
An ETI Perspective

The importance of local energy planning
to the decarbonisation of heat





Local area energy planning is vital to a successful decarbonisation of the UK heating sector.



The ability to develop comprehensive local area energy plans helps to aid decision making. It helps with investment plans for local authorities, incorporating the infrastructure requirements and provision of energy within their portfolio of services for local residents. And a greater grasp of the geographical capability of local energy provision helps local authorities address the needs of its residents from a holistic nature, and not as a service that sits in isolation.

The ETI's Smart Systems and Heat programme is looking into how you can create future-proof and economic local heating solutions for the UK which tackles the decarbonisation challenge whilst providing solutions designed with consumers requirements and preferences at the forefront.

Working with their delivery partners for the programme – the Energy Systems Catapult (ESC) – both parties have identified the development of detailed local area energy strategies as a key component to the decarbonisation challenge, and are working to provide local energy transition planning capability to help build consensus amongst stakeholders to allow for local energy infrastructure investment decisions to be made with confidence.

From a systems perspective to achieve a long term solution out to 2050 and beyond, the most cost optimal approach is to tackle the decarbonisation of power first, then the decarbonisation of heat accompanied by the continual decarbonisation of the transport system.



In the UK, heating is the largest single user of energy and the largest emitter of greenhouse gases. Government figures show that heating accounts for c45% of the UK's energy use. This is through a combination of space heating (the heating of rooms), the heating of water, the use of heat for cooking and the use of heat for industrial processes. It goes without saying that heat affects both domestic and industrial processes. This makes the scale of its decarbonisation very complicated. The production of heat in the UK accounts today for c30% of the UK's carbon emissions.

So to be able to meet the UK's climate change targets of reducing its level of emissions by 80% from 1990 levels by 2050, the country simply has to decarbonise its heat supplies. Failure to do so will mean failure to meet its climate targets.

And here comes the challenge the country has to address.

The scale of decarbonisation is huge. But as with most energy generation options today the high carbon choices for heating are always cheaper. Plus low carbon solutions are also relatively complex. They often include high upfront costs, and today they provide uncertain benefits for both consumers and providers. For a lot of people it is the fear of the unknown and the use of what they know and understand that leads to inertia.

Cost will always be an issue, both for the consumer and the provider.

WHEN SHOULD THE UK DECARBONISE HEAT AND WHY?



The answer is driven by energy system needs. To reach the UK 2050 climate and energy targets in a measured and affordable way, first the UK needs to decarbonise power over the coming decade and then move on to heat. To reach the cost optimal solution for the UK energy system in 2050 this also includes the continued decarbonisation of transport.

The emissions reductions in heat comes through the swapping of domestic gas boilers to an electric provision of heat, an increased use of hydrogen for the purpose of heat generation and an increase in the use of district heating. The latter is a model and method that is extensively used in mainland Europe but at a very small scale presently in the UK.

To meet the systems needs to reduce emissions levels to 80% of 1990 levels by 2050, the country needs to be aiming for heat in UK buildings to be almost zero carbon by this end date. Therefore any response to this challenge has to work in an energy systems strategic perspective with preparation beginning now and implementation from the mid-2020s.

To decarbonise its heat system, the UK needs to develop an innovation programme that will enable an affordable transition to low carbon homes. Because of the scale of transition involved, it is estimated that 90% of the UK's current housing stock will still be in use in 2050, the private sector cannot deliver this transition alone. This requires government investment to help demonstration "at scale" of the technologies this transition will

include. This is an essential requirement to help bring future (private) investors into the market.

Systems integration and the development of an identified commercial pathway to mass-markets are the key components of any transition to decarbonise heat. This means that public investment in the short run will help to enable the growth of low carbon markets and drive long term savings for the UK. But it is vitally important that all low carbon options developed need to be considered holistically. This is to allow the resources that are available to be effectively used across the whole energy system to deliver the overall goal of decarbonisation in an affordable and practical manner.

So the question that needs to be addressed is how do you move from a heating system that today generally provides a good service but burns natural gas and generates emissions, to one that is secure and affordable but produces at a near zero emissions level whilst continuing to provide the warmth and comfort that is so important to consumers.



LOCAL SOLUTIONS ARE THE ANSWER



Because of the diversity of the UK, in terms of its geography and consumer preferences, the decarbonisation solution needs to be one that is flexible and takes account of local characteristics. Location constrains the heating solutions that are available to each building and in turn existing buildings have their own constraints. So when developing low carbon options you have to take into account at a local level the housing stock, the geographical layout, the existing power and gas networks, local energy resources and local preferences. Then of course you must ensure that all of this works within the framework of the national energy system. It is entirely possible that UK heat supply will become more diverse, moving away from the current dominance of fossil fuel boilers.

Research into this area by the ETI and the ESC has highlighted that the principal options for the decarbonisation of heat include the construction of new local heat networks and the substantial reinforcement of electricity networks to allow for an increase in the provision of individual electric heating solutions for domestic premises.

The potential contribution of hydrogen is less clear. Now that the H21 Leeds City Gate project has demonstrated the feasibility of converting local gas networks to carry hydrogen, the Department for Business, Energy and Industrial Strategy are investing significantly to create the evidence base from which its potential across the UK can be robustly evaluated. The ETI has always considered hydrogen a potentially very attractive

option and our analytical tools have been designed to be capable of evaluating its application. We always find a significant amount of hydrogen production, storage and use in attractive future UK energy systems. Avoiding major local distribution network investments is an important feature of hydrogen for domestic and commercial heating (in addition to potential uses in industry, transport and peak electricity generation).



These options dictate a need to develop local energy strategies that identify (and articulate to all stakeholders) the key inherent characteristics of the area and from that base establish low carbon solutions for use in all buildings within that defined location. A lack of such a collective agreement risks a number of competing solutions operating independently in defined areas that will inevitably lead to increased costs. The timescale for network planning and the costs involved in network investment, when taken together, require agreement on local area plans.

At a local level, our belief from the work we have undertaken with a number of UK local authorities alongside our delivery partners the ESC, is that this is likely to involve an increase in the use of district heating, heat pumps and low carbon gases combined with increased energy efficiency measures. The widespread introduction of advanced home energy management systems (applications that increase the effective management of day to day services) into domestic properties will be required to make all of this work.

This is why it is important that more advanced local area planning is needed to identify the right technologies to be deployed in the right place at the right time. Given that these solutions have to match consumer preferences and fit local constraints then there is an important step before rolling out to the c26 million UK homes that will require new low carbon installations to meet 2050 climate and energy targets.



There is a real need to test and demonstrate low carbon heating approaches at a sufficient scale to provide the industry and government with continuous learning, through a cycle of learning by doing, to help inform policy frameworks which are vital to make any transition a reality. No technology breakthrough is required to deliver heating solutions but a great deal of practical development of integrated systems, specific product systems, supply chain capability, standards and policy detail is required across the different supply chains for domestic and commercial heat supply. Our latest estimates are that you need to be looking at demonstration projects on the scale of c6000 homes in total, across a number of different but typical UK locations, to provide this framework of knowledge to progress any transition activity. The industries involved will also need confidence in a significant, growing and sustainable market to justify the investments in product, skills and business development that will be required.

We have earlier talked about the period of implementation happening between the years of 2025-2050. This makes the years up to the mid-2020s very important. This should be viewed as a preparedness phase – which involves the translation of targets into defined plans of action, the development and demonstration of the products, business models and information and communications technology that will help to decide upon policy frameworks. This is crucial to build confidence and sufficient momentum to allow for rapid implementation at a grand scale from 2025 onwards.

ENERGYPATH NETWORKS DEMONSTRATION



In response to this “local” challenge, the ETI’s Smart Systems and Heat programme has developed the UK’s most advanced local area energy planning tool – EnergyPath Networks.

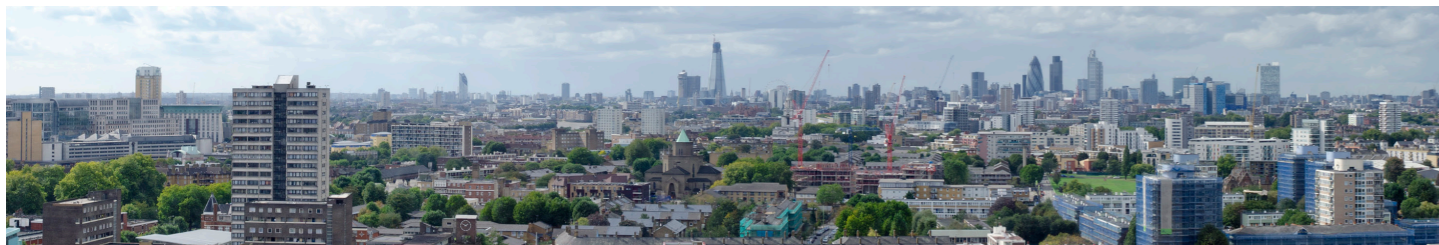
EnergyPath Networks enables the gathering and analysis of a wide range of data to create a local representation of all energy demand and supply for a local area. It maps the impact of future growth on local energy systems and develops pathways for a cost effective, local, low carbon energy transition. These pathways reflect the unique priorities of individual local authorities, and in collaboration with electricity, gas and heat network operators, identifies which energy options are most appropriate for a local area and in what order they should be prioritised.

The ETI and ESC are working in partnership with Bridgend, the Greater Manchester Combined Authority and Newcastle local authorities to develop “real life” solutions using EnergyPath Networks which will inform how they can meet the energy needs of their local communities moving forward.

EnergyPath Networks integrates, evaluates and prioritises

- > building fabric insulation
- > heat conversion and storage at a network and building level
- > gas, electricity, heat and other distribution network installation, upgrade maintenance or decommissioning
- > assessments of the impact on fuel poverty as well as the economic impact

The ability to develop a local area energy strategy using EnergyPath Networks provides evidence to produce a robust energy transition plan that is used by local authorities. Such a plan should help build consensus across the multiple parties involved in local area energy, as well as smoothing the transformation of local energy infrastructure, aiding political and commercial decision making and securing private sector investment.



Benefits of EnergyPath Networks include

- > efficient investment choices for technology and infrastructure requirements
- > faster roll out of low carbon technologies and the enabling local infrastructure
- > lower cost and higher quality technology infrastructure and associated energy provision
- > improvements in affordability, health and well-being
- > cost-effective national and local policy frameworks with focused direction and support
- > indicating which pathways locally have the greatest economic and social impact as additional information to the cost of supplying domestic and commercial energy



CONCLUDING THOUGHTS



To enable a cost effective low carbon transition, more advanced local area energy planning is needed to identify the right technologies in the right place, at the right time. These solutions will be influenced by a number of variable factors including local resources, political support and leadership, consumer and community preferences, technological innovation and cost.

Therefore the development of local area energy plans will play a vital role in identifying and developing cost effective low carbon

energy systems to meet future energy demand and support carbon reduction objectives. Local residents and businesses can have greater confidence that their investments in building fabric, heating systems and controls will be compatible with local network development and the cost of low carbon energy supplies; the supply chain can plan to meet local needs; and regional, national and UK government and regulators can have confidence that their actions are grounded in local realities with democratic consent.



FURTHER READING



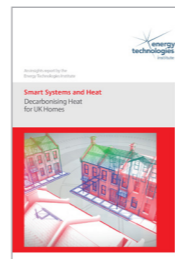
Housing Retrofits - A New Start

<http://www.eti.co.uk/insights/housing-retrofits-a-new-start>



Consumer challenges for low carbon heat

<http://www.eti.co.uk/insights/smart-systems-and-heat-consumer-challenges-for-low-carbon-heat>



Decarbonising heat for UK homes

<http://www.eti.co.uk/insights/heat-insight-decarbonising-heat-for-uk-homes>



Options Choices Actions - UK scenarios for a low carbon energy system

<http://www.eti.co.uk/insights/options-choices-actions-uk-scenarios-for-a-low-carbon-energy-system/>



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