Heat Reuse: Not Just a Load of Hot Air

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"Why aren't you re-using all that waste heat?" is a question that is increasingly being levelled at data centre operators by politicians, civil servants and the media. And in truth, it's not an unreasonable thing to ask: the UK commercial data centre sector consumes between 2.5 and 3TWh of electricity a year, which it essentially converts into heat.

In theory then, data centres should be good candidates for heat reuse. This has been recognised by local authorities who frequently require operators to provide waste heat in planning conditions. However, providing waste heat is one thing; finding a recipient is another thing entirely. As a result, in the UK there are few if any examples where waste heat from data centres is successfully being exported to customers through external networks. Some operators are, however, re-using waste heat within the facilities to heat office areas or to warm the generators, but these are atypical.

A cursory examination reveals why we are so bad at re-using our waste heat. Firstly, feasibility depends on the cooling system in place: a facility that uses free air cooling is unlikely to be a good candidate for heat reuse! Even with water based cooling, the low grade of the heat (usually between 23˚C and 30˚C, is another problem. New, immersive cooling technologies present much greater opportunities but are not yet widely adopted. And even if you can get that heat to the edge of site, there is the much more significant barrier: the complete lack of infrastructure to upgrade and transmit this heat to recipients.

UK Government has recognised that industrial heat reuse is beset by barriers and has set aside two funds: £320M for the development of heat network infrastructure and £18M to support heat providers. There are conditions (of course!): grants only cover part of the project costs and are limited to existing sites with customers in place. The latter two conditions immediately place severe limitations on scope and on the policy outcomes – within a rapidly growing sector the best opportunities for re-using heat are likely to be in new developments. Moreover, bids for funding have to be submitted at the very latest before September 2019.

Before we write it off, though, we should take a look at places where heat reuse is more common, for instance in Scandinavia and the Netherlands, and examine some data centre case studies to establish how it works, the issues that they have encountered and how they have been dealt with. The Multigrid initiative in Stockholm is a high profile example but comparisons with Scandinavia are not very helpful – the energy market is different and there is a very extensive heat network infrastructure in place especially in urban areas. The Netherlands has more in common with the UK because there is little infrastructure that can handle lower grade heat. So the Dutch commercial

data centre industry has announced formally that it will give away its waste heat and is now working with a range of stakeholders to establish networks. The Dutch Government has helped by defining this waste heat as zero carbon, thus creating market pull from developers keen to meet their emissions obligations.

So it is possible, and there is clearly appetite in the sector to make better use of our waste heat: the industry has even developed a performance metric: ERF or Energy Reuse Factor which we are likely to see referenced in the Green Public Procurement criteria currently being developed by the European Commission – so heat reuse could be a differentiator in tendering for public sector data centre contracts in future.