EM Magazine

ENERGY GUIDE

DELIVERING NET ZERO HEALTH ESTATES INFRASTRUCTURE?

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Challenging times ahead

Health estates professionals including NHS energy managers are used to delivering the seemingly impossible in minimum time frames against challenging budgetary restraints. But we are now faced with what must surely be one of the biggest challenges we will all have to face in the coming years, that is the urgent need to adopt progressive decarbonisation of our hospital energy infrastructure.

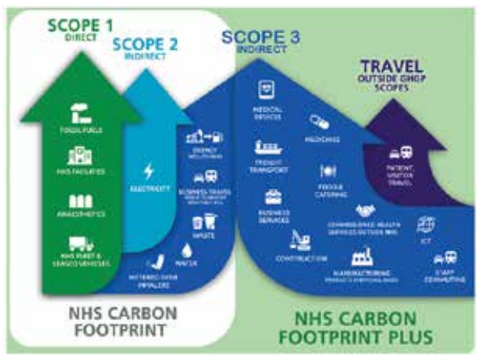
As part of establishing the extent of this challenge in the UK, the NHS published its "Delivering a 'Net Zero' National Health Service[1]" paper in October last year. This document heralds the determination of delivering net zero NHS carbon emissions by 2040, based upon a 1990 emissions baseline. This is 10 years ahead of the UK Governments own 2050 net zero target objective and furthermore, the NHS paper set out that 80% of the net zero target would be delivered by 2028 to 2032. Again, this is far more ambitious than the UK Governments target for at least a 68% reduction in UK total greenhouse gas emissions by the end of the decade. It potentially means that in order to meet these target objectives, very significant changes to the delivery of energy infrastructure and associated activities within the NHS are inevitable and will have to happen at pace.

1https://www.england.nhs.uk/greenernhs/publication/delivering-a-net-zero-national-health-service/

Health service carbon footprint

The targets in the NHS paper are based upon reducing the carbon emissions from activities represented within the NHS Carbon Footprint. This footprint can be applied to most health service organisations and primarily consists of energy used within buildings, energy used from health service owned and operated vehicles, water consumption, refuse and waste treatment as well as emissions associated with medical treatment procedures.

There is also an aspiration to affect the wider health service carbon footprint that includes upstream and downstream emissions, such as medical devices, business services, construction, food and catering, and manufacturing of products and services used in a hospital or the organisational supply chain. The NHS paper calls this the NHS Carbon Footprint Plus.



NHS Carbon Footprint – taken from "Delivering a 'Net Zero' National Health Service"

Net zero

Achieving a Net zero position means that you have dealt with reducing your carbon emissions as far as you are practically able to, and the only emissions left are those that you cannot avoid and so have to be offset. Offsets are usually by way of the organisation responsible for the unavoidable emissions paying to implement the equivalent emissions reductions by other means, such as purchasing the equivalent carbon emission reductions from green energy certificates, or funding other carbon emission reduction projects elsewhere, that achieve the equivalent reductions to get the organisation down to zero.

Importantly, we cannot all rely on offsets for reducing all of our carbon footprint and at the same time do nothing to make any reductions from each of our facilities and activities. If we all do this, we would make no material impact to either our total organisation emissions, or those of the NHS as a whole; as such there would have been no additionality taking place. Therefore, in order for real emission reduction beyond offsets to occur, we need to make material reductions at each of our NHS sites, which calls for variable levels of investment in time and money to implement.

Targeting reductions

The NHS "Delivering a 'Net Zero' National Health Service" paper identifies that in order to meet the NHS 2040 net zero emissions target for the secondary care estate, we need to achieve 20% of the required reduction from new building upgrade construction, 24% from optimising the way we use existing buildings and a further 25% needs to come from providing our buildings with low carbon and renewable energy.

This is implying more of the built estate carbon emission reduction has to come from optimising the existing facilities and providing them with low carbon and renewable heat and power (49%) compared to wholesale building renewal (20%).

These proportions have been determined for the entire NHS secondary care footprint and in practice, the target level of emission reductions required at organisational and at site level will vary, depending on the clinical delivery scope and extent, age, and condition of the associated estate portfolio.

'Do nothing' decarbonisation

In the UK, the impact of greening electricity supplies has been significant to date, with electricity carbon emissions having decreased by approximately 75% since 2012. This is great news for existing facilities and assets run from electricity as they have been decarbonising by themselves! But increasing effort will be needed over and above this impact if we are to achieve the strategic carbon reduction targets by the end of this decade. For one thing, most of the heat utilised by a typical hospital estate is delivered through burning fossil fuels, specifically natural gas and to a lesser degree fuel oil. These fuels have not decarbonised by any significant amount over the same period, nor are they likely to decarbonise to the levels needed in order for us to achieve the 2032 80% reduction target.

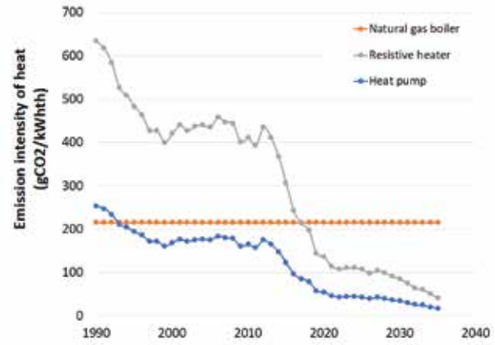
The potential exists for hydrogen fuel to replace natural gas used in heating boilers. Appropriately specified boilers can be installed today that can operate on natural gas now and also on hydrogen in the future. The question here is should we invest now in upgradable plant and how far into the future will we have to wait for a hydrogen supply to reach our site?

Future hydrogen supplies will be either produced by sequestering the CO_2 from natural gas (so called blue hydrogen) or derived from electrolysis using renewable electricity generation (green hydrogen). It seems likely that hydrogen roll-out may be geographically limited at least initially and that investment in distribution infrastructure may be significant, due to limitations in compatibility that some existing gas infrastructure may have to transport hydrogen as opposed to natural gas.

Meanwhile it is very unlikely that it will be possible to simply move all existing hospital heat infrastructure capacity currently on natural gas over to low carbon grid supplied electricity for large acute hospital sites, as this may not be practical or affordable.

Carrot and stick

In the UK, the existing climate change levy on natural gas and electricity continue to rise, with the levy on natural gas set to rise faster than electricity in the next few years. Even so, it remains the case that electricity is currently at least 4 times the cost of gas per kWh

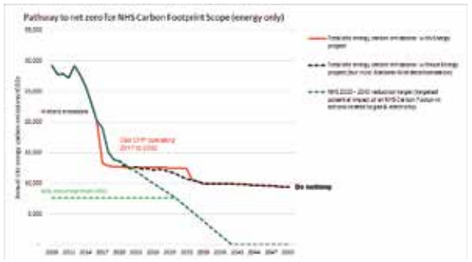


Source: https://ukerc.ac.uk/

purchased. This means although measures like natural gas combined heat and power (CHP) currently save less carbon than they did five years ago, they are still very significant revenue generators. The graph below shows a hospital gas CHP scheme that was installed in 2017 and its progressive carbon savings set against a rapidly decarbonising electricity supply from the National Grid.

At present around 30-40% of carbon emissions generated directly in the UK are taxed via by the UK's emissions trading scheme (ETS). The UK ETS is tipped to expand its scope, that might mean many consumers that were previously out of inclusion criteria will fall within its reach at some point in the future.

There is currently a government review as part of a strategy to deliver a so called "carbon price for the whole



economy" which may tackle wider aspects of carbon intensive economic activity supposedly in time for the COP26 UN climate change conference taking place in Glasgow in November 2021. However, it remains to be seen how far governments are prepared to unilaterally tax their economies on the basis of carbon emissions without stifling competitiveness.

A roadmap to net zero

All health service organisations need to understand the risk in terms of where they sit now, and where they are likely to sit in the near future. In the UK, the 2028 horizon is only a matter of a few years away, being the earliest point 80% of the 2040 NHS net zero target needs to be hit.

This means if they have not already done so, NHS organisations should now be identifying their carbon footprint in terms of current emissions and how these will sit with target reductions within the timescales needed. The position adopted should also take into account any planned expansion, contraction or renewal of particular site facilities and assets. These estimates can then feed into a carbon roadmap for each site.

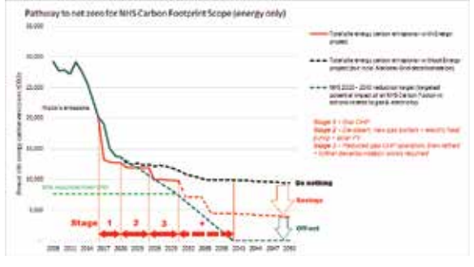
This roadmap will have an energy infrastructure plan that will consist of initial technology savings measures that are readily available, and which can be invested in and delivered today, followed by further future measures, that might depend on additional investment or perhaps government funding delivered in a second or third stage. In the UK this has recently been facilitated by the Public Sector Decarbonisation Scheme (PSDS) that provides grant funding for compliant technology applications, focusing on decarbonising heat as a priority.

The 'third phase' of the roadmap should point towards an end game, that positions an organisation close to the chosen target that the roadmap is pointing to, for example the 80% reduction by 2032 or net zero by 2040 (UK NHS targets). It could be that the end game position is going to be ultimately reliant upon technology not yet affordable such as workable scale heat pumps or currently unavailable infrastructure, such as hydrogen.

The road map should therefore show how we get there progressively in stages. Careful planning now should indicate measures we adopt today do not annex us from taking further steps in the future, or push solutions needed now into the long grass. **It needs to be a strategy that we can build upon**.

The graph below builds upon the previous graph that showed a site with a gas CHP installed in 2017. It shows how the energy scheme provided significant carbon savings initially, but now, with an increasing decarbonised electricity supply grid, those carbon savings are fast disappearing.

Remembering that grid electricity will largely decarbonise outside our immediate sphere of influence, we need to prioritise decarbonising heat.



The graph shows how prioritising heat decarbonisation will get this energy scheme example back on track by introducing a low temperature heat network (de-steaming) and installing some heat pump technology to deliver a carbon savings legacy that takes the organisation beyond 'do nothing' and closer to the 2032 80% target. It is also clear from this graph that stage 2 is not the end point, and that further investment will be needed to hit the 2032 80% reduction target.

If the investments made at each stage are strategically planned and delivered in a way that delivers a guarantee of continued performance and affordability, then getting close to 2030 targets and 2040 net zero become more realistic, and a way forward more believable. From this standpoint can be seen the benefit of strategic investment in the fundamentals of a future-proofed energy infrastructure that can be started now (Stages 1 and 2), and that if carefully performance managed, will maintain savings throughout its life, and can ultimately be adaptable and capable of taking advantage of future technologies as they come on stream during Stage 3 and beyond.