Killingworth Heat Network Opportunity



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Project Background

The Authority has delivered a programme of work that has more than halved the Authority's carbon footprint. This followed the energy hierarchy approach, with initiatives moving up through the stages of energy management, energy efficiency and energy generation. The Authority has invested significantly in a range of energy efficiency measures and continues to assess these options but now has a greater focus on heat decarbonisation.

In July 2019 full Council declared a Climate Emergency, setting a target to reduce the carbon footprint of the Authority and in acknowledgement of the gravity and urgency of the Climate Emergency, the refreshed Our North Tyneside Council Plan 2021-25, approved by full Council in September 2021, included the following ambition;

"We will publish an action plan of the steps we will take and the national investment we will seek to make North Tyneside Carbon Net-Zero by 2030."

The Authority's Net Zero 2030 Action Plan and its annual updates, are presented to Cabinet and remains focussed on;

- Improving energy efficiency
- Decarbonising power
- Decarbonising heat
- Decarbonising travel



Killingworth

Project Background

In 2016, North Tyneside Council (NTC) commissioned a borough wide Heat Mapping and Master Planning study. Killingworth was identified as one of six heat clusters across North Tyneside. In 2022, NTC advanced the project to a feasibility study and moved to Detailed Project Development in 2023.

The Killingworth area was also identified in the recent Government consultation map for Heat Network Zoning legislation (2025) as one of several areas in the North Tyneside borough likely to be subject to new heat network zoning regulations.

As shown below, the Killingworth scheme is in the process of developing an Outline Business Case (OBC).

The project team and their roles in developing the OBC for Killingworth Heat Network are described below:

- North Tyneside Council (NTC) The client; contact: michael.keenlyside@northtyneside.gov.uk
- **Turner & Townsend (T&T)** Project management support to the Council, developing the Strategic Case
- Sustainable Energy (SEL) Technical consultants developing the Economic Case; contact: <u>matthew@sustainable-energy.co.uk</u>
- Amberside Advisors (AAL) Financial and commercial consultants developing the Financial and Commercial Case; <u>main point of contact</u>: <u>jack.bedells@amberside.uk</u>
- Womble Bond Dickinson (WBD) Legal advisors providing legal support to the Council



Opportunity

Phase 1 heat demands come from NTC's buildings, eight local schools and social housing clusters. Circa 69% of the Phase 1 heat demand comes from public sector.

Phase 2 would expand the network to connect to an additional social housing cluster and primary school, as well as several large private sector demands including Morrisons and industrial estate loads.

The key network metrics for the fully built out scheme are shown on the right. The scheme prioritises soft dig, and the network within the housing clusters has been sized to supply both social housing and private housing demands, which have the potential to provide an additional demand of 2.2 GWh and increase the IRRs (private housing demand was not accounted in the base case economic modelling).



Technology

Economics

Wider Opportunity

Located approximately 10 km from Newcastle, Killingworth is experiencing significant development interest.

As a fast-growing town, it anticipates multiple planned developments in the coming years, which could be integrated into and served by the heat network. The key planned developments are Killingworth Lane (432 no. residential dwellings) and Killingworth Moore (1,446 no. residential dwellings, a local centre, a primary school and up to 68,000 m² of commercial space).

Additionally, there is potential for the scheme to expand southward towards Quorum Park (circa 93,000 m² of office space), Balliol (circa 45,000 m² of office space) and Gosforth Business Park (circa 23,000 m² of office space).



Technology - Fully built out energy centre

The Killingworth Council Depot site has been identified as the preferred location for the energy centre due to its position above four mine seams and council ownership. The existing buildings in the south of the Depot site are due to be demolished.

The energy centre will house mine water source heat pumps, gas Combined Heat and Power (CHP) unit (sized to supply electricity to the heat pump only), and peak and reserve gas boilers.







Technology - Mine Water Heat Source

Mine water source heat pumps utilise the thermal energy extracted from water that has flooded underground coal mine seams. This mine water can be extracted using boreholes, shafts, and adits, where it is then pumped to a heat pump. The heat pump then raises the fluid temperature through a compressor to the levels required by a district heat network scheme.

The mine water will be abstracted from one of the deepest seams, the Low Main seam (290 mBGL), and reinjected into the High Main seam (195 mBGL). The temperature of the heat source is expected to be approximately 15 degrees.

- Coal Authority reviewed historical data and colliery mine workings plans and recommended to target Low Main/High Main
- Pumping/injection tests will be required to confirm how much flow can be supplied and sustained at the site without short circuiting
- Borehole CAPEX has been tested with drilling market



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Economic Results

Base case scenario with GHNF funding and connection charges

		Phase 1	Phase 2
Capital costs for each phase (including contingency & optimism bias)		£20.1 m	£7.9 m
Total capital costs (including contingency & optimism bias)			£28.0 m
Grant funding		£3.7 m	
Residential connection charges		£2.2 m	£1.5 m
Commercial connection charges		£3.2 m	£1.6 m
25 years	IRR	3.7%	4.3%
	NPV	£0.3 m	£1.3 m
	Simple payback	17 years	16 years
	Net income	£6.2 m	£10.2
30 years	IRR	4.4%	5.0%
	NPV	£1.3 m	£3.0 m
	Simple payback	17 years	17 years
	Net income	£9.3 m	£15.0 m
40 years	IRR	5.1%	5.6%
	NPV	£2.9 m	£5.5 m
	Simple payback	17 years	17 years
	Net income	£15.2	£24.3

Disclaimer: these numbers have been generated from initial techno-economic modelling and a full financial model is in development, the IRRs shown are nominal, pre-tax, post grant

Scenario details

The fully built network meets all the eligibility criteria for Green Heat Network Fund (GHNF).

Both the social IRR and the end customer heat demand of the network are above the required minimum values.

Maximum funding available based on 2.5 p/kWh of heat delivered in first 15 years is £3,662,723.

Connection charges of £650/kW for commercial, and £10,000 per residential dwelling have been applied.

Killingworth

Network opportunity

Technology

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Summary

Economics

After funding and connection charges, a capital investment of £15.8 million is required to build out the network up to Phase 2.

The fully built out scheme will provide a 40-year net income of approximately £24.3 million and payback in 17 years.

The fully built network results in a levelised cost of heat of 19.24 p/kWh based on a 40-year business case.



Key techno-economic model assumptions

Commercialisation cost: £760k Cost of accessing heat source including 'pilot boreholes': £1.7 million Construction costs including preliminaries: £25.5 million

GHNF contribution assumed: £3.7 million Connection charge contribution modelled: £8.5 million Discount rate: 3.5%

Technology

Economics



Summary

Killingworth Heat Network Key Techno-economic Metrics

Heat demand: 10.5 GWh

Heat source: Mine water

Network length: 8.5 km

Estimated CAPEX: £28.0 million

Projected 40-year IRR: 5.6%

Payback period: 17 years





Contact us

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