

District Heating Network with a Deep Geothermal heat source (Hot Sedimentary Aquifer) in Stoke-on-Trent

25th October 2016



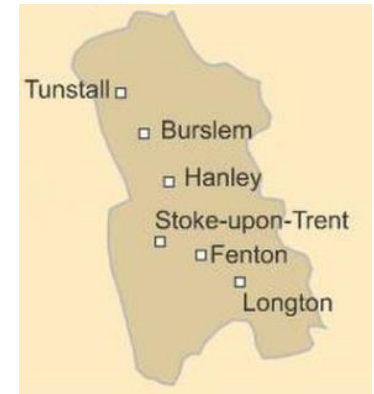
Stoke-on-Trent

Unitary Authority (**6 towns**)
250,000 inhabitants

Commonly known as
"The Potteries"

Well connected

Railway network
Motorway network
4 Airports – 1 hour



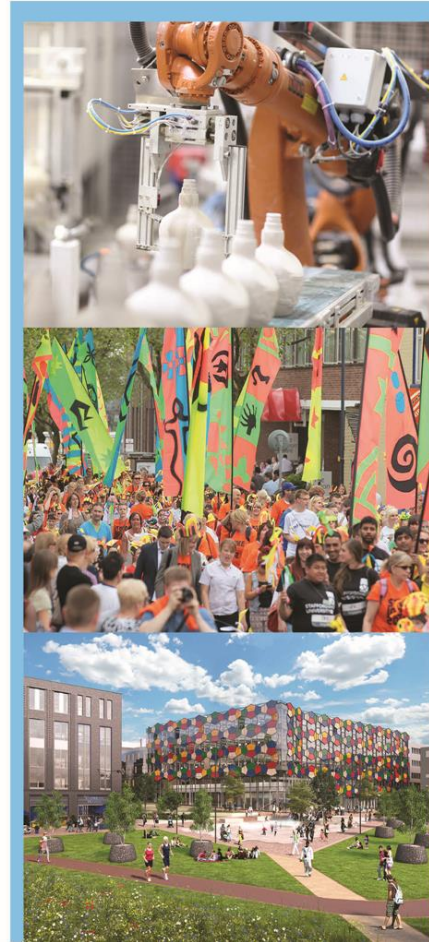
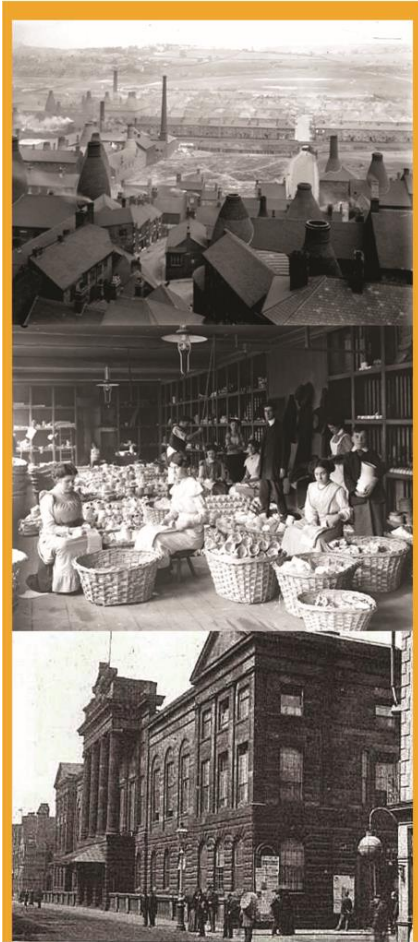
Circa 16km x 7.5km



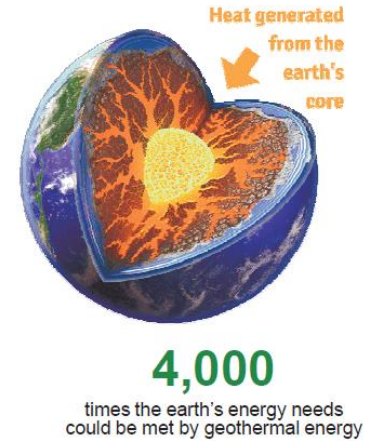
City of
Stoke-on-Trent

Stoke-on-Trent

The three lifetimes



Deep Geothermal heat



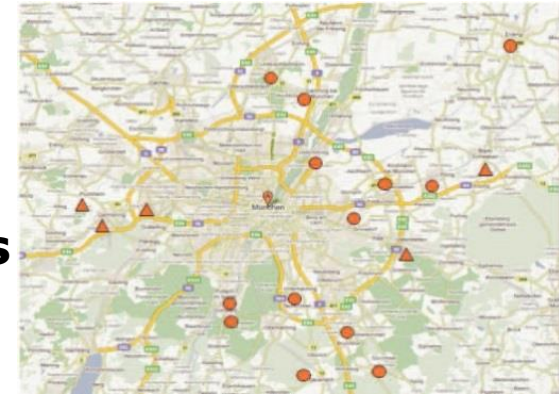
- **24/7** Availability
- Provides a **local** sustainable energy supply
- **Low carbon**
- **Not subject to fossil fuel price volatility or carbon taxes**
- Ideally suited to district heating schemes
- Minimal visual impact
- **Proven technology** (though not widely adopted in the UK)



Proven European examples

- **Europe**

257 geothermal district heating systems operation, equivalent to **4,000 MW**.
Predicted to double by 2016.



Munich region

- **Germany**

€4bn has been invested in the sector with Munich alone having **19 plants** in operation.

- **France**

Paris has **37 operating wells** providing heat to homes and businesses saving **350,000 tonnes of CO₂ per year**.

The latest system supplies heat to Paris-Orly airport **500,000 homes connected in Paris alone**



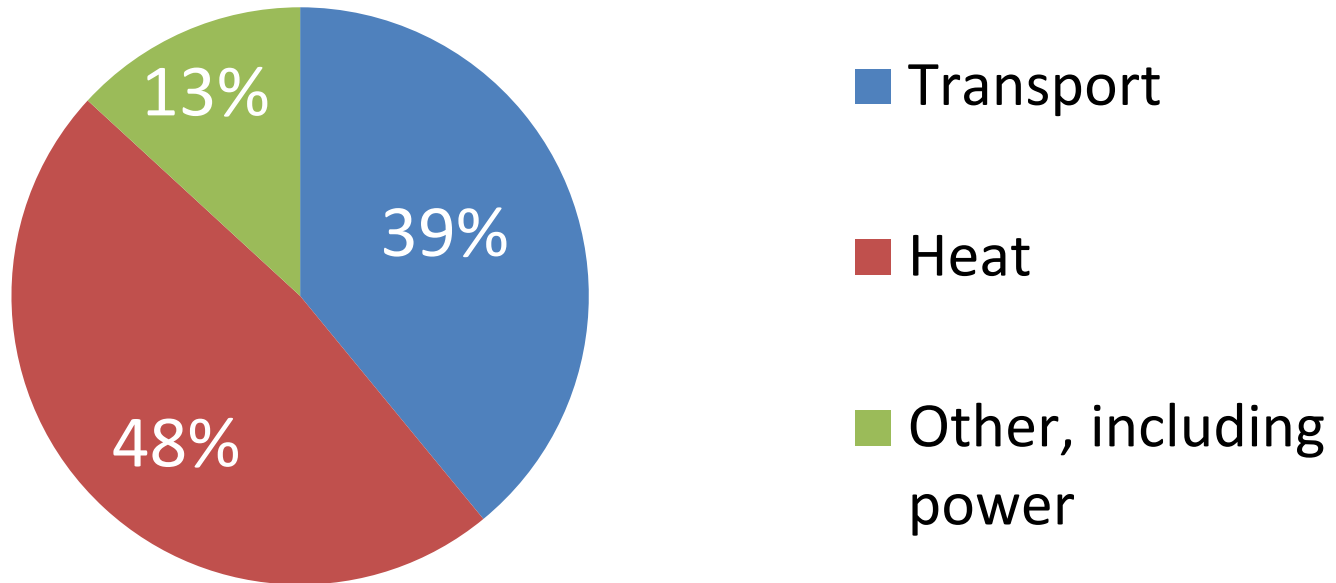
Paris region



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UK Background



UK Primary Energy Usage for Heat, Transport, Other (2014)

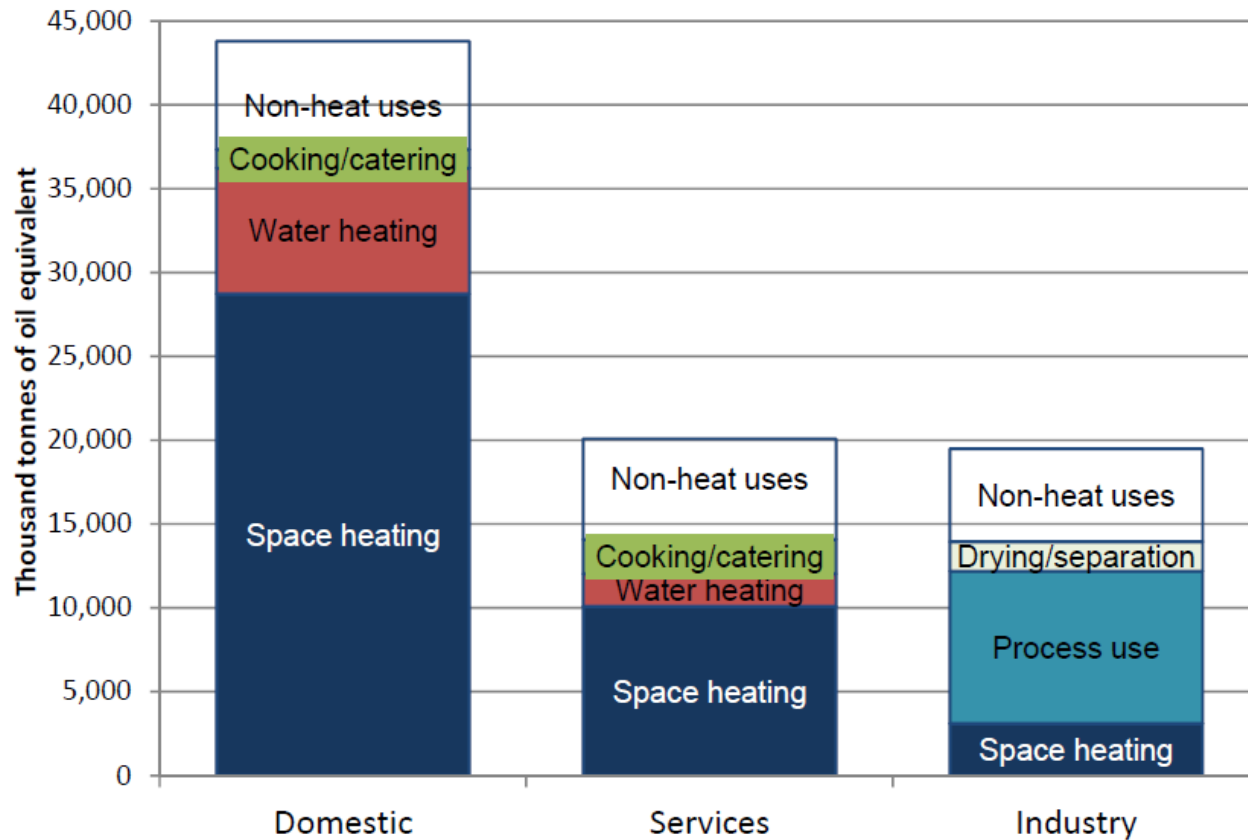
Source: Department of Energy and Climate Change - Heat Network Delivery Unit



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UK Background



Non-transport final energy consumption by use by sector (2013)

Source: Department of Energy and Climate Change - Statistics
www.gov.uk/government/uploads/system/uploads/attachment_data/file/386858/Estimates_of_heat_use.pdf



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UK Background

- Extensive gas grid, covering nearly 80% of houses.
- 1.6 million gas boilers installed/replaced in homes each year.
- Today: approx 2000 heat networks, supplying just 2% of buildings heat.
- Committee on Climate Change (CCC) central scenario for the 5th carbon budget shows heat networks serving 18% of buildings heat demand in 2050 (81TWh), saving 15.1MtCO₂e/year.
- 8-10% compound growth rate required to meet the lower end of CCC trajectories.



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Stoke-on-Trent Background

- Local ceramic industry is a key energy intensive user (Gas)
- UK gas reserve: 14days (Germany 77 days and France 91 days)
- Heavy 2010-11 winter brought a supply crisis
- High level of fuel poverty, poor housing stock
- Significant clusters of heat demand but spread across the city

Source: Atkins

<http://www.atkinsglobal.co.uk/en-GB/media-centre/features/natural-gas-whats-in-store>

SoTCC Objectives

The objectives of Stoke-on-Trent Energy initiatives are to address the energy trilemma of:

- **Security of fuel supply**
- **Cost**
- **Carbon**



DHN Scheme Components

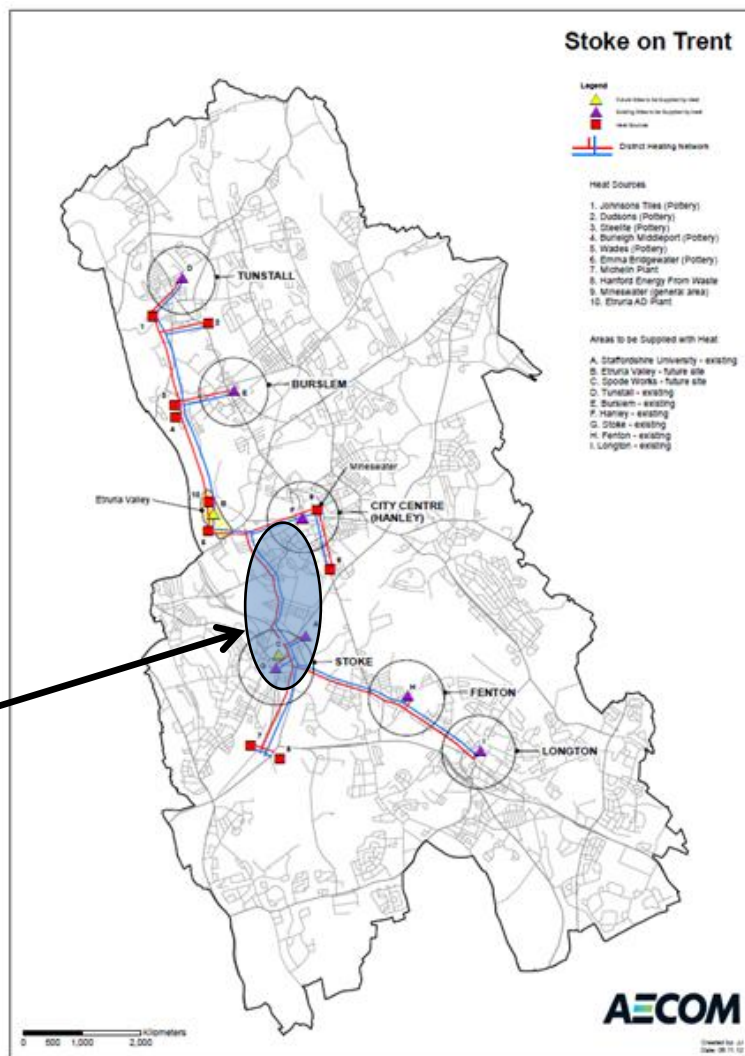


Whole System Approach

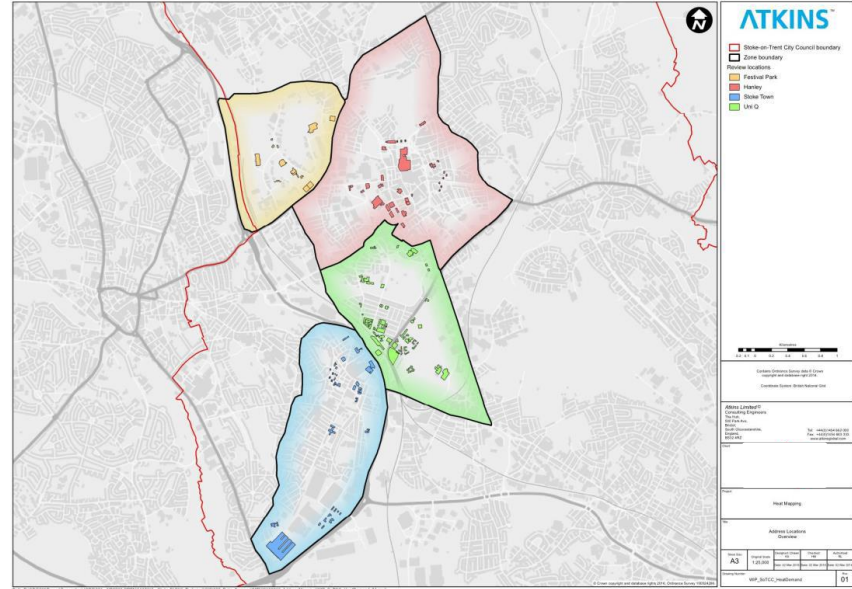
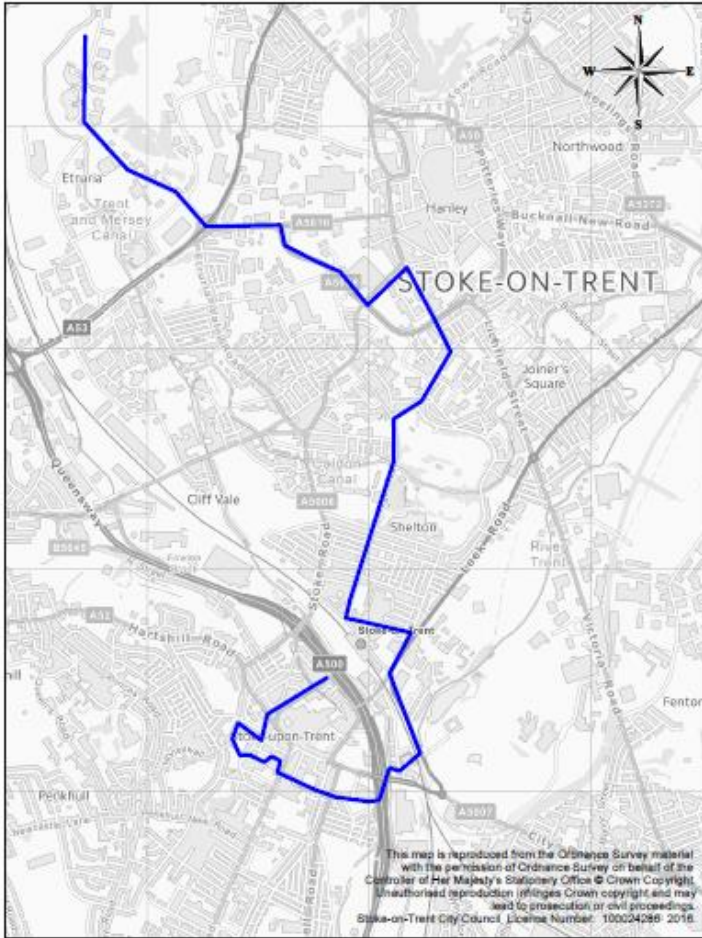
Heat Mapping - Strategic approach

Total current heat demand in City Council area = **1,907GWh** from DECC National Heat Map

Identifiable useful heat load in primary area identified is **170GWh p.a.** 9% of total city heat demand.



Demand Led Design



4 Clusters:

- Festival Park
- Hanley
- UniQ
- Stoke

48GWh per year

Circa 18km network (Trenching)

 Stoke on Trent City Council Civic Centre Globe Street Stoke on Trent ST4 1HH UK	Scale	1:16588 @ A4
	Date	27 Sep 2016
	Drawn By	Sébastien Danneel
	Drawing Ref	01
	Revision	1



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Heat Demand

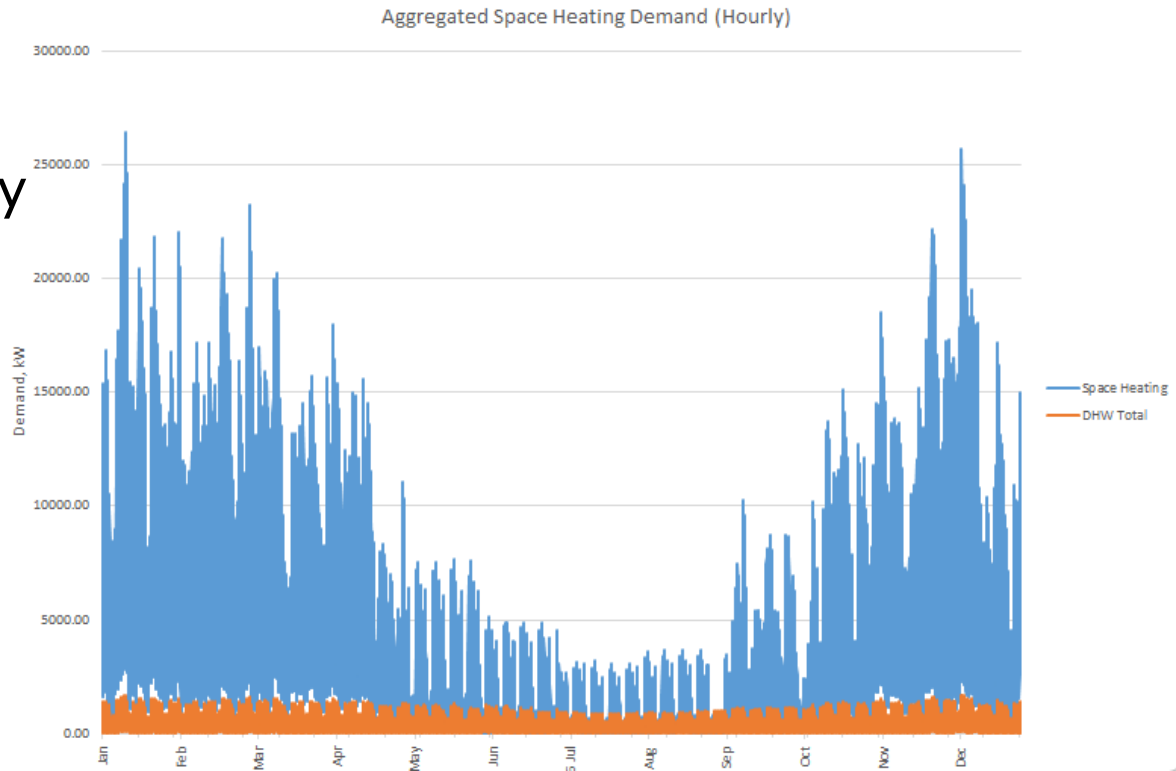
118 Buildings

- Plant room survey
- Last 24 months energy bills

48GWh p.a. identified

Large public covenant demand

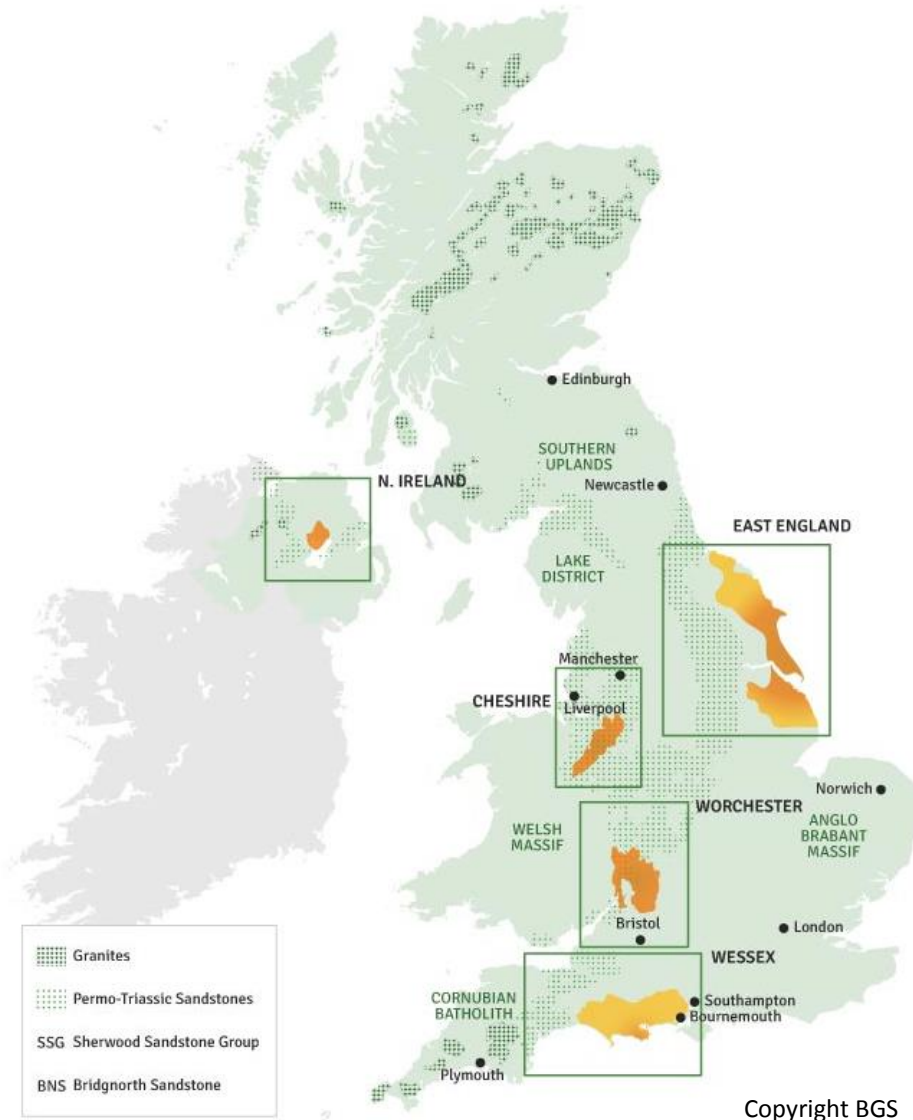
Half Hourly aggregated demand



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Deep Geothermal in Stoke-on-Trent?



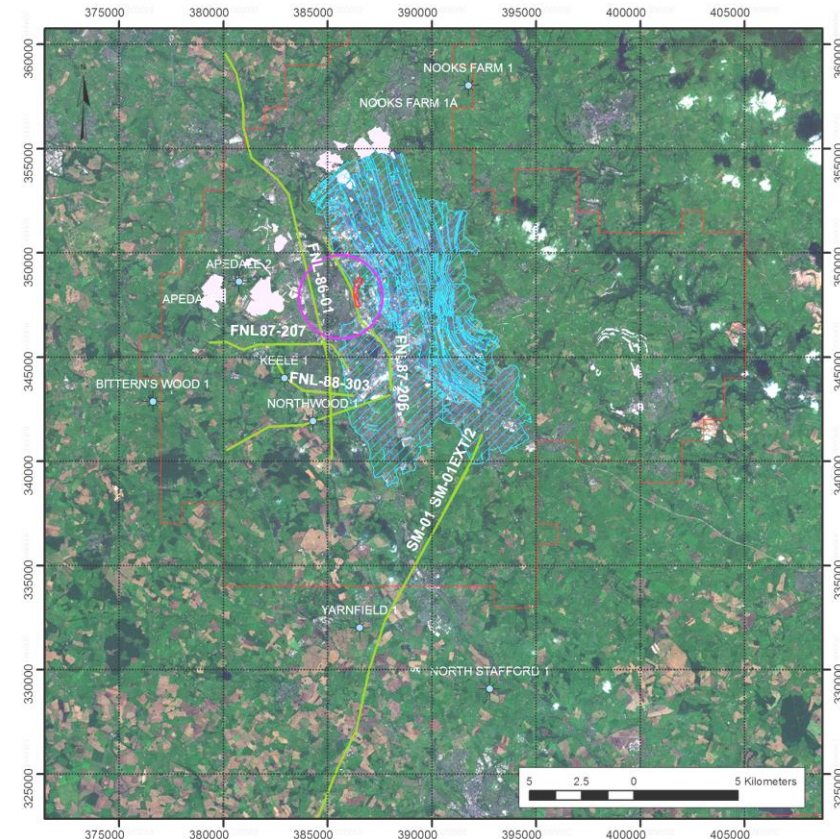
Miners at Hem Heath colliery

Technical Due Diligence

- 90km of 2D Seismic Reflection Line Data - UKOGL
 - Seismic reflection data acquired in 1980s
 - Reprocessing of FNL87-206 and FNL87-207
- BGS Digital Geology and Geophysical Data
 - Borehole data
 - Core material and cuttings
- Coal Authority Data
 - Mine workings
 - Temperature records

Wolstanton colliery 41°C at 1,000m

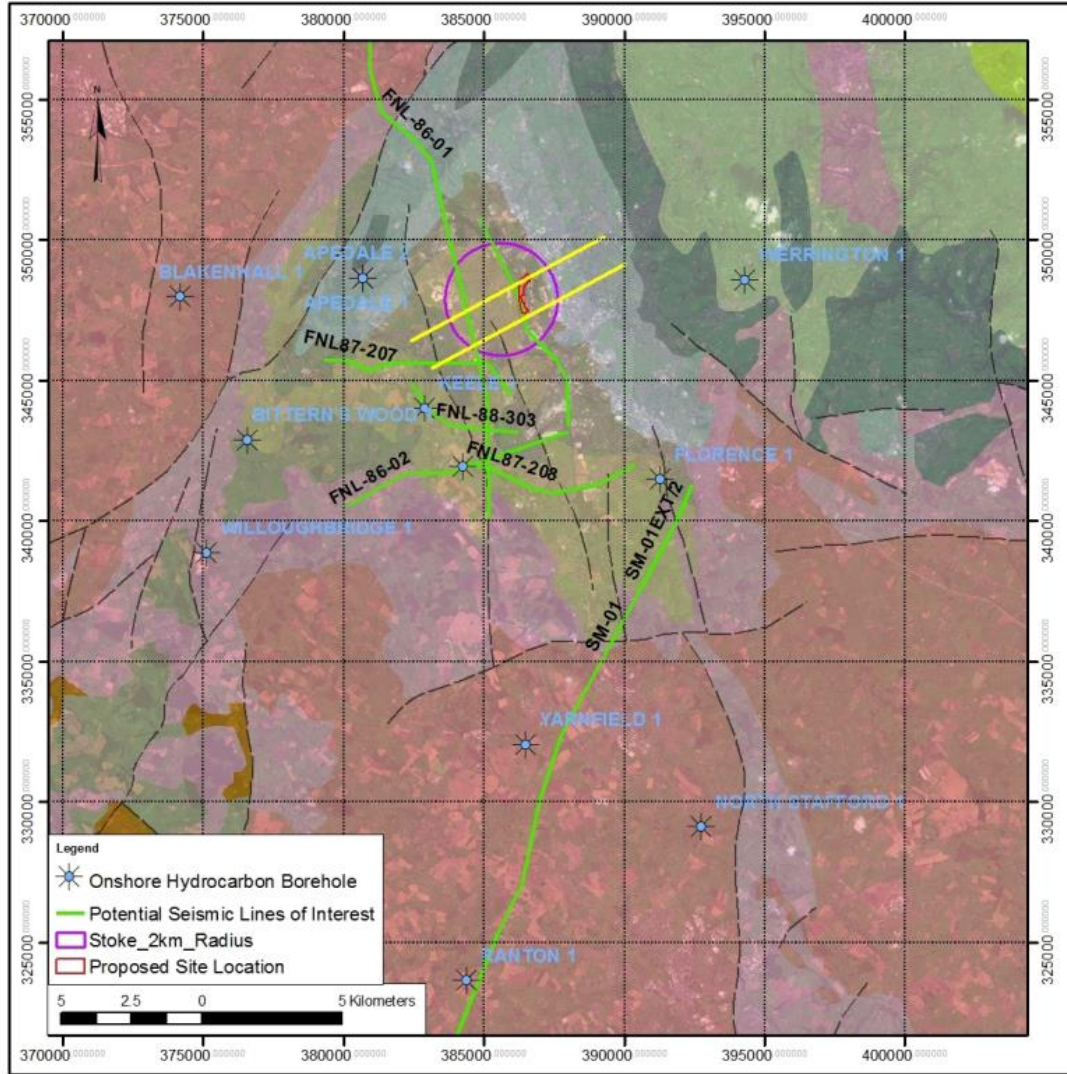
**Hot Sedimentary Aquifer
around 95°C located in
Lower Carboniferous Limestone
at a depth of 2.8km**



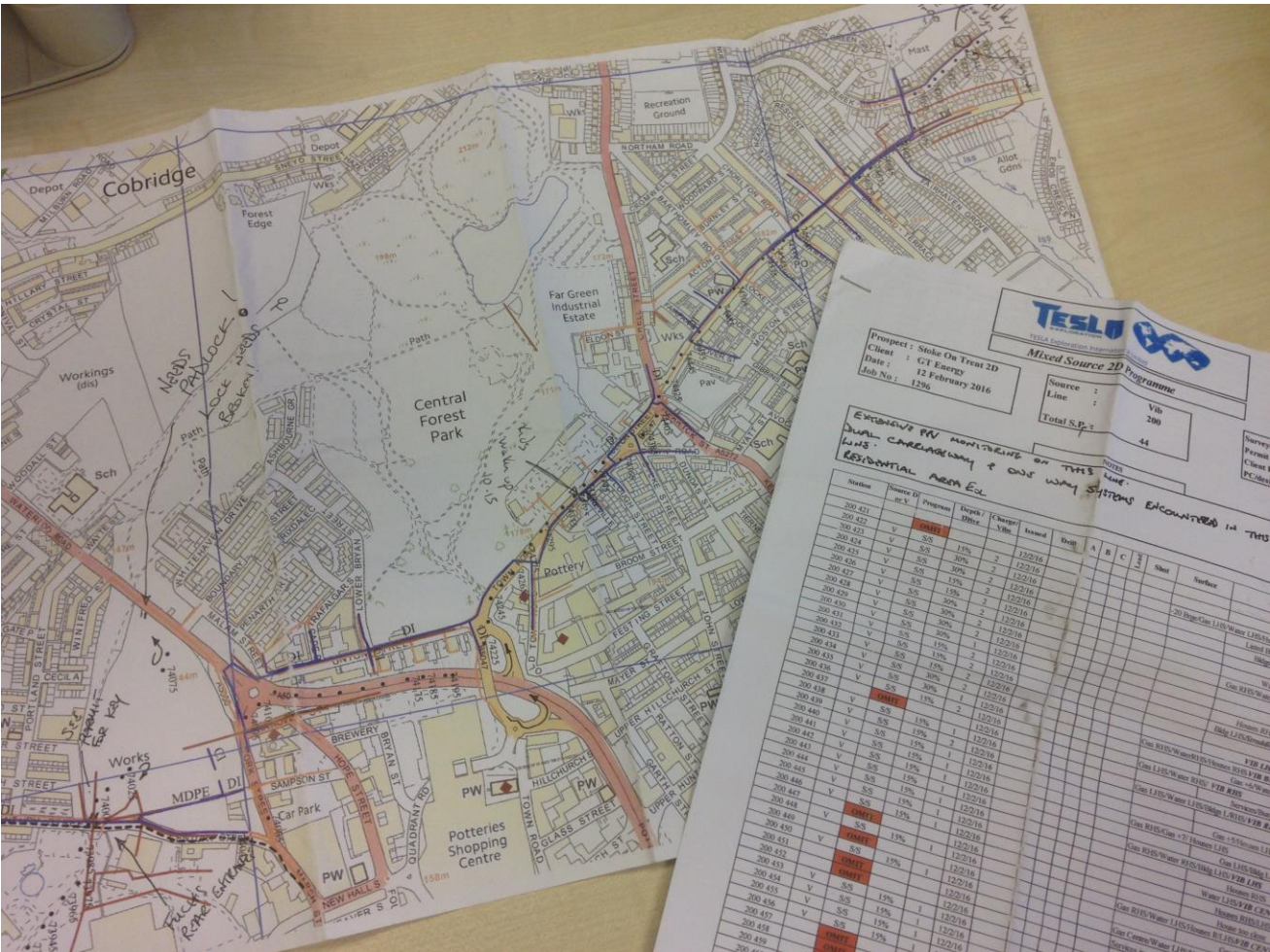
New Seismic Acquisition Survey Required

2 x 11km lines

Procured through OJEU tender process



New Seismic Acquisition Design

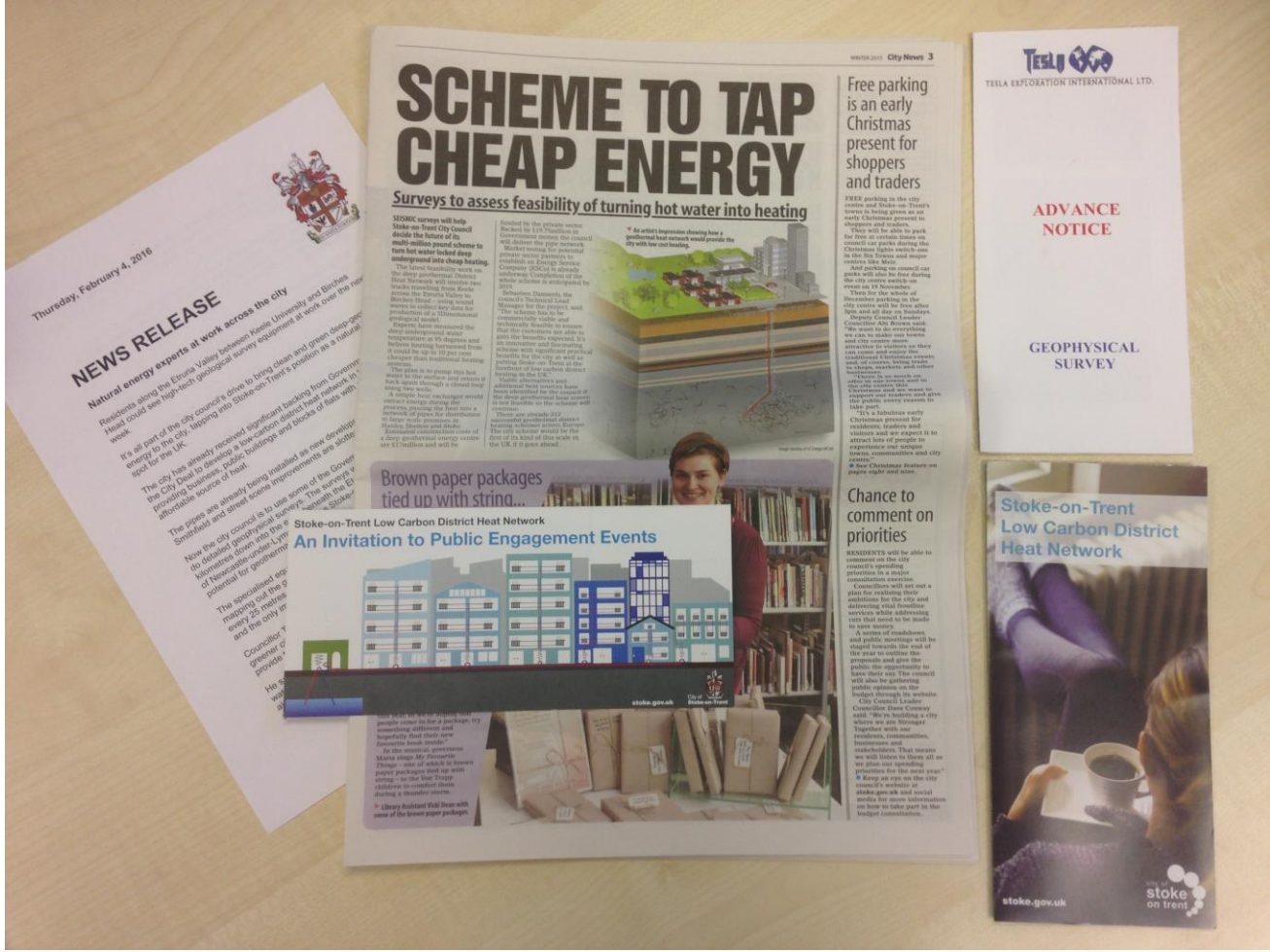


9 months working on design and permit (May 2015 to January 2016)

Various Stakeholders:

- Land Owner
- Utilities
- Highways
- Multiple authorities

Engagement



- 5 x Cllr Meetings (SoTCC, NuBLC, SCC)
- MP's and MEP's briefings
- 1 x article in City News
- 1 x Press Release
- 2 x Public Engagement Meetings
- 2 x 2.500 Leaflets Drop
- 4 x Staff Engagement Meetings
- 1 x BBC Radio Stoke Feature
- 1 x Sentinel Article

Survey Completed



- 9 days of acquisition, day and night working
- 4 Nodes missing out of 482
- Less than 12 complaints all resolved



Deep Geothermal system design completed

Data made openly available and issued through license

1st license issued

Current position

- **Cabinet Decision 18th October 2016 to proceed to delivery with financial closure planned summer 2017**
- **Direct council investment and adoption of 100% Local Authority ownership model for first phase of DHN**
- **Private sector investment and delivery of Geothermal heat source underway**

(Public Private Partnership (Joint Venture) options remain for future development phases and investment)



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Thank you

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