Wind Powered Hospitals

How climate friendly community energy could power the NHS and tackle health problems from energy poverty

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Introduction

In October 2020, the UK's National Health Service became the world's first to commit to going net-zero carbon by 2040. In making this pledge, the NHS recognised the importance of taking urgent action to cut emissions, and the threat posed to people's health by the climate crisis and air pollution.[1] As part of this trailblazing action to reach climate-safe health care, the NHS committed to purchase only renewable energy from April 2021.[2]

As large anchor institutions with significant purchasing power, NHS Trusts could help to accelerate emissions reductions from energy generation in the UK by deciding to commission the low carbon electricity they need from new, rather than existing, projects - supporting an increase in renewable energy capacity. Trusts could create further benefits for their local community by commissioning clean electricity from community projects which, rather than making a profit, invest their surplus income back into the local area via community benefit funds.

If surplus income from community supply were used to set up projects tackling energy poverty and cold, damp homes, it would improve the health and wellbeing of local people most in need. This in turn would reduce the costs of treating related health problems. This report explores how localities could achieve this virtuous circle of improved health, better quality of life, reduced greenhouse gas emissions and savings in healthcare costs for NHS Trusts.

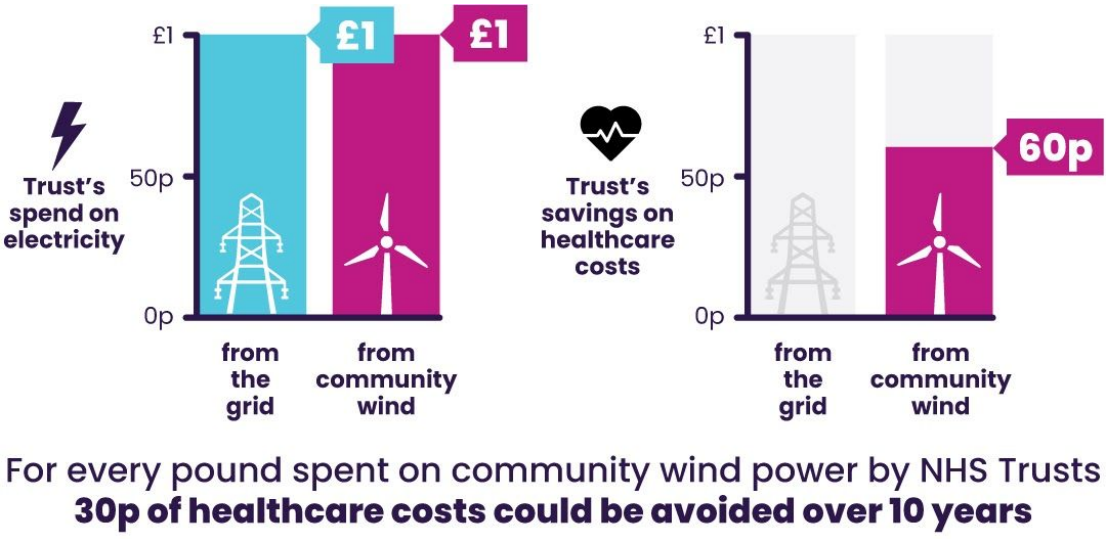
- An "**anchor institution**" is a large organisation which isn't profit-making, such as a hospital or local council, which exists to serve a population living in a particular place.[3]
- An **NHS Foundation Trust** is a National Health Service organisation which manages its services to meet the needs of the local community.[4]

[1] www.england.nhs.uk/2020/10/nhs-becomes-the-worlds-national-health-system-to-commit-to-become-carbon-net-zero-backed-by-clear-deliverables-and-milestones/
[2] www.england.nhs.uk/greenernhs/wp-content/uploads/sites/51/2020/10/delivering-a-net-zero-national-health-service.pdf
[3] www.health.org.uk/newsletter-feature/the-nhs-as-an-anchor
[4] www.uhb.nhs.uk/foundation-q-and-a.htm

Key findings

- Annual spend on electricity per NHS Trust from community wind generates **£2.6m** in avoided healthcare costs over ten years through tackling cold homes.
- Equivalent to a return over 10 years of **30p** in avoided healthcare costs **for every pound** Trusts spend on electricity at no extra cost.
- Average yearly spend of **£500,000** per NHS Trust on improving cold homes - **£12.5m** over 25 year project lifespan.

Figure 1: Comparative energy spend and subsequent avoided healthcare costs over 10 years for conventional and community energy supply.



This report provides an estimate of the reduction in healthcare spending that could be obtained for two NHS Trusts - Newcastle upon Tyne Hospitals NHS Foundation Trust and Sussex Community NHS Foundation Trust. We use available data to make this estimate, but further research is needed to provide a more detailed picture of the potential benefits from this route for commissioning electricity.

Costs and benefits of new community wind projects

We use the below model for the costs of a new community wind project, provided by Communities for Renewables CIC, a community interest company which reinvests surplus profit in supporting community energy initiatives.[5] Given the fixed costs for new wind projects, such as grid connections, this model suggests a minimum size threshold of 25 megawatts (MW) of installed capacity, which would generate around 70,000 MWh of electricity per year. NHS Trusts have annual electricity requirements of between 3,000 and 85,000 megawatt hours (MWh) per year. Newcastle upon Tyne Hospitals NHS Foundation Trust has an annual demand of 64,000 MWh, and Sussex Community NHS Foundation Trust[6] an annual demand of 23,000 MWh. This suggests that for smaller Trusts with electricity requirements significantly below this threshold, additional partners such as the local council or local businesses would be needed as electricity customers.

The electricity would be bought via what is known as a "sleeved" or "synthetic" power purchase agreement, in which the energy project feeds electricity into the grid and the buyer takes energy from the grid.[7] This type of agreement has the advantage that it doesn't require the electricity project to be situated adjacent to the energy user, and it doesn't require electricity supply and demand to be precisely balanced over time, avoiding the need for additional spending on energy storage. **The overall cost to the buyer from generation and supply from community wind under this model are in line with current costs for purchasing grid electricity.[8] This means that purchasing electricity from new community wind projects would essentially be cost neutral for Trusts in terms of their energy costs per unit.**

Table 1 sets out the capacity, costs and returns of a proposed new community onshore wind project.

[5] http://www.cfrcic.co.uk/
[6] Including the two hospital sites that have been merged with the Trust recently.
[7] www.urbangridsolar.com/what-is-a-sleeved-ppa/
[8] The overall costs would be broadly equivalent to buying from the grid, as outlined in www.businesselectricityprices.org.uk/retail-versus-wholesale-prices/

Table 1: Economic model for community benefit fund from a new onshore wind project of 25MW[9]

Installed capacity	25 MW (5 - 10 turbines)	
Annual electricity generated	70,000 MWh	
Wholesale price paid by buyer	£50 per MWh	
Actual price paid by buyer, including supply costs	£120 - £150 per MWh	
Total development and build cost	£30million, funded by: 70% bank debt at 3% interest over 15 years and 30% crowd funding at 4% interest over 20 years	
Community fund income (in 2020 money)	**Over 25 years**	**Over 20 years**
	£12.5million	£4.55million
	(£50k per year from the outset increasing to £200k+ per year over 10 years)	
Average annual community fund income	£500,000	£230,000
Average annual community fund income per MW of installed capacity	£20,000	£9,000

As this table shows, the surplus income generated by the proposed wind project increases over the project's lifespan, with a significant increase over the final five years of the project's life. This is because the project is financed with debt with a lifespan of 15-20 years. As the project pays off its finance, the surplus income it is able to generate increases. After 20 years, the project's debt is paid off and its entire income, apart from the costs of running the turbines, becomes a surplus which can be directed into the community benefit pot to support local people's health.

[9] Numbers provided to three significant figures.

How the community wind company works

Commissioning electricity from a community wind project, in which all the surplus value is directed into projects to support local people, creates a community benefit funding pot which is considerably larger than that which can be created by commercial projects. Existing routes to market for new renewable energy projects, such as the Contracts for Difference (CfDs) system run by the government or corporate power purchase agreements (PPAs), have an important role to play in providing a route to market for new clean energy projects. However, for non-profit making anchor institutions such as NHS Trusts **the community benefit model would have the advantages of: providing tangible benefits for the local community; directing resources back towards the people the Trusts exist to serve; reducing future healthcare costs; and supporting Trusts' emissions reduction targets.**

The model proposed here would see the wind project owned by an asset-locked community interest company or community benefit society, meaning its assets could not be sold or transferred to a commercial owner.

A **community interest company (CIC)** is used by "social enterprises that want to use their profits and assets for the public good".[10] There is a defined community which will benefit from its activities, such as people living in a particular place.[11] While CICs are not charities, they aren't run for profit. CICs are "asset locked", meaning their assets must be used in a way which benefits the community[12] and can only be transferred to another organisation which serves the community.[13] A community benefit society is run entirely for the benefit of the community, and can also have an asset lock.[14] [15]

The project finance comes from a combination of bank finance and community investment with a capped return. This would mean that all surplus income after operating and finance costs would go towards the project's community purpose. An appropriate community governance structure would be required, such as volunteer directors and/or representatives of the NHS Trust. The enterprise would be professionally managed by a community energy organisation, with operation and maintenance carried out by commercial contractors. Over the first twenty years of the project commercial investors and community investors would be paid back their capital with interest. The community benefit structure requires all surpluses after operating and finance costs, reserves and tax to be used to support its community purpose.

It is likely that there would need to be a mechanism within the power purchase agreement to provide some flexibility on prices over time. While the longer term commitment of 25 years would be needed to secure finance, there would also be a need to ensure that the Trust and the wind project would not become locked into rates that were very out of step with

[10]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/641412/13-786-community-interest-companies-frequently-asked-questions.pdf
[11]https://makeanimpactcic.co.uk/2018/02/whats-the-difference-between-a-cic-and-a-social-enterprise/
[12]www.resourcecentre.org.uk/information/legal-structures-for-community-and-voluntary-groups/#cic
[13]https://makeanimpactcic.co.uk/2018/02/whats-the-difference-between-a-cic-and-a-social-enterprise/
[14]https://communityshares.org.uk/about-cooperative-and-community-benefit-societies
[15]https://communityshares.org.uk/resources/handbook/community-benefit-societies

market prices. With a bespoke structure for the benefit of the Trust and the community, contracts could include a provision for price trigger points to allow a renegotiation of prices per unit if market electricity costs were to fall or rise significantly.

Figure 2: This model of energy commissioning creates a virtuous circle of reduced emissions, support for communities and reduced healthcare needs & costs.

The healthcare costs of cold homes

Household energy inefficiencies and energy poverty lead to cold, damp indoor living environments. Living in a cold home is bad for people's health, with links to respiratory and circulatory problems as well as poorer mental health, particularly for children, older people and people with long-term health conditions.[16] This leads to increased healthcare costs which are borne by the NHS, for example due to an increased need for GP appointments, prescription medication or hospital care.

Many households suffering from energy poverty live in homes which are poorly insulated and inefficient to heat, leading to higher carbon emissions and increased negative impacts on the climate, as well as people's health.[17] **Increasing energy efficiency therefore both supports better health and helps to cut emissions to protect the climate.**[18] A study of the impacts of poor quality housing on healthcare costs in Wales found that upgrading homes could reduce hospital admissions for circulation and lung conditions by 39%,[19] and a programme to improve central heating in Scotland found improvements for 40% of people with respiratory, circulatory or rheumatic health conditions.[20]

Modelling the healthcare costs avoided by improving the energy efficiency of homes is complicated. The Department for Business, Energy and Industrial Strategy (BEIS) has calculated the health benefits linked to improving energy performance, but has not yet found it possible to produce a robust quantification of the healthcare costs which could be avoided by improving home energy efficiency, although it expects these costs would be "significant".[21] At this stage, we therefore use as an indication of these costs a simple average of the overall annual cost of fuel poverty to the NHS divided by the number of households experiencing fuel poverty.

[16] https://fingertips.phe.org.uk/documents/Fuel_poverty_health_inequalities.pdf
[17] www.instituteofhealthequity.org/resources-reports/the-health-impacts-of-cold-homes-and-fuel-poverty/the-health-impacts-of-cold-homes-and-fuel-poverty.pdf
[18] www.instituteofhealthequity.org/resources-reports/the-health-impacts-of-cold-homes-and-fuel-poverty/the-health-impacts-of-cold-homes-and-fuel-poverty.pdf
[19] https://phw.nhs.wales/news/poor-housing-costs-health-service-95m-per-year-new-report/
[20] https://phw.nhs.wales/files/housing-and-health-reports/a-case-for-investment-executive-summary/
[21] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/936660/improving-home-energy-performance-through-landers-impact-assessment.pdf

The healthcare cost to the NHS in England from the impacts of living in a cold home were an estimated £1.36 bn per year in 2011/12 prices.[22] In 2012, there were around 2.28 million households living in fuel poverty.[23] **We therefore estimate the average cost to the NHS due to the health impacts of fuel poverty as around £730 per impacted household per year in 2019 prices.**[24] This is a relatively crude indicator of the potential healthcare savings from tackling cold homes and energy poverty. To determine this with greater accuracy research would be needed to assess the healthcare needs over time of a group of households in energy poverty which received energy efficiency interventions, against a control group which did not.

It is likely that higher healthcare costs could be avoided for individuals impacted more heavily by the negative health effects of living in a cold home. For example, treating respiratory failure costs the NHS at least £3,000 per patient, while treating high blood pressure costs at least £2,000.[25] This suggests that there is potential to achieve significantly greater cost savings than the figure we use here, by targeting the most severely impacted people for support. Research by the International Energy Agency found that the health and well-being benefits provided by energy efficiency programmes can have a benefit-cost ratio of up to 4:1, of which health benefits make up 75%.

We focus on avoided healthcare costs, but the improvements in health from tackling cold homes can also be considered in terms of quality-adjusted life years (QALYs) gained. An evaluation of the Warm at Home programme by Sheffield Hallam University using this metric found that every £1 of funding distributed to vulnerable households produced almost £4 of health benefits.[26]

[22]www.ageuk.org.uk/Documents/EN-GB/For-professionals/Consumer-issues/reducing_fuel_poverty_report.pdf?
[23]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/319280/Fuel_Poverty_Report_Final.pdf
[24] www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator
[25]www.theguardian.com/society/ng-interactive/2016/feb/08/how-much-have-i-cost-the-nhs
[26]www4.shu.ac.uk/research/cresr/sites/shu.ac.uk/files/warm-safe-well-eval-warm-home-programme.pdf

The cost of improving cold homes

Various community energy or local government initiatives have demonstrated the benefits of providing advice and support to households living in fuel poverty.[27] Investing the community benefit pot from new onshore wind projects into an initiative to tackle cold homes could provide advice, materials and installation services to local people. The Warm Front Scheme, which closed in 2013, spent an average of £1,200 per household.[28] This scheme was viewed as being "an effective tool for tackling fuel poverty",[29] received high customer satisfaction ratings from people whose homes became warm and comfortable,[30] and led to reduced levels of anxiety and depression.[31] We therefore take this as a guide to the level of spending which is required to bring homes up to an acceptable standard of warmth and comfort. In 2019 prices, £1,200 per household is around £1,400.[32]

The support service funded by the community wind benefit pot could be run from a dedicated electric van with pop-up workshop facilities, to visit areas experiencing severe fuel poverty and associated health problems. Advice would be offered by dedicated professionals, with a holistic approach to solving some of the problems associated with fuel poverty.[33]

[27] www.cse.org.uk/projects/view/1337; https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/451025/DECC_FINAL.pdf

[28] www.cse.org.uk/downloads/reports-and-publications/fuel-poverty/Fuel_and_poverty_review_June2014.pdf

[29] https://sticerd.lse.ac.uk/dps/case/cr/CASEreport72.pdf

[30] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/200831/Warm_Front_Annual_Report_V2_11-12__2_.pdf
It should be noted that the measures delivered by the scheme at the time included gas boilers, which would not deliver low-carbon heating, but we use this average spend as a guide to the costs involved.

[31] www.cse.org.uk/downloads/reports-and-publications/fuel-poverty/Fuel_and_poverty_review_June2014.pdf

[32] www.bankofengland.co.uk/monetary-policy/inflation/inflation-calculator

[33] Following a service model successfully developed by Plymouth Energy Community (PEC)

Table 2 sets out some forms of low-cost support which could be provided by the service.

Table 2: Example forms of advice, installation and maintenance support which the service could provide.

Advisory	Installation	Maintenance
Advice on energy grants and discounts	Thermal curtains around windows and doors	Downpipes and guttering
Help with understanding household energy controls	Dehumidifiers	Internal pipes
Support with energy tariff switching	Water cylinder jackets	Roof tiles and flashing
Addressing energy debt issues	Radiator reflector panels	Failing doors and windows
Help with understanding air flow and moisture	Draught proofing	Air bricks and vents
Help with claiming qualifying welfare benefits		

Table 3 sets out an indicative set-up budget for the community benefit fund generated by years 4-6 of the project.

Table 3: Indicative budget for the community benefit fund in years 4-6.

Total budget	£400,000
Staffing	£100,000
Electric van	£15,000
Home improvements	£285,000

Tackling cold homes using the wind project community fund

With an average community benefit pot of £230,000 per year over 20 years, and a cost of £1,400 per household to tackle energy poverty, each year the fund could support around 160 households. With each household in fuel poverty costing the NHS £730 per year, one year of investment of the community benefit fund into tackling energy poverty would save around £120,000 per year for each Trust, £0.6m over five years or £1.2million over 10 years.

Looking at the full lifespan of the project over 25 years, the average community benefit pot of £500,000 per year would allow the fund to support around 360 households per year. **Over 25 years, each year of investment of the community benefit fund into tackling energy poverty would save an average of £260,000 per year of avoided healthcare costs for each Trust, £1.3m over five years or £2.6 million over the following 10 years.** At a price for electricity of 13p per kilowatt hour, the spend on electricity by the Trust over the project's 25 year lifespan would therefore bring a return over ten years in avoided healthcare costs of around 30p per pound. The potential exists to avoid higher healthcare costs by targeting support to those who are most vulnerable, or experiencing the greatest healthcare needs due to living in a cold, damp home.

Key findings

- Annual spend on electricity per NHS Trust from community wind generates **£2.6m** in avoided healthcare costs over ten years through tackling cold homes.
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Policy change needed to unlock benefits

This model demonstrates the significant benefits to local people and the health service which would accrue from NHS Trusts commissioning their electricity from new community wind projects. However, in 2015 the UK government stopped contracts for new onshore wind projects (and for new solar), and brought in planning restrictions that made it nearly impossible for new onshore wind projects to be considered, let alone approved, in England.

The announcement earlier in 2020 that onshore wind auctions (Contracts for Difference) would restart was welcome, but new onshore wind projects are still blocked in England due to planning restrictions which are more onerous than those for new fossil fuels projects. To cut emissions at the speed to tackle the climate crisis, the UK will need to use all the tools in the box. It does not make sense to rule out using a significant part of the UK's onshore wind resource - or to rely only on solar power to cut emissions from onshore electricity generation in England - rather than a balanced mix of solar and onshore wind able to provide a more reliable electricity supply.

Onshore wind is the cheapest way to generate electricity,[34] and remains very popular with support from around 4 out of 5 people in the UK.[35] We think communities across the UK should be able to choose whether they want onshore wind - and that there should be a route to market for renewable energy projects which aim to support and help their local community, as well as providing clean electricity. To enable onshore wind to power hospitals, cut carbon emissions and support action on the health impacts of energy poverty, we now need a planning system that genuinely allows communities to choose.

[34]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/911817/electricity-generation-cost-report-2020.pdf
[35]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/844940/BEIS_Public_Attitudes_Tracker_Wave_31_key_findings.pdf