CARBON BITES

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The Future of District Heating: Challenges and Best Practice

The UK needs to decarbonise heating as part of the drive to reduce the UK carbon emissions in line. Key policy drivers include the Climate Change Act, and more recently, the Paris Climate Agreements. Additionally, there is always pressure to deliver heat as cost-effectively as possible – particularly domestically where household energy bills are steadily increasing.

District Heating (DH) networks can form part of the pathway forward for the UK, as they open up opportunities to utilise more sources of heat, and can have operational benefits through centralising plant. However, the degree to which DH should be a part of the future energy mix is not agreed.

Challenges

DH Networks fundamentally introduce distribution losses, increasing the heat demand by at least 20% (often considerably more). The first step to reducing emissions of any project should be to consider reducing energy demand, before deciding upon the technology to provide heat. The carbon savings through introducing DH must therefore be greater than either locally generated heat or the additional energy lost through distribution.

Historically DH Networks have not typically been designed, installed and operated in the most energy efficient or cost-effective manner in the UK. There is public backlash over standing charges levied on consumers, the cost of heat is often greater than if a local gas boiler had been installed. Furthermore, heat losses have been substantially larger than designed or modelled and individual controls are often difficult to use or inappropriate.

The decarbonisation of the electricity grid creates the possibility that gas-fired CHP engines will no longer producing a genuine carbon saving. As CHP engines often contribute substantially to the financial viability of the scheme, different funding mechanisms should be considered for future network installations without fossil-fuel supplied heat.

Decarbonising non-electrically powered heat is a key challenge. As more heating shifts towards electricity-powered technologies, either the electricity grid must be reinforced to accommodate this, or alternative sources of heat should still be considered part of the energy mix.

The space-heating demand of building stock is reducing as their fabric has improved. Supplying heat is becoming more driven by the hot-water demand. As diversity of demand is more pronounced for DHW than space heating, this can lend itself to centralised heat generation plant as overall peak demand is spread out over many units. However, it is important that the correct methodology to apply diversity is used, such as DS439, ensuring to adjust the methodology as appropriate to individual projects. Where metered data is already available, the use of this in sizing future networks should be encouraged.

Decarbonising the heat of legacy building stock is a challenge, as there are both practical- and financial- issues which limits the energy savings which can be cost-effectively achieved through fabric improvements. DHNs can have a role in lowering the heating emissions of legacy stock, but the requirement for the UK to reduce its overall emissions by 80% by 2050 should be considered, as any future fabric improvement may cause installed heat networks to become oversized.

Best Practice

Many best-practice standards have already been developed by, for example, the Swedish District Heating Association (Svensk Fjärrvärme - SDHA) which are widely used and already translated into English. Improved design, specification and installation would immediately improve the performance of DH Networks in the UK.

There should be a focus on block-level networks (communal heating) as then any network losses are potentially useful in heating the building. Lowering distribution network temperatures is often beneficial as this reduces heat losses in transmission.

Where genuine sources of waste heat exist, installing a network to make use of this heat is clearly beneficial. Alternatively, where opportunities to use low-grade heat or generate renewable heat exist on a scale beyond an individual block, a heat network may be beneficial.

The Future of Heat Networks

Future networks will inevitably become smarter with greater information transfer and control all across a network. Greater and smarter control of networks should allow:

- Comfort to be optimised;
- Elimination of DHW circulation loads (in new build);
- Load shifting (reducing peak capacity needed, reducing pipe sizing and losses);
- Optimisation of operating strategy (increasing efficiency);
- Automated system commissioning;
- Reduced metering/billing costs.

This future scenario depends on appropriate hardware and software. Examination of equipment installed on the continent, and through start-ups developing operating platforms to operate, control and meter heat networks, shows that the technology to implement this scenario is not far away from widespread commercial viability in the UK.

Matthew Smalley, Max Fordham, 08/08/17

Key Lessons Learnt

- Well implemented building level communal heating is nearly always beneficial
- District heating has a limited set of conditions where it is viable as a carbon reduction measure, such exploiting genuine waste heat, or where constraints of a dense urban site discourage smaller scale low-carbon technologies
- The challenge around the shift of heating from fossil fuels to electricity may drive technology choice

LINKS

- http://www.coheat.co.uk/
- http://www.maxfordham.com/people/bill-watts
- https://global.ihs.com/doc_detail.cfm?document_name=DS%20439&item_s_key=00567013