

Spatial mapping tools for district heating (DH): helping local authorities tackle fuel poverty – Executive Summary.

Executive Summary

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Introduction

District heating (DH) is expected to have an important role in the UK's future energy system, to deliver both low carbon energy and affordable heat¹. It uses waste heat sources or efficient generation technologies such as combined heat and power (CHP) to offer lower carbon and often *lower cost* heating options. As a result, DH is increasingly of interest in the fight against fuel poverty.

Clear intentions of local authorities for using DH to alleviate fuel poverty:

"The key driver for the scheme is reducing fuel poverty. Residents' heating bills could fall by up to 40 per cent once the plan is implemented, meaning they could each save around £200 each year." Islington Borough Council (Local Governments Association, 2012).

"The aim was to improve the poor energy rating of the buildings, and meet the Scottish Housing Quality Standard, while reducing carbon emissions and tackling fuel poverty." Dundee City Council (2012)

"Tangible benefits would include reduced labour and maintenance costs associated with individual systems, reductions in fuel poverty through more affordable heat – the energy is about 10 per cent cheaper than gas – and lower CO₂ emissions." Hull City Council (UKDEA, 2013)

Leeds City Council Affordable Warmth Action plan has a specific action to "Investigate opportunities for district heating, particularly in tower blocks." Leeds City Council (2013)

Local authorities are seen as playing a crucial local coordinating role to facilitate partnerships between the necessary stakeholders, and in some cases developing their own projects. Modelling tools such as heat demand mapping are being used to support identification of potential development sites with the aim of facilitating new projects and overcoming many of the barriers to district heating.

¹ DECC 2013b. The Future of Heating: Meeting the Challenge. London, UK: Department of Energy and Climate Change.

The DH development process can be difficult and complex². This research seeks to understand where and how fuel poverty and other social considerations are taken into account during the DH development process.

This research asks:

- Is the work of local authorities (LAs) motivated by an opportunity to reduce fuel poverty?
- How are modelling tools used to facilitate the development of projects?
- Do these modelling tools enable consideration of social criteria such as fuel poverty?
- How can modelling tools support be used to support development of DH to enable a reduction in fuel poverty?

Results Part 1:

Analysis of the strategic motivations of local authorities and the prominence of fuel poverty

It became clear from analysis of the interviews with the six local authorities that the motivations for developing district heating vary widely between authorities. Interviewees stated motivations including fuel poverty, regeneration of council housing stock, economic growth, job creation and carbon reduction.

Despite a clear articulation of the local authority’s drivers for wanting to develop district heating, the decision criteria used for planning and construction of a business case for a scheme did not necessarily reflect these drivers. By analysing the interviews and noting the mention of motivations and decision criteria, the following broad areas and rankings of importance were revealed³.

Table 1: Observed rankings indicating the relative number of times motivations were stated by local authorities planning district heating schemes vs. the number of times different decision criteria were mentioned for use within planning to construct a business case for a scheme.

Motivation	Decision Criteria
<p>1. Social</p> <p>Regeneration of housing stock</p> <p>Fuel poverty</p>	<p>1. Economic</p> <p>Where are opportunities to offer lower-risk, financial returns to:</p> <ul style="list-style-type: none"> - Potential investors? - The local authority?
<p>2. Environmental</p> <p>Carbon reduction</p>	<p>2. Social</p> <p>Where are opportunities to use ECO funding for a residential DH scheme?</p> <p>Are there opportunities to add on households to a planned commercially competitive scheme?</p>
<p>3. Economic</p> <p>Regional competitiveness e.g. attracting industries with low-carbon heat and electricity</p> <p>Local economic growth and job creation.</p>	<p>3. Environmental</p> <p>Will the carbon savings offered by a scheme reduce costs on the CRC?</p>



² BRE, University of Edinburgh & the Centre for Sustainable Energy 2013. Research into barriers to deployment of district heating networks. DECC. London.

³ Technical feasibility is, of course, important, irrespective of the underlying motivations.

Development approaches

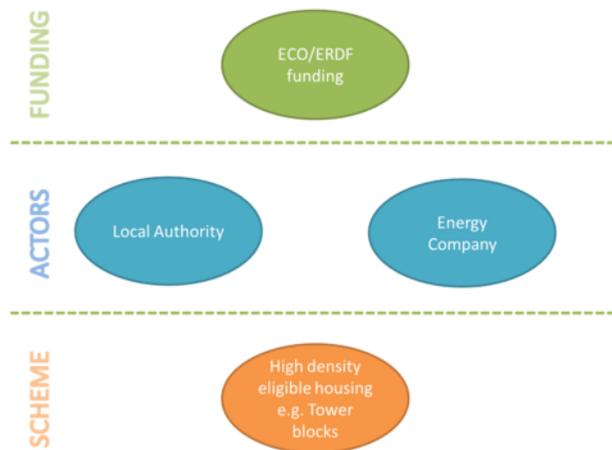
Interview analysis highlighted three categories of DH development approaches. Each interviewee was asked to describe the sources of funding and the extent of different actors' involvement in existing or future projects. In each case these were mapped and fell broadly into one of the following categories:

- **Funding driven approach:** Schemes that seek available funding sources to cover all or part of the capital costs of a project by European and UK government funding available;
- **Commercial approach:** Schemes that are driven by an aim to make financial profit for the investor (most likely private investors, but could potentially be the local authority).
- **Mixed approach:** Schemes that aimed to strategically cross-subsidise between the most commercially viable sites and other sites linked to multiple objectives e.g. social and environmental benefits.

Funding driven

A 'funding-driven' approach to district heating development focuses on obtaining external sources of funding to help make projects a reality. In the case studies considered in this research, this funding was largely from Energy Company Obligations (ECO) funding, and before that, CERT and CESP funding.

The funding sources are used to support the capital costs of schemes, primarily aimed at regeneration and fuel poverty reduction in social housing such as tower blocks.

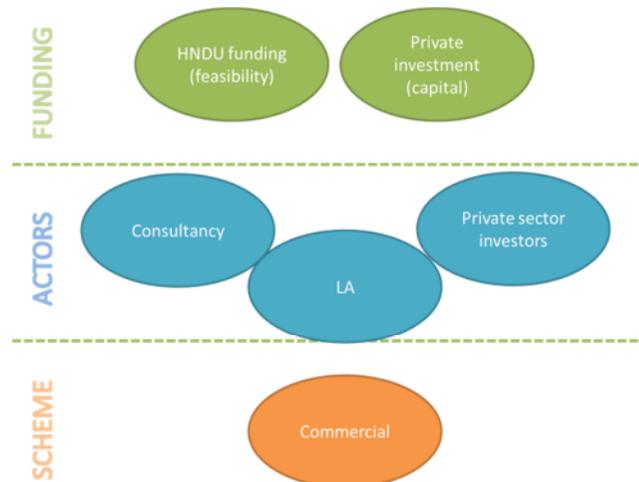


However, the reliance of this development approach on external funding means that planned projects remain at the mercy of the details of the funding criteria and budgets, which are subject to political changes. The vulnerability of relying on this as a source of capital funding was enforced in March 2014 when, 6 months after conducting these interviews, there was a significant change to the scale and criteria of ECO funding available⁴.

Commercial

These schemes use larger, dependable and more balanced heat loads from sites such as industrial processes, shopping centres, hospitals, universities or council buildings.

The heat profiles offered by these sites, combined with a small number of lower-risk customers enable a higher and more certain financial return for investments. As a result, these types of projects are more able to attract private financial capital.



The local authorities who use this development approach see DH as an opportunity to support local economic growth and job creation. They aim to attract industrial or commercial organisations looking for a source of low carbon heat to reduce their costs under the Carbon Reduction Commitment (CRC) or EU emissions trading scheme.

Funding from the DECC Heat Network Development Unit for complete city-level mapping and feasibility studies complements this approach well;

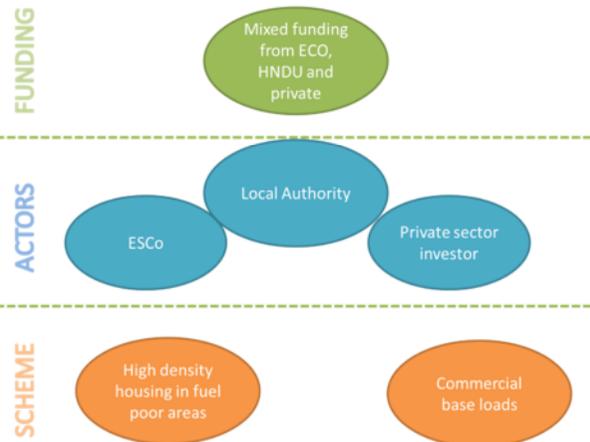
⁴ OFGEM. 2014. *Changes to ECO* [Online]. Available: <https://www.ofgem.gov.uk/publications-and-updates/changes-eco-ofgem-publications> [Accessed March 2014].

reducing the costs to the local authority for this stage of the process with the aim of attracting financial investment through this work.

Mixed approach

This approach aims to enable cross subsidy between commercially viable schemes and schemes which deliver on social and environmental objectives.

This is done by the local authority retaining all or part ownership within a scheme’s governance. Local authorities are then able to influence the direction of future schemes and facilitate cross subsidy when possible.



In this way, a mixed approach can offer a means to tackle fuel poverty in households that are not council-owned.

The ‘mixed’ approach was mentioned as an ambition for many local authorities in interviews.

Alignment between development approaches and local authority motivations

To some extent, the motivations for action expressed by the local authorities aligned with their development approach for short term action. The ‘funding driven’ and the ‘commercial’ development approaches dominate the case studies

- Economic growth and jobs creation -> commercial (privately funded)
- Income generation -> Commercial approach

- Social motivations (fuel poverty, regeneration) -> funding driven – However, these motivations were most likely to make a local authority think about how to achieve a mixed approach

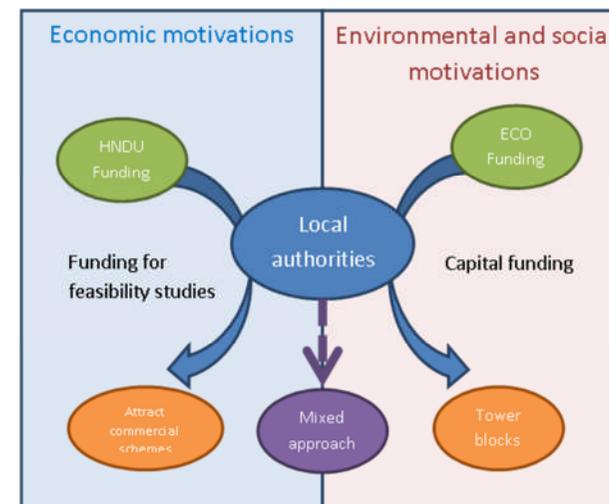
The main policy incentives for DH encourage a commercial approach:

The DECC Heat Network Development Unit provides grants to cover the cost of the feasibility studies which are explicitly described as aiming to identify opportunities “suitable for commercial investment”, aligning best with the commercial development approach. It does not offer any capital funding.

At present, the only funding available for capital investment through UK policy incentives is through ECO. For local authorities with stretched staff and financial resources, this further compounds the need to seek private investors for DH investment; leading to a prioritisation of revenue generation for the investor over social or environmental benefits.

Alignment of national policy

In summary, national policy drivers predominantly encourage a commercial approach, with ECO supporting realisation of environmental and social motivations. However there is not currently a mechanism which supports a mixed approach.



Results Part 2: Evaluation of the existing use of mapping tools within the DH development process and their relevance for using DH to alleviate fuel poverty.

Current use of mapping tools

Mapping was perceived to have an important role in the planning process and was consistently part of the pre-feasibility decision-making process for local authorities. Many were in the process of developing a heat map, or had ambitions to develop one to assist in the selection of suitable heat network projects. There were no common tools used; many had created bespoke methods and had used consultants to undertake feasibility studies.

Primarily considering techno-economic criteria

The current application of these maps predominantly aims to identify sites for commercial opportunities and therefore the maps focus on characteristics such as current heat demand that indicate likely technical and economic feasibility of a potential scheme. Local authorities clearly possess a wealth of local knowledge about the locations of areas with social deprivation or regeneration requirements, and these were considered informally in many cases. However, the use of such tools to formally build in consideration of wider social objectives of the council had not generally been considered.

Exception to the rule: The Scottish Heat Map

The Scottish Heat Map, soon to be launched, is an exception to the use of heat mapping that focuses primarily on techno-economic criteria. The Scottish Government's activity in this area has concentrated on building a heat map for Scottish local authorities that enables consideration of both fuel poverty reduction potential and commercial model potential. This is the best example of a planning tool which enables the construction of a business case for more than just financial benefits.

Building an evidence base for meeting strategic objectives for DH

The analysis highlighted the potential gap in England and Wales between the strategic aims of a local authority and the consideration of social factors within DH planning maps. The financial support from the Heat Network Development Unit to develop heat mapping exploring commercial investment opportunities does not necessarily support these wider considerations (although it does not preclude them either).

Development of the Heat Planning Tool

This mapping work is available publically through an interactive online tool called the Leeds Heat Planning Tool:

<http://sure-infrastructure.leeds.ac.uk/leedsheatplanningtool/> .

Based on the findings from interviews, an online mapping tool has been developed to allow a quick and easy consideration of some of the social considerations mentioned by local authorities.



The tool offers energy planners a quick and simple way to include social factors right from the early stages of district heating planning; offering an additional evidence base to support business cases for potential schemes and to open up discussions with stakeholders.

The tool gives users an initial indication of locations that have the potential to offer viable district heating alongside social benefits such as alleviating fuel poverty.

How the tool works

The mapping has been conducted at a census output area level. Each area has been scored based on whether it exhibits characteristics to suggest there are technical, economic and social benefits of DH to be realised in that area⁵. Thematic maps are created based on a calculated score for each area. The scoring calculation is summarised in figure 2. Areas within the top 10 percentile for a considered characteristic receive an increased score. When multiple characteristics are considered they are weighted to represent their importance within the business case construction.

⁵ Details on how the scoring has been calculated can be found at in the authors report to the funders: <http://sure-infrastructure.leeds.ac.uk/leedsheat/>.

Conclusions and policy recommendations

The current drive for development of district heating at both the national and local level offers opportunities for transitioning to a low carbon and efficient energy system *and* tackling some of the energy supply-side causes of fuel poverty. This research highlights the opportunities offered by a mixed approach that combines early consideration of social criteria, alongside techno-economic and governance issues, to achieve multiple objectives.

Based upon our findings, the following policy recommendations would support future mixed development approaches to district heating:

Short-term:

- Planning tools, incorporating social criteria, should be used in the early stages of district heating development to increase the visibility of fuel poverty objectives in decisions on future heating systems. We recommend that local authorities include social criteria explicitly in tender documents for heat mapping work, where fuel poverty is a key motivation.
- Social criteria should be included in the assessment criteria for Heat Network Development funding from DECC, to allow and encourage a mixed development approach.
- Spatial heat tools used in the assessment of district heating should be improved by moving away from a focus on current heat demand as an input parameter in the domestic sector. This can be problematic to assess in domestic properties where energy demand may fluctuate due to fuel poverty or a change in energy efficiency levels. Instead, the viability of district heating should be assessed using proxies that better reflect the underlying and future demand, such as household density, housing type and age.

Long-term:

- Options should be considered for adjustments to ECO funding to encourage a mixed development approach to district heating. In the long term, encouragement of access to both commercial and ECO funding would allow schemes to be less dependent on ECO funding and make socially focused schemes possible.
- The role of an area-based approach to tackling fuel poverty should be encouraged to allow strategic development of district in a wider number of areas including with mixed household ownership (social and private housing). At present the DECC fuel poverty policy does not consider district heating as a potential technology measure since it is not able to be targeted at only those households in fuel poverty⁶.
- There needs to be a stronger alignment between the strategies of the fuel poverty unit within DECC and the Heat Network Development Unit. This would allow flexibility of policy and funding support across the development timeline e.g. to allow funding support for feasibility studies for social housing projects and conversely to allow capital funding to kick-start projects with a more commercial focus where it was necessary.
- Funding support for district heating should be increased. 38% of the UK's energy system carbon emissions are from heat generation. Despite this, district heating has received little government support compared to other low-carbon energy technologies, such as offshore-wind or carbon capture and storage. Funding to support innovative business models and schemes for district heating can bring substantial environmental, social and economic benefits.

There is a strong ambition in local authorities to take a mixed approach to district heating development, and to jointly contribute to the strategic goals of fuel poverty reduction, regeneration and energy decarbonisation. This report has highlighted opportunities to support this work further and enable achievement of a greater level of district heating deployment. With increased knowledge and capacities in local authorities a mixed development approach can be achieved that will utilise district heating for lower carbon *and* affordable heating.

⁶ DECC 2013. Fuel poverty: a framework for future action - analytical annex. London, UK. – Page 56.

Other resources:

The full report covering this research is available from:

<http://sure-infrastructure.leeds.ac.uk/leedsheat/>

The Leeds Heat Planning Tool, alongside a **short video** to complement this report is available at:

<http://sure-infrastructure.leeds.ac.uk/leedsheatplanningtool/>

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