

## Low and Zero Carbon Heat Networks: can it be done? – Q&A Session

### 1 General Questions / comments

Question	Answer
Do you see 5G heat networks as opening up 'new markets' for heat networks, or it is something that might be rolled out where otherwise, several years ago, we might have put a 3G or 4G network?	Phil Jones: Yes, absolutely 5DHC will open up new approaches and markets. In particular 5 DHC is an ideal solution in dense cities with Htg and cooling. The 5DHC approach can share H&C – in effect cancelling out energy demand, and with a very low carbon outcome. Developers will look at 5 DHC and feel it is ideal in energy dense cities. But where it is a HEAT only HN then go 4DHC i.e. low temperature single energy centre. But there will also be opportunities to join 5DHC and 4DH. In GreenSCIES we are hoping to supply Bunhill 3DH from our 5DHC heat pump-based system – again a new opportunity.
During the 1970 - 1980 I felt that District Heating "Failed" due to the mean Government yardstick which did not allow for the individual control by the Tenant.	Phil Jones: Well I was there in the 80s and the DH was VERY high temp, often steam, poorly controlled and poor insulation. Pre insulated steel, better controls and lower temps have all changed/improved DH dramatically
Does CP1 look at different tariffs for heating and for cooling?	Phil Jones: CP1 (2020) still doesn't say much about district cooling systems – the doc is big enough already! But much of the text is still applicable. CP1 does address tariffs – but really just in feasibility and design. Its really site specific and up to the developer/operator. CP1 tries to set Min Requirements whilst still allowing designers/operators freedom to make professional decisions. CP1 does complement Heat Trust in saying tariffs should be clearly set out for customers.
Is cooling equally considered as well as heating?	<a href="#">Answered in session</a>
Also on that point - how are the panel handling future cooling projections - i.e. a warming climate - in their network sizing, capacity, and future additional kit	Phil Jones: 3DH and 4DH don't really address the rise in cooling – whereas 5DH can do that.
What should be cost for central system compared to individual boilers?	Phil Jones: ADE have a heat cost calculator that sets this out – once you include boiler maintenance and replacement then DH often comes out better.
Should waste heat be taxed as an incentive to encourage adoption of 5G heat networks?	Phil Jones: Hard to set a tax on waste heat but better to incentive its use. A £/MWh rate for uptake. Or maybe just a carbon tax would do it.

### 2 Questions to Phil Jones, London South Bank University

Question	Answer
In 4DHC is the supply temperature guaranteed at the building boundary?	Yes, but just at lower temps than say 3DH. As normal, this temperature would be specified in the customer Service Level Agreement
Could you comment on why the CCC sees heat networks as being appropriate only for the difficult to decarbonise existing stock and not the new-build sector where we should be focusing reducing heat demand?	I haven't picked that up from the CCC report. As in CP1, Heat networks eminently appropriate for new build and existing buildings – in the right place where heat density is reasonably high (MWh/m)
As a percentage of the number of heat networks how often do you think there is sufficient demand for both heating and cooling to make 5DHC viable?	Number of networks may be relatively small – but that's the wrong measure – should be looking at MWh supplied, and CO2 Tonnes reduced. i.e. some quite big systems will come through in cities, not many but big supply and savings.
Within low temperatures on 4DHC and even lower on 5DHC there will be lots of changes being required to existing heating and insulation of existing buildings?	From Roger Macklin: not necessarily. 5DHC will require heat pumps in each building. Providing the heat pumps can deliver high temperatures no such change would be necessary. From Phil Jones: And there are HPs available to provide 85C – have a look at Drammen in Norway and recently Queens Quay Glasgow – Star Rerig, Solid Energy etc. But yes, the more you can lower temps the higher the CoP.

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	<ul style="list-style-type: none"> <li>Phil Jones: Absolutely right - the more you insulate temperatures down, the more beneficial for HPs. In GreenSCIES existing buildings we are staying at 70C flow. But other new build developments are already going 60C flow (4G) because they have essentially insulated down before building.</li> <li>Phil Jones: 5DHC is generally larger polymer pipework, low pressure loss and so transfer pumping costs are relatively low. But borehole abstraction pumping is significant.</li> <li>Phil Jones: Worth saying that the BIG difference with 5DHC is ability to share (prosume) heat across the network. The more you can prosume the greater the cost/carbon savings. GreenSCIES is sharing up to 3MW of heat from the data centre to help heat all the other scheme buildings. Heerlen 5DHC Mine water scheme always insulates the building down as part of connecting to their 5DHC scheme</li> </ul>
Is the corollary that 5DHC are only appropriate if there is heat that can be recovered from other sites	In many ways you are right. Areas with good balance of heating & cooling = 5DHC. But if it's just a heat only heat network then maybe 4DHC is the solution, unless you have a big waste heat source like a data centre. If its heating only and no waste heat available, then go 4DH
Do 5DHC network efficiencies force building occupiers to have specific heating/cooling demands? And will it be difficult to achieve flexibility for future change in heating/cooling demand?	<a href="#">Answered in session</a> NO and NO 5DHC supply not constrained as much as 4DH. 5DH much more flexible in ability to supply demands, and add new demands Htg or cooling
Where can I get a copy of CP1	Link to CP1 (2020) on CIBSE website: <a href="#">CIBSE - Building Services Knowledge</a>

### 3 Questions to Antony Meanwell, Eon Energy

Question	Answer
Do you need an abstraction licence for the boreholes? Is there a plan to cope with periods of drought and water scarcity?	<a href="#">Answered in session</a> Yes, an abstraction licence from the EA is required. We are not taking water from the aquifer; we are abstracting the heat from the water then re injecting it back into the aquifer. Non consumptive – just changing temperature.
Interesting that you think it useful to recover heat from the chillers back into the return back to the borefield. Could you expand. is it better to put it into the flow from the borefield back to the heat pumps	Phil Jones: Example in GreenSCIES is that we are providing cooling to data centre (i.e. recovering heat) and then sending the recovered heat to act as a source for HP to heat other heat-only buildings. Sharing or Prosuming.
Are you impacted by the Tideway dewatering at present? Assuming this would only improve your case in the future	<a href="#">Answered in session</a>
Can you comment on the energy costs associated with circulating fluid around the heat network? This seems to be a significant 'cost'.	I am sorry but I don't have this information readily available.  Phil Jones: Relatively small in the bigger 5DHC picture but still important to include in techno economic feasibility calcs
When will citygen be delivering low carbon heat and what is the anticipated carbon factor for the heat?	[21/01 12:34] Meanwell, Antony (Guest) We are planning to deliver lower carbon heat from October this year. Once we have commissioned the system, we will release the carbon factor.
Question for Antony, very interesting. At Citigen what measures are you prioritising in existing building to lower returns - are you changing emitters and pipework?	[21/01 12:40] Meanwell, Antony (Guest) At the minute we are focusing on how we can re-commission buildings to bring down the return temperature. However, we are also looking at emitters and pipework, but this requires a larger amount of CAPEX.
Antony, you alluded to future opportunity for net zero carbon. Presuming the need to phase gas out to achieve this (and by extension gas-fired CHP), what do you see as the longer-term solution for existing heat networks?	[21/01 12:44] Meanwell, Antony (Guest) Long term, unless we see hydrogen develop, we see that smart local energy grids are the future as described by Phil. This sees waste heat from cooling being used in the building where it is generated, if it is not required in that building then it is shared

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	with other buildings using the ambient network. 5th gen networks also allow us to use low grade waste heat and renewable heat sources.
Will you be using grid regional and 1/2hrly carbon factors?	It is part of our plan for 2021/22 to do this.

### 4 Questions to Bhav Patel, Vattenfall

Question	Answer
You mentioned reporting for operational stage when discussing carbon factors. what reporting requirements exist for DH?	<a href="#">Answered in session</a> Lots of reporting now Min Requirements in CP1 (2020). Although still a voluntary CoP, CP1 is likely to play big part in regulatory framework Phil Jones: Lots of reporting now Min Requirements in CP1 (2020). Although still a voluntary Code of Practice, CP1 is likely to play big part in regulatory framework
Are there case studies of heat networks used within smaller towns, where there is smaller density of end users?	Phil Jones: There is a DECC (pre BEIS) case study brochure worth looking at. There are examples of smaller HNs and in particular in Scotland.

### 5 Questions to Henrietta Cooke, BEIS

Question	Answer
What role do you see for carbon taxes and levies in transforming heat networks?	<a href="#">Answered in session</a> <i>“As another step towards equalising the rates and encouraging energy efficiency, from April 2022 I’m freezing the levy on electricity and raising it on gas,”</i> Mr Sunak said.