study for HNO decarbonisation to test and validate the approach.
- Desktop analysis and stakeholder engagement to obtain insights into the operational and design characteristics of heat networks.
- Develop and validate an optimisation methodology using modelling which balances heat network performance with electricity connection cost constraints.
- Perform techno-economic analysis of 15 electrification scenarios, examining trade-offs between electricity connection costs and heat network performance.
- Develop strategic outline business case to articulate the benefits of flexible electrification of heat networks.

Outcomes

- The project has demonstrated a clear business case for integrating flexibility into heat network planning.
- With the Heatropolis project looking at large-scale trials, it was decided that Flex heat networks would close down rather than also moving to trial to avoid duplication of efforts.
- A new project called Heatscape will be launched to focus on mapping of current and future heat networks. This will look at the existing pipeline of heat networks. It will also look at existing heat networks to understand their current operational behaviours with gas CHP and what their impact on the grid will be if they electrify.

Learnings for Heatropolis

- Stakeholder engagement confirmed the importance of coordinated planning between DSOs, HNOs and connection partners to ensure realistic, efficient and timely connection schemes.
- The new Heatscape project, which will launch in 2025, could provide valuable insights and data for Heatropolis. The two projects should seek to collaborate and share learnings wherever possible. Any modelling done by Heatscape on future pipeline of electrified HNOs will be valuable to supporting the Heatropolis cost benefit analysis.

5. ENABLE DHC

Project ongoing

Project Overview

Description: EU funded project supporting district heating network operators in the development on their decarbonisation plans and switch to efficient networks as defined in the Energy Efficiency Directive. [More info.](#)

Countries: Austria, Belgium, Croatia, Germany, Ireland, Italy, Latvia, Slovenia, Ukraine

Organisations:

Coordinator:



12 partner organisations across the 9 participating countries

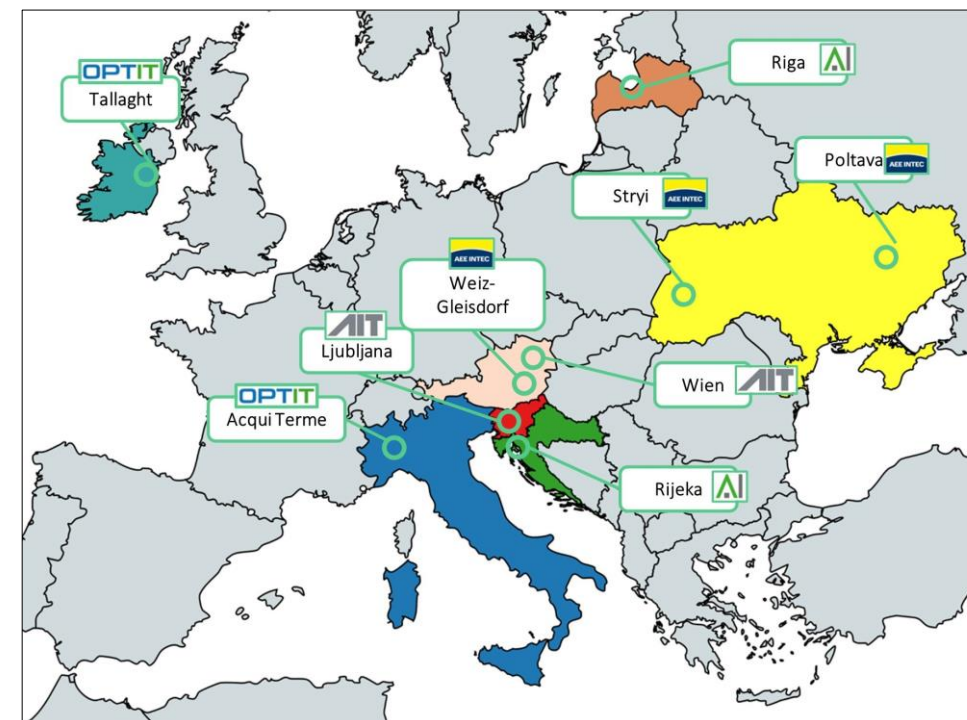
Dates: April 2024 – March 2027

Approach

- The project will develop 9 case studies of investment plans in 7 countries, with a key focus on digitalisation, sector integration and policy development.
- Analysis of the context and of the reference framework of local heat networks.
- Interaction and cooperation with relevant stakeholders.
- Assessment of technical feasibility and overall sustainability of a range of solutions.
- Development of detailed financial plans and business models.
- Creation of roadmaps and position papers, handbooks, and capacity building.

Outcomes

- The project will encourage replication of successful practices through strategic investment planning, stakeholder engagement and dissemination activities.



Learnings for Heatropolis

- The project will include an assessment of options for heat networks to participate in short term electricity markets by providing balancing/flexibility, electricity/gas networks constraints and capacity markets, which would be a valuable learning for Heatropolis.
- No updates for the Horizon Scan 2026. Check on updates and published results in the 2027 Horizon Scan.

Relevant themes



6. Thermochemical storage utilisation enabling data centre seasonal energy recovery (THUNDER)

Project Overview

Description: EU funded project aiming to overcome barriers to adoption of data centre waste heat recovery. The project will develop sustainable strategies and seasonal storage solutions to supply heat to neighbouring heat networks while providing heating/cooling to the data centres. [More info.](#)

Countries: Bulgaria, Italy, Belgium, Greece, Spain, Sweden, United Kingdom

Organisations:

Coordinator:

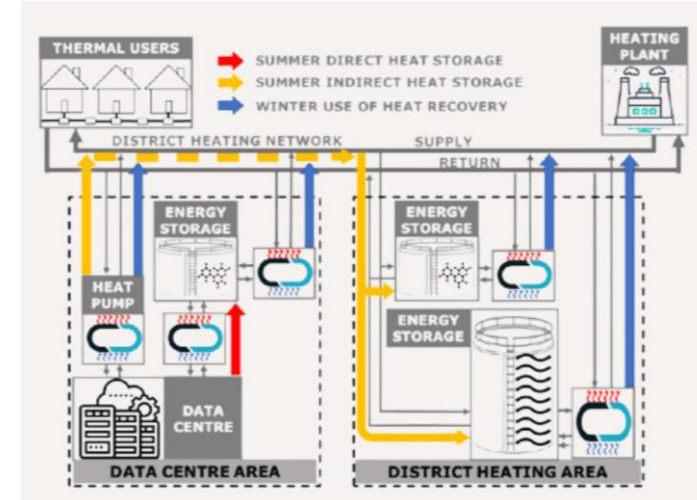


13 partner organisations across the 7 participating countries

Dates: January 2024 – January 2028

Approach

- This project is targeting the use of thermochemical storage technologies to accumulate heat during summertime and release it into the heat network in the winter period. This storage material have been selected for their compact storage capacity, and near-zero thermal losses.
- This will be tested in field at the Varna Demo site in Bulgaria. Replicability assessments and pre-feasibility analysis will be developed for 10 further demo sites across Europe.
- The project will also deliver novel business and financial models.



Outcomes

- Expected outcomes include assessment of innovative thermochemical materials for storage applications and advanced control logics for the system optimised controls.

Learnings for Heatropolis

- THUNDER will deliver learnings about the use of thermochemical storage for heat networks, as well as seasonal heat flexibility potential.
- No updates for Horizon Scan 2026. Check on updates and published results in the 2027 Horizon Scan.

7. TREASURE

Project Overview

Description: EU funded project demonstrating and improving large pit thermal energy storages for an accelerated realisation of sustainable district heating networks in Europe. [More info.](#)

Countries: Austria, Belgium, Czechia, Denmark, France, Germany, Poland

Organisations:
Coordinator:



22 partner organisations across the participating countries

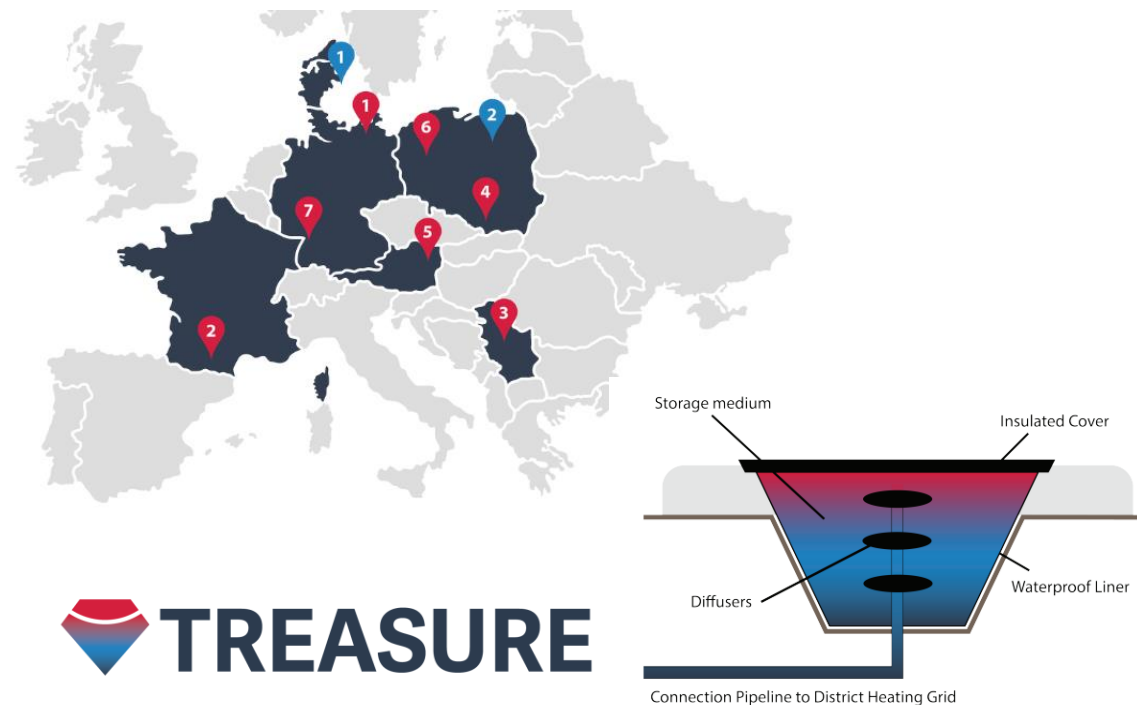
Dates: January 2024 – December 2027

Approach

- Through 7 demonstration projects across 5 countries, this project will refine storage technologies, leveraging data from existing projects in continuous improvement.
- Establish a benchmark for PTES systems, making them more financially viable, quicker to deploy, energy efficient and supported by a robust expert network.
- To find possible solutions to the financing, permitting and social challenges in the realisation of large pit thermal energy storage (PTES) projects.

Outcomes

- Deliver 3 operational and monitored large PTES demonstrators and 4 additional demonstrators in an earlier stage of development.
- Dissemination of developed roadmap and generated knowledge to accelerate the aim of realising over 2000 large PTES crucial for a decarbonised energy system.



 **TREASURE**

Learnings for Heatropolis

- Decarbonised heating systems based on renewable and waste heat sources are challenging due to the intermittency and mismatch of supply and demand. Thermal energy storage is a potential solution to store excess heat during periods of abundance and release it when demand peaks. This project will deliver advancements and learnings on the use of PTES for heat networks.
- No updates for Horizon Scan 2026. Check on updates and published results in the 2027 Horizon Scan.

8. USES4HEAT

Project ongoing

Project Overview

Description: EU funded project aiming to prove and demonstrate the effectiveness and viability of large-scale, seasonal, underground thermal storage for reliable and decarbonised heat supply. [More info.](#)

Countries: Sweden, Italy, Norway, Croatia, Bulgaria, Greece

Organisations:
Coordinator:

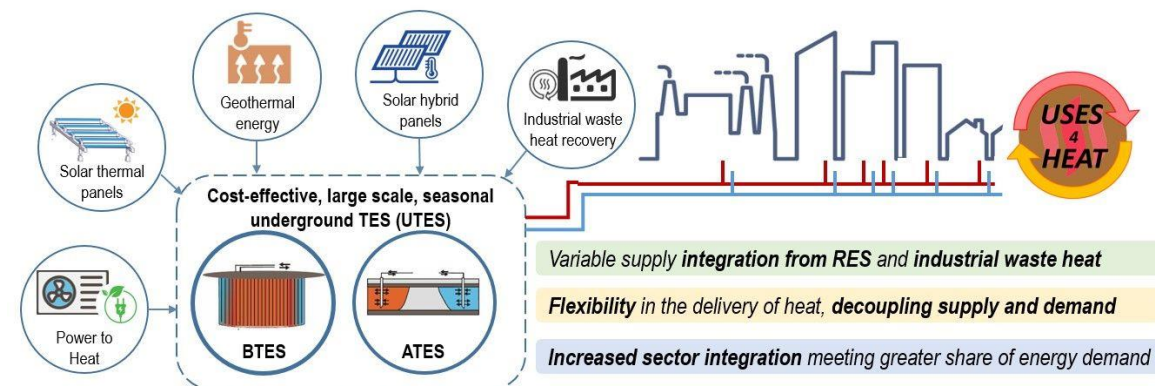


27 partner organisations across the participating countries

Dates: December 2023 – December 2027

Approach

- Implement 2 demonstration sites in Italy and Norway to demonstrate large-scale, seasonal, underground thermal energy storage solutions.
- 4 replicator sites will learn from the demonstrators and apply the results in their decarbonisation pathways.
- Develop six key enabling innovative technologies, including drilling solutions, highly efficient solar solutions, and AI driven analytics based predictive energy software.
- Promote the solutions across the EU and beyond and facilitate market uptake and widespread commercialisation.



Outcomes

- Maximise availability and resilience of heat supply while minimising losses and environmental impacts from the heat storage.
- Demonstrate the storage units as fully integrated into large-scale district heating networks and industrial waste heat recovery.

Learnings for Heatropolis

- This project will deliver advancements and learnings on the use of large-scale underground thermal energy storage for heat networks.
- No updates for Horizon Scan 2026. Check on updates and published results in the 2027 Horizon Scan.

10. SENERGY NETS

Project Overview

Description: EU funded project aimed at increasing the synergy between different energy networks, notably electricity, gas and district heating / cooling networks, while incorporating more locally produced renewable energy. [More info.](#)

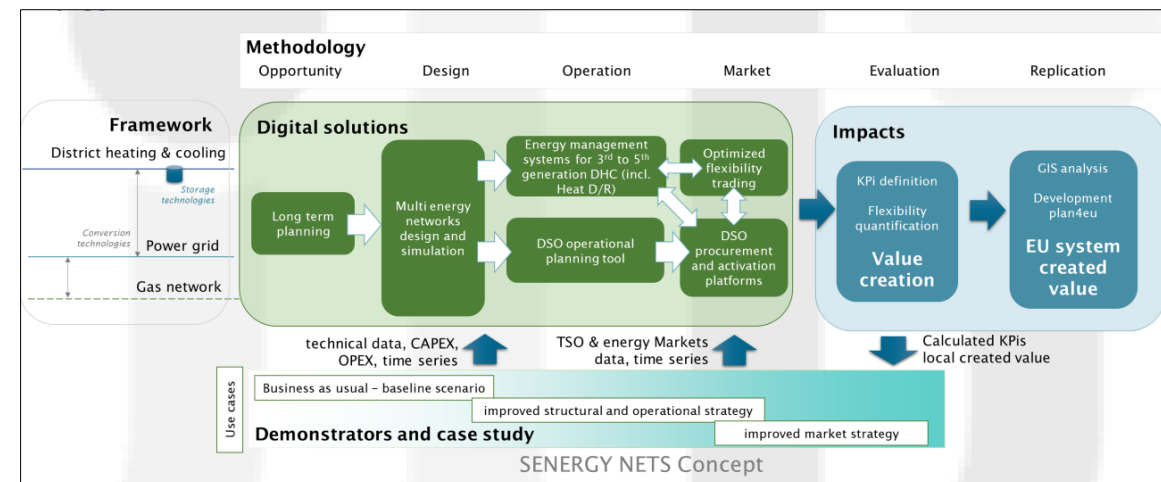
Countries: Spain, France, Italy, Slovenia, Sweden, Belgium, Austria, Germany

Organisations:  18 partner organisations across the participating countries
Coordinator: 

Dates: September 2022 – August 2026

Approach

- Develop a set of tools and platforms (up to TRL7/8) to optimise the planning of district heating and cooling as well as distribution grids with sector coupling consideration and allow the provision of flexibility services to distribution and transmission system operators.
- These solutions will be implemented on three pilot sites located in Milan, Ljubljana and Paris and their replicability will be tested in two additional real case studies presenting alternative climatic, economic and geographic conditions in Västerås and Cordoba.
- Develop and apply a consolidated method to evaluate the overall created value by sector integration.



Outcomes

- The key objectives of the project include:
 - Demonstrate the capability of multi-energy systems to decarbonise the heating and cooling sector using local RES production and sector coupling.
 - Enable multi-energy systems to provide flexibility services by delivering a set of tools for planning and operation.
 - Enabling flexibility provision at local scale by defining market requirements for DSO ancillary services adapted to multi-energy systems.

Learnings for Heatropolis

- This project is exploring how flexibility and sector integration can enable higher uptake of renewable supplies in heating and cooling networks, while delivering flexibility for the electricity network.
- The projects should aim to engage and share learnings as part of the WP7 stakeholder engagement plan.
- No updates for Horizon Scan 2026. Check on updates and published results in the 2027 Horizon Scan.

11. Aberdeen Heat & Power

Project Overview

Description: Aberdeen Heat & Power (AH&P) is an independent, not-for-profit company, founded in 2002 to develop and operate district heating systems. They now operate 4 heat networks across Aberdeen, delivering heat to over 3,000 homes and public buildings. For the moment, they principally use gas fired CHP and have been earning capacity market revenue since 2017. [More info.](#)

Countries: Scotland, United Kingdom

Organisations:



Dates: 2017 – present

Approach

- Working with Flexitricity as aggregator, AH&P started working through the Capacity Market process in 2016.
- This included ensuring their sites were ready and connected, entering the Early Auctions and T-4 auction, and metering and delivery.
- As a result, AH&P has been earning Capacity Market revenue since October 2017.

Outcomes

- AH&P CEO Ian Booth stated that “operationally, this has had no effect for us other than business as usual to maintain and maximise operations. The positive financial impact is starting to happen now, and this is expected to increase in subsequent years, which is pleasing to note”.
- AH&P is looking to expand but securing the funding is a major challenge. They’re planning on exploring a wide range of options to maximise their income, including working with Flexitricity to add more to their revenue stack.

Learnings for Heatropolis

- Heatropolis should engage with AH&P to understand in more detail how they are using their assets to participate in the capacity market.
- There are learnings here about how a natural gas fired CHP heat network is able to participate in flex, and how this could apply to a decarbonised network.

12. MAGNITUDE (1/2)

Project Overview

Description: EU funded project which aimed to develop business and market mechanisms to provide flexibility to the electricity system by increasing and optimizing synergies between electricity, heat and gas systems. [More info.](#)

Countries: France, Austria, UK, Italy, Spain, Belgium, Sweden, Denmark, Germany

Organisations:

Coordinator:



16 partner organisations across the participating countries

Dates: October 2017 – 2020

Approach

- Used 7 real-life examples of multi-energy systems (MES) to test and validate different regulatory frameworks, sector coupling technologies and business cases.
- Tested participation in electricity and gas day-ahead markets, Frequency Ancillary Services, Frequency Containment Reserve (FCR), automatic Frequency Restoration Reserve (aFRR) and upward/downward manual Frequency Restoration Reserve (mFRR).
- Tested improvement strategies such as larger thermal storage, larger gas storage, demand side peak reduction and improved controls.
- Assessed options against flexibility, energy efficiency, sustainability & economy KPI.
- Investigated the replicability and transferability of MAGNITUDE's business cases.
- Developed the specifications and a light implementation of a multi-energy data hub and interoperability layer.

Outcomes

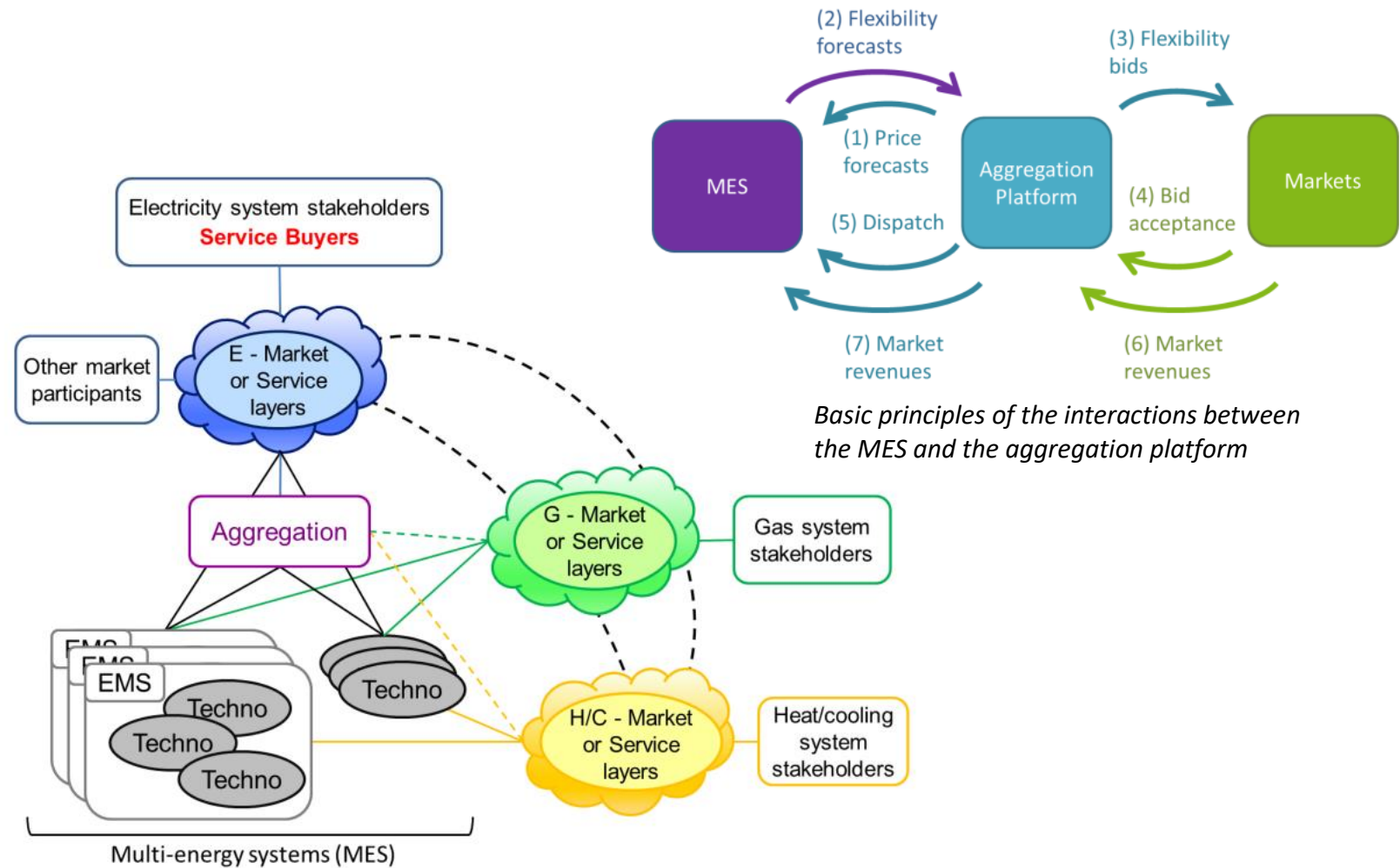
- The project confirmed that MES can definitely provide flexibility to support the integration of renewable energy sources in the electricity system.
- The simulations carried out for the seven real-life case studies showed that a significant amount of flexibility can be available but only a small part of the available flexibility is actually activated.
- The project recommended the following policy actions:
 - Aggregation of MES to enable participation to energy markets
 - Harmonisation of EU electricity markets
 - Creation of new frameworks for collaboration between different actors
 - Novel business models can promote energy integration

Learnings for Heatropolis

- In the Italian case study, site the winter heat peak was able to be reduced by 20% thorough incentivization of heat network end consumers. mFRR was the market with highest profit expectation in 2019, aFRR and FCR are technically feasible but show far lower profit expectation. Revenues from ancillary service markets were not sufficient to recover the additional costs to provide the flexibility for the chosen simulation set-up.
- Realistic revenues from flexibility exploitation are often overestimated, in particular for the intraday market.
- Generally, flexibility provision increases energy consumption. Introduction of storage can lead to reduction of wasted energy and therefore overall consumption.
- Generally, GHG emissions are higher because of the flexibility provision, although installation of local PV generation reduces GHG emissions.
- [More learnings can be found on the project website and final presentation.](#)

12. MAGNITUDE (2/2)

Mälarenergi Sweden	District heating and cooling networks
Paper mill Austria	Integrated pulp and paper mill
HOFOR Denmark	Distributed units at consumers' + district heating network
ACS Italy	Milan district heating network
Neath Port Talbot , UK	Steel industry, CCGT and large RES
EMUASA Spain	Wastewater treatment plant
Paris Saclay France	District heating & cooling networks + distributed units in substations



MAGNITUDE overview of case studies

MAGNITUDE overall system architecture

13. Gateshead District Energy Scheme

Project Overview

Description: Gateshead District Energy is a heat network funded and owned by Gateshead Council, and operated by public limited company, Gateshead Energy Company. Working with Flexitricity, they were the first industrial and commercial customer to enter National Grid’s Balancing Mechanism (BM) in 2018. [More info.](#)

Countries: Scotland, United Kingdom

Organisations:   

Dates: October 2019 – present

Outcomes

- The site was awarded a **15-year Capacity Market contract, at a clearing price of £18/kW** in the 2015 T-4 auction. This was brokered through aggregator Flexitricity and **pays the Council £60,000 per year**.
- Gateshead Council’s Energy Services Manager, Jim Gill, stated that “The main challenges in the industry are around price volatility so we need ways to make our business plan more resilient and that’s where grid services come in, extra income streams diversifies the way we can generate revenue and that makes our business case much more stable.”
- Gateshead Council is expanding their heat network and is exploring additional wholesale market trading opportunities. They are also looking at connecting new assets, including a new CHP engine, office buildings and EV charging stations.

Approach

- Provides heat and power to customers via a 5km underground network of heat pipes and high voltage “private-wire” electricity cables.
- Helps to balance the grid through a mixture of 3MWh battery storage, two 2MW CHP engines and a 250,000-litre hot water thermal storage at 30 minutes notice.
- When demand is high, the CHPs are instructed on by National Grid when they are not already running, and the extra heat generated is put into the network.
- At times of excess generation, the CHPs are instructed to turn off instead of shutting off wind farms. This can happen for 20 minutes to an hour without affecting heat customers thanks to the network’s thermal inertia and heat storage.
- The battery has also allowed the scheme to participate in frequency response and triad avoidance.

Learnings for Heatropolis

- There are learnings in this project about how a natural gas fired CHP heat network is able to participate in flex, and how this could apply to a decarbonised network.
- Flexitricity believe that a heat network with a heat pump could offer the same services to National Grid.
- Innovation has been critical to the scheme. Specifically, the use of private wires has made the initiative commercially viable. This was achieved through the purchase of high-voltage assets from the DNO to enable the connection of the private wire network to existing buildings.

14. IEA Annex 57 (1/2)

Project Overview

Description: Annex 57 (“Flexibility by implementation of heat pumps in multi-vector energy systems and thermal networks”) was a project carried out within the IEA’s Technology Collaboration Programme on Heat Pumping Technologies. It focused on solutions for heat networks and individual heat pumps that can create flexibility for the electrical grid. [More info.](#)

Countries: Austria, Denmark, Germany, Netherlands, Sweden

Organisations: Technology Collaboration Programme on Heat Pumping Technologies by IEA

Dates: January 2020 – November 2024

Approach

- Built on Annex 47 which showed that up to 50% of heating demand in Europe could be met by district heating, and 25% of this could be met by heat pumps.
- Annex 57 focused on the implementation of heat pumps in district heating/cooling systems and the creation of flexibility in the thermal network and electrical grid.
- Performed energy market analysis of the 5 countries involved.
- Collected and described 28 real-life cases where heat pumps are integrated and generating flexibility. Detailed descriptions of each example can be found [here](#).
- Barriers and solutions for individual heat pumps and large-scale heat pumps in district heating networks were identified.

Outcomes

- It was shown by various analyses that large heat pumps for district heating have a high economical potential to operate accordingly and act in ancillary services.
- Some of the cases showed that heat pumps can act in the ancillary service market, especially if they are combined with electrical boilers and weekly storages. But this is a new way to control heat pumps, and there are still barriers to overcome.
- Several limiting factors to the ramp-up times of large-scale heat pumps were identified including pressure and temperature fluctuations, component stress and wear, heat pump configuration, compressor type and refrigerant type.
- Barriers to flexibility provision from heat pumps were identified from a technical, regulatory, economic and social perspective.

Learnings for Heatropolis

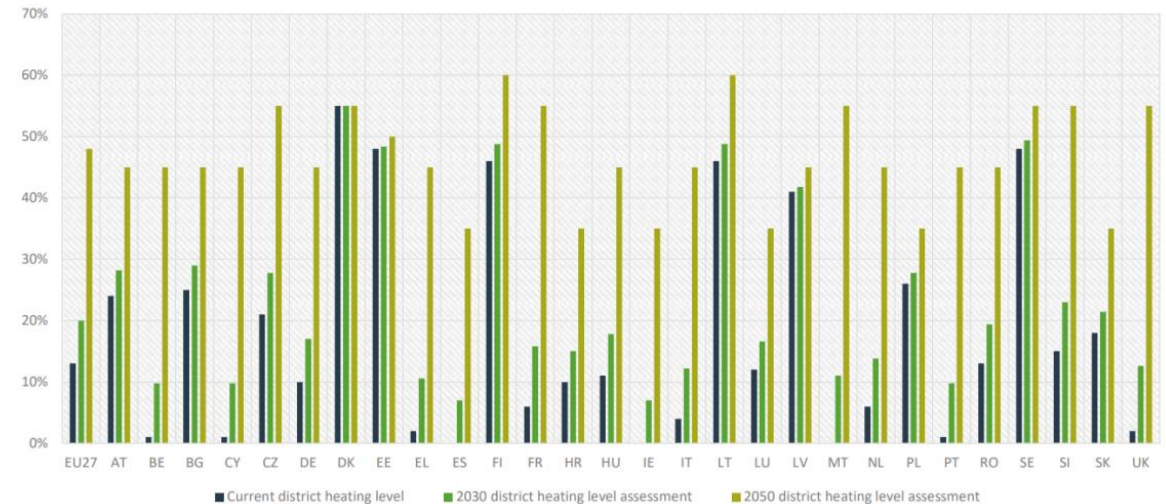
- Different types of FCR and aFRR showed the highest cost reduction, while mFRR was slightly less profitable.
- The combination of a heat pump and an electrical boiler gives certain advantages regarding reaction time and capacity. When it comes to delivering ancillary services, the boiler can react very fast up and down, and it can, thereby, supplement the heat pump to reach the bid limit when the plant operator is putting offers into the market.
- There are international examples of heat pumps in thermal grids participating in TSOs ancillary markets. One is the CO2 heat pump in Sdr. Felding, which is the first site in Denmark to obtain the official qualification to deliver aFRR regulation. In Denmark this requires a start-up time of max 5 minutes and a min bid size of 1MW.

14. IEA Annex 57 (2/2)

Technical	Ramp-up times	Stand-still times	Part load behavior	Measurement/control of electric load	Measurement of flexibility	Temperature flexibility	Fast change of source temperature
Regulatory	Unforeseeable changes in regulation	Local flex-markets still under development	Different regulations in different countries	Minimum bid size	Market entry requirements	Aggregation of small assets creates coordination problems	
Economic	Low revenues from day-ahead prices	Grid fees make up large part of electricity bill	Risk of end user intervention	Maintenance costs	Reduced efficiency and lifetime		
Other	Education of operators and installers	Cyber security / data protection	Acceptance of end users	Different electricity / heat supply mix in each country	More clear information from manufacturers	Wider digitalization measures needed	

	Low barrier for business model formation
	Medium barrier for business model formation
	High barrier for business model formation

Annex 57 Overview of barriers for flexibility business models



District heating levels towards 2030 and 2050 for heating buildings for EU27, per EU country and UK. (Aalborg university)

15. Flexi-Sync (1/3)

Project Overview

Description: ERA-Net Smart Energy Systems funded project which aimed to develop, demonstrate and replicate a service to optimise the flexibility from district heating networks and heat customers. [More info.](#)

Countries: Austria, Germany, Spain, Sweden

Organisations:

Coordinator:



16 partner organisations across the participating countries

Dates: 2019 – 2022

Approach

- The project developed an optimisation service based on platforms previously developed by Utilifeed and NODA Intelligent Systems. Software for optimising the energy system with an expanded system boundary was developed.
- It tested the new service in live district heating networks and buildings in the heating season of 2021-2022. There were 6 demonstration sites across the four participating countries. The demonstration work was primarily carried out by Utilifeed and NODA, in close collaboration with the demo site partners.
- Interactions were set up between the Utilifeed platform and the NODA system, which executed the control in the buildings providing flexibility.
- The solution used a combination of thermal storage, the thermal inertia of the buildings and heat network and smart controls to optimise operations.

Outcomes

- Production planners used the tool to optimise the production and distribution together with the flexibility in the buildings by sending a control signal from the tool. The production planners logged their experiences with using the tool and validated that it works. All six sites were also evaluated for more extended periods through simulation where the optimal dispatches, with and without the flexibility measures, were compared.
- Through the integration, a flexibility potential of the flexibility-enabled buildings for the upcoming hours and days has been sent from the NODA system. These forecasts have been utilised in the system optimisation in the Utilifeed platform. The optimised flexibility plan has then been sent back to NODA, which has executed the plan while at the same time guaranteeing the indoor climate in the buildings providing flexibility.

Learnings for Heatropolis

- This project showed that there were no complaints from residents about the thermal comfort of the buildings being used to provide flexibility, providing a positive indication for similar tests in the Heatropolis trials.
- Results from surveys and workshops done in the project showed that it is essential that occupants understand the flexibility setup but that it is difficult to inform them in an understandable and accessible way. This highlights the importance of educating trial participants as best as we can through WP6.
- The survey also showed that respondents preferred a flexibility setup in which they have control over the flexibility and are compensated economically for temperature ranges larger than $\pm 0.5^{\circ}\text{C}$, over flexibility setups with the same variation and no control or more considerable variations without control.

15. Flexi-Sync (2/3)

Maria Laach, Austria

- A district heating system with a heat plant, fuelled with biomass from agricultural and forest residues, and a district heating grid.
- **Annual demand:** 1.6 GWh district heating.
- **Flexibility used in project:** central storage tank, distributed storage tanks and future CHP.



Borås, Sweden

- A district heating system with a district heating grid, multiple CHPs and HWBs mainly fuelled with biomass, municipal waste and bio-oil. A 1.8 GWh thermal heat storage is used to balance the heat demand of the district heating system.
- **Annual demand:** 600 GWh district heating.
- **Flexibility used in project:** building heat pumps in combination with district heating. Two multi-family residential buildings are part of the demonstration.



Eskilstuna, Sweden

- A district heating system with one CHP and a heat only boiler, both fuelled by wood chips. Four bio-oil fuelled boilers used as peak capacity and four oil-fired boilers for reserve capacity.
- **Annual demand:** 700 GWh district heating.
- **Flexibility used in project:** building heat pumps and building thermal inertia. Two multi-family residential buildings are part of the demonstration.



Mölndal, Sweden

- A district heating system with a district heating grid and a CHP and multiple heat boilers mainly fuelled with biomass from forest residues and liquid biofuel (RME).
- **Annual demand:** 300 GWh district heating.
- **Flexibility used in project:** building thermal inertia. Three multi-family residential buildings are part of the demonstration.



Berlin, Germany

- A neighbourhood with residential buildings is part of the demonstration.
- **Annual demand of neighbourhood:** 618 MWh.
- **Flexibility used in project:** Thermal storages coupled with PV, waste heat integration and a CHP. Heat pumps in combination with district heating.



15. Flexi-Sync (3/3)

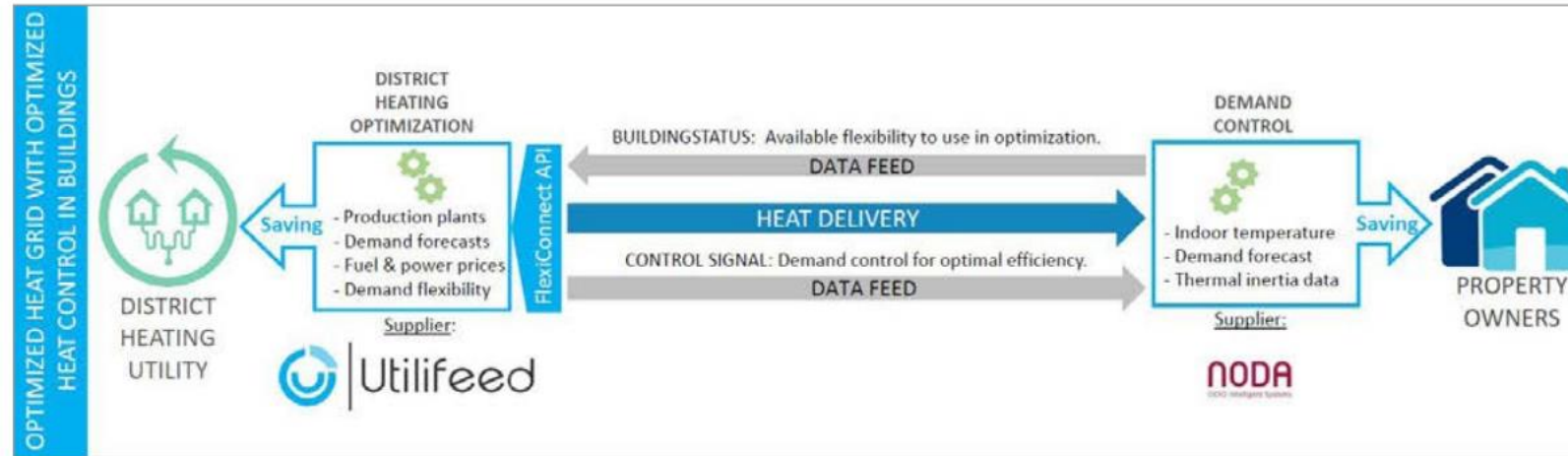


Diagram showing the solution developed and tested by the Flexi-Sync project

16. Whole system value of electrified district heating networks in decarbonising heat sector in the UK

Project Overview

Description: Study assessing the whole-system value of using centralised heating technologies to supply a portion of heat demand in the UK in 2035, in contrast to decentralized electrified heat supply. [More info.](#)

Countries: United Kingdom

Organisations:  **Newcastle University** |  **Brunel University London** |  **Imperial College London**

Dates: April 2024

Approach

- Performed whole system analysis using the Whole-electricity System Investment Model (WeSIM) developed by Imperial College London to evaluate the potential cost savings from rolling out electrical district heating networks to supply some of the UK's annual heat demand in 2035.
- Quantified system cost reductions compared to relevant counterfactual scenarios.
- The model included centralised electric boilers, centralised air source heat pumps and decentralised air source heat pumps, centralised and decentralised thermal energy storage.
- The model assumed that the electricity sector is decarbonized and 50% of total domestic and commercial heat is supplied by electrified heating technologies.

Outcomes

- Cost savings in scenarios excluding centralised electric boilers are significantly higher than in corresponding scenarios including these within heat networks.
- Whole system benefits increase with higher uptake levels of electrified heat networks in supplying electrified heat demand.
- The inclusion of centralised electric boilers to meet peak demand results in increased reinforcement costs of distribution networks compared to counterfactual scenarios with heat pumps only. This is because their COP is effectively equal to 1, meaning the grid needs to meet a higher peak demand.
- Increasing the amount of heat network thermal energy storage results in significantly lower peak demand.

Learnings for Heatropolis

- Quantitative modelling shows that a system-wide rollout of electrified heat networks could result in significant cost savings from a whole-system perspective, highlighting the need and importance of the Heatropolis project.
- The study demonstrates that rolling out heat networks can result in a reduction in total installed capacity of zero-carbon generation and energy storage. This reduction is significantly higher when centralised electric boilers are excluded as utilising centralised heat pumps with high COPs is more efficient than a mix of heat pumps and electric boilers with low COP.
- Given that several of the Heatropolis archetypes are planning to use a combination of heat pumps and electric boilers, we should look at the practical implications of this and see if it is possible to use flexibility to reduce the use and reliance on the electric boilers.