



Local Area Energy Planning:

Insights from three pilot local areas

Executive summary

Context

Energy is an essential part of national and local economies. It is required for everything from heating and lighting our homes and offices to transporting our goods and powering our industries. For the UK to reach its legally binding greenhouse gas emission reduction target of at least 80% by 2050, significant change is needed; both to our existing energy networks, and the heating systems and fabric of our homes and buildings.

National decisions and policies already have a direct impact on the options available both regionally and locally. For example, the rate of decarbonisation of national electricity generation will directly influence the carbon emissions associated with local electricity consumption.

Every local area is unique. Buildings, existing energy networks and people all vary between areas and the changes required to buildings and networks to effectively decarbonise our energy system will be specific to each area. Due to these local differences, it is not sensible to make all decisions at a national level. Forcing national solutions on local areas is likely to result in more expensive, less appropriate outcomes, and the decision on which solutions are best should be made at a local level.

Key findings

By achieving a low carbon economy we will create better places to live and work. Local Area Energy Planning provides the evidence, guidance and framework to enable the long-term transition to a low carbon energy system. It considers the unique characteristics of a local area and its existing energy system to guide the transition, aid decision making, prioritise resources, and support project and investment decisions.

Major changes to local energy networks and buildings will be needed to decarbonise heat, meet climate change goals and realise the benefits of low carbon transition. There will be significant benefits to be enjoyed from planning locally for this change, with decisions made now having a direct impact on future options. For example, extending a new or existing heat network could be more cost-effective than electrification of heating in individual homes. However, this will only be practical if the original network is designed to allow for future expansion. Planning for and executing these changes will take decades to complete. If the UK is to meet its 2050 carbon target, this process needs to start soon.

The change required to decarbonise will call for close coordination and decision making, involving different stakeholders at various scales. These include national and local government, network operators, energy providers, local communities and businesses as well as individual consumers. Any changes to a particular local area will need to be decided through a transparent, consensus-based process that includes all local stakeholders, including residents, businesses, local government, energy network operators and politicians. Currently, there is no structured planning process in place to manage this activity. A new approach to planning and delivering local energy systems is needed if we are to meet the challenge of climate change and deliver a resilient and low carbon energy system that works for people, communities and businesses.

Energy Systems Catapult has worked on three pilot local area studies exploring the decarbonisation of heat in buildings as part of the Energy Technologies Institute's Smart Systems and Heat (SSH) Programme. These are all able to achieve the near-complete decarbonisation of heat using existing technologies. The most cost-effective and desirable pathway for different local areas is influenced by a combination of factors, but all are heavily dependent on national energy system pathways – particularly the decarbonisation of national electricity supply.

There is no one size fits all solution and it will be important to retain optionality and flexibility in network and building choices as part of a Local Area Energy Planning process, supporting an affordable transition to low carbon heating. However, some common themes emerged from the pilot studies:

National policy

National government can enable local decarbonisation in several ways:

- A supportive policy and regulatory framework is needed for investment in future-proofed energy network infrastructure if this is to be planned, managed and delivered efficiently;
- Continued support for the vision to decarbonise national electricity generation by 2030 is required to achieve decarbonisation in local areas;
- Continued support for a wide range of different low carbon heating options, including heat networks, electrification, bio-fuel and hybrid solutions, is required.

Local planning

Local Area Energy Planning should include:

- Implementing a Whole Systems approach to aid an understanding of the options, inform the most appropriate combinations of network choices, fabric upgrades and heating systems in different places and allow more effective decision making;
- Setting clear local carbon budgets for emissions associated with buildings at levels above a 90% reduction on 1990 levels to support an acceleration in the decarbonisation of heat;
- Creating an open dialogue between key stakeholders, including local government and network operators, based on robust evidence to aid consensus-based decision making;
- Recognising there are just two windows of opportunity to change any individual heating system between now and 2050.

Local action

There are some local activities that could be undertaken immediately:

- Planning for the potential expansion of heat networks to connect existing homes and buildings over time;
- Planning and targeting domestic retrofit schemes;
- Delivery of new development to high standards of fabric energy efficiency and future-proofed to enable a transition to low carbon heating systems;
- Ensuring that sufficient skills and resources are available within local areas and network operators.

Development and demonstration

The following activities proved to be valuable across all local areas:

- Development and demonstration of integrated low carbon electric heating solutions;
- Development of smart heat storage solutions at domestic and network levels;
- Demonstration of hybrid heating systems as a potential transitional technology, particularly for hard to heat homes.



Data gathering

Improving knowledge of several areas would support the quality of Local Area Energy Planning:

- Investigation of the costs and impacts of low carbon gas, including hydrogen pathways, on local energy systems;
- Identifying sources of low carbon heat able to supply networks in local areas;
- Better understanding of the types and uses of non-domestic buildings and the options and costs to decarbonise them.

There is no single technology that can be used for cost-effective decarbonisation of heat. Commitment to a single decarbonisation pathway for domestic heat, such as the electrification of heat or repurposing of the gas grid for hydrogen, is considered a very high-risk strategy and unlikely to most cost-effectively meet the UK's 2050 energy and climate change goals.

Many of the technology building blocks needed to decarbonise heat already exist or are in development, and the integration of low carbon heating technology into more compelling customer propositions –including the development of new business models – represents a significant opportunity for innovation.

We have found that clean energy generation in local areas, such as combined heat and power generation and solar PV, alongside electricity storage, are likely to play a role in future local energy systems. However, local areas are expected to remain dependent on secure supplies of decarbonised national electricity by 2050.

Repurposing the gas grid for hydrogen is a potentially important and valuable option to decarbonise domestic heat, however, availability of data hasn't allowed this to be investigated in detail for the three local pilot study areas. Understanding the costs and impacts of a hydrogen pathway in different local areas is an important part of a structured approach to Local Area Energy Planning as well as in the context of national energy strategy.

Decarbonisation of domestic heating will influence individual private homeowners who have the right to decide for themselves what changes they wish to make to their homes. To make changes to the way they heat their homes, homeowners must be provided with certainty that the choices they make will be supported in the long term with networks built and maintained to supply the energy they need, in sufficient quantities, at an acceptable cost.

The total system cost of energy, operating existing networks, changing heating systems and maintaining building fabric, even under business-as-usual, will be very significant (£6b-£12b for the pilot local areas). The additional costs of decarbonising local areas compared to business-as-usual are likely to be modest if well planned (12% average increase for our pilot studies). The cost of heat network development is likely to be one of the most significant factors in defining the least cost solution in any local area. National and local policies can help ensure that the impact on consumers, including the vulnerable, is well managed and the opportunities for UK industry can be realised.

Transitioning homes from natural gas to alternative low carbon heating solutions is likely to increase the cost of energy for heat and lead to varying impacts on consumers at different times during the transition. There is a key challenge in ensuring that these changes do not affect fuel poor households, who often live in the most inefficient houses and are most exposed to the impact of increased energy costs.

“A combination of technologies and networks will be needed to reduce the carbon emissions associated with heating”

Energy Systems Catapult supports innovators in unleashing opportunities from the transition to a clean, intelligent energy system.

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