

Who has the power? Reflections on citizen engagement in district heating schemes in the UK and Sweden.

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Who has the power? Reflections on citizen engagement in district heating schemes in the UK and Sweden

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ABSTRACT

District heating (DH) schemes linked to Energy from Waste (EfW) and Biomass facilities have been championed for their potential to decarbonise heating yet their role in energy policy is contested. These schemes are a unique intersection between two vital environmental policy agendas - waste and energy - and can offer opportunities for citizens to affect both environmental agendas and future energy infrastructures.

Much has been written on the technical opportunities of DH and its policy landscape. This paper explores an important missing piece, to explore to what extent and how DH schemes support citizen engagement in local heat infrastructure decision-making. The benefits of citizen engagement are understood but there is currently no clear and consistent implementation of stakeholder engagement policy in this area. Evidence from four qualitative case studies is presented from the UK and Sweden to investigate strategies used by developers and operators to engage with stakeholders and how this influences their decision-making. However, limited examples of bottom-up, unplanned moments of citizen engagement were found as practice fails to live up to theory and policy rhetoric: ownership structures came through in our research as a key factor in this disconnect.

1. Introduction

District heating (DH) has a potentially crucial part to play in net zero strategies. The International Energy Agency (IEA, 2021) argues that to reach net zero the collective share of renewable sources and electricity in global district heat supplies together need to increase from 8% globally to about 35% in the next ten years. In a period of acute energy security challenges, the potential use of alternative heating sources to gas provides an additional policy rationale. Any sustained change of course requires ambitious national policy and effective local adoption by municipalities and their citizens. There is an emerging body of energy studies literature exploring this topic and the lessons to be learnt from existing practice, particularly in countries with high levels of DH uptake, like Denmark and Sweden (Lucia and Ericsson, 2014; Magnusson, 2016). Studies tend to focus on the policy or technical aspects of the DH, less common are examples of citizen engagement and the role the public acceptability of low carbon district heat networks plays. This paper attempts to fill that research gap by exploring four case studies from England and Sweden. Drawing on theories of citizen engagement, it helps to provide better understanding of changing policy and practice for how heat network providers understand citizen engagement in a context of

historic dis-engagement and ‘invisibility’ of heat infrastructure (Ambrose, 2020). Conceptually the paper opens up tensions between highlighting different publics and their emergence across different sites of participation and investigating the differential possibilities for empowerment or influencing decisions between different forms and sites of citizen engagement and participation. We highlight the need to consider how governance, ownership and the material configuration of energy infrastructures shape the power relations that impact on meaningful citizen participation.

Any investigation into citizen participation in energy systems must be set in the context of changes to energy system governance over the last 30 years, across the global north. This period saw a move away from public ownership of energy production, distribution, and supply to increasing focus on creation and maintenance of competitive energy markets. This has been overseen at an international level by organisations such as the European Commission, who have implemented programmes to privatise and ‘liberalise’ energy systems (Eadson and Foden, 2019). Energy markets are now the predominant means of organising production, distribution, and supply, even where state bodies retain ownership of some institutions. These markets have often not provided clear benefits for energy users and have required a series of measures to

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regulate markets to address lack of transparency, weak competition and in some cases market abuses (Nolden et al., 2022).

The prevalence of district heating varies across Europe and our two countries of choice exemplify that disparity. For example, while in Sweden over half of heat supply is provided by district heating (55% in 2014; Werner, 2017), it remains a small proportion (under 2%) of the UK's overall heat supply (DECC, 2012). There are also differences in organisation and ownership of district heating systems. In the UK, district heating systems set up prior to 1990 were predominantly local authority owned. Over the last 30 years many of these have been leased out or transferred to private sector organisations, and new systems have tended to be developed as joint ventures between local authorities and private sector organisations, or in some cases as entirely private sector-led, with private sector organisations managing supply arrangements. Some examples of alternative, non-profit ownership structures do exist – such as in Nottingham, where the district heating system is managed by a partnership of local authority and voluntary sector organisations. Swedish municipalities have traditionally played key roles as suppliers of gas, electricity, and district heating to households, more so than in the UK. However, like in the UK, deregulation of the electricity market in 1996 led to privatisation of many municipal energy companies (Wretling et al., 2018) and correspondingly ownership of district heating systems in Sweden has also become predominantly liberalised

(Magnusson, 2016).

Regardless of energy source and across prevalent ownership models, energy users remain distanced from the technicalities of where their heat and power come from, in part reflecting the predominance of centralised energy supply (Soutar and Mitchell, 2018). From a user perspective, energy markets deliver relatively homogeneous products, making energy difficult to marketize as a consumer good (Giulietti et al., 2005) and distancing energy users from energy systems, fuelling what is commonly referred to as 'energy invisibility' (Ambrose, 2020). The purpose of this paper then is to explore how this less explored aspect of DH, the role of citizen engagement, is understood by the key stakeholders involved in these schemes. The paper proceeds as follows. After a review of contemporary themes in citizen engagement and foray into the policy context of DH the methodology and case studies are introduced. The four case studies are then discussed through the lens of citizen engagement before the final conclusions and policy recommendations are presented.

2. Research background

2.1. Contemporary themes in citizen engagement

Citizen engagement in decision-making is important for better

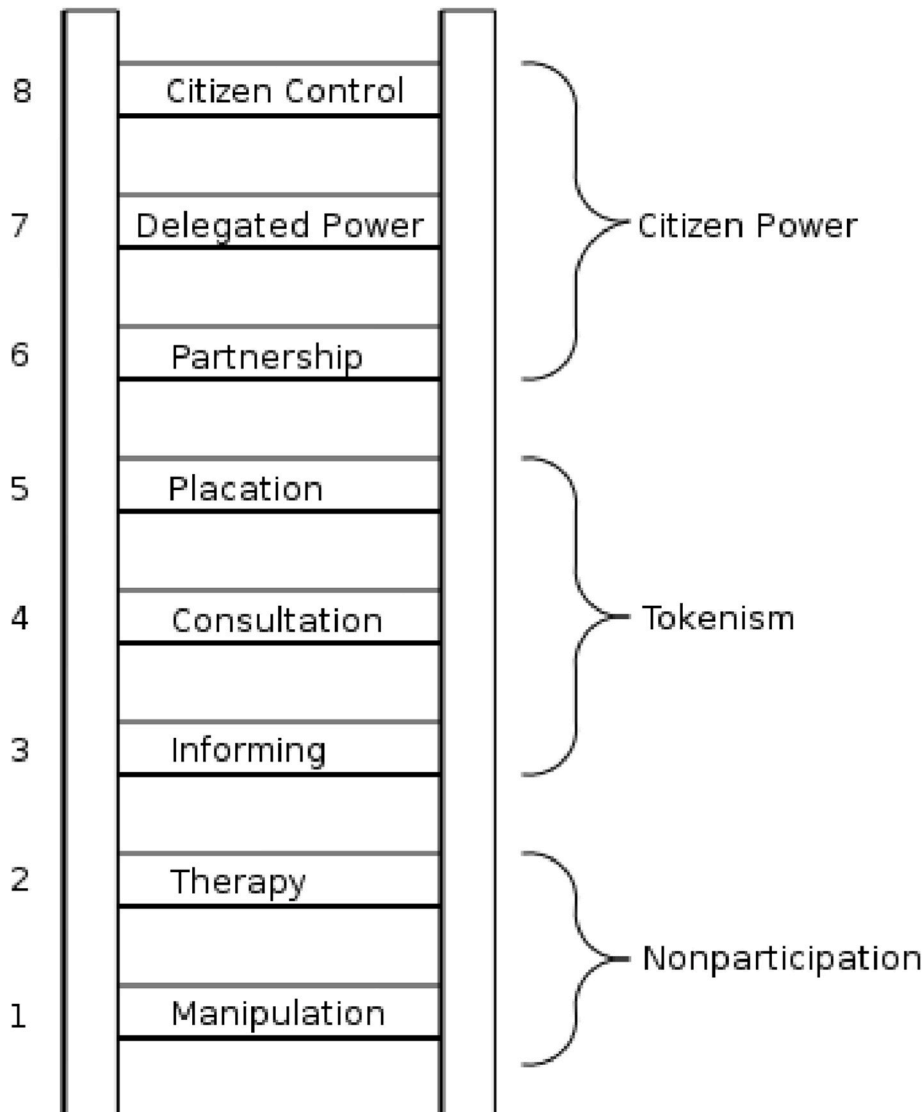


Fig. 1. Eight rungs on the ladder of citizen participation (Arnstein, 1969).

governance and achieving societally beneficial outcomes. Sovacool (2014) notes three key benefits of citizen engagement: First, democracy is increased as all citizens have a right to participate and be represented in environmental decision making; second, non-experts are often more attuned to the ethical issues of a situation; and third, greater acceptance can often be achieved by involving all those affected by the situation the engagement is focused on. A fourth benefit that is often overlooked is that processes of public engagement can create conditions for social learning which can potentially lead to behaviour change (Bull et al., 2008).

While citizen engagement is recognised as important for making policy decisions, engagement and/or participation takes a wide range of forms, which also vary in the extent that they are empowering and participatory. Viewed as a seminal model of participation, Arnstein's (1969) ladder of participation defined practical steps to empowerment (Fig. 1). She advanced the normative and ethical argument that citizen involvement is an improved and more just way of governing society. Further, she saw participation as having the potential for empowerment, supporting redistribution of power to those traditionally excluded from political and economic processes whilst creating a route for citizens to participate in social reform (Arnstein, 1969).

Contemporary debates in the space of citizen engagement in energy systems have moved beyond evaluating single stand-alone examples of participation to considering both the systemic context of participation (Chilvers and Longhurst, 2016) and on-going emergent dimensions to engagement (Eadson and Foden, 2019). Questions have also been asked of the validity of Arnstein's ladder (1969) and the dismissal of engagement that does not result in empowerment (Zakhour, 2020). Finally, in the context of smart cities, Cardullo and Kitchin (2019) proposed at least widening the scope of Arnstein's ladder to recognise the broader role citizens as consumers have within an urban context.

Chilvers and Longhurst (2016) emphasise four benefits of viewing participation from a systemic perspective. First, the need to view participation through a systemic lens and not isolate individual acts of engagement; second, this perspective expands what participation may look like; and third, this in turn changes the actor dynamics within participation and how people are enrolled. Finally, it stresses the importance of political or systemic change. Practically this manifests itself, for example, in how publics are framed in the process of engagement. In mainstream approaches to engagement, as outlined above, the public are a defined group who are 'engaged' with a specific purpose. In a constructivist approach it is argued that the 'public' are not a static group who are engaged, nor is engagement a neat defined process but instead an emerging and dynamic phenomenon.

Alongside these themes Chilvers and Longhurst (2016) note four overlapping approaches to complement our understanding of citizen engagement with energy transitions.

1. Deliberative democracy: citizens who are engaged in a deliberative way and encouraged to contribute via fora or surveys in order to inform the decisions of others.
2. Citizens as practitioners: this approach explores the role of citizens as consumers in the energy system.
3. 'Grassroots' innovations: typically, formal civil society groups who are proactive in contributing to local policy contexts rather than simply responding to being 'engaged'.
4. Social movements: these are actors or groups engaged in more contentious politics.

An important issue to consider is not just how to engage with different publics, but also who or what consists of legitimate publics to engage with. Contemporary debates emphasise that publics are not 'out there' to be discovered, but rather consist of a range of different interests and groups that might vary depending on the subject under discussion (Barry, 2013). Publics are *constructed* by material and discursive processes in relation to particular (sets of) issues (Chilvers and Kearnes,

2020). In addition to changing understanding of publics as constructed entities, there has been increasing attention given to the important role materiality plays in shaping and constructing publics. Marres and Lezaun (2011) argue that it is necessary to examine how material settings, devices and objects shape how publics are constructed. This way of thinking changes how we think about where engagement is enacted. Thinking about participation as being embedded in the material world draws attention to everyday engagement with objects, technologies, and landscapes. Thinking about materiality is important for our project: energy systems are inherently (socio)-material, they shape and are shaped by material landscapes (Cástan Broto, 2019) and everyday experiences of people in contemporary societies (Eadson and van Veelen, 2021). How do these themes relate to district heating and its policy context?

2.2. A brief policy review of district heating and citizen engagement

This section introduces the role of policy in citizen engagement with district heating in the particular research context of the UK and Sweden. This includes national and local government as well as intermediary and non-governmental regulatory bodies such as market regulators (the Office for Gas and Electricity Markets (Ofgem) in the UK, the Energy Markets Inspectorate (Ei) in Sweden) and city-regional or regional governmental organisations. Each has different responsibilities and resources relating to heat policy. There are three main areas of opportunities that existing policy and energy system operators seek to engage citizens: as energy users, in planning, and as governance stakeholders.¹

First and foremost, citizens are energy users of heat produced and distributed through the network. As heat networks often operate as de facto monopoly suppliers for residents of buildings supplied by district heating, residents are automatically 'engaged' with the system in a basic sense as consumers. Although mechanisms vary across networks, price-setting is a technical process and does not involve citizens. As such this effectively places these users at the bottom of the participation ladder with real potential to be open for manipulation. In the UK there is no existing regulatory framework for consumer protection in heat networks and qualitative research by BEIS (2018) found that approaches to consumer protection varied across heat networks. Thus district heat users have little awareness of their rights as consumers (Eadson and van Veelen, 2021). In response to this the Competition and Markets Authority (CMA, 2018) recommended establishment of a formal consumer protection body for heat networks: in December 2021, the UK government announced that Ofgem would take on this role although as of July 2022 no date has been set for this to take effect. A voluntary consumer protection organisation was set up in 2015, named Heat Trust. Members agree to abide by a code of conduct which Heat Trust says is compliant with wider UK electricity and gas market regulation. In 2018 its members covered around 10% of total heat network users (Heat Trust, 2018).

Despite a much longer history of widespread connection to district heating, liberalisation of energy markets in Sweden has produced a similar regulatory picture to the UK. Heat networks are considered market providers of energy and as such pricing is not directly regulated (IEA, 2019). However, following price rises over the 1990s and 2000s the District Heat and the City, 2019 introduced the 'price dialogue' mechanism as part of measures to improve transparency over pricing (Heat and the City, 2019). An independent not-for-profit organisation was established in 2011, called Prisdialogen ('Price Dialogue'). Prisdialogen assesses district heat prices and works to improve transparency in accounting. Local agreements (covering 72% of DH supply in 2017) set out principles for any price changes. This process has reportedly

¹ Note. Eadson and Bull published an on-line briefing paper on this in 2020. <https://www.shu.ac.uk/centre-regional-economic-social-research/publication/citizen-engagement-in-local-energy-decision-making-literature-and-policy-background>.

improved transparency and consumer trust (IEA, 2019) but offers limited potential for more engaged participation in energy system decision-making. More broadly, viewing energy users through a market prism – as consumers of a commodity – provides a very narrow framing for user participation. It also creates a narrow definition of energy publics, focusing only on those who buy heat through heat networks rather than wider communities who might be affected in different ways by heat networks (for instance as residents living close to incinerators or pipelines, or people/communities excluded from networks).

Second, citizen participation in heat network planning in Sweden and England has mostly been limited to statutory consultation regarding specific planned developments. The planning system in England is not a strong mechanism for delivering local low carbon energy or for building citizen engagement in local energy developments. An RTPI research report on Planning for a Smart Energy Future (2019) reported that:

At present, with a few exceptions, planning policy in England and progress on the ground lags behind the opportunities offered by smart energy to support clean growth and mitigate climate change ... the pace of change is not sufficient to harness the ambitions and benefits set out in the Clean Growth Strategy, or to meet the UK's legal commitments to decarbonise. (p.6)

There are various issues behind this statement. First, local plans have not tended to be strong mechanisms for community engagement in England (see Baker et al., 2007 and Brownill and Carpenter, 2007). Much of the engagement is through statutory consultation, rather than genuine participation in planning processes. However, the introduction of neighbourhood planning through the UK government's Localism Act in 2011 has created scope for more active citizen engagement in planning. In principle these could be a useful vehicle for low carbon and renewable energy projects (CSE, 2015; 2020) yet neighbourhood planning is underfunded, relies on voluntary commitment, and they tend to be in more affluent communities with the overriding emphasis on house building (Bailey and Pill, 2015; Parker, 2017).

A number of towns and cities in England are beginning to develop Local Area Energy Plans, which outline priorities for development and investment for secure, decarbonised energy systems. However, the role of citizens within these processes is unclear, especially when in the latest policy documents, for example, BEIS' proposals for heat network zoning in English towns and cities users are framed as consumer (BEIS 2021). It is proposed that heat network zones will be identified using a nationally determined methodology and delivered in partnership by "central and local government, industry and local stakeholders." Again, the role of citizens within the zoning process is very unclear.

In Sweden, there is a more developed system of planning for local energy. Local authorities are required to produce a local energy plan covering supply, distribution and use of energy, introduced through the Municipal Energy Planning Act (1977). The later Planning and Building Act (2010) mandated 'stakeholder participation' in decision-making:

The idea is to involve all participants, combining influence, inclusiveness, and deliberation, embracing democratic values such as citizens' rights to information, justice, and participation. The deliberative agenda has achieved a privileged position; even though several examples exist on how difficult it is to accomplish these normative ideals. (Gustafsson, Ivner and Palm, 2015 p207)

However, there remain concerns that municipal planners continue to be highly influential over problem definition, presentation of options, and deciding which participants are engaged.

A final mode of engagement, and Arnstein's ideal, is for citizens to actively participate in on-going decision-making about heat as formal stakeholders (for instance through community representatives on heat supplier boards). At present there are no policy levers in place to ensure this happens in England or Sweden. Energy market liberalisation in both countries has weakened the link between citizens and district heat projects. In England and Sweden, most heat networks were municipally

owned up until the 1990s. In principle this provided a degree of democratic accountability for heat networks: elected officials, with a statutory responsibility to protect the wellbeing of citizens were in theory democratically accountable for the performance of heat networks. Energy policy in England and Sweden has gradually eroded this democratic link however, with heat network development and operations increasingly conducted by private sector organisations, albeit often in partnership with, or under contracts with local authorities (Palm, 2007; Rutherford, 2014; Hawkey et al., 2013).

More direct participation might be possible through community or resident ownership of district heating networks. In recent years there have been calls for citizen ownership of energy systems in the name of energy democracy (Becker and Naumann, 2017; Eadson and van Veelen, 2021) alongside growth in community energy initiatives across Europe. However, community-led heat networks are relatively rare in England and Sweden, at least in part due to the high capital costs involved in setting up. The UK government has published guidance for citizen groups seeking to set up community-led heat projects (DECC, 2016) but there is little existing evidence on how these have fared in practice.

This review of policy relating to citizen engagement shows a clear gap which this paper seeks to address.

3. Methods

In order to explore the central research question of how do DH providers frame and implement citizen engagement a comparative case study approach was determined to be most appropriate. Case studies involve an investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence (Robson, 2011). Case study is more of a research strategy than a method. Like ethnography it is a stance which, once adopted, dictates a particular research approach to be studied (Stake et al., 1998; Robson, 2011). As a research approach, it is relevant because it draws out the unique context of the situation, provides for empirical study and is undertaken usually through multiple methods such as documentation and archive studies, interviews, and observation (Gray, 2004).

This research was funded by the Swedish Energy Agency, forming part of a wider study of citizen engagement with energy systems (see Ambrose, 2020 for more details). The four cases were selected as examples of large, longstanding urban district heating systems linked to Energy from Waste facilities. Beyond this a grounded approach was taken to the case studies inasmuch as none of the cases were selected for any particular track record, either positively or negatively, in citizen engagement. The mixed methods research approach proceeded as follows. First an initial literature review exploring the latest theories on citizen engagement literature, as well as a review of the policy landscape in Sweden and the UK, was conducted to develop insight and themes to be explored in the cases. The summary analysis of this review forms the basis of Section 2 of this paper. This led on to the primary case research conducted in England (Nottingham and Sheffield) and Sweden (Malmö and Helsingborg). A narrative review approach was taken which as Sovacool et al. (2018) note is less thorough than a systematic or meta-analysis but is recommended for an exploratory approach to a subject that allows for more reflective and qualitative insights to be drawn. This comprised of a thematic analysis of relevant websites, policy reports and journal papers via Scopus pertaining to these cases and the themes of citizen engagement and then semi-structured interviews with 5–10 key stakeholders related to each site, including those running and operating energy from waste plants and associated heat networks, customers of the network, local authority representatives and elected officials. A total of 25 interviews were completed. Each interview was undertaken utilising a semi-structured approach, that is with the spirit of a 'conversation with a purpose'. A broad set of questions were utilised based on the literature and then each interview, lasting between 30 min and 1 h, was transcribed and analysed and coded thematically via Nvivo 12 (see Appendix 1 for the master interview

schedule). The following types of stakeholders were interviewed (see [Appendix 2](#) for the full list and coding of interviewees).

- Nottingham: Head of district heating network at the city council, local authority energy officers (x2), elected official, representative of the company operating the local energy from waste facility and district heating network.
- Sheffield: Energy from waste plant and district heating network managers x 3, local authority officers, large customers of the network, residential customers of the network, national and city energy leads.
- Malmö: local authority officer, district heating network manager, elected official, regional governance official, large customer of the network.
- Helsingborg: district heating company representative, board members x 2 (chair & deputy chair), politicians x 2 (deputy mayor and opposition), civic activist, industrial heat provider.

Inevitable research limitations must be acknowledged, especially in the light of the majority of this research being conducted under the backdrop of a global pandemic. This prevented planned in-person fieldtrips to Swedish cases and almost all interviews were conducted remotely. The English cases were better known to the authors. Future extension of research to include a wider selection of cases would also potentially reveal further nuances to our findings, particularly to investigate different forms of market arrangement, ownership and governance structures, and material assemblages.

4. Results: Citizen engagement in practice

This section presents findings from the case studies. It incorporates insights from the semi-structured interviews into how and to what extent heat infrastructure developers and operators engage with their stakeholders. The case studies build from our review of policy in England and Sweden to build understanding of how engagement happens in practice and what this means for understanding existing and potential participation in DH within urban energy systems. We present them here as four cases representing different ownership structures and citizen participation with a summary table at the end ([Table 1](#)).

4.1. Nottingham: multi-stakeholder ownership with citizen communication

Nottingham is a major city in England with a rich industrial heritage of coal mining, manufacturing and textiles. Nottingham is widely regarded as a pioneer of Energy from Waste (EfW) with a first incinerator built back in 1874 ([Wang et al., 2020](#)). Eastcroft, a 170,000 tonne EfW facility was built in the early 1970s after the first Memorandum of Agreement being Nottingham City Council and the National Coal Board was drafted in 1972. The facility was upgraded in 1988 to cogenerate combined heat and power (CHP) from municipal waste and has been owned and managed by multi-national waste management firm FCC Environment (formerly the Waste Recycling Group) since 1998. The EfW facility currently feeds the district heating network via the London Road Heat Station (LRHS) which has a significant history, dating back to 1953. The plant was purchased in the early 1970s by Nottingham Corporation and leased to British Coal. From the outset the corporation was a joint venture, originally with the National Coal Board. The scheme then had two sources of heat: Eastcroft and the LRHS. After the demise of British Coal in 1995 the scheme transferred wholly to Nottingham City Council and began trading as EnviroEnergy (Nottingham) Limited. EnviroEnergy is now an autonomous company but wholly owned by Nottingham City Council based at LRHS. The scheme's main source of fuel is the 170,000 tons of municipal refuse burnt annually at Nottingham's Eastcroft incinerator. This currently provides 180,000 MW of high-pressure steam which, courtesy of a 14.5 MW condensing turbine

Table 1

Summative comparator of the four case studies.

City	About	Ownership	Type of Engagement
Nottingham	<ul style="list-style-type: none"> • 1st incinerator (1874) • 170t EfW facility • Supplies energy to 4700 homes & 100 business • Energy source: waste 	<ul style="list-style-type: none"> • EfW facility owned by FCC • District heating owned by NCC (EnviroEnergy) • Contract up for renewal in 2030 	<ul style="list-style-type: none"> • Unique partnership agreement • Liaison group • Nb. New contract negotiations • Consumer engagement via call centre
Sheffield	<ul style="list-style-type: none"> • EfW connected to district heating in 1970s. • New facility in 2007 • 225t EfW Facility • Supplies energy to 140 buildings • Energy source: waste 	<ul style="list-style-type: none"> • EfW facility & heat distribution infrastructure leased to Veolia from municipality 	<ul style="list-style-type: none"> • Ltd engagement • History of civic protest (a form of engagement!) • Engaged with the Walking with Energy walking tours
Malmö	<ul style="list-style-type: none"> • Opened in 1973 • Produces approximately 1.5 TWh of district heating a year. • Energy source: mixed (waste and residual heat from industry) 	<ul style="list-style-type: none"> • Privately owned heat network (EON) • EfW owned by the municipality • Strong strategic relationship with municipality re. energy & climate action 	<ul style="list-style-type: none"> • 'Limited engagement with existing network • Deliberative participation methods being explored for new development of geothermal generation.
Helsingborg	<ul style="list-style-type: none"> • Energy company incorporated in 1859 • District heating since 1974; district cooling since 1999 • Production of c.1TWh district heating per year • Energy source: Mixed (inc. waste, residual heat from industry, biomass and heat pump. 	<ul style="list-style-type: none"> • Both EfW and heat network owned by the municipality 	<ul style="list-style-type: none"> • Citizens elected to the board • Round table events 3x a year • Activism that blocked a proposed sell off

and 68 km of piping supplies around 4700 homes and 100 businesses across Nottingham including the Victoria and Broadmarsh shopping centres, the National Ice Centre Arena, Nottingham Trent University and various other large local developments.

Both NCC and Eastcroft recognise the need to engage local residents and they are able to cite examples of *communicating* with the 'general' public, although engagement implies something more than this. However, there are limits to wider engagement during complex contractual negotiations. In terms of community engagement in the district heating scheme, there is an engaged community liaison group, and planned schools and education outreach (once the new site is complete) but there is not much perceived scope to engage the public, for example in the new contract negotiations.

A key question for these case studies is what influences the direction of these facilities in terms of ownership, national policy, and decision-making at the local level. Whilst there is nothing especially unique or innovative with regards the public engagement, the ownership and governance structure of Eastcroft and the district heating scheme is distinctive and enabling Nottingham to do some interesting work. What is unique is the existence of a 1970 agreement between Eastcroft and the

city council: as a key employee of Eastcroft states, “it’s written in old language with a distinct absence of a commercial angle ... the way that the relationship works with Nottingham is we don’t have any of that, so we both understand that we’re all part of this same system, so what’s good for me is good for the local authority as well and what’s bad for them is bad for me” (N05).

This agreement is managed through EnviroEnergy, the wholly owned subsidiary of NCC that manages the district heating scheme. The contracts that exist for waste disposal are now tripartite between the city council, the county council, and Waste Notts Reclamation through FCC. The city council still retains a majority control of the capacity available at Eastcroft for delivery of waste. The board meetings, chaired by an elected member, manage the relationship and it is the essence of the relationship that is key. The nature of these relationships and how this links to engagement will be returned to in the final section.

4.2. Sheffield: private contracts with sporadic citizen activism

In Sheffield city centre, a multi-national private contractor leased energy generation and heat distribution infrastructure from Sheffield City Council on a 35-year lease set to expire in 2038. Ownership of the heat network is important to understanding its relationship to citizens. It primarily sees its role as a service provider of waste management, heat and power: citizens are foremost customers; public-facing bodies like the council are first of all contractors of the operator’s services. This contractual relationship is the main cause of deliberation: for example, in 2017 the council renegotiated its contract with the operator, requiring extensive negotiation, and support from external legal consultants to agree the changes. Otherwise, deliberative engagement was limited. For example, the engagement process over potential decarbonisation measures for the network’s back-up boilers involved presenting plans to the district heat lead at the local authority, then once plans were finalised the operator intended to communicate the changes to customers via mailouts. A company executive described this process, which is an example of top-down communication or consultation rather than engagement:

In the initial stages we bring the council on board because they’re the key stakeholder because we’re in partnership with them ... After that we’ll test different fuels on the boiler and check emissions and so on and if that’s successful, we’ll look to do any kind of upgrade to the boiler fuel systems ... At that point where we’ve proven the results and we’ve got a clear direction we’ll communicate that to all our customers to say this is what we’re doing (S01)

This was confirmed in a further conversation about new developments in the network. The heat network operator did say they would do some engagement with ‘citizens-as-customers’:

We’ll probably hold a few open days, we would send out a communication to all the customers which will just be a newsletter, put it on the website and take any opportunity to promote what we do. (S02)

Citizen engagement, then was limited and only understood in terms of consultation and limited to periodic communications about changes to the network, referred to by Arnstein (1969) as tokenism. Some actual engagement (rather than communication) took place around contracts and pricing with building owners but generally not for residential households: residential contracts and billing were managed by third parties, usually contracted by landlords. As such, the operator’s engagement stopped at the point the heat entered residential buildings (e.g., a block of flats). Pre-Covid, the operator would hold an annual open day to invite people to look round the energy from waste plant. But stakeholders felt that most citizens were not aware of the incinerator or the heat network, although this might be beginning to change with greater awareness of decarbonisation agendas.

Against the backdrop of limited formal engagement, at several points over the last 20 years the heat network had been subject to points of

disruption when citizens and civil society groups have mobilised around specific issues.

1. In 2001, seven Greenpeace protestors occupied the previous incinerator (which was replaced in 2006), protesting against pollution from the incinerator.
2. Unions representing waste workers took industrial action in 2012, 2016 and 2021, related to job losses (2012) and pay and conditions (2016 and 2021).
3. A dispute between residents at a large block of flats, which is supplied by the network, and the building’s owners and management company over proposed price rises in July 2020.

In each instance these moments of disruption created some change to – for example – prices for residents in the flat development, shifts towards environmental controls on incinerators, and some concessions around pay and conditions for workers. But they have not impacted on the overall business model. The Sheffield city centre network fits with a model of privatised provision where heat users are engaged as consumers rather than citizens. Other stakeholders tended to be engaged on a practical basis to achieve specific objectives. Although decarbonisation pressures were forcing some change and increased engagement with corporate stakeholders, the services contract to 2038 acted as a disincentive to invest in wholesale changes to the system.

4.3. Malmo: public-private partnership for coordinated energy systems

In Malmo, the heat network was also privately owned by a multi-national energy company, having also been sold from municipal ownership in the mid-1990s. The energy company operated DH in four Swedish cities and also owned electricity distribution and supply infrastructure in the region. Unlike Sheffield, however, the energy company did not own or operate the main EfW facility – which was owned by the municipality through a special purpose vehicle – and heat was also taken from other sources including waste heat from a large engineering firm and from a wastewater treatment plant. The energy company and municipal EfW producer both collaborated on joint projects, such as decarbonisation and renewable energy initiatives. They also had a broader relationship with the local authority, inputting to its energy strategy, and working in partnership with the council around decarbonisation across the city, for instance to develop a new ‘smart suburb’ in the city, providing a range of renewable energy and smart grid technologies. Malmo is widely seen as a pioneer city for sustainability and decarbonisation and is part of the European Commission’s Green Capital Network. This commitment to environmental sustainability has impacted on the DH operator’s actions too:

We have really strong dialogue with the city of Malmo when it comes to, for example, developing the environmental programme, setting goals and ambitions within Malmo and they have just now renewed their energy strategy for the city and for that we have been involved a lot. The ambition and the way the city of Malmo, they are a role model in Sweden for how much they work with the climate related questions and they pressure us to develop to do better and therefore a lot of our test beds and new projects and new products are developed in Malmo. (M01)

These arrangements were not without some tensions however, and this broader relationship did create some flashpoints related to the wider politics of energy in Sweden. For instance, there had been on-going debates about electricity supply shortages in southern Sweden and this led to some tensions between the municipality and the energy company:

That debate peaked one or two years ago and at that time there was a bit of tension between the energy company as a DSO [distribution system operator] and as a power producer and the city of Malmo not feeling the support from them as an actor of society. We felt at the time that they were only interested in increasing their own gross margins but they had a larger

role to play in the energy system and providing security of supply within the power grid to citizens and businesses of Malmö (M03)

Overall, however, participants felt that there was a strong and well-embedded partnership between the municipality and the energy company operating across strategic and operational decision-making: *"I wouldn't say always the same view but we share collective insights regarding what's good and what's bad for the energy system" (M02).*

As in Sheffield the central mode of engagement with citizens was as customers of the network. However, there were examples of more in-depth engagement relating to new developments. Energy infrastructure developments and innovations were relatively frequent in Malmö, in part owing to the city's proactive approach to energy and climate action. For instance, at the time of conducting the research, a public engagement campaign was planned relating to a proposed deep geothermal heat generation plant, with ambitions to experiment with different forms of engagement methods (although these were not yet specified): *"we are of course not sure how widespread the knowledge will get but we want to try new methods, more citizen engagement" (M02).*

The company was also developing an initiative called 'Go Local' for each of the four regions it operated in within Sweden. Go Local involved improving communication with citizens around developments, repairs, and maintenance as well as wider environmental campaigns like local cycling initiatives. Despite similarities in ownership structure, the difference to Sheffield can be ascribed to several factors, including: a broader strategic relationship on energy and climate action between the operator and municipality; a more proactive local authority with greater capacity for action; the energy company's position as owner of the heat network but not heat generation facilities, allowing greater flexibility over heat sources; and the energy company's role across Sweden in facilitating urban energy transitions beyond heat network development and operation. That said, the shared approach to energy system governance and citizen engagement did not extend to direct involvement in strategic decision-making.

4.4. Helsingborg: municipal ownership with democratic activism

In Helsingborg energy infrastructure (including a large DH network) was owned and managed by a municipal company which was initially formed in 1859. The municipal company managed utilities across the city. Citizens were indirectly engaged through election of councillors to the local authority, some of whom sat on the board of the company. In the last decade the implementation of *Prisdialogen* in Sweden changed how the municipal company interacted with citizens as customers, with the operator holding a round table event three times per year with customers to discuss prices and wider developments. One participant, who represented the municipal company, reflected positively about this change, which they attributed to customer pressure for reform:

Back in the old days, 10 or 15 years ago, we communicated with our customers 13 times a year, we send them a bill once a month and at the end of the year we send them a letter telling them what prices we were going to charge next year. This ultimately grew into protests against district heating companies, we were called monopolists ... [Prisdialog] this has been a game changer. We are now seen as more transparent the customers feel, it has had a pressure on prices ... so it's been very successful. [H01]

In general, however, the heat system was largely seen as a settled part of the urban landscape (although the network continues to expand, including linking to neighbouring cities) and citizens were not historically involved or seen as interested in its operations. That changed with a proposed sale of the company to a private buyer in 2018, which led to political and citizen-led campaigns to prevent its sale, ultimately resulting in a local referendum on its future. An overwhelming 96% of voters voted against its sale, and more broadly interviewees felt that the importance of local energy infrastructure was reasserted within citizens'

imaginings: *"certainly, for those who potentially didn't know about us, they do now" [H01].*

Reflecting on this moment of uncertainty and disruption also prompted our participants to talk about the *Prisdialog* mechanism. In response to uncertainty for customers around the potential takeover, through the annual *Prisdialog*, customer stakeholders negotiated with the DH provider to extend its 3-year price guarantee to 5-years, showing how customers could influence the price mechanisms. The *Prisdialog* was seen by our respondents as usually being a relatively uncontentious process. However, one participant – who was involved in discussions in both Malmö and Helsingborg – felt that changing energy technologies was creating potential for greater tensions in future years:

I think next year will be a year where we have lots of arguments because all district heating companies now in Sweden want to change the structure of the tariff because they have seen that a lot of industries, but also households ... have installed lots of heat pumps in Sweden in the last 10 years or so and they feel like they have to always have the capacity to serve with district heating but they are not getting paid to have that capacity standby, so that's why they are changing the tariff now ... I don't think the end users have realised that yet but they will do in the coming years, that they are changing the tariffs in that direction. [M02]

From this example we can see then how changing socio-technical arrangements such as heat generation technologies as well as ownership structures can create points of rupture to generate citizen engagement with heat infrastructure. In the case of a potential change of ownership, because the network was owned by the municipality citizens were able to assert their democratic rights to a say on the future of energy infrastructure in the city. Even so this was not 'invited' engagement but 'claimed' by activists who mobilised citizens to create a political challenge for elected leaders in the municipality.

5. Conclusion and policy implications

This paper sought to address a gap in literature on DH to explore contemporary approaches to citizen engagement and participation in DH systems, and consider what factors shape these approaches in different national contexts. We now draw together our empirical findings and policy review to consider implications for how we understand citizen engagement in district heating, and what these findings mean for existing theories of engagement, participation, and policy across a range of disciplines including energy studies and geography.

Our findings highlight several similarities across our case studies, regardless of geographic context. Citizen engagement is limited in all cases with few examples of actual engagement versus communication or consultation. But there were points of difference between the four cases, and opportunities for different and embedded forms of citizen engagement. From our findings we draw three themes of importance for understanding possibilities for citizen engagement and empowerment: market construction; ownership and governance; and material organisation. We now use these themes to draw out key points of discussion, including similarities and difference across our cases and between countries.

First, the nature of heat provision remains largely invisible and energy users are approached as customers of a supposedly marketised service rather than as active energy citizens.

These markets do not function in such a way as to create active market subjects, however. In England large scale district heating is often tied into long-term contracts of up to 30 years. Once they have been negotiated, they become legally settled, often leaving little of substance to engage citizens about, beyond the monitoring of the emissions which many EfWs will have community liaison groups for. This was reported to be less common in Sweden, but heat networks were often de facto monopoly suppliers to households. Although very different in nature, examples in Sheffield (as part of a local dispute) and through the nationally mandated *Prisdialogen* in Sweden do also provide some points of

deliberation and negotiation around the customer-provider relationships, but both prompted by external pressures.

Second, ownership and governance arrangements made some difference to how heat network operators engaged with citizens and other urban stakeholders. The Helsingborg case provided an example of municipal ownership allowing citizens the possibility to shape decision-making, albeit only through concerted and well-organised citizen mobilisation for action. More broadly, national policy, aligned with stronger civic capacity for action in our two Swedish cases highlighted some difference between the Swedish and English contexts. In both Helsingborg and Malmö heat network operators were more embedded within strategic planning for the respective cities, in part also due to their wider remit: both companies had responsibility for other utilities in each city. In England this cross-sector civic engagement appeared more limited, especially in Sheffield, where respondents reported that the relationship with local civic bodies was often limited to contractual matters or statutory consultations.

Third, the materiality of heat networks is clearly important to understanding current limitations to citizen engagement, as well as opportunities. As large and relatively settled urban infrastructure developments, often mostly invisible to local residents, established district heating networks are perhaps inherently difficult to open up for sustained, meaningful citizen engagement. Yet there are points of promise too. Again, there are small differences between the Swedish and English cases in this respect. In both Helsingborg and Malmö, the heat network incorporated multiple energy sources and there were also connections to other networks allowing network flexibility. The greater connectivity and openness of the technical-material organisation of these networks might also be one reason for a slightly more responsive and open approach to collaboration and engagement with citizens. The prospect of material change – such as the development of new geothermal heat generators in Malmö – can also create points of interest and engagement for citizens. In our English cases the networks were relatively closed by comparison. In Sheffield there had been municipal ambitions to open the network to other heat providers and to join with a second heat network outside the city centre, but these became difficult to achieve under existing contractual arrangements. But this is not a uniform challenge across England either: the potential for a more open system was also being considered in Nottingham. Nottingham City Council has committed to net zero by 2028, and its district heating scheme is key to that ambition. Central to this hope is the acknowledgment that district heating schemes are fuel agnostic. As one interviewee said, *“the heat network is there to be an energy system, distribute more efficiently and to be a more efficient way of providing heat where it's needed at the time it's needed (N02).”* Nottingham, and other cities face a critical moment in time then as they reflect on what might be the alternative fuel sources for their district heating schemes. It was hoped that this would provide an opportune time for meaningful engagement.

We have also used this investigation to reflect on conceptualisation of citizen participation and engagement within energy systems. Recent years have seen academics adopt a more critical and reflective tone to understanding participation and recognising the many forms it can take. This is to be welcomed although there is a potential tension between the calls to adopt constructivist, system-wide approaches which more clearly highlight different forms of engagement, and the need to emphasise power relations that shape (for example) the clear impact that ownership and governance structures have to impinge engagement, as our findings have highlighted. Chilvers et al. (2021) show how different types of citizen participation groups tend to prioritise different criteria for assessing energy transitions. There is also a need to distinguish between and better understand the possibilities for different forms of participation – or different configurations within ecologies of participation – that bring about meaningful systemic change. This includes policy options for building deliberation, partnership, and citizen empowerment into on-going governance of DH as well as in initial development phases. It also includes highlighting potential points of

disruption within existing systems whereby citizens can ‘claim’ participation through activism. This is an on-going challenge with large infrastructure projects like DH which by dint of their material organisation and often complex operations are often seen as difficult to open up for citizen involvement, and prevailing approaches to urban energy system governance often exacerbate these challenges.

Interestingly, in December 2022 BEIS announced a Heat Network Efficiency Scheme to invest £32 million to improve existing schemes. Taking into account the conclusions and policy reflections above with regards the benefits of citizen engagement it was interesting to review the guidance for applicants to see whether there is a requirement for engagement with local communities (BEIS, 2022). Three ‘narrative responses’ are required for the application and the second asks for a description of how “information regarding the funded works and their impacts will be disseminated by the applicant – to network customers, internally within the applicant organisation, and externally.” Whilst it is welcome to see a requirement to consider the customer it is again disheartening to see no guidance provided with regards to what this actually looks like beyond mere consultation or communication as opposed to engagement. Given the interesting and innovative examples of citizen and community engagement within the wider energy policy landscape this is a missed opportunity and underscores the importance of this paper and our conclusion that for now, the landscape of EfW and district heating is lagging behind the wider energy sector in terms of citizen engagement, at least as far as this foray into these case studies in England and Sweden has shown.

CRedit authorship contribution statement

Richard Bull: Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review & editing. **Will Eadson:** Conceptualization, Methodology, Investigation, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

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Appendix A. Supplementary data

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