

Questions for NHG

Rationale (this was raised at the Board meeting)

1. What was NHG's rationale for deciding that social rented homes should remain connected to the District Heat Network (DHN), while private sale and shared ownership homes will use the EAHPs?

The discussions and negotiations around EAHP's was a lengthy process. Whilst in principle we believe that EAHP's are perhaps the way forward, in the UK there is no real world data showing the performance and effectiveness of these systems in larger homes. There have been limited studies and Berkeley's undertook one such, by retro fitting into a number of smaller apartments on a recent scheme and getting Berkeley staff to live in them for a number of weeks to assess costs. This didn't include families. EAHP's are used more on the continent (especially Denmark, Sweden etc), but they generally build to higher thermal performance standards, so comparables cannot be made. The answers to the questions below address the main details that were being considered. NHG had reached a position that if higher thermal performance standards of the building envelope could be demonstrated, and minor back up options were available, that we could accept EAHP's in the SR homes. However, as the detailed design of the buildings had already been submitted to the Building Safety Regulator, the changes required would have caused a delay in the programme and so BH were unable to agree and reverted to the DHN for the SR blocks. Looking forward, to Phase 5, we feel more confident of the suitability, as not only will phase 5 have been designed for EAHP's, but there will be more comparable information to allow a rigorous assessment rather than having to use assumptions.

2. What are the key advantages and disadvantages of each approach from NHG's perspective, particularly in relation to:

Resident affordability – One of the key advantages of EAHP's is the lower routine maintenance costs, and PS / SO leaseholders will benefit from this, however SR tenants would not benefit as they do not contribute to these costs as they are picked up by NHG and not charged back through Service Charges (therefore it costs NHG more to retain the District Heating).

Energy Costs could also be cheaper if the demands are met mainly by the Heat Pump which will either be heating water (priority) or heating the apartment. However, for hot water, EAHP's rely on a hot water cylinder which is slowly heated by the heat pump. This would normally be able to happen overnight or during the day when there is lower demand for hot water or heat. However at times of high demand, such as families getting ready to go to work/education with multiple showers or returning in the evening with cooking, showering etc, we were concerned that the stored water and heat pump alone will not be able to keep up with demand and will not be able to replenish the hot water in time and could become reliant on the electric immersion heater. Also, whilst the Heat Pump is prioritising replenishing hot water, it has to reduce/stop contributing to heating the home which may result in the normally single electric panel heater, in the hall, having to heat the home. We were also considering the family make up of the larger homes containing young families or homes for vulnerable/frail/elderly residents, where the home is more likely to be occupied during the day with heating required and continued hot water use, which would reduce the ability of the hot water cylinder to recharge from the Heat Pump only, requiring greater use of the immersion heater.

Reliability. There are fewer mechanical/plumbing components in an EAHP, so they should be quite reliable, however there is little real world evidence in the UK, especially when used in larger homes with higher demands. EAHP's do have filters that need to be changed regularly (up to 4 times a year). Failure to change the filters will impact on the efficiency of the heat

pumps. Residents can change the filters themselves (although they are located at the top of the unit, so most will require steps to reach them) and whilst NHG could provide free filters or offer to change the filters for those who can't, unless residents use this service, the reliability and efficiency will decline.

Ease of maintenance. As above, the nature of the EAHP's have fewer moving parts and so should be relatively easy to maintain, which reduces the cost for those responsible for picking up the bill. Social Rent tenants will not see this benefit as it is a cost picked up by NHG. An annual service will be required and therefore tenants will need to provide access. Also, as this is a relatively new system, we had queried the availability of engineers trained to maintain such systems. Availability will though increase, with greater use of EAHP's in the future.

Resident control over energy costs. The two main controls for residents are the choice of electricity supplier; and how they use the system. Unlike district heating that only has one source of heat coming into the HIU in the home, and so the cost of a unit of heat doesn't change (at any one time) regardless of how it is used, EAHP's have two sources, the Heat Pump and the electric immersion heater and panel heater and depending on how the system is used will change the costs to residents. This will require a period of education for residents as to how to take full advantage of the EAHP.

As mentioned earlier, the most efficient use will allow the heat pump to charge the hot water cylinder over night or during the day when usage is low and if hot water use is managed so as not to drain all the stored hot water over a short period, then there should be no need for immersion heater to kick in, but the cost of electric for running the immersion heater will be higher than district heating for a given amount of water.

When it comes to heating, EAHP provides warm air into the room through a vent in the ceiling and the most efficient way of using this would normally be a constant comfortable heat rather than periods when the temperature is turned up so the room becomes hot, or heat escapes through an open balcony door. Each home is provided with an electric panel heater, usually located in the hall, and if the heat demand is too great for the Heat Pump, then the panel heater will switch on and the heat generated will be circulated through the home. The Heat Pump prioritises charging the hot water cylinder, therefore if you are demanding both the hot water and heat at the same time, it will be more likely that the panel heater will switch on. If the system is used in a way that allows the Heat Pump to do the majority of the work, then it will be very efficient in use, but the cost of a unit of heat from the panel heater will be more than a unit of heat from the district heating system.

3. If EAHPs are considered sufficiently beneficial for NHG'S shared ownership homes, why are they not considered appropriate for social rented homes? It isn't a case of the systems being beneficial, but that they were able to provide heat and hot water to the homes at average cost to the resident that was no higher than the DHN. There were two main considerations in assessing the suitability for SO.

The first is choice. SO leaseholders, like PS leaseholders, choose to buy an apartment at Woodberry Down rather than else where and so they will be aware of the EAHP and can make their own decision before they commit. One of the factors in their consideration could be the reduced maintenance costs that should be achievable with an EAHP. Social Rent tenants generally have limited or no choice, either if they are decanting from existing homes on WD or from the waiting list and are offered a 'suitable' home. They also do not benefit from the reduced maintenance costs.

The other consideration we made was the size of the SO homes compared to SR and the likely occupation demands on heating/hot water. Whereas 63% of Social Rent Homes are family (2b4p and above, 50% of which are 3 beds), 61% of SO homes are 1 bed and there are no 3 beds. As explained above, EAHP's are most efficient when the hot water cylinder can be

charged from the heat pump and is not drained quickly therefore not requiring the immersion heater to be used. This is most easily achieved in smaller homes with fewer occupants. SO lease holders, often will not occupy to the maximum bed size, meaning they are more likely to be able to achieve the efficiency EAHP's can offer. Whereas SR tenants are generally allocated to a home that meets the family needs at the time and therefore occupy to the maximum bed size, increasing the demand for heating and hot water. Feeding in to this, is the Woodberry Down area requirements for Social Rent homes achieving Parker Morris + 10% floor area's, requiring greater space heating demands.

4. Has NHG undertaken a comparison of the projected costs for residents under:

- ASHPs
- EAHP

Cost modelling is difficult as there is so little information in relation to real world use and performance of EAHPs in the UK. As mentioned earlier, where used on the continent, building performance standards are generally higher, similar to Passivhaus and so direct comparisons are not possible, whereas we are familiar with District Heating systems and have more reliable information. As with many technologies, manufacturers will list efficiency ratings which are rarely achieved in use ie cars mpg or range claims. NHG, BH, Nilan (EAHP manufacturer) and respective consultants undertook in depth discussions of the likely performance of the systems and if additional measures were required. These showed that for the smaller homes, they should deliver a reduced cost to residents, but for larger homes it was more borderline, especially taking into account that SR tenants do not benefit from the reduced maintenance costs.

5. Are there any anticipated service charge implications for residents under each option? The Maintenance Costs that NHG incur are not passed on to tenants through service charge
6. What are the anticipated maintenance and replacement costs for NHG? The cost of retaining the DHN is higher for NHG.
7. Has NHG assessed the risk of future DHN heat tariffs increasing? Whilst NHG recognise the risk of gas prices increasing, there is also a risk (albeit smaller) of electrical tariffs changing. But with regards to the DHN network, as had been discussed at the last Board meeting and recent Design Meetings, as part of BH's ongoing decarbonisation strategy, larger, more efficient Air Source Heat Pumps are being installed on Phase 4 that will feed into the energy centre, which should reduce the reliance on Gas. Also going forward, as new and/or more efficient technologies become available, these could be included in the energy centre, which may allow a reduction in tariffs. I should point out that NHG do not control the Ph3 Energy centre, so this question would be better answered by BH.
8. The presentation states that EAHPs provide cooling benefits during summer months. Will social rented residents connected to the DHN receive equivalent overheating mitigation measures? No. Phase 4 already benefits from stricter regulations in terms of overheating, which as Design Committee members are aware has resulted in some changes to the location, materials specification and extent of glazing. These measures have been assessed to avoid overheating and will form part of the Building Control approval. There are no additional measures being proposed for homes connected to the DHN.
9. NHG states that more evidence is required regarding larger family homes. Could NHG share the evidence and monitoring data that Berkeley has gathered? As mentioned earlier, the BH data relates to a test case study in a block of flats where EAHP's from different manufacturers were retro fitted, and tested with BH staff living in the apartments for a number of weeks. BH's data gathering wasn't related to the comparison of apartment size or family composition. As this is BH's information, I can ask if they are willing to share.

10. How long does it take NHG to consider the evidence for efficiency and effectiveness of Exhaust heat systems? Does NHG have any of their own developed properties with EAHP? This should be a cost analysis as well as efficiency? NHG has no experience of EAHP's and we have not been able to gain any useful information of its use in the UK in a similar setting (even from the manufacturer) to be able to assess its cost in use or reliability. These systems are new to the UK market and without adequate safeguards, we do not want to expose Woodberry Down tenants to the Innovation Risk. We are currently considering a proposal from another developer who are rolling their use out and are building to Passivhaus standards, but they have yet to be able to demonstrate the effectiveness in larger homes.
11. If EAHPs are not considered particularly effective for three- and four-bedroom flats or maisonettes, what alternative options have Berkeley Homes and NHG considered for larger homes beyond connection to the District Heat Network? The planning energy strategy relates to the DHN, so EAHP will be a variation to this. As part of the discussions with BH we looked at the possibility of an additional panel heater in larger homes and/or the ability of adding heaters if there was a problem. No other standalone alternatives were considered as these would have impacted on the existing plans. As Tom has presented, better Air Source Heat Pumps are already being fitted to roof area's to increase the efficiency of the Energy Centre.

Would it not make more sense to consider standalone ASHPs for larger family homes? Has a hybrid approach been assessed, whereby smaller flats are served by EAHPs, while larger homes utilise standalone ASHPs? It wouldn't be economically viable to consider a more granular hybrid model.

12. Does this proposed Phase 4 energy strategy differ from what has already been submitted for Building Regulations approval? BH manage this process and will be able to advise
13. Does compliance with overheating regulations (Part O) depend upon the cooling function provided by the EAHP system for Phase 4? No, the Social Rent homes are Part O compliant.
14. If the cooling function were removed for shared ownership, would it still comply with Building Regulations? Yes