Energy Systems Nexus

Collaborating for an integrated Net Zero future

Recoverable Heat in Heat Networks

Project Insights

October 2026

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What is the Energy Systems Nexus?

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Energy Systems Nexus is a collaboration centre that brings together the most progressive energy industry leaders with the sector's brightest minds to define, fund, and deliver a whole systems R&D programme, in pursuit of Net Zero.

Our industrial members collaboratively define and fund a programme of whole energy system research and development.

The Nexus is:

- Developing a cross-cutting R&D programme of projects that take a whole systems approach to realising Net Zero opportunities for industry
- Delivering a pipeline of high impact analysis that de-risks decisions needed to deliver Net Zero
- Forming impactful, collaborative partnerships to deliver insights for members and the wider sector to inform strategic thinking, develop skills, and bolster institutional capacity

Who are the Nexus members?

United Kingdom National Nuclear Laboratory

aws

e·on

Supported by members of the Nexus Strategic Advisory Group

Department for Energy Security & Net Zero

UKRI Engineering and Physical Sciences Research Council

Powered by the Catapult

Energy Systems Catapult was selected by the UK National Nuclear Laboratory to lead Energy Systems Nexus owing to its technology agnostic, data-led approach to whole energy systems analysis and commitment to accelerating Net Zero energy innovation.

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Recoverable heat: an under-utilised resource

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Recovering heat can turn surplus energy into low-carbon fuel — but the UK has not yet made this the norm.

Heat networks are moving from unregulated infrastructure to a strategic route for decarbonising heat in urban and industrial areas in the UK. This has already happened elsewhere in Europe.

3%
heat demand today

7%
target by 2035

20%
expected by 2050

Heat-network ambition: from today's small base to a mainstream heat source by 2050.

The issues this project tackles:

- **Potential is scattered:** Heat that might otherwise be wasted comes from industry, Energy-from-Waste, power generation, data centres, retail refrigeration and public infrastructure.
- **Connections have not been supported:** Heat grade, proximity, demand profile and network capacity need to align.
- **Barriers are systemic:** Incentives, risk allocation, contracts, time horizons, data visibility and infrastructure cost often block deployment.
- **Policy is shifting:** Ofgem regulation, technical assurance and zoning are creating momentum, but coordination is still needed.

Project response:

Energy Systems Nexus members co-funded this project to explore the barriers and develop practical recommendations to accelerate the use of recoverable heat in heat networks. This report is a summary of the project and the insights generated.

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Project methodology: a summary

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How we investigated the problem

Four linked work packages created an evidence chain from market context to business and policy insights.

WP1 — Market review
Built the evidence base: Explored the market, sources and net zero relevance for recoverable heat in networks.

WP2 — Spatial mapping
Located the opportunity: Quantified where heat sources sit in relation to potential heat-network demand.

WP3 — Business models
Tested viability: Clarified how characteristics including proximity, heat grade, heat profile, and anchor loads impact commercial models.

WP4 — Policy analysis
Created the action route: Proposed policy, regulatory and market opportunities

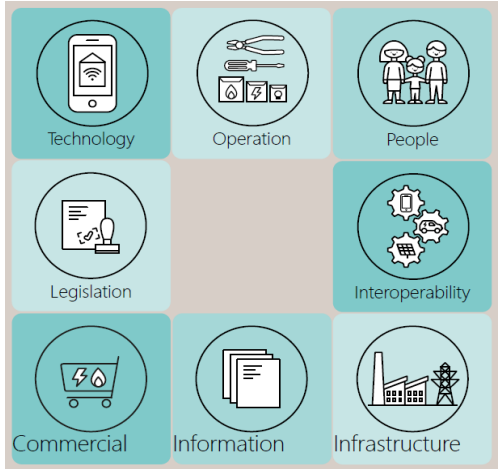

Figure 1: Aspects of Integration framework

WP1
37
UK and international heat networks reviewed that are using recovered heat

WP2
4,780
recoverable heat sources within 1km of heat network zones

WP3
9
barriers to viable, scalable business models explored

WP3
6
pricing and profit-sharing models tested

WP4
6
recommendations for policymakers to scale heat recovery

Cross-cutting
13
Industry stakeholders interviewed

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Recoverable heat helps, but doesn't fix the first barrier

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Project hypothesis: new contracting models or commercial structures might be needed to unlock wide-scale use of recoverable heat in heat networks in the UK

What we found:

The contractual agreements between recoverable heat providers and heat network operators are not currently considered as the major barrier within the heat network industry. The dominating issue is commercial barriers to investment into the foundational heat network infrastructure (e.g. the pipe network), which is not a problem that recoverable heat typically helps to overcome.

However, use of recoverable heat can **reduce operational costs** for heat network operators (and their end customers) by providing cheaper (or even free) heat, and providing diversification of heat sources, improving security of heat supply.

We examined and tested with stakeholders several models to determine the price that heat network operators might pay to recoverable heat providers, including:

- cost-based pricing,
- avoided-cost approaches,
- fixed-price agreements, and
- performance-based models.

However, these were often considered moot until the general landscape for heat network investment in the UK improves.

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Policy principles to make heat recovery the norm

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A coordinated approach, linking planning reform, carbon policy, market incentives and data infrastructure, will be essential to unlock the full value of recoverable heat.

1

Develop clear value frameworks to incentivise heat recovery investment

Misalignment of commercial incentives and lack of guaranteed offtake are often the biggest barriers to investing in the infrastructure required to make use of recovered heat.

2

Maintain contractual and operational flexibility

Different heat sources require distinct approaches to business model innovation, based on characteristics including grade of heat and proximity to demand.

Uniform mandates and rigid contractual requirements risk discouraging participation and limiting project viability.

3

Keep a live open data platform

Maintain data on heat source potential, to increase information availability at the development stage for investors.

The rest of this report goes through these policy principles in more detail, with specific policy recommendations within each one.

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1 | Develop clear value frameworks to incentivise heat recovery investment

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Misaligned commercial incentives between heat source and heat network operators can be a barrier to connecting recoverable heat.

Commercial barrier

Sale of heat is a non-core activity for many sources of recoverable heat.

Policy response

Make avoided emissions and useful heat offtake count in reporting and incentives:

1. **Increase recognition of the system value of heat recovery** for heat network zones in England during procurement by Zoning Coordination Bodies. The addition of “electricity network benefits” in procurement as an extra social value outcome would recognise the reduced dependency that heat networks with recovered heat sources can have on the electricity network through diversification of heat sources.
2. **Create a Carbon Reporting and Innovation Office** to improve carbon accounting rigour and credibility. This should have an economy-wide regulatory function and responsibility for overseeing emissions monitoring, reporting and verification, to ensure carbon accounting practices can support decarbonisation and competitiveness in the UK
3. **Expand the UK Emissions Trading System** to include Energy from Waste plants from 2028, including the free allowances for heat recovered for heat networks, and over time include domestic heating fuels in the ETS.

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1 | Develop clear value frameworks to incentivise heat recovery investment

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A lack of guaranteed offtake and mismatch between heat output and local heat demand is often the biggest barrier to investing in the infrastructure needed to use recoverable heat.

Commercial barrier

Heat network infrastructure, including pipework, heat exchangers and heat pumps, have a significant upfront cost, necessitating a strong business case and de-risking of investment.

Policy response

Increase capital support for recoverable heat connections:

1. Maintain Green Heat Network Funding (GHNF) for infrastructure to connect recoverable heat sources in heat network zones in England.
2. Explore potential for the **National Wealth Fund to de-risk construction** by providing guarantees for early-stage infrastructure, and loans that are repaid when projects reach certain financial metrics to help make private sector finance possible.
3. Consider developing **standardised contracting templates** for heat infrastructure as part of the National Wealth Fund requirements, to reduce transaction costs and connection risk.

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2 | Standardise the deal, not the business model

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Different heat sources require distinct business model approaches, based on characteristics including grade of heat and proximity to demand

Variable, low-grade, urban-based recoverable heat sources
e.g. data centres

Data centres provide relatively stable but low-grade heat, with viability of heat network connection depending on proximity to demand.

The heat they produce is dependent on demand for their computing services, so **lower-obligation, availability-based agreements** with **temperature ranges linked to operational conditions**, are likely to be more appropriate than fixed volumes and temperatures. There is also a temporal mismatch between construction of data centres and development of heat networks, affecting the timing and commercial structuring of offtake agreements.

Data centres are therefore **best suited as a supplementary input within a diversified heat supply mix**.

Data centres: close-up

Sale of heat is unrelated to data centre operators' core business of data storage and computing services, and revenues from sale of heat would not make a meaningful difference to their financial performance. As such, there is no business case for data centre operators to invest in heat recovery infrastructure or operate ancillary equipment (e.g. heat pumps) within their own site boundary, although they are generally happy to allow the heat to be off-taken – often at minimal or no charge to the heat network operator.

Heat network operators that we spoke to indicated that they would be happy to take responsibility for building and operating the heat pumps required to boost data centre heat to required temperatures – especially if the heat is provided for free. This keeps the investment obligation on data centre operators to a minimum.

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2 | Standardise the deal, not the business model

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Different heat sources require distinct business model approaches, based on characteristics including grade of heat and proximity to demand

Predictable, high-grade recoverable heat sources
e.g. nuclear power stations

Nuclear plants can offer large volumes of predictable, high-grade heat suitable for baseload supply, but face challenges related to the scale of: the demand needed for offtake, the infrastructure required to connect to demand, and the backup heat generation needed when reactors go offline for maintenance or refueling.

For nuclear plants cogenerating heat alongside electricity, **longer-term agreements based on defined volumes and performance guarantees** may be viable.

Nuclear cogeneration projects should seek planning input from national and local government. Classification as nationally strategic infrastructure would allow Development Consent Orders to be obtained, reducing the cost of receiving planning permission for infrastructure across multiple local government boundaries.

Nuclear: close-up

Existing nuclear power stations are optimised for electricity generation, and so are not ideally suited for heat supply in terms of their location or reactor design. Private commercial arrangements are unlikely to enable use of nuclear heat in heat networks in the UK, as the cost of building pipelines over long distances is generally considered too high – particularly if the corresponding scale of offtake demand cannot be guaranteed.

However, the volume of heat that nuclear reactors produce could provide a significant boost to regional strategies for decarbonising heat for both industry and homes. Future nuclear power stations should therefore be considered on a nationally strategic basis with cogeneration in mind, with planning for heat network infrastructure to be built alongside the power station.

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3 | Keep a live open data platform of heat source potential

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Different heat sources require different approaches to heat network integration, and these characteristics need to be more widely understood and available for potential developers.

1

Assess

Mandate techno-economic heat recovery assessments during planning permission applications to assess the potential, for those above a set energy threshold.

2

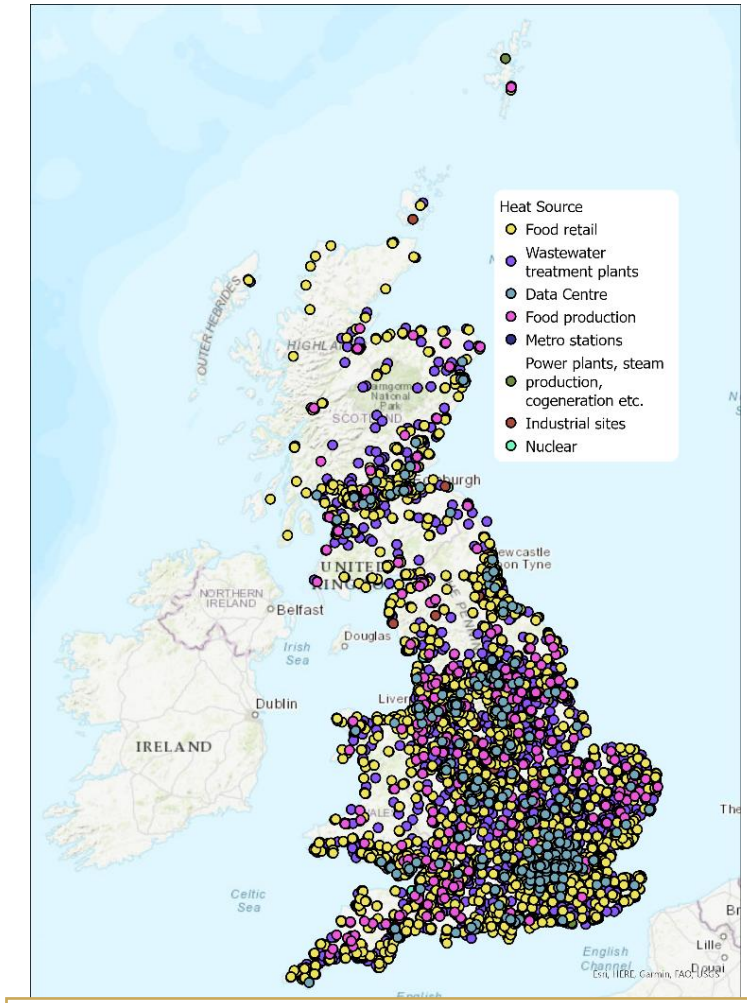
Publish

Standard data to include peak heat supply, annual heat supply, grade of heat, and expected seasonal variation.

3

Update

A live platform, keeping heat source data current for investors and local planners, not just for sources in/near to heat network zones. Some heat sources may be viable over longer distances outside of zones, such as nuclear power.



Distribution of heat sources used in this work. Combining commercial and industrial sources from the European Waste Heat Map, data centres from Data Center Map, and nuclear

Policy caution

If a default heat recovery mandate was imposed on the heat source, without first understanding how the interlinking operational, technical, financial, and contractual variables interact, there is a risk of placing undue burden on the heat source without full confidence that heat recovery will lead to impactful cost reductions for the end consumer.

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